Sweet Potato Crop Profile for New Jersey

Production Facts (1)

- **State rank**: 8th
- **New Jersey's contribution to total US production:** 0.87% in 2003
- **Typical per acre yields:** 100 to 200 cwt per acre
- **Annual production costs:** roughly $1500 to $2000 per acre – depends upon the amount of irrigation
- **Percent of crop for processing and fresh market**: 100% fresh market; either retail at farm markets, wholesale to grocery store chains, or retail to hunters as deer bait

Production Regions

Southern New Jersey (area south of Trenton)
Most of the sweet potato acreage occurs in the southern half of New Jersey. The soils in the south are coastal plain, generally light soils ranging from sand to sandy loams, but areas of heavier clay and silt loam soil do exist. Elevations are low with most of the area less than 200 feet in elevation. The warmest, seasonal temperatures occur in the extreme southern part of the state with the Salem County area being the warmest.

Northern New Jersey
The northern soils are Piedmont and Appalachian types, heavy silt loams and shaley soils, respectively. Elevations are generally above 200 feet and reach 1800 feet at High Point in extreme northern New Jersey. The topography is more rugged than southern New Jersey with alternating ridges and valleys running approximately from the southwest to the northeast, ending rather abruptly at the New Jersey - New York state line. The ridges extend southwesterly into eastern Pennsylvania. These ridges are important in influencing both weather conditions and pest infestations for the north.

Cultural Practices

Most sweet potatoes (*Ipomoea batatas)* grown in New Jersey are sold as retail in farm markets or wholesale to out-of-state buyers. Use of sweet potatoes as deer bait is becoming an important source of income for some sweet potato growers in the State.

Sweet potato fields are prepared in the spring in April and May. Depending upon the presence of white grubs, the fields may be fumigated or not.

Most growers generally do not fumigate while a very few always fumigate. Otherwise, pre-plant applications of herbicide and insecticide are made in early to mid-May. Vine cuttings called slips are planted in the spring in mid to late May to mid June. Two or more nodes of the cutting are covered by soil in low ridges.

Most growers obtain their slips for transplanting from other farms either in-state or out-of-state. At least one grower in New Jersey is known to raise his own transplants.

Once established, the plants produce vines that will eventually cover the ground between rows – hence producing row closure. Row closure occurs in late July or early August. Each plant will produce from 1 to 6 or so marketable roots which grow more or less vertically in the soil beneath the plant crown.

There are many varieties of sweet potatoes. The more common varieties grown in New Jersey are: Beauregard, O'Henry, Hernandez, and Jersey White. Beauregard and Hernandez are orange-fleshed varieties and O'Henry and Jersey White are white-fleshed varieties.

In general, pesticide use in sweet potato is minimal compared to other vegetable crops. Typically most growers do not use fumigants. But, New Jersey sweet potato growers apply a pre-plant incorporated herbicide, one post-plant pre-emergent herbicide, and one to two insecticide treatments during the growing season. Fungicides are rarely, if ever, used as there is no significant foliar disease of sweet potato in New Jersey.

Sweet potato roots are first graded in the field and later sorted on a conveyor belt. Culls, roots removed because of small size, deformed or damaged by insects, are boxed separately and kept for sale as deer bait.

Insect and Mite Control in New Jersey Sweet Potato

Oriental beetle – *Exomola orientalis (Scarabaeidae).* The oriental beetle has emerged as probably the most significant insect pest of sweet potatoes in New Jersey. The oriental beetle is an invasive species that arrived in the United States in 1920 and has spread along the Atlantic Coast and inland as far as Ohio, Kentucky and Knoxville, Tennessee. It is a member of the family Scarabeaidae which includes Japanese beetle, rose chafers, and May and June beetles.

Typically a turf pest, oriental beetle has developed a broad host range including blueberries, ornamentals, strawberries, and field corn as well as turf and sweet potatoes. Estimates of sweet potato roots having feeding damage have run from 5% to 30%. Anecdotal information indicates that crop losses as high as 90% may have occurred in New Jersey.

There is one oriental beetle generation a year with the adults emerging from the in-ground pupal stage in mid-June to mid-August. Peak emergence occurs quickly with the highest numbers of beetles present by the end of June. Pheromone trap catches of males rapidly taper off into August. The adults are highly variable in color ranging from light brown-grey to black. Lighter colored individuals usually have two longitudinal brown strips on the prothorax. Males are smaller than females and can be differentiated most easily by the enlarged antennal club of the male. The adults either feed very little on foliage or not at all.

Females lay eggs beginning in late June. First instar white grubs can be found in the soil by the end of July at a depth of 6 to 8 inches. The white grubs feed initially on the root hairs and as they grow begin feeding on larger roots. There are 3 instars and the last instar is the damaging stage on the sweet potato roots with this damage occurring from mid August until the sweet potatoes are harvested, sometimes to mid October. The 3rd instar overwinters and briefly resumes feeding in the spring when crops like field corn may be damaged. The white grubs go to the pupal stage in late May and early June.

Currently it is not clear which fields may harbor economic populations of oriental beetle. Lack of information about the beetles' biology makes it difficult to predict where problems will occur.

Adult male oriental beetles can be readily trapped and monitored using pheromone traps. However, counts from these trap numbers can be deceiving especially when trying to estimate populations within sweet potato fields. Experiments have shown that males will fly at least 150 feet to reach the pheromone. Trapping results in sweet potato fields suggest that they are capable of coming much greater distances. If that is the case then pheromone trapping may over estimate the abundance of the beetles in fields. Pheromone trap catches of 12,000 or more beetles for the growing season are not unusual.

Oriental beetle at a pheromone trap in sweet potatoes.

Both sexes can be trapped in blacklight traps implying that females do fly though it is not clear what the number of individuals caught means.

The behavior and biology of the female beetle is conjectural at best. In sweet potatoes it is not known how long the female remains above ground before burrowing into the soil to lay eggs. Nor is it known how many clutches of eggs are laid or whether the beetle returns to the surface or remains underground while laying eggs. It is also

unknown how far the female moves from her pupal cell. This is critical information because if the females travel only a short distance of 10 feet, for example, then fields not infested by overwintering white grubs are likely not to have severe damage in the following planting of sweet potatoes.

It is difficult to use grub information from other crops because of the marked differences in crop production between perennial and annual crops and the differences in the biology of the beetle between crops. For example, the white grubs reside in large numbers, up to 60 per square foot in the top soil in turf, with relatively little harm to the turf; but in sweet potatoes grubs are typically found 6 to 8 inches deep AND just one white grub per cubic foot of soil is sufficient to cause about 10% to 15% damaged roots.

At present, New Jersey sweet potato growers are urged to watch the soil as the ground is worked in the spring looking for white grubs. If large numbers of grubs are present then the field should be fumigated prior to planting. However, this is a stop gap measure as damage to the new crop can still occur from beetles reinvading the field after fumigation.

Threshold – not established.

Table 1: Calendar of sweet potato production and oriental beetle development

April and May	Farmers work the soil in preparation of planting sweet potato slips. Oriental beetle 3rd instars present in the soil actively feeding as soon as the soil is warm enough.
Late May	Farmers plant potato slips. White grubs begin entering the non-feeding pupal stage.
June	Farmers cultivate slips and form ridges for potatoes to grow on. Nearly all white grubs begin the month in the pupal stage and adult emergence begins in mid-June.
July	Farmers continue to cultivate and fertilize plants. Vines begin to run and by late July most of the ground is covered. Adults continue to emerge. Mating occurs and females begin laying eggs. First larvae are found by late July.

Table 1 (con't)

August	Row closure occurs. By late August the first of the early varieties are being harvested. Still a few adults emerging but most have emerged and have begun to die off. White grubs grow rapidly into 2nd and 3rd instars. First economic root damage begins to appear by late August.
September and October	Harvesting continues as the different varieties are ready. All or nearly all larvae are now in the 3rd instar. Feeding on potato roots continues until soil cools driving the white grubs deeper into the soil to overwinter.

White grubs (in general). Several other species of scarab beetles occur in sweet potato production areas and may contribute to the typical grub damage found on the potato roots. Larvae of Japanese beetles, May and June beetles, rose chafers, and Asiatic beetles may also be found in potato fields although these species, like oriental beetle tend to be grass root feeders. Larvae of these different species can be identified by using the pattern of peg-like hairs on the raster, the last abdominal segment.

Threshold – not established.

Black cutworm – *Agrotis ipsilon (Noctuidae)*. Cutworms are secondary pests of sweet potato in New Jersey that will feed on potato roots. The caterpillars feed near the upper end of the potato root often excavating a large cavity. The percent of potatoes with feeding damage is usually low, 5% or less, however damage levels fluctuate year to year.

Threshold **–** not established.

Wireworms – primarily *Melanotus communis* (?) *(Elateridae)*. Wireworms are the larval stages of click beetles and are frequent crop pests. Wireworm feeding injury tends to be short holes more or less straight into the potato root. *Melanotus* wireworms, which are the predominant species in the sweet potato production areas, may exist in the soil for 5 or 6 years although other species have one or three year life cycles. Damage levels tend to be low, 5% or less.

Threshold – not established.

Carrot beetle – *Bothynis gibbosus (Scarabaeidae).* The carrot beetle is a robust beetle, brown to reddish brown about ½ inch long. It is larger and thicker than the oriental beetle and unlike the oriental beetle, the adults of the carrot beetle are the primary cause of damage. So far it has been found in sweet potatoes only in close association with common ragweed. In late summer common ragweed plants may grow to 4 or 5 feet tall attracting carrot beetles which congregate on the roots of the ragweed, from 1 to several individuals. The beetles feed on the roots of the ragweed but will also feed on sweet potato roots that are within 9 inches of the ragweed roots. The feeding damage on the potatoes appears as shallow, saucer shaped depressions. Elimination of ragweed will prevent this damage from occurring.

Threshold – not established.

Sweet potato flea beetle – *Chaetocnema confinis (Chrysomelidae)*. This insect is a minor pest in New Jersey. Pockets of damage may be found but damage is usually not wide spread. The damage is caused by the larvae of the flea beetle which feeds as it tunnels in the potato root just beneath the skin. The tunnel appears as a wandering line across the surface of the potato.

Threshold – not established.

Corn Earworm – *Helicoverpa zea (Noctuidae).* The corn earworm caterpillar is not usually a pest of sweet potatoes but may feed on the foliage especially when large populations of the migratory pest move into southern New Jersey. If the sweet potatoes are harvested under these conditions the roots may be subject to feeding damage. Feeding damage occurs when the roots are dug up and lay on the soil surface waiting for work crews to box up the roots. The longer the roots lay on the ground the more likely the damage is to occur.

Threshold – not established.

Tortoise beetle - *Charidotella (=Metriona) bicolor*(?) *(Chrysomelidae)* This insect is a member of the leaf beetle family, Chrysomelidae. It is a minor pest that feeds on sweet potato leaves as both larvae and adults. Adults are about ¼ to ⅜ inches long and are brightly colored, iridescent green or gold. If the beetle occurs in sufficient numbers to cause significant defoliation prior to root sizing, yield would be reduced and insecticide use warranted. (2)

Threshold – not established.

Sweet potato weevil – *Cylas formicarius (Curculionidae)*. This is the most important insect pest of sweet potatoes in the Southern United States, but it does not occur in New Jersey.

Table 2: Growers' Typical Use of Chemical Controls - Insecticides

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General Use Insecticides

None

Restricted Use Insecticides

Telone II	Only one surveyed grower routinely fumigates his fields prior to planting
Lorsban	Used as a pre-plant soil applied insecticide for controlling wireworms and white grubs (most growers surveyed do this)
Thionex	Used as a foliar spray for controlling tortoise beetles (only one grower surveyed has had difficulty with tortoise beetles)
Sevin	Used as a foliar spray to reduce the number of oriental beetle adults (only one surveyed grower does this)

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Table 3: Insecticides listed in New Jersey potato pesticide use including white and sweet, 2000* (5)

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Sevin – 477 acres
Furadan – 60 acres
Lorsban – 277 acres
Mocap – 60 acres
Admire – 128 acres
Provado – 66 acres
Imidan – 1 acre
Piperonyl butoxide – 2 acres
Spintor – 45 acres
Vydate – 8 acres

** Pesticide use for white Irish potatoes and sweet potatoes were reported together in the survey taken by the New Jersey Department of Environmental Protection The following list is our best estimate to have been used on sweet potatoes in 2000.*

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Table 4: Current (2005) Pesticide Recommendations for Insect Pests, Product Rates Per Acre and Use (G=general, R=restricted) (4)

Wireworms, flea beetle larvae, and white grubs		
Chlorpyrifos (Lorsban)		
4E – 4 pts/A		R
15G – 13.5 lb/A		R
Ethoprop (Mocap)		
6EC – 2-2.67 qt/A		R
Cutworms		
Sevin bait	5 to 10 lbs of carbaryl bait/A	G
Flea beetle adults		
Sevin 1.25-1.5 lb 80S/A		R
Tortoise beetles		
Sevin 1.25-1.5 lb 80S/A		R

Chemical Use in IPM Programs
Because of the limited registered materials and light pest pressure there is no attempt to recommend a designed program using either least toxic or beneficial friendly insecticides.

Chemical Use in Resistance Management
Although growers are always urged to rotate chemical classes in their spray programs the paucity of registered materials makes resistance management difficult.

Alternatives
None

Cultural Control Practices
Crop rotation is important especially when damage from oriental beetle is encountered.

Biological Controls
None.

Post Harvest Control Practices
Pulled roots are left on the ground and work crews usually remove the roots almost immediately after pulling. Roots left in the field overnight are subject to increased damage from corn earworm, mice and deer.

Weed Pests in New Jersey Sweet Potatoes

Winter Annuals
Winter annuals are generally not a problem for sweet potato growers.

Summer Annuals
There are no specific weed problems except for two species: common ragweed and wild mustard. Common ragweed roots are attractive to the carrot beetle which feeds on them and sweet potato roots in close proximity to the ragweed. One grower complained of an inability to effectively control wild mustard with herbicides resorting to hand labor for removal.

Perennials
All perennials are potential problems for sweet potato production. Tillage practices and field rotation are the best control methods for perennials.

Table 5: Growers' Typical Use of Chemical Controls - Herbicides

General Use Herbicides	
None.	
Restricted Use Herbicides	
Devrinol	nearly all surveyed growers used Devrinol as a pre-transplant pre-emergent herbicide
Command	all surveyed growers used Command as a pre-emergent herbicide

Table 6: Herbicides listed in New Jersey potato pesticide use including white and sweet, 2000*(5)

Command – 235 acres
Fusilade – 5 acres
Devrinol – 325 acres
Poast – 42 acres

** Pesticide use for white Irish potatoes and sweet potatoes were reported together in the survey taken by the New Jersey Department of Environmental Protection The above list is our best estimate of herbicides to have been used on sweet potatoes in 2000.*

Table 7: Current (2005) Pesticide Recommendations for Weed Pests, Product Rates Per Acre and Use (G=general, R=restricted) (4)

Pre-emergents for control of annual grasses and certain broadleaves	
Clomazone (Command 3 ME)	0.5-1 lb/A
DCPA (Dacthal 6F)	6-10.5 lb/A
Napropamide (Devrinol 50DF)	1-2 lb/A
Post-emergents for grass control	
Fluazifop (Fusilade DX 2E)	0.125-0.188 lb/A
Clethodim (Select 2EC)	0.094-0.125 lb/A
Sethoxydim (Poast 1.5EC)	0.2-0.5 lb/A

Chemical Use in IPM Programs
Given the general nature of weed problems for New Jersey sweet potato, the current herbicide selections fit well with an IPM approach.

Chemical Use in Resistance Management
While farmers are urged to rotate classes of herbicides for resistance management, most likely the farmers have continued using the same materials.

Alternatives
None aside from cultivation.

Cultural Control Practices
Crop or field rotation.

Biological Controls
None.

Post Harvest Control Practices
None.

Disease Pests of Sweet Potato in New Jersey

There are two diseases that are potentially economic problems for sweet potatoes in New Jersey, but by and large, sweet potatoes are free of diseases.

Scurf (*Monilochaetes infuscans*). Scurf is a fungal disease of sweet potato transmitted from infected mother roots to transplants and then to the field. Scurf may persist in soils for several years. It normally affects the skin and outer layers of the storage root, but not the underlying flesh. Dark brown to black spots develop over the surface of the root throughout the growing season. The damage is mainly cosmetic, but scurf can increase water loss in storage. There are no above-ground symptoms.

Controls for scurf in New Jersey sweet potato include:

- using scurf-free seed roots,
- treating seed roots with an effective fungicide,
- bedding seed roots in soil free of the pathogen,
- cutting transplants at least 1 inch above the soil line,
- dipping slips in a fungicide if roots are infected,
- using a 3- to 4-year rotation.

Present levels of cultivar resistance are not sufficient for control. (3)

Soil rot or pox (*Streptomyces ipomoea*). Soil pox is a bacterial disease common in the major sweet potato production areas of the United States and Japan. Pox has become a serious problem in Eastern North Carolina within the last ten years, with more severe symptoms developing during seasons with hot, dry conditions. This is a minor disease in New Jersey.

Symptoms include a stunted feeder root system, black crusty lesions or 'scabs' (usually less than 1 inch in diameter) on roots and underground stems, and early girdling of storage roots resulting in misshapen, often dumbbell shaped roots. Infected plants are stunted, bronzed and chlorotic and may wilt or flower prematurely. Conditions leading to more serious disease loss include light, sandy soils, a pH greater than 5.2 and relatively dry soil. If periods of dry weather occur before roots start to form, yields are reduced, but few root lesions form. If the drought occurs after storage root initiation, there will be more lesions on the roots. Irrigation during dry periods may reduce disease severity but has not been found to increase yields.

Pox is very persistent, and heavily infested fields should not be used to produce sweet potatoes unless there is a fairly high level of pox resistance in the cultivar being grown. Rotation out of sweet potatoes for several years will reduce soil pox in the first year after sweet potatoes are reintroduced into the field, but not in subsequent years. In lightly infested fields with low pH, fumigation may be sufficiently effective to produce a crop profitably. Resistant cultivars are listed in the sweet potato chapter. Soil pox spreads on

infected soil or planting material, making it critical to sanitize planting and harvesting equipment between fields. (3)

Table 8: Growers' Typical Use of Chemical Controls - Fungicides

General Use Fungicides
None.
Restricted Use Fungicides
None.

Table 9: Fungicides listed in New Jersey potato pesticide use including white and sweet, 2000*(5)

Quadris - 8 acres
Bravo - 21 acres
Champ - 5 acres
Dithane - 143 acres
Tops Mz – 94 acres
Thiram – 60 acres

*** Pesticide use for white Irish potatoes and sweet potatoes were reported together in the survey taken by the New Jersey Department of Environmental Protection The list above is our best estimate to have been used on sweet potatoes in 2000. The acreage given here should be especially suspect since there are no economically important foliar diseases affecting sweet potatoes.*

Table 9: Current (2005) Pesticide Recommendations for Disease Pests, Product Rates Per Acre and Use (G=general, R=restricted) (4)

Seed root dipping		
Thiobendazole (Mertect 340 F)	8 oz./7.5 gal	G
Slip dipping at planting		
Dicloran (Botran 75 WP)	1 lb/10 gal	G
At harvest root dipping		
Dicloran (Botran 75 WP)	1 lb/100 gal	G

Chemical Use in IPM Programs
None.

Chemical Use in Resistance Management
None.

Alternatives
None.

Cultural Control Practices
Growers are urged to use disease free seed roots for producing slip transplants. To keep disease spread to a minimum, vines to be used for slips should be cut above the soil line to prevent contamination with the scurf disease causing organism.

Maintenance of a moderately acid soil pH, 4.8 to 5.2 will assist in control of pox.

Biological Controls
None.

Post Harvest Control Practices
None.

Nematode Pests

No specific nematode species has been identified as a crop-limiting pest of sweet potatoes in New Jersey. While there are areas of the State infested with sting nematode which probably has the greatest potential of being a pest, there is no significant acreage of sweet potatoes grown in those areas.

Vertebrate Pests

White-Tailed Deer - *Odocoileus virginianus* (Cervidae) – Deer can be serious pests especially for smaller sweet potato farmers where their entire planting may be affected. Deer cause damage mostly by grazing on the leaves but will also feed on exposed roots or even dig roots up. Grazing reduces top growth and limits the size of the developing roots. In smaller fields deer may consume all of the leaves leaving the grower with little or no yield. In larger plantings deer may graze along field borders adjacent to woodlots however no part of any field is safe from their feeding.

No pesticides or repellants have proven worthwhile in deterring deer damage in the long term.

Threshold – none established.

Rodents - (meadow voles and field mice (Muridae)) – Damage occurs near harvest when the rodents take advantage of heavy top growth to conceal their presence. The damage they cause is similar to cutworms where large portions of the root tops may be fed upon. Fresh damage is easily distinguished from cutworm damage because the gouging caused by the rodents' incisor teeth is evident in the potato flesh. The damage is usually light (1%) in larger commercial fields but small fresh market farmers may experience a higher percentage of economic loss.

Threshold – none established.

Woodchucks - *Marmota monax* (Sciuridae). – Woodchucks or groundhogs are minor pests of sweet potatoes and may graze the foliage as deer do.

Threshold – none established.

Alternatives to pesticide use

Two options for deer:
1) Deer fencing from the State is available for qualified farmers. If installed correctly, deer fencing is an effective tool to minimize deer damage to crops. However it is expensive and is feasible only for smaller fields or farms. In addition its use would be limited to farmland that the farmer owns rather than erecting it on rented ground.

2) While some farmers keep dogs to drive away deer the most effective alternate option to deer fencing is hunting. Local deer herds can be culled but the high reproductive capacity of deer means that populations remain high with continual annual problems.

Cultural Control Practices
None.

Biological Controls
None.

Post Harvest Control Practices
None.

Worker Activities and Exposure to Pesticide Residue

Liquid fumigants are applied pre-plant to New Jersey sweet potato fields for managing nematodes and /or soil insects. These materials are quite toxic. Applicators are at highest risk of exposure to these chemicals when tank mixing them, and the use of prescribed protective equipment is essential. Using some sort of boom sprayer, the fumigant is applied by injection shanks which place the material approximately 8 inches

deep into the soil. Thus the applicator has low risk of exposure during the application process itself. A chain behind the applicator smoothes out the soil sealing in the fumigant.

The greatest point of risk of pesticide exposure for most sweet potato growers is with preparation of the spray mixture of the pesticides. Post-plant application of the pesticides is made with a boom sprayer. Most growers have cabs on the tractors that prevent contamination by drift to the applicator, though it is unknown how many have cabs with their own ventilating systems.

There may be some hand weeding depending upon the amount and species of weeds that survive the herbicide treatments. Generally hand weeding is limited and exposure to residues of either herbicides or insecticides would be minimal because adequate pre-harvest intervals protect the workers.

Typically, very few applications of either herbicides and/or insecticides are made post-plant.

At harvest, the foliage is cut mechanically by mowers and the roots are dug by a potato digger. Workers then collect the potato roots. There is no exposure to pesticides at this time.

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References

1. NASS, 2000 Census of Agriculture, http://www.nass.usda.gov/census/.

2. University of Florida Institute of Food and Agricultural Sciences, Department of Entomology and Nematology; Florida Department of Agriculture and Consumer Services, Division of Plant Industry http://creatures.ifas.ufl.edu/veg/potato/golden_tortoise_beetle.htm.

3. Sustainable Practices for Vegetable Production in the South, Dr. Mary Peet, NCSU; http://www.cals.ncsu.edu/sustainable/peet/IPM/diseases/spotato.html .

4. 2005 New Jersey Commercial Vegetable Production Recommendations for New Jersey, S. Garrison, Ed. Rutgers, The State University.

5. New Jersey Department of Environmental Protection, Bureau of Pesticide Compliance, Pesticide Control Program. 2000. New Jersey Private Pesticide Applicator Survey Data for Potatoes (unpublished).

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