



# Northern New York Agricultural Development Program

## FACT SHEET

# 1 in a series on Soybeans

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### **Growing Soybeans in NNY**

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#### **Introduction:**

New York farmers planted a state record number of acres - 175,000 - of soybeans in 2004, with an average yield of 39 bushels per acre. In 2004, growing interest in buying soybeans by two processors located in Northern New York increased regional farmer interest in producing the crop under both conventional and organic farming practices. When growing for a specific market, growers must have a clear understanding of what that market requires. This fact sheet includes information for conventionally growing soybeans in Northern New York. For information on organic production of soybeans, see the Northern New York Agricultural Development Program Fact Sheet on Organic Food-Grade Soybean Production in NNY.

#### **Varieties**

Variety trials have shown yield differences of 10 bu/acre or more so variety selection is a management practice that strongly determines whether growers realize a profit. Commercial varieties of soybeans do not have soybean rust or soybean aphid resistance yet, so Maturity Group and yield are the most important factors in variety selection. Correct soybean variety selection can result in profit differences of \$20 to \$40 per acre.

Cornell University researchers Dr. Madison Wright and Harry McDonald established soybean variety trials at the William H. Miner Agricultural Research Institute in Chazy as early as 1967. In the 1980s, test plots were planted with new short season varieties developed in the northern climes of Canada and Minnesota. Trial yields topped 70 bushels per acre.

According to 2005 Cornell Field Crop Guidelines, tests to date indicate that soybeans grown in New York are somewhat higher in protein content (34 to 37 percent) and lower in oil content (16 to 18.5 percent) than soybeans grown in the Corn Belt.

Soybeans are classified by a different maturity system. Group 000 soybeans require the least heat, but are

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generally too early to plant for NNY conditions. Group 00 beans also require less heat to mature. Group 0, Group I and Group II require increasing amounts of heat. Group II varieties are suited only to the warmer areas of upstate New York, and are not recommended for Northern New York (NNY).

For Northern New York, Cornell suggests planting 80 percent of the acreage to Group 00 and 0 varieties and 20 percent to Group I varieties. However, do not plant Group I varieties in NNY after May 25th

**Table 1. Relative yields of recommended<sup>1</sup> Roundup Ready soybean varieties for Northern New York, based on tests in Clinton and Jefferson Co.** (*Recommended Roundup Ready Soybean Varieties in New York, Bill Cox, Cornell University What's Cropping Up, Vol. 15 No. 2, 2004*)

Variety	Company	Relative Yield (%)	Years in Test
<b>GROUP 0 Varieties</b>			
Razor	Hyland	102	2
Richochet	Hyland	102	1
<b>GROUP I Varieties</b>			
DKB15-51	Dekalb	105	1
FS122	FS Seeds	105	1
AG1903	Asgrow	104	1
S19-R5	NK	104	1
SG1919	Seedway	104	1

<sup>1</sup>Only varieties that have been tested at two locations in NNY with average relative yields equal to or greater than 100% are recommended. Only compare the relative yields of varieties within the same maturity group.

## Planting

### Soil:

The best soils for planting soybeans are fertile, well-drained, but not sandy or gravelly, soils with a pH of 6.5 or higher. Soybeans have done well in the Cornell trials at Miner Institute on tile-drained sandy silt loams, silt loams or clayey silt loams. The key may be soils that dry out in the top 18 inches so soybeans can be planted on time.

### Seedbed:

Prepare a seedbed much like for seeding alfalfa, clover or grass. A level seedbed free of ridges and protruding stones is best to protect combines that harvest close to the ground. Cornell Field Crop Guidelines state, "A combine that must be protected from ridges and stones will leave many unharvested pods on the stubble; four seeds per square foot equals a bushel grown but not harvested."

**Planting Equipment:**

Soybeans can be planted with a modern grain drill - for 7-inch row spacing, or with a corn planter for 15-inch or wider row spacing.

Soybeans need to be planted at a precise depth with good seed to soil contact to absorb water for germination. Corn planters do a better job of getting uniform seed depth and soil contact. Seeds must not be damaged in planting, so old-style grain drills are not suitable as the fluted feeds can physically damage the seed.

**Planting Depth:**

Planting depth should be about 1 to 1.5 inches depending upon soil moisture conditions and should never exceed 2 inches. If soil conditions are dry in the top 2 inches, Cornell suggests planting after the next rainfall.

**Row Spacing:**

Cornell Field Crop Guidelines suggest that early-maturing varieties tend to be short in stature and yield better in row spacings of 15 inches or less. In *"Growing Soybeans in the Champlain Valley,"* Dr. Beth Spaugh cautions some varieties will not bush out well even in 15-inch row spacing. In the undated report, Dr. Spaugh recommends against using 30-inch row spacing in the Eastern NNY area, stating that the early varieties do not bush out or take up the growing space enough to effectively utilize sunlight and this allows for increased weed problems.

Cornell Field Crop Guidelines suggest that row spacing may influence yield: "soybeans yield 2 to 4 bushels/acre less in 30-inch vs. 7-inch row spacing in New York."

**Seeding Rate:**

Soybeans have about 90 percent germination. Professor William Cox of Cornell's Department of Crop and Soil Sciences estimates the seed cost for conventionally planting soybeans to be about \$40/acre.

Seeding rate depends upon row spacing and seed size. Cornell Field Crop guidelines suggest plant populations of about 200,000 plants per acre for drilled 7-inch row spacing (8 seeds per 3 feet) and 180,000 plants per acre for 30-inch row spacing (31 seeds per 3 feet).

Professor Cox further notes that research at the Aurora Research Farm in 2003 and 2004 for soybeans under conventional tillage (moldboard plowed and cultimulched once) has not supported the recommendation of 200,000 seeds/acre for drilled 7-inch soybeans. When averaged across two growing seasons: one with dry August stress,

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**For NNY, Cornell Field Crop Guidelines suggest planting 80% of the acreage to Group 00 and 0 varieties and 20 percent to Group I varieties.**

**However, do not plant Group I varieties in NNY after May 25th.**

**New York soils do not naturally contain the bacteria that form effective nitrogen(N)-fixing nodules on soybean roots. Add soybean inoculant to the seed just before planting.**

**Soybeans like a pH of about 6.5. Soil test results will help determine needed lime and fertilizer applications.**

one a stress-free season, the variety planted yielded the same at five different seeding rates, ranging from 150,000 to 250,000 seeds/acre. Yields ranged from 51 to 53 bushels per acre (*What's Cropping Up?*, Vol 15. No. 3).

This seeding rate study is expected to continue at Aurora in 2005 and to evaluate the response of soybeans to seeding rates under zone tillage. In the meantime, Professor Cox suggests running test strips to see if seeding rates on one's own farm can be reduced without losing yield.

### **Planting Date:**

Planting dates are weather and soil condition dependent. The generalized optimum suggested planting time is the last two weeks of May. Dr. Spaugh writes that research at Miner Institute in Chazy suggests May 15 is the optimum planting date in that area with data indicating that planting may continue up to June 1 with expectations of good yields. Although yields decline with later plantings, in some areas of NNY, planting early varieties before June 10 can still produce high yields. Group 00, 0 and early to mid-Group 1 will do well if planted in mid-May. Data suggests that only Group 00 beans will do well if planting is delayed until June.

### **Inoculant:**

New York soils do not naturally contain the bacteria that form effective nitrogen(N)-fixing nodules on soybean roots. On soils with no recent history of growing soybeans, plants will be yellowish and low-yielding unless soybean inoculant is used liberally (a double coating for a first-time planting). Add the inoculant to the seed just before planting. Prior to use, inoculant packets should be stored out of the sun.

Research in Ontario and Michigan has shown better success with granular or liquid inoculants than with peat powder formulations when soybeans are being grown on a field for the first time. A poorly nodulated crop can be saved by applying nitrogen fertilizer at about 50 lbs N per acre as flowering ends.

## **Crop Management**

### **Lime and Fertilizer**

Soybeans like a pH of about 6.5. Soil test results will help determine needed lime and fertilizer applications.

Because soybeans have the ability to fix nitrogen, they do not require N fertilizer. A rough rule of thumb is that one pound of nitrogen will be fixed for each bushel of soybeans produced, up to a 40 lbs/acre maximum that can be credited to the next year's crop.

Cornell Field Crop Guidelines suggest using only a small amount of band-applied fertilizer at planting at least 2 inches to the side and 2 inches below the seed. Do not place any fertilizer in contact with the seed. Diammonium phosphates or urea should not be used in the fertilizer band. Do not use more than 40 pounds of potassium in the band at planting. Do not manure fields the fall, winter or spring before planting soybeans. Do not plant soybeans the first year out of alfalfa or grass to avoid excess nitrogen in the soil and large soybean plants with not many beans.

**Table 2. Fertilizers for soybeans<sup>1\*</sup>**

Soil Management Group	Nitrogen (N)	Fertilizer Nutrients to Be Added (lb/A)									
		Phosphorus (P <sub>2</sub> O <sub>5</sub> ) Soil Test Levels <sup>2</sup>					Potassium (K <sub>2</sub> O) Soil Test Levels <sup>2</sup>				
		Very Low	Low	Medium	High	Very High	Very Low	Low	Medium	High	Very High
I, II, and III	5-20	50	40	20	20	20	40	40	20	20	0
IV and V	10-20	50	40	20	20	20	60	60	40	20	0

<sup>1</sup>A more specific guideline will be obtained from a complete soil test analysis.

<sup>2</sup>See Table 4 for soil test results values within each level.

**Drought:**

Drought in the month of August can reduce yields. Moisture stress in August causes pods to shed and seeds to abort.

**Lodging:**

Modern combining equipment will cope with lodging, if lodging occurs.

**Rotation:**

Rotation of soybeans with a corn or small grain crop increases yields compared to monoculture practice. Suggested rotations include corn-corn-soybean-corn-seed down and corn-corn-soybean-small grain-seed down. For those not growing forages, a corn-soybean or corn-corn-soybean rotation is suggested.

**Weed Management**

Effective weed management will help protect the yield potential of your crop. Conducting weed surveys provides information to help plan control measures. Cornell Field Crop Guidelines suggest standard pre- and post-emergence herbicide control programs are effective for minimizing weed competition. For soybeans planted in 30-inch row spacing, banding of herbicides in a 10-inch band over the top of soybean rows at planting and timely cultivation(s)

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**Because soybeans are sensitive to atrazine and Princep residues, care should be taken the year before planting soybeans to ensure that herbicide carry-over will not affect their establishment.**

will minimize weed pressure. Cornell suggests that banding of herbicides reduces herbicide use on 30-inch row spacing by about 66 percent.

Roundup Ready technology has made postemergence broad-spectrum weed control (with the exception of yellow nutsedge) with a single nonresidual herbicide a reality. Cornell suggests glyphosate (the active chemical in Roundup) be applied to conventionally-planted Roundup Ready soybeans 24 to 30 days after planting and that, ideally, a burndown herbicide should be used before or at planting no-tillage soybeans and a second application of glyphosate should be made 24 to 30 days after planting. When a single glyphosate application is made for burndown and for postemergence weed control in no-tillage soybeans, research results suggest this application should be made 15 to 24 days after planting. Research indicates residual herbicides are not needed in most situations.

Because soybeans are sensitive to atrazine and Princep residues, care should be taken the year before planting soybeans to ensure that herbicide carryover will not affect their establishment. See the latest Cornell publications for the effectiveness of selected herbicides on annual weeds and for chemical weed control suggestions.

## **Pest Management**

### **Aphids:**

Relatively few insects have been reported to cause significant problems on soybeans in New York, with the exception of the soybean aphid, first seen in New York in 2001.

Soybean aphids are small, yellowish-green, and soft-bodied with two distinctive appendages (cornicles) on the tip of their abdomen. Aphids will be easily found on newly unfolding leaves and on the under surface of the uppermost leaves. Infestation damage includes stunting of plants, yellowing and misshaped or contorted leaves, and a charcoal gray discoloration of leaves indicating the presence of sooty mold. Under ideal conditions, as many as 15 generations of soybean aphids are possible during one growing season.

The aphids' natural enemy - ladybird beetles (ladybugs) – may appear in the uppermost canopy, and ants are commonly seen with aphids because the ants eat the sweet feces of the aphids.

To manage these aphids, monitor fields for the pests in the initial weeks following emergence. Beginning in late June, make weekly or biweekly field visits to check crop condition.



Fields near buckthorn, an overwintering host for soybean aphids, may need earlier monitoring.

Thoroughly check 20 to 30 plants per field, particularly new growth. Midwestern guidelines suggest management action if more than 250 soybean aphids are found per plant, if pest populations are increasing over several monitoring checks, and soybean crop development is prior to early pod fill(R4). For visual assistance in determining soybean growth stages, visit <http://www.planthealth.info/growthstage.htm>.

Conditions that favor aphid population growth include cool temperatures, plant stress, drought stress, and a lack of aphid predators. If parasitized aphids (mummies) are numerous, do not spray. A majority of aphid females with wings or with developing wings is an indication that the aphids will soon leave the field.

Ask your Cornell Cooperative Extension educator for assistance in selecting a proper insecticide, as needed. Using an unsprayed check strip to compare with sprayed areas can help determine the effectiveness of the treatment. Because spraying at early reproductive stages can threaten bee populations, alert local beekeepers to your treatment plans. Ask your local Cornell Cooperative Extension educator for Integrated Pest Management options.

### **Spotted Spider Mites:**

Spotted spider mites can cause problems in hot, dry years. The mites are minute – about 1/60 inch or less in length, eight-legged, and spider-like. They typically live in colonies that produce a thin web on the lower leaves of the soybean plants. Mite damage is seen as speckled leaves, which become yellow, curl, and turn brown before the plants die. Rain reduces the risk of mite problems.

### **Seedcorn Maggots:**

Under cool conditions in fields with high organic matter, e.g., manured fields, seedcorn maggot can be a problem. Cornell guidelines suggest using planter box application with a commercial seed treatment containing an insecticide.

### **Mexican bean beetles, Japanese beetles:**

Mexican bean beetles and Japanese beetles may appear in soybean fields in mid- to late summer. Adult beetles eat the leaves, causing a skeleton-like, brown plant appearance. This damage is rarely economic. Some soybean types can tolerate up to 35 percent defoliation until bloom, about 20 percent while pods are small and soft, and about 35 percent when pods are hardening. Treatment for pest damage below the percentages listed is not recommended.

**For visual assistance in determining soybean growth stages, visit <http://www.planthealth.info/growthstage.htm>.**

**Ask your local Cornell Cooperative Extension educator for assistance in selecting a proper insecticide, as needed, and for Integrated Pest Management options.**

**For information on Asian Soybean Rust, see the Northern New York Agricultural Development Program Fact Sheet: Coping with Asian Soybean Rust online at [www.nnyagdev.org](http://www.nnyagdev.org).**

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**Soybeans must be harvested on time and with the proper percentage of moisture.**

### **Corn Rootworms:**

Those farmers who will grow corn in rotation with soybeans will want to watch their soybean crop for evidence of corn rootworms. Control measures may be taken to prevent the corn rootworms in the soybean crop from causing a problem in the following year's corn crop.

### **Disease Management**

Cornell research notes several diseases: Phytophthora root and stem rot, pod and stem blight, brown spot, downy mildew, and Sclerotinia stem rot affect soybeans in New York, but little is known about incidence, severity or yield affects of the diseases. Sound agronomic practices are suggested for keeping diseases in check. For information on the use of fungicides, see Cornell Field Crop Guidelines.

### **Soybean Rust:**

See the Northern New York Agricultural Development Program Fact Sheet on Coping with Asian Soybean Rust.

### **Harvesting**

#### **Harvesting Equipment**

A combine with a flex head is suggested for efficient harvesting. Soybeans need to be harvested close to the ground, preferably within one to two inches. The flex head sits on the ground and follows the ground contours.

#### **Harvesting Date**

"*Growing Soybeans in the Champlain Valley*" suggests that Group 00 beans planted in mid-May will be ready for combining about the first week of October; Group 0 beans planted in mid-May will be ready for combining about October 10th; and Group 1 beans planted in mid-May will be ready for harvest about October 15. The report notes, however, that in some exceptional growing seasons, beans in Group 00 have been ready for harvest in mid-September.

Soybeans must be harvested on time to avoid seed pods shattering and dropping beans if left in the field too long (more than a couple of weeks). When stems and pods are brown and all the leaves have dropped off, check soybeans for moisture content. For storage, beans should be dried to 13-14 percent moisture. If the beans will be roasted, they can be harvested at 16-17 percent moisture. "*Growing Soybeans in the Champlain Valley*" suggests using a moisture meter, although with practice some farmers can judge moisture with their teeth. The report notes that some beans on a plant may be ready for harvest, while others are not, so test a cross-section of beans.



## **Storage**

Cornell Field Crop Guidelines suggest that harvested soybeans store safely at 14 percent moisture. Beans must be handled carefully to prevent cracking or breaking. This care is especially important when the beans are very dry, as expected in cold month storage.

**Soybeans store safely at 14 percent moisture.**

**Harvested beans must be handled carefully to prevent cracking and breaking, especially when the beans are dry.**

## Acknowledgements:

The primary sources of information used in developing this fact sheet follow. Dr. William J. Cox, Department of Crop and Soil Sciences, Cornell University, also provided information and assistance. Resources include:

- Cornell Field Crop Guidelines: <http://www.fieldcrops.org>
- Growing Soybeans in the Champlain Valley: <http://www.cce.cornell.edu/clinton/ag/soybeans/soybeans-home.html>
- Cornell What's Cropping Up? (Vol. 15 No. 2 and Vol 15. No. 3): <http://www.css.cornell.edu/extension/WCU/WhatsCroppingUpNewsletter.html>

## NNY Research/Education Institutes:

Cornell Cooperative Extension of St. Lawrence County Learning Farm and Education Center, Canton, NY;  
William H. Miner Institute, Chazy, NY: Everett Thomas;  
Cornell Baker Research Farm at Willsboro, NY: Michael Davis.

## For more information, contact your Cornell Cooperative Extension office:

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*April 2004*

**The Northern New York Agricultural Development Program** selects and prioritizes research the results of which can be practically applied to farms in the six-county region of northern NY: Jefferson, Lewis, St. Lawrence, Franklin, Clinton and Essex Counties.

**To learn more about the Northern New York Agricultural Development Program**, contact Co-Chairs Jon Greenwood, 315-386-3231, or Joe Giroux, 518-563-7523; or R. David Smith, Cornell University, 607-255-7286; or visit [www.nnyagdev.org](http://www.nnyagdev.org). ♦



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