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Agriculture-Based Economic Development:

Trends and Prospects for New York

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PREFACE

Structural change in New York agriculture continues to raise new questions about the industry and its future prospects for economic growth and development. What steps can educators, community leaders, and public agencies take to promote improvements in the economic and social climate for communities that are dependent upon farm and food production? The New York State Department of Agriculture and Markets and Cornell's College of Agriculture and Life Sciences play an important leadership role in the agriculture-based economic arena. This report is one of two documents that deals with the collaborative work that will be needed to advance the discussion of development challenges and opportunities for the State and identifies program milestones for the Commissioner. A second report, entitled *Market Enhancement Programs Operated in New York's Key Competitor States and Provinces*, documents the direction and scope of well over 100 ag-based economic development programs now operating in competitor states and Canadian provinces.

This research effort was conducted with financial support provided by the New York State Department of Agriculture and Markets. The Commissioner and his staff were directly involved in the study design and provided periodic advice on its conduct. In addition, the study was supervised by an advisory committee assembled by the Commissioner. The advisory committee membership included: Pat Hooker, NYS Farm Bureau; Tom Shepard, Dairylea Cooperative, Inc.; Joe Walsh, Cornell Cooperative Extension, Sullivan County, New York; Tim Pezzolesi, Cornell Cooperative Extension, Ontario County, New York; Martin Culik, Cornell Cooperative Extension, Genesee County, New York; R. David Smith, Cornell University; John Mitchell, IL Richer Feeds, Inc.; Ora Rothfuss, Ag Development Specialist, Wayne County Planning, Wayne County, New York. In addition, Michael Chamberlain, formerly with NYS AgriDevelopment Corp., made important contributions to the design and conduct of the study.

Agriculture-Based Economic Development: Trends and Prospects for New York

Executive Summary

Policymakers in New York State are confronted with a set of fundamental questions about agriculture-based economic development. The purpose of this report is to help advance the discussion of agricultural development challenges and opportunities for the State and identify program milestones for the Commissioner of Agriculture and Markets. Specific objectives were to assemble baseline information on farm and food trends and develop new estimates of interindustry relationships and economic multipliers for New York farm and food sectors. A companion report contains an inventory of agriculturally-based economic development of programs in New York's key competitor states and two Canadian provinces.

Addressing these topics requires a full understanding of concepts and definitions. Changes in the structure of farm and food production and differences in the language and terminology used by data providers made this step essential.

- To take the wide view and to recognize new forms of business, agricultural economic development should take the entire "food system" into account. This approach directs attention to economic activities ranging from behind-the-farm-gate food and fiber production to final food and fiber consumption and the steps in-between.

- Many farm and food business firms are seeking opportunities to diversify and grow their businesses. Following business growth and diversification strategies can make relatively simple businesses into multiproduct firms that combine commodity production with downstream provision of services, processing, and/or distribution to consumers.

- Along with diversified business forms, some new or just-emerging products will also test the meaning of farm and food production or blur any neat lines between commodity production, services, and manufacturing.

- Federal statistics count farms as places producing farm commodities having a market value of $1,000 or more per year. The 1997 Census reported that New York has about 32,000 farms. The Census also reported that New York has approximately 7.2 million acres of land in farms.

- The five-year Census routinely undercounts farms and subsequently underestimates the acreage of land in farms. Undercounts are evidenced in annual estimates of farms and land in farms made by the New York Agricultural Statistics Service. In 1997, the Service estimated farm numbers at 38,000 and land in farms at 7.8 million acres.

- A different impression of farmland area comes from the U.S. Department of Agriculture's National Resources Inventory (NRI). The 1997 NRI pegged cropland acreage and pasture acreage at 5.4 million and 2.6 million acres, respectively, an area *70 percent* higher than the amount reported in the Census. The discrepancies trace to differences in data gathering procedures and to important differences in definition.

- The Census definition of farm and farmland is markedly different from definitions currently embedded in New York's state law, leading to another possible source of confusion over definitions.

- Using total output as the unit of measure, the definitions of farm and food incorporated into this study focus attention on industries with output valued in excess of $23 billion in 1996. These industries include the farm sector, agricultural services, and food manufacturing.

Forward and backward linkages were examined to better understand the dependencies between farm

and food production and markets inside New York, other domestic outlets, and exports to other countries. Farming exerts impacts on the New York economy through forward linkages to transportation, wholesaling, retailing, and food services. Some of those links are achieved within New York State and some are achieved out of state. Backward linkages between food and agricultural production in New York and other sectors of the wider New York economy are analyzed through the calculation of economic multipliers.

- Estimates of forward linkages suggest that 65 percent of total gross output in New York's dairy production sector is sold to in-state buyers -- almost exclusively to milk handlers and processors. Offshore export sales of dairy farm products are extremely low while about 35 percent of the total finds its way out of state to processors and handlers.

- A similar pattern is evident for New York's poultry and egg sectors and the cattle sector, and features large domestic exports and negligible offshore exports. In sharp contrast, the highly mixed "other livestock" sector features in-state sales of about 74 percent, with shipments offshore accounting for about 19 percent of total gross output; shipments to domestic outlets outside the state of New York are a relatively low 7.5 percent.

- The picture for New York crop production is varied, with the fraction of total gross output accounted for by in-state sales ranging from 53 to 86 percent depending on the commodity sector considered. Dependence upon in-state markets is the highest for New York's rapidly growing greenhouse and nursery industries, with nearly $9 of every $10 in gross output going to in-state sales.

- Available trend data suggest that exports originating with firms in the New York food manufacturing sectors have increased since the late 1980s. In contrast, exports of raw farm commodities, whether crops or livestock, exhibited little trend over the interval 1988-1999.

- Economic multipliers were calculated using total output and employment as units of measure. Output multiplier estimates generally fall in the range of 2, suggesting each new dollar of farm and food output for the state brings additional production valued at nearly 1 dollar. Output multipliers for food and agricultural sectors compare reasonably well with those associated with expansions or contractions in nonfarm sectors.

- Because of differences in relationships between output and employment, employment multipliers are far more robust than output multipliers. The aggregate employment multiplier for food manufacturing is estimated at 4.0. This finding suggests that for every additional new job created in food manufacturing in New York State, an additional three jobs are supported in industries and sectors structurally linked to the food manufacturing sector.

Important secondary or multiplier benefits are predicated on successful efforts to produce direct economic impact. The conditions that warrant new production in any single farm or food sector must be fully understood. Much of the contemporary discussion about agriculturally based economic development is rooted in conditions and circumstances that have been operative in New York State for many years.

- At the close of World War II, New York had about 125,000 farms. Rapid farm consolidation has dominated the rural landscape. New cost-price relationships, economic opportunities on and off the farm, and shifting social realities have generated consistent declines in farm numbers over the last 50 years.

- Farm consolidation, along with expanded competition for land from nonfarm uses, has resulted in continual decreases in farm acreage -- from 16 million acres in 1950 to just over 7 million acres in the late 1990s. The largest percentage of this acreage has reverted to natural forest cover after cropping and pasture operations were abandoned by farmers. The remaining acreage has been converted to residential, commercial, and transportation uses.

- Farm and farm acreage losses have not translated into farm output decreases be-

cause of striking gains in land and labor productivity. Using 1996 as a reference point, receipts from crop sales and livestock/livestock product sales were estimated at $1 billion and $2.1 billion, respectively. Nearly seven of every $10 in farm output is accounted for by livestock and livestock products. This ratio has remained essentially stable during the last two decades.

- Production agriculture is dominated by fluid milk production. The New York dairy industry accounts for 56 percent of total receipts from farm marketings. In dollar terms the dairy industry generates a dollar volume in the vicinity of $1.74 billion at present. Production levels fluctuate slightly from year to year, and milk prices have shown greater volatility in recent years. Shifts in these price and quantity relationships have resulted in fluctuations in total gross receipts that range from about $1.4 billion to nearly $1.8 billion during the 1990s.

- The New York poultry and egg sector is substantially smaller than the dairy sector but generates nearly $90 million in cash receipts each year. Receipts from poultry production have remained relatively stable throughout the last decade, with fluctuations in cash receipts ranging between $82 million and something in excess of $100 million per year during the 1990s.

- The New York farm sector generates about $130 billion per year from the sale of meat animals; production value was substantially lower in the late 1990s compared with earlier years. In the early 1990s, cash receipts from this source approached $250 million. Similarly, cash receipts from the sale of miscellaneous livestock -- such as swine, sheep, and goats -- have declined in recent years. Presently, miscellaneous livestock generated receipts in the $90 million a year range.

- Much of New York's crop acreage is used to produce feed and forage crops to support the livestock industries mentioned above. Hay crops are the largest block of New York crop acreage, but many New York farmers sell crops to generate cash for the farm business. Receipts from the sale of oil seed crops (almost entirely soybeans), field grains (corn primarily), and food grains (wheat primarily) totaled more than $193 million in 1999, down from a peak of $250 million in 1996.

- In 1999, cash receipts from sales of all fruit crops approached $209 million. New York also has a vibrant vegetable crops industry. Cash receipts from the sale of vegetable crops were as high as $356 million in the late 1990s. Sales of greenhouse and nursery products have ramped up in recent years, and in 1999 receipts from this source exceeded $275 million.

Year-to-year movements in farm and food production during the 21-year interval 1977-1998 were examined. For each year in the interval, farm and food production was assessed using three alternate units of measure: employment, earnings, and value added.

- Farm employment in New York State, during a period of rapid increases in labor productivity and growth in average farm size, decreased from nearly 100,000 jobs to about 59,500 jobs between 1977 and 1998.

- Job-making in agricultural services over the last two decades has increased dramatically. As a result, industries defined as agricultural services result in the same proximate number of jobs as those found in direct crop and livestock production. For the reference year 1998, agricultural services employment is estimated at just over 59,000 jobs, more than a two-fold increase over the employment estimated in 1977.

- Abrupt employment expansion in ag services is not anomalous because this service category relates to production agriculture in only a limited way. While inclusive of such farm services as soil preparation, custom crop harvesting, crop preparation services for marketing, and veterinary services for livestock, the agricultural services category largely deals with several nonfarm lines of economic activity. Along with farm animals and to a much larger extent, veterinary services extend to a variety of companion animals. Similarly, other companion animal

services such as animal boarding or kennels are included in the ag services sector. Another major area encompassed by agricultural services is activity related to New York's green industries, including landscape, lawn and garden services, ornamentals, and trees, along with a variety of establishments purveying services for forestry and fisheries sectors.

- Employment in food manufacturing does not show employment increases but mirrors the steady job losses that characterized production agriculture throughout the 1977-98 interval. As with farm and agricultural services employment, food manufacturing accounts for over 59,000 jobs, down from more than 96,000 jobs in the mid-1970s.

- Moving away from employment as a unit of measure provides a distinctly different impression of trend in some cases. Value added originating in farming, in sharp contrast to farm employment, has remained relatively stable and exhibits a slight upward trend in current dollar terms over the last two decades. Value added in agricultural services mirrors employment trends and has increased abruptly during the last two decades.

- By the close of the 1990s' decade, value added in agricultural services exceeded the value added in production agriculture. This suggests that, like the larger macro economy, New York food and agriculture are becoming a service-based set of industries.

- Value added in food manufacturing has moved in directions counter to movements in employment over the past two decades. These countermovements are expected because of sharp increases in labor productivity over time. Value added in food manufacturing has increased precipitously since the mid-1970s and presently stands at about $5.5 billion, up from just over $3 billion in 1977.

- Taken together, the gross state product originating in New York food and agriculture has increased dramatically during the last two decades. In current dollar terms, the value added in these three sectors has increased from more than $4 billion per year to more than $8 billion over the 20-year interval.

- Comparisons of value added measured, alternatively, in current dollar and constant (price adjusted) dollar terms show that the New York macro economy realized a 29 percent real increase in value added production over the 1986-98 interval; real value added in ag services increased at a rate comparable to the statewide trend, with a percentage increase of 30 percent between 1986 and 1999.

- Real value added in the New York farm sector fell below the 1986 base year throughout the late 1980s and 1990s. Real farm value added rebounded slightly in the late 1990s and presently stands at about 97 percent of the 1986 level. Real value added in food manufacturing displays little trend between 1986 and the mid-1990s. However, value added in food manufacturing has fallen in recent years and registered an index value of 90 percent in 1998.

- Production agriculture generates earnings in the range of about $500 million each year. Earnings in farming are highly erratic with often-abrupt year-to-year changes triggered by fluctuations in commodity prices and/or the vagaries of weather. Farm proprietors absorb most of the volatility in farm earnings. Earnings include payments to hired farm labor, but proprietors' earnings are a relatively large proportion of the total and move with increases and decreases in net farm income.

- Earnings originating in agricultural services have systematically increased and presently are about $1.1 billion, an amount significantly above that generated by production agriculture.

- Like ag services, earnings in food manufacturing have increased systematically despite declining employment during the last two decades. In 1998, food manufacturing earnings stood at about $2.8 billion, an amount nearly six times the amount realized from crop and livestock production.

A useful context for interpreting long-term trends in income and employment is performance in New York compared with the nation and key competitor states.

- In percentage terms, the 1977-98 decrease in farm employment in New York was approximately in line with the U.S. average. For the nation as a whole, farm employment fell from about 3.9 million to 3.1 million over this two-decade span, a decrease of about 19 percent. With the exception of California and Washington, all 11 competitor states included in this study exhibit similar farm employment trends.

- Nationally, farm employment per 100 persons decreased systematically from 1.8 to 1.2 over this period, on average. Almost identical rates of change occurred among New York's competitor states, although relatively smaller shares of the total population were engaged in farming. New York's level of engagement as reflected in employment/population ratios is markedly lower than any of these cases and ranged between 0.5 and 0.33 between 1977-98.

- New York registered very sizable increases in agricultural services employment over the last two decades, but realized one of the nation's more modest employment gains in these aggregate sectors. Nationally, the percentage increase was over 200 percent during this interval, compared with 113 percent in New York. Percentage gains were uniformly higher in competitor states, with percentage increases approaching or exceeding 250 percent in several states, capped by North Carolina's impressive 326 percent gain.

- Some state-level percentage increases were made from fairly small employment bases. Adjusting the employment data for population size showed that New York's competitor states, on average, moved in accordance with the national trend. New York, however, realized a breakaway in the early 1980s, and employment increases have been relatively modest in agricultural services since that time.

- Patterns are much the same for food manufacturing, with New York realizing the largest percentage decrease in food manufacturing employment among the states included in this summary. Nationally, food manufacturing has not been a vibrant source of employment, with jobs hovering in the range of 1,700,000 since the mid-1970s.

- A similar pattern emerges when attention turns to measures based on state gross product or earnings. Data on per capita value added (gross state product) and earnings both show that New York lags behind the nation and competitor states. While both product and earnings have increased in New York over the recent past, rates of change have stagnated beginning in the early 1980s, with no recovery evidenced in the data.

Agriculture-Based Economic Development: Trends and Prospects for New York

Nelson L. Bills*

Introduction

Policymakers, industry leaders, planners and economic development professionals in New York State are confronted with a set of fundamental questions about agriculture-based economic development (AED) and its potential to support and/or enhance the economic vitality of communities across the state. Some of these questions are: How might accelerated efforts to grow the state's food and farming industries play into mainstream economic development efforts in New York State? Are there unexploited opportunities to boost performance in agriculture and food sectors? What benefits might come to local economies from more emphasis on local farm and food systems, or from more aggressive efforts to target offshore markets? How can educators, community leaders, and public agencies intervene with farm and agribusiness firms in ways that lead to cumulative improvements in the economic and social climate for communities as well as farm and food production?

This report seeks to better inform some of these questions. It grew out of a joint project with the New York State Department of Agriculture and Markets. The overall purpose of this project was to begin the collaborative work needed to advance the discussion of development challenges and opportunities for the State and identify program milestones for the Commissioner.

The project blends an extension outreach effort and applied research and is organized around three general topics. They are:

I. Community Involvement in Agriculture Economic Development for NYS — An Educational Opportunity;

II. Agriculture Economic Development for New York State;

III. Benchmarking Market Enhancement Programs in New York's Key Competitor States.

Each topic was developed in collaboration with the Commissioner and his staff. Guidance was also received from a project advisory committee organized by the Commissioner. This committee met periodically to review data, methods, definitions, and opportunities for communicating research results to diverse audiences across the state.

This report deals with II above, and concentrates on the assembly of 1) baseline information on trends in New York farm and food production, including available state-level information on farm and food production for major market outlets and 2) estimates of interindustry relationships and economic multipliers for New York farm and food sectors. The report is organized around several sections. The first section introduces key definitions and discusses the sources of data employed in this study. Subsequent sections are organized around each of the above study objectives.

This study is less comprehensive than assessments of New York's food and agricultural sectors conducted on an intermittent basis in years past. In the 1960s, the Department of Agricultural Economics issued a series of reports under the general theme of "Toward the Year 1985". These reports were an extensive analysis of individual commodities, markets, and the production circumstances for communities across New York State; numerous development issues were

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addressed at the farm and sector level, and changes in farm and food production were projected. Nearly 20 years later, in the mid-1980s, the College collaborated with the New York State Department of Agriculture and Markets on a project of similar intensity, entitled "Agriculture 2000".

The study reported here is far more modest in scope. It does not contain projections or detailed assessments of individual commodities or commodity groups or insight from analysts with commodity-based interests in production and marketing issues. Rather, the intent is to help set the stage for a continuing discussion of New York's farm and food challenges and opportunities.

The motivation for the study is primarily related to programmatic needs in Albany and in the New York State Department of Agriculture and Markets. The Commissioner has focused the department's attention on agricultural economic development and is interested in baseline data and analysis which helps illuminate options and shows a way forward on farm and food-based economic development.

Although economic parameters and dimensions are stressed here, several other critical motivations for encouraging vibrancy in New York's farm and food sectors are acknowledged. Namely, farming and industries allied with farming produce a variety of widely acknowledged community, landscape, and environmental values for New Yorkers. These values are absolutely crucial to a full discussion of New York farm and food issues, but do not receive explicit treatment in this report because of limits on time and resources. The results reported herein do not diminish the statewide interest in husbanding these wider social and environmental values but provide more insight into the economic circumstances for farm and food.

Concepts and Definitions

Changes in the structure of farm and food production make review of definitions and concepts a critical first step in this study. Some of these structural changes are subtle and not easily detected in the data and evidence commonly used to describe these industries. The language and terminology used by data providers and development practitioners is not uniform. This study draws upon and integrates information and data series maintained and published by six Federal data providers in three separate agencies.

These data sources are interlocking but often feature materially different terminology and data management conventions. These differences are typically overlooked or assimilated in the economic literature; economic analysts are usually quite familiar with, and sometimes entertained by, the nuances in data and their meaning. During the course of this study, which included guidance from a broad-based advisory committee, it became clear that users who are less familiar with data sources and economic jargon can be confused by what appears at first glance to be substantive differences in the data. One accomplishment of this study is the arrangement of data and their interpretations in ways that speak to policy questions while meeting the needs of multiple audiences and users. These individuals want to participate in the policy discussion without becoming snarled in the linguistics and jargon embedded in economic data by well-intended economic analysts.

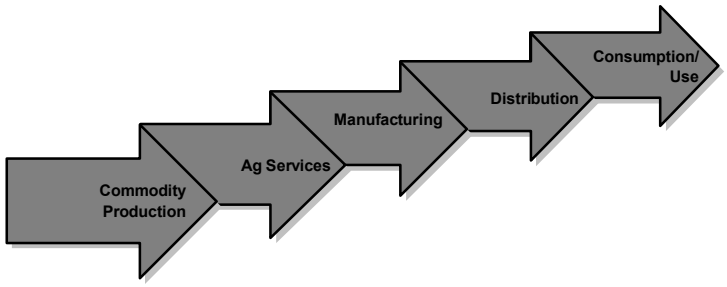
The farm and food system

The point of departure is a working definition of farm and food. One concern that prompted this study was that discussions of agricultural economic development often tend to be narrowly gauged, with a focus on one type of farm or industry. For example, it is not difficult to find commentators who are willing to use New York's largest farm industry, fluid milk production, as a metaphor for the state's food and agriculture industries. But conditions in any single New York industry, even its largest economic sector, hardly ever mirror the circumstances faced by other growers and producers. On the other hand, changes in technology, cost-price relationships, and shifts in consumer demand are encouraging farm, ag service, and food industries to adopt new business organizations and arrangements. Some of these adaptations are blurring the traditional lines between farm/nonfarm and food/nonfood endeavors.

For both reasons -- to avoid a myopic view and to recognize new business forms -- the organizing principle for this study was that the analysis should take the long view, considering to some extent all the elements of what has been referred to as the "food system". Such a construct is depicted in Figure 1, where economic activities ranging from behind-the-farm-gate food and fiber production to final food and fiber consumption and all the steps in-between are taken under consideration.

Farm and food business firms often cross the boundaries depicted in Figure 1 when they seek out oppor-

Figure 1. The Agriculture and Food System



tunities to diversify and grow their businesses. Following business growth and diversification strategies can make relatively simple businesses into multiproduct firms that combine production of farm commodities with downstream provision of services, processing, and/or distribution to consumers. Multiproduct firms are harder to accurately classify and are not always, if ever, accurately portrayed in published industry statistics. This adds another layer of difficulty to accurate descriptions of the New York farm and food sectors.

Examples of the problems caused by multiproduct firms abound. One profound example for New York agriculture and agricultural economic development is found in the arena of direct marketing. Strategies and tactics on the part of growers and producers to achieve direct contact (sales) with consumers are thought by many to be part and parcel of a community, farm-based economic development strategy. A frustration is devising ways to keep score on such efforts and accurately reflect them in the data surrounding the farming industry. Presently, Federal data managers attempt to take account of direct sales to consumers by farm operators while adhering to strict definitions of a farm product sale. To do so, data managers carefully discriminate among elements of a business unit that do and do not adhere to standing definitions of a "farm". Thus, a "firm", one business entity with both farm and nonfarm operations, may not be fully represented in farm statistics.

An example is the operation of a "farm market". Farm markets are engaged in wholesale/retail sales. Such markets are often, if not almost always, operated by individuals or corporations who "farm" by Census definition. The farm wholesale/retail operation, in turn, can, and oftentimes does, feature sales of produce from the attached farm operation along with the merchandising of any number of other products -- both food and nonfood -- processed (manufactured) on site or purchased at wholesale for resale. However, these manufacturing/retail activities are judiciously pruned from the statistical data gathered on agriculture (for the last two Ag Censuses, efforts have been made to account for "Value of agricultural products sold directly to individuals for human consumption", an accounting of product produced on the farm and sold to consumers). This leads to endless confusion over what the data represent and what one sees on the ground. For the latter, efforts to diversify a business and ensure its growth and long-term sustainability are often precisely the steps needed to add vibrancy to the local farm and food industry. The disconnect between data and the structure of farm and farm-related businesses will surely increase in magnitude as time goes on.

Even when business arrangements, business structures, and marketing channels are well understood, new or just-emerging products may test the imagery we all use to assign our own meaning to the terms "farm" and "food" or blur any neat lines between commodity production, services, and manufacturing. An example might be developments in biotechnology, which can lead to the use of farm plant and animal breeds as hosts for the production of new medical or industrial products. Clearly, the husbanding of the animal constitutes farming, but the principal product is a medical or industrial product rather than a farm commodity. Other examples can be found by considering changes in veterinary medicine, a traditional support industry for farming now largely organized around products/services for companion animals — equine, canine, and feline species in particular. Is the practice of a veterinarian, quite obviously an integral part of the economic fabric of both urban and rural communities, still to be classified as an "agricultural" service?

Conflicting definitions of farm and farming

With these issues in mind, our construct of the food system is anchored by commodity production on farms. Farm definitions are often the subject of academic and policy discussion, with distinctions drawn between "big" farms or "small" farms, "family" and "corporate" farms, "real" farms and "hobby" farms and so on. No attempt was made to advance or settle alternate farm definitions in this study. Rather, the definition used follows Federal statistics, which

count farms as places producing farm commodities having a market value of $1,000 or more per year. This definition is very inclusive and extends to operations that generate little, if any, net cash receipts for the farm operator in any given year. Based on this definition, the 1997 Census of Agriculture reported that New York has about 32,000 farms (USDA, 1999).

The definition of farmland in published agricultural statistics follows directly from the definition of farm and counts the acreage owned or leased by individuals (sole proprietors), partnerships, and corporations who conduct farming operations by Census definition (see Box 1). The last Census reported that New York has approximately 7.2 million acres of land in farms. Unfortunately, however, the five-year Census routinely undercounts farms and subsequently underestimates the acreage of land in farms. Undercounts are evidenced in annual estimates of farms and land in farms made by the New York Agricultural Statistics Service (NYASS, 2001a). In 1997, NYASS estimated farm numbers at 38,000 and land in farms at 7.8 million acres (USDA, 2001); that same year, as noted above, the Census pegged farm numbers at about 32,000 and land in farms at about 7.2 million acres (USDA, 1999). These are not inconsequential differences: underenumeration apparently reduces one's impressions of the State's total farmland pool by something approaching 10 percent. The collateral effect is to confuse the users once again with numbers materially different but labeled and packaged identically in alternate Federal publications and data series.

Referring to the Census of Agriculture, reported acreage of land in farms accounts for about one-fourth of the state's total land area. Accounting for underenumeration, as discussed above, increases this fraction slightly. In either case, land in farms is not synonymous with land actually used for crops or pasture for livestock. Each New York farm also contains acreage that can be called support land. Support land includes building spaces, roads and lanes, as well as some woodland acreage owned or leased by the farm operator.

An entirely different impression of farmland area comes from the U.S. Department of Agriculture's National Resources Inventory (NRI). The 1997 NRI pegged cropland acreage and pasture acreage at 5.4 million and 2.6 million acres, respectively, an area 70 percent higher than the amount reported in the Census (USDA, 2001). Some of the differences undoubtedly relate to differences in data gathering procedures, since the NRI is area-based point sample design, while the Census relies on survey responses by farmers. But the larger source of discrepancy, once again, relates to important differences in definition. The Census definition of farm does not turn on land cover, as with the NRI, but upon the market value of farm product sales. This definition can exclude acreages with crops and pasture as a land cover that generate little (under $1,000) or no revenue from farm product sales. The most important example is New York's equine industry. Many equine operations look like farms, take up considerable acreage used for crops and pasture, but are not organized to generate business revenue. Still other equine operations generate revenue, but not from farm commodity sales. Rather, the revenue comes from the provision of services (riding, training, boarding, and so on). Revenues from the provision of such services are out of bounds under prevailing farm definitions and such equine operations are not regularly counted in the Census. In contrast, the NRI makes an accounting of the landscape dimension of

Box 1: Census definitions of farm and land in farms

Land in Farms: Land owned, rented or leased from others, less land rented or leased to others.

All Land Owned: Report all land owned during the Census year whether held under deed, purchase contract or mortgage, homestead law, or as heir or trustee of an undivided estate. Include all land owned by you and/or your spouse, or by the partnership, corporation, or organization for which you are reporting.

All Land Rented or Leased FROM OTHERS: Report all land rented by you or your operation, including

- Land for agricultural use that you rented from others for cash
- Land you worked on a share basis (crop or livestock)
- Land owned by someone else that you used rent-free
- Land rented or leased BY THE ACRE from federal or state governments, Indian reservations, or railroads

All Land Rented or Leased TO OTHERS: Include all land rented out for any purpose

- Owned land rented to others for cash or a share of crops or livesck
- Land you rented from someone and then subleased to someone else
- Land worked for you by someone for a share of crops or livestock
- Land which you allowed others to use rent-free
- Land placed in the Conservation Reserve Program (CRP) or
- Wetlands Reserve Program (WRP) as acres rented to the government

Source: http://www.nass.usda.gov/census/census97/volume1/us-51/toc297.htm

such equine operations in determinations of land cover. That is, NRI technicians inventory cropland and pastureland regardless of whether the owner meets the Census definition of a farm. This means that equine operations are a key part of the rural and farm landscape in many locales but remain unrecognized in most farm statistics.

The substantial equine industry makes these data conventions increasingly anomalous and stilt the widely used and cited farm statistics for the State. For this reason, the USDA and the Commissioner of Agriculture and Markets periodically make provisions for one-off surveys of the New York equine industry. The most recent survey was conducted for calendar year 2000 and showed that New York had 30,000 places with equine in 2000 (NYASS, 2001b). In this survey a place is defined as anyone operating land on which equine are kept. Owners of equine boarding their animals on land they did not operate were excluded. Operators of places with equine were asked which type of activity best described their operation. Almost half of the operators, 49 percent, described their equine operation as noncommercial/nonfarm. Acreage in these operations exceeded 3 million acres, with about 0.9 million acres identified as fenced equine pasture.

Still further confusion can result when one turns to state law. The Census definition of farm and farmland and the land inventoried in the USDA NRI is markedly different from definitions currently embedded in New York's state law. Under New York's Agricultural Districts Law, Article 25 AA, several commodities and services are defined as crop or livestock production -- see Box 2. These definitions are used to administer agricultural assessments for farmland and allow local assessors to accurately identify acreage eligible for a reduced property tax bill. Along with definitions of farm product, the statute identifies "land used in agricultural production" (Box 3). The principal difference between the Federal farm definition and the state statute is that the latter has a considerably higher sales threshold ($10,000 on large land parcels and $50,000 on small land parcels), but other, more subtle, differences are also present. This means that the Census and the state statutes refer to materially different collections of rural land.

Box 2. Farm product definitions in state law

"Crops, livestock and livestock products" shall include:

- Field crops, including corn, wheat, oats, rye, barley, hay, potatoes and dry beans
- Fruits, including apples, peaches, grapes, cherries and berries
- Vegetables, including tomatoes, snap beans, cabbage, carrots, beets, and onions
- Horticultural specialties, including nursery stock, ornamental shrubs, ornamental trees and flowers
- Livestock and livestock products, including cattle, sheep, hogs, goats, horses, poultry, ratites, farmed deer, farmed buffalo, fur-bearing animals, milk, eggs and furs
- Maple sap
- Christmas trees derived from a managed Christmas tree operation
- Aquaculture products, including fish, fish products, water plants and shellfish

Source: New York State Consolidated Laws; Agriculture & Markets ARTICLE 25-AA, Agricultural Districts, S. 301

Box 3. Farmland definitions in state law

"Land used in agricultural production"

- Not less than ten acres of land used as a single operation in the preceding two years for the production for sale of crops, livestock or livestock products of an average gross sales value of ten thousand dollars or more
- Not less than ten acres of land used in the preceding two years to support a commercial horse boarding operation with annual gross receipts of ten thousand dollars or more,

Land used in agricultural production shall also include:

- Rented land which otherwise satisfies the requirements for eligibility for an agricultural assessment,
- Land of not less than ten acres used as a single operation for the production for sale of crops, livestock or livestock products which does not independently satisfy the gross sales value requirement, and currently is being so used under a written rental arrangement
- Land used in support of a farm operation
- Farm woodland which is part of land which is qualified for an agricultural assessment
- Land set aside through participation in a federal conservation program
- Land of less than ten acres used as a single operation in the preceding two years for the production for sale of crops, livestock or livestock products of an average gross sales value of fifty thousand dollars or more
- Land under a structure within which crops, livestock or livestock products are produced

Source: New York State Consolidated Laws; Agriculture & Markets ARTICLE 25-AA, Agricultural Districts, S. 301

Measuring farm and food output

Measurement of food and fiber production is relatively straightforward but does not seem transparent to some observers because of differences in terminology. As mentioned above, we draw on data from six different providers in three Federal agencies. These are: the USDA's National Agricultural Statistics Service, the New York State Agricultural Statistics Service, the USDA Census of Agriculture, the USDA's National Resources Inventory, the Bureau of Economic Analysis in the U.S. Department of Commerce, and the USDA's Economic Research Service (ERS). Each provider employs the same general accounting principles and crafts data series from identical core data sets. But often different words are used, with nuances that are largely of academic interest only. This means that the data sources are directly comparable on conceptual grounds, but confusion over language and terms distracts users and can lead to misinterpretation.

To reduce the confusion over words, a uniform terminology was adopted for this study as shown in Box 4. The central concept is gross output, which must be clearly distinguished from the cash receipts from product sales realized by a farm or firm. There is a tendency to use the terms "output", "cash receipts from product sales", and "farm marketings" interchangeably, but for several reasons this is at odds with the data and sound accounting practices. The term "output" is reserved for the most inclusive definition of income sources for a business. Although cash receipts from product sales constitute the largest component of total output or business income, several other sources are regularly tallied. These sources include "other business income" which, in the case of a farm business, is defined to include Federal farm program payments, income generated by custom work or leasing out farm equipment and services, and casual sales of forest products (see Box 4).

Federal estimates of total farm income also include substantial imputed income. Imputed income can be income "in-kind" or income not measurable by looking at money transactions in any single year. The largest imputation in Federal farm statistics is the imputed value of owner occupied housing; the value of home consumption -- crop or animal products commodities produced and consumed on the farm by the farm household -- is also estimated. These imputations, along with an estimate of annual inventory changes, can make a very noticeable difference in the annual output estimate. For example, "other farm income", including imputed income and payments received by New York farmers under Federal farm programs, added $218 million to New York farm gross output in 1996 (US Department of Commerce — see Appendix Table A-2). This was 7 percent of total gross output reported for the New York farm sector during calendar year 1996.

A working definition of farm and food

Many, if not most, discussions of farm and food in New York take into account only crop and livestock production, cash receipts, and other farm income at the farm gate. However, this study adheres to the idea of a food system. What list of industries can be used for an operational definition of the farm and food system? A useful description of the options is depicted in Figure 2. Using total output as the unit of measure, several component parts of the food system can be identified with alternate definitions turning on the inclusion or exclusion of major industrial sectors. A narrow "Definition A" would confine discussion to farm commodity production on New York

Box 4. Schematic showing calculation of total output, value added, and proprietor's (net business) income

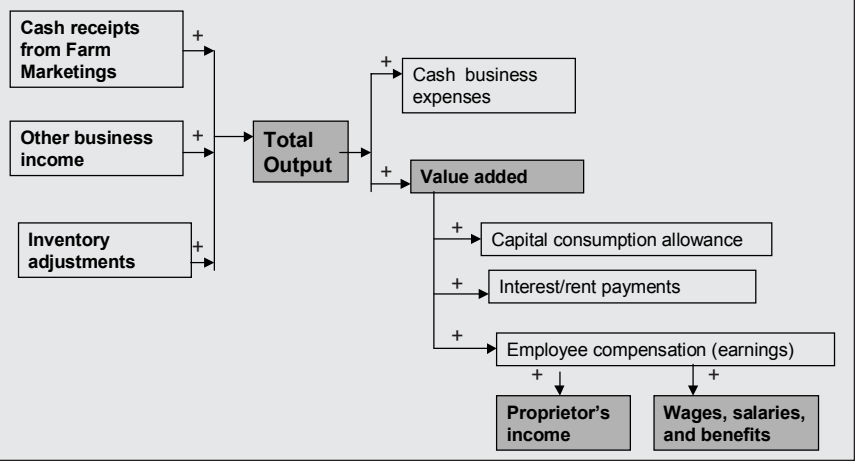
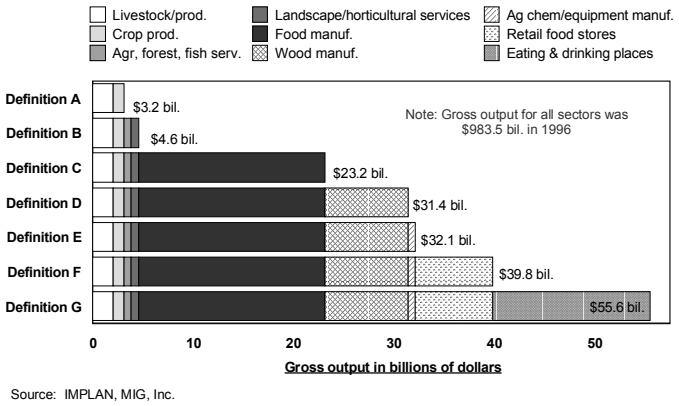


Figure 2. Defining Food and Agriculture: Value of Output by Industrial Sector, New York State, 1996



Source: IMPLAN, MIG, Inc.

farms as outlined above. A wider definition, "B" in Figure 2 would take the broad category "agricultural services" into account. Under Federal data gathering methodology and definitions, agricultural services include the categories of activity shown in Box 5[1]. Important components of the service sector include veterinary and other animal services. Included are services for commercial livestock and poultry producers and for owners of sport and companion animals. The latter, of course, not only includes equines, but also tends to further blur the line between agricultural and nonagricultural services by extending to a variety of companion animals and avian species.

A second major category of agricultural services relates to landscape, lawn, garden, and allied services. Many of these services, indeed the bulk of them, are provided to nonfarm clients, but often showcase the connections between New York's "green industries" and allied services (Box 5).

An even more inclusive definition of food and agriculture extends to manufacturing activity. This inludes the manufacture of food and kindred products (see Box 6), wood manufacturing, and agricultural chemicals/farm equipment manufacturing. These components, as reflected in definition "E" in Figure 2, extend the New York farm and food portfolio to gross output valued at just over $32 billion in 1996. Glancing further down the food distribution chain to food retailing and the services provided by eating and drinking establishments brings the value of that portfolio up to slightly more than $55.5 billion in the mid-1990s. It should be noted that, even with this most expansive definition, the value of farm and food output in New York State is barely more than 5 percent of the total gross output generated statewide (see Figure 2)[2].

Total output is a useful reference point for economic activity in the New York macro economy. However, several other widely received measures are available. Considering alternate measures can be important because they are not always well correlated with each other or with gross output, giving varying impres-

[1] The Federal definition of "agricultural services" is very comprehensive but probably excludes many lines of economic activity generally thought of in terms of "service" to agriculture: marketing and processing of raw farm commodities, their transport from the farm, financial and credit services, machinery repair, and so on. For purposes here, the more narrow definition of ag services is adopted in order to preserve access to published statistics. Some of these omissions can be dealt with in published data and some cannot. Many marketing and processing services fall into the category of food manufacturing and can be readily accounted for. These "accounted for services" largely fall on the output side. It is more difficult, and often impossible, to accurately segregate input services supplied directly to operators of agricultural businesses. Suppliers of these input services routinely service both farm and nonfarm customers and there is no convenient way to segment and showcase the farm component of that service base. This challenge to accurately describe farm input services is worsening over time as local farm service firms dwindle in number or diversify their businesses to attract nonfarm customers.

[2] Both the economic literature and data conventions used by analysts are far from settled. A recent USDA study concluded that "food and fiber industries" accounted for about 13 percent of the total U.S. gross domestic product (Lipton, et al, 1998). The USDA measurement may be defensible but it is very expansive, extending well beyond crop and livestock production, which according to USDA estimates accounted for less than one percent of total U.S. gross domestic product (GDP) in 1999. The remainder, over 13 percent of total domestic product, was attributed to mining, manufacturing, retail wholesale trade, transport, and services sectors deemed by the USDA to be linked to the production of raw food and fiber commodities. Nearly one-third of this total is accounted for by wholesale and retail trade activities (food and beverage retailing and wholesaling) along with trade in apparel and fibers, and tobacco.

Box 5. Establishments classified as agricultural services

- Soil Preparation Services
- Crop Planting, Cultivating, and Protecting
- Crop Harvesting, Primarily by Machine
- Crop Preparation Services For Market, except Cotton Ginning
- Veterinary Services For Livestock
- Veterinary Services for Animal Specialties
- Livestock Services, Except Veterinary
- Animal Specialty Services, Except Veterinary
- Farm Management Services
- Landscape Counseling and Planning
- Lawn and Garden Services
- Ornamental Shrub and Tree Services
- Timber Tracts
- Forestry Services
- Finfish Marine Products
- Shellfish Marine Products
- Miscellaneous Marine Products
- Fish Hatcheries and Preserves
- Hunting and Trapping, and Game Propagation

Source: US Bureau of the Census

sions of the farm and food sectors in some cases. These include measurements of value added, earnings (personal income generated by operating a business or working for a wage or a salary), and employment.

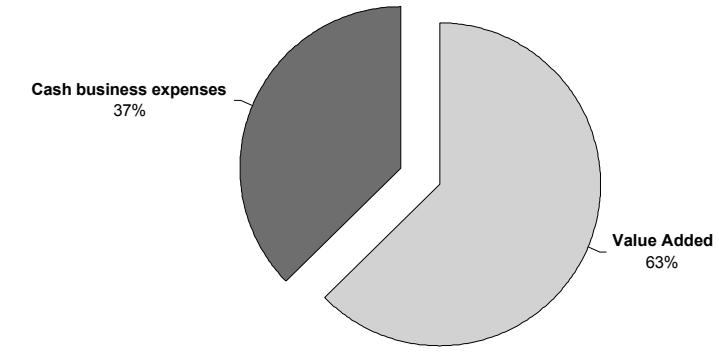
To provide the necessary contrast, relationships between the alternate units of measure are shown in Box 4 and further defined in Figures 3-5. Following standard data and accounting methods, value added by any single business firm, in any single industry or sector is defined as a derivative of total output, calculated by subtracting business expenses from total gross output (Box 4). In 1996, cash business expenses accounted for about 37 percent of total output in the entire New York State economy (Figure 3). The remainder is defined as value added. The value added measure is routinely used at the national and state levels to define, respectively, gross domestic output (GDP) and gross state product (GSP). The

Box 6. Establishments classified as food manufacturing (food and kindred products)

- Meat Packing Plants
- Sausages and Other Prepared Meats
- Poultry/ Egg Processing
- Creamery Butter
- Natural, Processed, and Imitation Cheese
- Dry, Condensed, and Evaporated Dairy Products
- Ice Cream and Frozen Desserts
- Fluid Milk
- Canned Specialties
- Canned Fruits, Vegetables, Preserves, Jams, and Jellies
- Dried and Dehydrated Fruits, Vegetables, and Soup Mixes
- Pickled Fruits and Vegetables, Vegetable Sauces and Seasonings, and Salad Dressings
- Frozen Fruits, Fruit Juices, and Vegetables
- Frozen Specialties, NEC
- Flour and Other Grain Mill Products
- Rice Milling
- Prepared Flour Mixes and Doughs
- Wet Corn Milling
- Dog and Cat Food
- Prepared Feed and Feed Ingredients for Animals and Fowls, Except Dogs and Cats
- Bread and Other Bakery Products, Except Cookies and Crackers
- Cookies and Crackers
- Sugar, Including Refining
- Candy and Other Confectionery Products
- Chocolate and Cocoa Products
- Chewing Gum
- Salted and Roasted Nuts and Seeds
- Cottonseed Oil Mills
- Soybean Oil Mills
- Vegetable Oil Mills, Except Corn, Cottonseed, and Soybeans
- Animal and Marine Fats and Oils
- Shortening, Table Oils, Margarine, and Other Edible Fats and Oils, NEC
- Malt Beverages
- Malt
- Wines, Brandy, and Brandy Spirits
- Distilled and Blended Liquors
- Bottled and Canned Soft Drinks and Carbonated Waters
- Flavoring Extracts and Flavoring Syrups NEC
- Canned and Cured Fish and Seafood
- Prepared Fresh or Frozen Fish and Seafoods
- Roasted Coffee
- Potato Chips, Corn Chips, and Similar Snacks
- Manufactured Ice
- Macaroni, Spaghetti, Vermicelli, and Noodles
- Food Preparations, NEC

Source: US Bureau of the Census

Figure 3. The New York Macro Economy: Total Gross Output



New York's Total Gross Output: $983.5 billion in 1996

Source: IMPLAN, MIG, Inc.

value added measure is important because it avoids double-counting the money value of production by an individual business firm, an entire industry, or industrial production aggregated to the state or national level directly comparable.

Value added, in turn, is defined to include employee compensation, capital consumption (depreciation) allowances, and interest/rent (Box 4). In 1996, employee compensation accounted for 63 percent of value added in the New York macro economy (Figure 4). Employee compensation, in turn, includes the wages, salaries and benefits of hired employees along with the net business income enjoyed by business proprietors. Income accruing to business proprietors accounted for about 12 percent of total employee compensation in 1996 (Figure 5). Estimates of income to business proprietors correspond exactly to "net farm income", the widely received reference point for farm and farm policy discussions.

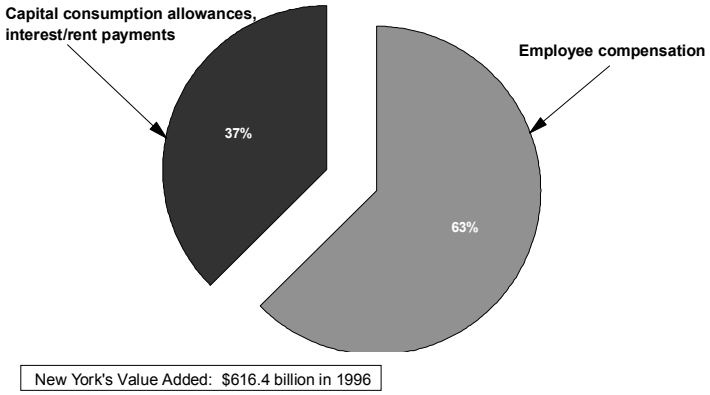
Forward and Backward Linkages

With a full understanding of concepts and definitions in mind, we turn to an assessment of the position of farms and food production in the New York economy. This positioning is discussed in terms of both forward and backward linkages with other sectors and with markets inside New York, other domestic outlets, and exports to other countries. Farming, agricultural services, and food processing exert impacts on the New York economy through forward linkages to transportation, wholesaling, retailing, and food services. Some of those links are achieved within New York State and some are achieved out of state. Unfortunately, relatively little information can be gleaned from published sources to fully understand these forward linkages. The U.S. Department of Agriculture collects and disseminates substantial data each year on in-state commodity production. In a few cases, for selected vegetable and fruit commodities, the USDA data track sales into fresh markets and sales to processors. However, for the larger volume of production, relatively little is known about the fate of in-state crop and livestock production.

Some additional insight can be obtained from the five-year Census of Agriculture. The Census reports on the volume of direct sales to consumers. These data can be arranged geographically or for farms that are classified according to their principal lines of commodity production. But again, this information is piecemeal and does not extend to a comprehensive description of sales in state or to transactions involving shipments elsewhere in the U.S. or abroad.[3]

[3] Questions about in-state production and its distribution to consumers in-state are an active area of research. Much is known about food consumption patterns, based on food disappearance data reported by the USDA and panel data showing detailed information on patterns of food intake by individual consumers. These data can be arranged to generate global estimates of in-state consumption of major and minor food items. But many questions remain on the marketing channels that in-state farm and food production follow. Producers and growers are often selling into a variety of markets and dealing with a variety of intermediaries who are doing business between the farm gate and final users of farm production. Selected contacts with representatives from food manufacturing firms over the course of this study suggest that building a database that would accurately depict movements of processed goods to final users would be difficult.

Figure 4. The New York Macro Economy: Value Added



Source: IMPLAN, MIG, Inc.

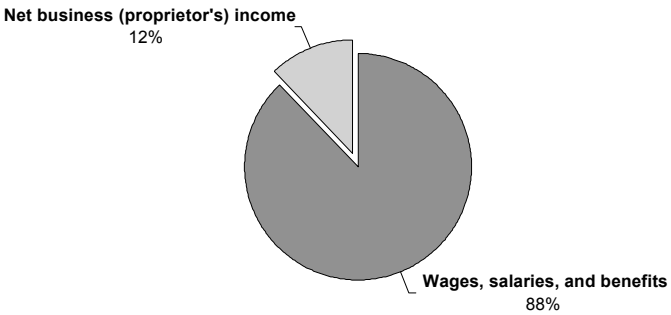
Forward Linkages

With these relatively severe data limitations in mind, two aggregate data sources were used to generate some base information on transactions involving in-state production of farm and food products. The first comes from IMPLAN, an input/output model describing estimates of transactions between nearly 500 industrial sectors in the New York economy. This model is based on structural relationships between industries found at the national level and reported by the U.S. Department of Commerce, Bureau of Economic Analysis. These data allow estimates of forward linkages to in-state buyers, shipments to foreign markets, and exports to other states in the U.S. Results are summarized in Figures 6 and 7 for major farm production sectors in the New York economy. Turning first to dairy farm products, the IMPLAN estimates suggest that 65 percent of total gross output in New York's largest farm production sector is sold to in-state buyers -- almost exclusively to milk handlers and processors. As expected, offshore export sales of dairy farm products are extremely low and estimated here at just 0.2 percent. The remaining production, amounting to 35 percent of the total, finds its way out of state to processors and handlers (Figure 6).

A similar pattern is evident for New York's poultry and egg sectors, with in-state sales to processors and handlers estimated at 57 percent. Negligible amounts of poultry and egg products are estimated to be sold into offshore markets, with the remaining nearly 42 percent finding its way to exports out of state but to domestic markets. The cattle sector features even larger domestic exports, pegged at 73 percent of total gross output; again, exports offshore are negligible with 26 percent of total production estimated to be sold in state (Figure 6). Finally, and in sharp contrast, the highly mixed "other livestock" sector features in-state sales of about 74 percent, with shipments offshore taking up about 19 percent of total gross output. Shipments to domestic outlets outside the state of New York are a relatively low 7.5 percent.

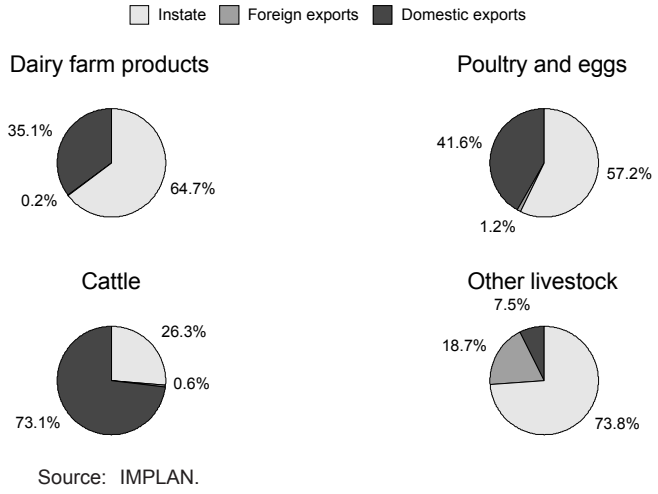
The picture for New York crop production is equally varied, as shown in Figure 7. Upon inspection, in-state sales predominate for all of these commodities. The fraction of total gross output accounted for by in-state sales ranges from 53 to 86 percent depending on the commodity sector considered. Not unexpectedly, depen-

Figure 5. The New York Macro Economy: Employee Compensation



Source: IMPLAN, MIG, Inc.

Figure 6. Estimated Destination of New York Livestock/Livestock Products, 1996



Source: IMPLAN.

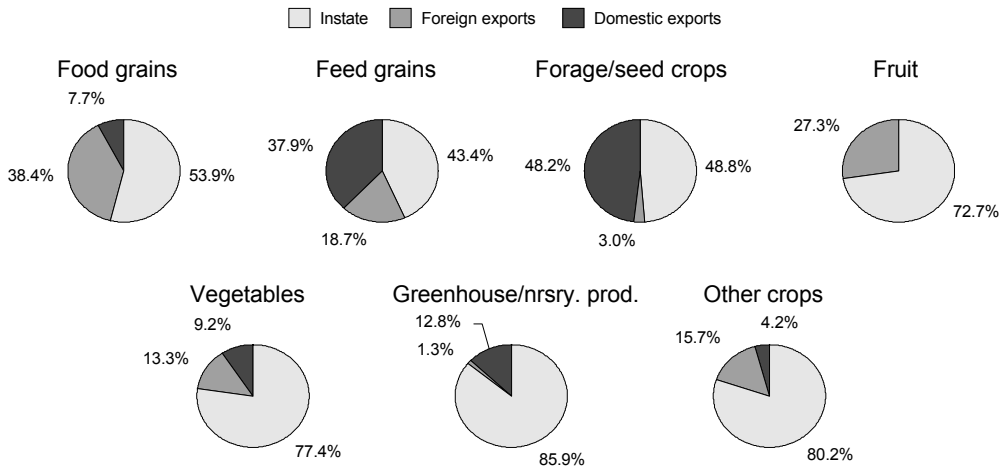
Some limited indications of trend in the important foreign export market are available from unpublished data (Figure 8). These data, based on analysis of the Census Bureau data on export shipments, suggest that exports originating with firms in the New York food manufacturing sectors have increased since the late 1980s. In contrast, exports of raw farm commodities, whether crops or livestock, exhibited little trend over the interval 1988-99.

Backward Linkages

Backward linkages between food and agricultural production in New York and other sectors of the wider New York economy are analyzed through the calculation of economic multipliers. The economic multiplier is an important tool in economic impact analysis. Formal study and our own practical experience indicate that industries are interdependent and that expansion or contraction in one industry is likely to have some far-reaching implications. As noted in this study, a substantial share of total gross output in the New York State economy is comprised of cash business expenses. To reiterate, these are transactions between businesses to acquire the inputs needed to

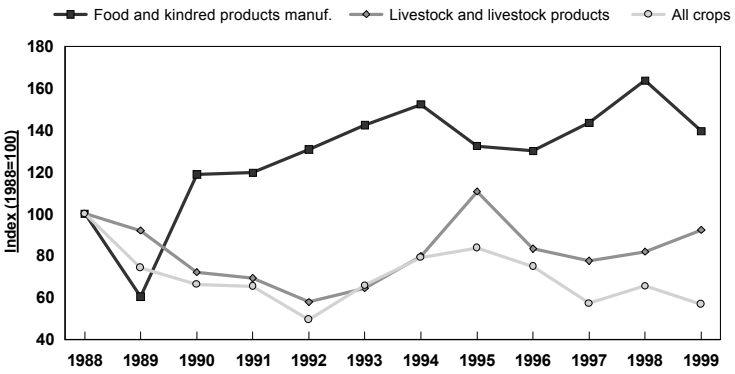
dence upon in-state markets is the highest for New York's rapidly growing greenhouse and nursery industries, with nearly $9 of every $10 in gross output going to in-state sales.

Figure 7. Destination of New York Crop Output, 1996



Source: IMPLAN.

Figure 8. Index (1988=100) of Estimated Exports of Agriculture and Food Manufacturing Products, New York, 1988-99



Source: MISER.

deliver additional product or service to a final user[4] . One aspect of this project has been to update information on these cash expenses and their generative impacts for the state. Assessment of such generative impacts is generally referred to as multiplier analysis.[5]

The object of multiplier analysis is to trace out the interrelationships between sectors and construct quantitative measures of the impact associated with increasing or decreasing a line of economic activity. The idea traces to economic base theory which classifies goods and services sold outside the region's boundaries as "exports", and hence, basic. Conversely, goods and services produced by the nonbasic sector are consumed within the region's boundaries. Expansion of the basic sector of the economy necessarily entails added production in these support industries, particularly in terms of intermediate inputs, all of which adds to the overall development of a regional economy.

The economic multiplier summarizes the cumulative (direct, indirect, and induced) effect of an initial change in final demand plus the resulting series of successive rounds of spending within the local economy. It is the ratio between the total change in spending and the initial change in final demand (or the income or employment implied by it).

Multipliers are constructed based on a "snapshot" of a regional economy. That is, the economic multiplier is governed by the pattern of economic transactions between firms and the final users of their products for a single year. Lots of transactions between in-state business firms make for relatively large economic multipliers; relatively fewer transactions mean smaller multipliers. This means that multipliers can go out of date as structural relationships (patterns of transactions) between sectors change. Structural changes can emanate from technological developments, important shifts in relative prices, regional trade patterns, and several other sources.

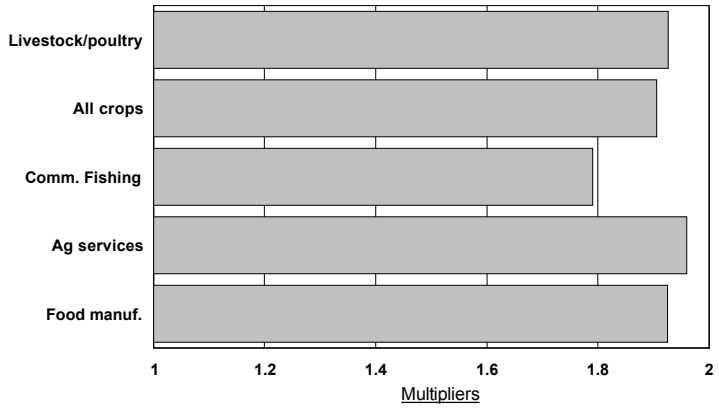
Another, and closely related, concern with multipliers is that they best represent the effects of small or marginal changes in output in any one sector. Large shifts in a regional economic system require a more detailed analysis before their effect on total income or employment can be measured. Finally, multiplier estimates rest on models utilizing local secondary data combined with coefficients from a national model. This procedure avoids the prohibitively high costs of conducting an exhaustive survey of transactions in a regional economy. However, reliance on this procedure requires the assumption that differences between the structure of the local economy and the national economy can be accurately measured. The restrictiveness of these assumptions is less severe as one progresses from a county-level economy to a state-level economy.

Multipliers can be calculated using several units of measure. The measures used in this study are total output and employment. The former provides a use-

[4] Final use in regional economic models makes allowances for inventory adjustments, expenditures on capital account, and deliveries of goods and services to local households or to buyers out of state (exports).

[5] For earlier work on input/output analysis and the New York State economy, see Boisvert and Bills; Jack, Bills, and Boisvert, 1996a; Jack, Bills, and Boisvert, 1996b.

Figure 9. Output Multipliers for Selected Farm and Food Sectors, New York



Source: IMPLAN.

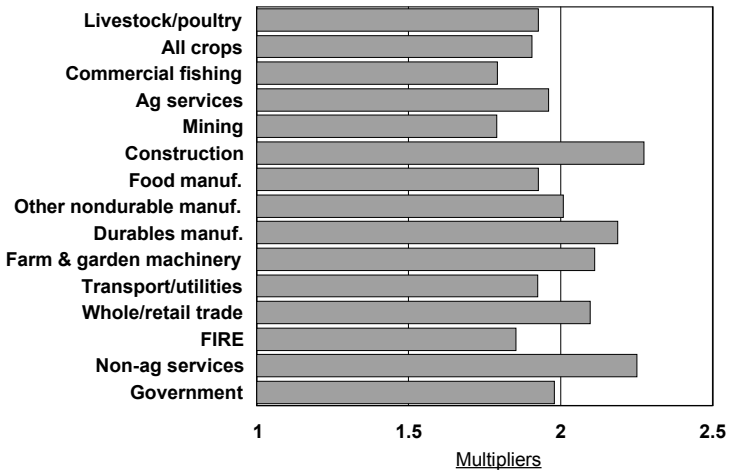
ful reference point for analysis because it shows an estimate of the generative effects associated with business revenue expansion or contraction across New York food and farm industries. These data are often of interest to a variety of audiences concerned with the impacts of individual farm and food sectors.

Output multipliers for selected farm and food sectors in the New York State economy are shown in Figure 9. These estimates were calculated from the IMPLAN input/output model and provide an estimate of the total generated effects associated with one unit, that is, $1.00 additional delivery of product to a final user. Because of structural interdependence between sectors, new production in a food or agricultural sector will generate successive rounds of transactions as firms backward linked to these industries also adjust output to meet the intermediate needs for farm and food production. These estimates take into account the first dollar of direct requirements along with the dollar value of additional production required to sustain the unit increase in farm and food production. These values, as shown in Figure 9, generally fall in the range of 2, suggesting each new dollar of farm and food output for the state brings additional production valued at nearly 1 dollar. The estimates take into account both the indirect effects of new industrial production and the induced effects associated with added amounts of household consumption expenditures and additional output by state and local governments.

To achieve additional precision on the multiplier question, the model results for several aggregated sectors of the New York economy are presented in Figure 10. These results allow one to compare the generative effects of new farm or food production with those associated with new output in nonfarm sectors of the New York economy. Looking at aggregated sectors suggests that output multipliers for food and agricultural sectors compare reasonably well with those associated with expansions or contractions in nonfarm sectors.

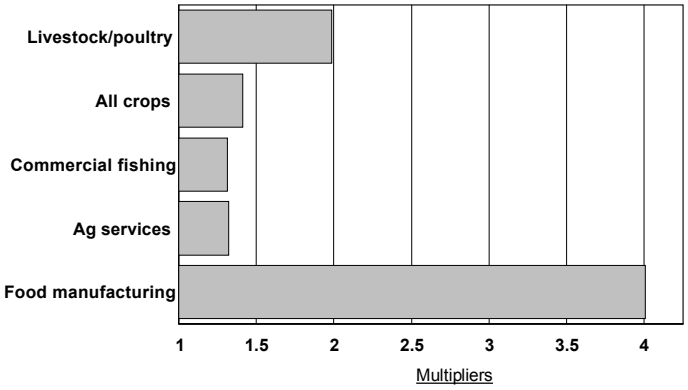
Because of differences (often material differences) in relationships between output and employment, results arranged using employment as a measurement unit portray different outcomes (Figure 11). An immediate observation is that the employment multipliers are far more robust than the output multipliers. Indeed the aggregate multiplier for food manufactur-

Figure 10. Output Mulitipliers for Selected Industrial Sectors, New York



Source: IMPLAN.

Figure 11. Employment Multipliers for Selected Farm and Food Sectors, New York



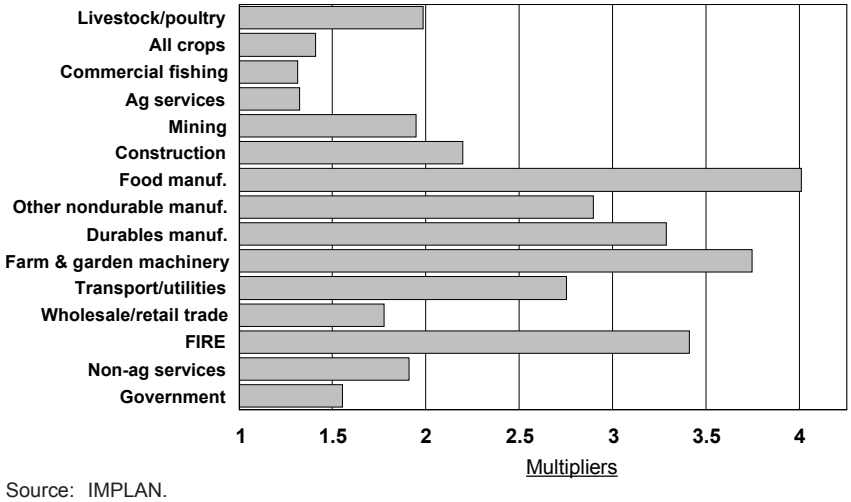
Source: IMPLAN.

ing amounts to 4.0 using employment as a unit of measurement. This finding suggests that for every additional new job created in food manufacturing in New York State, an additional three jobs are supported in industries and sectors structurally linked to the food manufacturing sector. These structural linkages include relationships and transactions with production agriculture, but also extend to a variety of service industries that depend upon food manufacturing as a sales outlet for their proucts and services. Similarly, the employment multiplier for livestock and poultry is a relatively robust 2.0, suggesting one additional job for every new job created in the sector.

The conclusion that employment benefits associated with expanded food manufacturing output in New York State are relatively robust is sustained when the frame of reference is the entire macro New York economy, as shown in Figure 12. Model results suggest that food manufacturing exerts one of the highest employment multiplier effects of any industry in the state.

Because this study is preoccupied with farm and food policy for the state, the IMPLAN model results were disaggregated to derive output and employment multipliers for selected industries in the farm, agricultural services, and food manufacturing sectors. Results are displayed in Boxes 7 and 8. As expected, the disaggregated results show that the generative effects of new in-state production of farm and food products vary materially among individual

Figure 12. Employment Multipliers for Selected Industrial Sectors, New York



Source: IMPLAN.

Box 7. Disaggregated output and employment multipliers for selected farm and ag services sectors, New York, 1996

Sector	Output	Employment
Dairy Products	1.83	2.24
Poultry and Eggs	1.58	1.91
Cattle	1.89	1.56
Sheep, Lambs and Goats	1.91	1.23
Hogs, Pigs and Swine	1.73	1.48
Food Grains	1.96	1.27
Feed Grains	1.87	1.46
Hay and Forage Crops	1.87	1.18
Fruit	1.92	1.50
Vegetables	1.92	1.85
Oil Bearing Crops	1.95	1.36
Forest Products	1.80	1.92
Greenhouse and Nursery Products	1.90	1.50
Commercial Fishing	1.98	1.42
Agricultural, Forestry, Fishery Services	1.95	1.44
Landscape and Horticultural Services	1.98	1.31

Source: IMPLAN

Box 8. Disaggregated output and employment multipliers for selected food manufacturing sectors, New York, 1996

Sector	Output	Employment
Meat Processing	1.64	2.72
Dairy Processing	2.26	5.72
Canned Fruits and Vegetables	2.00	3.14
Dehydrated Food Products	1.89	2.16
Pickles, Sauces, and Salad Dressings	1.83	3.66
Frozen Fruits, Juices and Vegetables	1.97	3.10
Food Grain Processing	2.15	5.46
Dog, Cat, and Other Pet Food	2.00	4.91
Prepared Livestock/Poultry Feeds	1.81	4.52
Bakery,Confections, Nuts	1.97	2.75
Beverages	1.95	5.49
Fish and Seafood Products	1.68	2.06
Potato Chips & Similar Snacks	1.81	3.45

Source: IMPLAN

industries, depending on the type of commodity or service. Turning first to farm commodity production, output multipliers vary within a relatively narrow range of about 1.7 to just under 2.0. Similarly, multiplier estimates for agricultural services approach 2.0 (Box 7). However, use of employment as a unit of measure distinguishes dairy products in a small but noticeable way. The employment multiplier for new dairy production in -state is estimated at 2.24.

These multiplier relationships persist when attention turns to food manufacturing as shown in Box 8. Disaggregated multipliers for food manufacturing using product output as the unit of measure range from 1.64 to 2.26, with the highest multiplier garnered in the New York dairy processing sector. Robust multipliers for dairy processing carry over to the employment side as well, with an estimated employment multiplier on additional output in the dairy processing sector estimated at 5.72. An equally robust multiplier is estimated for New York's food grain processing sector along with beverages production. Employment multipliers for those two sectors are estimated at 5.46 and 5.49, respectively. Multipliers also approach 5.0 for the New York livestock/poultry prepared feeds sector. The sector is responsible for the manufacturing and delivery of mixed and blended feeds to livestock and poultry producers.

Farm and Food Trends in New York State

These findings on backward linkages and economic multipliers add more perspective to New York's food and agriculture system. As noted above, we found that in 1996 New York's agriculture and food sectors -- farms, ag services, and food manufacturing -- generated an impressive $23.2 billion. On a relative basis, this is a small percentage of the state's total gross output, but the multiplier estimates confirm the anecdotal evidence, which suggests that food and agriculture exerts a relatively large generative effect on the New York economy. Compared with other New York industries, farm and food firms make relatively large proportions of their cash business expenditures in-state. This means that efforts to enhance production in these sectors produce relatively large secondary and tertiary benefits for industries linked to farm and food production.

However, important secondary or multiplier benefits are predicated on successful efforts to produce direct economic impact. That is, the conditions that warrant new production in any single farm or food sector must be fully understood. To further this understanding, long-term trends in farm and food production are examined in this section. These trends are important because much of the contemporary discus-

sion about agriculturally based economic development is rooted in conditions and circumstances that have been operative in New York State for many years.

At the close of World War II, New York had about 125,000 farms. Rapid farm consolidation has dominated the rural landscape of the state since that time as the farming industry reacted to new cost/price relationships, economic opportunities on and off the farm, and shifting social realities. As a result, farm numbers have declined consistently over the last 50 years (Figure 13). Some farm loss over this span is due to a 1974 change in farm definition that increased the volume of sales needed to qualify as a farm. In earlier years the definition turned on both acreage and value of farm production thresholds. Farm numbers have remained relatively stable in the 1990s. Census data show that farm businesses continue to be consolidated into larger economic units, but smaller part-time farms have increased over the last decade. Today, more than 40 percent of all New York farms can be classified as residential farms because the operator has a full-time job off the farm.

Farm consolidation, along with expanded competition for land from nonfarm uses, has resulted in continual decreases in farm acreage (Figure 14). Land in farms decreased from 16 million acres in 1950 to just over 7 million acres in the late 1990s. There are no comprehensive data on land conversion over this 50-year interval, but the circumstantial evidence suggests that much of this acreage was idled and has reverted to natural forest cover when cropping and pasture operations were abandoned by farmers. The remaining acreage has been converted to residential, commercial, and transportation uses.

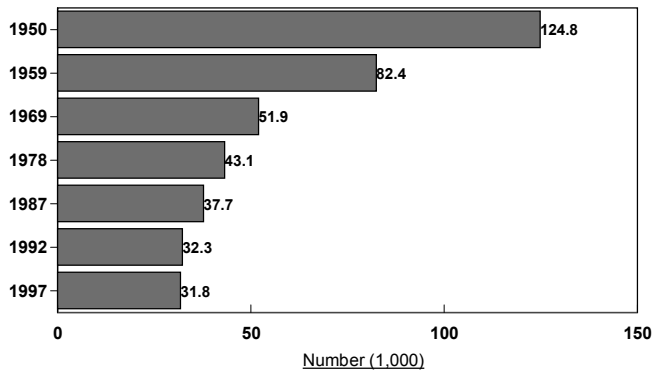
Farm and farm acreage losses have not translated into farm output decreases because of striking gains in land and labor productivity in the industry. Cash receipts, either from the production of crops, livestock, or livestock products, are shown in Figure 15. Using 1996 as a reference point, receipts from crop sales and livestock/livestock product sales were estimated at $1 billion and $2.1 billion, respectively. Nearly $7 of every $10 in farm output is accounted for by livestock and livestock products. This ratio has remained essentially stable during the last two decades, despite some increase in total farm output.

Production agriculture is dominated by fluid milk production. The New York dairy industry accounts for 56 percent of total receipts from farm marketings. In dollar terms the dairy industry presently generates a dollar volume in the vicinity of $1.74 billion (Figure 16). Production levels fluctuate slightly from year to year, and milk prices have shown greater volatility in recent years. Shifts in these price and quantity relationships have resulted in fluctuations in total gross receipts that range from about $1.4 billion to nearly $1.8 billion during the 1990s.

The New York poultry and egg sector is substantially smaller than the dairy sector but generates nearly $90 million in cash receipts each year (Figure 17). Receipts from poultry production have remained relatively stable throughout the last decade, with fluctuations in cash receipts ranging between $82 million and something in excess of $100 million per year during the 1990s.

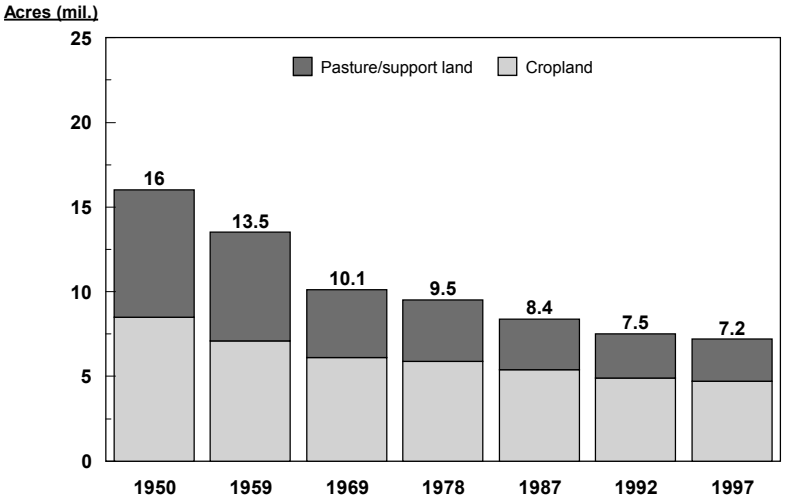
Apart from dairy and poultry production, the New York farm sector generates about $130 billion per year from the sale of meat animals (Figure 18). This production value was substantially lower in the late 1990s compared with earlier years. In the early 1990s, cash receipts from this source approached $250 million. Similarly, cash receipts from the sale of miscellaneous livestock -- such as swine, sheep, and goats -- have declined in recent years. Presently, miscellaneous livestock generated receipts in the range of $90 million a year (Figure 19).

Figure 13. Farm Numbers for New York, Selected Census Years, 1950-1997



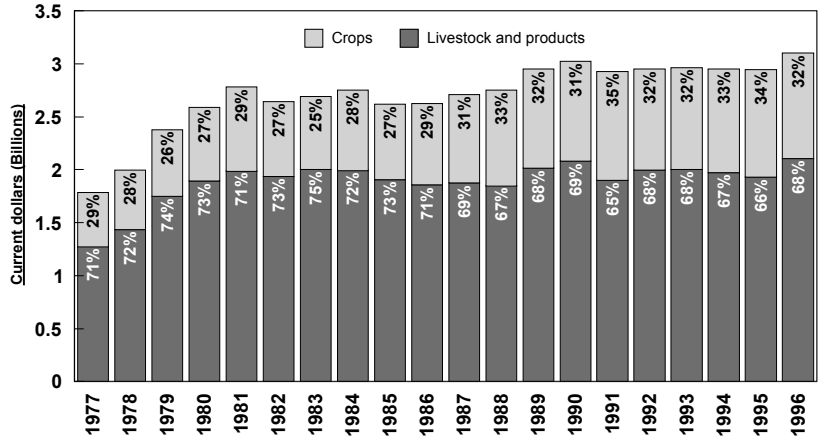
Source: US Dept. of Commerce. See Appendix Table A-1 for data.

Figure 14. Land in Farms for New York, Selected Census Years, 1950-1997



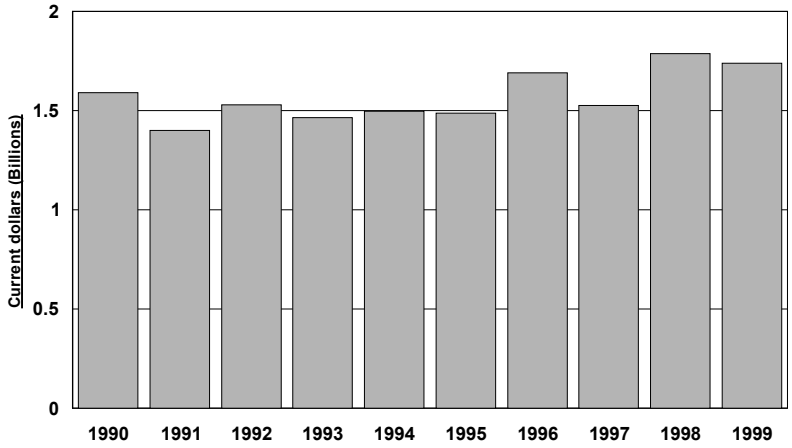
Source: US Dept. of Commerce. See Appendix Table A-1 for data.

Figure 15. Cash Receipts from Farm Marketings, New York, 1977-1996



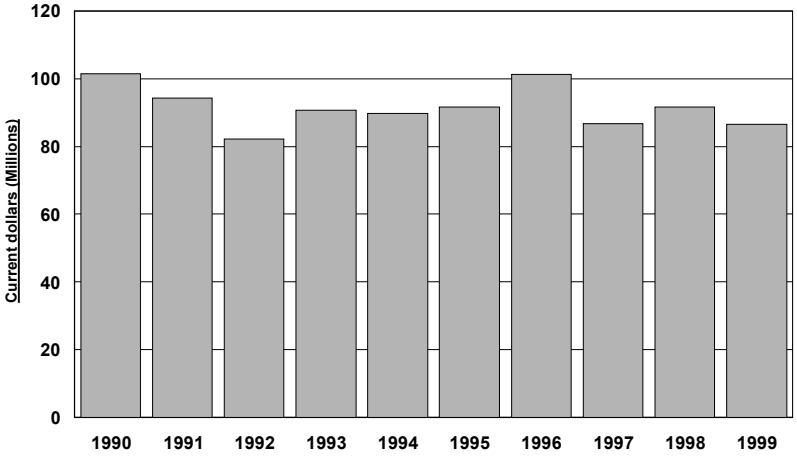
Source: US Dept. Commerce, Bureau of Economic Analysis. See Appendix Table A-2 for data.

Figure 16. Cash Receipts from Farm Marketings: Dairy Products, New York, 1990-1999



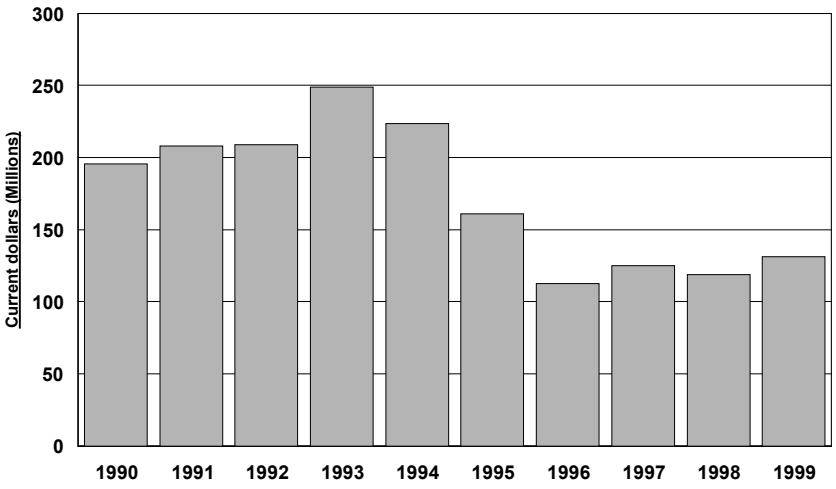
Source: US Dept. of Agriculture, Economic Research Service. See Appendix Table E-1 for data.

Figure 17. Cash Receipts from Farm Marketings: Poultry and Eggs, New York, 1990-1999



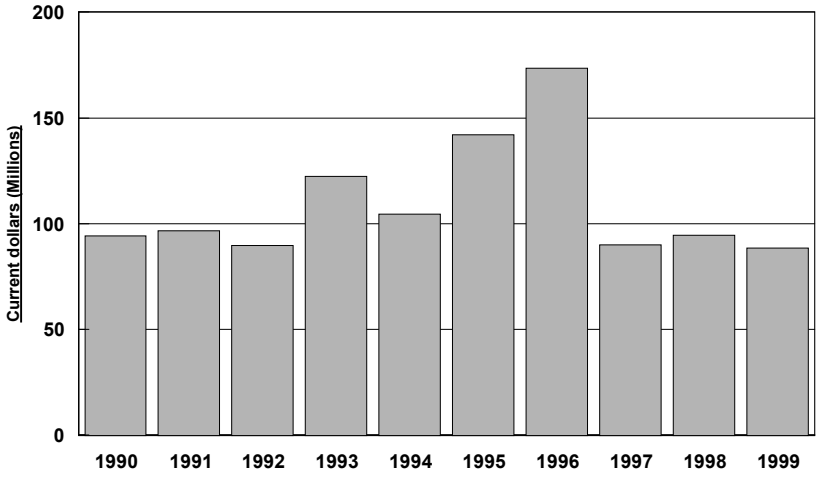
Source: US Dept. of Agriculture, Economic Research Service. See Appendix Table E-1 for data.

Figure 18. Cash Receipts from Farm Marketings: Meat Animals, New York, 1990-1999



Source: US Dept. of Agriculture, Economic Research Service. See Appendix Table E-1 for data.

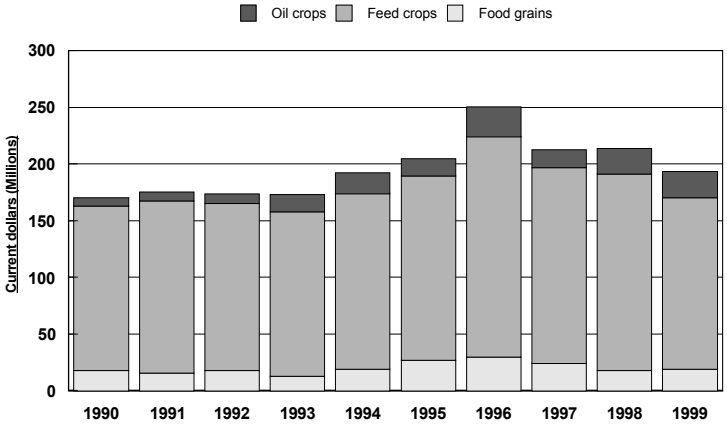
Figure 19. Cash Receipts from Farm Marketings: Miscellaneous Livestock, New York, 1990-1999



Source: US Dept. of Agriculture, Economic Research Service. See Appendix Table E-1 for data.

Much of New York's crop acreage is used to produce feed and forage crops to support the livestock industries mentioned above. Hay crops are the largest block of New York crop acreage, but many New York farmers sell crops to generate cash for the farm business. Receipts from the sale of oil seed crops (almost entirely soybeans), field grains (corn primarily), and food grains (wheat primarily) are shown in Figure 20. In 1999 cash receipts from this source totaled more than $193 million, down from a peak of $250 million in 1996. The 1996 crop year was noteworthy for crop farmers because of favorable prices for several field crops. Because of similar yield and price interactions, cash receipts from the sale of fruit crops ranged between $193 and $211 million during the late 1990s. In 1999, cash receipts from sales of all fruit crops approached $209 million (Figure 21). New York also has a vibrant vegetable crops industry. Cash receipts from the sale of vegetable crops were as high as $356 million in the late 1990s (Figure 22). Sales of greenhouse and nursery products have ramped up in recent years, and in 1999 receipts from this source exceeded $275 million (Figure 23).

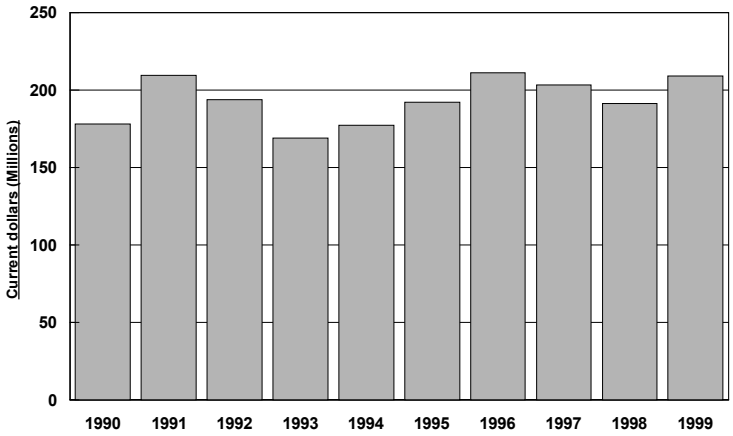
Figure 20. Cash Receipts from Farm Marketings: Oil, Feed, and Grains, New York, 1990-1999



Source: US Dept. of Agriculture, Economic Research Service. See Appendix Table E-1 for data.

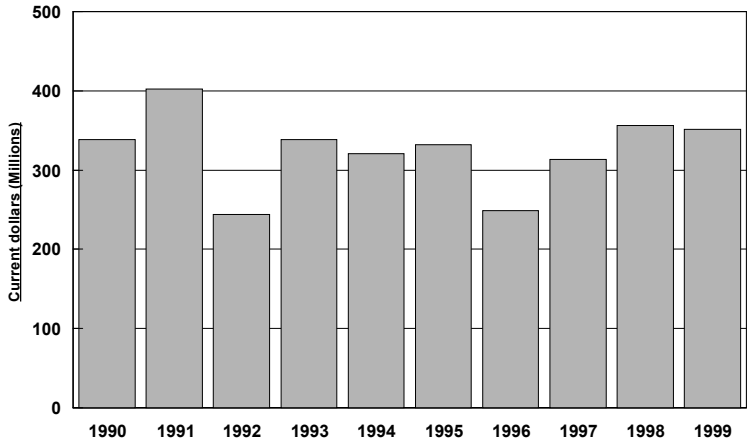
Movement beyond production agriculture to a review of trends for all key farm and food sectors shifts attention to agricultural services and food manufacturing. These sectors, along with commodity production, account for gross output estimated at about $23 billion in 1996. An effort is made to give the trend information the context needed to make comparisons in two key dimensions: between sectors and between competitor states. The sectoral comparisons center upon year-to-year movements in farm and food production during the 21-year interval 1977-98. These years were largely dictated by data availability. Then, for each year in the interval, farm and food production was assessed using three alternate units of measure: employment, earnings, and value added. Each unit of measure is

Figure 21. Cash Receipts from Farm Marketings: Fruit Crops, New York, 1990-1999



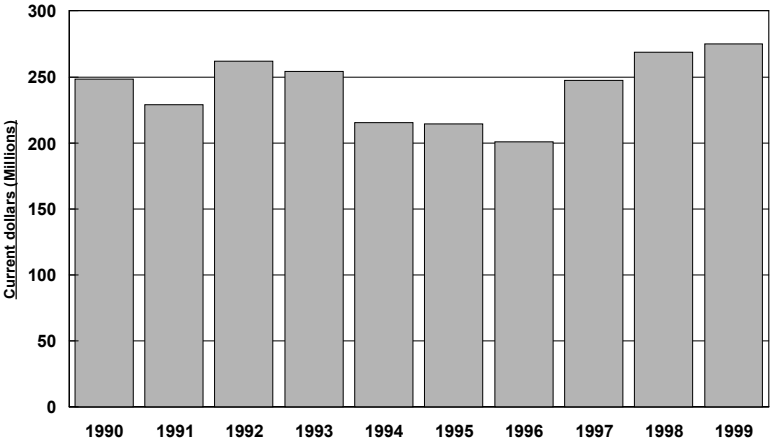
Source: US Dept. of Agriculture, Economic Research Service. See Appendix Table E-1 for data.

Figure 22. Cash Receipts from Farm Marketings: Vegetable Crops, New York, 1990-1999



Source: US Dept. of Agriculture, Economic Research Service. See Appendix Table E-1 for data.

Figure 23. Cash Receipts from Farm Marketings: Greenhouse and Nursery Crops, New York, 1990-1999



Source: US Dept. of Agriculture, Economic Research Service. See Appendix Table E-1 for data.

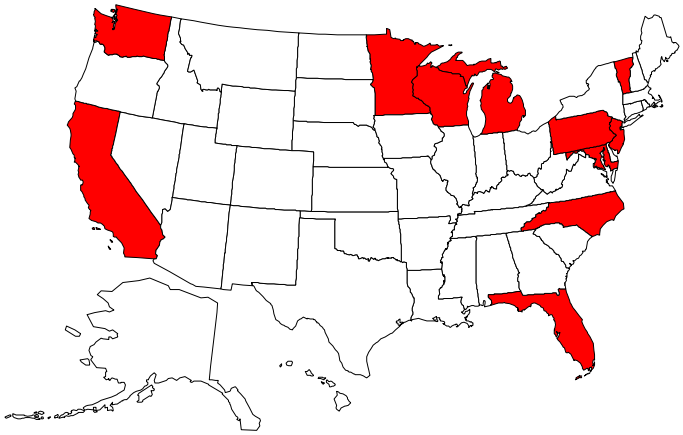
applied to the U.S., New York, and to 11 states deemed to be good reference points for New York food and agriculture because they are thought to be similarly positioned in major farm commodity markets. See Figure 24 for a graphic representation of the 11 competitor states identified by the New York State Department of Agriculture and Markets.

The time series data are shown in Appendix Tables A-D and some of the salient trends are briefly summarized in this section. Turning first to employment, Figure 25 shows year-to-year levels of employment in farm, agricultural services, and food manufacturing, respectively, over the 1977-98 span. Farm employment, during a period of rapid increases in labor productivity and growth in average farm size, decreased from nearly 100,000 jobs to about 59,500 jobs. These jobs are measured in Federal statistics after taking into account production by nearly 60 different types of farm businesses (see Box 9). Data protocols used in Federal statistics make employment counts inclusive of both full-time and part-time employees. Labor use in farming is relatively difficult to measure because of dependence on family labor, use of seasonal workers in some commodity areas, and the predominance of smaller, part-time farms. Published data estimates do not distinguish between full and part-time work, nor is the seasonality of some farm employment taken into account.[6]

Interestingly, job making in agricultural services over the last two decades has increased fairly dramatically. As a result, industries de-

[6] While these data problems are substantial for farming, all of them are probably endemic and plague our efforts to understand job making in small businesses outside the farm sector as well. Clearly, similar problems can prevail in the service sectors where businesses often operate on a small scale and/or provide numerous jobs on a part-time basis.

Figure 24. Eleven of New York's Competitor States



fined as agricultural services result in the same proximate number of jobs as those found in direct crop and livestock production. For the reference year 1998, agricultural services employment is estimated at just over 59,000 jobs, more than a two-fold increase over the employment figure estimated in 1977 (Figure 25). Such abrupt employment expansion would appear to be anomalous at first glance but comes into sharper focus when the classification of agricultural service establishments is understood. The Federal definition of agricultural services is probably at odds with the common perception of the services afforded farm operators. That perception usually turns on firms that supply farm inputs -- feed, livestock, seed, fertilizer, and the like -- and/or transport and process raw farm commodities. However, very little of these lines of activity make their way into the category "agricultural services" in published data series.

Rather, this service category relates to production agriculture in only a limited way. While inclusive of such farm services as soil preparation, custom crop harvesting, crop preparation services for marketing, and veterinary services for livestock, the agricultural services category largely deals with several nonfarm lines of economic activity. Along with farm animals and to a much larger extent, veterinary services extend to a variety of companion animals. Similarly, other companion animal services such as animal boarding or kennels are included in this sector. Another major area encompassed by agricultural services is activity related to New York's green industries, including landscape, lawn and garden services, ornamentals, and trees. Lastly, agricultural services are inclusive of a variety of establishments purveying services for the forestry and fisheries sectors (Box 6).

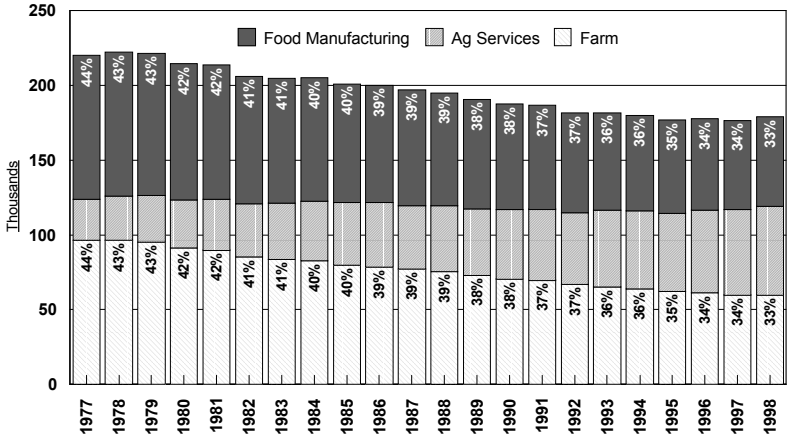
Employment in food manufacturing does not show employment increases but mirrors the steady job losses that characterized production agriculture throughout the 1977-98 interval (Figure 25). As with farm and agricultural services employment, food manufacturing accounts for over 59,000 jobs,

Box 9. Establishments classified as farms

- Wheat
- Rice
- Corn
- Soybeans
- Dry Pea and Bean Farms
- Cotton
- Tobacco
- Sugar Beets
- Sugarcane
- Irish Potatoes
- Field Crops, Except Cash Grains, NEC
- Hay Farms
- Peanut Farming
- Other Field Crop Farms
- Vegetables and Melons
- Strawberry Farms
- Other Berry Farms
- Grapes
- Tree Nuts
- Orange Groves and Farms
- Other Citrus Groves and Farms
- Apple Orchards and Farms
- Combination Fruit and Tree Nut Farms
- Floriculture Farming
- Nursery Farming
- Mushrooms
- Beef Cattle Feedlots
- Beef Cattle, Except Feedlots
- Hogs
- Sheep Farms
- Goat Farms
- General Livestock, Except Dairy and Poultry
- Dairy Heifer Replacement Farms
- Dairy Farms
- Broiler, Fryers, and Roaster Chickens
- Chicken Eggs
- Turkey and Turkey Eggs
- Poultry Hatcheries
- Fur-Bearing Animals and Rabbits
- Horses and Other Equines
- Finfish Farms
- Shellfish Farms
- Alligator and Frog Production
- Bee Farms
- General Farms, Primarily Livestock and Animal Specialties

Source: US Bureau of the Census

Figure 25. Food and Agriculture Employment, New York, 1977-1998



Source: US Dept. of Commerce, Bureau of Economic Analysis.

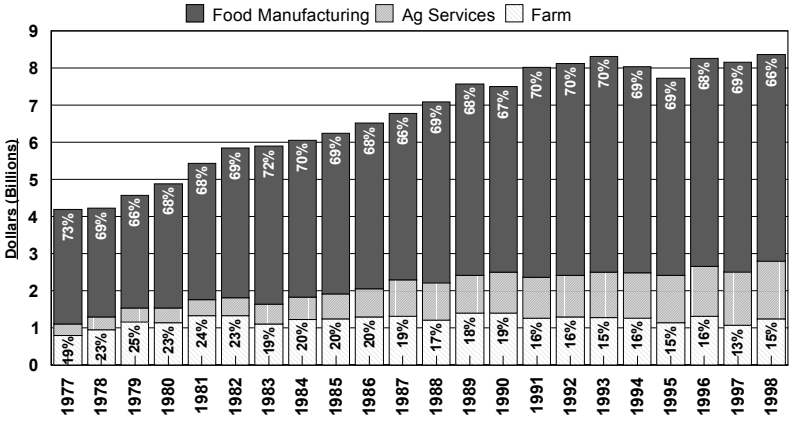
down from more than 96,000 jobs in the mid-1970s. Food manufacturing by necessity is a very diverse collection of establishments involved in all phases of food processing and packaging. The broad category "food manufacturing" not only includes processing of food and beverages for human consumption, but also extends to the production of mixed and blended animal feeds and pet foods (see Box 6).

Moving away from employment as a unit of measure provides a distinctly different impression of trend in some cases. A useful measure is value added, the remaining component of total output after cash business expenses have been accounted for in any single industrial sector (see Box 4). Value added originating in farming, in sharp contrast to farm employment, has remained relatively stable and exhibits a slight upward trend in current dollar terms over the last two decades. In 1996, value added in the New York farm sector was about $1.2 billion (Figure 26).

Value added in agricultural services, as one might expect, closely mirrors movements in employment. This is so because service sectors by definition are marked by high levels of labor input and are subject to relatively low rates of incremental change in labor productivity. For these reasons, employment and value added, dominated in this case by payments for labor services, are closely correlated as evidenced in Figures 25 and 26. Interestingly, by the close of the 1990 decade, value added in agricultural services actually exceeded the value added in production agriculture. This suggests that, like the larger macro economy, New York food and agriculture is becoming a service-based set of industries.

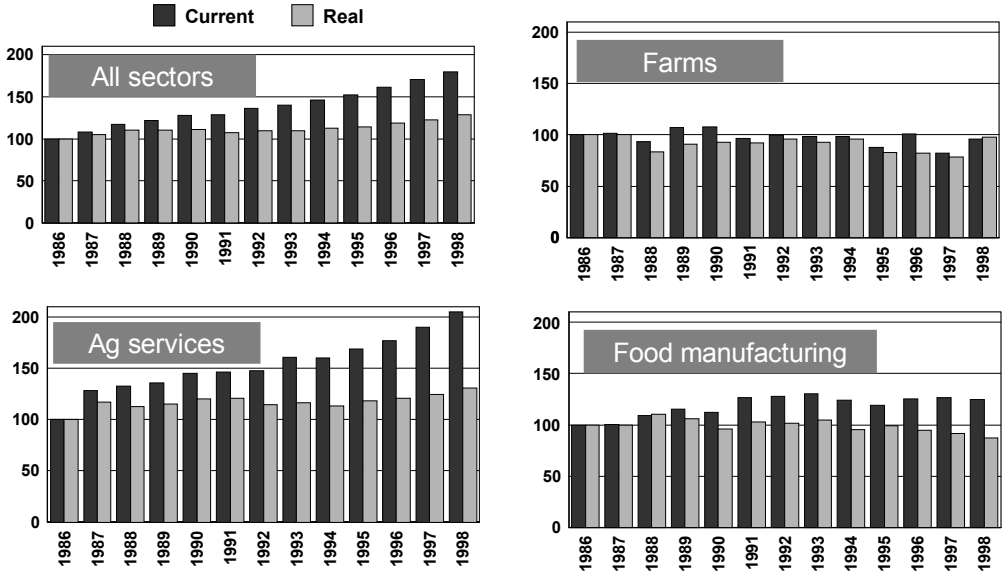
Value added in food manufacturing, on the other hand, has moved in directions counter to movements in employment over the past two decades. These countermovements are expected because of sharp increases in labor productivity over time. As Figure 26 shows, value added in food manufacturing has increased precipitously since the mid-1970s and presently stands at about $5.5 billion, up from just over $3 billion in 1977.

Figure 26. Valued Added Originating in Food and Agriculture, New York, 1977-1998



Source: US Dept. of Commerce, Bureau of Economic Analysis.

Figure 27. Index (1986=100) of Current and Real Value Added, New York, 1986-1998

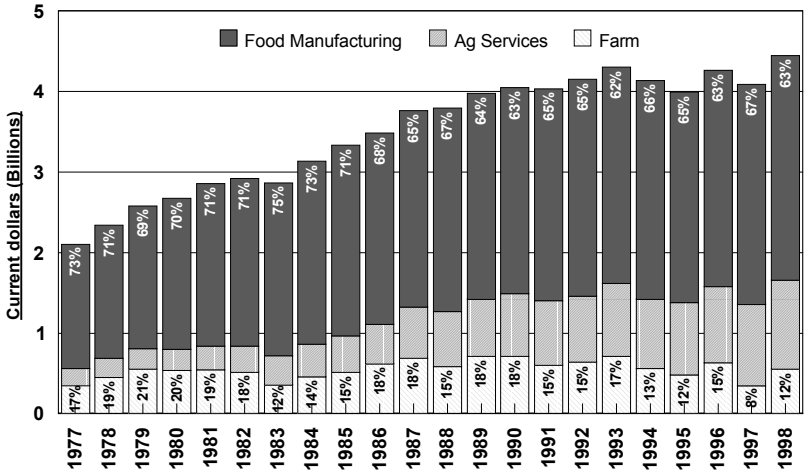


Source: US Dept. of Commerce, Bureau of Economic Analysis.

Taken together, the gross state product originating in New York food and agriculture has increased dramatically during the last two decades. In current dollar terms, the value added in these three sectors has increased from more than $4 billion per year to more than $8 billion over the 20-year interval (Figure 26). These value added increases reflect movements in both quantity produced and relative prices. Separating these price and quantity effects is of interest, and such data are now generated by the U.S. Department of Commerce. Results for the New York situation are shown in Figure 27 for calendar years 1986-98. Calculations of current and real value added for the entire state economy and for farm, ag service, and food manufacturing sectors have been indexed to calendar year 1986 as a base year. This procedure allows one to compare movements in percentage terms, in value added terms, and in both real and current dollar terms. The results show that the New York macro economy realized a 29 percent real increase in value added production over the 1986-98 interval (Figure 26). In real terms, value added in New York's ag services sector increased at rates comparable to the average for all industries, with a percentage increase of 30 percent between 1986 and 1999. In contrast, real value added in the New York farm sector fell below the 1986 base year throughout the late 1980s and 1990s. Real farm value added rebounded slightly in the late 1990s and presently stands at about 97 percent of the 1986 level. Real value added in food manufacturing displays little trend between 1986 and the mid-1990s. However, value added in food manufacturing has fallen in recent years and registered an index value of 90 percent in 1998 (Figure 26).

Additional insight on recent trends can be gained by measuring movements in earnings (personal income) generated in farming, agricultural services, and food manufacturing. According to Federal statistics, production agriculture generates earnings in the range of about $500 million (Figure 28). As expected, earnings in farming are highly erratic with often-abrupt year-to-year changes triggered by fluctuations in commodity prices and/or the vagaries of weather. Farm proprietors absorb most of the volatility in farm earnings. Earnings include payments to hired farm labor, but proprietor's earnings are a relatively large proportion of the total and move with increases and decreases in net farm income. In contrast, earnings originating in agricultural services have systematically increased (Figure 28). Presently, agricultural services generate about $1.1 billion in earnings, an amount significantly above that generated by production agriculture.

Figure 28. Employee Compensation (Earnings) Originating in Food and Agriculture, New York, 1977-1998



Source: US Dept. of Commerce, Bureau of Economic Analysis.

Like ag services, earnings in food manufacturing have increased systematically, but in the face of declining employment for the last two decades. In 1998, food manufacturing earnings stood at about $2.8 billion, an amount nearly six times the amount realized from crop and livestock production (Figure 28).

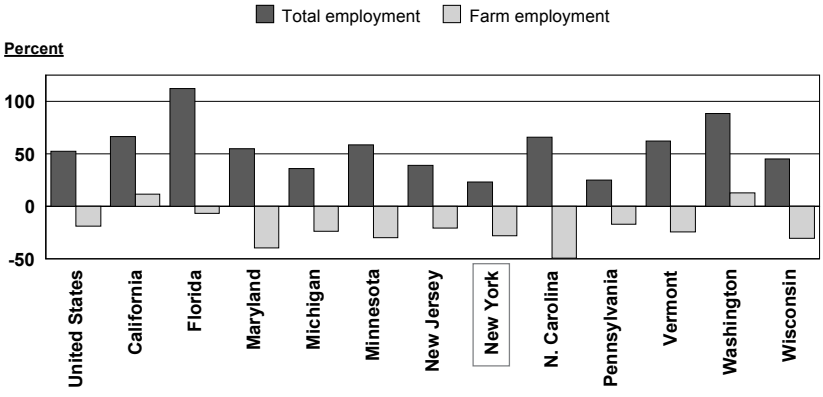
Trends in an Interstate Context

A reasonable question at this juncture is: So what? Are long-term secular trends observed in New York an aberration, or are they essentially in line with developments elsewhere in the nation? To place these trends in sharper perspective, comparisons are made with the national trend and with the states thought to be significant competitors with New York farmers in national and international commodity markets.

Turning first to employment on farms, it should be noted that, in percentage terms, the 1977-98 decrease in farm employment was approximately in line with the U.S. average. For the nation as a whole, farm employment fell from about 3.9 million jobs to 3.1 million jobs over this two-decade span, a decrease of about 19 percent (Figure 29), while total employment increased by more than 50 percent. With the exception of California and Washington, all states included in this study exhibit similar farm employment trends. California and Washington registered an increase in farm employment of 11 and 13 percent, respectively, between 1977 and 1998. New York's sluggish macro economy is clearly evidenced in these employment data. Total employment in New York State grew by a very modest 23 percent over the 21-year interval as New York registered low population growth and high rates of net outmigration at the state level.

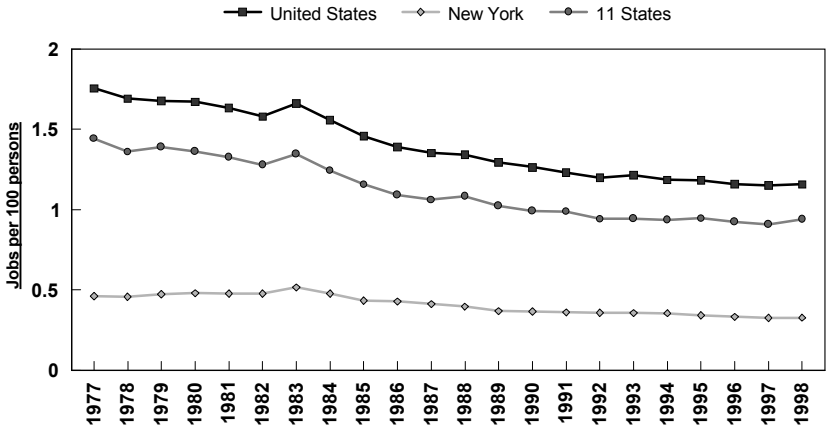
Taking population into account and averaging employment/population ratios for the 11 comparison states results in a useful comparison of trend on a

Figure 29. Change in Farm Employment, New York, 11 Competitor States and the US, 1977-1998



Source: US Dept. Commerce, Bureau of Economic Analysis.

Figure 30. Farm Employment Per 100 Population for New York, 11 Competitor States, and the US, 1977-1998



Source: US Dept. Commerce, Bureau of Economic Analysis.

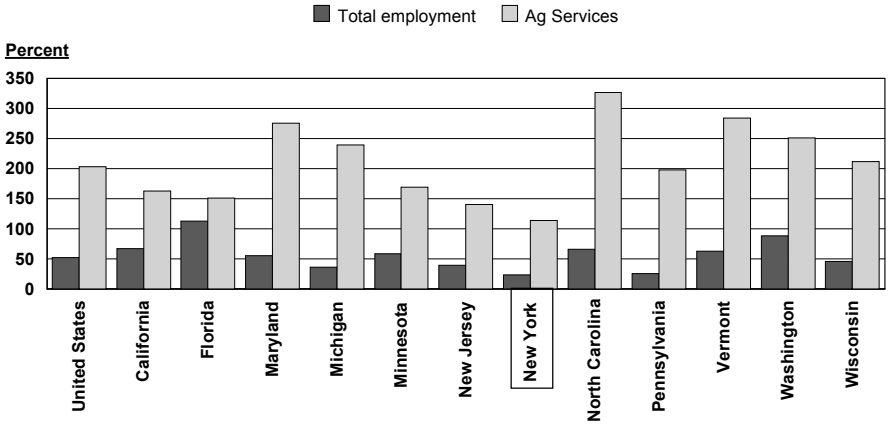
yearly basis since 1977 (see Figure 30). A striking difference between New York, the nation, and competitor states is evidenced in employment/population ratios. Nationally, farm employment per 100 persons decreased systematically from 1.8 to 1.2 over this period, on average. Almost identical rates of change occurred among New York's competitor states, although relatively smaller shares of the total population were engaged in farming. New York's level of engagement as reflected in employment/population ratios is markedly lower than any of these cases and ranged between 0.5 and 0.33 between 1977 in 1998.

As noted above, New York registered very sizable increases in agricultural services employment over the last two decades. However, it can be seen that these increases are far less dramatic in a national and regional context (Figures 31 and 32). Although impressive in absolute terms, New York realized one of the nation's more modest employment gains in these aggregate sectors. Nationally, the percentage increase was over 200 percent over this interval, compared with 113 percent in New York. Percentage gains were uniformly higher in competitor states, with percentage increases approaching or exceeding 250 percent in several states, capped by North Carolina's impressive 326 percent gain (Figure 31).

Some of these percentage increases, of course, were made from fairly small employment bases. Adjusting for population, as in Figure 32, sheds much additional light on agricultural services employment and shows that New York's competitor states, on average, moved in accordance with the national trend. New York, however, realized a breakaway in the early 1980s, and employment increases have been relatively modest in agricultural services since that time.

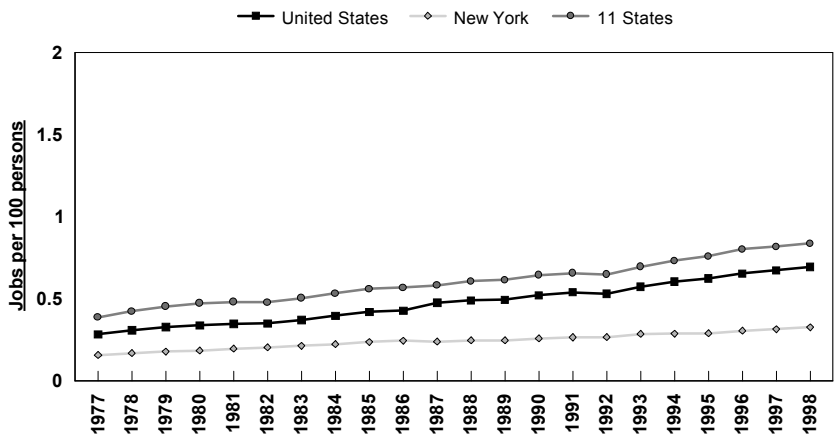
Patterns are much the same for food manufacturing, with New York realizing the largest percentage decrease in food manufacturing employment among the

Figure 31. Change in Ag Services Employment, US and Selected States, 1977-1998



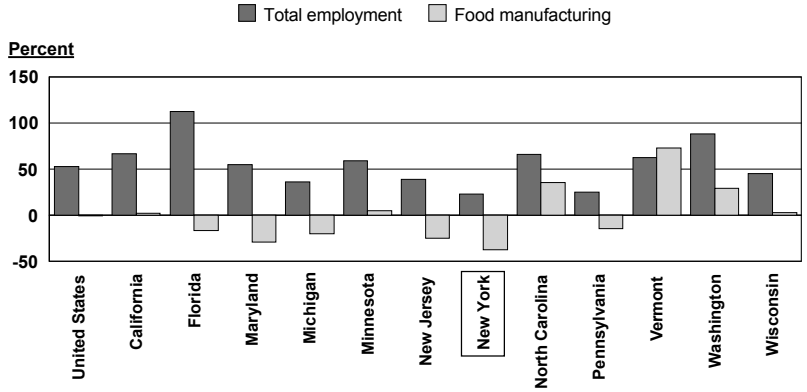
Source: US Dept. Commerce, Bureau of Economic Analysis.

Figure 32. Ag Services Employment Per 100 Population for New York, 11 Competitor States, and the US, 1977-1998



Source: US Dept. Commerce, Bureau of Economic Analysis.

Figure 33. Change in Food Manufacturing Employment, New York, 11 Competitor States, and the US, 1977-1998

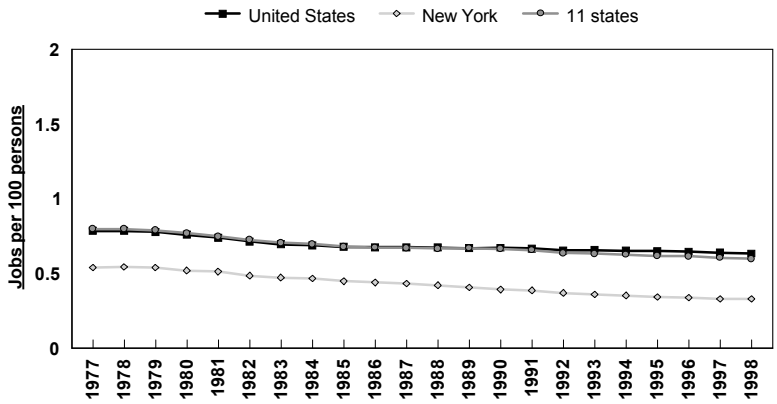


Source: US Dept. Commerce, Bureau of Economic Analysis.

states included in this summary (Figure 33). Nationally, food manufacturing has not been a vibrant source of employment, with jobs hovering in the range of 1.7 million since the mid-1970s. This stable employment in the face of population increases has reduced the incidence of food manufacturing employment from about 0.8 per 100 persons to 0.6 (Figure 34). This general relationship holds in each of New York's competitor states and, on average, employment per 100 persons has moved in virtual locked step with movements at the national level. New York has evidenced similar patterns, but again with relatively low employment concentration in food manufacturing (see Figure 34).

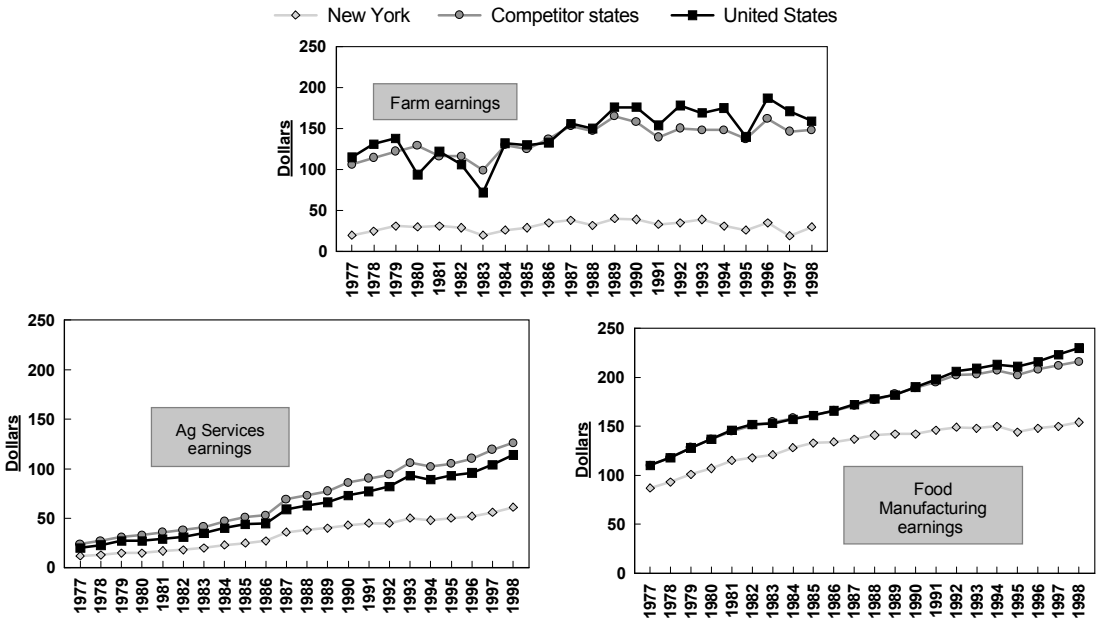
A somewhat similar pattern emerges when attention turns to measures based on state gross product or earnings, as shown in Figures 35 and 36. Per capita value added (gross state product) and earnings both show that New York lags behind the nation and competitor states. While both product and earnings have increased in New York over the recent past, rates of change have stagnated, beginning in the early 1980s, with no recovery evidenced in the data.

Figure 34. Food Manufacturing Employment Per 100 Population for New York, 11 Competitor States, and the US, 1977-1998



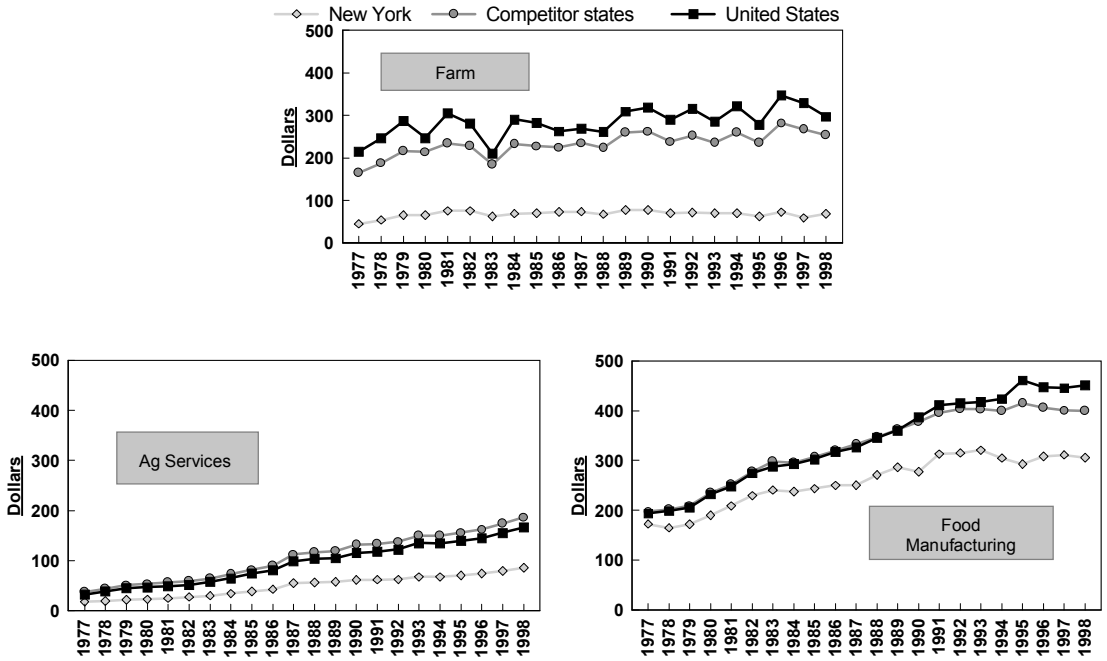
Source: US Dept. Commerce, Bureau of Economic Analysis.

Figure 35. Per Capita Employee Compensation (Earnings) for Farms, Ag Services, and Food Manufacturing, 1977-1998



Source: US Dept. Commerce, Bureau of Economic Analysis.

Figure 36. Per Capita Value Added, 1977-1998



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