

## Five Management Points for Soybeans in Maine

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In 1996, we saw the beginning of soybean production in Maine, with a whopping 25-30 acres grown. Soybeans are grown in Vermont, Quebec, and New Brunswick, so there seems to be no good reason that they can't be grown here. This year (2000), I am expecting between 2,500 and 3,000 acres in the state. This crop could fill several roles in Maine agriculture, including an alternative rotation crop for potatoes, a local protein source for dairy and livestock rations, and as a potential oilseed crop. I will not cover all aspects of soybean production here. Instead, I'll briefly discuss five 'management points' for this crop - that is, five decisions that you will face that make the difference between success and disappointment.

### **Point #1: Variety Selection**

Like potatoes, forages and other crops, you should pay attention to yield potential and disease resistance in selecting a soybean variety. However, the critical factor with our short growing season is Maturity Rating. Soybean maturity is separated into 13 numerical categories (000, 00, 0, and 1-10), with '10' being very long-season. In Maine, we obviously stick to the lower part of the scale. Based on some research and on-farm tests in 1996-1999, '00' and '0' are reasonable across much of Maine, as they are across northern Vermont and New York. In northern Maine (St. John Valley), the very short-season '000' varieties are recommended. Category '1' varieties have consistently matured in central Maine, including Orono. Even these short-season varieties are capable of 40-50 bu/a yields under good management.

### **Point #2: Soil Fertility and Soil pH**

Soybean is not a heavy feeder for nutrients. A 50 bu/a soybean crop will remove about 40 lb  $P_2O_5/a$  and 80 lb  $K_2O/a$ , while fixing it's own N from the atmosphere (it is a legume). Some people have interpreted this as meaning that we don't need to fertilize soybeans - this may cost you. Soybeans will respond to P and K applications if soil nutrient levels are low. Looking at it the other way, they will not perform well on low-fertility sites. Simply take a soil test and you will know where you stand.

The big soil factors for soybean are soil pH and soil drainage. Both Cornell and Penn State recommend soil pH in the 6.4-7.0 range. In this range, N fixation is not limited by acidity or excess aluminum, and the availability of other nutrients is high. Although we may settle for a range of 6.2-6.8, I wouldn't recommend soybeans on anything below this range. If soil pH causes you problems with barley production, it will certainly cause problems with soybeans. You can approach this management point in two ways. First, you could lime a low pH field up to the recommended range (start the year before - it takes time). Second, and easier, is to select fields already at or near this range. This is both a more realistic option (especially in potato rotations) and a cheaper option. That's why they are called *management* points.

While you are selecting a site, keep the other soil factor in mind: soil drainage. Soybeans should be grown on well-drained fields, to make sure N fixation is sufficient, reduce disease potential, and allow for timely planting and harvest. On poorly drained sites, N fixation will decrease while disease potential increases, and wet soils may delay both planting and harvesting operations. Also avoid excessively drained, droughty soils. On these soils, moisture stress during pod fill (August) is more likely, which can reduce yield significantly.

**Point #3: Be Careful at Planting**

This is really two points. First, soybeans are a legume (like alfalfa and red clover). If you want free nitrogen (I assume you do), then take care in inoculating the seed with *Rhizobia*, the bacteria that uses atmospheric N. Inoculant should be mixed with seed just prior to planting, and it helps to use a little water when mixing. This helps the charcoal-based inoculant stick to the seed. Also, if soybeans have not been grown on the field before, use three times (yes, three) the recommended rate of inoculant. Sure inoculant costs money - but not much.

The other management point for planting is seedbed. Packing with either packer wheels on the planter (if you are using a grain drill) or with a cultipacker after planting has two benefits. First, it assures good seed-to-soil contact needed for germination. Second (planning for the future), it provides a smooth seedbed that will be appreciated at harvest time. Soybean plants in cool climates, which we seem to have, have pods within three inches of the soil surface. On a rough seedbed, you will lose many of these beans trying to avoid picking up soil or rocks. This is doubly true if you don't have a flex-head combine.

**Point #4: Harvest Management**

Remember that pods will be growing close to the soil surface. Most harvest losses occur in front of the combine. Reels should be running at 1.25 times ground speed; if running too fast, shattering losses will increase. It is also important to keep things sharp, to avoid pulling plants into the combine. In 1997, the average yield loss during harvest was over 10 bu/acre: go slow and be careful!!

Soybeans should be stored at moisture levels below 14%. It is possible to reach these levels in the field, but plants may be quite brittle if numerous frosts occur before harvest. Delaying harvest (or late harvest of early varieties) may also cause plants to be brittle, increasing harvest loss potential. You should monitor both plant maturity and moisture content late in the season. Harvesting at 16-18% moisture, and drying down to 12-13%, may reduce harvest losses. Some drying can be combined with post-harvest roasting (see below).

**Point #5: Post-Harvest Processing**

As with other rotations crops, you are much better off if you know your market before growing the crop. Soybeans destined for livestock feed are most often roasted.

Although ruminants can eat raw beans in limited amounts, roasting has several advantages over feeding raw beans. First, it decreases the activity of enzymes like urease that are present in raw beans; this enzyme reduces the efficiency of N use by the animal. And second, heating changes protein structure, making protein less available in the rumen. This 'by-pass protein' is then available to the animal through the small intestine. Roasting can increase by-pass protein from 30% of total protein to 55-60% of total protein, depending on roasting time and temperature. In Vermont, northern New York, and New Brunswick, portable roasters that move from farm to farm are used for processing, reducing the investment needed on any single farm. Even with these portable roasters, on-farm grain storage is big advantage, either before or after roasting.

### **Conclusion**

The learning curve for new crops is usually pretty steep. Soybean is actually a pretty hardy crop, but it responds well to good management decisions like those outlined above. These are all decisions that you should consider before growing the crop. If you decide to try soybeans, here are a few additional 'Soybean Facts.'

**Planting Pattern:** Soybeans are commonly grown in both wide (30-36 inch) and narrow (5-15 inch) rows. The first uses a corn planter, the second a grain drill. In cool climates, narrower rows usually lead to increased yields; you also get faster ground cover. All 1996 and 1997, all soybeans in Maine were grown in narrow rows.

**Planting Date:** There is a yield reduction for late planting, although it is not as severe as a crop like corn. Soybeans are also sensitive to soil crusting. Planting should be based on soil condition, rather than strictly calendar date. In 1996 and 1997, planting dates ranged from early-May to early June.

**Planting Rate:** In wide rows, planting 150,000 - 175,000 seeds/acre; increase this to 200,000 225,000 seeds/acre for narrow rows. There are significant differences in seed size, so plant by number, not weight, of seed.

**Weed Control:** There are numerous herbicides available for soybeans, but that shouldn't be the only weed control. Early ground cover (with flat leaves), a vigorous crop, and early cultivation also work well.

**Markets:** There are a number of distinct markets for soybeans. Some are 'food grade,' used in producing and amending food products. Organic soybeans for the food market get premium prices. There is also an oilseed market, with the by-product (soybean meal) moved to the livestock sector. And there is a market for roasted or processed soybeans for livestock feed (discussed above).