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The Food Industry Heading Into

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Contents

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Economics Editor:
Lewrene Kay Glaser
(202) 786-3313

Managing Editor:
Juliana King
(202) 786-1494

Art Director:
Joan A. Van Chantfort

Editorial Staff:
Martha R. Evans
Tracy Fleck
Judith Foulke
Brenda Powell

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A New Look for Supermarket Produce Sections

Catherine Greene
(202) 786-1888

Health food stores, produce markets, and big-city food shops have traditionally carried unusual items like fresh-cut herbs, exotic fruits and vegetables, and organically grown produce. Now, however, many of these items can be found in America's major supermarkets. Specialty fruit and vegetable displays form a fundamental part of the new up-scale image of many produce sections. Supermarkets are expanding these sections in response to the growing demand for unusual items and to assure their customers the store has "everything."

Increased demand for specialty produce dovetails with the general increase in fruit and vegetable consumption in recent years. Americans consumed 427 pounds of fruits and vegetables per capita in 1987, a 12-percent rise since 1972, with much of the increase coming from fresh produce. Several reasons account for consumer interest in specialty items. Americans have become more health conscious, eating lots of fresh fruits and vegetables as part of a well-balanced diet. Consequently, we want a huge selection of produce. In addition, Americans are exposed to a greater variety of foods. We travel more frequently, finding new foods, and often wanting to prepare such items at home. Unusual fruits and vegetables are appearing on restaurant menus. Also influencing our diets are recent immigrants from the Caribbean, Central America, and Southeast Asia who have brought their native foods with them.

To address this growing interest, supermarkets are rushing to add colorful, delectable, and unusual items to their produce sections. A recent Food Marketing Institute survey showed that the number of items carried in produce

departments more than doubled to 150 between the mid-1970's and the early 1980's. Today, the total is over 250 items, including new packs and sizes of traditional fruits and vegetables as well as exotic and specialty produce.

Chain supermarkets lead in offering sections devoted to unusual produce and specialty items, according to *Progressive Grocer's* 1987 Home Testing Institute (HTI) survey. Only 29 percent of the independent supermarkets offered a gourmet section, while almost half of the chain supermarkets did so in 1987. Twenty-one percent of the independent supermarkets and 38 percent of the

chains had nutrition and health sections. Twenty-one percent of the independents and 67 percent of the chains provided floral sections, often as part of the produce area.

Consumer Awareness Varies

Consumers have tried, or at least seen, many of the new specialty fruits and vegetables, according to a 1987 nationwide survey conducted for *The Packer*. The survey revealed that the most frequently tried specialty fresh vegetables were alfalfa and bean sprouts (71 percent of the respondents), snow peas (58 percent), pearl onions (61 percent), parsnips (45 percent), leeks (37 percent), baby



Immigrants from the Caribbean, Central America, and Southeast Asia have introduced fruits and vegetables from their native lands.

The author is an agricultural economist with the Fruits, Vegetables, Sweeteners, and Tobacco Branch, Commodity Economics Division.

vegetables (34 percent), Chinese cabbage (32 percent), and shallots (32 percent). About one-third of the respondents had also seen or heard of less widely known specialty vegetables like Belgian endive, bok choy, celeriac, daikon (white radish), kohlrabi, parsley root, and sunchokes (Jerusalem artichoke).

The most frequently tried specialty fresh fruits were pomegranates (48 percent), persimmons (38 percent), kumquats (33 percent), quince (18 percent), and guavas (16 percent). However, at least one-third of the respondents had seen or heard of breadfruit, passion fruit, plantains, prickly (cactus) pear, and red bananas. Asian pears, carambolas (star fruit), cherimoyas, sapotes, radicchio, and rappini were nearly unknown.

Fresh herbs were in widespread use among the survey respondents. At least two-thirds had tried fresh chives, dill, garlic, mint, and parsley. Over half had tried fresh basil, oregano, and sage, and at least one-third had tried fresh ginger root, horseradish root, rosemary, tarragon, and thyme. Among the 16 fresh herbs examined, only cilantro (Chinese parsley) was unfamiliar to a majority of the respondents.

The survey revealed that consumers in the western United States were more likely to have tried specialty produce and fresh herbs. One contributing factor is the West's large Asian and Hispanic populations, with their interests in exotic produce. Also, California is the largest vegetable-producing State and likely raises the most specialties.

The survey also indicated that upper-income consumers ate more specialties. They may be better informed about the variety of produce available and better able to afford the premium prices that specialties sometimes command.

Specialty Supplies Soar

Although USDA does not survey acreage and production of specialty

vegetables, some State agencies do. Reports from Arizona, California, Florida, Hawaii, and Maryland indicate that harvested acreage of specialty vegetables has been increasing since 1981, sometimes dramatically (*table 1*). In Arizona, harvested acreage of bok

choy climbed steadily from 34 acres in 1981 to 136 acres in 1986, almost 300 percent. Arizona acreage of Boston and romaine lettuce rose by 168 and 288 percent, respectively.

California harvested acreage of Santa Claus, Casaba, and Crenshaw melons in-

Table 1. Only a Few States Report Fresh Specialty Vegetable Acreage

State and commodity	1981	1982	1983	1984	1985	1986
<i>Acres</i>						
Arizona						
Bok choy	34	49	43	71	93	136
Endive	93	87	67	79	84	72
Escarole	46	48	38	47	61	46
Boston lettuce	105	91	131	172	255	281
Romaine lettuce	279	259	490	755	794	1,083
Leaf lettuce	600	550	681	824	1,028	1,678
Parsley	158	146	144	135	131	114
California¹						
Santa Claus and Casaba melons	1,100	1,700	1,400	1,800	1,700	2,300
Crenshaw melon	900	950	1,200	1,400	1,400	1,500
Persian melon	450	500	450	400	550	600
Misc. vegetables ²	101,400	105,500	108,700	120,000	127,500	133,000
Florida						
Escarole and endive	6,200	5,300	5,600	5,700	5,700	5,500
Tropical vegetables ³	11,500	11,400	11,000	8,500	11,100	11,900
Hawaii						
Chinese cabbage	na	330	370	400	370	350
Daikon	na	180	190	200	260	260
Lotus root	na	35	35	30	35	35
Romaine lettuce	na	115	140	135	150	160
Watercress	na	25	30	35	35	30
Bitter melon	na	16	20	25	20	30
Oriental squash	na	35	40	50	35	30
Chinese peas	na	10	15	15	15	15
Taro	na	350	370	370	400	390

na = not available. ¹The California Agricultural Statistics Service compiles a County Commissioner Report, which reports acreage of specialty vegetables in detail, in addition to the State Summary. ²Includes artichokes, green lima beans for processing, cabbage, cucumbers, garlic, green onions, oriental vegetables, bell peppers, watermelons, and others. ³Includes boniato (sweet potato), calabaza (pumpkin), malanga (dasheen, jautia), and cassava (also called crantz, yucca, tapioca).

Source: State Agricultural Statistics Services, annual State summaries, selected States, various issues.

creased 90 percent between 1981 and 1986. Hawaiian oriental vegetable acreage expanded after 1982. Daikon, Chinese peas, and bitter melon acreage rose by 44, 50, and 87 percent, respectively. Harvested acreage of chili peppers in Maryland more than tripled from 1984 to 1986. In Florida, however, tropical vegetable acreage (primarily boniato, calabaza, and malanga) remained fairly constant.

Along with acreage increases, U.S. supplies of specialty vegetables have risen dramatically since the early 1980's, from both domestic and imported sources. Romaine, red and green leaf, and other fancy lettuce varieties make up the bulk of domestic specialty shipments, followed by greens (like swiss chard and arugula), escarole and endive, miscellaneous oriental vegetables, chili



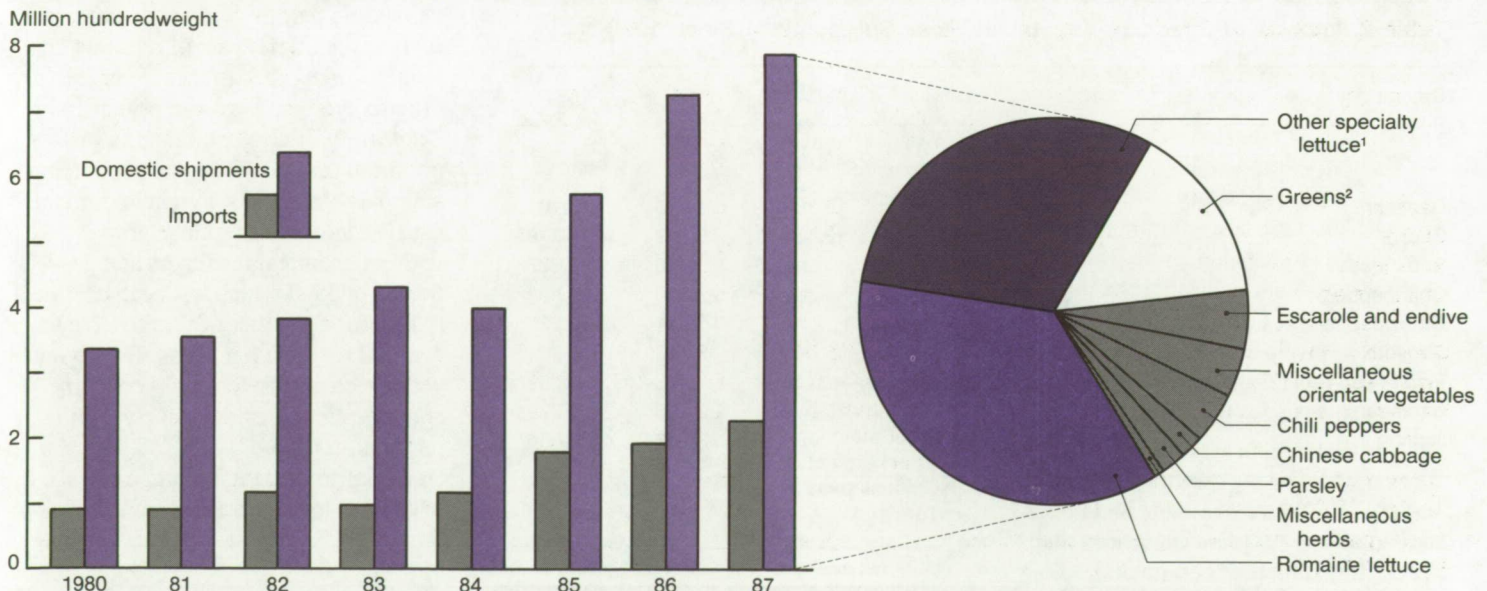
Specialties lend a new, upscale image to many produce sections.

peppers, Chinese cabbage, parsley, and miscellaneous herbs (figure 1).

While shipments of iceberg lettuce and tomatoes, major traditional vegetables, have been growing about 3 percent annually since 1980, specialties have skyrocketed. Domestic shipments of chili peppers grew 30 percent annually between 1980 and 1987. Tropical vegetable supplies (mostly imported) grew 28 percent during this period. Fancy lettuce (Boston and leaf) shipments gained 27 percent.

Although shipment information, which is collected by USDA's Market News Service, reflects only a sampling of supplies available from foreign or domestic sources, foreign trade statistics from the Bureau of the Census show that imports of specialty produce also support

Figure 1. U.S. Specialty Vegetable Supplies Are Increasing



¹Boston, bibb, red and green leaf lettuce. ²Includes arrugula, beet tops, borage, broccolirabe, cabbagesprouts, chicoria, collards, dandelion greens, field cress, hanover salad, kale, kohlrabi, mustard greens, rappini, sorrel, soup greens, swiss chard, and turnip greens.

Source: Catherine R. Greene and Shannon Reid Hamm, "Specialty Vegetables and Flowers: Alternatives for Small Growers," *Vegetables and Specialties Situation and Outlook Report*, TVS-244, ERS, USDA, February 1988.

the trend toward increasing consumption. Imports of dasheens, endive, snow peas, chili peppers, red and yellow Holland peppers, chayotes, fiddlehead ferns, and jicama have all increased since 1980 (table 2).

Supplies of specialty fruits have increased in a similar fashion in recent years, and kiwi fruit is perhaps the path-breaking item. They were first planted in the United States in 1967, and only 100 acres had been planted by 1970. However, by 1987, kiwi fruit was raised on nearly 8,700 acres in California by more than 1,200 growers and distributed by 45 fresh-market handlers. Kiwi fruit consumption has increased from 0.15 pounds per capita in 1983 to 0.28 pounds in 1987.

Marketing Specialties

Consumers and retailers agree on the importance of an interesting and attractive fresh produce department. In the

1987 HTI survey, customers rated a good produce department fourth in importance out of 44 supermarket characteristics, following cleanliness, complete price labeling, and low prices. It rated ahead of good meat and dairy departments, convenient store location, and frequent specials.

Retailers have focused on enhancing their produce departments as a way of enticing new customers and offsetting the recent decline in the percentage of consumers' income spent on food for home consumption. In the 1987 HTI survey, 97 percent of the supermarket chain executives polled said that the emphasis on perishables was growing. This emphasis was seen as the most important way to draw customers, and was ahead of other tactics, such as specials, cut-throat pricing, and television advertising.

Specialty produce displays glamorize not only the produce department, but the entire supermarket, and assure consumers

that exotic treats are available whenever they want them. However, ideas vary on how best to display these items. One technique is to cluster them into a separate section in the produce department. This emphasizes the great variety of specialties available. The other technique is to cross-merchandise them with high-value staples. Placing jicama next to lettuce for example, may suggest that both are salad ingredients.

Successful marketing depends on educating produce department employees and cashiers on the characteristics of these items. This allows them to answer questions and provide consumers with more information. Stores are experimenting with signs, videotapes, books on specialties, brochures, and recipes to increase customer awareness. Retailers also have to absorb the costs associated with the higher "shrink" or unsold produce that often occurs with specialties.

Challenges of Organic Retailing

Organically grown produce, also an expanding part of produce departments, involves a different set of retailing challenges. Like other specialty vegetables, organic produce is grown primarily in California. It also commands a price premium because of higher production and marketing costs. Organic produce is usually defined as produce grown without chemical fertilizers and pesticides on land which has been chemical-free for a number of years. Consumer demand for such items has risen in recent years because of increasing concern about pesticide residues in conventional production.

In California, total organic sales at the wholesale level increased from \$1 million in 1977 to \$50 million in 1987, and

Table 2. Imports of Specialty Vegetables Rose Substantially Since 1980

Commodity	1980	1982	1984	1986	1987
<i>Metric tons</i>					
Dasheens	12,574	17,424	19,366	21,898	18,101
Endive	1,126	1,498	2,554	3,268	3,378
Snow peas	na	na	na	5,746	7,687
Chili peppers	na	na	na	27,190	28,598
Other peppers	na	na	na	81,861	90,233
Chayote	2,373	3,953	5,047	5,657	5,701
Fiddlehead fern	34	28	33	48	52
Bamboo shoots	10,714	12,188	15,902	23,406	29,322
Jicama	2,335	6,207	7,782	8,495	8,886

na = not available.

Source: Catherine R. Greene and Shannon Reid Hamm, "Specialty Vegetables and Flowers: Alternatives for Small Growers."

there are now approximately 900 growers with 30,000 acres. Most of the organic produce is still sold through small retail outlets in this country, but organic wholesalers and shippers have begun to target supermarkets. For example, a Texas Department of Agriculture program to market and promote organic produce, begun in 1987, works with major retail chains as well as traditional organic foodstores. In California, an estimated 28 percent of all organic growers sell directly to the consumer.

The biggest challenge that supermarkets face is finding sufficient quantities and ensuring their organic status. Several States with organic producers, including Texas and Washington, have begun certification programs. These programs guarantee organic status by using some combination of routine inspections, approved soil amendment and pest control regulations, and record-keeping by growers.

Supermarket retailers display organic produce much like other specialty produce, using signs, other educational materials, and clustering items together.

Cashiers are usually educated on how to differentiate between organically and conventionally grown produce. In addition, separate water baths are used for each type. Another challenge for supermarkets is promoting organic items without implying that conventionally grown produce is less desirable.

Food as Fashion

America's growing interest in fresh produce has prompted a renaissance of farmers' markets during this decade. Some estimates of the number of currently operating farmers' markets and produce stands are as high as 20,000. However, the vast majority of produce is still sold through conventional supermarkets.

While pre-cut vegetables, microwave-ready produce, and other innovations are gaining popularity, it is exotic fruits and vegetables which have caused the most excitement. Produce managers are beginning to emphasize interesting, fashionable, and high-quality produce, rather than just aiming for volume sales of traditional items. The number of

specialty produce items available will continue to grow, but the array may change as some items become widely used and new ones are introduced. ■

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Freight Rates: Their Importance to Fresh Produce Prices

Richard Beilock, Nicholas Powers, and James MacDonald

(202) 786-1868

Americans eat more fresh produce today than ever before. Per capita consumption of fresh fruit alone rose to about 88 pounds in 1985 from 78 pounds in 1970, a 13-percent increase. Consumption of fresh, commercially grown vegetables increased 24 percent to 81 pounds per person during the same period.

The reasons behind these increases are many. In recent years, consumers have become more health conscious, turning to fresh produce as a way to cut calories, add variety, and improve nutrition. But another nonconsumer-oriented factor has also contributed to the increase of fresh produce consumption during the past several years—transportation.

The U.S. interstate highway system and refrigerated trucking provide the means of getting a wide variety of fresh, quality produce to consumers across the Nation in a timely and consistent fashion. Today, transportation plays a big role not only in what kinds of produce we eat, but also in how much we pay for them. In fact, transportation represents nearly one-third of the cost that retailers pay for delivered produce.

Trucking dominates the interstate produce transportation industry. Truck brokers help the industry set rates by monitoring rate changes and transmitting this information to shippers, carriers, and receivers (*see sidebar*).

Rates vary with a number of factors. Seasonally, they are highest during the late spring and early summer, when shipment volumes are greatest. They also vary with the type of produce and its

Truck Brokers

Receivers—wholesalers or grocery stores, for example—usually rely on truck brokers to arrange for hauling produce. Indeed, in 1985 and 1986, some 66 percent of the produce shipped from Florida by truck was arranged for by brokers. Receivers sometimes haul their own produce, but this arrangement accounted for only 7 percent of produce trucked out of the State during the same period. Twenty-four percent of the produce movements in 1985 and 1986 were arranged by receivers directly contacting carriers, or carriers on behalf of receivers directly contacting shippers. Other arrangements accounted for 3 percent.

The prevalence of truck brokers arranging transport reflects the value of information. Few receivers have the time, or expertise, to monitor carriers and their rate changes. Similarly, carriers find that market information can be costly to assemble. Therefore, brokers serve as a link among shippers, carriers, and receivers. Brokers usually charge a commission of 8 to 10 percent to coordinate transportation and provide administrative, information, safety, and bookkeeping services.

origin. For example, freight rates for sweet corn are often higher than those for green peppers. Because of the greater distance, rates from California to New York City are usually higher than those from Florida to New York City.

But why do transportation rates for fresh produce change? Why do they dif-

fer among commodities? What determines the rates? A recent USDA report based on a 1985-86 survey of over 3,000 motor carriers hauling produce out of Florida to national markets may provide some answers. Because Florida is the Nation's number two supplier of fresh produce, these findings probably apply to other major transport systems involved in shipping U.S. produce.

A Little Background

Most U.S. produce is grown in southern and western States, then shipped to the large markets of the Northeast and North Central United States and eastern Canada. Nearly 80 percent of the 1.32 million truckloads of produce shipped across State boundaries in 1984/85 came from Florida, Texas, and the far western States. (A truckload con-



Development of U.S. interstates and refrigerated trucking consumers.

Beilock is an associate professor at the University of Florida. Powers is an agricultural economist in the Food Marketing and Consumption Economics Branch, Commodity Economics Division. MacDonald, a former member of the Food Marketing and Consumption Economics Branch, is an associate professor at Rensselaer Polytechnic Institute.

tains approximately 43,000 pounds of fresh produce.)

Nationally, Florida accounted for 14 percent of interstate produce movements in 1985. While Florida provides the entire United States and Canada with produce, most of its deliveries are in the East. Only an estimated 9 percent of Florida's interstate produce shipments went to the West, including western Canada, while 20, 33, and 38 percent went to the Great Lake States, Southwest, and Northeast and eastern Canada, respectively. Overseas exports accounted for only 4 percent of Florida's produce shipments.

The variety of Florida's produce challenges the transportation industry. Demand for services, for example, varies by commodity. Service requirements are also more stringent for higher value and perishable commodities (*see sidebar*). Because of gas emissions as produce respire and different temperature require-

Shipping Fresh Produce

Because produce is highly perishable, shipping speed is extremely important. Therefore, the interstate transportation system for produce must respond rapidly to the changing needs of thousands of shippers and receivers. Shippers assemble and prepare the produce for shipping. Receivers are usually wholesalers, individual retail outlets, or major grocery store chains.

Good, timely service is a top priority for shipping produce because of its high value, fragility, and perishability. For highly perishable commodities, such as fresh strawberries and cherries, swift service is imperative. To avoid costly damage, most perishables require controlled tempera-

tures and humidity, and careful handling and transporting (no crushing and low vibration levels).

Reliability of pickup and delivery times are also important. Receivers at terminal markets, such as Hunts' Point in the Bronx, New York City, and the Jessup Market near Baltimore, Maryland, schedule deliveries to coincide with expected high prices and demand. As little as 1-hour's difference between scheduled and actual delivery times can result in lower returns to the shipper. For example, a shipper wants his lettuce to arrive slightly before 9:00 a.m., when a major grocery chain buys large quantities. Delays can also result in freight claims against the carrier.



g ensures the availability of fresh produce for

ments, some commodities cannot be transported with others, especially if the journey takes several days. For example, lettuce is not transported with fresh grapefruit.

The problems presented by the variety of commodities are further complicated by pronounced seasonal swings in the total amount of produce shipped from Florida. Produce shipments from Florida start near zero during late September or early October and build to around 5,000 truckloads per week by the first of the calendar year. Throughout January and early February, shipment levels drift downward, stabilizing at around 3,000

truckloads per week by the end of the second month. This volume remains essentially unchanged for almost 3 months, after which shipments rise abruptly in late April or early May—peaking at 7,000-9,000 truckloads per week by the end of May to mid-June. Thereafter, shipments fall to their summer level of fewer than 1,000 truckloads per week.

Differences among the commodities in their seasonal production and shipping cycles also play a role. During September and October, most shipments are of citrus. This dominance is progressively eroded, first by tomatoes, then by late

winter and spring crops, such as potatoes and watermelons.

The Trucking Industry

Produce is normally sold free on board (f.o.b.). This means that the receiver buys the produce at the point of origin and assumes responsibility for transportation at, or near, the point of production or packing. The receiver may be a buyer at a northern wholesale market, an individual retail outlet, or a major grocery chain. In 1985, trucks accounted for 94 percent of all produce transported from Florida. The remaining share was by rail.

Truck (motor) carriers can be divided into three groups:

- Owner/operators—small carriers with one to three vehicles, which are normally driven by the owners and are available for hire.
- For-hire fleets—carriers with fleets of vehicles and drivers that are available for hire. Hastings Trucking Company is an example of a for-hire fleet carrier operating out of Florida.
- Private carriers—carriers that primarily haul their own cargoes. National grocery chains, such as Safeway, transport some of their own produce.

Owner/operators, for-hire fleet carriers, and private carriers, respectively, accounted for 50, 37, and 13 percent of the produce carried by trucks out of Florida in 1985/86. Most of the refrigerated carriers surveyed specialized in produce shipping. On average, refrigerated carriers spent 69 percent of their operating time hauling produce. Only 7 percent of those surveyed hauled fresh produce less than 10 percent of the time.

Private carriers are the most likely to haul a load only one way. This means private carriers probably have higher per mile operating costs. Owner/operators or for-hire fleets can charge less because they can spread their fixed costs over more revenue-miles since they haul loads both inbound and outbound.

But trucking costs are affected by a multitude of factors. Most produce is hauled in refrigerated trailers. However, since refrigeration takes more energy, costs are slightly higher than for non-refrigerated hauls. Each stop to load or unload produce adds time and increases mileage, and therefore raises costs. How heavily the trailer is loaded also comes in to play, but as a rule, most truck capacity is used. Ninety-two percent of refrigerated tractor-trailers leaving Florida carried a load, suggesting an efficient produce transportation system.

How Transportation Rates Vary

Truck transportation rates have an obvious effect on retail prices. When truck rates change, so will the prices consumers pay for produce. The biggest factors affecting freight rates are: volume, commodity value and perishability, destination, distance, and trailer size.

In the 1985-86 study, drivers were surveyed at three agricultural inspection stations operated by the Florida Department of Agriculture and Consumer Services. This is what the statistical analysis of the data suggests:

- Per truckload freight charges increase with distance. However, the rate of increase slows as distances get longer. The per-mile increase in rates was \$1.08 to Atlanta, \$1.05 to St. Louis, \$1.01 to Denver, and 92 cents to Seattle. Such easing of per-mile freight charges reflect the

spreading out of fixed costs, such as searching for loads, over long distances.

- Rates vary for different regions. Loads from Florida bound for the Northeast and eastern Canada commanded higher rates than those bound for the Great Lakes States. Loads with destinations west of Florida received the lowest rates. Even when the distances traveled were equal, carriers hauling produce up the East Coast received \$94 more compensation per load than those hauling produce toward the Great Lakes States, and \$175 more than those hauling produce directly to the West.

These regional differences may reflect keener competition for certain routes and, hence, the lower rates for westward movements. For instance, 94 percent of the vehicles headed West or toward the Great Lakes States had loads when they entered Florida, while only 83 percent of the vehicles headed up the East Coast had loads inbound. Competition for outbound loads headed for the West and Lake States, consequently, would be expected to be more intense.

- Rates rise with trailer size. Truckload rates increased an estimated 18 cents per additional cubic foot of trailer capacity. Carriers with 48-foot (ft) by 8.5-ft trailers, the largest single trailers operating out of Florida, received an average of \$135 more per produce load than those with 40-ft by 8-ft trailers, the smallest single trailers commonly encountered.
- Cargo value and perishability also have an effect. Truckload charges were higher for more valuable and more perishable commodities. Shippers and receivers prefer high-quality transportation service, but some may be more willing to pay for it than others. For example, a load of

strawberries is generally more perishable, more susceptible to damage, and more expensive to transport than a load of grapefruit. Shippers and receivers, consequently, are more willing to pay a premium for quality transport of a strawberry load than for a grapefruit load. If transportation services are better for strawberries than for grapefruit, freight rates will likely be higher for the berries.

The average daily loss in value due to perishability is higher the greater the cargo's value and the shorter its shelf life. Consequently, higher average daily loss is associated with higher freight rates. The Florida survey indicates that for every additional \$1 in average daily loss in value due to perishability, freight rates rose an estimated 9 cents. For example, carriers received an average of \$17 more for a load of sweet corn than for a load of green peppers because of corn's greater perishability and value (figure 1). Likewise, carriers received about \$50 more, on average, for a load of beans or tomatoes than for a load of green peppers.

• Multiple pickups and drops add time and mileage. In the study, truckload rates rose an estimated \$50.30 per pickup and \$10.48 per drop. That rates were higher for pickups than drops was unex-

pected, since a drop often requires more time and distance.

• Rates follow seasonal cycles. The principal determinant of seasonal fluctuations in freight charges is the total volume of

produce shipped. In Florida during the May-June peak, freight rates were \$251 higher than in November, \$259 higher than in January, and \$224 higher than in March. The higher rates reflect the stronger demand for transportation during peak shipping periods.

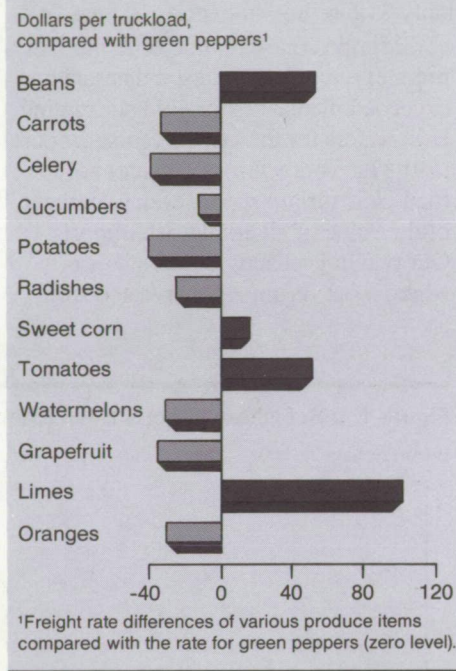
• Freight rates for produce are essentially unaffected by carrier type (owner/operator, for-hire fleet, or private carrier) or method of contracting for loads (broker, direct contact between shipper and carrier, or direct contact between receiver and carrier). This suggests that there was considerable competition among carriers and brokers.

This study helps explain why freight rates fluctuate. Such changes are important to consumers because transportation constitutes nearly one-third of the cost that retailers pay for delivered produce. Because retail prices tend to move with retailers' costs, consumers face higher prices for produce when costs for delivered produce rise. ■

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Richard Beilock, James MacDonald, and Nicholas Powers. *An Analysis of Produce Transportation: A Florida Case Study*, AER-597. ERS, USDA, in process.

Figure 1. Beans, Sweet Corn, Tomatoes, and Limes Cost More to Ship by Truck Than Green Peppers in 1985/86



Aquaculture: Meeting Fish and Seafood Demand

Dave Harvey
(202) 786-1885

The production of aquatic animals and plants in controlled environments is a centuries-old practice in parts of Asia. Now, aquaculture is spreading rapidly in the United States and other countries to supplement commercial fishing, which has been taxed by an ever-increasing demand for fish and seafood and a growing world population. Nations are being pressured to harvest lesser known species and to develop alternative sources of marine products.

The Food and Agriculture Organization of the United Nations projects that global demand for aquatic species could reach 114 million metric tons by the year 2000, compared with 92 million today. Ocean harvests are expected to meet only 94 million metric tons of the projected demand. Aquaculture could help bridge the gap.

Aquaculture already supplements the traditional ocean catch of shrimp. The worldwide catch has been stable at around 1.6 million metric tons for the last 10 years. Aquacultural production of shrimp, however, grew from 78,300 tons in 1982 to 216,000 tons in 1985. It could reach 490,000 tons by 1990, when it may account for between 20 and 25 percent of worldwide supply.

Fish and shellfish, the mainstay of many foreign diets, are becoming more important in American diets. In 1987, U.S. fish consumption was a record 15.4 pounds per capita and, if aquacultural products and recreational catch are included, an estimated 20.2 pounds, up 20 percent from 1980 and 30 percent above the 1970 level. Greater fish consumption in the United States probably reflects both diet and health concerns, as well as an increase in consumer incomes.

The author is an agricultural economist with the Fruits, Vegetables, Sweeteners, and Tobacco Branch, Commodity Economics Division.

Because the demand for aquatic foods has expanded while the traditional ocean catch has been steady, the United States has turned to other sources for its supply. In 1970, we imported about \$1 billion of fish products and exported just over \$300 million, for a trade deficit of \$700 million. By 1987, the trade deficit for edible fish products exceeded \$4 billion, with a record import level of \$5.7 billion and only \$1.6 billion in exports (*figure 1*).

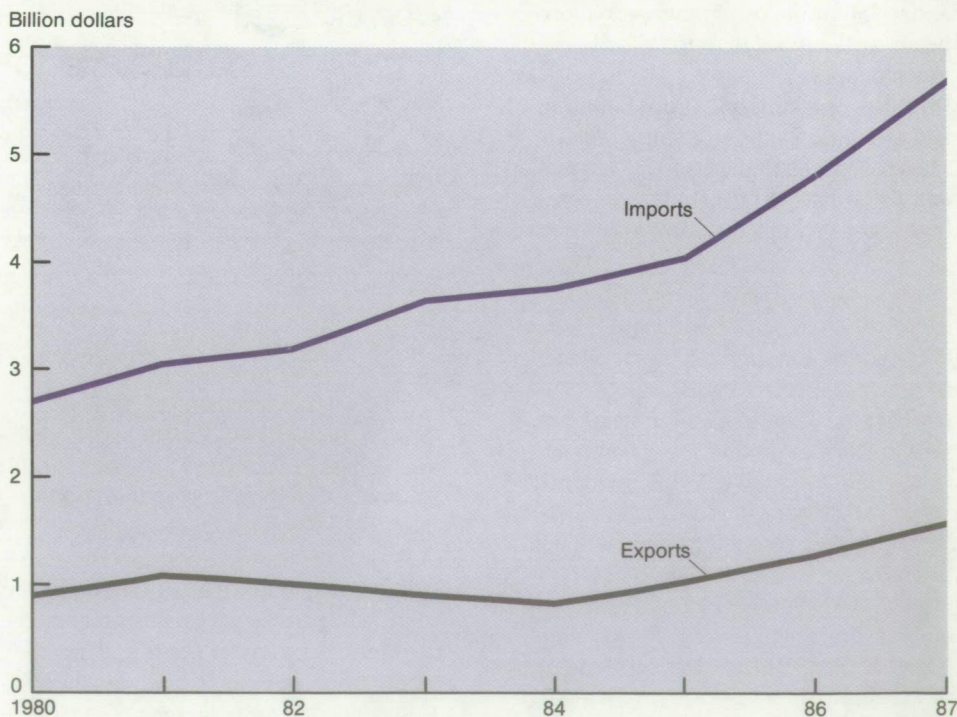
Shrimp is one example of rising fish product imports. Domestic demand has exceeded the harvest of wild shrimp in U.S. waters for the last 10 years. Imports in 1987 accounted for 67 percent of the total U.S. shrimp supply and 30 percent of the value of all edible fish imports. Our two largest sources are Mexico, where most shrimp are harvested from

the ocean, and Ecuador, where much of the shrimp are grown in ponds.

Domestic Aquaculture Production Rises Sharply

U.S. aquaculture is supplying more and more of the fish we eat. While still relatively small compared with other segments of U.S. agriculture, the industry is growing rapidly. Production of some species increased 300 percent between 1980 and 1987. Catfish rose from less than 80 million pounds in 1980 to over 345 million in 1987, and crawfish production, from less than 25 million pounds to approximately 100 million (*figure 2*). (U.S. aquaculture is concentrated in catfish, crawfish, salmon, and trout, which together accounted for about 90 percent of the estimated 750 million pounds

Figure 1. U.S. Fishery Imports Have Risen in Recent Years



produced in the United States in 1987 and about 90 percent of the \$600 million value.)

The potential for continued growth is just as strong. For example, catfish production has increased at an annual rate of slightly under 30 percent for the last 10 years. However, additional catfish operations are continually coming into production as farmers look for alternatives to traditional crops. Farm-raised salmon is also likely to increase as the U.S. market grows and the domestic ocean catch remains unchanged. According to Extension agents at Louisiana State University, crawfish production could also increase rapidly as demand expands beyond the traditional Louisiana market.

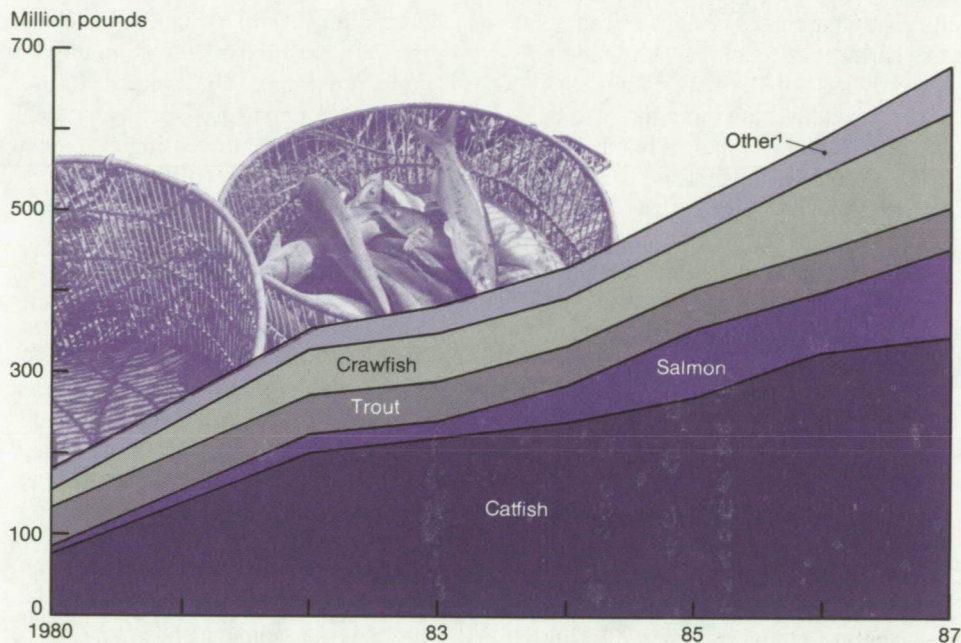
One factor involved in increased U.S. fish consumption is its image as a healthy food. Fish is thought of as being lower in calories than red meat. Furthermore, some evidence—not conclusive but promising—suggests that certain fish oils may help to reduce cholesterol levels.

The impact of greater fish consumption on other protein sources will largely depend on what species are in the greatest demand. Imports range from inexpensive frozen fish products to high-priced jumbo shrimp and smoked salmon. Domestic items also command a wide range of prices. There are some relatively inexpensive products, like carp and tilapia, and there are high-value products, such as fresh salmon, softshelled crawfish, and shrimp. Some of the cheaper products will compete with both imported fish and lower priced meat and poultry in grocery stores. More expensive items will also compete with their imported counterparts and with value-added poultry and other meats.

Developing Value-Added Products

The catfish industry is following the chicken industry's lead in developing brand names and product loyalties, rather than offering a generic item like beef and

Figure 2. Four Species Accounted for 90 Percent of Edible U.S. Aquaculture Production in 1987



¹Includes tilapia, carp, buffalo, sturgeon, mullet, abalone, and other species.
Source: USDA Office of Aquaculture.

pork. To develop brand loyalty, poultry processors have advertised on a firm-by-firm basis and have developed a large number of value-added products that are partially or fully prepared. The trout and salmon industries are also actively working on value-added products that promote their brand names.

There is a wide range of products needed by the foodservice industry, from the highest quality fresh products for expensive restaurants to prepared, portion-controlled items for less expensive outlets. For instance, gourmet restaurants may require fresh salmon or trout, while fast-food establishments could use a variety of species, depending on the price, in their fish sandwiches. Aquacultural products, such as catfish and trout, will compete with meats and especially poultry for menu space.

Increasing Prices Relative to Meats

Between 1980 and 1987, the average retail price for beef rose 8 percent, pork went up 42 percent, and chicken, 20 percent. Fishery product prices, on the other hand, rose much faster, 49 percent, with fresh fish and shellfish, up 71 percent, accounting for most of the increase. These increases were also much higher than the 27-percent overall rise in prices for food consumed at home.

These price changes occurred while the diets of many Americans were changing. Chicken overtook pork in 1987 and has been rapidly approaching beef as the most popular meat. Total fish consumption rose 20 percent between 1980 and 1987.

Some of fish's growing appeal is related to health issues and concerns about

the fat content of beef and pork. A second factor may be increasing disposable incomes, which would account for rising purchases of high-priced items like shrimp and salmon. Third may be the growing popularity of eating out. Fishery products are more likely to be eaten at restaurants than at home.

Aquaculture in the future could help to moderate increases in fish prices by supplementing the supplies from wild catch. However, in some cases, aquaculture will not compete with the harvest of the same species in the wild. For example, almost all of the catfish and trout we eat already comes from domestic aquaculture. Furthermore, salmon, the second largest import of edible seafood, is also our largest fish export. While much of what we ship overseas is ocean-caught Pacific salmon from the West Coast, most of what we import, especially to the East Coast, is farm-raised Atlantic salmon from Norway and the United Kingdom.

In some areas, aquaculture will allow the economic expansion of some industries that would be impossible otherwise. In terms of value, crawfish is the second largest aquaculture species in the United States. In the past, the market has been regional. However, with the increased popularity of cajun cooking, crawfish has expanded into markets beyond the Gulf Coast. The larger production will have to come from farm-grown crawfish as wild population levels are unlikely to change. An especially promising item is high-value softshell crawfish. Only the tail portion of regular crawfish, about 25 percent of the body, is edible. These crawfish may sell for between 40 and 90 cents a pound in season. Softshells, of which over 90 percent is edible, may sell for up to \$10 a pound.

Shrimp is the single most valuable fishery import, accounting for over \$1 bil-

lion in 1986. The harvest of wild shrimp in U.S. waters has remained basically stable for nearly 10 years, while the demand for shrimp has continued to grow. The result has been more imports and higher prices. The domestic farm-grown shrimp industry is still very small and is counting on increasing efficiency in production and breeding to be competitive against countries with much lower land and labor costs.

The Future for Aquaculture

Diversity may be one of the keys to growth in domestic aquaculture. For example, alligators are produced commercially in Florida and Louisiana, chiefly for their skins. Tilapia—a food fish native to Africa—is grown in such widely scattered locales as Florida, Louisiana, Idaho, and Arizona. Salmon is grown on both coasts, crawfish in Louisiana and Texas, shrimp in Texas and South Carolina, sturgeon in California, and shellfish along the Atlantic and Pacific Oceans. This diversity means that aquaculture will not be dependent on growing conditions in any one area or on demand for any one type of product (*see sidebar*).

Growing Nonedible Fish

Two segments of the aquacultural industry do not impact on food production. The baitfish industry, centered in Arkansas, used over 50,000 acres of ponds for production. Baitfish are sold throughout the country, with larger fish being used for ocean fishing. Smaller baitfish are also used as live food for tropical fish. The second segment, tropical fish production, is located mainly in Florida, with over 1,200 acres of ponds. In 1987, sales of tropical fish in Florida were estimated at \$21.7 million.

Although people associated with aquaculture are enthusiastic about its future, there is still much work to be done. Aquaculture faces many of the same problems as other agricultural industries. First, because of their lack of a long-term record of operation, many in the industry may have difficulty getting loans. In most areas, bankers are unfamiliar with fish farming. Because the products of aquaculture, the fish, often cannot easily be seen, a banker has no way of confirming the operator's record of the number of fish in the pond. Also, aquaculture is more capital intensive than many types of traditional farming. For example, construction costs for ponds are high, and the time it takes for fish to grow to maturity can be quite long, compared with traditional crops.

Second, large quantities of high-quality, uncontaminated water are needed. The amount varies with the type of operation. Raceways for trout or salmon need more water than ponds for catfish or tilapia. Also, the optimal water temperature depends on the type of fish. Trout and salmon need cool water, while catfish grow much better in warm water. In fact, catfish thrive in water as hot as 80 degrees Fahrenheit. The one constant is that the water must be free of contaminants. This may limit a farmer's ability to raise rice and crawfish or soybeans and crawfish as part of a crop rotation on the same land, or to convert land previously used for traditional crops. Aquaculturists also have to be aware of what chemicals may come from nearby land. The problem of water availability will probably grow as supplies come under increasing pressure from competing uses, such as other crops, housing, and industry.

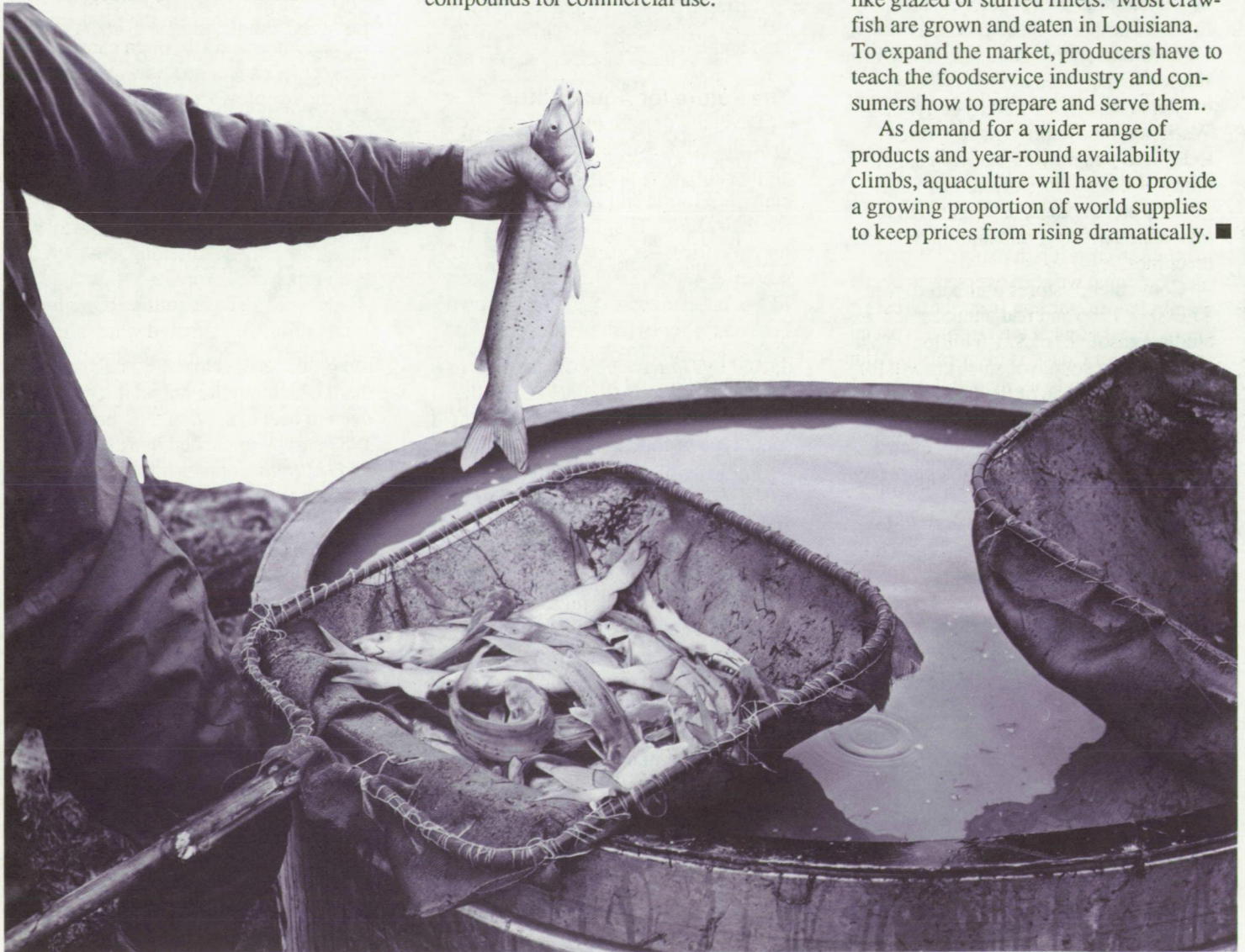
Third, many operations face the problem of predators. For the most part, birds are the chief culprits, but turtles,

snakes, and other animals are also pests. In many cases, the birds—like herons, ospreys, and cormorants—are protected by law, so little can be done about them. Producers have used a number of methods to scare birds away, but most efforts have only temporary success.

Fourth, as farmers try to increase the economic viability of their operations by raising yields per acre, the threat of disease expands. There are very few therapeutic compounds available for use in fish farming because aquaculture is not yet large enough to make it feasible for companies to develop and test new compounds for commercial use.

Last of all, some products have only a regional following. Take the catfish and crawfish industries. Catfish have long been popular in the South, but not in other areas of the country. However, catfish are gaining a wider market since the industry has stressed farm-raised, grain-fed fish and new value-added products, like glazed or stuffed fillets. Most crawfish are grown and eaten in Louisiana. To expand the market, producers have to teach the foodservice industry and consumers how to prepare and serve them.

As demand for a wider range of products and year-round availability climbs, aquaculture will have to provide a growing proportion of world supplies to keep prices from rising dramatically. ■



New catfish operations have increased as farmers look for alternative crops.

Take-Out Food in Convenience Stores

Charlene Price
(202) 786-1866

Convenience stores are already popular for their quick-service groceries, hot coffee, and cold beverages. Now they are slowly moving into the foodservice market to meet consumer demands for low-priced take-out foods, short checkout lines, and one-stop shopping.

These small grocery stores sell a limited number of basic foods, as well as high-volume, nonfood items. Some offer limited foodservice menus, often with customer seating as well as carryout. Walk into many convenience stores today and you may take advantage of many of the services offered by large grocery store chains, such as video rentals, check cashing, and automatic teller machines.

Convenience stores numbered over 47,000 in 1986 and had annual sales (excluding gasoline) of \$21.6 billion. Take-out food as a source of sales growth for these outlets is one of the most meaningful developments of the past few years. In 1968, take-out food was not even a product category in industry reports (see sidebar).

Rushed consumers have very little time to shop or wait in long lines. They want convenience. These stores offer just that. Many are in the neighborhood or right around the corner from the office, and many stay open 24-hours a day, long after most other grocery stores and fast-food places close.

In addition to groceries and hot and cold drinks, customers can pick up a variety of foods, from fresh entrees to just-baked sweet rolls, donuts, cakes, and pies in many stores. A 1988 survey con-

Take-Out Food Sales

In 1986, America's foodservice establishments sold \$177 billion worth of meals and snacks, excluding alcoholic beverages, up 5.4 percent from 1985. Grocery store services were the big gainers. Rapid growth in this sector reflects the increasing popularity of take-out products at supermarkets and the rise of foodservice in convenience stores.

According to the Food Marketing Institute's 1987 report on the take-out food market, about 8 out of 10 households bought take-out food at some time during a 4-week period. Consumers spent an es-

timated \$62.4 billion on take-out foods that year.

The report, based on interviews taken in January and February 1987, indicates that about 64 percent of consumers' take-out food dollars was spent in restaurants. Forty-one percent of that went to fast-food, ethnic, and other restaurants and 23 percent to pizza parlors. Foodstores accounted for the remaining 36 percent of the take-out food dollar. Supermarkets held 23 percent of that share, while other foodstores, independent delicatessens, convenience stores, small grocery stores, and gourmet stores took 13 percent.

ducted by *Convenience Store News* of convenience store retailers across the country found that most stores provided some type of foodservice.

For example, virtually all chain stores offered fresh beverages, while half of the independent stores served fountain soda, and two-thirds served fruit juices or fresh coffee. Convenience store gasoline chains tended to offer more packaged sandwiches, while traditional chains sold sandwiches made with fresh deli meats along with fresh salads, such as coleslaw and potato salad. Gasoline chains also served more hot dogs, while more traditional outlets, like 7-Eleven and Circle K, sold more chicken, hamburgers, pizza, and soups. Dispenser ice cream and popcorn were more prevalent among non-gasoline chains. Mexican food was served at less than half of all store locations.

Although many stores prepare some of their own foods individually, others

use products developed especially for them which require only a microwave oven to heat to serving temperature. In a 1987 survey published in *Restaurants and Institutions* magazine, 19 percent of the firms responding indicated they use a central commissary to prepare sandwiches, baked goods, and chicken for distribution to individual units. Eighty-seven percent of all respondents prepared some items on the premises.

Food preparation in the store may require additional equipment and labor, which in many instances may not be cost effective. According to *Convenience Store News*, equipment costs for a fried chicken program can run from \$10,000 to \$18,000 per store, depending on interior modifications. The \$10,000 buys the necessary ventilation system. The higher figure adds a sink, a vapor holding oven, and kitchen walls.

Some convenience stores in high-traffic areas provide salad bars. Some salad

The author is an agricultural economist with the Food Marketing and Consumption Economics Branch, Commodity Economics Division.

bars are stand-alone islands, while others are part of larger foodservice centers. Items range from a few salad ingredients supplementing a meal from the deli or grill to a full array. Salad is usually sold at \$1.99 to \$2.49 a pound, and the bar generally operates at a gross profit margin of 50 to 70 percent.

Market Share for Take-Out Foods

Many convenience stores are making take-out food their primary marketing thrust. Though other product categories hold a larger share of sales, take-out foods are the fastest growing (*table 1*). According to the National Association of Convenience Stores, take-out food increased its share of the convenience store market 62 percent between 1983 and 1986, while traditional foods decreased. In 1986, take-out foods equaled 14.4 percent of total (nongasoline) sales in the industry. Analysts project that take-out food will soon account for 25 percent of the industry's annual merchandise sales.

Although fountain drinks led the way in convenience take-out food sales in 1986, their gain was at the expense of packaged soft drinks. Fountain drinks accounted for 3.6 percent of food sales, up from 2.1 percent in 1983. Deli services, excluding sandwiches, were also in the lead in 1986, accounting for 3.3 percent of total sales. Hot beverages almost doubled from 1.4 percent in 1983 to 2.7 percent in 1986.

Convenience store prices generally tend to be higher than those in supermarkets. However, these outlets can offer some take-out foods at lower prices than their fast-food counterparts because they operate on a self-service principle. For example, at Stop-N-Go stores in California, Florida, Georgia, Nevada, Tennessee, and Texas, two hot dogs with toppings ranging from chopped onions to hot chili sell for \$1.49, while at Super America outlets, headquartered in

Bloomington, Minnesota, two hamburgers sell for \$1.19.

Take-out foods typically generate gross profits in the range of 45 to 55 percent, compared with averages of 30 to 40 percent for other items. For instance, the gross margin on a grilled hamburger is about 50 percent, versus 30 percent for one pack of cigarettes. This profitability

encourages many operators to invest in food merchandising equipment.

Take-Out Offerings

Southland Corporation, the largest convenience store operator in the country with more than 7,600 units, has pioneered the sale of take-out foods. Their menu includes hot and freshly

Table 1. Take-Out Food Sales Grew 62 Percent During 1983-86

Category	Percent of nongasoline sales			
	1983	1984	1985	1986
Traditional items	91.1	90.3	86.9	85.6
Beer	14.6	13.7	13.9	13.7
Soft drinks	11.8	11.3	10.2	10.3
Juices	0.9	0.8	1.0	1.4
Milk and milk products	6.9	6.9	6.6	5.9
Packaged deli items	1.1	1.3	1.2	0.8
Produce	0.3	0.4	0.4	0.6
Eggs	0.3	0.4	0.4	0.3
Frozen food	0.6	0.7	0.7	0.7
Ice cream	1.5	1.6	1.6	1.4
Ice	1.0	0.9	0.9	1.0
Bread and cakes	4.2	4.0	3.5	3.3
Cookies	0.8	0.8	0.8	0.9
Salty snacks	3.5	3.8	3.7	3.9
Candy and gum	4.9	4.9	4.9	4.9
Groceries	9.2	9.0	5.9	5.6
Health and beauty aids	3.4	3.3	3.4	3.0
Tobacco	17.6	18.1	17.8	19.8
Publications	4.0	4.0	5.4	3.7
Wine and liquor	1.1	1.3	1.3	1.4
Automotive/motor oil	1.0	0.8	0.7	0.9
General merchandise	2.4	2.3	2.6	2.1
Take-out foods	8.9	9.7	13.1	14.4
Fresh sandwiches	1.4	1.7	1.7	1.3
Frozen sandwiches	0.9	1.2	1.4	1.3
Deli services ¹	2.0	1.3	3.0	3.3
Food cooked on-site	0.3	0.2	0.3	0.4
Fountain drinks	2.1	2.4	2.6	3.6
Frozen beverages	0.2	0.5	0.9	0.9
Hot beverages	1.4	1.2	1.6	2.7
Other fast food	0.6	1.2	1.6	0.9
Total nongasoline sales	100.0	100.0	100.0	100.0

¹Excludes sandwiches.

Source: National Association of Convenience Stores Annual Report, 1987.

baked goods, including cheese-steak sandwiches, french fries, potato sticks, and macaroni and potato salads. The company's outlets, primarily 7-Elevens, also offer a variety of breakfast items, such as sausage and egg sandwiches on biscuits and fresh-baked pastries. Prices range from \$3.19 for a freshly made sandwich to 39 cents for a fresh-baked donut.

Southland has recently introduced several new concepts in its convenience stores. In Richmond, Virginia, a 7-Eleven fast-food grill called "The Works" offers consumers burgers and hot dogs with a choice of 15 condiments, including mayonnaise, lettuce, and grated cheese. The 7-Eleven Express store is a smaller, high-volume, gasoline outlet that also emphasizes take-out foods—fresh-made deli sandwiches, salads, and hot dogs, as well as self-service beverages.

Circle K Corporation, the second largest convenience store operator in the country, offers its customers a core menu of 15 fresh sandwiches, including breakfast sandwiches featuring eggs, sausage or ham, and cheese on a sesame seed bun. In addition, individual outlets in each State may provide a variety of "elective" menu items.

Convenience stores also gear the food they offer to the tastes of the region, area, or neighborhood where they are located. West Coast 7-Elevens serve hot sandwiches, while Southeastern stores offer fried okra, and stores in Illinois offer polish sausages. Circle K units offer 10 types of burritos in the Southwest, a Cuban sandwich in Florida, and a beef barbecue sandwich in Texas.

Another new feature is in-store seating. According to a Cahners Bureau of Foodservice Research survey, at least some convenience stores offer patrons a place to sit while they eat. Small chains



Convenience stores are moving into foodservice to meet consumer demand for low-priced take-out food.

(operating 26-500 stores) are more likely than larger chains to include a sit-down dining area. One-fourth of all convenience stores lacking in-store seating say they plan to add some.

Teaming Up With Fast-Food Restaurants

Some convenience store firms have formed joint ventures with well-known, fast-food companies to gain expertise in food preparation, sanitation, and other aspects of running this type of operation. The arrangements also allow convenience stores to benefit from the reputation of the fast-food chains. The fast-food companies gain by expanding without substantial capital investment.

Southland Corporation has formed an agreement with Hardee's Food Systems, the fourth largest burger chain, to sell hamburgers and breakfast products at a number of 7-Elevens. Southland also entered into a similar venture with Church's Fried Chicken, Inc., and teamed up with Winchell's Donut Houses, Dunkin Donut, and Mr. Donut.

In 1987, The Pizza Chain agreed to open scaled-down (250 sq ft) operations called "Pizza Inn Express" in Circle K stores to sell take-out and home-delivered pizzas. Circle K has another test going with Hooker Enterprises, an operator of small, drive-thru hamburger stands. Two fixed units featuring burgers, fries, soft drinks, and shakes have opened at Circle K locations in Phoenix, Arizona. The fast-food stands lease space in the convenience store's parking lot. Mobile units offering similar service also operate in the area.

White Castle System, Inc., has come up with a slightly different twist in joint ventures. They freeze and package their hamburgers for distribution to convenience stores and supermarkets. According to results of the Cahners survey published in *Restaurants and Institutions*, 13.1 percent of the convenience store chains without fast-food joint ventures in 1987 planned to have them in the future.

Not All Roses

Although convenience stores are doing well with sales compared with alternative fast-food sources, their share of the market remains quite small. According to a Gallup Poll of consumer attitudes, "Most consumers still view convenience stores as a good source for snacks and breakfast and do not perceive the total fast-food concept." In addition, the Food Marketing Institute's 1987 sur-

vey on the take-out food market reported that when people were asked to name places that come to mind when they think of take-out food, only 7 percent mentioned convenience stores. This suggests that many consumers do not associate take-out foodservice with these outlets.

Some stores are aiming to change that awareness problem. Southland Corporation, for example, is using 30-second television commercials to promote 7-Eleven as the place "Where Good Things Come Easy." The commercials air in 41 States. Wawa, Inc., a convenience store chain based in Wawa, Pennsylvania, and Atlantic Richfield's AM/PM mini markets also use television to promote their take-out foods.

Attracting upscale customers has been a problem for convenience stores. Many outlets are experimenting with various services like automated bank teller machines, post office boxes, video games, and video rentals. At some stores, customers can also pick up airline tickets, drop off laundry, and purchase freshly cut flowers, in addition to selecting from an expanded line of grocery products and gasoline services. Many outlets are being remodeled and cleaned to make them more attractive to affluent customers and grocery shoppers in general.

The industry faces other problems as well. For example, will customers accept the taste and texture of more and more microwave-heated products? Adding foodservice equipment can be expensive, and in many cases could place these firms under "restaurant" codes, which would require the addition of public restrooms. Limited space and storage, particularly for frozen foods, is another hindrance.

Future Trends

Even with these concerns, the future looks bright. As convenience stores continue to grow in number, take-out foods as a percentage of their overall product mix will expand. *Convenience Store News* predicts that foodservice will become the biggest single source of sales and profits, accounting for about 25 percent of nongasoline sales. Although a few outlets already offer pizza, hot deli sandwiches, and turnovers, many others are planning to sell them in the future. More bakery products will be offered, and as more food manufacturers come up with better products requiring limited labor and equipment, more prepared and microwave foods will be offered. Fresh deli departments may be in 75 percent of all convenience stores by the year 2000.

Beyond the prepared foods categories, other innovations might include improved and more flexible product packaging. Additional services might include expanded video sections, car washes, pay phones, laundry, and dry cleaning. Non-food items, like greeting cards and paperback books, may be offered.

Foodservice distributors and wholesalers are already tailoring their products and services to help convenience store operators capture more of the foodservice dollar. These firms assess individual store needs and opportunities and make recommendations on items that are likely to be profitable. Many wholesalers set up accounts to provide equipment and training to make the new endeavors successful. These foodservice specialists also train employees in food handling and preparation, salad bar maintenance, meat case setup, and inventory rotation.

Joint ventures are likely to increase as more oil companies get into the marketplace. A 1987 survey of con-

venience store executives published in *Convenience Store News* indicated that convenience stores and fast-food chains may share land with other service-oriented businesses, resulting in "convenience centers" that comprise a variety of businesses, such as convenience stores, fast-food restaurants, dry cleaners, and car washes. ■

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Labor Costs in Food Marketing

Howard Elitzak
(202) 786-1870

One out of every nine workers earns a paycheck from firms engaged in processing and distributing food after it leaves the farm, making the food industry the Nation's largest employer. Most foods must be cleaned, graded, packed, processed, priced, and stocked on shelves. These services combined make labor the largest expense in putting food on American tables.

In 1987, labor costs accounted for 34 percent of total consumer food expenditures, compared with 25 percent received by the farmers. These costs consist of wages, salaries, employee benefits, and imputed earnings of unpaid family workers. They relate only to workers in four industry segments—processing, wholesaling, retailing, and foodservice establishments—that engage in marketing domestically produced farm foods. Indirect labor costs, like those associated with intercity transportation and the manufacture of supplies (such as packaging materials), are included elsewhere in the marketing bill (*figure 1*).

Labor costs of firms that process and distribute foods grown on U.S. farms rose 5.2 percent in 1987, the smallest increase of the last 20 years. Most of the rise was due to employment growth. And while the foodservice segment is the largest employer (accounting for 53 percent of food industry workers in 1987), the major developments which limited the increase in labor costs occurred in the second largest segment, retailing. That sector employed 26 percent of all food industry workers (*table 1*).

Employment Growth

Food industry employment grew 36 percent from 1977 to 1987. Of the four segments, retail foodstores and foodser-

vice experienced the largest increases, 40.5 and 51.8 percent, respectively. A number of factors contributed to this growth.

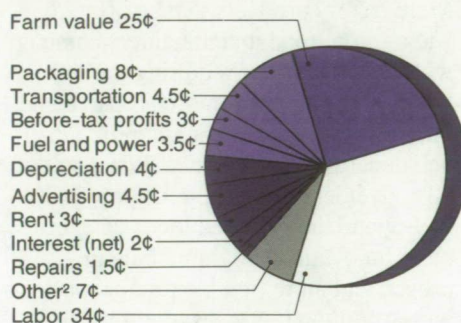
The most important one was the greater demand for convenience, which has grown with the increase in single households and two-income families. As

consumers demanded more "one-stop shopping," grocery and convenience stores enlarged their outlets, expanded their operating hours, and offered greater product diversity. For example, supermarkets now offer in-store bakeries, delicatessens, salad bars, and check-cashing facilities. All of these developments have increased the need for employees. New supermarket formats, such as superstores, combination stores, and superwarehouse stores, also need additional staffing.

The same factors increased foodservice employment. Fast-food sales accounted for 48 percent of commercial eating place business in 1986. Labor costs have been held down by the minimum wage often paid to fast-food employees. The high incidence of part-time workers who are paid entry-level wages—or less, if they receive tips—and the lack of collective bargaining for wages and benefits resulted in lower costs per worker than in the other segments of the food industry.

In 1987, real retail food sales (adjusted for inflation) grew only 1.2 per-

Figure 1. Labor is the Largest Component of the Consumer Food Dollar¹



¹Preliminary 1987 data. ²Includes property taxes and insurance, accounting and professional services, promotion, bad debt, and miscellaneous items.

Table 1. Foodservice Accounts for Most Food Industry Employment

Year	Manufac- turing	Wholesaling	Food retailing	Food- service	Total
<i>Thousands</i>					
1977	1,711.0	611.7	2,106.3	3,948.6	8,377.6
1978	1,724.1	635.3	2,198.9	4,277.2	8,835.5
1979	1,732.5	648.1	2,296.8	4,513.1	9,190.5
1980	1,708.0	655.3	2,383.6	4,625.8	9,372.7
1981	1,671.1	667.7	2,448.4	4,749.5	9,536.7
1982	1,635.9	666.9	2,477.6	4,831.2	9,611.6
1983	1,614.8	682.4	2,556.2	5,041.8	9,895.2
1984	1,612.2	707.2	2,637.1	5,388.0	10,344.5
1985	1,602.5	734.8	2,775.4	5,709.2	10,821.9
1986	1,616.9	757.0	2,872.9	5,878.8	11,125.6
1987	1,636.1	764.9	2,959.1	5,993.6	11,353.7

Source: *Employment and Earnings*, Bureau of Labor Statistics.

The author is an agricultural economist with the Food Marketing and Consumption Economics Branch, Commodity Economics Division.

cent. With sales growth slowing and employment levels up, food retailers have tried to cut costs. Faced with competition from low-cost warehouse stores, wholesale clubs, and non-union independents, retailers have pressed for wage and benefit concessions from their employees.

Wage Developments

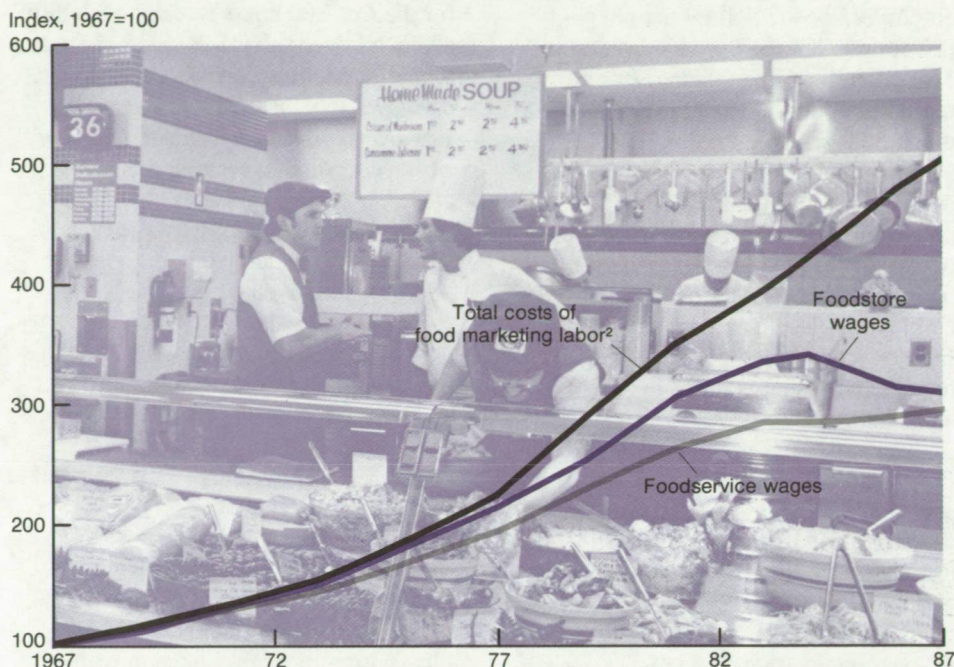
During the last few years, food retailers have demanded across-the-board wage cuts to reduce labor costs. Unprofitable stores were closed and others were scheduled to close in the absence of significant wage concessions. Unionized stores have closed in some regions because they have found it difficult to compete with stores paying lower wages to non-union employees. For example, Kroger shut down stores in the Midwest and South after failing to win wage concessions.

Management's willingness to close unprofitable operations in the absence of significant wage and benefit concessions by employees has resulted in the lowest number of strikes since World War II. A record low of 46 major work stoppages in all industries, including food retailing, occurred in 1987, making it the sixth consecutive year with fewer than 100 major strikes. In comparison, all but 4 years from 1947 to 1981 had between 200 and 400 major strikes.

Retailers have generally succeeded in reducing labor costs. After 1982, average annual increases in hourly earnings began to slow (*figure 2*). Changes in foodstore wages dropped from a 5.4-percent increase in 1982 to a 1.6-percent decrease in 1987 (*table 2*).

In 1987, 188,000 food retailing workers were covered by major contracts that were subject to negotiation. Rising total labor costs, coupled with a limited ability to raise product prices, prompted

Figure 2. Wages Are Moderating, But Labor Costs Are Still Rising¹



¹1987 preliminary. ²Includes employee wages or salaries and their health and welfare benefits, and imputed earnings of proprietors, partners, and family workers not receiving remuneration.

Table 2. Average Hourly Earnings for Food Retailing Workers Have Fallen Since 1984

Year	Manufacturing	Wholesaling	Food retailing	Foodservice
Dollars				
1977	5.37	5.43	4.78	2.93
1978	5.80	5.92	5.24	3.22
1979	6.27	6.39	5.67	3.45
1980	6.85	6.96	6.24	3.69
1981	7.44	7.57	6.85	3.95
1982	7.92	8.25	7.22	4.09
1983	8.20	8.70	7.52	4.27
1984	8.39	9.03	7.64	4.26
1985	8.57	9.22	7.35	4.33
1986	8.74	9.30	7.06	4.35
1987	8.92	9.52	6.95	4.41

Source: *Employment and Earnings*, Bureau of Labor Statistics.

union negotiators and management to jointly seek ways to preserve jobs while holding down wage and benefit costs. Several methods have been used.

Two-tiered wage contracts. These provide lower wages and benefits to workers hired after a specified date than those paid to workers already on the job. Different work rules may also apply to each tier. For example, new hires may be assigned multiple tasks and may not receive overtime pay on Sundays, while more senior employees would not be affected. Some two-tiered systems are temporary, so that pay and benefit differentials may eventually be eliminated.

In other cases, the systems are being altered by regularly scheduled collective bargaining talks. Regardless, both

management and workers complain about reduced productivity because employees on the bottom tier are paid less for performing the same work. Moreover, lower paid employees are now more numerous and, consequently, wield more clout with their union representatives. Therefore, union negotiators are trying to eliminate two-tiered provisions. The most common method of phasing this system out is to award larger pay increases to lower paid employees over an extended period. Employees on the upper tier often receive lump-sum bonuses in lieu of wage increases.

Part-time workers. According to *Progressive Grocer* magazine, part-time employment in retailing accounted for 61 percent of foodstore employees in 1987. Retailers are using part-timers more often to operate stores that stay open for long hours.

Part-time workers lower labor costs in several ways. They are paid less and receive fewer benefits than full-time employees. Part-timers also cut labor costs by reducing overtime work by full-timers.

It has been suggested that the use of part-time employees effectively constitutes a two-tiered system, with part-time and temporary workers making up the lower tier. The popularity of hiring part-time employees will grow as employers find they can lower costs by maintaining a relatively lean labor base which can be augmented by temporary workers during busy periods. In response, unions are encouraging management to hire full-time workers by establishing a two-tiered system of employer contributions to health benefit programs. In one agreement cited by

Progressive Grocer, employers contributed to health plans at a higher rate for the first 100 hours worked in a month and at a lower rate thereafter. Under this scenario, one full-time worker costs the employer less than two part-timers. However, it is unlikely that this plan will be widely adopted because the savings are offset by higher wages paid to full-time employees. (Hourly wage rates increase at an accelerated pace the more hours an employee works.)

Furthermore, because many experienced part-timers take full-time jobs when they are available, more turnover and pressure to raise part-time wage rates may result.

Lump-sum payments. Two-thirds of foodstore workers covered by 1987 wage settlements received lump-sum payments, which serve as incentive payments and compensate for freezes, cuts, and foregone wage increases. These payments are sometimes linked to firm profits or earnings. They reduce the magnitude of wage adjustments in three ways. First, they do not affect employee benefits that are tied to the wage rate, so benefit costs are reduced. Second, they hold down the wage rate base that serves as the foundation of subsequent negotiated wages. Third, because the wage rate base is used in subsequent negotiations, the lump-sum payments eliminate the compounding effects of future wage increases.

Foodstore wage settlements in 1987 provide a good example of how lump-sum payments can hold labor costs in check. The average wage increase for contracts with lump-sum payments came to 1.1 percent over the life of the contract. Without a lump sum, the average increase was 2.6 percent. These payments have figured prominently in 1988 bargaining sessions. Forty percent of all

workers involved in collective bargaining this year currently have lump-sum provisions in their contracts.

Profit-sharing plans. These were developed in response to competition from non-union stores. Often called gain-sharing plans, they provide profit-sharing or bonus incentives for improved employee performance (measured by the decline in labor costs as a percent of store sales). The savings are distributed as a bonus if labor costs fall below a specified level. However, workers may be required to take a substantial pay cut (or a base pay freeze) in return for these incentive plans.

Employee stock ownership plans. Firms purchase stock using a percentage of their profits, and then divide it among workers whose service has exceeded a certain number of hours. According to *Progressive Grocer*, 75 percent of these plans have been developed in the last 5 years, and their use may increase by 75 percent over the next few years. Their effectiveness has been attributed to their ability to reward improved worker productivity. Management can also use these plans to cut labor costs during slow business periods, because less stock is purchased when profits are low.

Cost-of-living adjustments (COLA's). COLA's are generally tied to movements in the Consumer Price Index. In the recent past, high inflation and the desire of employees to maintain income parity made COLA's a prominent component of labor contracts. Lower inflation rates have reduced the importance of COLA's over the last few years. Moreover, COLA's have been suspended or eliminated in many negotiated settle-

ments in return for features like lump-sum payments.

Backloaded contracts. These contracts have become prevalent since 1983. They provide lower wage increases in the first year of a contract, relative to subsequent years. Prior to 1983, more contracts were frontloaded, which means the largest wage increase occurred in the first year. Backloaded contracts are much more prevalent in food retailing than in most other segments of the economy. Indeed, 1987 contracts increased wages an average of just 0.5 percent for the first year and 1.6 percent in the remaining years. These figures, the lowest on record for foodstore workers, can be compared with averages of 2.2 and 2.1 percent, respectively, for wage settlements in the aggregate economy.

Backloaded contracts dampen wage increases in two ways. First, negotiated contracts have recently resulted in historically low wage increases, and in many cases, wage freezes or reductions. Second, subsequent increases are smaller because of the lower initial wage in the contract's first year. In contrast, the higher initial wage of a frontloaded contract compounds the amount of the increase after the first year, thus leading to higher labor costs compared with a backloaded contract.

Unions are beginning to demand restoration of certain provisions they had previously conceded. Therefore, frontloaded contracts are again likely to become common. This could magnify the effects of any wage increases adopted through collective bargaining agreements. However, backloaded contracts will remain an important factor in restraining labor costs through 1990, since most contracts are typically negotiated for 3-year periods.

Benefit reductions. Employee benefits were an increasingly important

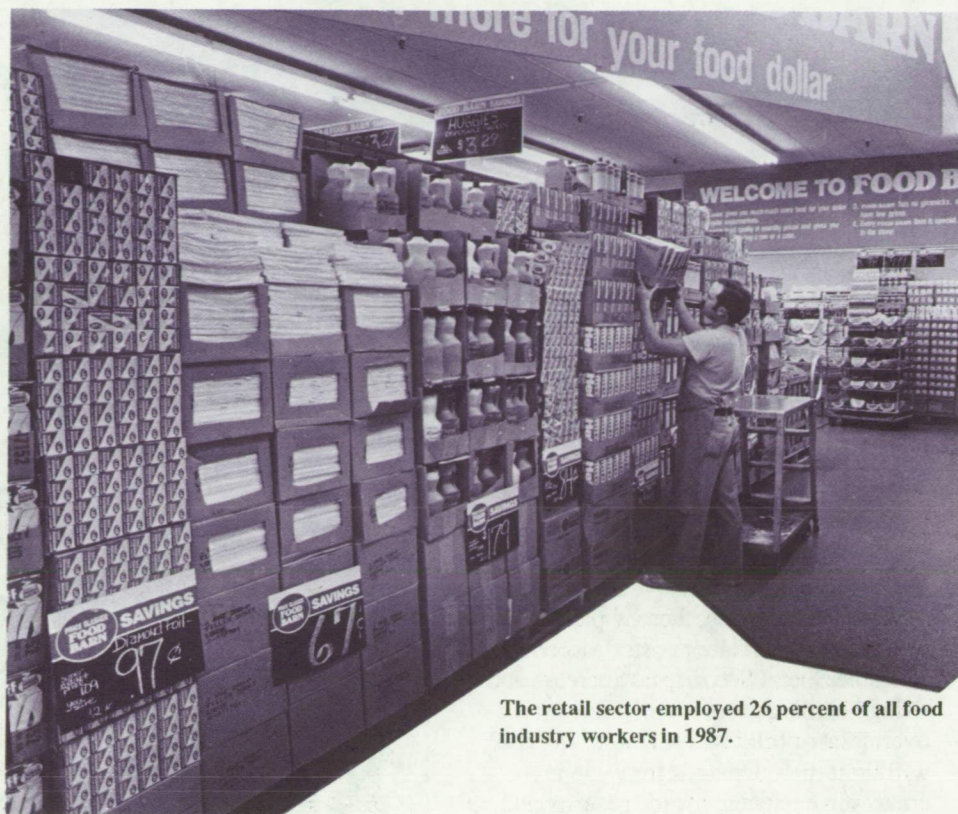
form of compensation from 1977 to 1987. Data from Cornell University's *Operating Results of Food Chains* indicate that employee benefits made up 20 percent of retail labor costs in 1977, and as much as 25 percent in 1987. However, by last year, their growth had slowed to about the same rate that wages and salaries grew, according to Commerce Department data. In recent contract negotiations, employees have been required to pay a larger share of the benefit costs.

Union bargaining activity can potentially lead to increases in benefit costs paid by management through changes in provisions affecting health insurance, retirement plans, and paid vacation time.

Management-worker relations. Some new concepts in management-worker relations have emerged over the last few years. "The Quality of Work Life" program in A&P's Super Fresh stores is one of the more prominent examples. Profit-sharing is often an integral part of

such programs. In addition, labor and management hold regular meetings to discuss ways of raising productivity and store sales, thereby increasing the probability of employee bonuses. Workers are often encouraged to solve on-the-job problems. Such plans have also been used as bargaining chips to remove work rules, like those affecting part-time help and scheduling changes, that may have impinged on management's ability to run an efficient operation.

Demographic trends. Shortages of entry-level employees continue to plague food retailers and foodservice operators, particularly in suburban areas with low unemployment rates. Management has had difficulty attracting workers to these low-paying jobs. Consequently, some fast-food chains have offered starting pay as high as 75 percent above the minimum wage to attract employees. Many employers are looking for senior citizens and retirees to fill the labor gap. Persons over 55 may account for one-fourth of



The retail sector employed 26 percent of all food industry workers in 1987.

the foodservice workforce during the next 25 years.

What's Ahead

Most contracts negotiated in 1987 will remain in effect through 1990 and will hold down labor cost increases. However, costs will accelerate in the future, since fewer negotiated contracts this year will be backloaded or contain two-tiered wage scales. Lump-sum payments are likely to increase, thereby placing upward pressure on labor costs. Moreover, a sizable Social Security tax increase and rising health care costs will augment the overall labor bill. Nevertheless, workers will limit their demands for wage increases in exchange for job security and moderate cost-of-living increases.

Management will continue to benefit from the wage restructuring of the last few years. Wage increases will frequently be calculated on a reduced base. Moreover, higher productivity should result from the phasing out of two-tiered wage scales. Labor costs of union and non-union companies will likely increase in a similar pattern. Non-union labor costs are often based on union wage patterns and the availability of entry-level workers.

The Bureau of Labor Statistics projects that the number of persons aged 16 to 24—a major source of labor for the food retail and foodservice segments—will decrease by 2.7 million workers between 1984 and 1990, while approximately 1 million new jobs will be created. The projected labor shortage should drive up entry-level wages.



Labor costs accounted for 34 percent of total consumer food expenditures in 1987. Photo: Giant Food, Inc.

As many of these developments suggest, the trend toward relatively small labor cost increases has bottomed out and the net effect will be larger labor cost hikes during the next year or two. ■

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Food Processing and Beverage Industries: Moving Toward Concentration

Wyn Francis and Mindy Petrusis
(202) 786-1525

Agricultural processing and beverage industries provide the link between farmers and consumers, where wheat becomes a loaf of bread or a croissant and milk becomes packaged cheese or ice cream. In this way, food processors actually define much of what is available to consumers. Although the agricultural processing industries represent a broad spectrum of products, all are manufacturers turning raw agricultural inputs into a constantly expanding array of new products.

Economic swings tend to have powerful effects on the food processing and beverage sector because aggregate demand rises slowly, primarily with population increases. Therefore, with little opportunity for dramatic growth, the cost side of the picture—labor, energy, interest and exchange rates, and inflation—takes on greater-than-normal importance. In this context, the mid-1980's were turbulent times for agricultural processors.

The U.S. Economy and Food Processing

Between 1975 and 1984, the U.S. economy experienced a number of major shocks. Hardest hit were manufacturing and agricultural-related industries. During the second half of the 1970's, the economy, still reeling from the effects of the first energy crisis, was hit by another. At the same time, inflation and interest rates exploded, foreign competition seemed to dominate many of our most important manufacturing industries, and the dollar hit post-World War II lows against most major currencies. Agriculture, however, thrived. The low exchange rates and high inflation helped exports and fueled the dramatic expansion in U.S. agricultural productive capacity.

Then, in the first half of the 1980's, the United States experienced two recessions and one economic boom. The rapid economic shifts were accompanied by dramatic increases in the value of the dollar, lower interest rates (though real interest rates remained high), and unprecedented increases in the Federal budget and trade deficits. These events had further corrosive effects on manufacturing, while putting agriculture into an economic tailspin, as prices of commodities and land dropped precipitously. Recently, some gains in agriculture and manufacturing have been made, especially as dollar exchange rates have once again plummeted.

As with the rest of the U.S. economy, the agricultural processing and beverage sector underwent restructuring between 1975 and 1984. Faced with increasing costs—especially for labor, raw products, and energy in the late 1970's—and rapid changes in consumer tastes and purchasing patterns, food processing industries increased automation and aggressively pursued mergers and acquisitions. For example, Pillsbury Co. purchased Green Giant Co. in 1979, Haagen-Dazs (ice cream manufacturing and retailing) in 1983, and Van De Kamp frozen seafood in 1984.

The net result over the 10 years was that employment in agricultural processing industries fell by a little over 2 percent and the number of business establishments dropped almost 13 percent. Underlying these numbers are two significant trends—an ongoing concentration of establishments and a shifting of employment patterns within the food processing and beverage sector.

Food and related product manufacturing—the bakery industry and meat packing, for example—plays an important role in the U.S. food and fiber system. This group of manufacturers is the principal buyer of farm production and the major supplier of food and beverage

products to retailers and consumers. In 1984, food processors shipped \$300 billion worth of products and accounted for 7.6 percent of the national income originating in manufacturing and 6.7 percent of the total manufacturing employment. In 1986, food manufacturers actually ranked first in sales among all manufacturers, including automobiles and steel.

The sector is also known for its diversity. There are 47 food and beverage manufacturing industries, which employed 1.4 million workers in 1984 in some 21,160 establishments. These businesses range from meat packing and processing plants to canneries, distilleries, bakeries, and even ice manufacturers. Another indication of diversity, as well as competition for consumer spending, is the number of new products introduced. In 1977, 1,791 new products were brought to market by these industries. By 1984, the number had risen to 1,988. New products virtually exploded in 1985 and 1986 with 2,206 and 2,500 entries. However, just seven industries (bread and related products, meat packing plants, bottled and canned soft drinks, poultry dressing plants, miscellaneous food preparations, fluid milk, and sausage and other prepared meats) accounted for more than half of total employment and just under half of the establishments in the food processing and beverage sector.

Industry Location

In 1984, most food processing was located in metropolitan areas. Some 14,490 establishments employed about one million workers. Slightly more than half of these urban jobs and establishments were in large cities—metro

The authors are economists with the Farm and Rural Economy Branch, Agriculture and Rural Economy Division.

areas with populations exceeding one million (*table 1*). An additional one-third were located in medium-size metro areas with populations between 250,000 and 999,999. The rest of the metro employment and establishments, some 17 percent, were found in small metropolitan areas.

Only five industries accounted for 44 percent of the sector's total metro employment: bread and related products (146,000 employees), bottled and canned soft drinks (93,000), meat packing plants (72,000), miscellaneous food preparations (71,000), and fluid milk processing (60,000). Surprisingly, these industries also accounted for 44 percent of food processing jobs in each of the three types of metro areas.

While most of the sector's employment and establishments were concentrated in metropolitan counties, nearly 30 percent were located in rural America in 1984. At that time, nonmetropolitan counties accounted for 6,670 food processing establishments providing jobs to some 406,000 persons. More than half of these businesses and jobs were in the less urbanized areas—counties with urban populations between 2,500 and 19,999. Urbanized nonmetro counties, with urban populations of at least 20,000, accounted for an additional 33 percent of the establishments and 37 percent of the employment. Totally rural counties, however, had only 10 percent of the sector's nonmetro establishments and 7 percent of the employment.

Poultry dressing plants and meat packing plants dominate food processing employment in rural America. In 1984, these industries provided 69,000 and 62,000 rural jobs, respectively. The third largest employer in rural areas, makers of frozen fruit and vegetable products, was far behind, accounting for 21,000

Table 1. In 1984, Most Food Processing Was Located in Metropolitan Areas

Area	Employment		Establishments	
	Thousand	Percent	Number	Percent
Metropolitan¹	1,010	71.3	14,490	68.5
Large	515	36.4	7,730	36.5
Medium	321	22.6	4,530	21.4
Small	174	12.3	2,230	10.6
Nonmetropolitan²	406	28.7	6,670	31.5
Urbanized	152	10.7	2,190	10.3
Less urbanized	226	16.0	3,800	18.0
Rural	28	2.0	680	3.2
Total	1,416	100.0	21,160	100.0

¹Metropolitan areas are defined in terms of total population: over one million—large; 250,000 to 999,999—medium; and less than 250,000—small. ²Nonmetropolitan areas are defined in terms of urbanized population: at least 20,000 in a county—urbanized; 2,500 to 19,999 less—urbanized; and no urban population—rural.

Source: *County Business Patterns*, Bureau of the Census, Department of Commerce.

workers. More than half of all employment in poultry dressing plants is concentrated in the South, while over half of the meat packing employment and establishments are in the Midwest and Texas. The majority of frozen fruit and vegetable employment and establishments are predictably located on the West Coast and in Florida.

Industry Concentration Is Increasing

Over the past several decades, the structure of the U.S. food processing sector has changed dramatically. Faced with slow growth in consumer demand, increased prices for farm products, energy, labor, and packaging, and narrow profit margins, food and beverage processors have been consolidating.

The Commerce Department's 1983 *U.S. Industrial Outlook* estimated that a

record 700 mergers and acquisitions had taken place in 1982. Of the top 200 food processing firms in 1975, ranked according to estimated U.S. food shipments, about one out of five had been bought by the summer of 1984. Besides Pillsbury's purchases, General Foods Corp. bought Oscar Mayer and Co. in 1981 and Entenmann's Bakeries in 1982. Beatrice Foods Co., ranked third in 1975, acquired Esmark, the top food processor that year, in 1984 for \$2.9 billion. Between 1972 and 1982, the number of food and beverage firms declined by 19 percent to about 19,000. The number of establishments dropped 13 percent from 24,290 in 1975 to 21,160 in 1984.

Consolidation was widespread throughout the sector, both in metropolitan and rural areas. Between 1975 and 1984, the number of establishments dropped in seven of the nine

major industries (table 2). Only the sugar and confectionery products industry and the miscellaneous food and related products industry—making frozen packaged fish, roasted coffee, and manufactured ice, for example—grew in the number of establishments. But these increases were quite small, less than 1 percent and 6 percent, respectively. In contrast, the dairy products industry (primarily fluid milk processing) lost almost 30 percent of its number.

Nonmetro areas were the hardest hit. Almost one out of five rural establishments closed during the 1975-84 period, compared with one in ten in metro areas. Closure rates were especially high, 30 percent or more, for nonmetro dairy product, bakery, and beverage firms. Closures in these industries, and in preserved fruit and vegetable, grain mill, and fats and oil products, exceeded the rates found in metro areas.

These closure rates point to a pattern of heavier consolidation in rural areas. In large metropolitan areas, closure rates averaged about 8 percent between 1975 and 1984 (table 3). In medium and small metro areas, these rates increased to 12.6 and 13.2 percent. Nonmetro areas continued the trend, but the rates jumped to 16.9 percent in urbanized nonmetro areas, 18.6 percent in less urbanized areas, and 19.5 percent in totally rural areas.

Employment Shifts

Consolidation in the food processing and beverage sector appears to have been accompanied by a shift in employment to less populated areas. For the United States as a whole, employment in the sector decreased 2.2 percent during the 1975-84 period, a loss of 32,000 jobs. This overall loss, however, masks clearly divergent trends in metro and nonmetro

Table 2. The Number of Food Processing Establishments Declined Between 1975 and 1984

Industry	Metro areas		Nonmetro areas	
	Employment	Establishments	Employment	Establishments
<i>Percent change 1975-84</i>				
Meat	-11.6	-15.2	29.0	-12.1
Dairy	-17.8	-25.4	-11.0	-36.8
Preserved fruits and vegetables	-5.9	-5.5	7.6	-14.0
Grain mill	-9.7	-4.8	-3.8	-8.1
Bakery	-4.4	-6.2	0.9	-34.4
Sugar and confectionery	-4.5	0.2	2.8	1.4
Fats and oils	-19.7	-13.6	-12.3	-17.2
Beverages	-4.5	-17.7	-1.6	-29.6
Miscellaneous food and related products	12.5	5.8	18.8	5.2
Total	-6.4	-10.2	9.9	-18.1

Source: *County Business Patterns*, Bureau of the Census, Department of Commerce.

Table 3. Employment in Nonmetro Areas Has Grown

Area	Change between 1975 and 1984			
	Employment		Establishments	
	Thousand	Percent	Number	Percent
Metro areas¹				
Large	-69	-6.4	-1,650	-10.2
Medium	-54	-9.5	-660	-7.9
Small	-13	-3.9	-650	-12.6
	-2	-0.8	-340	-13.2
Nonmetropolitan²				
Urbanized	37	9.9	-1,480	-18.1
Less urbanized	4	2.6	-450	-16.9
Rural	30	15.0	-870	-18.6
	3	12.4	-160	-19.5
Total	-32	-2.2	-3,130	-12.9

¹Metropolitan areas are defined in terms of total population: over one million—large; 250,000 to 999,999—medium; less than 250,000—small. ²Nonmetropolitan areas are defined in terms of urbanized population: at least 20,000 in a county—urbanized; 2,500 to 19,999—less urbanized; no urban population—rural.

Source: *County Business Patterns*, Bureau of the Census, Department of Commerce.

economies. Metro employment exhibited a definite downward trend, with the loss of 69,000 jobs—a decline of 6.4 percent for the period. On the other hand, nonmetro employment gained 37,000 jobs—a growth of 9.9 percent.

Employment changes among the different metro and nonmetro areas during the period was the complete opposite of their consolidation trends. The number of jobs fell 9.5 percent in large metropolitan areas, 3.9 percent in medium-size, and 0.8 percent in small metro areas. In nonmetro counties between 1975 and 1984, jobs increased substantially in more sparsely settled areas—from 2.6 percent in urbanized nonmetro areas to 15.0 percent in less urbanized areas and 12.4 percent in totally rural areas.

Given the economic difficulties experienced by rural areas in general, and by manufacturing in particular, it is somewhat surprising to see how employment grew in those areas between 1975 and 1984. Twenty-six of the 47 industries composing the food processing and beverage sector expanded in nonmetro areas. In contrast, metro areas had only 18 industries with positive growth. The meat packing industry, a leading employer in the sector, lost about 32,300 jobs in metro areas and 4,300 in urbanized nonmetro counties, due in part to closings by packers with high labor costs and outdated plants and machinery. On the other hand, in less urbanized rural areas, employment in meat packing plants increased by 11,300. The poultry dressing industry has experienced dramatic growth in the last decade, but most of the expansion also occurred in less urbanized rural areas where almost 16,100 jobs were added. In metro and

the other nonmetro areas, this expansion was more modest—7,800 and 5,400 jobs, respectively.

Changes Among Regions

The Northeast, by far the most densely populated part of the country, was the only region to experience drops in both metro and nonmetro food processing employment during 1975-84. Shifts in employment occurred not only between metro and nonmetro areas but also between regions, as nonmetro jobs in more densely populated areas shifted to areas with still fewer people. For example, food processing employment in metropolitan areas fell in three of the four U.S. Census regions (Northeast, Midwest, and South), but increased in nonmetro areas in three of the four regions (Midwest, South, and West) (*figure 1*). It seems unlikely that firms

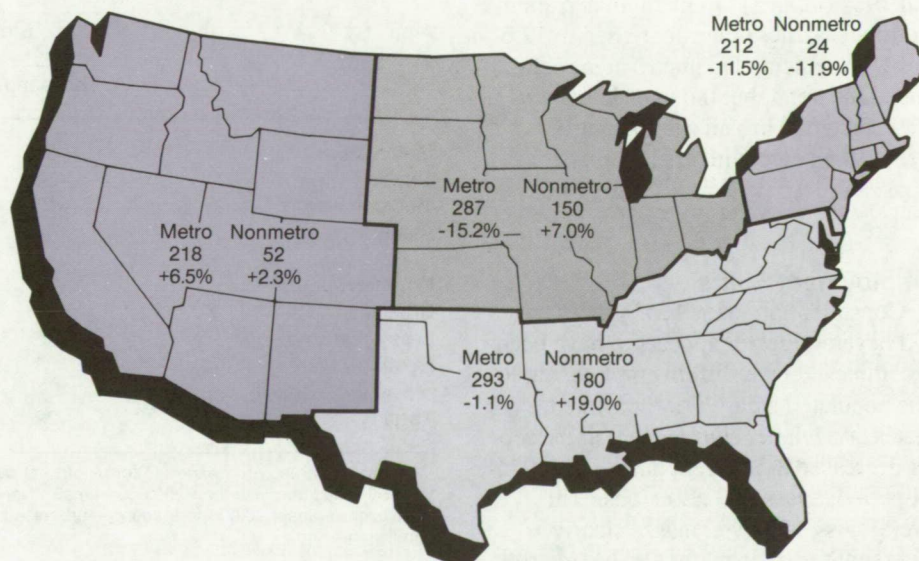
leaving a particular metro area would all have relocated in the same region.

These data conform with the demographic shift for the period from the so-called rust belt (industrial States of the Midwest and the East) to the South and West. It also shows that the South and West have gained the most new food processing jobs—25,400 and 14,500.

Along with the drop in employment, the Northeast had the greatest rate of decline in food processing establishments. The Midwest, however, sustained the heaviest losses in actual establishment numbers. The South also experienced heavy losses. Only in the West did the number of establishments increase, but only in metro areas (*figure 2*). Given the very high closure rates for nonmetro establishments, in combination with a moderate increase in nonmetro food processing employment, the trend

Figure 1. The South and West Gained Food Processing Jobs

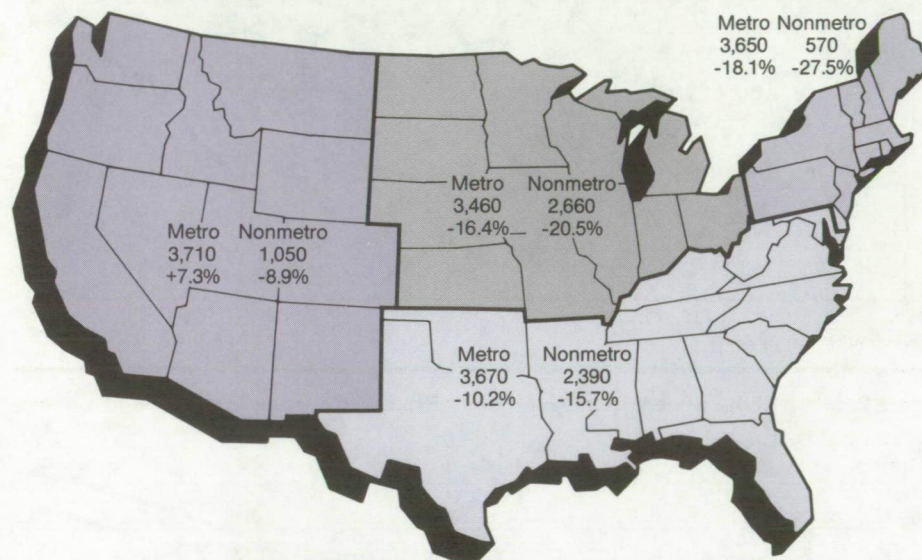
Thousand workers in 1984
Percent change from 1975



Source: *County Business Patterns*, Bureau of the Census, Department of Commerce.

Figure 2. The Northeast Experienced the Greatest Percentage Decline in Food Processing Establishments

Number of establishments in 1984
Percent change from 1975



Source: *County Business Patterns*, Bureau of the Census, Department of Commerce.

toward industry concentration would seem particularly pronounced in rural America.

Looking To the Future

Demand for food and related products over the next decade is expected to rise about 0.9 percent per year, the same growth rate as the general population. Because the demand for food and beverages is increasing slowly and consumer tastes are changing rapidly, food sector mergers will likely continue. With acquisitions, mergers, and improved efficiency and productivity through automation, no great employment increases are expected within the sector.

It is difficult to say whether the metro-nonmetro or regional shifts in employ-

ment between 1975 and 1984 will continue. Given the data available, it is not fully clear why changes in employment growth were so different between nonmetro and metro areas, or between regions. And while the impetus for mergers and acquisitions is more apparent, the reasons for the dramatic variations in metro-nonmetro industry concentration are less clear.

Lower transportation costs from farm to factory and cheaper labor seem a prime incentive for companies to favor rural areas. These factors were especially important in the 1970's when labor, energy, and transportation expenses climbed rapidly. With those costs lower or increasing at much slower rates throughout the 1980's, rural areas may look forward to long-term employment gains, though possibly at reduced rates

due to slower projected national economic growth.

Rural employment may benefit from the continuing consumer trend away from red meats to poultry and other meat products. Poultry dressing plants, the largest source of food processing employment in nonmetro areas, will be major beneficiaries of this shift. Also, while overall meat packing industry employment may continue to decline, recent trends indicate that rural areas seem capable of at least sustaining, if not increasing, employment in this second most important nonmetro food processing industry.

Two other factors are likely to have significant and sustained impacts on the agricultural processing and beverage sector. Rapidly changing consumer tastes and an increasing array of new products will feed off each other, and probably continue sector volatility despite a virtual guarantee of stable, if unspectacular, sales growth. However, many of the new products will be introduced by a relatively limited number of large firms with substantial market shares in their respective industries, dampening some of the volatility.

Taking all the above considerations together, a continuation of the current overall and metro-nonmetro trends appears most probable. Factors that could most affect sector growth or promote more rapid regional shifts are any large changes in the cost of doing business in the agricultural processing and beverage sector. ■

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Why Has Dairy Product Consumption Increased?

Richard Haidacher and James Blaylock
(202) 786-1863

America's interest in dairy products is on the rise again. After two decades of declining or stagnant per person consumption, a dramatic turnaround occurred in 1983. Excluding Government donations, per capita consumption increased an average 2 percent per year from 1983 to 1986, in sharp contrast to the 1.5-percent annual declines witnessed from the mid-1960's to the mid-1970's (figure 1).

Why this turnabout for dairy products? Are falling dairy product prices relative to other foods responsible? Have higher consumer incomes, health and nutrition concerns, and demographic changes in the population played a major role? Has the greatly expanded promotion effort of dairy producers been responsible? The quick answer to these questions is that all the factors have contributed in varying degrees.

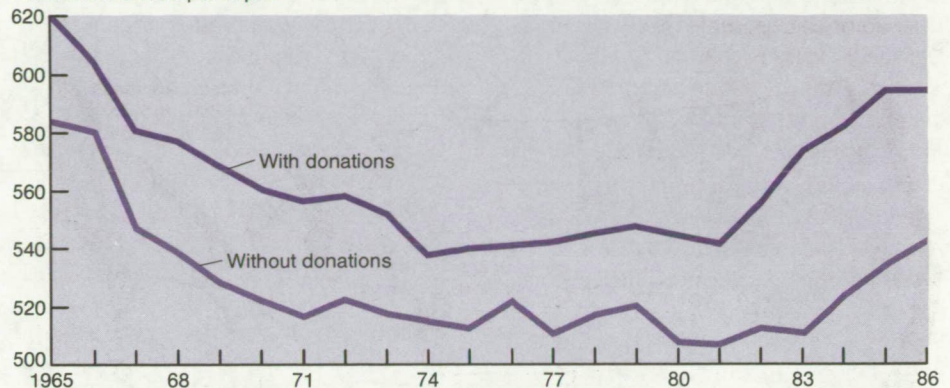
Which Products Have Gained?

Much of the recent increase in total dairy product consumption is due to cheese. Per capita consumption, including donations, has grown over 4 percent per year, more than doubling since 1966 (figure 2). Cheese is one of the few dairy products with steadily rising per capita consumption. Growth has been mainly in the away-from-home market and as an ingredient in processed foods. The pizza market has been particularly important. Meanwhile, home use declined from 1980 to 1984 and then increased slightly from 1985 to 1986 as processed products, such as packaged, sliced American cheese, became more popular. To put the market in perspective, about 38 percent of cheese is consumed at home, about 39 percent away from home, and about 23 percent as an ingredient in various foods.

The importance of the expanding cheese market to the overall growth in

Figure 1. After Historical Declines, Consumption of Dairy Products Rose in the 1980's

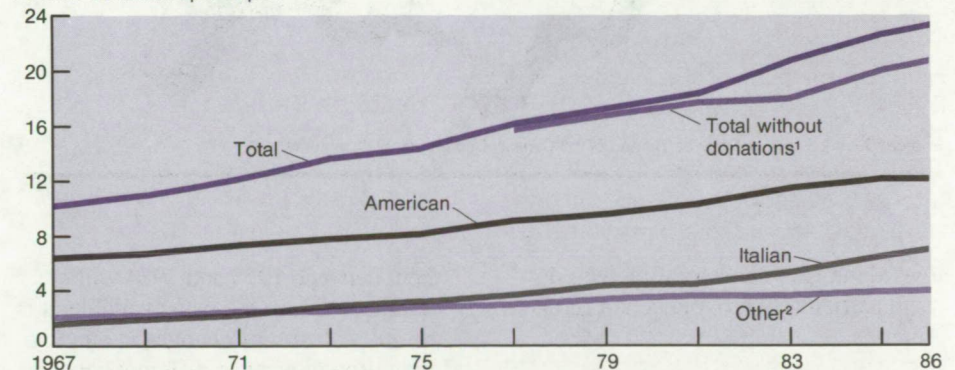
Pounds consumed per capita¹



¹Milk equivalent (milkfat basis).

Figure 2. Much of the Recent Increase in Dairy Product Consumption Is Due to Cheese

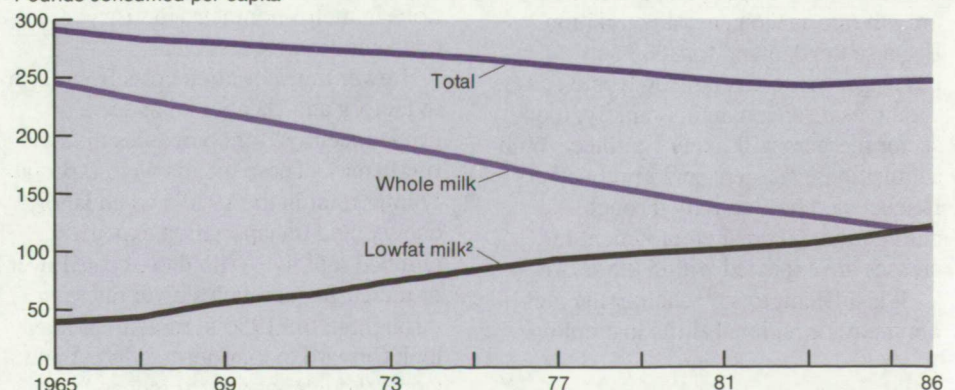
Pounds consumed per capita



¹Data on donations of individual dairy products were not available prior to 1977. ²Includes Swiss, Brick, Muenster, Blue, Edam, Gouda, Cream, and Neufchatel.

Figure 3. Consumption of Lowfat Milk Has Steadily Replaced Whole Milk

Pounds consumed per capita¹



¹Includes donations. ²Also includes skim, buttermilk, chocolate milk, and yogurt.

The authors are agricultural economists with the Food Marketing and Consumption Economics Branch, Commodity Economics Division.

dairy product consumption cannot be overemphasized. Because it takes approximately 8.5 pounds of milk to make 1 pound of cheese, increases in commercial cheese sales accounted for about 73 percent of the growth in commercial sales of all dairy products between 1981 and 1986.

Per capita consumption of fluid milk rose modestly after a long decline. However, the total 1982-86 gain of 3.5 pounds was not large enough to push consumption above the 1981 level of 245.4 pounds. Per capita consumption of fluid milk and cream declined an average of 1 percent per year from 292.2 pounds in 1965 to 241.9 pounds in 1982. But this overall decline in fluid milk and cream products masks a rather significant change among individual items—lowfat has steadily replaced whole milk. Per capita consumption of whole milk declined about 3 percent per year from 246 pounds in 1965 to 118 pounds in 1986. Other milk, mostly lowfat, increased at an average annual rate of 5 percent from 39 pounds per capita in 1965 to over 119 pounds in 1986 (*figure 3*).

Per capita butter consumption also rose between 1982 and 1986, mostly due to greater Government donations. Excluding donations, per capita butter consumption stabilized at about 4.0 pounds a person after declining 3.5 percent per year from 6.4 pounds in 1965. Butter consumed at home dropped, while the share consumed away from home and as ingredients gained. About 30 percent of butter is now used at home, with the rest going to the ingredient and away-from-home markets.

Consumption of frozen dairy products remained relatively stable during 1965-86, rising from 26.8 pounds per capita in 1965 to 28.1 pounds in 1986. Ice cream, the largest component, accounted for

18.5 pounds in 1965 and 18.3 in 1986. Ice cream and related products consumed at home have increased since 1980.

Per capita consumption of condensed and evaporated milk products declined about 3 percent annually, from about 16 pounds in 1965 to 7 pounds in 1980, where it remained until 1984 before increasing to 7.9 pounds in 1986. Consumption of dry milk products fluctuated between a high of 7.4 pounds per capita in 1973 and a low of 5.6 pounds in 1981. Use was up to 7.2 pounds by 1986 as a result of Government donations; otherwise, the level would have been 6.6 pounds. Because of their relatively small volumes, consumption gains in condensed, evaporated, and dry milk products contributed little to expanding total per capita consumption.

Price, Income, and Advertising Effects on Demand

Retail prices for dairy products have risen less than for most other foods during much of the 1980's. The Con-

sumer Price Index (CPI) for dairy products rose an average of 1.2 percent annually after 1981, while the CPI for all other foods increased more than 3 percent. This effectively lowered relative dairy product prices. Consumers' purchasing power (real disposable per capita income) also grew more than 3 percent per year during 1983-86, compared with a little over 2 percent in the 1965-83 period.

Recent ERS analyses of annual data from 1953-86 clearly indicate that falling prices increase consumption. A 10-percent decrease in price increases per capita consumption of total dairy products by about 3 percent, all other factors remaining constant. The reverse is also true: an increase in price lowers consumption. Decreasing the price of each dairy product by 10 percent would also increase its consumption, but by varying amounts (*table 1*).

Consumption of evaporated, condensed, and dry milk products; cheese; and fluid milk appear to be most respon-

Table 1. Consumption Changes in Response to Price and Income Changes

Products	Per capita change attributed to a 1-percent change in: ¹		
	Price (annual data)	Income (annual data)	Income (household survey data) ²
	Percent change ³		
Fluid milk	-0.26	-0.22	0.02
Cheese	-0.33	0.59	0.32
Butter	-0.17	0.02	0.35
Evaporated, condensed, and dry milk	-0.83	-0.27	-0.12 ⁴
Frozen and other dairy products	-0.12	0.01	0.21
Total dairy products	-0.31	0.18	0.14

¹Percent change in consumption attributed to a 1-percent change in price or income. ²Refers only to at-home consumption. ³A negative number shows that a change in price or income affects consumption in the opposite direction. ⁴Includes only canned milk.

sive to changes in their own prices, with butter and frozen dairy products being the least responsive.

The analyses also suggest that increasing income often raises consumption. For total dairy products, a 10-percent increase in income increases per capita use 1.8 percent. But a 10-percent increase in income affects individual dairy products differently. Per capita consumption of fluid milk products decrease, while use of butter and frozen dairy products are hardly affected, and consumption of cheese increases substantially.

The income effect on per capita cheese consumption is one of the largest relative to other foods. For example, a 10-percent increase in income raises chicken consumption 3.6 percent and potato consumption 1.6 percent, while cheese consumption rises 5.9 percent. In contrast, people use less fluid milk and evaporated, condensed, and dry milk products when incomes rise.

However, when analyzing annual consumption data, it is difficult to separate the effects of income and time. Data from household surveys, which are unaffected by time trends, provide an added measure of reliability in the analysis. The annual data measure total quantities, while survey information only measures expenditures for at-home use. Household survey data indicate a 10-percent rise in income increases per capita at-home expenditures on total dairy products 1.4 percent, but again, individual items are affected differently. Such an increase has little or no effect on per capita expenditures for fluid milk, lowers spending on canned milk, and raises expenditures on frozen and other dairy products, cheese, and butter.

The Dairy and Tobacco Adjustment Act of 1983 authorized a national program for dairy product promotion. The program is funded by a mandatory 15-cent-per-hundredweight as-

essment on all milk produced and marketed commercially. As a result, generic advertising expenditures for fluid milk in 12 regional markets increased 62 percent from \$18.6 million during September 1983 through August 1984 to \$30 million a year later.

However, from September 1985 to August 1986, expenditures dropped more than 21 percent to \$23.5 million. There were two reasons for this. First, advertising programs were not initiated until about 6 months after the collection of money began. Thus, the amount of funds available during September 1984-August 1985 was larger than the amount normally collected and spent in 1 year. Second, during September 1985-August 1986, some expenditures were diverted from fluid milk advertising to cheese, ice cream, and butter.

Branded and generic advertising of cheese for the entire United States increased 64.5 percent in 1984 and 28.8 percent in 1985, illustrating the tremendous impact of the 1983 Act. Not only did generic expenditures expand during this period, but brand advertising rose 44 percent in 1984 over 1983 levels. Total advertising for cheese grew from \$57.8 million in 1981 to \$135.4 million in 1985. In 1986, it dropped slightly to \$131 million. Analysis of consumers' response to increased advertising expenditures generated by the Act indicates that the promotional efforts raised consumption of certain dairy products.

Government donations of dairy products from surplus stocks displaced some commercial sales. For example, cheese donations under the Temporary Emergency Food Assistance Program (TEFAP) increased substantially in 1983-86 over pre-1983 levels. ERS research has shown that each 100 pounds of cheese donated displaces about 35 pounds of commercial purchases. A pound of TEFAP butter displaces an equal amount of margarine, but virtually

no butter. By subtracting donations from total consumption, we can get a clearer picture of the volume of products moving through commercial channels.

Tying It All Together

The demand for dairy products is sensitive to a number of factors, but changes in relative prices and income are the most pronounced. Consequently, sharply rising consumer incomes and falling dairy prices relative to other foods generated most of the 1983-86 increase in dairy consumption. However, for specific products, namely cheese and fluid milk, promotional efforts have also had a positive effect.

A rough assessment of the relative impact of prices and income can be obtained by first combining the previously measured price and income responses with the actual changes in relative prices and real income (adjusted for inflation) for the 1982-86 period. From this, we obtain an estimate of the change in per capita consumption that might be attributed to these factors. Subtracting these estimated changes from the actual changes in per capita consumption (excluding donations) leaves a residual change in consumption that can be attributed to all other factors (*table 2*).

Between 1982 and 1983, per capita consumption of dairy products, excluding donations, declined about 2.1 pounds. During this period, relative dairy prices fell and consumer incomes rose. These two factors increased consumption (less donations) by 3.38 and 2.14 pounds, respectively. However, all other factors affecting demand—such as changes in the prices of substitutes, demographics, lifestyles, and health concerns—apparently outweighed the positive effects of declining prices and rising incomes to push total consumption down.

However, in each year between 1983 and 1986 consumption levels rose sharp-

Table 2. Several Factors Affect Consumption

	Per capita change from prior year			
Year	Civilian consump- tion ¹	Change attributed to		
		Own price ²	Income ²	Other factors ³
<i>Pounds</i>				
1983	-2.1	3.38	2.14	-7.62
1984	13.4	4.88	5.14	3.38
1985	10.0	2.84	2.02	5.14
1986	8.7	3.08	3.37	2.25

¹Excludes donations. ²Nominal price and income deflated by CPI for all items. ³Includes all factors other than own price and income which influence demand, such as advertising, demographic changes, and other prices.

ly, largely due to falling dairy prices and rising incomes. About 4.9 pounds of the 13.4-pound increase in consumption between 1983 and 1984 can be attributed to prices and 5.1 pounds to income, leaving about 3.4 pounds of the gain due to other demand factors.

Factors other than dairy prices and incomes were relatively important in explaining consumption changes between 1984 and 1985. However, it is impossible to attribute the 5.14-pound per capita gain to any specific factor. Advertising expenditures for fluid milk and cheese increased dramatically between 1984 and 1985, and as research indicates, it should have had a positive effect.

Between 1985 and 1986, per capita consumption increased by 8.7 pounds. Declining prices and income growth accounted for 6.45 pounds of the gain. Advertising expenditures declined from 1985 levels, which may partially account for the smaller gain attributed to other factors.

Demographics and Health Effects

While changes in relative prices, advertising, and consumer income explained much of 1983-86's consumption gains, health and nutrition concerns may have had some influence. There is little, and mostly ambiguous, evidence on how attitudes about health and nutrition affect purchases of dairy products. For example, one study showed that the dietary intake of calcium has increased during the 1980's, but the share coming from dairy products has declined. Also, consumption of lowfat milk is steadily replacing whole milk, yet cheese use is

rising despite apparent consumer awareness about fat and cholesterol.

On the other hand, population changes may have minimal year-to-year impact on consumption. Demographic changes, except population growth, have little influence on year-to-year adjustments in national consumption because regional, racial, and age distributions alter slowly over time. Even the combined effect of these factors projected to the year 2000 would increase per capita cheese consumption at home by less than 1.4 percent (*table 3*). Demographic factors are

Table 3. Shifts in Demographics Have Differing Effects on At-Home Food Expenditures

Demographic factors	Changes in expenditures from 1980 levels				
	Milk and cream	Cheese	Butter	Other dairy products ¹	Total dairy products
	<i>Percent</i>				
Age					
1990	-0.2	1.0	1.1	0.5	0.5
2000	-0.9	1.9	1.8	2.1	1.6
Region					
1990	-0.1	-0.2	-0.7	0.1	-0.1
2000	-0.2	-0.4	-1.3	0.3	-0.1
Race					
1990	-0.3	-0.5	-0.2	-0.2	-0.3
2000	-0.5	-0.1	-0.3	-0.4	-0.6
Total²					
1990	-0.6	0.3	0.2	0.4	0.1
2000	-1.6	1.4	0.2	2.0	0.9

¹Includes evaporated, condensed, and dry milk, and other dairy products. ²Net adjustment after accounting for projected changes in all demographic variables.

more important, however, in explaining variations in expenditures among

households and between at-home and away-from-home consumption. ■

Dairy Market Characteristics

Several characteristics of the dairy market contribute to shaping consumption of dairy products.

From a supply perspective, the dairy sector is more heavily regulated than most other domestic agricultural industries. Milk marketing orders authorized by the Agricultural Marketing Agreement Act of 1937 and the Commodity Credit Corporation program authorized by the Agricultural Act of 1949 provide both price and income support to milk producers. Supports are implemented through direct Government purchases of manufactured dairy products to maintain minimum prices consistent with program targets. Imports are also restricted because foreign dairy products are generally available at lower—often subsidized—prices. Less than 4 percent of U.S. dairy products move abroad, mostly through assistance programs, and imports are limited to a roughly comparable share of the market. Hence, producers depend heavily on the domestic market and on program decisions affecting support pricing.

From the demand side, per capita use of dairy products has generally declined over the long run. For example, while consumption in several individual product

categories rose (such as cheese and lowfat milk), overall use of dairy products (including Government donations) declined from a 1939 peak of 824 pounds per capita to a low of 542 pounds in 1981. Population grew fast enough to keep total consumption rising slowly from 108 billion pounds to 123 billion pounds over the same period.

These supply and use characteristics combined in the late 1970's and early 1980's to generate large surpluses. Milk support prices were raised from \$3.71 per hundredweight (cwt) in 1965 to a high of \$13.49 for a short period in 1981. This rise stimulated production through more cows and greater yields per cow. Processing and marketing costs, as well as milk support prices, influence retail prices for dairy products. While retail dairy product prices declined relative to other food prices during at least part of this period, they were still likely higher than they would have been without milk price supports. High support prices also encourage the production and use of dairy substitutes.

With these forces at work, Government purchases (on a milk-equivalent basis) increased from 1 to 6 percent annually in the 1970's to a peak of 12 percent in 1983.

Reference

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Rising budget outlays during the early to mid-1980's stimulated program changes in dairy legislation passed in 1983 and 1985. As a result:

- Support prices were linked directly to the amount of Government purchases beginning on April 1, 1985. Support prices fell from \$13.10 in November 1983 to \$10.60 per cwt in January 1988.
- The Temporary Emergency Food Assistance Program (TEFAP) sharply expanded cheese and butter donations to low-income consumers during 1983-85.
- TEFAP donations were reduced slightly in 1986. Donations allowed some people to consume more dairy products (or to substitute products such as butter for margarine) without purchasing the products in commercial outlets.
- Dairy producers began paying assessments in 1984 to support research and promotion activities. The assessment of 15 cents per cwt on all milk marketed generates about \$200 million annually, most of which is spent on advertising and promotion. Expenditures for advertising dairy products have more than doubled over pre-1984 levels.

Spending on Meat, Poultry, Fish, and Shellfish

Michael Harris
(202) 786-1870

Traditional consumption data from USDA provide the food sector with information on general trends of what Americans are eating. However, such data reflect the total amount of food available and not the amount consumed at home versus that eaten in restaurants or in processed foods. Comparing trends in at-home per capita spending for red meat, poultry, fish, and shellfish with total per capita consumption of these foods offers another estimate of American eating patterns.

During 1980-85, total per capita consumption of most meat products increased even though there was a decline in food spending for at-home consumption (*see sidebar*). This may be explained by the growth in away-from-home eating and the increased use of these foods as ingredients in entrees.

For instance, total per capita pork consumption dropped 10 percent, while beef increased 3 percent, fish and shellfish climbed 13 percent, and poultry rose 15 percent from 1980 to 1985 (*table 1*). On the other hand, at-home spending (adjusted for price changes) for meat, poultry, and fish declined about 7 percent. Purchases of pork for at-home use dropped 18 percent, beef, 14 percent, and poultry, 1 percent. Fish and seafood was the only category that rose, up 11 percent (*table 2*).

Prices of the commodities and their substitutes have a direct effect on what we buy. Since red meats, poultry, fish, and shellfish are substitutes for one another, their relative prices affect how much consumers purchase. For example, if pork prices increase relative to poultry, consumers may use more poultry. The

Estimating Consumption

Total per capita consumption (disappearance) statistics for meat, poultry, fish, and shellfish are based on annual estimates of production, adjusted for imports, exports, and stock changes. The data are collected at the processing level and represent the total amounts available for direct consumption or as ingredients for manufactured food mixtures used in households, eating places, and institutions. These numbers are refined by removing bone and some fat from the carcass weight, but no adjustments are made for spoilage or cooking loss.

Another way to look at consumption trends is to examine food

spending patterns. Data on expenditures for meat, poultry, fish, and shellfish eaten at home are available from the Continuing Consumer Expenditure Survey (CCES), conducted by the Labor Department's Bureau of Labor Statistics. By adjusting the data for price changes, we can estimate the amount of these foods consumed at home. However, the expenditure data for meat, poultry, fish, and shellfish do not include the relatively small quantities used as ingredients in entrees and other processed products. (Data are not available for directly measuring the quantity of food commodities eaten away from home.)



Despite higher prices, total consumption of fish rose 13 percent between 1980 and 1985.

The author is an agricultural economist with the Food Marketing and Consumption Economics Branch, Commodity Economics Division.

Table 1. Poultry and Fish Consumption Have Steadily Increased in the 1980's

Year	Poultry			Red meat					Fish and shellfish	Total red meat, poultry, and fish ¹
	Chicken	Turkey	Total ¹	Beef	Veal	Pork	Lamb	Total ¹		
<i>Pounds per capita²</i>										
1980	34.5	8.3	42.8	72.1	1.3	49.1	1.0	123.4	12.8	178.9
1981	35.5	8.5	44.0	72.7	1.3	46.8	1.0	121.9	12.9	178.8
1982	36.5	8.5	45.0	72.4	1.4	41.9	1.1	116.7	12.3	174.0
1983	37.0	8.9	45.9	73.8	1.4	44.0	1.1	120.3	13.1	179.2
1984	38.2	9.0	47.2	73.6	1.5	43.7	1.1	119.9	13.7	180.8
1985	39.8	9.5	49.4	74.3	1.5	44.1	1.1	120.9	14.4	184.7
1986	40.6	10.5	51.1	74.1	1.6	41.6	1.0	118.3	14.7	184.1
1987	43.4	11.9	55.3	69.2	1.3	41.9	1.0	113.4	15.4	184.1

¹Totals may not add due to rounding. ²Boneless equivalent. Conversion factors for red meats adjust numbers from carcass to boneless weight: beef 0.698 (1980-85) and 0.69 (1986-87); pork 0.67. Fish and shellfish is calculated on an edible-weight basis by the Commerce Department.

Table 2. Comparing Prices, Expenditures, and Consumption

Item	Consumer price index		Per capita expenditures for at-home consumption ¹		Per capita consumption (disappearance)	
	1980	1985	1980	1985	1980	1985
<i>Percent of 1980</i>						
Meat						
Beef	100	99	100	86	100	103
Pork	100	121	100	82	100	90
Other red meat	100	108	100	104	100	113
Poultry	100	113	100	99	100	115
Fish and shellfish	100	123	100	111	100	113
Meat, poultry, and fish	100	109	100	93	100	103

¹Based on price deflated data from the *Continuing Consumer Expenditure Survey* (CCES).

Consumer Price Index for meat, poultry, and fish increased about 9 percent between 1980 and 1985. Separately, beef decreased less than 1 percent, poultry increased 13 percent, pork rose 21 percent, and fish climbed about 23 percent.

Because prices, expenditures, and consumption are interrelated, the jump in pork prices, relative to beef and chicken, partially explains the per capita decline in both total pork consumption and at-home expenditures. At the same time that beef prices decreased slightly, beef expenditures for at-home consumption fell 14 percent. Since the consumption data indicate we ate more beef per capita, away-from-home meals and processed meat products likely made up the difference (*see sidebar*).

Poultry prices increased 13 percent between 1980 and 1985, while at-home expenditures dropped 1 percent. However, a 15-percent gain in total per capita consumption suggests a rapid increase in

Sales of Meat Entrees

Meat entrees are some of the fastest growing items sold in foodstores, according to recent ERS estimates. Sales of frozen entrees, which often contain several kinds of meat, definitely increased from 1983 to 1986. Poultry dishes rose from 1.48 pounds to 1.62 pounds per capita. Italian ones increased 0.48 pounds. Meat and Mexican items increased 0.12 pounds and 0.17 pounds, respectively. And oriental entrees rose 0.19 pounds. All of this indi-

cates an increase in consumption of frozen meals containing meat.

Sales of complete frozen dinners also showed an increase from 1983 to 1986 with per capita consumption rising 0.32 pounds. Pot pies increased 0.17 pounds. Frozen ground beef went from 0.87 to 1.03 pounds, a 0.16-pound increase. Nonfrozen items also rose during the period. For instance, canned tuna rose 0.42 pounds and sliced lunch meat increased 0.31 pounds, while bacon showed a 0.25-pound drop in per capita consumption.

Sales of Processed Meat Products Are on the Rise

Item	Foodstore sales			
	1983	1984	1985	1986
<i>Pounds per capita</i>				
Canned				
Tuna	2.69	2.81	3.03	3.11
Beef stew	0.45	0.46	0.48	0.46
Frozen				
Dinners	1.54	1.90	1.92	1.86
Poultry entree	1.48	1.56	1.63	1.62
Italian entree	0.95	1.19	1.41	1.43
Ground beef	0.87	0.90	1.01	1.03
Pot pies	0.86	0.95	0.99	1.03
Breaded fish	0.84	0.84	0.88	0.89
Meat entree	0.57	0.57	0.65	0.69
Mexican entree	0.34	0.37	0.44	0.51
Sausage dinner	0.30	0.36	0.45	0.47
Oriental entree	0.21	0.36	0.42	0.40
Refrigerated				
Frankfurters	3.78	3.66	3.98	3.87
Bacon	3.50	3.41	3.48	3.25
Sliced lunch meat	2.90	2.98	3.20	3.21
Breakfast sausage	1.48	1.42	1.45	1.54
Canned ham	0.56	0.43	0.46	0.41
Total	23.32	24.17	25.88	25.78

poultry eaten away from home, probably in fast-food establishments.

Fish and shellfish prices increased about 23 percent. Yet despite the higher prices, total consumption and at-home expenditures rose 13 and 11 percent, respectively. The gain indicates increased demand for these items.

Expenditures Differ Between Households

Household characteristics—such as income, age of the head of the household, and size of the household—also influence expenditures for meat, poultry, fish, and shellfish eaten at home (*table 3*).

The Continuing Consumer Expenditure Survey data indicate that households at various income levels changed their expenditure patterns at different rates between 1980 and 1985. Lower income households bought less meat, poultry, fish, and shellfish. Household spending for beef fell the most, 34 percent. Pork dropped 23 percent, fish and shellfish, 14 percent, and poultry, 13 percent. The decline in meat expenditures in lower income households appears to be greater for the more expensive sources of protein, such as beef and pork. For the middle income group—households between \$15,000 and \$19,999—expenditures for fish products increased 15 percent. Beef and poultry decreased 32 and 18 percent, respectively, and pork fell 17 percent.

Households with incomes above \$30,000 cut spending on beef 15 percent and pork 10 percent. This group increased poultry purchases 5 percent and fish and shellfish, 21 percent. But these figures only reflect at-home expenditures, and this higher income group tends to be big food spenders away from home.

Household food expenditures also appear to vary significantly with the age of

Table 3. At-Home Spending Varied With Household Characteristics

Characteristic	Per capita expenditures ¹							
	Beef		Pork		Poultry		Fish and shellfish	
	1980	1985	1980	1985	1980	1985	1980	1985
<i>Percent of 1980</i>								
Income								
Under \$5,000	100	66	100	77	100	87	100	86
\$15,000 to \$19,999	100	68	100	83	100	82	100	115
\$30,000 and over	100	85	100	90	100	105	100	121
Age of household head								
25 to 34	100	70	100	74	100	92	100	130
35 to 44	100	87	100	79	100	100	100	109
45 to 54	100	106	100	87	100	105	100	116
Over 64	100	94	100	88	100	91	100	93
Number of household members								
One	100	87	100	79	100	86	100	102
Two	100	96	100	86	100	101	100	110
Three	100	83	100	87	100	97	100	107

¹The data indicate how national food expenditures changed over time. Expenditure figures were deflated and then divided by the base year (1980) quantity to provide an approximate measure of changes in amounts purchased.

the head of the household. The survey indicates that households headed by young people (between age 25 and 34) reduced beef, pork, and poultry purchases by 30, 16, and 8 percent, respectively, between 1980 and 1985. Spending on fish and shellfish for at-home consumption, on the other hand, rose 30 percent. This in-

crease was in all categories, except canned.

In households headed by 35- to 44-year-olds, pork expenditures dropped 21 percent, beef lost 13 percent, poultry remained the same, and fish and shellfish rose 9 percent. For the 45- to 54-year-old age group, pork was the big loser with a 13-percent drop. Poultry rose 5 percent, beef increased 6 percent, and

fish gained 16 percent. The 45- to 54-year-olds were the largest spenders for food consumed at home, probably because they have the largest household income of any of the groups.

For the over-64 age group, purchases in all four categories fell. Beef dropped 6 percent, fish and shellfish, 7 percent, poultry, 9 percent, and pork, 12 percent. However, in general, older households tended to spend more for food consumed at home. That does not necessarily mean that older people spend more. As a group, younger people tend to eat out more often.

At-home expenditure patterns also varied with household size. In 1985, single-member households purchased less beef, pork, and poultry than in 1980, but 2 percent more fish and shellfish. Two-member households spent less in two categories. Beef fell 4 percent and pork dropped 14 percent, while poultry gained 1 percent and fish and seafood, 10 percent. Households with three members bought 17 percent less beef and 13 percent less pork. Poultry decreased 3 percent. Fish and shellfish increased 7 percent.

Not only was there considerable spending variation among household sizes during 1980-85, but substantial changes also occurred within given household sizes. Red meats and poultry did not do as well as fish and shellfish, with respect to changes in per person expenditures within households. In general, the survey data indicate that larger households increased their purchases per person during the period. ■

Recent Trends in Domestic Food Programs

Masao Matsumoto
(202) 786-1864

Participation and program costs discussed in this article compare the second quarter of fiscal 1988 (January-March 1988) with the same period in 1987. Recent data are reported as of June 1988 and are subject to revision.

Federal expenditures for the domestic food assistance programs increased by 4.4 percent, from \$5.1 billion in the second quarter of fiscal year 1987 to \$5.3 billion in that period of 1988. The higher outlays reflect cost-of-living adjustments in most programs.

Food distribution costs declined from a year earlier due to fewer bonus commodities available for distribution and a reduction in the Temporary Emergency Food Assistance Program (*table 1*).

Food Stamp Program

Average participation in the Food Stamp Program fell 2.6 percent, from 19.5 million persons to 19.0 million. Benefit costs rose by 5.7 percent to \$2.85 billion, and total expenditures were \$3.16 billion, 5.8 percent above 1987 levels.

Average monthly per person benefits for food stamps, which are intended to assist low-income households purchase a nutritionally adequate diet, increased from \$46.21 to \$50.08. These benefits are based on family size, income of the household, and the costs of the Thrifty Food Plan.

Child Nutrition Programs

An average of 24.2 million children participated in the National School Lunch Program each school day during the second quarter of 1988, a 1.3-percent increase over the previous year. Eligibility for free and reduced price

meals, which provide approximately one-third of the recommended dietary allowances for school-age children, is determined by family size and income. Total lunches served during the quarter increased from 1.26 billion to 1.30 billion. Meals served free or at reduced prices declined from 49.1 percent of the total to 47.6 percent. The decline in the relative number of subsidized meals from year-earlier levels may be attributable to the improved economic conditions in most parts of the Nation.

Schools receive commodities and cash payments for every lunch served. In fiscal 1988, they received 12 cents worth of commodities per meal compared with 11.25 cents in 1987. Schools also receive bonus commodities. During the January-March 1988 quarter, \$97.6 million worth of bonus commodities were distributed to schools, compared to \$131.0 million a year earlier. This 25.5-percent drop was largely due to reduced Government surplus stocks.

The School Breakfast Program provided subsidized breakfasts to an average of 3.7 million children during the second quarter of 1988, 1.0-percent above 1987. Total breakfasts served during the quarter increased by 3.1 percent due to more operating days and higher participation. Free and reduced price meals dropped from 88.4 to 87.6 percent of all breakfasts served. Total expenditures for the program rose from \$140.0 million to \$150.6 million, a 7.5-percent increase.

Daily attendance at facilities offering the Child Care Food Program rose from an average of 1.29 million children to 1.35 million. The number of day-care homes and child-care centers participating in this program increased from 108,000 to 121,000, reflecting the increased use of child-care services by working mothers. Total meals served

climbed 9.2 percent to 205.8 million. Total costs for the Child Care Food Program rose from \$138.7 million to \$155.4 million.

Half pints of milk served under the Special Milk Program increased significantly from 42.1 million in the second quarter of 1987 to 55.4 million in 1988. Most of the gain was due to a recent amendment to the Child Nutrition Act which expanded eligibility to kindergarten pupils who attend half-day sessions. Total cost for this program rose 36 percent to \$5.45 million.

Supplemental Food Programs

Participation in the Special Supplemental Food Program for Women, Infants, and Children (WIC) reached a monthly average of 3.55 million persons, a new high. This compares with 3.42 million in the previous year. Participation by pregnant and lactating women and by infants increased 7.2 percent and 6.5 percent, respectively, while the number of children remained nearly constant. These figures reflect an increased effort to target benefits to those who are at greater nutritional risk. Program costs grew 7.2 percent for a total of \$446.5 million in 1988. Average monthly benefits per participant increased from \$32.67 to \$33.82.

Costs of the Commodity Supplemental Food Program, including both women, infants, and children and the elderly, advanced 7.0 percent, from \$9.6 million to \$10.3 million in 1988. Participation of the elderly averaged 81,900, a 70-percent increase. In contrast, the numbers of women, infants, and children declined 5,800 during the same period.

Food Distribution Programs

Cost of food donations to persons on Indian Reservations and in the Pacific Trust Territories dropped from \$12.6 mil-

The author is an agricultural economist with the Food Marketing and Consumption Economics Branch, Commodity Economics Division.

Table 1. Benefit Costs for Family Food and Child Nutrition Programs Rose in 1988

Programs ¹	1986	1987	FY 1987 quarters ²				FY 1988 quarters ²	
			I	II	III	IV	I	II
Million dollars								
Family food								
Food stamps	10,605	10,500	2,646	2,697	2,639	2,517	2,781	2,850
Puerto Rico ³	824	856	214	214	214	214	221	221
Food distribution								
Indian Reservations	47	49	12	13	12	12	12	12
Schools ⁴	848	898	266	275	160	197	253	256
Other ⁵	281	209	51	52	41	65	56	53
TEFAP ⁶	846	846	218	210	208	209	211	195
Cash-in-lieu of commodities ⁷	145	146	39	39	37	31	38	38
Child nutrition ⁸								
School lunch	2,714	2,822	868	901	692	360	875	934
School breakfast	406	447	137	140	112	58	145	150
Child care and summer food	529	590	118	124	144	204	131	139
Special milk	15	15	4	4	4	4	5	5
WIC ⁹	1,583	1,680	406	416	421	434	426	446
Total ¹⁰	18,843	19,058	4,979	5,085	4,685	4,306	5,155	5,300

¹Fiscal years, administrative costs are excluded unless noted. ²Preliminary. Quarterly data may not add to annual total due to rounding. ³Puerto Rico transferred from the Food Stamp Program to substitute Nutrition Assistance Program on July 1, 1982—represents annual appropriations. Includes Northern Marianas block grant.

⁴National School Lunch, Child Care Food, and Summer Food Service Programs, and schools receiving only commodities. ⁵Commodity Supplemental Food Program and Elderly Feeding Pilot Projects, excluding bonus commodities, and donations to charitable institutions. ⁶Initiated December 1981. ⁷Child nutrition programs and Nutrition Program for the Elderly. ⁸Cash expenditures. ⁹Special Supplemental Food Program for Women, Infants, and Children—includes administrative costs. ¹⁰May not add due to rounding.

Source: Monthly data from the Food and Nutrition Service.

lion in 1987 to \$12.3 million in 1988 due entirely to a reduction in available bonus commodities. Average participation in this program also fell from 149,200 per month to 141,100.

Food valued at \$195.5 million was distributed to charitable institutions in the second quarter of 1988, 6.7 percent less than in 1987.

USDA provides food and cash-in-lieu of commodities to the Nutrition Program

for the Elderly (NPE) administered by the Department of Health and Human Services. In the second quarter of 1988, USDA provided a total of \$43.9 million worth of food and cash, not including \$2.1 million of bonus commodities. During the same period, a daily average of 876,800 elderly persons participated in the program, compared with 874,000 a year earlier.

Due to declining Government surplus stocks available for distribution, the Tem-

porary Emergency Food Assistance Program (TEFAP) has been scaled back. In the second quarter of 1988, \$195.5 million worth of commodities were distributed, a 6.7-percent decrease from \$209.8 million in 1987. Congress recently passed legislation in the Hunger Prevention Act of 1988 that extends the program through fiscal 1990 and appropriates \$120 million annually to purchase commodities to supplement available surplus stocks. ■

Food and Nutrition Legislation

Susan L. Pollack
(202) 786-1696

Numerous food and nutrition bills were introduced in the second session of the 100th Congress since April 1. One recently passed law and some of the legislation is described below.

Food Assistance P.L. 100-435

The Emergency Hunger Prevention Act provides \$1.6 billion over the next 3 years for domestic food assistance and nutrition programs. It requires USDA to spend \$40 million in fiscal years 1989-90 and \$32 million in fiscal 1991 for food distributions to soup kitchens and emergency feeding centers.

The Temporary Emergency Food Assistance Program (TEFAP) is extended for 2 years. The TEFAP provisions require USDA to spend \$120 million each year for high-protein foods for program distribution. Also, the Secretary of Agriculture must supply 7 million pounds of cheese to the Commodity Supplemental Food Program.

In addition, P.L. 100-435 increases the reimbursement rate for school breakfasts by 3 cents and provides for a child-care deduction of up to \$160 per month per child to enable parents to work, receive job training, or receive educational preparation for work. It also establishes farmers' market projects providing coupons to WIC participants.

H.R. 4532—Rep. Robert Davis (MI)

This bill would ensure that surplus dairy products are provided to the Temporary Emergency Food Assistance Program (TEFAP) before they are offered to dairy export programs. Also, the Dairy Export Incentive and the Export Sales of Dairy Products Programs would be extended until 1991.

The author is an agricultural economist with the U.S. Agricultural Policy Branch, Agriculture and Trade Analysis Division.



H.R. 4688—Rep. Gerald Solomon (NY)

This bill would extend TEFAP by providing appropriations for fiscal years 1989 and 1990.

H.R. 4780—Rep. Thomas Sawyer (OH)

The bill would amend the Child Nutrition Act of 1966 to ensure homeless women, infants, and children access to the Special Supplemental Food Program, a supplement to food stamps. These individuals would also have access to any program which distributes food to the needy, including meals served at soup kitchens, shelters, or through other emergency food assistance programs.

H.R. 4789—Rep. Byron Dorgan (ND)

The bill would require USDA to solicit applications, at least once a year, from organizations for processing and distributing surplus commodities under domestic food programs. Once an application is approved, the organization would be responsible for paying to have the food processed and transported to the final distribution point.

H.R. 4999—Rep. Timothy Penny (MN)

The Child Care and Nutrition Enhancement Act of 1988 would help States

fund projects developing their own child-care programs through matching Federal grants. It would enhance the Child Care Food Program, which provides meals to children in day-care centers, family and group day-care homes, and Head Start centers. H.R. 4999 would also establish a tax credit for those making home improvements to become child-care providers, establish an investment tax credit for businesses which provide on-site child-care facilities or shared offsite facilities, and revise the dependent child-care tax credit to allow low-income families to benefit from the tax credit.

S. 2404—Sen. Ernest Hollings (SC)

The Child Care Act of 1988 would amend Title XX of the Social Security Act. It would increase funds for child day-care services and establish a national advisory commission on child care. The commission would develop a national repository for information on the need for child-care services and facilities, current availability of services and facilities, and Federal, State, and local standards governing them.

The commission would also investigate child-care issues, such as infant,

prenatal, and school-age child care, child nutrition, training opportunities and standards and licensing requirements for child-care providers, tax credit for dependent-care services, earned income disregarded for child-care expenses under the Aid to Families with Dependent Children Program, after-school programs, and information and referral networks for child-care services.

S. 2475—Sen. Tom Harkin (IA)

The Farmers' Market Nutrition Enhancement Act would amend the Child Nutrition Act of 1966. It would authorize seven States to participate in pilot projects and require them to share expenses. The bill would allow participating States to issue coupons worth \$10 to \$20 to participants in the Special Supplemental Food Program for Women, Infants, and Children (WIC). These coupons could only be redeemed at farmers' markets for locally grown produce.

S. 2486—Sen. Rudy Boschwitz (MN)

The Nutritional Assistance Improvements Act would reauthorize TEFAP for the next 3 years. It also would authorize USDA to annually purchase \$225 million

of high-protein commodities to supplement the surplus commodities that may be available. Provisions affecting the Child Nutrition Act of 1966 would increase the reimbursement rate for school breakfasts from 3 to 6 cents and provide for an additional meal or snack for institutions or organizations which care for children for more than 8 hours a day. The bill also includes farmers' market demonstration projects, similar to S. 2475.

Food Safety and Quality

H.R. 4520—Rep. W.J. Tauzin (LA)

This bill would establish a financial assistance program for research relating to pathogenic contamination of shellfish growing areas. The research program would include:

- An environmental assessment of commercial shellfish growing areas in the United States, including evaluation of the relationship between sewage contamination and human enteric pathogens.
- An evaluation of such relationships with their potential risks to public health.
- A comparison of current microbiological methods with new technological

methods to evaluate pathogens in shellfish and their growing waters.

- Design of epidemiological methodology to relate microbiological data, sanitary survey data, and shellfish consumption to actual risks to the public health.

The program would be administered by the chief scientist of the National Oceanic and Atmospheric Administration, who would also be responsible for providing \$500,000 worth of grants to eligible applicants to carry out the research program.

H.R. 4937—Rep. Pat Roberts (KS)

The Pesticide Food Safety Act of 1988 would implement a list of recommendations developed by the National Academy of Sciences and mandate scheduling for pesticide safety reviews. The bill would also institute new safety standards for pesticide residues in foods and establish a research and education program for improving integrated pest management systems. ■

USDA Actions

Kathryn L. Lipton
(202) 786-1696

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

Sales Exemptions for Meat and Poultry Changed. USDA increased the value of meat that retailers can sell to hotels, restaurants, and similar institutions without Federal inspection from \$30,500 to \$31,600. The ceiling for poultry was decreased from \$31,000 to \$28,100. Retail meat and poultry sellers are exempt from Federal inspection if their total sales stay below the limit set by USDA each year, and if sales to institutions do not exceed 25 percent of total annual sales.

Varroa Mite Quarantine Lifted. USDA removed the Federal quarantine imposed on 13 States infested with the Varroa mite, a parasite of honeybees. The States are Florida, Illinois, Maine, Michigan, Mississippi, Nebraska, New York, Ohio, Pennsylvania, South Carolina, South Dakota, Washington, and Wisconsin. According to USDA, the regulatory program established under the quarantine was not the appropriate method to contain the spread of the mites.

CITE Test Approved for Brucellosis. USDA has approved the concentration immunoassay technology (CITE) test as an official supplement to standard card tests for brucellosis in cattle and bison. The CITE test permits diagnostic testing in the stockyard and provides faster results than if the blood was sent to a laboratory. The standard card test is so sensitive that cattle and bison with residual brucellosis vaccine antibodies



CITE tests for brucellosis in cattle provide faster results than sending blood to the laboratory.

may test positive even though they do not carry the disease. The supplemental CITE test will help clarify these erroneous results and avoid destruction of valuable animals. Negative brucellosis tests are required for interstate movements of many cattle and bison. Official tests also are used to determine whether producers will be compensated for destroyed animals.

Inspection Chief Named U.S. Codex Coordinator. Lester M. Crawford, administrator of USDA's Food Safety and Inspection Service (FSIS), has been named U.S. coordinator for Codex Alimentarius Commission activities. The commission, sponsored by the United Nation's World Health Organization and Food and Agriculture Organization, sets international food hygiene and other standards to protect public health and promote free trade. Crawford will retain his post as FSIS administrator.

Agricultural Trade Mission Teams Appointed. Seven private sector and Government officials met with their counterparts in the Philippines and Hong Kong to discuss agricultural trade prospects and other mutual agricultural interests. An eight-member trade mission team met with officials in Indonesia and Singapore. The visits took place during May 1988 as part of a series of U.S. agricultural trade and development missions jointly sponsored by USDA, the State Department, and the U.S. Agency for International Development. Congress authorized the program in December 1987 to encourage greater U.S.-private sector and foreign country participation in U.S. agricultural trade and development activities.

Final Rule Issued on Notifying Suspected Meat Act Violators. Under a new rule, USDA must notify suspected violators of the Federal Meat Inspection

The author is an agricultural economist with the U.S. Agricultural Policy Branch, Agriculture and Trade Analysis Division.

Act (FMIA) that evidence is being referred to the Justice Department for possible criminal prosecution. The Processed Products Inspection Improvement Act of 1986 requires USDA to give notice to suspected violators of FMIA. However, the 1986 Act also gives USDA authority to establish exemptions.

USDA does not have to provide prior notice in five types of cases. These include instances where evidence could be destroyed or altered, covert operations or other investigations might be compromised, the suspected violator might flee to avoid prosecution, bribery or clandestine slaughtering or meat processing is suspected, or violations involving laws other than the FMIA may be involved.

Overtime Rates for Federal Inspection Increased. USDA increased overtime rates charged for Federal inspection of meat and poultry plants, hourly rates for voluntary inspection and certification services, and charges for laboratory work. According to USDA, the higher rates are necessary to cover the costs of inspections, including salary increases for Federal employees as well as agency costs such as travel and benefits. Overtime rates for Federal inspection of meat and poultry plants increased from \$22.84 to \$24.68 per hour. Hourly rates for voluntary inspection and certification services rose from \$19.04 to \$21.16, and charges for laboratory work increased from \$41.36 to \$43.80. Under Federal law, USDA assumes inspection costs during regular working hours in plants

producing meat and poultry products for interstate and foreign commerce. However, USDA is authorized to charge plants for all mandatory inspection services beyond approved work schedules, voluntary laboratory work, and all voluntary inspection and certification services.

USDA To Allow Interstate Movement of Certain Organisms. Certain genetically engineered microorganisms can now be moved interstate between research facilities without a permit. Scientists from USDA's Animal and Plant Health Inspection Service (APHIS) have found that, when properly packaged, the commonly used laboratory organisms do not pose a risk to people, plants, animals, or the environment. The microorganisms being exempted are not only nontoxic but cannot survive outside of carefully controlled laboratory conditions. The exempted microorganisms are *Escherichia coli* genotype K-12 and its derivatives, sterile strains of *Saccharomyces cerevisiae*, and asporogenic (nonspore forming) strains of *Bacillus subtilis*. The organisms must not contain genetic sequences that allow them to invade or damage plants. Shippers must follow conditions outlined by APHIS.

Administrator Named for APHIS. James W. Glosser has been appointed administrator of the Animal and Plant Health Inspection Service. Glosser will administer programs related to animal and plant health and quarantine, humane treatment of animals, and the control and eradication of pests and diseases.

Glosser joined USDA in December 1983 as assistant administrator of APHIS, and became associate administrator in July 1985. He served as acting administrator of the agency following the death of Donald Houston earlier this year.

Louisiana Recognized as Citrus-Producing Area. USDA has recognized the entire State of Louisiana as a commercial citrus-producing area. As a result, citrus fruit from areas quarantined because of citrus canker may not enter Louisiana without a certificate indicating the fruit meets stringent restrictions. Previously, only a small part of southern Louisiana was designated as a commercial citrus area. Florida is the only State quarantined because of citrus canker. The disease can cause defoliation and other serious damage to leaves and twigs of certain citrus plants. It can also damage fruit, making it unmarketable.

Field Testing of Genetically Engineered Tomatoes Approved. USDA issued a permit to the Monsanto Agricultural Company of St. Louis to allow field testing of genetically engineered tomato plants that are designed to resist certain insect pests. The resistance was created by introducing a naturally occurring protein toxic to certain insects into the plants. When susceptible insects, such as the tomato hornworm, the cabbage looper, or the corn rootworm, eat the plant, they die from the toxin. The protein is nontoxic to humans, wild or domestic birds, fish, mammals, or most other insects. ■



In the News

Dietary Vitamin A May Be Safer For Elderly

Elderly Americans should probably rely more on fruits and vegetables for their vitamin A rather than on daily supplements. According to a recent study by the Human Nutrition Research Center on Aging at Tufts University, prolonged, daily use of multi-vitamins may cause low-level vitamin A toxicity.

The study surveyed 562 men and women over age 60. Of the half that took multi-vitamin and mineral supplements, five who had taken them for more than 5 years had two or three times normal levels of retinyl esters in their bodies. Four of the five had early signs of liver damage, an indication of chronic toxicity.

When retinyl esters enter the blood, they can convert to free retinol, which is toxic. The study indicates elderly seem more likely to have buildups of these esters than younger people. According to USDA's Agricultural Research Service (ARS), vitamin A needs can be met by eating fruits and vegetables that are high in beta carotene, a nontoxic source. Carrots, squash, tomatoes, dark-green leafy vegetables, peaches, and apricots all contain high levels of this vitamin A source.

For more information, contact nutritionist Stephen Krasinski, (617) 956-5864.

Vitamin C Helping Hypertension

Vitamin C supplements may someday be prescribed for mild hypertension if recent findings hold up under more intensive research.

In a recent study by ARS and Alcorn State University in Mississippi, an extra gram (1,000 mg) of vitamin C each day for 6 weeks significantly reduced blood sodium levels, as well as sodium-potas-

sium ratios, in 12 men and women who had mildly elevated blood pressure. No change occurred in eight participants with normal blood pressure, says physiologist/nutritionist David Trout with USDA's Carbohydrate Nutrition Laboratory in Beltsville, MD.

The supplements also lowered systolic pressure in the hypertensive participants but did not affect their diastolic pressure, the figure that most often concerns doctors, says ARS.

For more information, contact David Trout, (301) 344-2386.

Warming Up to Dietary Iron

Dietary iron may do more than prevent tired blood. It may also quell chattering teeth. A new study indicates that a person's ability to regulate body temperature may depend on daily iron intakes.

In the USDA study, six healthy young women consumed less than one-third of the recommended dietary allowance of iron and then used supplements to meet their daily needs. When they were exposed to cool temperatures, the women lost 29 percent more body heat and produced 9 percent less heat after the low-iron period than after the supplemental period, according to physiologist Henry Lukaski with USDA's Grand Forks Human Nutrition Research Center.

Other studies conducted at the Grand Forks, ND, center indicate that low copper or iron levels may also impair sleep. According to James Penland, a research psychologist there, women with low copper and iron appear to need more sleep and have more difficulty getting quality, restful sleep.

For additional information on iron and its connection with body temperature regulation, contact Henry Lukaski, (701) 795-8429. For information on the

relationship between mineral levels and sleep, contact James Penland, (701) 795-8471.

New Method for Measuring Dietary Fiber

ARS's Nutrient Composition Laboratory in Beltsville, MD, has developed a simplified method for measuring dietary fiber in foods. The new method allows chemists to analyze more samples in half the time and at half the cost.

The method could help speed up availability of fiber information on foods if the procedure is validated in further tests being arranged by USDA's Human Nutrition Information Service (HNIS).

USDA chemist Betty Li says the new procedure may actually be better than the official U.S. method for distinguishing between soluble and insoluble fibers—an important point since each type reportedly has different health benefits. Eventually, both values will be listed in HNIS's Agriculture Handbook 8.

For more information, contact Betty Li, (301) 344-2466.

A More Complete Soybean

Soybeans and other legumes will provide a more complete protein composition when a corn gene with enhanced sulfur content can be bio-engineered into the crops. Legumes are often very low in sulfur-containing amino acids.

Scientists already inserted corn's high sulfur storage protein gene into tobacco cells, which in turn produced plants with unusually high levels of sulfur amino acids. However, before such varieties of soybeans can be developed on a large scale, scientists must produce seed-bearing soybeans and other plants from the bio-engineered cells, says plant

physiologist Eliot Herman of USDA's Plant Molecular Genetics Laboratory in Beltsville, MD.

For additional information, contact Eliot Herman, (301) 344-3258.

The Most Flavorful Peanuts

When it comes to flavor, U.S. peanuts fare better in world markets than those grown by three of our competitors, China, Argentina, and Malawi, according to preliminary results from a joint ARS-industry study.

Heading the research for USDA, chemist John Vercellotti says the first year findings suggest that U.S. peanuts have the highest intensity of roasted peanut flavor, less bitterness, and fewer off-flavors. Chemical analysis of the peanuts supports the findings, says ARS. Vercellotti, who works for ARS's Food Flavor Quality Research Division in New Orleans, LA, adds that more studies are planned over the next 2 years to confirm these results. The studies will be a part of an overall strategy to increase U.S. peanut exports, he says.

For more information, contact John Vercellotti, (504) 286-4421.

Eliminating Salmonella from Poultry

Attempts to cut salmonella contamination in fresh poultry by washing chilled



Salmonella bacteria are hard to wash off poultry because they hide in the ridges and crevices of the skin.

products before packing may not be as successful as previously thought.

ARS research shows that salmonella bacteria are hard to wash off poultry be-

cause they hide in the ridges and crevices of poultry skin, says USDA food technologist Huda Lillard. These ridges become more pronounced, sheltering the bacteria even more, when the carcass is immersed in water. Salt water is more effective, but still removes only a small percentage of the contaminants, says Lillard, who is based at the Richard B. Russell Research Center in Athens, GA.

Research on how to eliminate salmonella contamination in processed poultry is continuing. For information, contact Huda Lillard, (404) 546-3567.

New Uses for Traditional Spices

Nutmeg and mace, traditional favorites for flavoring holiday foods, may one day be used as natural controls for insects that infest stored wheat and other cereal grains, says Helen Su, a research chemist at USDA's Stored Product Insects Research and Development Laboratory in Savannah, GA.

Recent studies conducted by ARS showed that oil extracts from these spices killed 10 to 20 percent of two beetle pests and 30 to 40 percent of rice weevils. The extracts, sprayed on wheat at concentrations of 2,000 parts per million, repelled rice weevils for 4 months.

For additional information, contact Helen Su, (912) 233-7981. ■

Reports of Interest

The following descriptions are of recent Economic Research Service reports that may be of interest to the food industry. To order copies from the U.S. Government Printing Office (GPO), complete the form on page 46.

U.S. Food Marketing Sales Rise 4 Percent

Total sales of the U.S. food marketing system reached more than \$600 billion in 1987, a rise of about 4 percent above 1986. Food consumed at home accounted for \$238 billion, food away from home accounted for \$205 billion, and alcoholic and packaged beverages, \$71 billion.

In addition to increased sales, the sector saw a 25-percent rise in the number of grocery products introduced last year. That number included more than 7,900 new food products, according to the recently released *Food Marketing Review*, 1987.

The report details changing trends in the food industry, from decreased after-tax profits for food retailers in 1986 to increased foreign investment by U.S. food marketing firms last year.

Food Marketing Review, 1987. By Anthony E. Gallo, Walter B. Epps, Philip R. Kaufman, Charles R. Handy, Harold R. Linstrom, and Lester H. Meyers. August 1988. \$6.00. GPO Stock Number 001-019-00594-7.

Weak Dollar Has Mixed Reviews in U.S. Export Market

Developing countries have become important markets for U.S. agricultural products, accounting for more than 40 percent of U.S. farm exports in 1986. Trade with some of these countries, whose ability to purchase from the world

market depends on their own sales to the United States, is hurt by the weak dollar.

The developing economies lose income because the U.S. dollars they earn on the goods they sell us buy less on the world market. Consequently, U.S. agricultural sales to the developing countries could also drop. However, developing countries whose exports are sold for stronger currencies than the U.S. dollar could purchase more U.S. goods.

This report measures the effects of changes in currency exchange rates from 1980 to early 1987 on the ability of 14 developing countries to buy U.S. agricultural exports.

How the Dollar's Value Affects U.S. Farm Exports to Developing Countries. By Mary E. Burfisher. July 1988. \$1.50. GPO Stock Number 001-019-00593-9.

USSR's Livestock Inventories Are Large, But Productivity Lags

In a 20-year effort to boost supplies of livestock products, the Soviet Union has increased its inventories of cattle and hogs to well over comparable U.S. totals in 1987. Productivity, however, has not kept pace with the United States. Soviet meat production is 40 percent lower for pork and 35 percent lower for beef and veal. Agricultural reform policies, now being implemented by Gorbachev, are intended to boost production rather than inventories, but this reversal in emphasis will require many changes.

One of the major reasons for low productivity, especially in hogs, has been lack of protein in the feed. A large proportion of low-quality feeds and inappropriate mixes have been used in hog rations. Also, a large share of the roughage, such as hay and silage, that is fed to cattle has been of such low quality that it has contributed little to animal productivity and has negated the positive

effect of higher quality feed when included in the same ration.

The Soviet Union has recognized the problem, and since 1982, has adopted a number of policies to increase its protein feed production, such as expanding oil-seed and pulse crops, shifting roughage crops away from grasses to higher protein legumes, like alfalfa and clover, and expanding industrial production of protein to be used in mixed feeds. In addition, the Soviets are importing more soybean meal.

This report reviews the conditions which led to the current reforms of the Soviet livestock sector, and it evaluates the potential for success of the proposed programs.

The Soviet Livestock Sector: Performance and Prospects. By Edward C. Cook. June 1988. \$1.75. GPO Stock Number 001-019-00587-4.

Nonmetro Elderly Population Is Growing and So Are The Problems

The elderly make up a rapidly increasing proportion of the U.S. non-metropolitan population and a disproportionate share are living in poverty. The nonmetro elderly poverty rate was 21 percent in 1980 with a median income of \$4,111, while the metropolitan elderly's poverty rate was 13 percent with a median income of \$5,003.

Analyses suggest that the low-income status of nonmetro elderly can be attributed more to their circumstances than to their location. Unemployment, low occupational status, low educational attainment, and living alone were the major factors contributing to poverty.

This report examines the demographics of the nonmetro elderly population, points out the important per-

sistent differences in their characteristics, and discusses the problems of this growing population segment.

The Nonmetro Elderly: Economic and Demographic Status. By Nina Glasgow. June 1988. \$2.00. GPO Stock Number 001-019-00570-0.

How Much Can Farmworkers Depend on Farming?

The overall drop in farm employment in recent years could continue, depending on changes in technology, the structure of agriculture, immigration policy, and farm legislation. Besides declining labor needs, the agricultural work force has faced periodic low income from farming.

This report identifies characteristics of the households and individuals most affected by changes in farm employment and income. It separates farmworkers into three groups: hired farmworkers, farm operators, and unpaid farmworkers. It discusses their demographic charac-

teristics with text and statistical data and makes comparisons among the three groups.

The Agricultural Work Force of 1985: A Statistical Profile. By Victor J. Oliveira and E. Jane Cox. March 1988. \$1.75. GPO Stock Number 001-019-00568-8.

Market Characteristics for Nine Fresh Fruit and Vegetable Imports

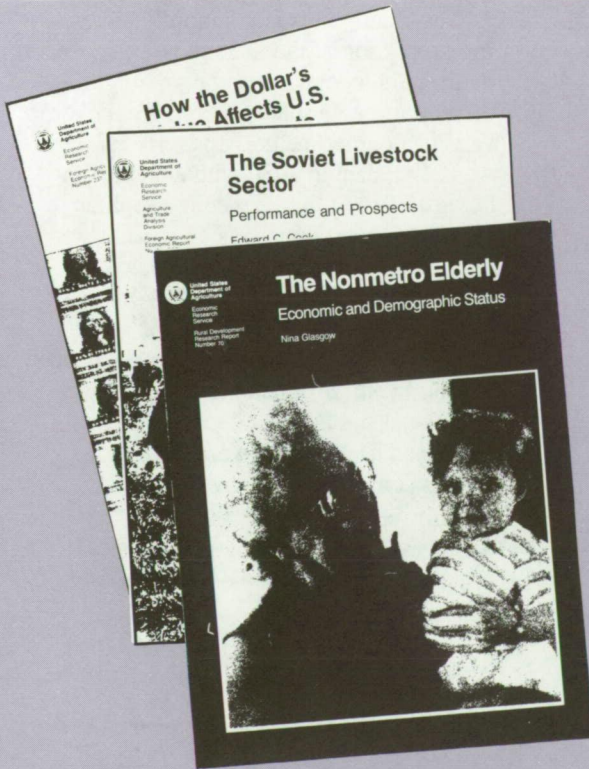
This is an indepth study of U.S. production, consumption, supply (including imports and exports), and prices for nine commodities in the fresh form. They are avocados, broccoli, cantaloupes, cauliflower, cucumbers, honeydew melons, limes, mangoes, and peppers.

The report was developed to provide needed market information on nontraditional agricultural products. The Caribbean Basin Economic Recovery Act of 1983 offered 27 Caribbean and Central American countries duty-free access to

U.S. markets for a minimum of 12 years. U.S. growers need to know how the Caribbean Basin Initiative affects their competitive position, or how they might expand shipments to the region.

This free publication provides a 10-year annual and monthly data base for the nine commodities, determines annual and seasonal patterns of quantity and price trends, identifies additional information needs for more effective supply and demand analyses, and identifies the primary sources of fruit and vegetable data.

Fresh Fruits and Vegetables: Some Characteristics of the U.S. Market for Nine Selected Imports, 1975-85. By Richard N. Brown, Jr., and Nydia R. Suarez. June 1988. Staff Report No. AGES880527. Copies are available from the authors while supplies last, as are uniform data sets for each commodity (compatible with IBM and Lotus spreadsheets), (202) 786-1680. ■



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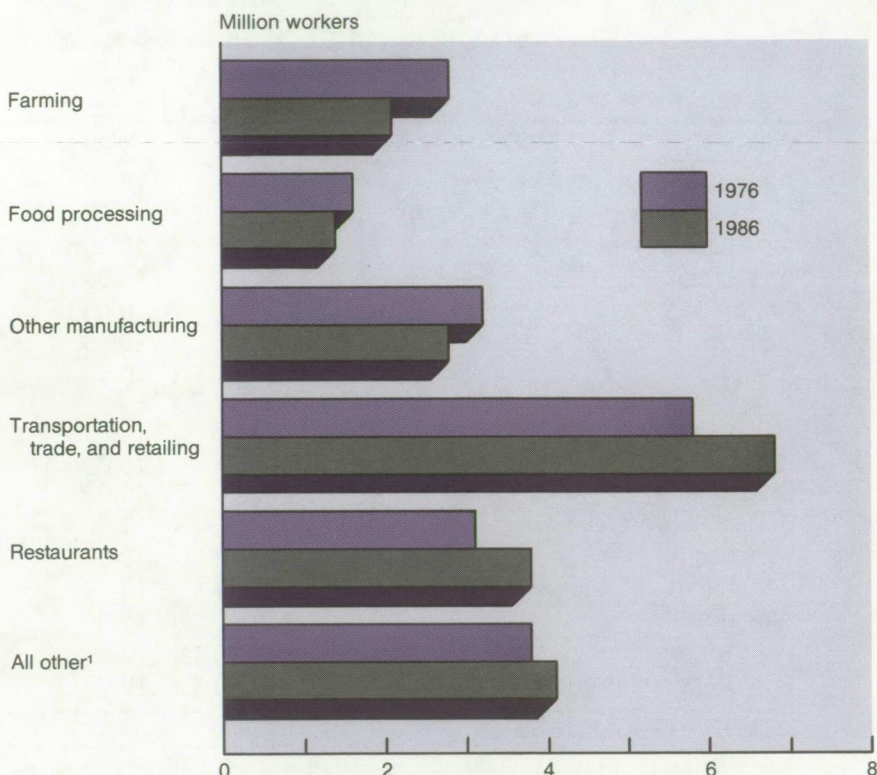
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The U.S. Food and Fiber System

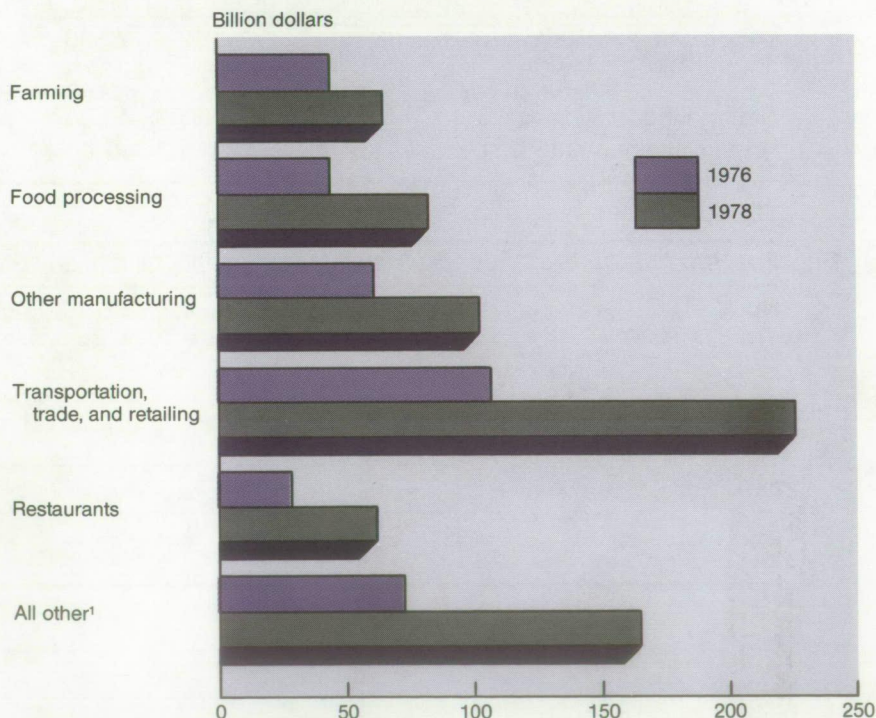
In 1986, the food and fiber system employed 21 million workers, up from 20.2 million in 1976. However, the system's share of total domestic employment dropped from 21.0 percent to 17.9 percent during the period, reflecting faster growth in the general economy. Transportation, trade, and retailing accounted for the largest number of food and fiber workers in both 1976 and 1986—5.8 million and 6.8 million, respectively. Restaurant employment, spurred by the boom in fast-food outlets, was the fastest growing category, increasing 23 percent during the decade. The number of people employed in farming dropped 25 percent to 2.1 million in 1986. As agriculture has become more mechanized and the number of farms continues to decrease, workers have sought jobs in other sectors of the economy.

The Food and Fiber System Provided Employment to 21 Million Workers in 1986



The food and fiber system generated \$701.5 billion worth of output in 1986, 16.6 percent of total GNP (Gross National Product). In 1976, the system accounted for \$354.6 billion in output, or 19.9 percent of GNP. Because demand for farm products tends to be relatively stable, activities such as producing, assembling, processing, and distributing these products to consumers are also relatively stable. Therefore, as the economy grew during the decade, demand for other products increased at a faster rate, and the food and fiber system's share of output and employment dropped.

The System Also Generated Over \$700 Billion Worth of Output



Source: *Economic Indicators of the Farm Sector, Farm Sector Review 1986*, ECIFS 6-3, ERS, USDA, January 1988.

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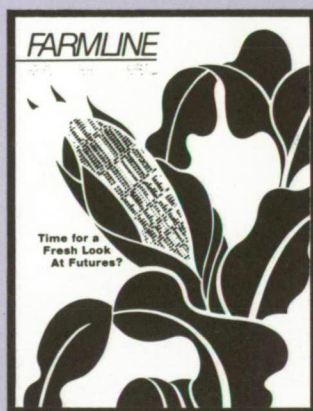
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