# Nutrient Status of Organic Vegetable Fields in Northeast US

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## Introduction

The fertility of organic vegetable fields often is maintained by additions of organic amendments. Maintaining optimum levels of nutrients, especially N and P, is difficult when organic amendments are the primary source of nutrients. The objective of this study was to survey the fertility status of organic vegetable fields in Northeast US.

## Methods and Materials

Soil samples were collected from 153 organic vegetable fields in 5 states: Maine, New Hampshire, Massachusetts, Connecticut and New Jersey. One set of samples was collected in May, June or July from the surface foot of soil for soil nitrate. We used these samples to document the nitrogen fertility of the soil. Another set of samples was collected in October or November from the surface 6-inch layer of soil for pH and macronutrient (Ca, Mg, P, and K) fertility. We collected samples from 31 farms. We did not randomly choose the farms. Farms were chosen to provide a distribution of factors thought to affect fertility, such as length of time in organic production, and type of compost or manure used to maintain fertility. The modified-Morgan extract was used to categorize the macronutrient fertility of the soil. Soil pH was measured in a 1:1 soil:water mix. Soil nitrate was extracted using 0.01 *M* $CaCl_2$ and measured using the cadmium reduction method.

We collected information about the history of the field management from each farmer. The type of information collected included: type of nutrient applications, frequency of nutrient applications, tillage, cover crop use and cropping pattern, etc.

## Results and Discussion

Selected information about the management of the fields is shown in Table 1. Most of the farms use compost and some use manure. All of the farms use winter cover crops (data not shown) and about half of the farms use season-long cover crops. These practices reduce erosion and nutrient losses from fields.

Table 1. Selected management information about the fields and farms[1]

| | % of fields | % of farms |
|---|---|---|
| Use compost or manure | 87 | 17 |
| Don't use compost or manure | 13 | 83 |
| | | |
| Type of raw manure used | | |
| Don't use | 73 | 75 |
| Chicken manure | 9 | 8 |
| Cow manure | 11 | 12 |
| Poultry ranging in fields | 8 | 8 |
| | | |
| Type of material used to make compost[2] | | |
| Don't use | 27 | 33 |
| Chicken manure | 10 | 17 |
| Dairy manure | 11 | 12 |
| Horse manure | 16 | 17 |
| Leaves | 7 | 8 |
| Mushroom soil | 23 | 17 |
| Don't know material | 5 | 4 |
| | | |
| Use of season-long cover crops | | |
| Use | 46 | 52 |
| Don't use | 54 | 48 |
| | | |
| Type of tillage used | | |
| Rotovator or rototiller | 47 | 48 |
| Other tillage (plow disk, etc.) | 53 | 52 |

[1] Based on a total of 128 fields and 25 farms.
[2] Primary type of material used. Most compost made from more than one material.

A summary of the soil test categories is shown in Table 2. Heavy rainfall shortly before planting probably reduced soil nitrate concentrations. Spring rainfall is known to affect PSNT values (Balkcom et al., 2003, JEQ 32:1015-1024). For this reason, the PSNT categories may not accurately represent the nitrogen fertility of the fields.

The high percentage of fields with P values above optimum are mostly due to long-term applications of manure, manure-based compost or mushroom soil. The fields testing below optimum for P may not show P deficiencies due to the more efficient cycling of P in organic vegetable fields.

The high percentage of fields with Ca and Mg values above optimum are mostly due to long-term applications of poultry manure, poultry manure-based compost or mushroom soil.

Table 2. Summary of soil test values on 153 organic vegetable fields in 2002.

| Nutrient | % below optimum | % optimum | % above optimum |
|---|---|---|---|
| PSNT | 58 | 14 | 28 |
| P | 27 | 12 | 61 |
| Ca | 19 | 11 | 70 |
| Mg | 10 | 12 | 78 |
| K | 32 | 22 | 46 |
| pH | 3 | 65 | 31 |

Categories based on modified-Morgan soil test critical concentrations
pH below opt=<6.0; above=>7.0

**Conclusions**

Organic vegetable growers could improve the sustainability of their farms by developing and implementing nutrient management plans. Implementation of nutrient management plans should minimize over and under application of nutrients and improve the profitability of organic vegetable farms.