



Agricultural Self-Sufficiency on Martha's Vineyard

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**Prepared by the Martha's Vineyard Commission,
in conjunction with the Island Plan.**

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1. Introduction



All over the world, a long history of bad decisions has harmed much prime land or taken it out of agriculture for various other uses that do not produce food. Growing numbers of people depend on less and less farmland for their sustenance.

Historically, the farms and fisheries of Martha's Vineyard produced most of what was needed to feed the population. In the past century, the amount of land in food production has dropped considerably, while the population has grown briskly. As a result, the Vineyard imports the vast majority of its food. The imports reduce self-sufficiency on a number of fronts. Trucking food across the country consumes fossil fuels and contributes to harmful emissions, adding to global

warming and associated sea-level rise. Closer to home, off-Island spending contributes to "leakage" of funds from the local economy.

Although considerable farm land has been suburbanized or otherwise developed, the Vineyard still identifies strongly with its remaining farms. According to the 2005 *Martha's Vineyard Visual Preference Survey*, respondents liked and were most concerned about the rural character of the Vineyard, notably fields, farms, and rural roads. The farms and fields of the Vineyard present iconic vistas that are as familiar to Vineyarders as our own backyards. There are many active farms, and there is strong interest in keeping agriculture and agricultural products prominent in Vineyard landscapes and lifestyles. (See table of Vineyard organizations involved with agriculture).

In the course of discussions with farmers and others working on open space planning for the *Island Plan*, questions arose regarding how self-sufficient the Vineyard is or could be. Although issues of self-sufficiency seemed fundamental to those farmers around the table, it soon became clear that there had been little academic interest. No one else seemed to be working on this. This grass-roots concern of Vineyarders led ultimately to this report, including original methodology devised for this study.

In framing an understanding of self-sufficiency, it was first necessary to understand how self-sufficient the Vineyard is today with respect to food, and to outline strategies for increasing food self-sufficiency. This involved inventorying both the existing supply and demand.

After identifying the existing demand for food and supply of farmland, the next step was to make projections for the possible future of farming on the Vineyard. The MVC outlined scenarios of possible

population growth, in cooperation with the *Island Plan*, and estimated the land area requirements to feed each person, focusing on the year-round population.

Next, the MVC outlined three possible strategies for achieving greater food self-sufficiency:

- Maintaining and increasing the amount of land in food production,
- Increasing the productivity of those lands being used for food production, and
- Moving towards a “Vineyard Food Basket” that relies more on foods that could be grown here, and less on imports.

The MVC identified potential farm land by locating prime agricultural soils that are currently on protected open space and on “available” land and outlined options of how much total acreage could be in food production in the future: the conversion of existing non-food farms and dormant fields back into food production, the possible recruitment of undeveloped prime agricultural soils into food production, and the possible growth in backyard plots.

The findings in this report present various alternatives for increasing self-sufficiency. The study does not imply acceptance by the community of any of these choices. Some choices, such as land use, are community decisions. Others are entirely personal, such as what food to eat, or whether or not to plant a vegetable garden at home. The intention here is merely to point out options.

Island Organizations Involved with Farming

- ***The Agricultural Society*** runs the annual Fair and other events throughout the year, hosts a variety of agricultural competitions, and has an agricultural grant program.
- ***The Island Grown Initiative*** works to support the local agricultural community by raising consumer awareness about the importance of buying locally grown food; it is actively pursuing ways to increase local meat and poultry production on Island.
- ***The Farm Institute*** is a non-profit institution that is responsible for implementing education and outreach programs to Island students, residents, and visitors of the Island.
- ***The Martha's Vineyard Shellfish Group*** produces and distributes millions of quahog, scallop, and soft shell clam seedlings to the towns, and is responsible for educational and outreach programs promoting the well-being of Island shellfish and water quality in coastal ponds.
- ***The Martha's Vineyard Conservation Partnership*** includes several non-profit organizations that have worked to promote conservation of farmland.
- ***The Dukes County Commission*** has a representative to the USDA Pilgrim Resource Conservation & Development Area Council in addition to implementing the island's 4H program. Under the County, the Island did have an agricultural agent through the UMASS Extension Service.
- ***The Martha's Vineyard Commission*** has been involved in farm protection for decades, and has recently hosted a series of activities promoting coordination among Island agricultural stakeholders. The MVC interfaces with state and federal agencies such as the Massachusetts Department of Agricultural Resources, the USDA Pilgrim RCD, and the Southeastern Massachusetts Agricultural Partnership.
- ***The Martha's Vineyard Agricultural Alliance*** brings all the above groups together in an informal structure with regular meetings.

2. Status of Farming on Martha's Vineyard

2.1 Local Food Production

Vineyard farms and farm products are well known to most residents. However, the task of discerning how much food is produced on how much farmland is not an easy one. For purposes of open space planning, it is important to know acreage in production. Data, however, report dollar value of production, not acreage.

The USDA's National Agricultural Statistics Service (NASS) provides records in dollar value. Statistics for Dukes County from 2002 indicate a food and non-food production total of \$1,454,000, including \$895,000 from crops and \$559,000 from livestock, less \$697,000 for sales clearly non-food (\$684,000 for nursery, greenhouse, floriculture and sod; and \$13,000 for horses, ponies, mules, burros and donkeys), for an approximate value of \$757,000 (wholesale) for **food production**.

According to Economic Research Service/USDA, the average farm value-to-retail cost in 2005 (the most recent year listed) was 2.16, so the retail value of food production may be estimated at \$1,635,120. It is important to note that a large part of this dollar value, approximately 64%, was from aquaculture. The retail value of food produced on land was \$588,643.20.

Production was broken down by NASS into categories as follows:

- \$199,000 from vegetables, melons, potatoes and sweet potatoes (~\$429,840 retail)
- \$25,000 from fruits, tree nuts and berries (\$54,000 retail)
- \$8,000 from other crops and hay (\$17,280 retail)
- \$14,000 from poultry and eggs (\$30,240 retail)
- \$21,000 from cattle and calves (\$45,360 retail)
- \$5,000 from hogs and pigs (\$10,800 retail)
- \$24,000 from sheep, goats and their products (\$51,840)
- \$483,000 from aquaculture (\$1,043,280 retail)

NASS also recorded that 45 farms produced food crops on 530 acres, and that 397 acres were used for all hay, haylage (and grass silage), and greenchop. Unfortunately, those numbers do not match the acreage identified by the MVC in 2009. This leads to speculation that the NASS production data may underestimate the acreage production, perhaps reflecting on reporting or tabulation inconsistencies. The discrepancy indicates a need for further refinement of the identification of acreage in production, including closer contact with individual farmers on Martha's Vineyard.

In 2009, farm land was identified and digitized by MVC staff from aerial photos and other available data. The findings were reviewed by the Island Grown Initiative, Bob Woodruff and Bill Wilcox. MVC staff and others identified a total of 1,687 acres of active farms, of which horses occupy 259 acres, feed hay is produced on 493 acres, and food is produced for human consumption on 935 acres. In 2009, there were also 612 acres of fields that were not in production, of which 514 acres include properties with at least some agricultural-class soils. Agricultural soils were identified as classes 1 through 4, exclusive of agricultural soils within areas already developed, within the State Forest, or

within the runway areas of the Airport. Note that the figure of 935 acres in food production may include some parts of a farm that are not actively being used for food production and is being examined more closely. Island farmers James Athearn and Andrew Woodruff are working with MVC staff to further refine this number. If this number is to be modified, the estimates in this study that are derived from this figure will be adjusted accordingly.

Existing Farm Land on Martha's Vineyard (acres)							
	<i>Aquinnah</i>	<i>Chilmark</i>	<i>Edgartown</i>	<i>Oak Bluffs</i>	<i>Tisbury</i>	<i>West Tisbury</i>	Total
<i>In food production</i>	0	326	275	24	72	238	935
<i>In feed-hay production</i>	0	58	168	16	8	243	493
<i>Horse farms</i>	0	10	46	0	27	176	259
<i>Total farms</i>	0	394	489	40	107	657	1,687
<i>Cleared fields (not farmed)</i>	0	128	197	17	24	247	613

The table at the right shows the reported use of land by food category. For those farms that produce multiple types of products (i.e. chicken & produce) the area of the farm is counted twice (or possibly more if it produces more kinds of products). See the appendix for a more detailed breakdown by town and product.

Land in Food Production by Food Category	
<i>Category</i>	<i>Acres</i>
<i>Beef</i>	471
<i>Chicken/Poultry</i>	510
<i>Dairy</i>	5
<i>Vegetables</i>	457

Additional "farms" were identified as point locations.

5 sites for seafood/aquaculture, of which:

- 4 produce oysters
- 1 produces oysters & scallops

11 sites for 'point' farms (e.g. bee hives and school/community gardens), of which:

- 1 produces honey
- 9 produce fruits and vegetables
- 1 produces fruits, vegetables and flowers.

2.2 Demand for Growing Local Food and Demand for Imports

According to Shuman and Hoffer's 2007 *Leakage Analysis of the Martha's Vineyard Economy*, Martha's Vineyard's year-round population spent an estimated \$43,196,679 on food in 2005, including \$23,925,773 at home and \$19,270,152 away from home. (Note that food consumed away from home (restaurants, etc.) includes costs of preparation and service, in addition to the cost of

the food.) Because the food production and consumption data are in dollar value, it was not possible to estimate acreage requirements directly from the production and consumption data.

As a basis for estimating current and future demand, an estimate was made of per capita food demand and of the average acreage needed to produce this food, using a myriad of local, off-Island, and on-line sources. Note that all these estimates are based on feeding only the year-round population; it would take roughly twice as much to feed the seasonal population and visitors as well.

The Leopold Center for Sustainable Agriculture, at Iowa State University, provides an on-line demand calculator, <http://www.ctre.iastate.edu/marketsize/Default.aspx>, which was used to estimate food demand. The Estimator uses data collected each year by the U.S. Department of Agriculture's Economic Research Service (ERS) to estimate demand based on national averages. The Standard Demand includes foods that could be grown on The Vineyard as well as foods such as oranges that cannot. Demand is available in pounds, bushels, truckloads, etc. According to the Estimator, the average American eats 1,713 pounds of food each year. If we had to import all the food eaten by the year-round population, this would require 1,327 10-ton truckloads per year.

There is no such convenient on-line source to estimate the acreage needed to grow the food to meet the demand. Instead, a myriad of local and off-Island sources were consulted in order to determine the acreage needed, on The Vineyard, to grow enough bushels, bags or pounds of each and every food item listed. The food items and their acreage demands are listed in the appendix pages.

Various meat items are produced on The Vineyard, although not in quantities sufficient to meet demand. Information on yield per acre is well known to the farmers who produce meat products. Don Liptak (Natural Resources Conservation Service) provided basic information on what constitutes an animal unit (1,000 pounds) to count per acre. A cow is the basis (1,000 pounds). So, 8-10 goats make up an animal acre, etc. Don Liptak and Bill Wilcox (MVC staff) also provided basic information on the yield of dressed meat per animal. A local farmer (identity shielded) provided further specific local information on dressed weight, acreage demands and how long it takes to produce each pound of meat. For a locally-specific example, it takes 18 months to produce a beef cow with 600-800 pounds of hanging weight, which yields about 60% of that weight in useful cuts. So, in order to meet the Standard Demand of 93.8 pounds of beef per capita, requiring about 1/3 acre per person, about 5,100 acres would be needed to meet the Standard Demand for beef for the Vineyard's year 'round population. For scale, picture the State Forest. Of course, there may be ways to push the productivity, such as growing beef on acreage too stony or rough for row crops. Fishing and aquaculture, of course, do not require any land area.

The yield per acres of certain fruit and vegetable items are well known to Vineyard farmers and consumers. For instance, a local corn farmer (identity shielded) provided the local acreage requirements for corn. Estimating the yield per acre of certain other food items in the fruits, vegetables, and grains categories required a bit more creativity and "borrowing" from off-Island acreage demands. In order to meet the barley demand, for example, estimates available on-line (39.4 bushels/acre) were only converted to pounds to arrive at the generic estimate for acreage demand. Barley was grown in

Massachusetts in the 17th century, but has not been locally grown for some time. The Vineyard could conceivably meet its own barley demand.

Each food item which constitutes Standard Demand was reviewed for whether or not it could be grown here, and if so, how much acreage would be required to meet the Standard Demand. These acreages were summed, producing an estimate of 3/4 acre per person.

If the Vineyard devoted 3/4 acre per person to growing foods targeted to meet the Standard Demand, it would require 11,583 acres. For scale, picture land twice the size of the State Forest, recalling that nearly half (about 5,100 acres) would be devoted to producing beef. Feeding the Standard Demand would also require 214 truckloads of imports for items which cannot grow here, such as oranges. Imports would continue to fill 16% of the year-round demand.

2.3 Level of Self-Sufficiency

The level of self-sufficiency was estimated in two ways. Based on dollar value, local agricultural production of \$1,635,120 (including aquaculture) represents about 3.7% of the estimated total purchases of food \$43,196,679. Local agricultural **lands** produced \$588,643 (excluding aquaculture), representing about 1.4% of the same estimated total food purchases.

Based on acreage, 530 acres (NASS data) represents 4.6% of the estimated 11,583 acres required to produce 84% of food (other than 16% which must be imported). The MVC preliminary estimate of 935 acres currently in food production would represent about 7%.

Note: This is not to suggest that we are currently producing about 7% of our food, but that we could produce up to 7% if all currently farmed land was devoted to meeting the Standard Demand. That is certainly not what farmers plan for. Crops are chosen for the market, not to produce a nutritionally balanced diet. The items and quantities grown here have already been reported earlier here, in the available dollar format. When looking at open space planning, it is important to look at acreage, potential acreage, and what could be produced on the acreage. For this study, further projection analysis is based on the land acreage method, using the estimate of 935 acres presently in food production, recognizing that this represents a departure from the NASS production records. Although these acreage figures are rough approximations, they will service as a useful basis for the projections and alternative scenarios calculated in the next sections, and help to review the relative impacts of various options.

Estimated Standard Annual Food Demand <i>(Local production of some items, imports of items not feasibly produced here)</i>				
Per Capita Demand			Demand to Feed Current Population <i>(15,444 people)</i>	
<i>Food demand (pounds)</i>	<i>Land required (acres)</i>	<i>Number of 10-ton truckloads</i>	<i>Land required (acres)</i>	<i>Number of 10-ton truckloads</i>
1,713	0.75	0.013	11,583	214

3. Projections

3.1 Growth

The *Island Plan* estimated growth projections as follows:

Year -round population	Existing Situation (2008)	15,444 year-round residents
	Scenario 1 (No net growth)	15,444 year-round residents
	Scenario 2 (Modest growth)	21,158 year-round residents
	Present Trends	26,873 year-round residents

3.2 Self-Sufficiency

Using the estimate of $\frac{3}{4}$ acre farmland needed per person, the Vineyard could meet standard demand with 11,583 acres in food production (Note that the present farmland production choices are not targeted to Standard Demand and account for only 1.4% of food spending by year-rounders.). Growth in population would increase the need for farmland (as well as the truckloads of imports). With the same 935 acres in food production as in 2009, an increase in population would result in a decrease in potential self-sufficiency, as follows.

Self-Sufficiency with Scenarios of Population Growth (Standard Food Basket)				
Land in Food Production (Acres)	Land Needed to Supply 84% of Year-round Demand (Acreage to feed year-round population, 84% of standard demand, importing 16% of demand)			
	<i>Existing Acreage Demand</i>	<i>Scenario 1 Acreage Demand</i>	<i>Scenario 2 Acreage Demand</i>	<i>Present Trends Acreage Demand</i>
935	11,583 Acres	11,583 Acres	16,841 Acres	21,390 Acres
<i>Self-sufficiency</i>	6.8%	6.8%	4.7%	3.7%

(Note that self-sufficiency is reduced by the tonnage of imports required to meet demand.)

4. Strategies for Achieving Greater Self-Sufficiency

This section looks at several possible strategies for increasing the agricultural self-sufficiency of The Vineyard, namely by increasing the amount of land in food production, by increasing the amount of food produced on that land, and by changing food consumption patterns so that more people can be fed with the same level of production.

4.1 Increasing Land in Food Production

Land is of paramount significance in determining food production. The question of getting and keeping land in food production is particularly difficult on a small island where land is so obviously finite and land values are so high. Property values are determined by the economic realities of the high-end vacation trade, rather than as working lands. This section looks at various alternatives regarding the amount of land in food production, and then compares them with various growth scenarios.

The first question is how much existing farmland will remain in food production, and how much additional land can be used for farming. (Note that the following calculations are based on the MVC estimate of 935 acres rather than the 530 acres reported to NASS; for this land use calculation, it is more important to consider the total acreage, regardless of whether or not the food production was reported to NASS.)

Four alternatives were outlined for how much land might be in food production.

- Alternative 1 – Minimum: This assumes only permanently protected farmland or permanently protected open space currently being farmed, namely 636 acres.
- Alternative 2 - Existing Situation: This is based on the estimate of 935 acres.
- Alternative 3 – Increase: assumes keeping all existing farms, putting into food production former farms and fields that are still open, and also farming on 10% of undeveloped land that is prime ag soil of Class I or II, for a total of 2,102 acres.
- Alternative 4 – Major Increase: This scenario is similar to alternative 3, but it would boost to 20% use of undeveloped land that is prime ag soil, and would also assume that half of lots at least one acre in size would have backyard gardens of ¼ acre, resulting in a total of 3,398 acres in food production.
- Alternative 5 – Profound Increase: This scenario would provide enough acreage to meet 84% of demand, with the remaining 16% met by imports. It is **highly unlikely** that there would ever be this much acreage devoted to agriculture on The Vineyard. Acreage would represent

A range of levels of self-sufficiency was then calculated based the ratio between two numbers:

- The amount of land in food production, namely the four alternatives just described;
- The amount of land need to feed the current and potential future population, based on the scenarios in the Island Plan.

This shows that with the maximum amount of population growth (Present Trends) and the minimum alternative of land in food production (Alternative 1), self-sufficiency would drop to 2%. However, with no population growth (Scenario 1) and a realistic maximum amount of land in food production, the

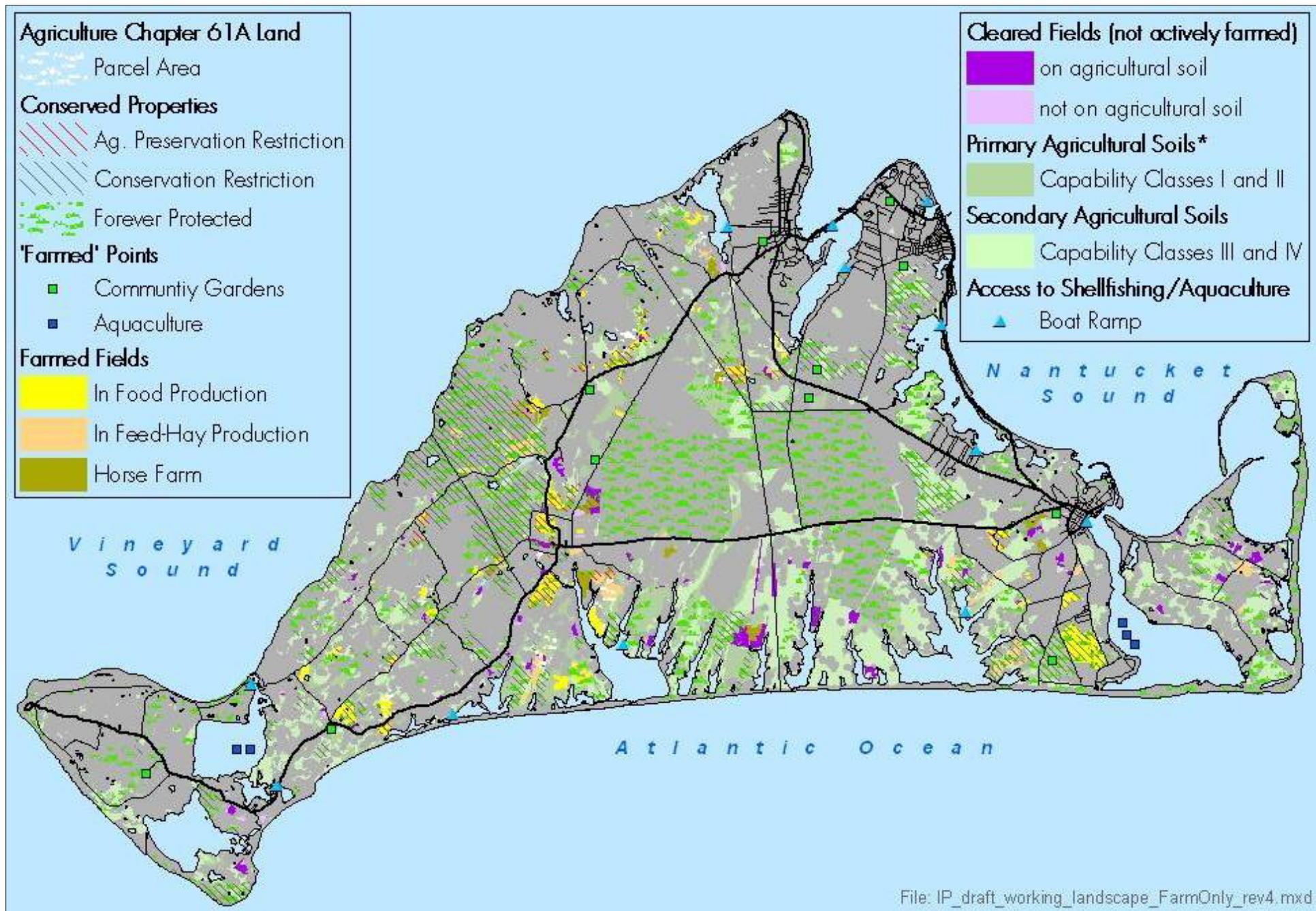
level of self-sufficiency could rise to 25%. Even with 11,583 acres in production, only 84% of demand would be met.

Self-Sufficiency with Population Growth and Alternative Areas of Land in Food Production (Standard Food Basket)					
Land in Food Production (Acres)		Land Needed to Supply 84% of Demand (Acreage to feed year-round population, a standard demand diet, to be supplemented by imports of 16% of demand)			
		<i>Existing Acreage Demand</i>	<i>Scenario 1 (No Net Growth) Acreage Demand</i>	<i>Scenario 2 (Modest Growth) Acreage Demand</i>	<i>Present Trends Acreage Demand</i>
Acres		11,583	11,583	16,841	21,390
Alternative 1: reduction	636	5%	5%	3%	2%
Alternative 2: existing	935	7%	7%	5%	4%
Alternative 3: increase	2,102	15%	15%	11%	8%
Alternative 4: major increase	3,398	25%	25%	16%	13%
Alternative 5: profound increase	11,583	84%	84%	58%	46%

Land Protection: It is important to look at the level of protection afforded by various types of restriction.

Some protections are permanent. These include in-fee (direct ownership), of which there are 45 acres on the Vineyard in food production. Another 336 acres are protected by a permanent APR (Agricultural Preservation Restriction). Another 255 acres in food production are protected by permanent Conservation Restrictions. The total of permanently protected land in food production is 636 acres.

Another type of protection is afforded by a Chapter 61A agricultural restriction, which is revocable. The farmer is afforded a tax break which makes food production for profit a more feasible scenario for the property. This arrangement is not permanent, however, and these lands should not be thought of as protected from any development in the future. These lands might be likely choices for permanent protection, should funds become available and owners willing. There are 1,048 acres of Chapter 61A farmland on The Vineyard.



Existing Total Farm Land by type of protection (acres)							
	Aquinnah	Chilmark	Edgartown	Oak Bluffs	Tisbury	West Tisbury	Total
Permanently Protected							
<i>In fee (ownership)</i>	0	42	47	0	0	4	93
<i>Agricultural Preservation Restriction</i>	0	120	35	10	34	163	361
<i>Conservation Restrictions</i>	0	56	282	11	0	164	513
<i>Total permanently protected</i>	0	217	364	21	34	332	967
Chapter 61A	0	58	18	14	13	108	212
Total	0	276	381	35	48	440	1,179

Existing Land in Food Production by type of protection (acres)							
	Aquinnah	Chilmark	Edgartown	Oak Bluffs	Tisbury	West Tisbury	Total
Permanently Protected							
<i>In fee (ownership)</i>	0	38	7	0	0	0	45
<i>Agricultural Preservation Restriction</i>	0	120	35	10	34	138	336
<i>Conservation Restrictions</i>	0	39	214	0	0	2	255
<i>Total permanently protected</i>	0	197	256	10	34	140	636
Chapter 61A	0	43	0	14	13	47	118
Total	0	240	256	24	48	187	754

The farm land property owned 'in-fee' by a conservation group but having an APR or CR, is reported in the respective ARP or CR summation only. The Chapter 61A properties were identified from the assessor's use code for a parcel. Only the farmed area of the parcel is included in the 'Chapter 61A' summation. Only those farms without an APR or CR are included in this 61A summation.

Targeting existing farms for permanent protection is obviously the highest priority. In addition to targeting existing farmland for protection, various alternatives for achieving increased protection or acquisition are outlined in the Island Plan, notably section 2 (Development and Growth) and section 3.1 (Natural Environment – Open Space).

In addition, the following specific measures could help increase the amount of land in food production. Securing permanently affordable land for farming is by far the biggest challenge to the preservation of agriculture on The Vineyard.

- Prioritize farmland in allocation of funds for open space protection: It has been estimated that about 150 acres of open space are protected each year on the Vineyard. More of that number could be targeted for farmland currently in or suitable for food production, particularly for existing farms. It is important that in the future, conservation restrictions for farmland specify that they be used for food production.
- Re-assignment of municipal and other open space: Some land that is already in ownership of, or under restriction by, public entities or non-profits could be suitable for food production. This study is helping identify these properties, and some could be recruited for food production, whether by farmers or through community gardens. The Martha's Vineyard Land Bank and the Sheriff's Meadow Foundation have undertaken to convert some already protected open space into active food production.
- Increase backyard production: Overall acreage in food production could be increased if more and more Vineyarders use some land at home for food production. For most properties, this would mean soil improvements. This could very well include stepped-up composting, on an individual basis or as part of the Vineyard's overall waste management.
- Increase farm viability: Ensuring that farming flourishes on The Vineyard is a multi-faceted challenge; involving not only land preservation, but also the logistics and economics of farm operations, processing, distribution, and marketing, as well as the difficulty of finding and housing workers. This includes setting up on-Island meat processing, maintaining the promotional program to encourage people to buy Island-grown food, and increasing the efficiency of ordering and delivery between farmers and local restaurants, caterers, and grocers. It also includes expanding value-added food and farm-related products to provide an additional revenue stream to farmers. The Island Plan recommends setting up a Martha's Vineyard Agricultural Commission as the key mechanism to coordinate all the efforts in this field (see box). The creation of the Agricultural Alliance is seen as a first step in this direction.

Proposals About an Agricultural Commission

Island Plan Recommendation

- **Set up a Martha's Vineyard Agricultural Commission.** *The Vineyard is fortunate to have several organizations that work directly or indirectly to promote agriculture – the Agricultural Society, the Island Grown Initiative, the Martha's Vineyard Shellfish Group, the Farm Institute, the Martha's Vineyard Conservation Partnership, the County, and the MVC. However, each of these organizations has a specific and limited mandate or role. A Vineyard Agricultural Commission could help coordinate ongoing efforts and take on new responsibilities to further agriculture on the Island. The non-regulatory Ag Comm could advise boards of selectmen and other town entities about agricultural and aquaculture issues, advocate for the local agricultural community, encourage the pursuit of agriculture, promote agriculture/aquaculture-based economic opportunities, preserve, revitalize, and sustain agricultural businesses and land, developing trust and a working relationship among farmers, residents, town boards, and other institutions, and oversee implementation of the other strategies listed below. It is proposed that the Ag Comm be made up of a representative of each town and each of the above organizations. An informal Martha's Vineyard Agricultural Alliance has been set up as a first step to creating the Ag Comm.*

Specific Roles as Outlined in Proposal to Create an Agricultural Commission

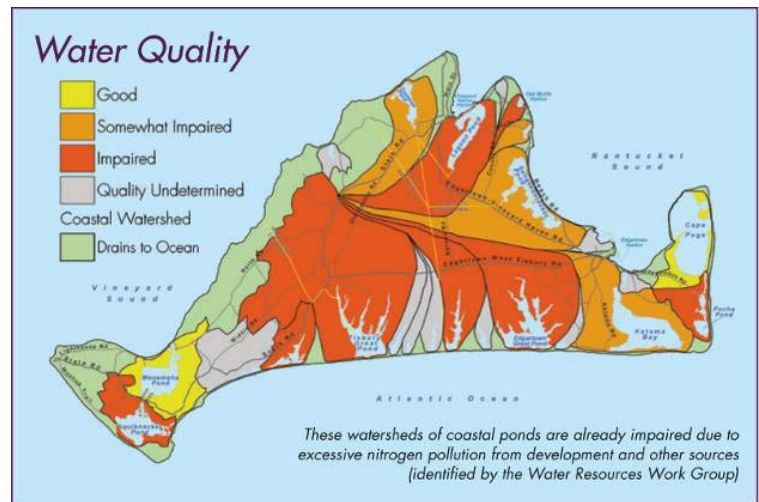
Agricultural Commissions have great flexibility to pursue a wide variety of programs or projects. The following are the priority initial roles for the Martha's Vineyard Agricultural Commission.

1. **Coordination of Ongoing Efforts:** *Provide a forum for the Agricultural Society, the County, the Martha's Vineyard Commission, town boards, the Island Grown Initiative, the Conservation Partnership, and other organizations and individuals to coordinate their efforts supporting agriculture and aquaculture on Martha's Vineyard.*
2. **Providing Advice to Public Entities:** *Advise towns (Town Meetings, Boards of Selectmen, Planning Boards, Boards of Assessors, Boards of Appeals, Conservation Commissions, Boards of Health, Historical Commissions, Open Space Committees), and other town and regional boards and committees on issues involving agriculture and aquaculture], especially how agriculture relates to town plans (e.g. Master Plans, Open Space Plans), land use development, state and local regulations (e.g. Right-to-Farm By-Laws), zoning and other issues that come before town boards.*
3. **Public Awareness About Agriculture:** *Facilitate public awareness efforts about the importance of agriculture on the Vineyard, preserving agricultural lands, the importance of tolerating perceived negative impacts from farming. Coordinate grassroots advocacy that improves the visibility of farming within the community*
4. **Preservation of Agricultural Land:** *Help coordinate efforts by town boards and non-profit organizations to on to include the protection of agricultural lands, preservation rural character, and provide viable options for retaining the use of the land for agricultural purposes. Participate in town planning processes in order to retain agricultural land and agricultural-related businesses.*
5. **Agriculture-Related Mediation:** *Provide services for mediation to resolve conflicts between operators of working lands and other residents.*
6. **Technical Assistance to Farmers:** *Facilitate provision of information and access to technical services available from the Commonwealth and other sources, to larger and small-scale farmers. Pursue initiatives appropriate to creating sustainable land use practices and sustainable agricultural and aquacultural communities*
7. **Other Activities:** *Identifies what other measures would be useful to promote agriculture on Martha's Vineyard. Identify what entities could take them on or, if appropriate, have the Commission take them on.*

Island Plan: Selected Recommendations About Open Space Preservation

- ***Increase the rate of acquisition of open space, both outright ownership and conservation restrictions.*** Past efforts to protect open space on the Island have been heroic. However, with the dramatic increase in real estate costs, it is increasingly difficult to come up with the funds for open space protection. The adoption of the Community Preservation Act provides an important, though relatively modest, new source of funding, though its resources are also needed for affordable housing and historic preservation. Ultimately, increased private philanthropy will be needed. Organizations involved in land preservation should re-evaluate and coordinate their priorities in light of the mapping efforts in the Island Plan, so that efforts are focused on the highest value areas. These organizations should look for new opportunities for funding, and expand their efforts to acquire priority properties. Acquisition could include trail easements from private owners, or buying properties and reselling them after placing a trail or other easement on it, to recoup the purchase price.
- ***Establish clear standards for the MVC and local regulatory boards to require partial open space protection, or other mitigation, as properties are developed.*** The MVC already has an Open Space Policy that requires most projects larger than 5 acres to include open space protection, typically of between 40% and 60%, and up to 80% in the most highly critical areas. This Policy should be updated to reflect the mapping and other priorities of the Island Plan. It would be desirable that towns adopt similar measures for projects that are reviewed only at the town level. Town Planning Boards, Conservation Commissions, and the MVC should work together on advance planning for each area, to identify the most important part of each property to be protected to come together as a continuous open space. The MVC could assist the local boards with policies and regulations where they find need for modification; this could include performance standards in local wetlands by-laws for buffer areas subject to Conservation Commission review.
- ***Work with property owners and public entities to restore and manage their lands in a way that furthers open space goals.*** *In the past, many areas on the Island were developed in ways that undermine the open space goals outlined in the Island Plan. Some current and future owners would likely be willing to restore much of their land if they were aware of the reasons for doing so, and if they were given assistance such as advice on design and appropriate plant materials. This could include replanting native vegetation to restore habitat, putting farms back into food production, and maintaining or reopening priority vistas and viewsheds.* Establish mitigation procedures (such as cap and trade) to offset impacts of existing and future development. Recommend offsetting practices that will improve, not merely mitigate, conditions.
- ***Give predictable tax abatements for open space preservation.*** A program (similar to Chapter 61) that gives fair and uniform tax incentives to landowners for donating open space easements would encourage such donations. This would be similar to the practice among thirteen towns on Cape Cod that provide standardized reductions in property taxes for conservation restrictions that provide public access. Ideally, a similar policy would be used in all Island towns.
- ***Establish a multi-organizational program allowing long-term voluntary undevelopment of critical natural properties.*** The idea behind undevelopment is to purchase remainder interests ("life estates") from willing sellers in prioritized areas. At the end of the owner's lifetime, the house would be moved or recycled and the land restored to open space, usually as native vegetation with public access whenever possible. This strategy, successfully used at the Cape Cod National Seashore, achieves open space goals – such as habitat restoration, linking recreational open space, and view enhancement – at a lower cost, because property is acquired in the future (the longer the buyer waits, the less expensive it is). It also allows owners to remain living there, it gives them additional funding at a time in their lives when they might need it, and it leaves them with an asset for heirs that is more easily dividable than real estate.

Relation to Water Quality: A critical issue with bringing more land into food production and or increasing productivity is the relation to water quality. Row crops are especially likely to require the use of fertilizer, some of which is likely to end up going into the water table, eventually ending up in a coastal pond or the ocean. This is problematic if the watershed feeds into a coastal pond that is already impaired because of excessive nitrogen.



Existing and Potential Farmland by Type of Watershed (acres)

Type of Watershed (based on water quality of pond)	Existing Land in Food Production	Total Existing Farmland	Open Fields	Prime Undeveloped Ag Land	Potential Backyard Gardens	Total
Impaired	453	1,040	339	2,815	430	4,624
Somewhat Impaired	305	370	50	579	248	1,246
Good Water Quality	2	19	52	42	56	169
Unknown Water Quality	143	182	114	905	91	1,291
Draining to Ocean	31	77	59	443	266	845
Total Acres	935	1,687	613	4,784	1,090	9,109

Definitions:

Existing Land in Food Production - includes land producing food for human consumption. Locations were identified by people with local knowledge and on-screen digitized from 2005 aerial photos.

Total Existing Farmland - includes land producing food for human consumption as well as horse farms and hay producing lands. Methodology same as above.

Open Fields - includes land that is currently cleared but not actively farmed for any reason. Methodology same as above.

Prime Undeveloped Ag Land - includes soil capability classes I and II. However, it excludes those ag. soils that are present on lands which are developed, or within the State Forest, or within the runway area of the Airport. The original base data was from the Dukes County Soil Survey (year 1986). 'Developed land' is land within 100 yards of a building (as digitized from 2005 aeriels).

Potential Backyard Gardens are assumed to exist on presently developed residential parcels that are 1 acre or greater in size. Only those parcels completely within a watershed boundary were included in this calculation. 'Developed Residential' was ascertained from the assessor's parcel data. Any use code in the one thousand's range excluding 'residential vacant' (1300, 1310, & 1320). For each of these parcels the garden size was assumed to be a 1/4 acre. (1,236 is the garden acreage of all developed residential parcels >= 1 acre. 1,090 is the garden acreage of those developed residential parcels >= 1 acre AND completely within a watershed boundary)

Watershed Boundaries represent the major watersheds on Martha's Vineyard. Some boundaries are based on a groundwater model while others are based on surficial topography. File maintained by the MVC 2009.

4.2 Increasing Productivity

Apart from the prime need to keep and increase the amount of land in food production, it is possible to use the land in ways that would increase food production in other ways, such as the following.

- Increase yield per acre: It could be possible to increase the amount of food produced per acre in a number of ways, such as selecting crops that make a more intensive use of the land. Also, certain farming practices such as the increased use of fertilizer and/or pesticides could also increase yield, but might not be acceptable for other reasons. The use of fertilizer is especially critical in nitrogen-sensitive watersheds, notably those feeding coastal ponds that have been identified as being either impaired or somewhat impaired.
- Extend the growing season with greenhouses: Greenhouses would provide an opportunity to grow food in three, or even four, seasons. However, off-season growing on The Vineyard is limited by the expense of powering greenhouse heat and lights. A group of Vineyarders are pursuing a plan to use wind power to provide this energy, possibly also supplying the schools with energy as well as food.

4.3 Changing Consumption Patterns - Vineyard Food Basket

The third major way to increase agricultural self-sufficiency is to move towards consumption patterns that are better suited to what can be grown efficiently on The Vineyard. In order to look at what might be feasible, a hypothetical alternate demand was created, the "Vineyard Food Basket". This analysis shows what could happen if, over the coming years or decades, people's eating habits shift in response to increased transportation costs brought about by the rising cost of oil, in response to a desire for healthier eating, and possibly in response to increased community awareness of the desirability of greater local consumption and food self-sufficiency.

This estimate started with the standard demand for the major food categories (dairy, fats & sugars, fruits, grains, meats & nuts, and vegetables), and tweaked the demand within each category to account for items which will never grow here, such as citrus. In the citrus example, that demand was transferred, pound for pound, to berries and non-citrus fruits. Demand for certain land-extensive items was reduced, with that demand transferred to less land-extensive food items. By far the biggest change is that in meat, the demand for beef was reduced by 75% for the Vineyard Food Basket, with that demand transferred to fish (for zero land requirement).

Several members of the conservation community reviewed the Vineyard Food Basket and suggested eliminating rice and cranberries, although both are or have been grown in Massachusetts. It would be highly unlikely that new wetland acreage could be re-assigned to commercial production of rice or cranberries, considering the biodiversity value presently provided by wetlands.

There are also nuances involved in local production that are not reflected in the generic acreage requirements per pound. Beef, for instance, can be grown on less-than-prime soil, such as stony hillsides. The acreage requirements can be further refined in cooperation with the same farmers who contributed to the numbers so far reflected here. Some demand was **eliminated** in the Fats & Sugars category, and does not appear as demand elsewhere; the demand for processed sugars, (dextrose, sucrose, glucose) was eliminated, and the demand for salad oil was reduced. There is, of course more

potential to further refine the “Vineyard Food Basket” by further reducing demand for land-extensive items (with replacement by items with less acreage requirements) and perhaps further refinement to focus on the healthiest choices. It is likely that this has already happened on the Vineyard to some extent. Vineyarders are likely to consume more fish than the standard 17 pounds per year, and far less in the way of fast food.

Demand for Food - Dukes County (U.S. Food Market Estimator)					
Estimate for Standard Demand			"Vineyard Food Basket" Estimate		
			calculated: 1/13/9		
	Pounds for current year-round population	Pounds per capita		Pounds for current year-round population	Pounds per capita
dairy	4,128,707	266.63	dairy	4,128,707	266.63
milk	2,811,822	181.58	milk	2,951,094	190.58
dairy case	676,643	43.7	dairy case	793,056	51.21
cheese	465,725	30.08	cheese	582,138	37.59
cottage cheese	40,132	2.59	cottage cheese	40,132	2.59
yogurt	170,786	11.03	yogurt	170,786	11.03
frozen dairy	384,556	24.83	frozen dairy	384,556	24.83
ice cream	223,442	14.43	ice cream	223,442	14.43
ice milk	105,962	6.84	ice milk	105,962	6.84
misc. frozen dairy	55,153	3.56	misc. frozen dairy	55,153	3.56
misc. dairy	255,686	16.51	misc. dairy	0	0.00
cheese spread	58,931	3.81	cheese spread	0	0.00
evaporated milk	100,482	6.49	evaporated milk	0	0.00
powdered milk	38,790	2.51	powdered milk	0	0.00
processed cheese	57,482	3.71	processed cheese	0	0.00
fats & sugars	3,762,665	242.99	fats & sugars	2,004,502	129.45
cane or beet sugar	965,129	62.33	cane or beet sugar	965,129	62.33
butter, marg, etc.	418,500	27.03	butter, marg, etc.	418,500	27.03
butter	73,033	4.72	butter	73,033	4.72
cream	170,741	11.03	cream	170,741	11.03
cream cheese	38,925	2.51	cream cheese	38,925	2.51
margarine	70,752	4.57	margarine	70,752	4.57
sour cream	65,049	4.2	sour cream	65,049	4.2
fats & oils	1,193,556	77.08	fats & oils	596,778	38.54
beef tallow	60,067	3.88	beef tallow	6,458	0.42
lard	25,833	1.67	lard	25,833	1.67
misc. fats & oils	33,211	2.14	misc. fats & oils	0	0.00
salad oil	689,630	44.54	salad oil (corn oil)	179,673	11.60
shortening	384,814	24.85	shortening	384,814	24.85
processed sugars	1,161,386	75		0	0.00
syrops	24,095	1.56	syrops	24,095	1.56
honey	17,269	1.12	honey	24,095	1.56
fruits	4,163,712	268.89	fruits	4,163,712	268.89
berries	183,024	11.82	berries	274,536	17.73
blackberries	1,137	0.07	blackberries	1,137	0.07

Standard Demand	Pounds for current year-round population	Pounds per capita	Vineyard Food Basket	Pounds for current year-round population	Pounds per capita
blueberries	12,846	0.83	blueberries	33,400	2.16
cranberries	36,083	2.33	cranberries	0	0.00
misc. berries	1,072	0.07	misc. berries	1,072	0.07
raspberries	11,298	0.73	raspberries	11,298	0.73
strawberries	120,587	7.79	strawberries	227,629	14.70
melons	427,312	27.6	melons	427,312	27.60
cantaloupe	148,216	9.57	cantaloupe	148,216	9.57
honeydew	32,807	2.12	honeydew	32,807	2.12
watermelon	246,289	15.91	watermelon	246,289	15.91
non-citrus fruits	2,117,292	136.73	non-citrus fruits	3,461,863	223.56
apples	783,018	50.57	apples	2,434,616	157.22
apricots	14,180	0.92	apricots	14,180	0.92
cherries	9,058	0.58	cherries	9,058	0.58
grapes	192,673	12.44	grapes	578,019	37.33
kiwi	7,151	0.46	kiwi	7,151	0.46
peaches	125,566	8.11	peaches	188,349	12.16
pears	86,650	5.6	pears	86,650	5.60
plums	23,858	1.54	plums	23,858	1.54
prunes	6,532	0.42	prunes	6,532	0.42
raisins	113,450	7.33	raisins	113,450	7.33
citrus fruits	1,436,083	92.74	citrus fruits	0	0.00
grains	2,986,189	192.84	grains	2,986,189	192.84
whole grains	402,104	25.97	whole grains	81,822	5.28
barley	10,300	0.67	barley	10,300	0.67
oats	71,522	4.62	oats	71,522	4.62
rice	320,282	20.68	rice	0	0.00
grain meals	2,584,085	166.88	grain meals	2,904,367	187.56
flour	2,090,113	134.98	flour	1,887,867	121.92
corn grits	131,623	8.5	corn grits	131,623	8.50
corn meal	294,215	19	corn meal	748,609	48.34
corn starch	68,134	4.4	corn starch	136,268	8.80
meats & nuts	5,059,567	336.44	meats & nuts	5,059,567	336.44
eggs	507,324	32.76	eggs	1,014,648	65.52
fish	255,601	16.51	fish	1,991,083	128.58
fish	105,336	6.8	fish	820,547	52.99
shellfish	96,226	6.21	shellfish	1,076,007	69.49
poultry	1,839,263	118.78	poultry	1,839,263	118.78
chicken	1,578,020	101.91	chicken	1,578,020	101.91
turkey	261,243	16.87	turkey	261,243	16.87
nuts	152,771	9.87	nuts	0	0.00
red meat	2,454,872	158.53	red meat	1,357,649	87.68

Standard Demand	Pounds for current year-round population	Pounds per capita	Vineyard Food Basket	Pounds for current year-round population	Pounds per capita
beef	1,452,267	93.79	beef	363,067	23.45
lamb	18,354	1.19	lamb	18,354	1.19
pork	976,228	63.04	pork	976,228	63.04
veal	8,023	0.52	veal	0	0.00
vegetables	6,280,613	405.59	vegetables	6,280,613	405.59
green vegetables	836,947	54.04	green vegetables	836,947	54.05
asparagus	21,808	1.41	asparagus	21,808	1.41
bell peppers	108,480	7.01	bell peppers	27,120	1.75
broccoli	137,081	8.85	broccoli	270,212	17.45
Brussels sprouts	4,342	0.28	Brussels sprouts	4,342	0.28
cabbage	126,844	8.19	cabbage	126,844	8.19
celery	93,953	6.07	celery	939	0.06
cucumbers	98,070	6.33	cucumbers	147,105	9.50
green peas	44,054	2.84	green peas	66,081	4.27
okra	6,219	0.4	okra	1,555	0.10
pickles	48,863	3.16	pickles	48,863	3.16
snap beans	122,078	7.88	snap beans	122,078	7.88
leafy vegetables	610,766	39.44	leafy vegetables	610,766	39.44
escarole	3,762	0.24	escarole	3,762	0.24
kale	5,112	0.33	kale	20,448	1.32
lettuce (head)	312,256	20.17	lettuce (head)	159,906	10.33
lettuce (leaf)	232,011	14.98	lettuce (leaf)	348,017	22.47
mustard greens	5,891	0.38	mustard greens	1,473	0.10
spinach	37,868	2.45	spinach	75,736	4.89
turnip greens	5,696	0.37	turnip greens	1,424	0.09
misc. vegetables	753,558	48.66	misc. vegetables	753,558	48.66
chili peppers	98,552	6.36	chile peppers	49,276	3.18
dry edible beans	98,903	6.39	dry edible beans	166,878	10.78
dry peas & lentils	11,614	0.75	dry peas & lentils	11,614	0.75
garlic	43,872	2.83	garlic	43,872	2.83
misc. vegetables	85,925	5.55	misc. vegetables	85,925	5.55
mushrooms	62,202	4.02	mushrooms	62,202	4.02
onions	333,791	21.56	onions	333,791	21.56
sauerkraut	18,699	1.21	sauerkraut	0	0.00
red vegetables	1,330,092	85.9	red vegetables	1,330,092	85.90
eggplant	14,870	0.96	eggplant	14,870	0.96
radishes	8,144	0.53	radishes	8,144	0.53
tomatoes	1,307,077	84.41	tomatoes	1,307,077	84.41
starchy vegetables	2,348,091	151.64	starchy vegetables	2,348,091	151.64
cauliflower	32,994	2.13	cauliflower	32,994	2.13

Standard Demand	Pounds for current year-round population	Pounds per capita	Vineyard Food Basket	Pounds for current year-round population	Pounds per capita
lima beans	4,929	0.32	lima beans	4,929	0.32
<i>potato chips</i>	292,393	18.88	<i>potato chips</i>	0	0.00
potatoes	1,609,866	103.96	potatoes	1,902,259	122.85
sweet corn	407,908	26.34	sweet corn	407,908	26.34
yellow vegetables	401,159	25.91	yellow vegetables	401,159	25.91
carrots	178,411	11.52	carrots	178,411	11.52
pumpkins	74,226	4.79	pumpkins	74,226	4.79
squash	77,735	5.02	squash	77,735	5.02
sweet potatoes	70,788	4.57	sweet potatoes	70,788	4.57

The resultant 1,591 pounds of food per person would require less than ½-acre per person, or about 6,700 acres to feed today’s year-round population. For scale, picture the State Forest, including the new lands across the West Tisbury Road. The self-sufficiency of this scenario also includes the elimination of at least 214 truckloads of imports, with associated fossil fuel consumption and emissions.

**Requirements to Supply “Vineyard Food Basket”
Compared to Standard Demand**

	Demand	Requirements Per Capita		Requirements for Year-Round Population	
	<i>Pounds per capita</i>	<i>Acres</i>	<i>Truckloads (10-ton)</i>	<i>Acres</i>	<i>Truckloads</i>
Vineyard Food Basket <i>Demand met only by items grown here.</i>	1,591	0.44	0	6,765	0
Standard Demand <i>Local production of 84% of demand. Imports of items not feasibly produced here, amounting to 16% of demand.</i>	1,713	0.75	0.013	12,293	214

**Self-Sufficiency with Population Growth and
Alternative Areas of Land in Food Production
Vineyard Food Basket**

Land in Food Production (Acres)		Land Needed to Supply Needs (Acres to feed year-round population, Vineyard Food Basket, no imports)			
	<i>Acres</i>	<i>Acreage Demand for Existing Population</i>	<i>Acreage Demand for Scenario 1 (No Net Growth)</i>	<i>Acreage Demand for Scenario 2 (Modest Growth)</i>	<i>Acreage Demand for Present Trends</i>
	Acres	6,765	6,765	9,309	11,824
Alternative 1: reduction	636	9%	9%	7%	5%
Alternative 2: existing	935	14%	14%	10%	8%
Alternative 3: increase	2,102	31%	31%	23%	18%
Alternative 4: major increase	3,398	50%	50%	37%	29%
Alternative 5: profound increase	6,765	100%	100%	73%	57%

5. Conclusions

To become more self-sufficient, there are a number of available options, involving basics of supply and demand.

It is time to seriously look at land use practices that continue to take farmland out of food production. The primary focus is to keep what we have. Beyond that, due diligence could result in increasing the acreage devoted to food production. There are also means to increase yield per acre, particularly in the areas of backyard and community gardens, and with greenhouses. Even some less-than-prime land could be put into production, such as by raising beef on stony hillsides.

If Vineyarders transition to more of a Vineyard Food Basket, the Island community could reduce our reliance on imports even more, and maintain better health. The standard American diet includes lots of calories from processed foods, from red meat and from oils and fats. We could eliminate much of the fats and sugars and keep the healthier grains, fruits and vegetables, while contributing household-by-household to agricultural self-sufficiency.

The data indicate that the Vineyard presently produces enough food to meet about 4% of local demand, with enough land in food production to potentially meet 7%. Projecting supply and demand into the future, the most pessimistic estimate would allow us to potentially to meet 3% of demand. The most ambitious realistic estimate would allow us to meet half the demand (It would be possible to meet 100% of demand, but only by adjusting to a "Vineyard Food Basket" and devoting 6,765 acres to production of specified items).

It could be useful that the community select a target for self-sufficiency (such as "20% self-sufficient by 2020") and focus efforts towards meeting that goal. There could be a public campaign using the target as a slogan.

There are many efforts underway on The Vineyard to protect farmland and to promote farming. By shedding light on how self-sufficient the Vineyard is today, and how various strategies could increase self-sufficiency, this study can enrich the discussion of how self-sufficient Vineyarders want to be in coming generations and how to get there.

APPENDIX – DATA

Reported Use of Land by Category and Town

TOWN	Product	Acres
CHILMARK	B	97.5499
CHILMARK	BCLP	53.5848
CHILMARK	C	91.7345
CHILMARK	CFPV	4.1829
CHILMARK	CFV	1.79
CHILMARK	CV	1.9787
CHILMARK	DLV	5.3745
CHILMARK	FV	1.0728
CHILMARK	L	67.8381
CHILMARK	V	0.5896
EDGARTOWN	BCFPV	35.6042
EDGARTOWN	BCLPV	202.492
EDGARTOWN	FV	28.882
EDGARTOWN	V	7.87
OAK BLUFFS	BC	4.852
OAK BLUFFS	BCV	4.5455
OAK BLUFFS	FV	9.2985
OAK BLUFFS	V	5.3313
TISBURY	BCP	17.3471
TISBURY	CFV	5.0201
TISBURY	CLP	1.6917
TISBURY	FV	24.1325
TISBURY	L	8.4021
TISBURY	V	15.6735
WEST TISBURY	B	9.9675
WEST TISBURY	BCFPV	3.2862
WEST TISBURY	BCL	41.894
WEST TISBURY	C	4.5145
WEST TISBURY	CFV	27.3269
WEST TISBURY	CLV	3.6758
WEST TISBURY	CP	4.287
WEST TISBURY	FV	5.4384
WEST TISBURY	L	73.8144
WEST TISBURY	V	64.0208

Product	Acres
B	105.4432
BCD	4.8520
BCDFPV	38.8904
BCDL	95.4788
BCDLPV	202.4920
BCDP	17.3471
BCDV	4.5455
BD	2.0742
BDLV	5.3745
CD	96.2490
CDFPV	4.1829
CDFV	34.1370
CDLP	1.6917
CDLV	3.6758
CDP	4.2870
CDV	1.9787
DL	150.0546
FV	68.8242
V	93.4852
	935.0638

same total as 'in food production'

Key	Description
B	Beef
C	Poultry
D	Dairy
F	Flowers
L	Lamb
H	Honey
P	Pork
V	Produce (veg. & fruit)
Y	Hay
S	Seafood

January 9, 2009	WHAT'S REQUIRED TO MEET FOOD DEMAND IN VARIOUS CATEGORIES					
	based on U.S. Food Market Estimator http://www.ctre.iastate.edu/marketsize/Default.aspx					
	<i>Vineyard production where plausible; otherwise imports (together these would meet the demand)</i>					
	present demand (pounds)	present demand (pounds per capita)	acreage required per capita	10-ton truckloads per capita	acreage required for 15,444	truckloads required for 15,444
total			0.7502	0.013076	11,583	214.3
dairy	4,128,707	267	0.0341	0.000366	558	6.0
dairy - beverage milk demand (pounds milk produced and acreage required/cow)	2,811,822	182	0.0107		175	
dairy case	676,643	43.70	0.0193		316	
cheese	465,725	30.08	0.0177		290	
cottage cheese	40,132	2.59	0.0010		16	
yogurt	170,786	11.03	0.0006		11	
frozen dairy	384,556	24.83	0.0041	0.000000	67	
ice cream	223,442	14.43	0.0024		39	
ice milk	105,962	6.84	0.0011		18	
misc. frozen dairy	55,153	3.56	0.0006		10	
misc. dairy	255,686	16.51	0.0000	0.000366	0	6.2
cheese spread	58,931	3.81	0.0000	0.000183	0	3.1
evaporated milk	100,482	6.49	0.0008		13	
powdered milk (whole)	38,790	2.51	0.0011		18	
processed cheese	57,482	3.71	0.0000	0.000183	0	3.1
fats & sugars	3,762,665	242.99	0.1846	0.003622	3,024	61.0
cane or beet sugar	965,129	62.33	0.0069		113	
butter, marg, etc.	418,500	27.03	0.0220		361	
butter	73,033	4.72	0.0059		96	
cream	170,741	11.03	0.0000		0	
cream cheese	38,925	2.51	0.0009		15	
margarine	70,752	4.57	0.0152		250	

sour cream	65,049	4.2	0.0000		0	
fats & oils	1,193,556	77.08	0.1556	0.000122	2,550	2.1
beef tallow	60,067	0.97	0.0000		0	
lard	25,833	1.67	0.0000		0	
misc. fats & oils	33,211	0.00	0.0000	0.000122	0	2.1
corn oil	689,630	46.68	0.1556		2,550	
shortening	384,814	24.85	0.0000		0	
processed sugars	1,161,386	75		0.003500		58.9
syrops	24,095	1.56	0.0000	0.000000	0	
honey	17,269	1.56	0.0000		0	
misc. syrups	7,209	0.44		0.000020		0.3
fruits	4,163,712	268.89	0.0202	0.006791	331	114.3
berries	183,024	11.82	0.0023	0.000116	38	2.0
blackberries	1,137	0.07	0.0000		0	
blueberries	12,846	0.83	0.0004		6	
cranberries	36,083	2.33	0.0000	0.000116	0	2.0
misc. berries	1,072	0.07	0.0000		1	
raspberries	11,298	0.73	0.0004		6	
strawberries	120,587	7.79	0.0016		26	
melons	427,312	27.60	0.0027	0.000000	44	0.0
cantaloupe	148,216	9.57	0.0013		21	
honeydew	32,807	2.12	0.0003		5	
watermelon	246,289	15.91	0.0011		19	
non-citrus fruits	2,117,292	136.73	0.0152	0.002284	249	38.5
apples	783,018	50.57	0.0054		89	
apricots	14,180	0.92	0.0001		1	
avocadoes	52,547	3.39		0.000183		3.1
bananas	388,453	25.09		0.001160		19.5
cherries	9,058	0.58	0.0001		1	
dates	2,253	0.15		0.000073		1.2
figs	3,410	0.22		0.000011		0.2

grapes	192,673	12.44	0.0058		96	
kiwi	7,151	0.46	0.0000		1	
mangoes	32,501	2.10		0.000105		1.8
misc fruits, frozen	9,058	0.58		0.000029		0.5
olives	11,434	0.74	0.0000		1	
papaya	16,050	1.04		0.000052		0.9
peaches	125,566	8.11	0.0016		26	
pears	86,650	5.60	0.0016		26	
pineapple				0.000671		11.3
plums (beach plum)	23,858	1.54	0.0000		0	
prunes (dry wt.)	6,532	0.42	0.0001		2	
raisins (raisin grapes)	113,450	7.33	0.0004		7	
<i>citrus fruits</i>	1,436,083	92.74	0.0000	0.004390	0	73.9
grains	2,986,189	192.84	0.0816	0.000977	1,337	16.4
whole grains	402,104	25.97	0.0317	0.000977	519	16.4
barley	10,300	0.67	0.0199		327	
oats	71,522	4.62	0.0117		192	
rice	320,282	20.68	0.0000	0.000977	0	16.4
grain meals	2,584,085	166.88	0.0499	0.000000	818	0.0
whole wheat flour	2,090,113	134.98	0.0468		766	0.0
corn grits	131,623	8.50	0.0006		9	0.0
corn meal	294,215	19.00	0.0019		31	0.0
corn starch	68,134	4.40	0.0007		11	0.0
meats & nuts	5,059,567	326.74	0.3888	0.000106	6,371	1.8
eggs	507,324	32.76	0.0076		124	0.0
fish	255,601	119.24	0.0000	0.000031	0	0.5
fish	105,336	49.75	0.0000		0	0.0
canned fish	3,727	0.24		0.000012		0.2
salmon	2,899	0.19		0.000009		0.2
sardines	3,002	0.19		0.000010		0.2
shellfish	96,226	6.21	0.0000		0	0.0

tuna (canned)	44,412	2.87		0.000143		2.4
poultry	1,839,263	118.78	0.0157	0.000000	257	0.0
chicken	1,578,020	101.91	0.0157		257	0.0
turkey	261,243	16.87	0.0000		0	0.0
nuts	152,771	9.87	0.0000	0.000049	0	0.8
red meat	2,454,872	158.53	0.3656	0.000026	5,990	0.4
beef	1,452,267	93.79	0.3115		5,104	0.0
lamb	18,354	1.19	0.0030		49	0.0
pork	976,228	63.04	0.0511		838	0.0
veal	8,023	0.52	0.0000	0.000026	0	0.4
vegetables	6,280,613	405.59	0.0410	0.001215	672	20.4
green vegetables	836,947	54.05	0.0097	0.000324	159	5.4
artichokes	25,154	1.62		0.000081		1.4
asparagus	21,808	1.41	0.0010		16	0.0
bell peppers	108,480	7.01	0.0004		6	0.0
broccoli	137,081	8.85	0.0030		48	0.0
brussels sprouts	4,342	0.28	0.0001		2	0.0
cabbage	126,844	8.19	0.0003		4	0.0
celery	93,953	6.07	0.0000	0.000303	0	5.1
cucumbers	98,070	6.33	0.0007		11	0.0
green peas	44,054	2.84	0.0008		13	0.0
okra	6,219	0.40	0.0000	0.000020	0	0.3
pickles	48,863	3.16	0.0003		6	0.0
snap beans	122,078	7.88	0.0032		52	0.0
leafy vegetables	610,766	39.44	0.0057	0.000000	94	0.0
collard greens	8,170	0.53		0.000026		0.4
escarole	3,762	0.24	0.0001		2	0.0
kale	5,112	0.33	0.0001		2	0.0
lettuce (head)	312,256	20.17	0.0028		45	0.0
lettuce (leaf)	232,011	14.98	0.0014		23	0.0
mustard greens	5,891	0.38	0.0002		3	0.0

spinach	37,868	2.45	0.0010		17	0.0
turnip greens	5,696	0.37	0.0002		3	0.0
misc. vegetables	753,558	48.66	0.0097	0.000000	159	0.0
chili peppers	98,552	6.36	0.0003		5	0.0
dry edible beans	98,903	6.39	0.0061		101	0.0
dry peas & lentils	11,614	0.75	0.0007		12	0.0
garlic	43,872	2.83	0.0002		4	0.0
misc veg (<i>summer squash</i>)	85,925	5.55	0.0005		8	0.0
mushrooms	62,202	4.02	0.0000		0	0.0
onions	333,791	21.56	0.0018		29	0.0
sauerkraut	18,699	1.21	0.0000		1	0.0
red vegetables	1,330,092	85.90	0.0068	0.000000	111	0.0
eggplant	14,870	0.96	0.0001		1	0.0
radishes	8,144	0.53	0.0000		0	0.0
tomatoes	1,307,077	84.41	0.0067		110	0.0
starchy vegetables	2,348,091	151.64	0.0069	0.000891	114	15.0
cauliflower	32,994	2.13	0.0007		12	0.0
lima beans	4,929	0.32	0.0003		5	0.0
potato chips	292,393	18.88	0.0000	0.000891	0	15.0
potatoes	1,609,866	103.96	0.0035		58	0.0
sweet corn	407,908	26.34	0.0024		39	0.0
yellow vegetables	401,159	25.91	0.0022	0.000000	36	0.0
carrots	178,411	11.52	0.0010		16	0.0
pumpkins	74,226	4.79	0.0004		6	0.0
squash	77,735	5.02	0.0003		6	0.0
sweet potatoes	70,788	4.57	0.0005		8	0.0

ACREAGE REQUIRED TO MEET FOOD DEMAND IN VARIOUS CATEGORIES						
	VINEYARD FOOD BASKET (localized demand, with no imports) January 13,2009					
	pounds per unit per year	acres per unit	acres per pound	present demand (pounds)	present demand (pounds per capita)	acreage required per capita
total				24,623,290		0.4380
dairy				4,128,707	267	0.0385
dairy - beverage milk demand	17,000	1	0.000059	2,811,822	182	0.0107
dairy case				793,056	51.21	0.0237
cheese	1,700	1	0.000588	582138	37.59	0.0221
cottage cheese	2,720	1	0.000368	40,132	2.59	0.0010
yogurt	17,000	1	0.000059	170,786	11.03	0.0006
frozen dairy				384,556	24.83	0.0041
ice cream	6,071	1	0.000165	223,442	14.43	0.0024
ice milk	6,071	1	0.000165	105,962	6.84	0.0011
misc. frozen dairy	6,071	1	0.000165	55,153	3.56	0.0006
misc. dairy				0	0.00	0.0000
cheese spread				0	0.00	0.0000
evaporated milk	8,095			0	0.00	0.0000
powdered milk (whole)	2,297			0	0.00	0.0000
processed cheese				0	0.00	0.0000
fats & sugars				2,004,502	129.45	0.0676
cane or beet sugar	9,000	1	0.000111	965,129	62.33	0.0069
butter, marg, etc.				418,500	27.03	0.0220
butter	802	1	0.001247	73,033	4.72	0.0059
cream	0	1	0.000000	170,741	11.03	0.0000
cream cheese	2,720	1	0.000368	38,925	2.51	0.0009
margarine	300	1	0.003333	70,752	4.57	0.0152
sour cream	0	1	0.000000	65,049	4.2	0.0000
fats & oils				596,778	38.54	0.0387
beef tallow	0		0.000000	6,458	0.42	0.0000

lard	0		0.000000	25,833	1.67	0.0000
misc. fats & oils				0	0.00	0.0000
salad oil (corn oil)	300	1	0.003333	179,673	11.60	0.0387
shortening	0	0	0.000000	384,814	24.85	0.0000
syrops	0	0	0.000000	24,095	1.56	0.0000
honey	0	0	0.000000	24,095	1.56	0.0000
fruits				4,163,712	268.89	0.0460
berries				274,536	17.73	0.0043
blackberries	2,000		0.000000	1,137	0.07	0.0000
blueberries	2,300	1	0.000435	33,400	2.16	0.0009
cranberries	0	0	0.000000	0	0.00	0.0000
misc. berries	2,000	1	0.000500	1,072	0.07	0.0000
raspberries	2,000	1	0.000500	11,298	0.73	0.0004
strawberries	5,000	1	0.000200	227,629	14.70	0.0029
melons				427,312	27.60	0.0027
cantaloupe	7,600	1	0.000132	148,216	9.57	0.0013
honeydew	7,600	1	0.000132	32,807	2.12	0.0003
watermelon	13,900	1	0.000072	246,289	15.91	0.0011
non-citrus fruits				3,461,863	223.56	0.0391
apples	9,324	1	0.000107	2,434,616	157.22	0.0169
apricots	12,240	1	0.000082	14,180	0.92	0.0001
cherries	9,700	1	0.000103	9,058	0.58	0.0001
grapes	2,134	1	0.000469	578,019	37.33	0.0175
kiwi	14,000	1	0.000071	7,151	0.46	0.0000
peaches	5,040	1	0.000198	188,349	12.16	0.0024
pears	3,500	1	0.000286	86,650	5.60	0.0016
plums (beach plum)	0	0	0.000000	23,858	1.54	0.0000
prunes (dry wt.)	3,700	1	0.000270	6,532	0.42	0.0001
raisins (raisin grapes)	18,060	1	0.000055	113,450	7.33	0.0004
citrus fruits				0	0.00	0.0000
grains				2,986,189	192.84	0.0735
whole grains				402,104	25.97	0.0317
barley	33.6	1	0.029762	10,300	0.67	0.0199

oats	394	1	0.002538	71,522	4.62	0.0117
rice	0	0	0.000000	320,282	20.68	0.0000
grain meals				2,584,085	166.88	0.0419
whole wheat flour	2,886	1	0.000347	1,567,585	101.23	0.0351
corn grits	15,000	1	0.000067	131,623	8.50	0.0006
corn meal	10,000	1	0.000100	748,609	48.34	0.0048
corn starch	6,400	1	0.000156	136,268	8.80	0.0014
meats & nuts				5,059,567	326.74	0.1628
eggs	34.6	0.008	0.000231	1,014,648	65.52	0.0152
fish				1,991,083	128.58	0.0000
fish				820,547	52.99	0.0000
shellfish				1,076,007	69.49	0.0000
poultry	26	0.004	0.000154	1,839,263	118.78	0.0157
chicken	26	0.004	0.000154	1,578,020	101.91	0.0157
turkey	0	0	0.000000	261,243	16.87	0.0000
nuts				0	0.00	0.0000
red meat				1,365,672	88.19	0.1320
beef	277	0.92	0.003321	363,067	23.45	0.0779
lamb	30	0.075	0.002500	18,354	1.19	0.0030
pork	185	0.15	0.000811	976,228	63.04	0.0511
veal				0	0.00	0.0000
vegetables				6,280,613	405.59	0.0495
green vegetables				836,947	54.05	0.0130
asparagus	1,400	1	0.000714	21,808	1.41	0.0010
bell peppers	17,800	1	0.000056	27,120	1.75	0.0001
broccoli	3,000	1	0.000333	270,212	17.45	0.0058
brussels sprouts	3,000	1	0.000333	4,342	0.28	0.0001
cabbage	32,000	1	0.000031	126,844	8.19	0.0003
celery (hothouse)	0	0	0.000000	939	0.06	0.0000
cucumbers	9,300	1	0.000108	147,105	9.50	0.0010
green peas	3,500	1	0.000286	66,081	4.27	0.0012
okra (hothouse)	0	0	0.000000	1,555	0.10	0.0000
pickles	9,300	1	0.000108	48,863	3.16	0.0003

snap beans	2,500	1	0.000400	122,078	7.88	0.0032
leafy vegetables				610,766	39.44	0.0063
escarole	2,400	1	0.000417	3,762	0.24	0.0001
kale	2,400	1	0.000417	20,448	1.32	0.0006
lettuce (head)	7,300	1	0.000137	159,906	10.33	0.0014
lettuce (leaf)	10,800	1	0.000093	348,017	22.47	0.0021
mustard greens	2,400	1	0.000417	1,473	0.10	0.0000
spinach	2,400	1	0.000417	75,736	4.89	0.0020
turnip greens	2,400	1	0.000417	1,424	0.09	0.0000
misc. vegetables				753,558	48.66	0.0137
chili peppers	20,300	1	0.000049	49,276	3.18	0.0002
dry edible beans	1,040	1	0.000962	166,878	10.78	0.0104
dry peas & lentils	1,040	1	0.000962	11,614	0.75	0.0007
garlic	12,000	1	0.000083	43,872	2.83	0.0002
misc veg (<i>summer squash</i>)	12,000	1	0.000083	85,925	5.55	0.0005
mushrooms	0	0	0.000000	62,202	4.02	0.0000
onions	12,000	1	0.000083	333,791	21.56	0.0018
sauerkraut	32,000	1	0.000031	0	0.00	0.0000
red vegetables				1,330,092	85.90	0.0068
eggplant	13,900	1	0.000072	14,870	0.96	0.0001
radishes	0	0	0.000000	8,144	0.53	0.0000
tomatoes	12,600	1	0.000079	1,307,077	84.41	0.0067
starchy vegetables				2,348,091	151.64	0.0076
cauliflower	3,000	1	0.000333	32,994	2.13	0.0007
lima beans	1,040	1	0.000962	4,929	0.32	0.0003
<i>potato chips</i>		0	0.000000	0	0.00	0.0000
potatoes	29,500	1	0.000034	1,902,259	122.85	0.0042
sweet corn	11,000	1	0.000091	407,908	26.34	0.0024
yellow vegetables				401,159	25.91	0.0022
carrots	12,000	1	0.000083	178,411	11.52	0.0010
pumpkins	12,900	1	0.000078	74,226	4.79	0.0004
squash	14,500	1	0.000069	77,735	5.02	0.0003
sweet potatoes	9,000	1	0.000111	70,788	4.57	0.0005

APPENDIX II – ACKNOWLEDGEMENTS AND REFERENCES

Jo-Ann Taylor, Principal Author
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