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VEGETABLE CONSUMPTION, DIETARY GUIDELINES AND AGRICULTURAL PRODUCTION IN NEW YORK STATE – IMPLICATIONS FOR LOCAL FOOD ECONOMIES

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ABSTRACT

Local food economies where local producers respond to regional consumers' needs are gaining attention as a means for boosting agriculture and food production in New York State. Concurrent with this interest in local agriculture is a national concern over the health effects of American food consumption patterns and the capacity of agriculture to support nutritious diets. This study merges these areas of inquiry in the context of a nutritionally and economically important agricultural sector, namely New York State vegetable production.

Three questions are examined in this research. 1) How does New York State vegetable production compare with the vegetable consumption by New Yorkers? 2) How do production and consumption of vegetables compare with the recommendations in the U.S. Department of Agriculture Food Guide Pyramid? 3) What implications do these comparisons have for New York State agriculture? These questions were addressed using existing national and state data to estimate vegetable production and vegetable consumption in New York State. Then, in-state agricultural production and food consumption were compared with the Food Pyramid recommendations.

Annual per capita consumption estimates for the Northeast suggest that New Yorkers consume approximately 160 pounds of vegetables per person per year. Based on population estimates, this level of per capita consumption indicates that New Yorkers consumed 2.9 billion pounds of vegetables in calendar year 1999. In contrast, New York State agriculture harvested an average of 3.3 billion pounds of vegetables annually during 1994-1998. After adjusting for post-harvest losses and inedible portions, the consumable equivalent of this farmgate production is 1.6 billion pounds. Based on a crop by crop comparison, New York produces a handful of vegetable crops (e.g., beets, cabbage, onions, pumpkins, snap beans, and sweet corn) in quantities that exceed the estimated in-state demand. As a result, New York produces enough vegetables to provide 38 percent of the total vegetable consumption plus 500 million pounds of "surplus" of the aforementioned crops.

Comparisons with the Food Guide Pyramid demonstrate that both vegetable consumption and production in New York State mirror national trends, featuring lesser amounts of nutritionally important vegetable groups. Consumption of the "dark green leafy & deep yellow vegetables" and the "dry legumes" are only 41 percent and 19 percent, respectively, of the recommended amounts. Though New York State harvests enough dry edible beans to match the current level of consumption, it is well below the recommended amount. Furthermore, New York is a minor producer of the dark green leafy and deep yellow vegetables, producing only 12 percent of the recommended number of servings.

This research could have favorable implications for New York State vegetable growers and consumers. Agricultural census data suggests that New York's vegetable sector has historically been robust. It has maintained a consistent quantity of land in vegetable production for the last 50 years, despite shifts in crops, and has proven to be adaptable. Though New York State is among the nation's top six vegetable producing states, this research suggests that the local market is still large relative to state output. Though more geographically specific information would be helpful for growers to put this information into practice, it is clear that much potential exists for some growers to target local and regional markets and nutritionally conscious consumers.

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INTRODUCTION

Local food economies in which there are well-developed demand responses by local producers to regional consumers' needs are gaining attention as a means for boosting agriculture and food production in New York State, while improving the diets of consumers. Many New Yorkers see the economic, social and natural resource advantages in maintaining a diverse rural landscape and an economically viable land base for farming. Others see benefits coming to local economies from more emphasis on connections between local food consumption and local farm and food systems. Benefits include job creation in the production and value-added segments of the food system, the potential for retaining and perhaps expanding the level and diversity of agricultural production, the opportunity to enjoy fresh and nutritious foods raised in the local area, and a greater sense of community that such connections provide.

Unfortunately, very little evidence is available concerning the real potential for these state and local food linkages to expand local marketing and network-building opportunities. In-state production of major farm and food commodities can be described with great accuracy but marketing channels for New York's crops and animal products are not known with certainty. One cannot readily access uniform and comprehensive comparisons of sales in offshore international markets and sales into domestic outlets, either within or outside of any individual state. The food-purchasing behavior of New York consumers is only understood in a general way. Data on food consumption exists in the aggregate, but very little information is available on a regional basis to associate in-state production of agricultural products with in-state consumption of those products.

Because of these data gaps, the discussion of food consumption issues and agricultural production issues for the State is disconnected and proceeds in separate tracks. Conventional wisdom develops to fill the information vacuum and unsubstantiated claims and speculations abound. The debate over appropriate state and local farm and food policy is largely fueled by anecdotal evidence or based on inference, without the necessary supporting data to reveal important patterns and develop a clear strategy. The search for steps that might be needed to retain and expand income and employment for New York

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farm and food system businesses, while at the same time securing a safer and more nutritious food supply for New Yorkers, is thus hampered.

In this report we begin to explore the relationship between in-state food consumption, in-state agricultural production, and current recommendations for a healthy diet. The research reported here is only a beginning. This analysis is confined to vegetable production and consumption. The initial focus on vegetables is useful from both a production and consumption perspective. On the production side, vegetable production is a major source of income and employment for New York farmers. On the consumption side, much of the discussion about dietary change for improved health and disease prevention focuses upon the nationally recognized need for an increase in vegetable and other "plant food" consumption.

We examine three questions: 1) How does New York State vegetable production compare with the vegetable consumption by New Yorkers? 2) How does the consumption of vegetables by New Yorkers compare with recommendations in the USDA Food Guide Pyramid? 3) What are the implications for New York State agriculture? The paper is organized into several sections. The Introduction section is foundational and seeks to broaden perspective on the subject by looking at current food consumption trends versus dietary recommendations and production trends in New York agriculture, emphasizing New York's robust vegetable sectors. The methodology for the study and the research results are presented in the Methods and the Results sections. The conclusions of the study are explored in the Discussion section; our research reveals some data constraints, as well as some as yet untapped opportunities for New York State's food agriculture industries, based on the production and consumption comparisons.

National Dietary Recommendations

Interest in diet as a major strategy for disease prevention and health maintenance was first given prominent national attention with the publication of *Nutrition and Your Health: Dietary Guidelines for Americans* (Frankle and Owen, 1993). The guidelines expanded upon the initial emphasis on nutritional adequacy to include health promotion as a goal of nutrition recommendations for Americans, age 2 years and over.

Since 1980, the United States Department of Agriculture (USDA) and the United States Department of Health and Human Services (DHHS) have jointly published a revised version of *Nutrition and Your Health: Dietary Guidelines for Americans* every five years (Davis and Saltos, 1999). The Dietary Guidelines have been relatively consistent since 1980, emphasizing seven distinct guidelines for health improvement and disease prevention. The fifth and most recent edition, as shown in Figure 1, contains ten dietary guidelines that are organized around three broad diet and health principles – aim for fitness; build a healthy base; choose sensibly (USDA and DHHS, 2000).

Figure 1: Dietary Guidelines for Americans

AIM FOR FITNESS

- Aim for a healthy weight.
- Be physically active each day.

BUILD A HEALTHY BASE

- Let the Pyramid guide your food choices.
- Choose a variety of grains daily, especially whole grains.
- Choose a variety of fruits and vegetables daily.
- Keep food safe to eat.

CHOOSE SENSIBLY

- Choose a diet that is low in saturated fat and cholesterol and moderate in total fat.
- Choose beverages and foods to moderate your intake of sugars.
- Choose and prepare foods with less salt.
- If you drink alcoholic beverages, do so in moderation.

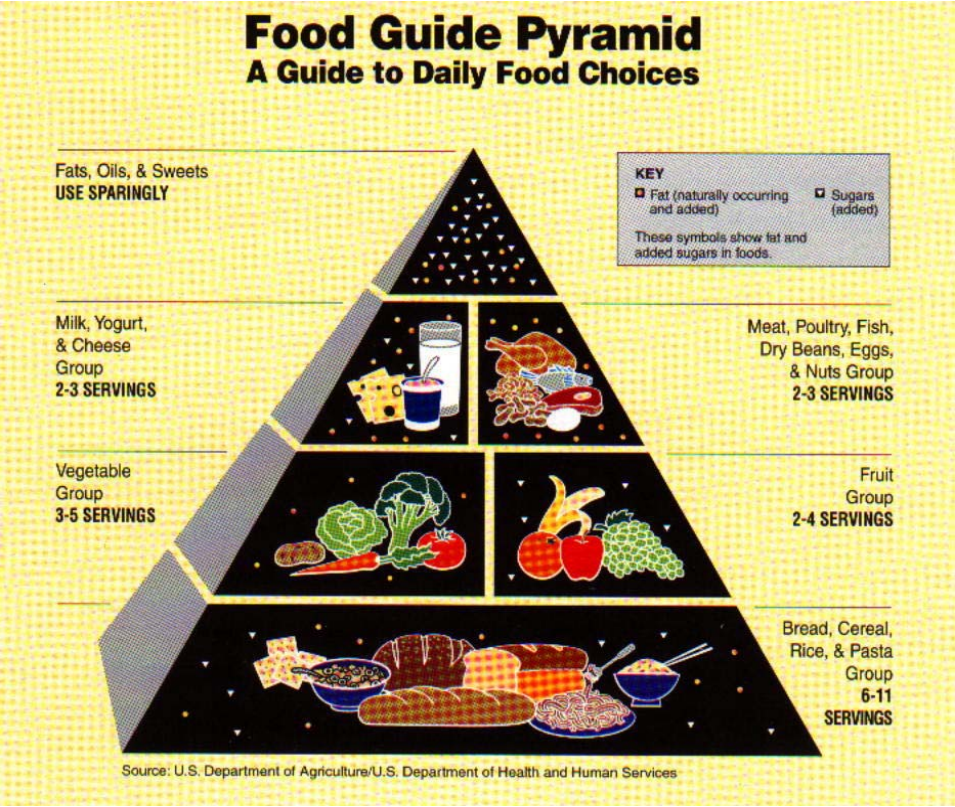
Sources: US Department of Agriculture and US Department of Health and Human Services, 2000.

In the fourth edition (1995), the Food Guide Pyramid was introduced as the nutrition education implementation strategy of the dietary guidelines. This food guide replaced the Basic Four Food Groups, first proposed in 1958 in a USDA publication titled "Food for Fitness – A Daily Food Guide" (USDA, 1977). The Food Guide Pyramid and its precursor (as well as earlier food guides) were based on the concept of selecting from different food groups and maintaining a balance between the proportion of micronutient-dense foods and energy-yielding foods (Frankle and Owen, 1993). Such guides are useful because they provide a quantitative measure for which to strive in order to meet the more generally articulated guidelines. "A food guide translates recommendations on nutrient intake into recommendations on food intakes. It provides a conceptual framework for selecting the kinds and amounts of foods of various types which together provide a nutritionally satisfactory diet" (Welsh *et al*., 1992).

Intake Recommendations Based on the Food Guide Pyramid

The USDA Food Guide Pyramid (Figure 2) divides food into five major groups (grains, vegetables, fruits, dairy, and protein-rich foods) and a sixth group of foods that should be consumed in moderation (added fats and sugars). The Pyramid suggests the quantities of food that should be eaten from each of these major groups as well as the limits for consumption of added fats and sugars. These recommendations are expressed as servings of food (e.g., a medium-sized carrot, a cup of lettuce) rather than by weight. Expressing the recommendations in such everyday measures is meant to facilitate adherence to the Food Guide Pyramid guidelines.

Figure 2: USDA Food Guide Pyramid



Sources: US Department of Agriculture and US Department of Health and Human Services, 2000.

The Pyramid displays a range of servings for each food group (e.g., 3 to 5 vegetable servings daily). This range is intended to assist individuals in consuming foods in proportion to their energy requirements. People with a low caloric need should consume at the low end of the range while those with a high caloric need should consume at the high end of the range. The Pyramid defines low, medium, and high calorie diets as approximately 1600, 2200, and 2800 calories per day.

The design of the Pyramid conveys the importance of plant foods in a healthful diet. Foods from the grain products group, along with vegetables and fruits, are the basis of healthful diets. These plant foods are emphasized because they are rich sources of vitamins, minerals, complex carbohydrates (starch and dietary fiber), and other substances that are important for health. Plant foods are also generally low in fat. Foods within the same group have different combinations of nutrients and other beneficial substances. For example, some vegetables and fruits are good sources of vitamin C or vitamin A, while others are high in folate; still others are good sources of calcium or iron. Thus, the Dietary Guidelines, in recommending a variety of foods within and across food groups, assure an adequate intake of essential and protective nutrients. This area has become a subject of national research with the discovery of compounds known as phytochemicals which are thought to be protective against certain cancers and other chronic disease.

Food Consumption Trends

Americans have access to an abundant, highly varied and, for most, a very affordable food supply that should facilitate adherence to the dietary guidelines. Yet, only a small fraction of the US population consumes the recommended number of servings from each of the major food groups (Krebs-Smith *et al*., 1996; Munoz *et al*., 1997).

Most Americans of all ages eat fewer than the recommended number of servings of grain products, vegetables, and fruits (Tippet and Cleveland, 1999), and fewer than 20% of children in the US are consuming the recommended 5 servings of fruits and vegetables per day, a significant concern due to the likelihood of childhood dietary habits continuing into adulthood (Krebs-Smith *et al*., 1996; Kennedy and Goldberg, 1995; Baranowski *et al*., 1997; Dennison at al., 1998). These discrepancies between consumption levels and dietary recommendations represent major public health concerns given the association of diets low in fruits and vegetables with an increased incidence of obesity, heart disease, lung disease and diabetes and certain types of cancer (Ziegler *et al*., 1996).

McNamara *et al*. (1999) conducted a review of how Americans were eating relative to federal dietary recommendations and quantified discrepancies (or "gaps") between consumption, dietary recommendations, and the food supply. They projected those gaps to the year 2020 based on demographic changes estimated by the US Census Bureau. The authors then considered how full compliance with the recommendations in the Food Guide Pyramid would impact aggregate food supplies, in the near and long term. The rationale behind their analysis is that, socio-cultural and behavioral factors not withstanding, successful adoption of the dietary guidelines "also requires that sufficient quantities of healthful foods be available in the market" (McNamara *et al*., 1999).

According to their analysis, if consumers were to immediately meet the Food Guide Pyramid recommendations for vegetables, commercial availability of dark-green vegetables, deep-yellow vegetables, and dry beans, peas and lentils would each need to roughly triple in magnitude. Supplies of vegetables consumed in excess of dietary need, namely potatoes and other starchy vegetables, could decrease without threatening consumer ability to meet recommendations. McNamara *et al*. suggest that in order to satisfy such an increased demand for these foods, the food supply would need to be augmented through modest increases in domestic production but largely through expanded imports.

Young and Kantor (1999) estimated adjustments in crop acreage that could occur to meet changes in food demand if the American diet became more consistent with Food Guide Pyramid recommendations. They estimated that a total of 5.6 million additional acres would need to be put into production. They noted that although this is a small overall change (about 2 percent of the average area of US cropland planted in 1991-1995), more significant acreage changes could be anticipated for single commodity groups like sweeteners, fats and oils, fruits, and some vegetables. They also stress that, because of land and climatic differences, adjustments for some commodities may be concentrated in certain regions.

Food Production Trends in New York State

The number of farms and farm acreage peaked in New York in the early 1900s (see Table 1) (NYS Census of Agriculture), but sharp declines in farms, land in farms, and cropland occurred during the 1920s and 1930s. At the close of World War II, there were about 125,000 farms in New York State. Since that time, farm consolidation has dominated the rural landscape of the state as the farming industry reacted to increased production potential, new cost-price relationships, economic opportunities on and off the farm, and shifting social realities. As a result, farm numbers have continued to decline over the last fifty years. In 1992, the Census counted about 32,000 farms. The number of farms in New York remained relatively stable in the 1990s with farm businesses continuing to be consolidated into larger economic units, while smaller part-time farms are increasing in number. Today, more than 40 percent of all New York farms can be classified as residential farms, because the operator also has a full-time job off the farm (USDA, 1999b).

Table 1. Farm numbers, land in farms, and improved land in New York State, census data, 1910-1997

Census Year	Farm Numbers	Land in Farms	Improved Land or Total Cropland*
		million acres	
1910	215,600	22.0	14.8
1920	193,200	20.6	13.2
1930	159,800	18.0	10.5
1940	153,200	17.2	10.2
1950	124,800	16.0	8.5
1960	82,400	13.5	7.1
1970	51,900	10.1	6.1
1978	43,100	9.5	5.9
1987	37,700	8.4	5.4
1992	32,300	7.5	4.9
1997	31,757	7.3	4.7

* Improved land included all land from which crops were harvested including pasture from which hay could have been harvested. Cropland was substituted for "improved land" in the Census of Agriculture in 1925.

Source: Stanton and Bills, 1996

Likewise, total acres in agriculture declined over the past century. Farm consolidation, expanded competition for land from nonfarm uses, and the removal of marginal lands from agricultural production have precipitated continual decreases in farm acreage. Land in farms decreased from 16 million acres in 1950 to just over 7 million acres in the late 1990s. The amount of forested land increased from 11.7 million acres in 1950 to 16.3 million acres in 1992 through the reversion of idled farmland to forest cover (Stanton and Bills, 1996; Bills and Stanton, 1999). The remaining acreage has been converted to residential, commercial, and transportation uses.

However, farm and farm acreage losses have not translated into decreases in farm output due to significant gains in crop yields and labor productivity. The real (price

adjusted) value of farm output has increased about 60 percent since 1950. Today, nearly $7 of every $10 in farm output is accounted for by livestock and livestock products. This ratio has remained essentially stable for the last two decades. The New York dairy industry presently accounts for 56 percent of total receipts from farm marketings.

Much of New York's crop acreage is used to produce feed and forage crops to support the livestock industries mentioned above. Although small acreages are involved, New York has a vibrant vegetable crops industry. Cash receipts from the sale of vegetable crops were $356 million in the late 1990s, and vegetables currently account for 11 percent of the value of farm marketings. New York is a major producer of several vegetables, ranking 5th in the United States in overall vegetable production. The state ranks first in the nation in cabbage and pumpkin production, second in sweet corn (for fresh and processed markets), beets, and processing cabbage, third in cauliflower, and fourth in snap beans.

More Production to Meet In-State Food Needs

Several factors inherent to New York State and the Northeastern US would seem to indicate a potential for increased reliance on local food sources. Despite the pressures that population density has placed on farmland for other uses, the fact that we have nearly 60 million "eaters" in the Northeast, many of them concentrated in densely populated areas, provides an opportunity for local food producers to supply these regions of concentrated demand. The Northeast is home to some of the largest cities in the world and many city and metropolitan residents have financial resources to support agriculture in the local area and a growing interest in doing so.

The population in the Northeast is also increasingly diverse. By 2010, it is estimated that New York, for example, will have no ethnic majority. This diversity in population presents an opportunity for our food and agriculture system. Today's immigrants, as well as those who arrived decades ago, play an important role in agricultural development in the United States. Immigrants represent a strong force for shaping culinary preferences, developing niche markets, and expanding agricultural diversity (Walz, 2000; Kotkin, 2001).

Not only is our regional population diverse culturally, it is also increasingly diverse economically. Many residents of New York State suffer from persistent food insufficiency (or food insecurity as it has been more commonly referred to). Approximately 11% of the population in the United States, or 31 million Americans, lived at or below the poverty line in 2000, with incomes below $17,603 for a family of four (Bureau of the Census, 2001). An additional 12 million people, together totaling almost a sixth of the US population, had incomes at or below 125% of the poverty line (Bureau of the Census, 2001), all within the income eligibility criteria for federal assistance programs such as the Food Stamp Program. According to recent estimates of food security, almost 10% of US households are not food secure (Nord *et al.,* 1999). This figure varies significantly from state to state and is generally lower in the Northeast, although food insecurity in New York State is consistent with the national average (Nord *et al.,* 1999).

Issues of both ethnic and economic diversity are important because, when considering what consumers and producers can do to build local food systems, we must be clear as to whom we are talking about, what we can expect from whom, and what strategies might apply to some groups and not to others. Further, some of the most effective long-term strategies for alleviating food insecurity are consistent with the development of sustainable, locally-based food systems. For example, the Women, Infants, and Children (WIC) Farmers' Market Nutrition Program (FMNP) was established in 1992 for the dual purpose of providing fresh fruits and vegetables to women, infants, and children who are nutritionally at risk and expanding consumer awareness of farmer's markets (USDA Food and Nutrition Service, 2002).

While rarely considered to be the nation's "breadbasket", the Northeast is well suited to the production of a wide variety, and perhaps an even greater quantity, of foods needed to more closely match the food requirements and preferences of Northeasterners. While a short growing season in the region is a limitation to vegetable growers who desire more contact with local consumers, other factors favor production in the region. The Northeast has pockets of superb soils and ample water resources. In contrast, California, which dominates the production of fruits and vegetables in the US, is dependent on a highly subsidized but limited supply of water for agricultural uses. As competition for water resources increases in California and costs mandated by dependence on fossil fuels for long distance shipping become less sustainable, the advantages of production of vegetables in the Northeast for regional consumption will become more apparent (Duxbury and Welch, 1999). Finally, in the minds of our region's farmers, non-governmental organizations (NGOs), researchers and extension agents, there resides an abundance of intelligence about appropriate farming and marketing methods that can be harnessed and directed toward the goal of achieving more reliance on local food systems.

METHODS

Existing national and state data were employed to make comparisons among New York State vegetable production, New York State vegetable consumption, and the Food Guide Pyramid guidelines. Our first question, “How does current consumption contrast with current production?” was addressed by comparing vegetable production on a crop-by-crop basis with estimates of vegetable consumption for the entire state. Our second question, “How do consumption and production compare with the Food Guide Pyramid recommendations?” was approached by comparing the quantities of vegetables grown and consumed in New York State with the estimated amounts that would be needed if the diets of all New Yorkers were consistent with the Food Guide Pyramid recommendations.

The methods used in the study are described in four subsections. The sources of agricultural production and food consumption data and the reasons for choosing these data sets are discussed in "Vegetable Consumption Data" and "Vegetable Production Data". In the third subsection, "Food Pyramid Recommendations", the procedures used for calculating the number of vegetable servings required by the average New Yorker are outlined. In the fourth subsection, "Comparing Production, Consumption and Food Guide Pyramid Recommendations", the transformations necessary for making comparisons between vegetable production, vegetable consumption, and the nutritional recommendations are explained.

Vegetable Consumption Data

Estimating food consumption for a single state is not a straightforward procedure; there are no surveys of food consumed in individual states, nor is there any tracking of food across state borders. Instead, food supply accounting and comprehensive food consumption surveys are done only at the multi-state and national levels. Thus, the researcher must rely on aggregate national or regional per capita consumption estimates that are assumed to roughly approximate the food consumption within a single state.

Two general types of consumption data are available. Food supply data (also referred to as food disappearance) estimates the amount of food that enters the US food system. The USDA Economic Research Service (ERS) calculates these estimates annually using a balance sheet approach that accounts for domestic production, imports, exports, and beginning and ending stocks of primary foodstuffs. National survey data estimates actual consumption by interviewing a representative sample of the United States population to find out what each participant ate over a 24-hour period. These national surveys are intensive, and the USDA Agricultural Research Service (ARS) conducts them only periodically. Three such surveys have been conducted since the late 1970s.

For this study, national survey data containing regional estimates were used to estimate per capita consumption of vegetables in New York. These estimates were obtained from the Food Commodity Intake Database (FCID). The FCID data were recently released in electronic format by the US Environmental Protection Agency (EPA) and the USDA

Agricultural Research Service (ARS) for the purpose of estimating human exposure to pesticide residues through foods. This database was constructed using information gathered in the 1994-1996 Continuing Survey of Food Intake by Individuals (CSFII)[1] plus a supplemental survey of children (ages 9 and younger) conducted in 1998 (EPA and ARS, 2000b). The food consumption data from these CSFII surveys (which is reported in terms of food eaten) were converted into consumption of constituent food commodities in grams per kilogram bodyweight.

Though the FCID provides little original data, several features make it useful for this study and preferable to the CSFII and the national food supply statistics. First, the groupings used in the FCID for fruits and vegetables are taxonomically more similar to agricultural commodity groups regularly reported in state/Federal vegetable production statistics than are the groupings used in the CSFII. This facilitated comparisons of food consumption with agricultural production. Second, data for each survey participant are coded by census region, making it possible to compile food consumption estimates for the Northeastern, Midwestern, Southern, and Western US For the purposes of this study, we are assuming that food consumption in New York can be more closely estimated based on data for the Northeast2 region. Lastly, the FCID reports estimates of intake of 548 different commodities, including many minor or micro crops that are not described in the US food supply data.

In the currently available version of the FCID (version 2.1), the data have not been summarized. The database contains all individual consumption estimates for each survey participant, and it is up to the user to perform the desired summaries[3]. For this study, it was necessary to calculate average per capita consumption of a commodity from the FCID. This is accomplished through a two-step process. First, consumption estimates are converted from units of grams per kilogram bodyweight to grams per person. Second, a weighted average of all observations is taken using the sample weights assigned to each participant. This was accomplished using the formula shown below[4].

$$C_i = [\sum (I_{ij} \times BW_j \times SW_j)] / SW_t$$

Where:

C_i = daily per capita consumption of food commodity "i" in the population of interest

I_{ij} = intake of commodity "i" (in grams of food per kg bodyweight) by the "j^{th}" individual surveyed from the population of interest

BW_j = the bodyweight (in kilograms) of survey individual "j"

SW_j = the sampling weight of survey individual "j"

SW_t = the total sampling weight for the population of interest

[1] The CSFII is the national survey conducted by the USDA Agricultural Research Service to provide information on the kind and amount of foods that Americans consume.

[2] The Northeast region consists of the following states: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

[3] The FCID includes extensive documentation to assist the user in properly using the information contained in the database.

[4] This formula was derived with the help of Dr. Edward Frongillo, Division of Nutritional Sciences, Cornell University.

Because the FCID was derived from 24-hour recall data, it estimates consumption per day. Annual per capita consumption was extrapolated by multiplying the daily estimates by 365. These average annual per capita consumption estimates were tabulated for both the Northeast region and the entire US Estimates for the Northeast are assumed to be representative of annual per capita consumption in New York State. Both US and Northeast per capita consumption estimates are shown in Appendix 1.

Vegetable Production Data

Agricultural production data for New York State are published by the USDA in two publications: New York Agricultural Statistics (NYAS) and the Census of Agriculture. The methods of data collection for these sources are different, and each has its strengths and weaknesses.

NYAS uses both list and area frame statistical designs to generate estimates of farm gate production. These estimates are reported on an annual basis, providing a reliable source of time-series data. The major weakness associated with this data source is that it provides estimates for principal crops (in terms of harvested acreage and field edge value), rather than an exhaustive list of vegetable crops. Vegetable crops which involve fewer acres and/or small total farmgate value are not included in this data source. Furthermore, the list of principal vegetable crops is periodically adjusted by the USDA to stay within budget limits and to adjust to changing conditions in the field, thereby changing the comparative data.

The Census of Agriculture is conducted at 5-year intervals by mailing a questionnaire to individuals and corporations thought to operate a farm or a ranch. The Census, now conducted by the USDA, contains coverage biases and consequently underreports farm numbers, farmland, and farm commodity production. The advantage of the Census is that it covers a wider array of crops and animals than does the NYAS data.

In order to avoid underreporting production and overlooking minor crops, the agricultural production of New York State was estimated using both data sources. When data was available for a commodity in NYAS, the production estimates from that publication were used. When data was not available in NYAS, estimates from Census of Agriculture were used. This approach provides data for the largest number of crops; preference was given to NYAS data, the more accurate data set.

For the purposes of this study, it is critical to note that the Census of Agriculture does not list production of *vegetables* in terms of the weight produced. Rather, it lists the amount of land harvested for each crop. Thus, for each vegetable commodity, production was estimated by multiplying the area harvested by the average yield per acre. Average yield estimates were obtained from faculty members of Cornell's Department of Horticulture and Department of Horticultural Sciences.

Food Guide Pyramid Recommendations

As described in the Introduction, the USDA Food Guide Pyramid provides recommendations for food intake from each food group based on an *individual's* daily caloric needs. To compare the average per capita consumption of a *population* with these recommendations, it is necessary to estimate the average number of servings required per capita within that population. This was accomplished using demographic data for New York State and estimates of the appropriate number of Pyramid servings for individual age/gender cohorts. Estimates of the daily number of vegetable servings required by members of various age/gender cohorts were obtained from a description of the Healthy Eating Index (HEI), a device developed by the USDA Center for Nutrition Policy and Promotion (CNPP) to measure compliance with the Dietary Guidelines. (Bowman *et al*., 1998). These estimates are based on the average caloric requirements of each age/gender group and the recommended number of Food Guide Pyramid servings at such levels of energy intake. They are reported by Bowman and others (1998, p.5). Serving recommendations for vegetables are shown below in Appendix 6.

Demographic data from the US Bureau of the Census were used to estimate the population of each age/gender cohort in New York State. These population estimates were multiplied by the servings recommendations for their respective age-gender cohorts to estimate the number of servings required by each cohort. The cohort totals were summed and an average taken to estimate the average number of vegetable servings recommended per person. The results of these calculations are displayed in Appendix 6.

In addition to the recommendation for the daily number of vegetable servings, the Food Guide Pyramid emphasizes consumption of certain types of foods within the vegetable food group, namely dark green leafy vegetables and dry beans, peas and lentils. The USDA encourages Americans to "choose dark-green leafy vegetables and dry beans, peas and lentils often". Although the Food Guide Pyramid does not suggest a quantitative target for these types of vegetables, the literature that evaluates American diets and the US food supply vis-à-vis the Food Guide Pyramid does provide clear precedents for interpretation.

The recommendation for dark-green leafy vegetables was accounted for using the method employed by Kantor (1998; 1999) and Young and Kantor (1999) to compare the US food supply with the Food Guide Pyramid. These authors interpret the Dietary Guidelines on vegetables to mean that vegetable servings should be evenly divided between three vegetable subgroups: dark-green leafy and deep yellow vegetables; dry beans, peas, lentils and other starchy vegetables; and other vegetables. Evenly dividing one's vegetable servings in this way would result in conformity with the recommendation to "eat several servings of dark green and leafy vegetables each week".

The recommendation for dry beans, peas, and lentils was accounted for based on menus reported in Shaw, *et al*. (1996)[5]. These menus show 5¼ servings of legumes being consumed in a five-day period. We therefore interpreted the recommendation on dry beans and peas to mean that, on average, people should consume one serving of legumes per day.

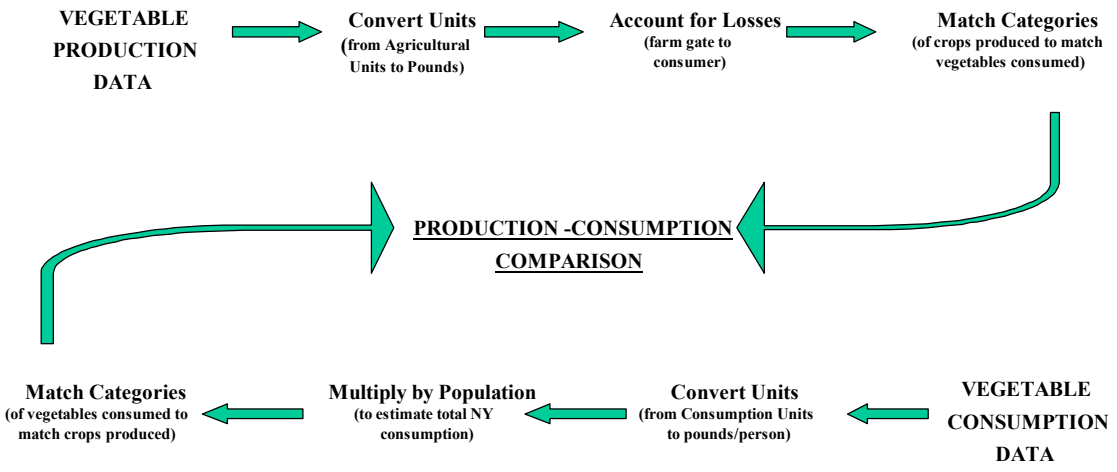
[5] See Table 7B: Food group/subgroup servings from 5 days' menus at 2,200 calories.

Since dry beans, peas, and lentils can be considered in either the vegetable or the protein group, we estimate that, on average, 0.5 servings of vegetables per day should come from legumes.

Comparing Production, Consumption, and Food Guide Pyramid Recommendations

The steps taken to compare New York State vegetable production data with vegetable consumption data for the Northeast are illustrated in Figure 3. Production data was transformed by converting to a common unit, accounting for losses that occur between the farm gate and the consumer, and pooling production of fresh and processed vegetables by crop (e.g., sweet corn, versus fresh market sweet corn and sweet corn for processing) . Per capita consumption data are transformed by converting to a common unit, extrapolating to estimate total state consumption, and pooling consumption of food products by crop (e.g., carrots versus carrots and carrot juice).

Figure 3: Flow diagram of steps in comparing production and consumption



The common unit to which agricultural production and food consumption data have been converted is pounds. Vegetable production data have been converted from either tons or hundredweight, while vegetable consumption data have been converted from grams per kilogram bodyweight.

Loss that occurs between the farmgate and the consumer was quantified using estimates from the USDA's Economic Research Service (ERS). ERS has produced estimates of food loss at five stages in the food distribution system (Kantor, 1998). They define these stages as loss from primary to consumer weight[6], non-edible share, cooking loss, retail loss, and foodservice and consumer loss. In this study, production data have been converted from a harvested weight (measured at the farm gate) to a consumable equivalent weight using the ERS percentage estimates for loss (see Appendix 4). Cooking loss (e.g., loss due to boiling, frying, steaming, etc.) was not included in this conversion.

[6] ERS defines "Loss from primary to consumer weight" as loss that occurs between the farm gate and the retailer (e.g. evaporative losses, damage during transport, weight changes from food processing, etc.).

ERS produced loss estimates for every food product that is tracked in their Food Supply data. However, this study includes vegetables that are not tracked by ERS. Losses for vegetables not tracked by ERS were estimated as follows. "Loss from primary to consumer weight", "retail loss" and "consumer and food service loss" were estimated using the average values of these losses for fresh vegetable commodities. Estimates of the inedible share of non-ERS vegetables were available in Matthews and Garrison (1975).

Production and consumption data were grouped by single crop names to allow for comparison between the data sets. This regrouping was necessary because the crop categories used by NYAS and the Census of Agriculture do not always match exactly with those used in the FCID. Cabbage, for example, is a single category in the FCID; it includes consumption of both fresh and processed forms. In NYAS, however, cabbage is divided into two categories: cabbage for fresh market and cabbage for sauerkraut. In order to compare the production and consumption of cabbage, it is necessary to pool the production data into a single category: cabbage. This matching procedure is outlined for all crops in Appendix 7.

In order to compare vegetable production data and per capita consumption data with the dietary guidelines, data were converted from a weight basis to a "servings" basis. The average weight of a single serving of a given vegetable was determined using the USDA Nutrient Database for Standard Reference (NDB). By dividing the weight of the vegetable consumed (or produced) by the average weight of one serving, an estimate of the number of servings consumed (produced) was obtained. Both are expressed in servings per capita. These conversions are shown in Appendices 2 and 5.

The New York State estimates of vegetable servings produced per capita and vegetable servings consumed per capita are compared with the average number of vegetable servings per person recommended in the Food Guide Pyramid.

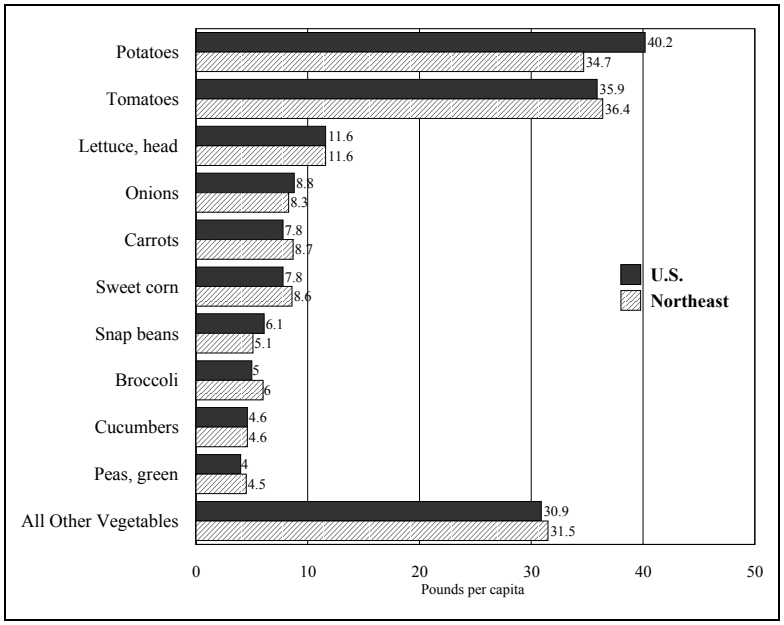
RESULTS

The findings of this study are reported in five subsections: "Vegetable Consumption in New York State" presents the estimates of total vegetable consumption for New York State and addresses the difference between national and regional consumption data. "New York State Vegetable Production" presents data on the kinds and amounts of vegetables that are grown in New York and the amount of land used to raise them. "Comparing Vegetable Production and Vegetable Consumption in New York State" provides a detailed comparison of these two data sets and addresses the issue of food loss. "Comparing New York State Consumption and Production to the Dietary Guidelines" assesses the degree to which the estimated vegetable consumption of New Yorkers meets, or fails to meet, the Pyramid guidelines and the degree to which production mirrors these recommendations. "Synthesizing the Results" integrates the findings' vegetable consumption, agricultural production, and nutritional recommendations and prompts a discussion of the possible implications this research has for New York agriculture.

Vegetable Consumption in New York State

As described in the methods, regional food consumption data are believed to reflect the eating patterns of a large state better than national consumption data. In order to understand how the use of regional rather than national data influences the estimate of vegetable consumption, US data was compared with that of the Northeast. This comparison is shown in Figure 4. The chart displays annual per capita consumption of the ten most commonly consumed vegetables in the US with their respective consumption in the Northeast. Consumption of vegetables not included in the top ten has been aggregated in the "All other vegetables" category.

Figure 4: Average annual per capita consumption of top ten vegetables in the US and Northeast

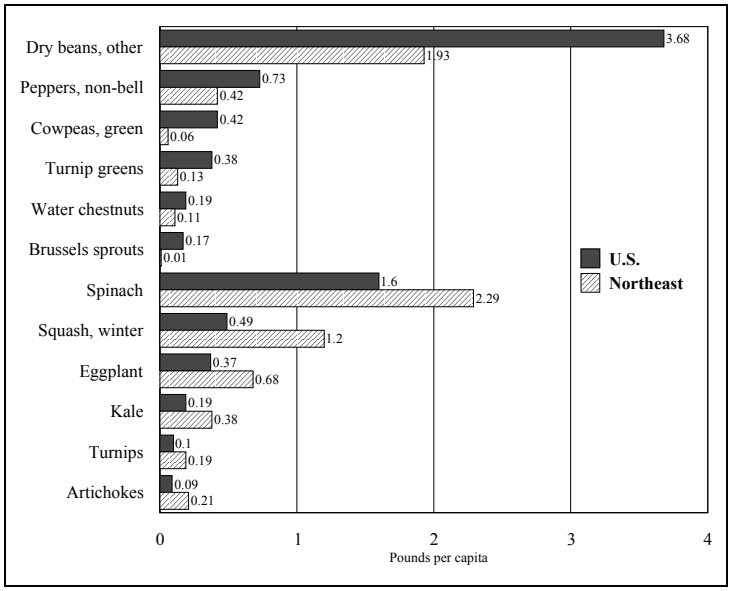


Sources: derived from US Environmental Protection Agency and USDA Agricultural Research Service, 2000a.

Judging from this figure, the consumption of vegetables in the US and the Northeast is quite similar. Each of the top ten vegetables is consumed in roughly the same proportions at both the national and regional levels, with only minor differences. Consumption of tomatoes, carrots, sweet corn, broccoli, and green peas appears to be slightly greater in the Northeast than in the US, while consumption of potatoes, onions and snap beans appears slightly lower. Consumption of head lettuce and cucumbers appears to be about the same. The most noticeable discrepancy is observed with potatoes, where the average consumption reported for the Northeast is 5.5 pounds lower than the average for the US While this difference is noticeable, it is far from overwhelming.

Though not apparent from Figure 4, more striking differences between the two data sets are observed amongst the vegetables aggregated in the "All other vegetables" category. Over 70 different vegetables are included in this category, many of which would be considered "ethnic" and "regional" foods. A comparison of per capita consumption of some of these less frequently consumed crops is shown in Figure 5.

Figure 5: Average annual per capita consumption of selected "minor" vegetables in the US and Northeast



Sources: derived from US Environmental Protection Agency and USDA Agricultural Research Service, 2000a.

Figure 5 displays a selection of twelve crops included in the "All other vegetables" category. For six of these crops (dry beans, other; peppers, non-bell; cowpeas, green; turnip greens; water chestnuts; and Brussels sprouts) consumption in the Northeast is lower than the national average. The other six crops (spinach, winter squash, eggplant, kale, turnips, and artichokes) are consumed in the Northeast in quantities higher than the national average. The differences observed between regional and national averages for these crops are, proportionally, very large. Winter squash, for example, is consumed by Northeasterners in quantities more than twice the national average. Meanwhile, consumption of Brussels sprouts in the Northeast appears to be less than one tenth of the national average.

Not all of the crops included in the "All other vegetables" category display such marked differences, but many do. The contrast between Figures 4 and 5 suggests that the greatest regional differences in vegetable consumption are found among minor crops rather than among the top ten crops. A complete comparison of Northeast and US per capita consumption for individual vegetables is shown in Appendix 1.

Total consumption of vegetables in New York State is summarized in Table 2. As in Figure 4, individual estimates are shown for the top ten vegetables, while consumption of all other vegetables is aggregated in a single category.

According to Table 2, a total of almost 2.9 billion pounds of vegetables were consumed in New York State in 1999. Of this total, 2.3 billion pounds came from the top ten vegetables, while approximately 560 million pounds came from the remaining 70 crops. These estimates highlight the degree to which the top ten vegetables dominate the diet. More importantly, they provide a benchmark to which production of vegetables can be compared.

Table 2. Estimated total annual consumption of vegetables in New York State

Vegetable Commodity	Per Capita Consumption (Northeast)	Total Consumption (estimated) [A]
	lbs	*million lbs*
TOP TEN VEGETABLES		
Tomatoes	36.4	661.5
Potatoes	34.7	631.6
Head Lettuce	11.6	210.8
Carrots	8.7	157.8
Sweet Corn	8.6	155.7
Onions	8.3	150.2
Broccoli	6.0	110.0
Snap Beans	5.1	93.2
Cucumber	4.6	84.5
Green Peas	4.5	82.6
ALL REMAINING VEGETABLES	31.5	572.9
TOTAL *	**160.0**	**2,910.7**

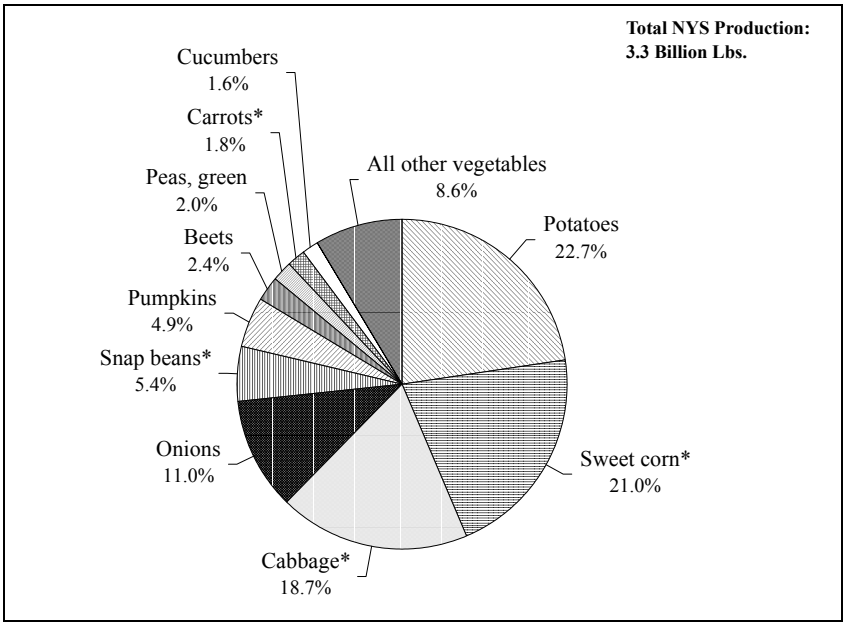
[A] Total New York State consumption estimated based on 1999 population data.
* Totals may not add due to rounding.

Sources: derived from US Environmental Protection Agency and USDA Agricultural Research Service, 2000a and Bureau of the Census, 1999.

New York State Vegetable Production

The 5-year average production of vegetables in New York State from 1994 to 1998 is shown in Figure 6. Again, the top ten commodities (on a weight basis) are displayed individually, and all other vegetables are aggregated into a single category. Based on this figure, a small number of crops account for the majority of the vegetable production in the state. Just four crops (potatoes, sweet corn, cabbage, and onions) account for approximately 75% of the state's vegetable production, and the top ten crops account for over 90% of production. The relatively small "All other vegetables" category accounts for less than 10% of all vegetable production, yet it contains more than 35 commodities.

Figure 6: Average New York State vegetable production (farmgate); 1994-1998



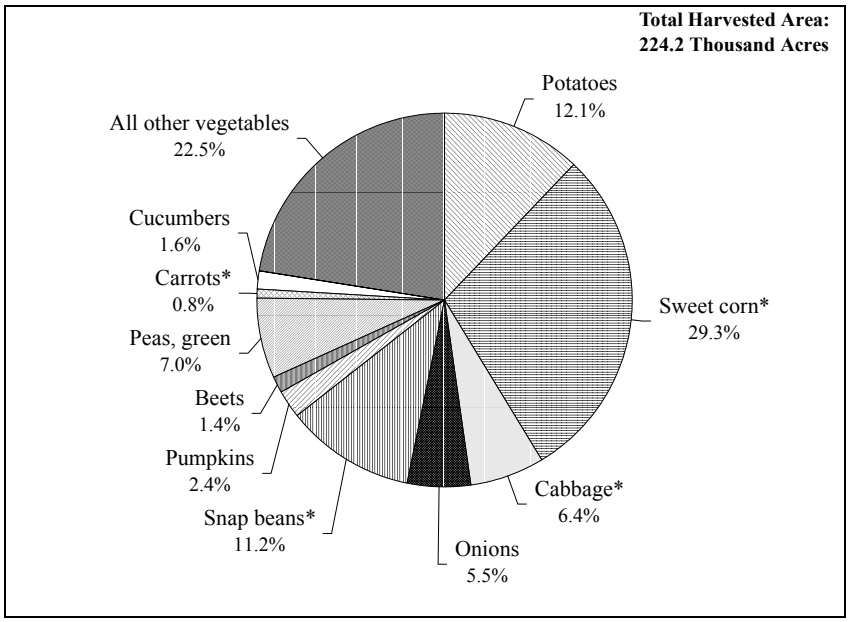
* Includes fresh market and processed production.

Sources: derived from New York Agricultural Statistics Service, 1999 and USDA National Agricultural Statistics Service, 1999b.

The 5-year average harvested acreage of vegetables in New York State is shown in Figure 7. Based on this figure, sweet corn accounts for the largest share of New York's harvested vegetable acreage. It is followed by "All other vegetables", potatoes, snap beans, green peas, cabbage, onions, pumpkins, cucumbers, beets and carrots. The surprisingly large share of land utilized by the "All other vegetables" group is largely the devoted to dry beans.

Clearly evident from Figure 7 is that there is little correspondence between the size of a crop's share of the total vegetable production and the size of its share of the land. Potatoes, cabbage, onions, pumpkins, beets, and carrots all use less land in proportion to the amount they produce, while sweet corn, snap beans, green peas, and the aggregate category "All other vegetables" occupy a larger portion of the land in proportion to the amount they produce. The amount of land devoted to cucumbers is proportional to the amount produced.

Figure 7: Average harvested area of vegetables in New York State, 1994-98



* Includes fresh market and processed production.

Sources: derived from New York Agricultural Statistics Service, 1999 and USDA National Agricultural Statistics Service, 1999b.

Table 3 summarizes average vegetable production in New York State in terms of area harvested, yield, and total amount produced. As in previous figures, data are shown for the top ten crops and for the category "All remaining vegetables". For data on individual crops in the "All remaining vegetables" category, see Appendix 3.

Table 3. Production and harvested acreage of vegetables in New York State: Average 1994-1998

Vegetable Commodity	Area Harvested	Yield	Harvested Production
	thousand acres (000)	*thousand lbs/ac (000)*	*million lbs (000 000)*
TOP TEN VEGETABLES			
Potatoes	27.1	27.4	741.8
Sweet corn [A]	65.6	10.5	686.5
Cabbage [A]	14.3	42.7	612.3
Onions	12.2	29.5	360.4
Snap beans [A]	25.1	7.0	175.4
Pumpkins	5.4	30.0	161.6
Beets	3.2	24.7	78.9
Green peas	15.6	4.1	64.5
Carrots [A]	1.7	34.8	59.0
Cucumbers	3.5	15.1	52.4
ALL REMAINING VEGETABLES	48.8	5.8	282.1
TOTAL *	**224.2**	**14.6**	**3,274.8**

[A] Includes production for both fresh and processed markets.

* Totals may not add due to rounding.

Sources: derived from New York Agricultural Statistics Service, 1999 and USDA National Agricultural Statistics Service, 1999b.

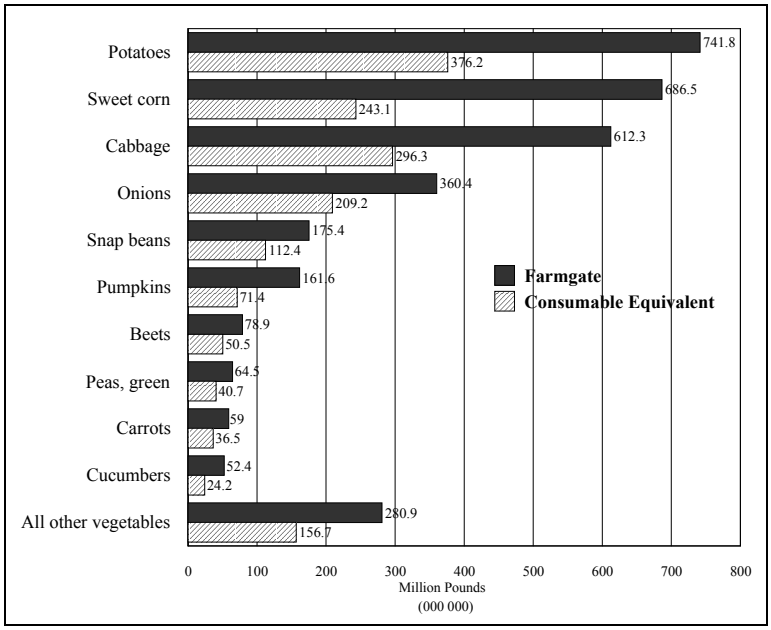
According to Table 3, an average of approximately 3.3 billion pounds of vegetables are harvested in New York State per year. Of this total, almost 3 billion pounds come from the top ten crops while only 275 million pounds come from the remaining 35 crops. To produce this quantity of vegetables, approximately 220 thousand acres are harvested in New York State. This amount is small relative to the total amount of cropland harvested in the state, 3.9 million acres in 1999 (NY Agricultural Statistics Service, 2000).

Comparing Vegetable Production and Vegetable Consumption in New York State

Performing a comparison of production data to consumption data requires accounting for "losses" that occur between measurement of harvest at the farm gate and ingestion of food at the dinner plate. A summary of these calculations is shown in Figure 8.[7]

Figure 8 contrasts "farm gate" production of vegetables in New York State with the "consumable equivalent" of that production. The differences are substantial. Consumable equivalent production is, on average, approximately 50% of the weight measured at the farm gate, and the magnitude of the change varies widely from crop to crop. The consumable equivalent of sweet corn, for example, is only 35% of the harvested weight. Conversely, 64% of the harvested weight of snap beans is available for consumption.

Figure 8: Comparison of harvested production with effective production after accounting for losses in food system



Sources: derived from New York Agricultural Statistics Service, 1999; USDA National Agricultural Statistics Service, 1999b; Kantor,1998 and Matthews and Garrison, 1975.

Consumable equivalent production is compared with total consumption in Table 4. As in previous figures, Table 4 reports the findings of the comparison for the top ten vegetable commodities consumed in the Northeast and for two aggregate groups ("All

[7] See Appendix 4 for calculations of loss for all commodities.

remaining vegetables" and "Total" of all vegetables). For each category, four values are shown: total consumption, consumable equivalent production, the amount production exceeds consumption, and the ratio of production to consumption.

Table 4. Comparison of estimated New York State vegetable consumption with New York State vegetable production

Vegetable	Total Consumption [A]	Consumable Equivalent Production [B]	Amount Residual [C]	Ratio Production / Consumption
	million lbs	*million lbs*	*million lbs*	*%*
TOP TEN VEGETABLES				
Tomatoes	661.5	18.0	-	2.7%
Potatoes	631.6	376.2	-	59.6%
Head Lettuce	210.8	8.7	-	4.1%
Carrots	157.8	36.5	-	23.1%
Sweet Corn	155.7	243.1	87.4	156.2%
Onions	150.2	209.2	59.0	139.3%
Broccoli	110.0	1.2	-	1.1%
Snap Beans	93.2	112.4	19.2	120.6%
Cucumbers	84.5	24.2	-	28.6%
Green Peas	82.6	40.7	-	49.3%
ALL REMAINING VEGETABLES	572.9	547.4	358.6	33.0%
TOTAL *	**2,910.7**	**1,617.6**	**524.3**	**37.6% [D]**

[A] NYS consumption estimated based on Northeast per capita consumption and 1999 population data.
[B] See Appendix 4 for factors used in converting from farmgate to consumable equivalent production.
[C] Amount Residual = Consumable Equivalent Production-Total Consumption (if consumption > production then Amount Residual = 0).
[D] Excess production subtracted from total production to calculate ratio as follows:

$$\text{Ratio} = \frac{\text{CE Production} - \text{Amount Residual}}{\text{Total Consumption}}$$

* Totals may not add due to rounding.

Sources: Consumption estimates derived from US Environmental Protection Agency and USDA Agricultural Research Service, 2000a and Bureau of the Census, 1999; production estimates derived from New York Agricultural Statistics Service, 1999; USDA National Agricultural Statistics Service, 1999b; Kantor,1998 and Matthews and Garrison, 1975.

According to the estimates of total consumption, New York State residents ate 2.9 billion pounds of vegetables in 1999. In contrast, the "consumable equivalent" production of vegetables by the state's agriculture has averaged 1.6 billion pounds per year over the last 5 years. Some of these vegetable crops (e.g., sweet corn, onions and snap beans) are produced in larger quantities than they are consumed, and the total surplus of such crops is 524 million pounds per year. Based on these estimates, New York agriculture has the capacity to provide 37.5% of the state's total annual vegetable intake, keeping the existing annual surplus of a handful of crops at its current level.

The ratios for individual crops indicate that this 37.5% is not evenly distributed. For some crops (sweet corn, onions, and snap beans) the consumable equivalent production exceeds the estimated total consumption. For the others, consumable equivalent

production is less than estimated consumption; in some cases (tomatoes, head lettuce, and broccoli) being just a small fraction of the estimated consumption. Thus, the ratio of production to consumption varies widely from crop to crop.

This wide variation in production-consumption ratios is also observed among the less frequently consumed crops. Table 5 shows estimates of total consumption, consumable equivalent production, the amount production exceeds consumption, and the ratio of production to consumption for crops included in the "All remaining vegetables" category. Similar to the previous table, Table 5 shows that production of some crops exceeds consumption, production of other crops is a substantial share of consumption, and production of the remaining crops is small in relation to current consumption. However, additional observations can be made from the detail displayed in Table 5.

Table 5. Comparison of consumable equivalent (CE) production and total consumption for minor vegetable crops in New York State: average 1994-1998

Vegetable [A]	Total Consumption [B]	CE Production [C]	Amount Residual [D]	Ratio [E]
	1000 lbs	*1000 lbs*	*1000 lbs*	*%*
Cabbage	69,214.8	296,261.2	227,046.4	428.0%
Celery	58,179.4	249.8	0.0	0.4%
Peppers, bell	53,599.9	3,966.3	0.0	7.4%
Spinach	41,582.6	2,105.9	0.0	5.1%
Dry beans, other	35,048.3	4,106.5	0.0	11.7%
Squash, summer	32,987.3	17,381.4	0.0	52.7%
Mushrooms	27,000.9	328.5	0.0	1.2%
Squash, winter	21,769.8	16,247.0	0.0	74.6%
Cauliflower	20,843.3	4,799.7	0.0	23.0%
Sweet potatoes	19,251.1	-N-	-N-	-N-
Lettuce, leaf and Romaine	15,506.8	7,257.7	0.0	46.8%
Dry beans, kidney	14,268.3	27,500.2	13,231.9	192.7%
Green lima beans	12,459.5	78.3	0.0	0.6%
Eggplant	12,419.1	4,512.8	0.0	36.3%
Collards	9,457.2	625.8	0.0	6.6%
Beets	9,414.8	50,457.1	41,042.3	535.9%
Podded peas	9,353.7	-N-	-N-	-N-
Asparagus	9,094.9	122.8	0.0	1.4%
Peppers, non-bell	7,629.9	375.9	0.0	4.9%
Kale	6,939.7	304.7	0.0	4.4%
Green onions	6,907.2	2,405.4	0.0	34.8%
Dry beans, black	5,834.9	12,235.4	6,400.5	209.7%
Pumpkins [F]	4,201.7	71,410.0	67,208.2	1699.5%
Okra	4,098.8	10.9	0.0	0.3%
Radishes	3,944.4	1,940.4	0.0	49.2%
Artichokes	3,757.5	-N-	-N-	-N-
Green pigeon peas	3,569.9	-T-	-T-	-T-
Dry peas	3,549.1	-N-	-N-	-N-
Turnips	3,505.3	347.6	0.0	9.9%
Escarole/endive	3,489.5	548.7	0.0	15.7%
Dry cowpeas	3,483.5	-N-	-N-	-N-
Chickpeas	3,445.8	N/A	N/A	N/A
Lentils	3,395.5	-N-	-N-	-N-
Yams	2,627.5	-T-	-T-	-T-
Chinese mustard	2,460.9	-D-	-D-	-D-
Bok choy	2,460.9	N/A	N/A	N/A
Chinese cabbage	2,460.7	5,867.1	3,406.4	238.4%
Turnip greens	2,377.1	53.0	0.0	2.2%
Garlic	2,271.1	1,208.1	0.0	53.2%
Bean sprouts	2,088.3	N/A	N/A	N/A
Water chestnut	1,915.0	-T-	-T-	-T-

Vegetable [A]	Total Consumption [B]	CE Production [C]	Amount Residual [D]	Ratio [E]
Bamboo shoots	1,851.5	-T-	-T-	-T-
Dasheen, leaves	1,530.2	-T-	-T-	-T-
Parsley	1,287.0	366.9	0.0	28.5%
Radicchio	1,087.9	N/A	N/A	N/A
Green cowpeas	1,059.3	-N-	-N-	-N-
Chicory	1,032.4	113.9	0.0	11.0%
Belgium endive	1,032.1	N/A	N/A	N/A
Mustard greens	1,000.5	504.8	0.0	50.5%
Rhubarb	706.8	999.7	292.8	141.4%
Tomatillos	661.4	N/A	N/A	N/A
Chinese waxgourd	655.4	N/A	N/A	N/A
Dandelion leaves	546.9	N/A	N/A	N/A
Watercress	454.6	-N-	-N-	-N-
Breadfruit	413.5	-T-	-T-	-T-
Brussels sprouts	271.4	286.3	14.8	105.5%
Leeks	264.6	N/A	N/A	N/A
Arugula	258.8	N/A	N/A	N/A
Grape leaves	237.6	N/A	N/A	N/A
Dasheen, corm	186.9	-T-	-T-	-T-
Dry pigeon peas	173.7	-T-	-T-	-T-
Swiss chard	158.3	N/A	N/A	N/A
Rutabaga	76.6	N/A	N/A	N/A
Tanier, corm	63.3	-T-	-T-	-T-
Alfalfa sprouts	24.2	N/A	N/A	N/A
Chinese broccoli	20.6	N/A	N/A	N/A
Parsnip	18.9	N/A	N/A	N/A
Amaranth leaves	5.4	N/A	N/A	N/A
Beet greens	<0.1	N/A	N/A	N/A
Other Vegetables	N/A	6,628.0	N/A	N/A
Mixed Vegetables	N/A	5,834.7	N/A	N/A
TOTALS *	**572,946.0**	**547,442.5**	**358,643.4**	**33.0%**

D – data withheld to avoid disclosing information on a single farm (Census of Agriculture)
N – no production (consumption) of this crop was reported
T – crop cannot be grown in New York under conventional management
N/A – data not available on this vegetable crop category

[A] Some vegetables are aggregates of more than one commodity from the consumption and/or production data sets. See Appendix 7 for commodities included under each vegetable.
[B] Based on 1999 population estimates. See Appendix 1 for per capita consumption estimates.
[C] See Appendix 4 for conversion from "farmgate" production to "consumable equivalent" production.
[D] Residual = CE production – Total consumption (if consumption > production then residual = 0)
[E] Ratio of CE production to Total consumption
[F] Most pumpkins grown in New York State are for the Halloween market and are used for decorative purposes only.
***** Totals may not add due to rounding.

Sources: Consumption estimates derived from US Environmental Protection Agency and USDA Agricultural Research Service, 2000a and Bureau of the Census, 1999; production estimates derived from New York Agricultural Statistics Service, 1999; USDA National Agricultural Statistics Service, 1999b; Kantor,1998 and Matthews and Garrison, 1975.

First of all, there are a few crops (Chinese cabbage, rhubarb, and Brussels sprouts) for which production is low (relative to other vegetables) but which still exceed consumption. Secondly, there are several crops (e.g., leeks, Swiss chard, parsnips) for which no production data are available. Finally, there are two categories (mixed vegetables and other vegetables) for which production data are collected but which provide no information as to what types of vegetables they include.

Comparing New York State Consumption and Production to the Dietary Guidelines

Comparing vegetable consumption and production to the recommendations of the Food Guide Pyramid requires a shift in units. Rather than thinking of food in terms of the weight consumed, it is necessary to think in terms of food group servings. Tables 6 and 7 reflect this measurement shift.

The comparison of per capita vegetable consumption for the Northeast with the Food Guide Pyramid recommendations is shown in Table 6. Based on the conversion of consumption data into servings, residents of the Northeast consume an average of 3.2 servings of vegetables per day. In contrast, the demographic calculations (outlined in the methods) indicate that New Yorkers should be consuming an average of 4.1 servings of vegetables per day. Thus, there appears to be a gap of almost one serving per person per day between the recommended and the actual consumption of vegetables in New York State. However, this gap is not represented equally among the three subgroups of vegetables.

Of the three subgroups, the dark green leafy and deep yellow vegetables appear to be the most under-consumed. Current consumption from this group meets only 40% of the quantity recommended by the Food Guide Pyramid. The starchy vegetables and legumes also appear to be under-consumed, with current consumption meeting only 78% of the Pyramid recommendation. The consumption of the leguminous starchy vegetables (dry beans, peas, and lentils) is particularly low – 0.1 servings per day – and represents a serious deficit between nutritional recommendations and eating patterns. In contrast, the current consumption from the "other vegetables" subgroup exceeds the amount recommended. Unlike the deficits, this over-consumption of vegetables is not of concern. The intent of the Pyramid recommendation for vegetables is to increase the consumption of vegetables among Americans. Thus, exceeding these recommendations by a modest amount is *not* problematic.

In addition to meeting these subgroup recommendations, the guidelines stress that Americans need to consume a greater variety of vegetables. No quantitative yardstick has been established to measure variety[8]. However, an understanding of the lack of variety and selection of vegetables in the diets of Northeasterners can be gained by examining Figure 9, which displays average annual per capita consumption of vegetables in the Northeast on a "servings basis".

[8] The Healthy Eating Index requires that a minimum of eight different foods be consumed per day to meet the guideline for variety in the diet. However, this guideline applies to *all* foods consumed in a day and is not an adequate yardstick for measuring variety in a single food group across the entire year.

Table 6. Average Northeast per capita consumption of vegetable subgroups and select sampling of vegetables compared with average per capita Food Guide Pyramid recommendations for New York State

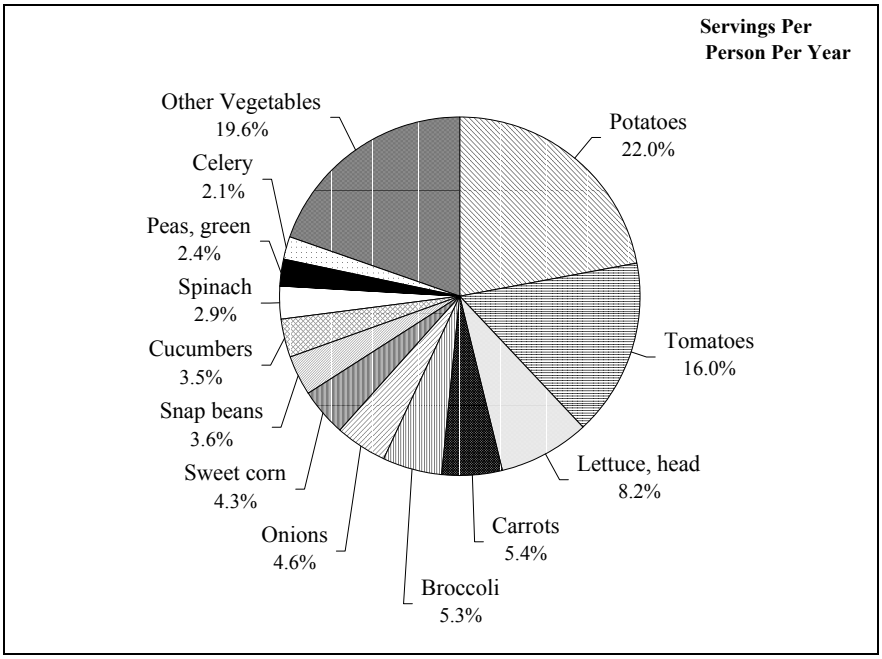
Vegetable Type	Current Consumption [A]	Pyramid Guidelines [B]	Share of Guidelines
	servings/day	*servings/day*	*percent*
DARK GREEN & DEEP YELLOW VEGETABLES *	0.6	1.4	40%
Dark green & leafy	0.3	-	-
Deep yellow	0.2	-	-
STARCHY VEGETABLES & LEGUMES *	1.1	1.4	78%
Potatoes	0.7	-	-
Dry beans, peas, lentils	0.1	0.5	30%
OTHER VEGETABLES *	1.6	1.4	112%
Tomatoes	0.5	-	-
Head lettuce	0.3	-	-
TOTAL VEGETABLES *	**3.2**	**4.2**	**76%**

[A] See Appendix 2 for conversion of consumption from pounds to servings.
[B] See Appendix 6 for calculation of average number of servings needed per day.
* Totals may not add due to rounding.

Sources: derived from US Environmental Protection Agency and USDA Agricultural Research Service, 2000a.

It is clear from this figure that a small number of vegetables provides most of the servings consumed by Northeasterners. Just four vegetables (potatoes, tomatoes, head lettuce, and carrots) provide over 50% of all vegetable servings consumed in the Northeast, and approximately 75% of all servings are supplied by the top ten. Furthermore, the "All other vegetables" category, which provides only 24% of vegetable servings, contains over 70 vegetable crops (see Appendix 2). Thus, although many different vegetable crops are

Figure 9: Average annual per capita vegetable consumption in the Northeast (servings basis)



Sources: derived from US Environmental Protection Agency and USDA Agricultural Research Service, 2000a.

included in the Northeastern diet as a whole, most of these vegetables are either consumed in very small amounts or by very few people. This suggests that many if not most Northeasterners should increase the variety of vegetables they include in their diet.

Table 7 compares New York State consumable equivalent vegetable production with the Pyramid recommendations. According to this comparison, New York agriculture produces the equivalent of 1.6 vegetable servings per person per day, or 38 percent of the recommended consumption. Similar to current consumption, this production is not equally distributed among the three subgroups. Starchy vegetables and "other" vegetables make up the large majority of New York State vegetable production (0.7 and 0.8 servings per person per day, respectively), while dark green leafy and deep yellow vegetables constitute a small fraction of the state's vegetable production (about 0.1 servings per person per day). Considering that production of the deep yellow vegetables includes pumpkins (which are used primarily for decoration and not eaten), the representation of these nutritionally important vegetables is remarkably small.

Table 7. Average New York State per capita production of vegetable subgroups and select vegetables compared with average per capita Food Guide Pyramid recommendations for New York State

Vegetable Type	Current Production [A]	Pyramid Guidelines [B]	Share of Guidelines
	servings/day	*servings/day*	*percent*
DARK GREEN & DEEP YELLOW VEGETABLES*	0.1	1.4	10%
Dark green & leafy	0.0	-	-
Deep yellow	0.1	-	-
STARCHY VEGETABLES & LEGUMES*	0.7	1.4	50%
Potatoes	0.3	-	-
Dry beans, peas, lentils	0.1	0.5	19%
OTHER VEGETABLES*	0.8	1.4	56%
Cabbage	0.3	-	-
Onions	0.2	-	-
TOTAL VEGETABLES *	**1.6**	**4.2**	**38%**

[A] See Appendices 3, 4 and 5 for complete information on sources of production data and the conversion from weight of vegetables to servings.

[B] See Appendix 6 for derivation of average number of servings recommende4d per person per day in New York State.

* Totals may not add due to rounding.

Sources: derived from US Environmental Protection Agency and USDA Agricultural Research Service, 2000a.

Synthesizing the Results

The intent of this research is to improve the understanding of the links between vegetable consumption, vegetable production, and nutrition within the context of New York agriculture, which necessitates integrating the findings presented thus far. Tables 8 and 9 are offered as a potential starting point for identifying where opportunities may lie for New York agriculture to both supply a greater share of produce to New York residents and promote better state-wide nutrition.

Table 8 summarizes the comparison of harvested area, consumable equivalent production, and total consumption of vegetables in New York State. The crop type categories (e.g., large acreage, medium acreage) aggregate the vegetable crops based on the amount of land devoted to production of a crop in New York State, showing subtotals for each group.

As expected, Table 8 shows that a small number of crops (grown on relatively large acreages) use the vast majority of harvested area and provide the vast majority of vegetable production in New York State. The larger number of crops grown on medium and smaller acreages use a relatively minor share of the harvested area and provide a modest share of the total production.

Of perhaps greater interest is the consumption data in Table 8 which hints at the potential opportunity for development and expansion of the "minor" vegetable crops. As a whole, crops in the medium acreage and small acreage categories are consumed in quantities far greater than the quantities in which they are produced. Furthermore, the crops in the "unknown or no acreage" group are consumed in quantities several times greater than the production of the small acreage and unspecified crops. Lastly, the chart shows that of the 79 vegetables consumed in New York, only nine cannot be grown in the state, and those nine account for a mere 0.4% of total consumption. This potential is further elaborated on in Table 9.

Table 9 compares harvested area, consumable equivalent production, and total consumption on a crop-by-crop basis, indicating the nutritional Food Guide Pyramid subgroup to which a crop belongs. The crops are listed in order of the harvest area, and are grouped according to the crop type categories shown in Table 8.

The purpose of Table 9 is to serve as a starting point for identifying crops that may have potential for increased regional production based on current consumption and current acreage, as well as to identify crops for which consumption may change among Americans who are concerned about nutrition. An important pattern observed in this table is that the dark green leafy vegetables are consistently produced in quantities much lower than current consumption (if they are produced at all).

Table 8. Summary comparison of harvested area, consumable equivalent production, and estimated consumption of vegetables in New York State

Crop Type	Area Harvested	Ratio	Consumable Production	Ratio	Total Consumption	Ratio	Number of Crops
	acres	*% of total*	*1,000 lbs*	*% of total*	*1,000 lbs*	*% of total*	#
Large acreage crops (>9000 Ac)	191,480	85.4%	1,317,549.4	81.5%	1,202,572.0	41.3%	8
Medium acreage crops (500-9000 Ac)	29,488	13.2%	278,643.1	17.2%	1,478,264.3	50.8%	17
Small acreage crops (<500 Ac)	1,534	0.7%	8,931.1	0.6%	160,169.6	5.5%	19
Unspecified crops [A]	1,681	0.8%	12,462.8	0.8%	N/A	N/A	N/A
Unknown or no acreage crops [B]	N/A	N/A	N/A	N/A	51,114.1	2.0%	27
Crops NYS cannot grow [C]	T	T	T	T	17,624.4	0.4%	9
ALL CROPS*	**224,183.0**	**100.0%**	**1,617,586.4**	**100.0%**	**2,871,373.0**	**100.0%**	**80**

N/A – data not available

T – crops cannot be grown in new York State under conventional management

[A] Unspecified crops are crops in the categories "mixed vegetables" and "other vegetables" as described in the Census of Agriculture. "Mixed vegetables" is a category for farms that grow a large number of crops on a small area of land (less than 1 acre per crop). "Other vegetables" is an aggregate category for crops reported on census forms that do not fit into one of the commodity categories used by the Census.

[B] Includes crops that are tracked by Census of Agriculture but for which no production was reported in NYS. Also includes crops not tracked by the Census that could possibly be grown in NYS. Production of these crops could potentially fall into the "mixed vegetables" and/or "other vegetables" categories.

[C] Includes crops that were reported in consumption surveys but which cannot be grown in New York State under conventional management.

* Totals may not add due to rounding.

Sources: Production estimates derived from New York Agricultural Statistics Service, 1999; USDA National Agricultural Statistics Service, 1999b; Kantor,1998 and Matthews and Garrison, 1975; consumption estimates derived from US Environmental Protection Agency and USDA Agricultural Research Service, 2000a and Bureau of the Census, 1999.

Table 9. Comparing harvested area, consumable equivalent (CE) production, and consumption of vegetable crops in New York State

Crop Type	Vegetable [A]	Area Harvested [B]		CE Production [C]		Total Consumption [D]		Subgroup
		Amount	Ratio	Amount	Ratio	Amount	Ratio	
		acres	*% of total*	*1000 lbs*	*% of total*	*1000 lbs*	*% of total*	
LARGE ACREAGE CROPS	Sweet corn	65,600	29.3%	243,090.2	15.0%	155,657.7	5.3%	Starchy
	Potatoes	27,120	12.1%	376,160.3	23.3%	631,613.5	21.7%	Starchy
	Snap beans	25,100	11.2%	112,418.6	7.0%	93,228.7	3.2%	Other
	Dry beans, kidney	22,100	9.9%	27,500.2	1.7%	14,268.3	0.5%	Legumes
	Green peas	15,600	7.0%	40,700.0	2.5%	82,596.8	2.8%	Starchy
	Cabbage	14,340	6.4%	296,261.2	18.3%	69,214.8	2.4%	Other
	Onions	12,220	5.5%	209,183.5	12.9%	150,157.3	5.2%	Other
	Dry beans, black	9,400	4.2%	12,235.4	0.8%	5,834.9	0.2%	Legumes
	SUBTOTAL – Large acreage *	**191,480**	**85.4%**	**1,317,549.4**	**81.5%**	**1,202,572.0**	**41.3%**	
MEDIUM ACREAGE CROPS	Pumpkins [E]	5,388	2.4%	71,410.0	4.4%	4,201.7	0.1%	Deep Yellow
	Cucumbers	3,480	1.6%	24,150.8	1.5%	84,456.4	2.9%	Other
	Dry beans, other	3,300	1.5%	4,106.5	0.3%	35,048.3	1.2%	Legumes
	Beets	3,200	1.4%	50,457.1	3.1%	9,414.8	0.3%	Other
	Tomatoes	2,660	1.2%	18,019.9	1.1%	661,455.4	22.7%	Other
	Carrots	1,696	0.8%	36,496.6	2.3%	157,767.1	5.4%	Deep Yellow
	Squash, summer [F]	1,450	0.65%	17,381.4	1.1%	32,987.3	1.1%	Other
	Squash, winter [F]	1,450	0.65%	16,247.0	1.0%	21,769.8	0.7%	Deep Yellow
	Cauliflower	1,180	0.5%	4,799.7	0.3%	20,843.3	0.7%	Other
	Peppers, bell	958	0.4%	3,966.3	0.2%	53,599.9	1.8%	Other
	Radishes	810	0.4%	1,940.4	0.1%	3,944.4	0.1%	Other
	Lettuce, head [G]	800	0.4%	8,745.9	0.5%	210,790.2	7.2%	Other
	Chinese cabbage	714	0.3%	5,867.1	0.4%	2,460.7	0.1%	Other
	Spinach	627	0.3%	2,105.9	0.1%	41,582.6	1.4%	Dark green
	Broccoli	612	0.3%	1,178.0	0.1%	110,016.6	3.8%	Dark green
	Lettuce, leaf and Romaine [G]	600	0.3%	7,257.7	0.4%	15,506.8	0.5%	Dark green
	Eggplant	564	0.3%	4,512.8	0.3%	12,419.1	0.4%	Other
	SUBTOTAL – Medium acreage *	**29,488**	**13.2%**	**278,643.1**	**17.2%**	**1,478,264.3**	**50.8%**	

Crop Type	Vegetable [A]	Area Harvested [B]		C E Production [C]		Total Consumption [D]		Subgroup
		Amount	Ratio	Amount	Ratio	Amount	Ratio	
		acres	*% of total*	*1000 lbs*	*% of total*	*1000 lbs*	*% of total*	
SMALL ACREAGE	Green onions	287	0.1%	2,405.4	0.1%	6,907,166	0.2%	Other
CROPS	Asparagus	232	0.1%	122.8	< 0.1%	9,094.9	0.3%	Other
	Rhubarb	180	0.1%	999.7	0.1%	706.8	< 0.1%	Other
	Garlic	153	0.1%	1,208.1	0.1%	2,271.1	0.1%	Other
	Collards	134	0.1%	625.8	< 0.1%	9,457.2	0.3%	Dark green
	Peppers, non-bell	102	0.1%	375.9	< 0.1%	7,629.9	0.3%	Other
	Mustard greens	86	< 0.1%	504.8	< 0.1%	1,000.5	< 0.1%	Dark green
	Kale	68	< 0.1%	304.7	< 0.1%	6,939.7	0.2%	Dark green
	Brussels sprouts	63	< 0.1%	286.3	< 0.1%	271.4	< 0.1%	Other
	Parsley	51	<0.1%	366.9	< 0.1%	1,287.0	< 0.1%	Dark green
	Escarole/endive	50	<0.1%	548.7	< 0.1%	3,489.5	0.1%	Dark green
	Green lima beans	48	<0.1%	78.3	< 0.1%	12,459.5	0.4%	Starchy
	Turnips	34	<0.1%	347.6	< 0.1%	3,505.3	0.1%	Other
	Turnip greens	12	<0.1%	53.0	< 0.1%	2,377.1	0.1%	Dark green
	Celery	11	<0.1%	249.8	< 0.1%	58,179.4	2.0%	Other
	Chicory	11	<0.1%	113.9	< 0.1%	1,032.4	< 0.1%	Dark green
	Mushrooms	7	<0.1%	328.5	< 0.1%	27,000.9	0.9%	Other
	Okra	5	<0.1%	10.9	< 0.1%	4,098.8	0.1%	Other
	Chinese mustard	-D-	-D-	-D-	-D-	2,460.9	0.1%	Other
	SUBTOTAL – Small acreage *	**1,534**	**0.7%**	**8,931.1**	**0.6%**	**160,169.6**	**5.5%**	
UNSPECIFIED CROPS	Mixed vegetables	894	0.4%	6,628.0	0.4%	N/A	N/A	N/A
	Other vegetables	787	0.4%	5,834.7	0.4%	N/A	N/A	N/A
	SUBTOTAL – Unspecified *	**1,681**	**0.8%**	**12,462.8**	**0.8%**	**N/A**	**N/A**	
UNKNOWN OR NO	Alfalfa sprouts	N/A	N/A	N/A	N/A	24.2	< 0.1%	Other
ACREAGE CROPS	Amaranth leaves	N/A	N/A	N/A	N/A	5.4	< 0.1%	Dark green
	Artichokes	-N-	-N-	-N-	-N-	3,757.5	0.1%	Other
	Arugula	N/A	N/A	N/A	N/A	258.8	< 0.1%	Dark green
	Bean sprouts	N/A	N/A	N/A	N/A	2,088.3	0.1%	Other

Crop Type	Vegetable [A]	Area Harvested [B]		CE Production [C]		Total Consumption [D]		Subgroup
		Amount	Ratio	Amount	Ratio	Amount	Ratio	
		acres	*% of total*	*1000 lbs*	*% of total*	*1000 lbs*	*% of total*	
UNKNOWN OR NO ACREAGE CROPS	Beet greens	N/A	N/A	N/A	N/A	<0.1	< 0.1%	Dark green
	Belgium endive	N/A	N/A	N/A	N/A	1,032.1	< 0.1%	Other
	Bok choy	N/A	N/A	N/A	N/A	2,460.9	0.1%	Other
	Chickpeas	N/A	N/A	N/A	N/A	3,445.8	0.1%	Legumes
	Chinese broccoli	N/A	N/A	N/A	N/A	20.6	< 0.1%	Dark green
	Chinese peas	-N-	-N-	-N-	-N-	9,353.7	0.3%	Other
	Chinese waxgourd	N/A	N/A	N/A	N/A	655.4	< 0.1%	Other
	Daikon	-N-	-N-	-N-	-N-	-N-	-N-	Other
	Dandelion leaves	N/A	N/A	N/A	N/A	546.9	< 0.1%	Dark green
	Dry cowpeas	-N-	-N-	-N-	-N-	3,483.5	0.1%	Legumes
	Dry peas	-N-	-N-	-N-	-N-	3,549.1	0.1%	Legumes
	Grape leaves	N/A	N/A	N/A	N/A	237.6	< 0.1%	Dark green
	Green cowpeas	-N-	-N-	-N-	-N-	1,059.3	< 0.1%	Starchy
	Leeks	N/A	N/A	N/A	N/A	264.6	< 0.1%	Other
	Lentils	-N-	-N-	-N-	-N-	3,395.5	0.1%	Legumes
	Parsnip	N/A	N/A	N/A	N/A	18.9	< 0.1%	Other
	Radicchio	N/A	N/A	N/A	N/A	1,087.9	< 0.1%	Other
	Rutabaga	N/A	N/A	N/A	N/A	76.6	< 0.1%	Starchy
	Sweet potatoes	-N-	-N-	-N-	-N-	19,251.1	0.7%	Deep yellow
	Swiss chard	N/A	N/A	N/A	N/A	158.3	< 0.1%	Dark green
	Tomatillos	N/A	N/A	N/A	N/A	661.4	< 0.1%	Other
	Watercress	-N-	-N-	-N-	-N-	454.6	< 0.1%	Dark green
	SUBTOTAL – Unknown/No acreage *	**N/A**	**N/A**	**N/A**	**N/A**	**57,348.1**	**2.0%**	
CROPS NEW YORK CANNOT GROW	Bamboo shoots	-T-	-T-	-T-	-T-	1,851.5	0.1%	Other
	Breadfruit	-T-	-T-	-T-	-T-	413.5	< 0.1%	Other
	Dasheen, corm	-T-	-T-	-T-	-T-	186.9	< 0.1%	Starchy
	Dasheen, leaves	-T-	-T-	-T-	-T-	1,530.2	0.1%	Dark green
	Dry pigeon peas	-T-	-T-	-T-	-T-	173.7	< 0.1%	Legumes

Crop Type	Vegetable [A]	Area Harvested [B]		CE Production [C]		Total Consumption [D]		Subgroup
		Amount	Ratio	Amount	Ratio	Amount	Ratio	
		acres	*% of total*	*1000 lbs*	*% of total*	*1000 lbs*	*% of total*	
CROPS NEW YORK	Green pigeon peas	-T-	-T-	-T-	-T-	3,569.9	0.1%	Starchy
CANNOT GROW	Tanier, corm	-T-	-T-	-T-	-T-	63.3	< 0.1%	Starchy
	Water chestnut	-T-	-T-	-T-	-T-	1,915.0	0.1%	Other
	Yams	-T-	-T-	-T-	-T-	2,627.5	0.1%	Starchy
	SUBTOTAL – Cannot be grown *	-T-	-T-	-T-	-T-	**12,331.6**	**0.4%**	
TOTALS*		**224,183**	**100.0%**	**1,617,586.4**	**100.0%**	**2,910,685.6**	**100.0%**	**ALL**

N/A – data not available for this crop
D – Census of Agriculture has withheld data to avoid disclosing information on an individual operation
N – no production (consumption) reported for this crop
T – crop cannot be grown in New York under conventional management

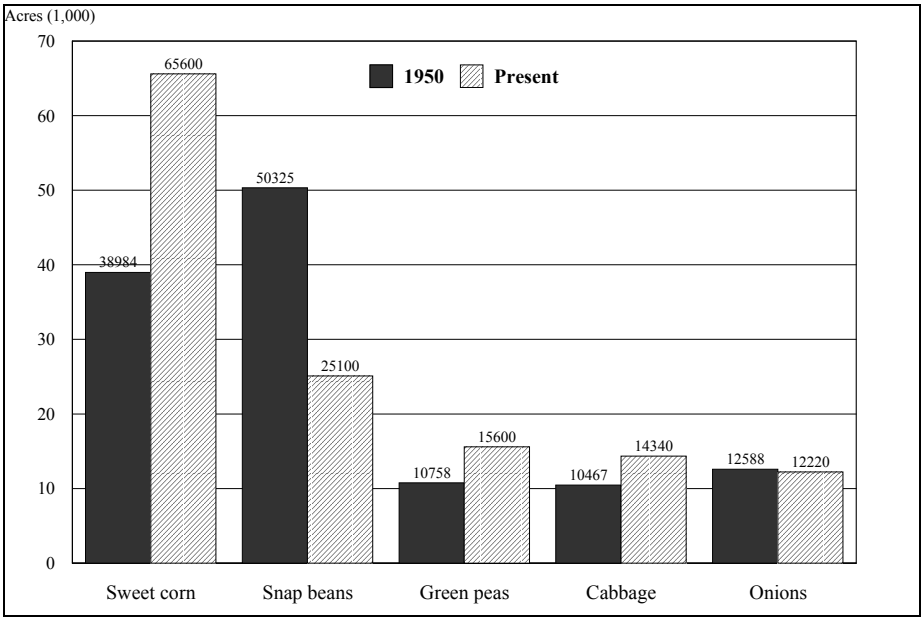
[A] Some vegetables are aggregates of more than one commodity from the consumption and/or production data sets. See Appendix 7 for commodities included under each vegetable.
[B] Area harvested includes both fresh market and processed market acreage for the following crops: cabbage, carrots, snap beans, and sweet corn. See Appendix 3 for more information.
[C] See Appendix 4 for conversion of farm gate production to consumable equivalent production.
[D] Based on 1999 population estimates for New York State. See Appendix 1 for per capita consumption estimates.
[E] Most pumpkins grown in New York State are for the Halloween market and are used for decorative purposes only.
[F] Census of Agriculture does not differentiate between winter and summer squash. Assumed that 50% of "squash" acreage devoted to each type.
[G] NYASS and Census of Agriculture do not differentiate between head type and leaf (Romaine) type lettuces. Acreage estimates based on personal communication with Dr. Stephen Reiners, Dept. of Horticultural Sciences, Geneva Experiment Station, Cornell University, 29 July, 2000.
* Totals may not add due to rounding.

Sources: Production estimates derived from New York Agricultural Statistics Service, 1999; USDA National Agricultural Statistics Service, 1999b; Kantor,1998 and Matthews and Garrison, 1975; consumption estimates derived from US Environmental Protection Agency and USDA Agricultural Research Service, 2000a and Bureau of the Census, 1999.

Tables 8 and 9 are useful for comparing consumption and production in light of the nutritional recommendations of the Food Guide Pyramid and the current allocation of New York State agricultural land to vegetable production. In order to appraise the implications of this comparison for New York agriculture it is helpful to add an historical perspective.

Figures 10, 11, and 12 compare the harvested acreage of selected New York vegetable crops in 1959 with the present harvested acreage. Using the taxonomy from Tables 8 and 9, these charts compare a sampling of "large acreage," "medium acreage," and "small acreage" crops in order to show how dynamically New York State vegetable production has changed in the last forty years.

Figure 10: Harvested acreage for selected "large acreage" vegetable crops, New York 1959 and present

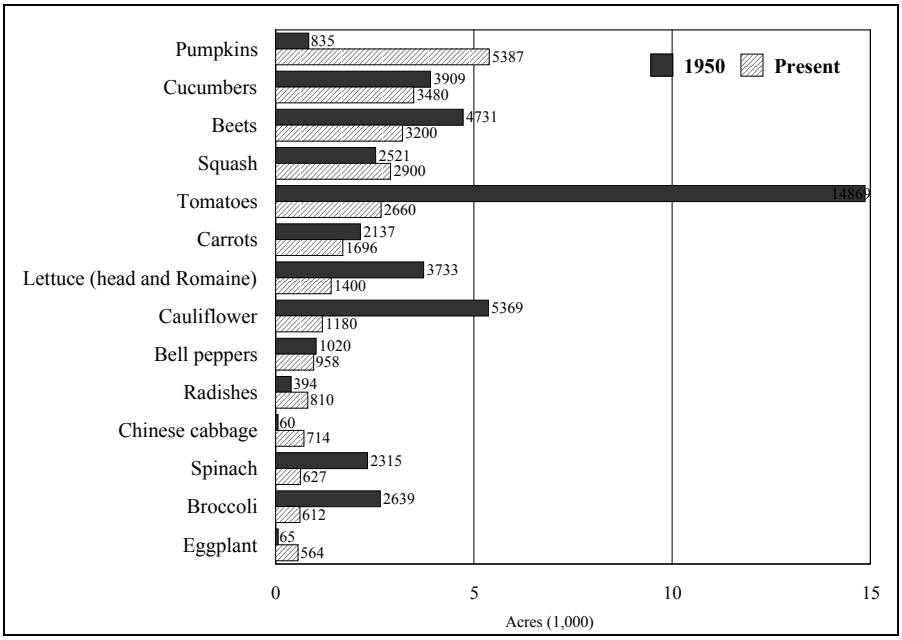


Sources: 1959 data from Bureau of the Census, 1961; current data from New York Agricultural Statistics Service, 1999.

According to Figure 10, the harvested acreage of selected "large acreage" crops has nominally increased, by almost 8%. Sweet corn acreage has increased by more than 40%, while snap bean acreage has sharply declined by more than 50%. Acreage of green peas and cabbage has grown, while onion acreage appears stable.

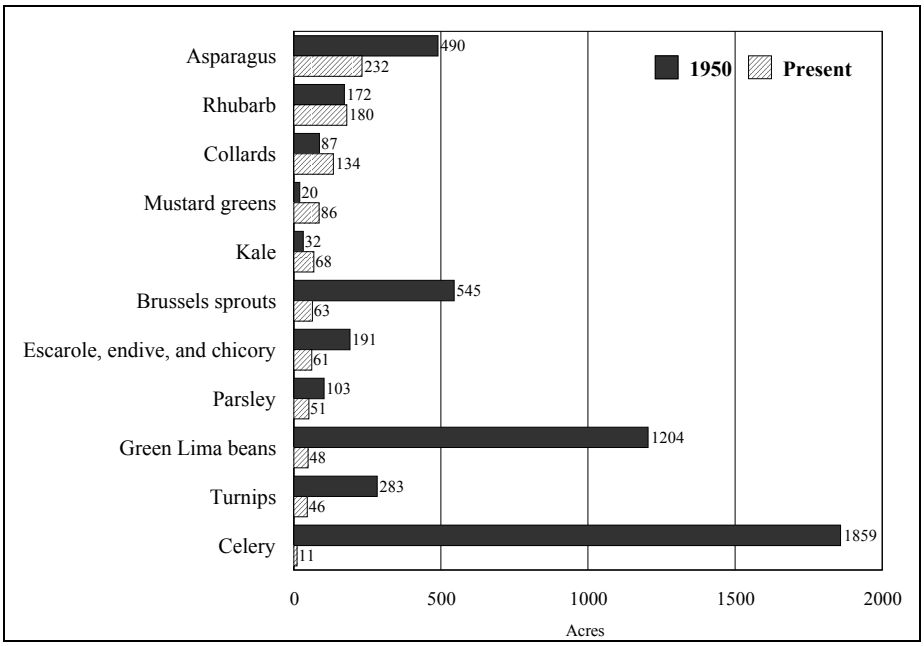
According to Figure 11, the harvested area of "medium acreage" crops has decreased overall. Sharp declines in acreage are observed for tomatoes, lettuce, cauliflower, spinach and broccoli, and modest declines are noted for cucumbers, beets, and carrots. However, several crops appear to have experienced substantial growth. Current harvested acreage of pumpkins, Chinese cabbage, and eggplant represents an almost 600% increase over 1959 acreage, while squash and radish acreage displays a more modest increase. The acreage of green peppers remains stable.

Figure 11: Harvested acreage for selected "medium acreage" vegetable crops, New York, 1959 and present



Sources: 1959 data from Bureau of the Census, 1961; current data from New York Agricultural Statistics Service, 1999 USDA National Agricultural Statistics Service, 1999b.

Figure 12: Harvested acreage for selected "small acreage" vegetable crops, New York, 1959 and present



Sources: 1959 data from Bureau of the Census, 1961; current data from New York Agricultural Statistics Service and 1999 USDA National Agricultural Statistics Service, 1999b.

According to Figure 12, harvested acreage of "small acreage" crops has generally decreased. Precipitous declines in acreage are observed for celery, green lima beans, and Brussels sprouts, and more modest decreases are noted for asparagus, parsley, turnips,

and endive, escarole, and chicory. Harvested acres of rhubarb, mustard greens, collards, and kale have generally remained stable or experienced modest increases.

From Figures 10, 11, and 12, it is clear that the amount of land devoted to individual vegetable crops has shifted considerably during the last forty years. The causes of these changes, as well as how shifts in consumption patterns and nutrition will affect New York consumers will be addressed in the following section.

DISCUSSION

This study was motivated by growing national interest in the interrelationships between food consumption, agricultural production, and nutritional recommendations, concurrent with increased interest in locally-marketed foods' potential to add vibrancy to New York agriculture. As mentioned in the introduction, meaningful discussion of these issues requires an information base that heretofore has not been compiled. Thus, this study was initiated as a beginning compilation of the important facts and an interpretation of some issues that are presented by these facts. Our results provide a benchmark for how New York State vegetable consumption, vegetable production, and the Food Guide Pyramid recommendations compare with one another, and raises both awareness of and questions about the implications this triumvirate has for New York agriculture.

The results of this research are discussed in five sections: 1) issues related to the sources of data; 2) issues raised by the estimation of vegetable consumption for NYS; 3) significance of the comparison of Northeast diets with the Pyramid recommendations; 4) issues related to vegetable production and its comparison with consumption; 5) implications of the research for New York agriculture.

Issues Related to the Sources of Food Consumption and Production Data

Our study builds on extensive research/data collection efforts by Federal agencies. Substantial amounts of these data, our study shows, can be used to address state (and sub-state) policy questions. However, the data inevitably contain some gaps, and we judge some of them to be significant enough to raise questions about the feasibility of conducting similar research in the future.

Food Consumption Data

The Food Commodity Intake Database (FCID) proved to be the optimal source of food consumption data for this study, providing data on an extraordinary number of vegetable commodities and allowing for the calculation of average food consumption for individual regions. These qualities permit a detailed comparison of estimated New York State vegetable consumption with the state's agricultural production and with national dietary guidelines. In spite of these advantages, however, the FCID has several limitations that constrain the interpretation of the analysis and the utility of this database for future work.

The FCID reports data for an exhaustive number of vegetables. It provides estimates of consumption for more than 80 vegetable products from over 70 different vegetable crops. This represents a greater breadth of crop detail than is included in the USDA food disappearance data. Indeed, it is the only source of food consumption estimates for many of the less frequently eaten, but potentially important niche market crops, such as beets, leeks, squash, and Chinese vegetables – all of which are crops presently grown in New York State.

Further, consumption estimates can be calculated for multi-state census regions, allowing the analyst to quantify the degree to which diets vary across the country. No other food consumption database provides consumption estimates at a sub-national level and classifies food according to crop[9]. Thus, the FCID offers a unique opportunity to begin to investigate regional differences in food consumption that can readily be related to regional food production.

In addition to coding data by region, the FCID reports the age, gender, ethnic group, and household income level of each respondent in the study. Thus, it is possible to calculate average consumption for different demographic groups using this database. This particular use of the data was beyond the scope of the current study, but represents a potential resource for future research.

The FCID presents users with two principal constraints. First, respondent bias and the thoroughness of the surveyor influence the accuracy of the food consumption estimates. Second, the FCID is a cross-sectional rather than a time-series data set. The degree to which these limitations are of concern is discussed below.

Because the FCID consumption estimates are based on survey data, both the respondents' biases and the carefulness of the interviewer affect the accuracy of the data. Jonnalagadda and others (2000) claim that most studies of the accuracy of food intake surveys suggest that respondents underestimate their energy intake by 20 percent. Vegetables, however, are not energy dense foods and the consumption of vegetables may not be underreported to the degree that energy-dense foods are. Indeed, Kantor's (1998) comparison of loss-adjusted food supply data with the Continuing Survey of Food Intake by Individuals (CSFII) confirms this. She observed a difference of just 0.4 vegetable servings per day between the loss-adjusted food supply and the CSFII (3.8 versus 3.4 servings per day, respectively), indicating that both methods yield similar estimates of consumption for the vegetables food group. Thus, respondent bias and the care taken in administering surveys appear not to have greatly affected the accuracy of vegetable consumption estimates.

The more serious limitation of the FCID may be that it is a cross-sectional rather than a time-series data set. The consumption estimates reported in this database are based on a single survey conducted in the years 1994, 1995, 1996 and 1998. Unless national surveys of food consumption continue to be collected, and unless the EPA continues to convert survey data into FCID commodities, there will be no way of tracking future changes in food consumption using this data source. Because surveys of this magnitude exact substantial financial and human resources, it is unclear whether they will continue to be conducted regularly.

[9] The Continuing Survey of Food Intake by Individuals (CSFII) has also coded data according to census region; however, the classification of foods is not as comparable to agricultural commodities as is the FCID.

Crop Production Data

NYASS is the only source of time series data on agricultural production in New York State. As such, it is a critical resource for tracking changes in acreage, production, and yield of vegetable crops in the state's agriculture. Unfortunately, the number of crops that are tracked by the NYASS is limited, and data are unavailable for many vegetable crops.

Data are consistently available for those crops that form the bulk of New York's vegetable sector (i.e. cabbage, green peas, onions, snap beans, and sweet corn). However, the assortment of "minor " crops included on the NYASS list of principal vegetable crops (crops for which data are collected) changes periodically due to changes in acreage or the relative importance of a crop to the state's agricultural community. Thus, crops that are considered to be of lesser importance (such as carrots, green peppers, lettuce, and squash) may or may not be included in the statistical bulletin for a given year.

Minor crops may represent important market opportunities for some NYS growers. Therefore, lack of production data limit the usefulness of the NYASS data for a study of this kind. If comprehensive production data are deemed to be valuable to the future of the state's agriculture, then more resources will need to be allocated to this important service.

The Census of Agriculture is an important complement to the NYASS annual data. It reports on all harvested acreage and covers a larger number of vegetable crops, but a drawback is that total production or yield per acre is not reported. For this study, estimates of yield for minor vegetable crops were obtained from selected faculty in Cornell University's Department of Horticulture. Estimates unique to New York State were not always available. The accuracy of the yield estimates is uncertain for several of the vegetable crops included in this study, and may represent a substantial data gap deserving of future research.

Discussion of Issues Related to Vegetable Consumption

The analysis of the per capita consumption data raises some questions about how vegetable consumption varies across the country. The use of these data to estimate total consumption for New York State serves as a useful framework for quantifying the size of a local market. Analogous methods may be useful for estimating the size of markets in smaller geographic areas.

Comparing National and Regional per Capita Consumption

The comparison of national annual per capita vegetable consumption with Northeast annual per capita consumption revealed important similarities and differences. Per capita consumption of the top ten vegetables is nearly identical in both the Northeast and the US as a whole, demonstrating that these vegetables are ubiquitous in the American diet. Furthermore, the fact that they account for 80% of the total weight of vegetables consumed in the US and Northeast suggests that vegetable consumption from region to region is more similar than it is different.

In contrast, per capita consumption of many of the less frequently consumed vegetables appears markedly different, which tells us that regional variations in vegetable consumption are expressed primarily through the minor crops. Since these minor vegetables constitute a much smaller share of the diet, regional preferences are overshadowed by the similarities across regions.. Nonetheless, the differences in annual per capita consumption observed for crops such as artichokes, eggplant, spinach, and winter squash are substantial. This clearly justifies the need for more locally specific consumption data when estimating the size of markets for minor vegetable crops.

Furthermore, it is critical to recognize that the differences observed between national and Northeast regional vegetable consumption will be smaller than the differences among individual regions. Indeed, the comparison of Northeast consumption with national consumption may actually conceal differences that exist between regions. A direct comparison of Northeast annual vegetable consumption to each of the other three census regions would be a more powerful test of regional differences; although such an analysis falls outside the boundaries of this study, it may be a fruitful area for future research.

Calculating Total Vegetable Consumption for the State

The estimates of total New York State vegetable consumption (shown in Tables 2, 4, 5, and 9) are general indicators of relative market size for each crop in the state. The purpose of these estimates is to provide a yardstick for assessing whether New York State production of vegetables exceeds, lags or is equivalent to the amount of vegetables consumed. These data also provide a baseline for projecting the future size of vegetable markets when and if the diets of New Yorkers shift to closer adherence to USDA Food Guide Pyramid recommendations; they can also facilitate tracking demographic changes and consumers' food preferences.

These estimates are an initial attempt to quantify the size of the "local New York State" market. Some may consider this definition of "local" too broad. Others may consider it too restrictive, arguing that it neglects markets in other states that are as "local" as the markets in New York State. Although the state boundary is an arbitrary definition, it is not an irrelevant one. People generally have a strong identification with their home state, and many states have programs to promote the consumption of foods produced on their farms. Moreover, the consumption of food grown in one's state of residence represents a step in the direction of promoting local agriculture, versus the current trend toward globalization of the marketplace.

Potential for More Geographically Specific Estimates

Admittedly, estimates of total state vegetable consumption have limited utility, neither giving any indication of how these markets are distributed throughout the state, nor showing how demand for a crop may vary from one part of the state to another. They also provide no insights into the attributes inherent in vegetables that are most important to consumers when making purchasing decisions. However, the methods used to produce these estimates may be valuable for generating more specific market data in the future. For example, the estimate of New York State consumption is an extrapolation based on

per capita consumption data and the state's population. By using population estimates for smaller geographic areas (such as counties), the approximate size of markets for major cities or regions within New York State could more readily be quantified. This would provide a rough but easily accessible estimate of how markets for vegetables are distributed throughout the state.

In addition, the demographic information provided in the FCID may allow for more sophisticated projections to be made. It is possible to calculate average consumption for different age, income, and ethnic groups using this data set. By combining consumption data specific to demographic groups with Census Bureau projections of population and demographic change, it may be possible to predict how the size of the market for vegetables in New York State is likely to change in the future. Moreover, it may be possible to estimate how demand for individual vegetable crops varies across the state, based on demographic differences and consumer food preferences.

Discussion of Issues Related to Nutrition

Based on Northeast consumption data, the diets of New Yorkers fail to meet USDA Food Guide Pyramid recommendations for vegetables and mirror the deficiencies observed in studies of national food consumption. This raises questions regarding the implications of nutrition for New York State agriculture, which we discuss below.

Comparing Consumption to the USDA Food Guide Pyramid

This analysis suggests that the diets of New Yorkers fail to meet the recommendations of the Food Guide Pyramid in three major ways. First, total consumption of vegetables is approximately one serving per person per day below the average recommended number of servings. Second, the dark green vegetables, deep yellow vegetables, and the dry beans, peas and lentils contribute a much smaller share of vegetable consumption than the Pyramid recommends. Third, more than three-quarters of all vegetable servings come from just ten vegetables suggesting the need for greater variety of vegetables in the diet.

These findings are consistent with previous analyses of US food supply data which suggest that Americans do not consume an adequate variety of vegetables and that consumption of dark green vegetables, deep yellow vegetables, and dry beans, peas, and lentils are far below Food Guide Pyramid recommendations (Kantor 1998, Kantor 1999, Putnam *et al*., 2000). Analysis of food survey data from the CSFII confirms that the American diet lacks variety and contains inadequate intake of these three vegetable subgroups and further suggests that total consumption of vegetables falls short of meeting Pyramid recommendations (Tippett and Cleveland, 1999). This congruence between this current study and national studies provides strong evidence that these deficiencies are both real and worthy of concern.

It is important to recognize that comparing average consumption with average requirements hides the variability that exists in the greater population. There are

undoubtedly individuals who currently eat diets that closely conform to the Food Guide Pyramid recommendations. Indeed, it is likely that a minority of individuals consume vegetables in quantities that surpass these guidelines. In contrast, there are also many individuals who consume vegetables in quantities much lower than the current average. These people would need to make even larger improvements in their diets to meet Food Guide Pyramid recommendations.

Relevant Nutritional Questions Raised by the Research

The significant gap between current and recommended vegetable intake raises several key questions. First, to what degree should New York agriculture be concerned with dietary deficiencies? Conventional thinking often defines nutrition as a consumption-related rather than a production-related issue. Indeed, agriculture has traditionally been viewed as a producer of food but not necessarily "a producer of nutrition". However, nutrition is influenced from both the consumer side and the producer side (Kennedy *et al*., 1999), and there is a clear need to include good nutrition among the goals of agricultural production (Welch and Graham, 1999). Therefore, it is reasonable for New York agriculture to act not only in response to current consumer demand but to consider its role in promoting the consumption of food groups that are lacking in the American diet.

Second, how much and at what pace will New Yorkers modify their diets to meet Food Guide Pyramid recommendations? US food supply data suggests that demand for some of the nutritionally important subgroups of vegetables may be growing rapidly. Consumption of broccoli and romaine and leaf lettuces (both dark green vegetables) has skyrocketed in the last thirty years, growing 386 percent and 1,063 percent respectively (Putnam *et al*., 2000). Consumption of carrots (a deep yellow vegetable) has experienced similar growth, increasing by 73 percent since the early 1970s (Putnam *et al*., 2000). However, the parallel boom in consumption of less nutritionally desirable vegetables, such as frozen potatoes (mostly as French fries), tempers the relatively positive view one can derive from the documented increases in consumption of dark green and deep yellow vegetables. The existence of dichotomous trends of improved diet quality concurrent with diminished quality indicates that the extent and pace at which New Yorkers will adopt better eating habits still remains unclear.

In addition to these two broad questions, this analysis of nutrition raises more focused questions related to diets and agriculture. For example, which vegetables would New Yorkers prefer to eat if they wished to increase the variety of vegetables in their diets? Can nutritional value be a successful marketing strategy for uncommon but nutritious vegetable crops? What factors prevent people from eating more dark green vegetables and deep yellow vegetables? What factors would encourage people to include a greater variety of vegetables in the diet? All of these questions indicate that greater knowledge and awareness of consumers' decision-making processes is necessary to increase the population numbers meeting the dietary goals for vegetables. The size of the deficit between current consumption and USDA Food Guide Pyramid recommendations suggests that considering these and other related questions would be valuable to farmers who grow such vegetables.

Discussion of Issues Related to Vegetable Production

New York State agriculture specializes in production of a select group of vegetable crops, mirroring a larger national trend. It, therefore, comes as no surprise that the comparison of vegetable production and consumption reveals that New York agriculture could supply a greater share of the vegetables (particularly certain specialty crops) that its citizens consume; currently, the majority of vegetables comes from outside of the state. The conversion of production data from a "farm gate" to a "consumable equivalent" weight was an essential step in performing this comparison and highlights the issue of food loss. All of these findings point to valuable areas to explore regarding the potential of New York agriculture to strengthen its knowledge of and connections with New York consumers.

Current Vegetable Production

According to the combined NYASS and Census of Agriculture data, New York State currently produces over 40 vegetable crops. However, though a variety of crops are grown, just a handful of crops predominate. Measured on a weight basis, just 10 crops account for over 90 percent of production (see Figure 6). Measured on an acreage basis, just 8 crops occupy 85 percent of cropland devoted to vegetables (see Table 8). This predominance of relatively few crops reflects the well understood national trend toward specialization in agriculture.

The discrepancy observed between amount of land devoted to vegetables and the weight produced is a reflection of the differences in yield among the vegetable crops. The yield per acre of vegetable crops varies widely from crop to crop, and the amount of land devoted to each crop varies accordingly. Sweet corn, for example, yields about 10,500 pounds per acre while cabbage yields 42,700 pounds per acre (see Table 3). Thus, although the harvested weights of these two crops are similar, sweet corn requires more than 4 times as much land as cabbage.

It is likely that this discrepancy could be further explained by differences in market value and costs of production for each crop. Though these factors lie beyond the scope of this study, they will be important for understanding current patterns of vegetable production and for assessing the potential of alternative crops.

Calculating Consumable Equivalent Production

This study introduces the concept of "consumable equivalent production". Though perhaps at first cumbersome, this term represents a rather unique concept. We propose that "consumable equivalent production" be used to estimate of the amount of food that is actually eaten based on the amount of food measured at the farm gate. This conversion process is essential for making comparisons between production and consumption data, and it presents some important findings of its own.

The differences observed between "farm gate" and "consumable equivalent" production values were consistently large and varied from crop to crop. The magnitude of

the differences highlights that post-harvest losses (whether due to spoilage or waste) claim a large share of vegetable production and are worthy of consideration. The variation in post-harvest loss also reflects the fact that certain crops have larger percentages of inedible material (peels, cobs, cores, stalks, etc.) than others, suggesting that crop yield per acre is not always the best indicator of food production per acre.

These observations provoke many questions, including questions regarding the value that Americans place on food. Are post-harvest losses lower when consumption and production are closer spatially and temporally, and can they be accurately predicted? Does the large amount of loss indicate that vegetables are not highly valued, or that inefficient and flawed management exists in the system? Which vegetables are more likely to be wasted? Can the market produce a favorable nutritional outcome if consumers undervalue nutritious foods? Considering that vegetable intake is in deficit of nutritional recommendations, such questions are most relevant.

Comparison of Production and Consumption

The comparison of vegetable consumption with vegetable production must be interpreted with care. This contrast is intended to serve as a baseline for assessing the potential for New York agriculture to supply the current demand for vegetables in New York State. It is also intended to prompt an initial discussion on where potential exists for New York agriculture to expand its share of "local" markets. This comparison does not estimate the amount of New York grown produce that is consumed in the state, nor does it evaluate the relative ease or difficulty of expanding local market share for these crops. It does, however, raise engaging questions for New York State's vegetable production and marketing sectors.

According to the overall analysis, New York has the capacity to provide 38 percent of the total quantity of vegetables consumed in the state. This implies that at least 62 percent of all vegetables consumed in New York come from outside the state. We cannot be sure of this amount because fresh vegetables and processed products with vegetable ingredients move over political borders in marketing channels that have not as yet been identified. Regardless of the exact percentage, should this be of concern to anyone? Although this analysis does not answer that question, it does suggest that there is a large local market for vegetables that is currently being supplied by sources outside of New York State. The sheer size of this market should stimulate interest in the growth potential of New York vegetable agriculture to respond to local demand, in addition to competing in regional, national and international commodity market channels.

The comparison of individual crops suggests that vegetables can be classified in three main categories. The first category contains crops for which production is equal to or greater than consumption. It includes small number of crops: beets, Brussels sprouts, cabbage, Chinese cabbage, onions, snap beans, and sweet corn. The second category contains crops for which production is somewhat less (25% to 75%) than consumption. It contains a larger number of crops, including cucumbers, eggplant, green peas, potatoes, and squash (among others). The third category contains crops that are produced in significantly

smaller quantities relative to consumption (< 25%). It also contains a large number of crops, including asparagus, broccoli, celery, spinach, and tomatoes (among others).

This classification structure based on production volume suggests that there may be similar marketing opportunities among vegetable crops in the same group. For example, crops produced in large quantities relative to consumption may be marketed throughout a larger geographic area (regionally, nationally and internationally), while crops produced in small quantities relative to consumption may be marketed more locally. However, this categorization will not be valid for all crops. While most of the crops that are produced in large amounts relative to consumption (e.g., beets, cabbage) are likely to be marketed over large geographic areas, such generalizations may not always hold true. Chinese cabbage, for example, is produced in larger quantities than the estimated consumption, but it is conceivable that this estimated consumption is lower than the actual consumption. New York City has a large Asian-American population, and the Northeast per capita consumption may not accurately represent consumption of this ethnic vegetable. Thus, while the production-consumption ratios may generally be indicative of the geographic reach of New York State vegetable production, such generalizations will not always hold true.

The observations above indicate that the most valuable use of this study may be for generating questions about how and where New York vegetables are marketed, sold and consumed. For example, where does all the Chinese cabbage go? Why does New York produce so little broccoli, and how does that small amount get sold? Does consumption of "summer" vegetables (e.g., tomatoes, cucumbers, and zucchini) peak in the summer? Such questions will help to frame a discussion of the potential New York vegetable agriculture holds for growing through targeting "in-state" and other "local" markets. Thus, this comparison serves as a first step toward opening up a larger discussion.

Implications for New York's Agriculture

One of the initial goals of this research was to identify production levels for New York's total collection of vegetable crops. It was known at the outset that, in New York State, many vegetable crops are grown in small quantities, and much of this production is not tallied in federal statistics. In some cases, data are reported in alternate data sources. Our study assembles for the first time in one place all published information on vegetable production in New York State.

We also knew at the outset that New York vegetable growers are producing products in quantities that bear no obvious relationship to the volume consumed by New Yorkers. Indeed, the organizing principle for this research was that, thus far, there have been no comprehensive data on instate consumption of fresh and processed vegetables. At the same time, for New York State producers who have not had the benefit of this data, political boundaries have been essentially meaningless when their planting and marketing decisions are made. Growers rarely organize production by considering product demand generated by New York municipalities, or by the state as a whole; it is likely that the same condition holds true for processors who purchase vegetables from

within New York State. While some growers and processors are becoming more interested in these matters, there has been only anecdotal information on the ultimate destination of New York vegetable production in a geographic context. By observation, one can often deduce that some small acreage crops are destined for "local" consumption while growers of large acreage crops are primarily targeting markets that are larger in geographic scale. But surprises can abound and shifts in technology and customer preferences continually modify the definition of "local".

As seen in Table 9, there are too many crops to discuss all the potentially interesting comparisons found in this chart. However, a few examples may prove illustrative. Spinach consumption (41 million pounds per year), for example, is almost twenty times greater than current spinach production (2 million pound per year) in New York State. As a dark green leafy vegetable, spinach is important from the standpoint of nutrition, and fulfills the Food Guide Pyramid recommendation to eat several servings of this type of vegetable per week. Thus, spinach may be a vegetable for which potential exists to strengthen ties between New York growers and New York consumers.

Turnip consumption (3.5 million pounds per year), similarly, is almost ten times greater than current turnip production (370 thousand pounds per year). As turnips are a less commonly consumed vegetable (0.1% of annual consumption), increased consumption of turnips is consistent with the Dietary Guidelines' recommendation to increase variety in the diet. Thus, turnips may be one of a family of minor crops for which potential exists to strengthen ties between local producers and consumers.

A final example of how Table 9 may be used is provided by the "Unspecified" crops and the "Unknown or no acreage" crops. These categories highlight the degree to which production data are unable to account for many of the smaller crops. Some of the crops in these categories (e.g., artichokes, Chinese peas) are tracked by the Census of Agriculture. Many, however, are not enumerated by any agricultural statistics agency even though they are often found in larger supermarket produce aisles (e.g., arugula, beet greens, Swiss chard). This finding emphasizes the limitations of existing data sets to assess production of "minor" crops.

There are limits to the implications which can be drawn from our study regarding the prospects for expanding or reducing vegetable acreage in New York State. Growers are responding to prices, anticipated trends and other market factors, as well as their new and ongoing relationships with buyers of their product. This study does not address prices or the nature of these marketing relationships. However, and significantly we think, our results help inform future decisions regarding vegetable production by estimating the volume of in-state consumption and the directions in which state vegetable consumption may be trending as health-conscious New York State consumers adhere more closely to nutritional guidelines.

The results of this study lay the groundwork for estimating the potential market value of vegetables currently consumed in smaller amounts locally (statewide) as well as revealing the potential influence of expanding ethnic markets and other trends in consumer preferences and food choices. Such information can be increasingly important

to growers who can gain strategic advantages in targeting local, ethnic, or other demographically important markets. One marketing approach that could be supported by this research is expanding production of crops currently being under-produced relative to consumption, exploiting local niche markets further. Producers now targeting a few high volume markets for processed or fresh vegetables would do well to consider the results of this study in light of their prospects for diversifying production and possibly increasing the economic vibrancy of their businesses.

We believe the analysis we offer has the potential to deepen and enrich decisions at the farm, and at the agency or state levels. Looking across New York State, the vegetable sector is arguably one of the biggest success stories of New York State agriculture. Despite many dramatic changes in the industry over the last century, vegetable production has remained a mainstay of New York agriculture. Today as in years past, sales of vegetables to fresh and processed markets constitute one of the largest sources of income for New York farmers. However, vegetable acreage has shifted, often dramatically, between communities and regions, and among crops as growers ongoingly adjust to shifts in cost-price relationships. Some of these shifts were documented in our comparison between vegetable production in the 1990s and the late 1950s. In 1959, the census reported New York State vegetable acreage at about 174,500 acres. Although New York State has lost millions of farmland acres since that time either to development or reforestation, land dedicated to vegetable production has remained fairly constant at 170,000 acres, with the number of farms classified as vegetable farms by the census remaining amazingly stable as well.

Our analysis shows that, importantly, harvested acreage for several of New York's vegetable crops that are produced in the largest volumes has remained relatively stable or expanded over these years. For example, sweet corn acreage increased from about 39,000 acres to 65,000 acres between the 1950s and the late 1990s. This crop helps provide a good illustration of the challenges faced by New York State growers with shifting acreages and volumes of production, shifting demographics and customer tastes. Large numbers of consumers equate fresh sweet corn with summer vegetable consumption; yet, with the climatic and economic conditions New York growers face, the average crop of sweet corn will only reach fresh markets and consumers from mid summer to early or mid fall. Therefore, some larger growers have adapted not only by targeting local fresh markets with this crop but also by shipping their product to warm-weather regions where the fresh market season for sweet corn has already ended. This option may not be available for smaller growers. On the other hand, large and small New York State growers have capitalized on the greatly increased pumpkin use (mainly for entertainment) by taking advantage of opportunities for direct fall marketing of this crop.

Contrasting with that are the decreases in acreage of some high volume vegetable crops, as markets for processed vegetables have changed for New York growers. Today, snap bean acreage is about half of that recorded in 1959. Similarly, tomato acreage has plummeted since the 1950s. Noteworthy gains and losses, in actual or percentage terms, are apparent for several other crops as well.

Surprisingly, harvested acreage of several medium acreage or minor acreage crops, such as beets, cucumbers, and squash, has remained relatively stable or declined only slightly over the past 40 years. With increased yields, this would indicate stable or appreciable increases in market sales for these commodities.

Even though identifying potential production opportunities for producers is beyond the scope of this study, primarily because those opportunities are greatly intertwined with decisions producers must make about their perceived markets, our study clearly does add new perspective and context to marketing discussions, and illuminates areas where additional research is needed in setting goals and researching in-state markets for vegetable commodities. From the work we present, large, medium, and small volume vegetable producers will undoubtedly discover new options for targeting New York State consumers and capitalizing on demographic and ethnic market trends, as more nutrition-savvy New Yorkers adhere to the Food Guide Pyramid dietary standards.

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Appendix 1. Estimated annual per capita consumption of vegetables in the US and in the Northeast

FCID Commodity	Description	Comments	Consumption - US	Consumption - NE	Ratio NE to US Consumption
			lbs/person/yr	*lbs/person/yr*	*%*
Alfalfa, seed	weight of dry seed	Alfalfa sprouts are the human food item.	0.0027	0.0013	49.3%
Amaranth, leafy	weight of leaf	Includes tampala, Chinese spinach, lambsquarter, and pokeweed (pokeberry).	0.0291	0.0003	1.0%
Artichoke, globe	edible portion of flower head		0.0925	0.2065	223.2%
Artichoke, Jerusalem	edible portion of tuber		0.0005	-N-	-N-
Arugula	weight of leaves		0.0030	0.0142	478.8%
Asparagus	weight of edible portion of spears/stems		0.6051	0.4998	82.6%
Balsam pear	weight of whole fruit	Includes balsam apple, Chinese cucumber, and bittermelon.	0.0091	-N-	-N-
Bamboo, shoots	weight of shoots	Bamboo shoots are the human food item.	0.1194	0.1018	85.2%
Bean, black, seed	dry weight of bean	Includes black turtle bean, bayo, and brown bean.	0.2802	0.3207	114.4%
Bean, broad, seed	dry weight of bean	Also called fava bean.	0.0061	-N-	-N-
Bean, cowpea, seed	dry weight of bean	Includes cowpea, crowder pea, blackeye pea, and southern pea.	0.0994	0.1914	192.7%
Bean, cowpea, succulent	weight of bean; excluding pod	Includes cowpea, crowder pea, blackeye pea, and southern pea.	0.4163	0.0582	14.0%
Bean, great northern, seed	dry weight of bean		0.7796	0.6328	81.2%
Bean, kidney, seed	dry weight of bean		0.7592	0.7841	103.3%
Bean, lima, seed	dry weight of bean		0.0818	0.0428	52.4%
Bean, lima, succulent	weight of bean; excluding pod		0.6656	0.6847	102.9%
Bean, mung, seed	dry weight of bean	Bean sprouts are the human food item.	0.0894	0.1148	128.3%
Bean, navy, seed	dry weight of bean	Includes pea bean.	0.8702	0.6404	73.6%
Bean, pink, seed	dry weight of bean		0.0433	0.1714	395.7%
Bean, pinto, seed	dry weight of bean	Include calico and red Mexican bean.	1.9013	0.4386	23.1%
Bean, snap, succulent	weight of bean and pod	Includes green bean, runner bean, and wax bean.	6.0973	5.1234	84.0%
Beet, garden, roots	weight of roots; juice		0.3999	0.5174	129.4%
Beet, garden, tops	weight of leaves	Include pumpkin leaves.	0.0012	0.0001	0.1%
Belgium endive	weight of leaves	Also called witloof chicory.	0.0370	0.0567	153.2%
Breadfruit	weight of pulp; excluding peel		0.0045	0.0227	509.4%
Broccoli	weight of flower heads and adjoining stems		5.0436	6.0460	119.9%
Broccoli, Chinese	weight of flower buds, adjoining stems and leaves		0.0101	0.0011	11.3%

FCID Commodity	Description	Comments	Consumption - US	Consumption - NE	Percentage
			lbs/person/yr	*lbs/person/yr*	*NE/US*
Brussels sprouts	weight of leaf sprouts		0.1694	0.0149	8.8%
Cabbage	weight of leaves		3.8828	3.8037	98.0%
Cabbage, Chinese, bok choy	weight of leaves and stems		0.1071	0.1352	126.3%
Cabbage, Chinese, mustard	weight of leaves		0.1071	0.1352	126.3%
Cabbage, Chinese, napa	weight of leaves		0.1071	0.1352	126.2%
Carrot	weight of roots, with or without peel, excluding tops		7.5691	8.2873	109.5%
Carrot, juice	weight of juice at single strength (or standard dilution)		0.2682	0.3828	142.7%
Cauliflower	weight of flower heads and adjoining stems	Includes broccoflower and green cauliflower.	0.9725	1.1454	117.8%
Celery	weight of leaf stalk		2.9229	3.1842	108.9%
Celery, juice	weight of juice as single strength (or standard dilution)		0.0130	0.0131	100.7%
Chickpea, seed	dry weight of bean	Also called garbanzo bean.	0.1690	0.1894	112.1%
Chicory, tops	weight of leaves		0.0370	0.0567	153.2%
Chinese waxgourd	weight of flesh; including or excluding peel	Includes togan and wintermelon.	0.0072	0.0360	499.3%
Collards	weight of leaves		0.5259	0.5197	98.8%
Corn, sweet	weight of kernels; excluding cob and husk		7.8065	8.5542	109.6%
Cucumber	weight of flesh and seeds; including or excluding peel		4.6137	4.6413	100.6%
Dandelion, leaves	weight of leaves		0.0074	0.0301	403.5%
Dasheen, corm	weight of the corm	Includes taro.	0.0248	0.0103	41.4%
Dasheen, leaves	weight of the leaves	Includes taro.	0.0168	0.0841	501.1%
Eggplant	weight of whole vegetable; including seeds, with or without peel		0.3658	0.6825	186.6%
Endive	weight of leaves	Includes escarole.	0.1175	0.1918	163.2%
Garlic	weight of bulb; excluding skin (outer scales)		0.1394	0.1248	89.5%
Grape, leaves	weight of leaves		0.0070	0.0131	185.7%
Kale	weight of leaves	Includes mizuna.	0.1913	0.3814	199.3%
Leek	weight of whole plant; including leaves and bulb		0.0107	0.0145	136.2%
Lentil	dry weight of edible seed		0.1699	0.1866	109.8%
Lettuce, head	weight of leaves; juice		11.6426	11.5840	99.5%

FCID Commodity	Description	Comments	Consumption - US	Consumption - NE	Percentage
			lbs/person/yr	*lbs/person/yr*	*NE/US*
Lettuce, leaf	weight of leaves	Includes romaine.	0.7276	0.8522	117.1%
Mushroom	weight of caps or caps and stems		1.4707	1.4838	100.9%
Mustard greens	weight of leaves and stems		0.1813	0.0550	30.3%
Okra	weight of pods; including seeds		0.3583	0.2253	62.9%
Onion, dry bulb	weight of bulb; excluding outer skin		8.8005	8.2519	93.8%
Onion, green	weight of bulb or bulb and leaves		0.4284	0.3796	88.6%
Palm heart, leaves	weight of stem and leaves		0.0052	-N-	-N-
Parsley, leaves	weight of leaves and stems		0.0894	0.0707	79.1%
Parsnip	weight of roots with or without peel		0.0046	0.0010	22.6%
Pea, dry	dry weight of pea		0.1074	0.1950	181.6%
Pea, edible podded	weight of pea and pod		0.3327	0.5140	154.5%
Pea, pigeon, seed	dry weight of pea		0.0019	0.0095	509.4%
Pea, pigeon, succulent	weight of pea	In US presently, usually found as canned pigeon peas.	0.0475	0.1962	413.1%
Pea, succulent	weight of peas		3.9596	4.5391	114.6%
Pepper, bell	weight of flesh; excluding seeds and stem	Includes sweet pepper, cooking pepper, pimento, and banana pepper.	2.4774	2.9456	118.9%
Pepper, non-bell	weight of flesh, with or without seeds; excluding stem		0.7346	0.4193	57.1%
Potato, chips	weight of potato from chip or stick, with or without peel		1.8425	1.9451	105.6%
Potato, dry (granules/ flakes)	dry weight of granules or flakes		0.4965	0.3430	69.1%
Potato, tuber, w/o peel	weight of tuber; excluding peel		29.5559	25.2383	85.4%
Potato, tuber, w/peel	weight of tuber; including peel		8.2942	7.1841	86.6%
Pumpkin	weight of pulp; excluding seeds and rind		0.2242	0.2309	103.0%
Radicchio	weight of leaves		0.0477	0.0598	125.3%
Radish, Oriental, roots	weight of roots		0.0049	-N-	-N-
Radish, roots	weight of roots		0.1674	0.2168	129.5%
Rhubarb	weight of stalks; excluding leaves		0.0642	0.0388	60.5%
Rutabaga	weight of roots; excluding tops		0.0388	0.0042	10.8%
Shallot	weight of bulb; excluding skin		0.0001	-N-	-N-
Spinach	weight of leaves; juice		1.6001	2.2852	142.8%

FCID Commodity	Description	Comments	Consumption - US	Consumption - NE	Percentage
			lbs/person/yr	*lbs/person/yr*	*NE/US*
Squash, summer	weight of flesh, seeds and peel	Includes crookneck squash, kampyo, scallop squash, straightneck squash, vegetable marrow, and zucchini.	1.7954	1.8128	101.0%
Squash, winter	weight of flesh; excluding seeds and peel	Includes butternut squash, hubbard squash, calabaza, acorn squash, and spaghetti squash.	0.4877	1.1964	245.3%
Sweet potato	weight of roots, with or without peel; juice		1.2114	1.0580	87.3%
Swiss chard	weight of leaves and stalks		0.0319	0.0087	27.3%
Tanier, corm	weight of corm	Also called cocoyam.	0.0007	0.0035	486.7%
Tomatillo	weight of fruit; excluding outer husks		0.1293	0.0363	28.1%
Tomato	weight of pulp, seeds and skin; tomatoes without skin but with seed (example canned whole tomatoes)		19.0957	18.1341	95.0%
Tomato, dried	weight of dried tomato (may include skin and/or seeds)		0.0383	0.0313	81.8%
Tomato, juice	weight of juice at single strength (or standard dilution)		2.0536	2.7379	133.3%
Tomato, paste	weight of concentrated tomato pulp from food described as paste; excluding seeds and skin		2.7592	3.1545	114.3%
Tomato, puree	weight of concentrated tomato pulp (from food described as puree or sauce); excluding seeds and skin		11.9768	12.2927	102.6%
Turnip, roots	weight of roots		0.1019	0.1926	189.0%
Turnip, tops	weight of leaves and stems		0.3838	0.1306	34.0%
Water chestnut	weight of tuber		0.1874	0.1052	56.2%
Watercress	weight of leaves and stems; juice		0.0077	0.0250	325.6%
Yam bean	weight of roots	Also called jicama.	0.0171	-N-	-N-
Yam, true	weight of roots		0.0284	0.1444	508.8%
TOTALS *			**162.7893**	**159.9577**	**98.3%**

N – no consumption reported in surveys

* Totals may not add due to rounding.

Sources: derived from US Environmental Protection Agency and USDA Agricultural Research Service, 2000a.

Appendix 1A. Vegetable commodities included in the Food Commodity Intake Database (FCID) but not reported in consumption surveys

FCID Commodity	Description	Comments	Consumption - US	Consumption - NE
			lbs/person/yr	*lbs/person/yr*
Bean, broad, succulent	weight of bean and pod	Also called fava bean.	-N-	-N-
Broccoli raab	weight of flower buds, adjoining stems and leaves		-N-	-N-
Burdock	weight of roots		-N-	-N-
Cardoon	weight of leaf stalks		-N-	-N-
Celeriac	weight of tuberous root		-N-	-N-
Celtuce	weight of stalks and leaves		-N-	-N-
Cress, garden	weight of leaves		-N-	-N-
Cress, upland	weight of leaves	Includes yellow rocket and winter cress.	-N-	-N-
Fennel, Florence	weight of leaves	Includes Italian and sweet fennel.	-N-	-N-
Kohlrabi	weight of leaves and stems		-N-	-N-
Radish, tops	weight of leaves		-N-	-N-
Radish, Oriental, tops	weight of leaves		-N-	-N-
Rape greens	weight of leaves and stems		-N-	-N-
Salsify, roots	weight of roots	Also called oyster plant.	-N-	-N-
Salsify, tops	weight of leaves	Also called oyster plant.	-N-	-N-

N – no consumption reported in surveys

Sources: derived from US Environmental Protection Agency and USDA Agricultural Research Service, 2000a.

Appendix 2. Average annual per capita vegetable consumption data in US and Northeast (servings basis)

Vegetable Subgroup	FCID Commodity Name	Nutrient Database Number	Nutrient Database Serving Portion [A]	Serving Weight	Consumption US	Consumption NE
			unit	*grams*	*servings/year*	*servings/year*
DARK GREEN LEAFY	Amaranth, leafy	11003	1 cup raw leaves	28	0.472	0.005
AND	Arugula	11959	1 cup raw	20	0.067	0.323
DEEP YELLOW	Beet, garden, tops	11086	1 cup raw	38	0.014	0.001
	Broccoli	11090	1/2 cup raw, chopped or diced	44	52.040	62.384
	Broccoli, Chinese [B]	11969	1/2 cup cooked	44	0.104	0.012
	Cabbage, Chinese, bok choy	11116	1 cup raw, shredded	70	0.695	0.877
	Cabbage, Chinese, mustard [C]	11116	1 cup raw, shredded	70	0.695	0.877
	Carrot	11124	1/2 cup raw, chopped, grated, strips or slices	60	53.694	62.707
	Carrot, juice	11655	6 fluid ounces	177	0.688	0.982
	Chicory, tops [D]	11152	1 cup raw, chopped	51.4	0.327	0.501
	Collards	11161	1 cup raw, chopped	36	6.633	6.554
	Dandelion, leaves	11207	1 cup raw, chopped	55	0.061	0.248
	Dasheen, leaves [E]	11502	1 cup raw	28	0.272	1.364
	Endive	11213	1 cup raw, chopped	50	1.067	1.741
	Grape, leaves	11974	1 cup raw	14	0.228	0.423
	Kale	11233	1 cup raw, chopped	67	1.297	2.584
	Lettuce, leaf	11253	1 cup raw, shredded	56	5.899	6.909
	Mustard greens	11270	1 cup raw, chopped	56	1.470	0.446
	Parsley, leaves	11297	1 cup raw	60	0.676	0.535
	Pumpkin	11422	1/2 cup raw, 1" cubes	58	1.755	1.807
	Spinach	11457	1 cup raw	30	24.214	34.582
	Squash, winter	11643	1/2 cup raw, cubes	58	3.818	9.365
	Sweet potato	11507	1/2 cup raw, cubes	66.5	8.270	7.223
	Swiss chard	11147	1 cup raw	36	0.402	0.110
	Turnip, tops	11568	1 cup raw, chopped	55	3.168	1.078
	Watercress	11591	1 cup raw, chopped	34	0.102	0.334
	SUBTOTAL – DGL & DY *				168.129	203.971

Vegetable Subgroup	FCID Commodity Name	NDB Number	NDB Serving Portion [A]	Serving Weight	Consumption US	Consumption NE
			unit	*grams*	*servings/per/yr*	*servings/per/yr*
OTHER	Alfalfa, seed [F]	11001	1/2 cup sprouted, raw	16.5	0.594	0.293
VEGETABLES	Artichoke, globe	11007	1 medium artichoke	128	0.328	0.732
	Artichoke, Jerusalem		1/2 cup, slices	75	0.003	-N-
	Asparagus	11011	1/2 cup raw	67	4.100	3.387
	Balsam pear [G]		1/2 cup, (1/2" pieces)	46.5	0.089	-N-
	Bamboo, shoots	11026	1/2 cup raw, ½ in pieces	76	0.713	0.608
	Bean, mung, seed [H]	11043	1/2 cup sprouted, raw	52	7.027	9.018
	Bean, snap, succulent	11052	1/2 cup raw	55	50.330	42.291
	Beet, garden, roots	11080	1/2 cup raw	66	2.751	3.559
	Belgium endive [I]	11151	1/2 cup raw	45	0.374	0.572
	Brussels sprouts	11098	1/2 cup raw	44	1.748	0.154
	Cabbage	11109	1 cup raw, shredded	79.5	25.183	21.722
	Cabbage, Chinese, napa [J]	11119	1 cup raw, shredded	76	0.640	0.808
	Cauliflower	11135	1/2 cup raw	50	8.831	10.401
	Celery	11143	1/2 cup raw, diced	60	22.116	24.094
	Celery, juice [K]	11655	6 fluid ounces	177	0.033	0.034
	Chinese waxgourd	11593	1/2 cup raw, cubes	61	0.054	0.268
	Cucumber	11205	1/2 cup raw, slices	52	40.281	40.522
	Eggplant	11209	1/2 cup, cubes	41	4.050	7.557
	Garlic	11215	1/2 cup raw	68	0.931	0.833
	Leek	11246	1/2 cup raw	44.5	0.109	0.148
	Lettuce, head	11252	1 cup raw, shredded or chopped	55	96.104	95.621
	Mushroom	11260	1/2 cup raw pieces	35	19.078	19.248
	Okra	11278	1/2 cup raw	50	3.254	2.045
	Onion, dry bulb	11282	1/2 cup raw, chopped or sliced	68.75	49.943	54.493
	Onion, green	11291	1/2 cup raw, chopped	50	3.889	3.447
	Palm heart, leaves		1/2 cup	73	0.032	-N-
	Parsnip	11298	1/2 cup raw, slices	66.5	0.031	0.007
	Pea, edible podded	11300	1/2 cup raw, chopped	49	3.083	4.763
	Pepper, bell	11333	1/2 cup raw, chopped or sliced	60.25	15.097	22.196
	Pepper, non-bell	11670	1/2 cup raw, chopped or diced	75	4.447	2.538
	Radicchio	11952	1 cup raw, shredded	40	0.541	0.679
	Radish, Oriental, roots		1/2 cup, sliced	73.5	0.030	-N-

Vegetable Subgroup	FCID Commodity Name	NDB Number	NDB Serving Portion [A]	Serving Weight	Consumption US	Consumption NE
			unit	*grams*	*servings/per/yr*	*servings/per/yr*
OTHER	Radish, roots	11429	1/2 cup raw, slices	58	1.310	1.697
VEGETABLES	Rhubarb	09307	1/2 cup raw, diced	61	0.478	0.289
(continued)	Shallot		1/2 cup, chopped	80	0.001	-N-
	Squash, summer	11641	1/2 cup raw, sliced	56.5	14.427	14.567
	Tomatillo	11954	1/2 cup raw chopped or diced	66	0.889	0.250
	Tomato	11529	1/2 cup raw, chopped or sliced	90	96.327	91.476
	Tomato, dried	11955	1/4 cup	13.5	1.289	1.054
	Tomato, juice	11886	6 fluid ounces	182	5.123	6.830
	Tomato, paste	11546	2 tablespoons	32.8	38.191	43.662
	Tomato, puree	11547	1/2 cup	125	43.500	44.647
	Turnip, roots	11564	1/2 cup raw, cubes	65	0.712	1.345
	Water chestnut	11588	1/2 cup raw slices	62	1.372	0.771
	Yam bean		1/2 cup, slices	60	0.129	-N-
	SUBTOTAL – OTHER *				568.970	570.354
STARCHY	Bean, black, seed	16014	1/6 cup [L]	32.3	3.939	4.507
VEGETABLES	Bean, broad, seed		1/6 cup [L]	25	0.110	-N-
	Bean, cowpea, seed	16062	1/6 cup [L]	27.8	1.623	3.126
	Bean, cowpea, succulent	11191	1/2 cup raw	72.5	2.607	0.365
	Bean, great northern, seed	16024	1/6 cup [L]	30.5	11.605	9.420
	Bean, kidney, seed	16027	1/6 cup [L]	30.7	11.227	11.596
	Bean, lima, seed	16071	1/6 cup [L]	29.7	1.250	0.654
	Bean, lima, succulent	11031	1/2 cup raw	78	3.874	3.985
	Bean, navy, seed	16037	1/6 cup [L]	34.7	11.385	8.379
	Bean, pink, seed	16040	1/6 cup [L]	35	0.562	2.223
	Bean, pinto, seed	16042	1/6 cup [L]	32.2	26.807	6.185
	Breadfruit	09059	1/2 cup raw, unthawed	110	0.018	0.094
	Chickpea, seed	16056	1/6 cup [L]	33.3	2.304	2.582
	Corn, sweet	11167	1/2 cup raw	77	46.028	50.437
	Dasheen, corm [E]	11518	1/2 cup raw, sliced	52	0.217	0.090
	Lentil	16069	1/6 cup [L]	32	2.411	2.647
	Pea, dry	16085	1/6 cup [L]	32.8	1.486	2.700

Vegetable Subgroup	FCID Commodity Name	NDB Number	NDB Serving Portion [A]	Serving Weight	Consumption US	Consumption NE
			unit	*grams*	*servings/per/yr*	*servings/per/yr*
STARCHY	Pea, pigeon, seed	16101	1/6 cup [L]	34.2	0.025	0.127
VEGETABLES	Pea, pigeon, succulent	11344	1/2 cup raw	77	0.280	1.157
(continued)	Pea, succulent	11304	1/2 cup raw	72.5	24.795	28.424
	Potato, chips		1 ounce chips	18	46.473	49.061
	Potato, dry (granules/ flakes) [M]	11378	1/4 cup	12	28.179	12.976
	Potato, tuber, w/o peel	11352	1/2 cup raw diced	75	178.912	152.776
	Potato, tuber, w/peel	11352	1/2 cup raw diced	75	50.207	43.488
	Rutabaga	11435	1/2 cup raw, cubes	70	0.252	0.027
	Tanier, corm [N]	11991	1/2 cup raw, sliced	67.5	0.005	0.023
	Yam, true	11601	1/2 cup raw, cubes	75	0.172	0.874
	SUBTOTAL – STARCHY *				456.752	397.922

N – no consumption reported in surveys of Northeast

[A] Serving portion and weight from the Nutrient Data Base for Standard Reference (NDB) (USDA Agricultural Research Service, 2001).
[B] The weight of a cooked serving of Chinese broccoli has been used because there is no entry for raw Chinese broccoli in the NDB.
[C] There is no entry for Chinese mustard cabbage in the NDB. The weight for a serving of raw pak-choi has been used to approximate the weight of a serving of mustard cabbage.
[D] The weight of a serving size of chicory (chopped) listed in the NDB appears to be in error. (It lists the weight per cup as 180 gm.). The weight of a serving of chicory has been estimated by taking an average of the serving weights of the other green leafy vegetables.
[E] There is no entry for "Dasheen" in the NDB. The serving weight shown is for "Taro". According to Kay (1987, p. 233), Dasheen and Taro are both common names for the species *Colocasia esculenta*.
[F] According to Meyerowitz (1999, p. 11), 5 tablespoons of alfalfa seed (approximately 2 ounces) produces 1 pound of alfalfa sprouts. Consumption of alfalfa seed was multiplied by a factor of 8 to estimate the weight of alfalfa sprouts consumed.
[G] The balsam pear goes by several other common names including bitter gourd, bitter cucumber and bitter melon.
[H] According to Poehlman (1991, p. 334), optimal sprout yield for mung beans is 8 to 10 kg per kg of seed. Consumption of mung bean seeds was multiplied by a factor of 9 to estimate the weight of mung bean sprouts consumed.
[I] There is no entry for "Belgium endive" in the NDB. The serving weight shown is for "Witloof chicory". According to Ryder (1999, p. 26), Belgium endive is also known as witloof chicory.
[J] There is no entry for raw Chinese napa cabbage in the NDB. The serving weight shown is for Chinese cabbage (Pe-tsai).
[K] There is no entry for celery juice in the NDB. The serving weight of carrot juice has been used to approximate the weight of a serving of celery juice.
[L] One-sixth cup of dry beans yields ½ cup of cooked beans.
[M] One-quarter cup of dehydrated potato flakes or granules yields ½ cup of cooked mashed potatoes.
[N] There is no entry for "Tannier" in the NDB. The serving weight shown is for "Tannia". According to Kay (1987, p. 223), Tanier and Tannia are both common names for the plants of the *Xanthosoma spp*.
* Totals may not add due to rounding.

Sources: derived from US Environmental Protection Agency and USDA Agricultural Research Service, 2000a and USDA Agricultural Research Service, 2001.

Appendix 3. Average harvested area, yield, and production of vegetable commodities in New York State, 1994-1998

Vegetable Commodity [A]	Area Harvested	Yield [B]	Production
	acres	*lbs/ac*	*lbs*
Artichokes [C]	-N-	8,800	-N-
Asparagus	232	1,600	371,200
Beets (processing)	3,200	24,655	78,896,000
Bell peppers	958	8,000	7,664,000
Broccoli	612	5,000	3,060,000
Brussels sprouts	63	8,000	504,000
Cabbage (fresh market)	11,660	42,580	496,480,000
Cabbage (kraut)	2,680	43,199	115,772,000
Carrots (fresh market)	630	30,698	19,340,000
Carrots (processing)	1,066	37,223	39,680,000
Cauliflower (fresh market & processing)	1,180	16,525	19,500,000
Celery	11	40,000	440,000
Chicory [D]	11	20,000	220,000
Chinese cabbage	714	14,000	9,996,000
Chinese peas [E]	-N-	3,000	-N-
Collards	134	10,000	1,340,000
Cucumbers (fresh market)	3,480	15,063	52,420,000
Daikon	-N-	N/A	-N-
Dry beans, black	9,400	1,547	14,540,000
Dry beans, other classes	3,300	1,479	4,880,000
Dry beans, red kidney, dark	3,200	1,500	4,800,000
Dry beans, red kidney, light	18,900	1,475	27,880,000
Dry cowpeas and dry southern peas	-N-	N/A	-N-
Dry edible peas	-N-	N/A	-N-
Eggplant	564	16,000	9,024,000
Escarole/endive [E]	50	20,000	1,000,000
Garlic [F]	153	16,333	2,499,000
Green cowpeas and green southern peas	-N-	N/A	-N-
Green lima beans [G]	48	2,937	140,994
Green onions	287	16,000	4,592,000
Green peas (processing)	15,600	4,134	64,488,000
Hot peppers	102	8,000	816,000
Kale	68	10,000	680,000
Lentils	-N-	N/A	-N-
Lettuce, head [E]	800	24,000	16,320,000
Lettuce, Romaine and leaf [E]	600	24,000	14,400,000
Mushrooms [H]	7	71,874	493,693
Mustard cabbage [I]	D	14,000	D
Mustard greens	86	10,000	860,000
Okra	5	4,000	20,000
Onions (fresh market)	12,220	29,496	360,440,000
Parsley	51	12,000	612,000
Pimientos	-N-	N/A	-N-
Potatoes	27,120	27,353	741,800,000
Pumpkins	5,388	30,000	161,640,000
Radishes	810	4,000	3,240,000
Rhubarb	180	20,000	3,600,000
Snap Beans (fresh market)	4,600	6,565	30,200,000

Vegetable Commodity [A]	Area Harvested	Yield [B]	Production
	acres	*lbs/ac*	*lbs*
Snap beans (processing)	20,500	7,081	145,164,000
Spinach	627	8,000	5,016,000
Squash, summer [J]	1,450	20,000	28,990,000
Squash, winter [J]	1,450	24,000	34,788,000
Sweet corn (fresh market)	27,960	8,453	236,340,000
Sweet corn (processing)	37,640	11,959	450,132,000
Sweet potatoes	-N-	10,000	-N-
Tomatoes (fresh market)	2,660	12,767	33,960,000
Turnip greens	12	10,000	120,000
Turnips	34	20,000	680,000
Watercress	-N-	N/A	-N-
Other Vegetables [K]	787	14,874	11,705,838
Mixed Vegetables [K]	894	14,874	13,297,356
TOTALS *	**224,183**		**3,267,892,087**

D – Census of Agriculture has withheld data to avoid disclosing information on a single farm operation.
N/A – Data not available.
-N- – No production reported for this commodity.

[A] Data for vegetables in regular fonts are Census of Agriculture point estimates for 1997, unless otherwise noted. Data for vegetables in italicized fonts are 5-year averages from New York Agricultural Statistics.
[B] Unless otherwise noted, yield estimates for crops in regular font are based on values from Zandstra and Price (1988).
[C] Yield estimates for artichokes based on personal communication with Anu Rangarajan, Professor, Dept of Horticultural Sciences, Cornell University, 21 July, 2000.
[D] Yield for escarole/endive used to estimate yield of chicory.
[E] Yield estimates based on personal communication with Steve Reiners, Professor, Dept of Horticultural Sciences, Cornell University, 29 July, 2000.
[F] Yield estimates for garlic based on US average for 1996, 1997 and 1998 (USDA National Agricultural Statistics Service, 1999a).
[G] Yield for green lima beans based on US average yield of lima beans for processing for 1996, 1997 and 1998 (USDA National Agricultural Statistics Service, 1999a).
[H] Area harvested has been converted to acres from "square feet under glass or other protection". The yield per acre estimate is based on an average yield of 1.65 pounds per sq. ft. as described by Rettew, *et al*. (1941, p. 92).
[I] Mustard cabbage is a type of Chinese green. The yield for Chinese cabbage has been used to estimate the yield of mustard cabbage.
[J] Census of Agriculture does not differentiate between winter and summer squash. Squash acreage for each type was assumed to be 50% of total.
[K] Average yield for all vegetables (dry beans, peas, and lentils and mushrooms excluded) used to estimate yield of mixed vegetables and other vegetables.
* Totals may not add due to rounding.

Sources: Derived from New York Agricultural Statistics Service, 1999; USDA National Agricultural Statistics Service, 1999; and Zandstra and Price, 1988.

Appendix 4. Converting farmgate production to consumable equivalent production using estimates of post-harvest loss and inedible portions

Vegetable Commodity	Production at Farmgate [A]	Primary to Consumer Loss	Retail Loss	Inedible Portion	Consumer / Foodservice Loss	Consumable Equivalent Production [B]
	lbs	*%*	*%*	*%*	*%*	*lbs*
Artichokes	-N-	7	2	60	30	0
Asparagus	371,200	9	2	47	30	122,814
Beets (processing)	78,896,000	24	1	0	15	50,457,148
Bell peppers	7,664,000	8	2	18	30	3,966,261
Pimientos [C]	-N-	8	2	28	30	0
Broccoli	3,060,000	8	2	39	30	1,178,049
Brussels sprouts	504,000	8	2	10	30	286,276
Cabbage (fresh market)	496,480,000	7	2	20	30	253,395,448
Cabbage (kraut)	115,772,000	56	1	0	15	42,865,741
Carrots (fresh market)	19,340,000	3	2	11	30	11,453,608
Carrots (processing)	39,680,000	25	1	0	15	25,043,040
Cauliflower (fresh market & processing)	19,500,000	8	2	61	30	4,799,668
Celery	440,000	7	2	11	30	249,833
Chicory [C]	220,000	8	2	18	30	113,854
Chinese cabbage [C]	9,996,000	8	2	7	30	5,867,068
Chinese peas [C]	-N-	8	2	6	30	0
Collards [C]	1,340,000	8	2	26	30	625,819
Cucumbers (fresh market)	52,420,000	8	2	27	30	24,150,817
Daikon [C]	-N-	8	2	7	30	0
Dry beans, black	14,540,000	0	1	0	15	12,235,410
Dry beans, other classes	4,880,000	0	1	0	15	4,106,520
Dry beans, red kidney, dark	4,800,000	0	1	0	15	4,039,200
Dry beans, red kidney, light	27,880,000	0	1	0	15	23,461,020
Dry cowpeas and dry southern peas	-N-	0	1	0	15	0
Dry edible peas	-N-	0	1	0	15	0
Eggplant	9,024,000	10	2	19	30	4,512,848
Escarole/endive	1,000,000	7	2	14	30	548,663
Garlic	2,499,000	19	2	13	30	1,208,077
Green cowpeas and green southern peas [C]	-N-	8	2	12	30	0

Vegetable Commodity	Production at Farmgate [A]	Primary to Consumer Loss	Retail Loss	Inedible Portion	Consumer / Foodservice Loss	Consumable Equivalent Production [B]
	lbs	*%*	*%*	*%*	*%*	*lbs*
Green lima beans [C]	140,994	8	2	12	30	78,306
Green onions [C]	4,592,000	8	2	17	30	2,405,426
Green peas (processing)	64,488,000	25	1	0	15	40,699,989
Hot peppers [C]	816,000	8	2	27	30	375,946
Kale [C]	680,000	8	2	29	30	304,705
Lentils	-N-	0	1	0	15	0
Lettuce, head	16,320,000	7	2	16	30	8,745,940
Lettuce, romaine	14,400,000	7	2	21	30	7,257,660
Mushrooms	493,693	N/A	2	3	30	328,513
Mustard cabbage [C]	D	8	2	7	30	D
Mustard greens [C]	860,000	8	2	7	30	504,770
Okra [C]	20,000	8	2	14	30	10,855
Onions (fresh market)	360,440,000	6	2	10	30	209,183,517
Parsley [C]	612,000	8	2	5	30	366,933
Potatoes	741,800,000	4	2	23	30	376,160,252
Pumpkins [C]	161,640,000	8	2	30	30	71,409,966
Radishes	3,240,000	3	2	10	30	1,940,365
Rhubarb [C]	3,600,000	8	2	56	30	999,694
Snap beans (fresh market)	30,200,000	6	2	12	30	17,137,268
Snap beans (processing)	145,164,000	22	1	0	15	95,281,295
Spinach	5,016,000	15	2	28	30	2,105,877
Squash, summer [C]	28,990,000	8	2	5	30	17,381,360
Squash, winter [C]	34,788,000	8	2	26	30	16,246,998
Sweet corn (fresh market)	236,340,000	8	2	64	30	53,697,204
Sweet corn (processing)	450,132,000	50	1	0	15	189,393,039
Sweet potatoes	-N-	4	2	25	30	0
Tomatoes (fresh market)	33,960,000	15	2	9	30	18,019,889
Turnip greens [C]	120,000	8	2	30	30	53,014
Turnips [C]	680,000	8	2	19	30	347,621
Watercress [C]	-N-	8	2	8	30	0

Vegetable Commodity	Production at Farmgate [A]	Primary to Consumer Loss	Retail Loss	Inedible Portion	Consumer / Foodservice Loss	Consumable Equivalent Production [B]
	lbs	*%*	*%*	*%*	*%*	*lbs*
Other Vegetables [D]	11,705,838	8	2	21	30	5,834,747
Mixed Vegetables [D]	13,297,356	8	2	21	30	6,628,035
TOTAL VEGETABLES *	**3,267,892,087**					**1,617,038,315**

D – Census of Agriculture has withheld data to avoid disclosing information on a single farm operation.
N/A – Data not available.
N – No production reported for this commodity.

[A] See Appendix 3 for more information on farmgate production.
[B] Consumable equivalent production is calculated by multiplying farmgate production by the product of all loss factors (loss factor = 1 – loss percentage).
[C] This commodity is not reported in Kantor (1998). Primary to consumer loss, retail loss, and consumer foodservice loss have been estimated using the average for all fresh market vegetables reported in Kantor. Inedible portion was obtained from Matthews and Garrison (1975).
[D] Primary to consumer loss, retail loss and consumer foodservice loss estimated using average of all fresh market vegetables reported in Kantor (1998). Inedible portion estimated using average of all fresh market vegetables shown in Appendix 4 (excludes processed vegetables and dry beans, peas or lentils).
* Totals may not add due to rounding.

Sources: Farmgate production estimates derived from New York Agricultural Statistics Service, 1999; USDA National Agricultural Statistics Service, 1999b; loss estimates from Kantor,1998 and Matthews and Garrison, 1975.

Appendix 5. Consumable equivalent production of vegetables in New York State (servings basis), average 1994-1998

Vegetable Sub-Group	Vegetable Commodity [A]	NDB Serving Portion [B]	Serving Weight	Consumable Equivalent Production [C]
		unit	*grams*	*servings*
DARK GREEN	Broccoli	1/2 cup, chopped or diced	44	12,155,320
LEAFY AND	Carrots (fresh market)	1/2 cup, chopped	64	81,249,034
DEEP YELLOW	Carrots (processing)	1/2 cup, chopped	64	177,649,065
	Chicory [D]	1 cup, chopped	51.4	1,005,637
	Collards	1 cup, chopped	36	7,892,268
	Escarole/endive	1 cup, chopped	50	4,981,858
	Kale	1 cup, chopped	67	2,064,716
	Lettuce, Romaine	1 cup, shredded	56	58,838,890
	Mustard cabbage	1 cup, shredded	70	D
	Mustard greens	1 cup, chopped	56	4,092,241
	Parsley	1 cup	60	2,776,461
	Pumpkins [E]	1/2 cup, 1" cubes	58	558,967,663
	Spinach	1 cup	30	31,868,943
	Squash, winter	1/2 cup, cubes	58	127,174,777
	Sweet potatoes	1/2 cup, cubes	66.5	0
	Turnip greens	1 cup, chopped	55	437,607
	Watercress	1 cup, chopped	34	0
	SUBTOTAL *			**1,071,154,479**
OTHER	Artichokes	1 medium artichoke	128	0
	Asparagus	1/2 cup	67	832,205
	Beets (processing)	1/2 cup	66	347,084,017
	Bell peppers	1/2 cup, chopped	74.5	24,170,235
	Pimientos	1/2 cup, chopped	74.5	0
	Brussels sprouts	1/2 cup	44	2,953,848
	Cabbage (fresh market)	1 cup, shredded	70	1,643,450,479
	Cabbage (kraut)	1 cup, shredded	70	278,014,947
	Cauliflower (fresh market & processing)	1/2 cup	50	43,580,982
	Celery	1/2 cup, diced	60	1,890,403
	Chinese cabbage	1 cup, shredded	76	35,048,013

Vegetable Sub-Group	Vegetable Commodity [A]	NDB Serving Portion [B]	Serving Weight	CE Production [C]
		unit	*grams*	*servings*
OTHER	Chinese peas	1/2 cup, chopped	49	0
(CONTINUED)	Cucumbers (fresh market)	1/2 cup, slices	52	210,855,206
	Daikon	1/2 cup, sliced	73.5	0
	Eggplant	1/2 cup, cubes	41	49,971,539
	Garlic	1/2 cup	68	8,065,691
	Green onions	1/2 cup, chopped	50	21,841,264
	Hot peppers	1/2 cup, chopped or diced	75	2,275,724
	Lettuce, head	1 cup, shredded or chopped	55	72,193,761
	Mushrooms	1/2 cup pieces	35	4,261,287
	Okra	1/2 cup	50	98,566
	Onions (fresh market)	1/2 cup, chopped	80	1,187,116,457
	Radishes	1/2 cup, slices	58	15,188,372
	Rhubarb	1/2 cup, diced	61	7,440,346
	Snap Beans (fresh market)	1/2 cup	55	141,460,356
	Snap beans (processing)	1/2 cup	55	786,503,778
	Squash, summer	1/2 cup, sliced	56.5	139,666,152
	Tomatoes (fresh market)	1/2 cup, chopped or sliced	90	90,900,330
	Turnips	1/2 cup, cubes	65	2,427,998
	SUBTOTAL *			**5,117,291,957**
STARCHY	Dry Beans, black	1/6 cup [F]	32.3	171,977,589
AND	Dry Beans, other classes	1/6 cup [F]	32.3	57,720,126
LEGUMES	Dry Beans, - red kidney, dark	1/6 cup [F]	30.7	59,732,795
	Dry Beans, - red kidney, light	1/6 cup [F]	30.7	346,947,983
	Dry Cowpeas and Dry Southern Peas	1/6 cup [F]	27.8	0
	Dry Edible Peas	1/6 cup [F]	32.8	0
	Green cowpeas and green southern peas	1/2 cup	72.5	0
	Green lima beans	1/2 cup	78	455,780
	Green peas (processing)	1/2 cup	72.5	254,866,138
	Lentils	1/6 cup [F]	32	0
	Potatoes (end use unknown)	1/2 cup diced	75	2,277,023,393

Vegetable Sub-Group	Vegetable Commodity [A]	NDB Serving Portion [B]	Serving Weight	CE Production [C]
		unit	*grams*	*servings*
STARCHY	Sweet Corn (fresh market)	1/2 cup	77	316,604,295
(CONTINUED)	Sweet corn (processing)	1/2 cup	77	1,116,681,035
	SUBTOTAL *			**4,602,009,132**
MISCELLANEOUS	Mixed Vegetables	N/A	58.3	51,614,545
	Other Vegetables	N/A	58.3	45,436,965
TOTAL VEGETABLES *				**10,887,507,082**

D – Census of Agriculture has withheld data to avoid disclosing information on a single farm operation.
N/A – not applicable. Category is an aggregate of several vegetable crops. More than one serving size may apply.

[A] See Appendix 3 for complete information on production at farmgate.
[B] Serving portions and weights from the Nutrient Data Base for Standard Reference (NDB) (USDA Agricultural Research Service, 2001).
[C] See Appendix 4 for conversion of farmgate to consumable equivalent production.
[D] The weight of a serving size of chicory (chopped) listed in the NDB appears to be in error (it lists the weight per cup as 180 gm.).The weight of a serving of chicory has been estimated by taking an average of the serving weights of the other green leafy vegetables.
[E] Most of the pumpkins produced are sold for decorative purposes. Only a small percentage is actually eaten.
[F] One-sixth cup of dry beans yields 1/2 cup of cooked beans.
[G] Serving weight based on average weight of a serving for all fresh vegetables in Appendix 5 (excludes processed vegetables and dry beans, peas, and lentils).
* Totals may not add due to rounding.

Sources: Serving sizes from USDA Agricultural Research Service, 2001; see Appendix 4 for derivation of consumable equivalent production.

Appendix 6. Vegetable servings consumed if all New York residents ate according to Food Guide Pyramid recommendations

Gender	Age	NY Population [A]	Pyramid Recommendation for Individuals	Pyramid Recommendation for NYS Population
			servings / day	*servings / day*
M and F	2 to 3	479,093	2.0	958,186
M and F	4 to 6	766,731	3.3	2,530,212
M and F	7 to 10	1,051,535	3.7	3,890,680
M	11 to 14	488,412	4.5	2,197,854
M	15 to 18	480,767	5.0	2,403,835
M	19 to 24	699,783	5.0	3,498,915
M	25 to 50	3,498,813	5.0	17,494,065
M	51+	2,180,451	4.2	9,157,894
F	11 to 14	467,436	4.0	1,869,744
F	15 to 18	458,515	4.0	1,834,060
F	19 to 24	683,734	4.0	2,734,936
F	25 to 50	3,689,476	4.0	14,757,904
F	51+	2,768,175	3.5	9,688,613
TOTAL	**All ages ≥ 2**	**17,712,921**	**4.2** [B]	**73,016,898**

[A] Estimated population for July 1, 1999.

[B] Weighted average number of servings recommended per person per day

Sources: population data from Bureau of the Census, 1999; Pyramid recommendations from Bowman and others, 1998 (p. 5).

Appendix 7. Vegetable names used in this study and their respective commodity names in production and consumption data sets

Vegetable	Consumption Data [A]	Production Data [B]
	commodity name	*commodity name*
Alfalfa sprouts	Alfalfa, seed	N/A
Amaranth leaves	Amaranth, leafy	N/A
Artichokes	Artichoke, globe	Artichokes
Arugula	Arugula	N/A
Asparagus	Asparagus	Asparagus
Bamboo shoots	Bamboo, shoots	N/A
Bean sprouts	Bean, mung, seed	N/A
Beet greens	Beet, garden, tops	N/A
Beets	Beet, garden, roots	*Beets (processing)*
Belgium endive	Belgium endive	N/A
Bok choy	Cabbage, Chinese, bok choy	N/A
Breadfruit	Breadfruit	N/A
Broccoli	Broccoli	Broccoli
Brussels sprouts	Brussels sprouts	Brussels sprouts
Cabbage	Cabbage	*Cabbage (fresh market) / Cabbage (kraut)*
Carrots	Carrots / Carrot juice	*Carrots (fresh market) / Carrots (processing)*
Cauliflower	Cauliflower	*Cauliflower (fresh market & processing)*
Celery	Celery / Celery juice	Celery
Chickpeas	Chickpea, seed	N/A
Chicory	Chicory, tops	Chicory
Chinese broccoli	Broccoli, Chinese	N/A
Chinese cabbage	Cabbage, Chinese, napa	Chinese cabbage
Chinese mustard	Cabbage, Chinese, mustard	Mustard cabbage
Chinese waxgourd	Chinese waxgourd	N/A
Collards	Collards	Collards
Cucumber	Cucumber	*Cucumbers (fresh market)*

Vegetable	Consumption Data [A]	Production Data [B]
	commodity name	*commodity name*
Daikon	Radish, Oriental, roots	Daikon
Dandelion leaves	Dandelion, leaves	N/A
Dasheen, corm	Dasheen corm	N/A
Dasheen, leaves	Dasheen, leaves	N/A
Dry beans, other	Bean, broad, seed / Bean, great northern, seed / Bean, lima, seed / Bean, navy, seed / Bean, pink, seed / Bean, pinto, seed	*Dry Beans, other classes*
Dry beans, black	Bean, black, seed	*Dry Beans, black*
Dry beans, kidney	Bean, kidney, seed	*Dry Beans, red kidney, dark / Dry beans, red kidney, light*
Dry cowpeas	Bean, cowpea, seed	Dry Cowpeas / Dry Southern Peas
Dry peas	Pea, dry	Dry Edible Peas
Dry pigeon peas	Pea, pigeon, seed	N/A
Eggplant	Eggplant	Eggplant
Escarole/endive	Endive	Escarole / Endive
Garlic	Garlic	Garlic
Grape leaves	Grape, leaves	N/A
Green cowpeas	Bean, cowpea, succulent	Green cowpeas / Green southern peas
Green lima beans	Bean, lima, succulent	Green lima beans
Green onions	Onion, green	Green onions
Green peas	Pea, succulent	*Green peas (processing)*
Green pigeon peas	Pea, pigeon, succulent	N/A
Kale	Kale	Kale
Leeks	Leek	N/A
Lentils	Lentil	Lentils
Lettuce, head	Lettuce, head	Lettuce, head [C]
Lettuce, leaf and Romaine	Lettuce, leaf	Lettuce, Romaine [C]
Mushrooms	Mushroom	Mushrooms

Vegetable	Consumption Data [A]	Production Data [B]
	commodity name	*commodity name*
Mustard greens	Mustard greens	Mustard greens
Okra	Okra	Okra
Onions	Onion, dry bulb	*Onions (fresh market)*
Parsley	Parsley, leaves	Parsley
Parsnip	Parsnip	N/A
Peppers, bell	Pepper, bell	Bell peppers / Pimientos
Peppers, non-bell	Pepper, non-bell	Hot peppers
Podded peas	Pea, edible podded	Chinese peas
Potatoes	Potato, chips / Potato, dry (flakes/granules) / Potato, w/o peel / Potato, w/ peel	*Potatoes*
Pumpkins	Pumpkin	Pumpkins
Radicchio	Radicchio	N/A
Radishes	Radish, roots	Radishes
Rhubarb	Rhubarb	Rhubarb
Rutabaga	Rutabaga	N/A
Snap beans	Bean, snap, succulent	*Snap beans (fresh market) / Snap beans (processing)*
Spinach	Spinach	Spinach
Squash, summer	Squash, summer	Squash
Squash, winter	Squash, winter	Squash
Sweet corn	Corn, sweet	*Sweet corn (fresh market) / Sweet corn (processing)*
Sweet potatoes	Sweet potato	Sweet potatoes
Swiss chard	Swiss chard	N/A
Tomatillos	Tomatillo	N/A
Tomatoes	Tomato / Tomato, dried / Tomato, juice / Tomato, paste / Tomato, puree	*Tomatoes (fresh market)*

Vegetable	Consumption Data [A]	Production Data [B]
	commodity name	*commodity name*
Turnip greens	Turnip, tops	*Turnip greens*
Turnips	Turnip, roots	*Turnips*
Water chestnut	Water chestnut	N/A
Watercress	Watercress	*Watercress*
Yams	Yam, true	N/A

N/A – production data not available for this vegetable

[A] Commodity names shown are from Food Commodity Intake Database (FCID), version 2.1 (Environmental Protection Agency Agricultural Research Service, 2000a). See Appendix 1 for more information on individual commodities.

[B] Italicized commodity names are from New York Agricultural Statistics Service (1999). Commodity names shown in regular typeface are from the 1997 Census of Agriculture unless otherwise noted. See Appendix 3 for more information on production data.

[C] Lettuce is not differentiated into head and leafy (Romaine) types by either New York Agricultural Statistics Service or the USDA Census of Agriculture. Production estimates for each type are based on personal communication with Dr. Stephen Reiners, Dept. of Horticultural Sciences, Cornell University, 29 July, 2000.

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