

Growing high quality organic grains and soybeans for the Canadian processing market

by Vijay Cuddeford

IT'S REASONABLE TO SAY THAT TEN YEARS AGO, MANY ORGANIC CONSUMERS WERE HAPPY TO BUY ORGANIC FOOD, REGARDLESS OF THE QUALITY. But increasingly, today's organic consumer is a different breed and won't accept stunted apples, wilted spinach, or stale bread. Organic and high quality. That's what consumers expect today.

Currently, the term 'organic' is defined only by the method of production. But the organic industry is paying close attention to consumers' demands. Some certification bodies are considering amending organic standards to require a high quality product. The issue of quality is especially important for growers who want to capture lucrative overseas markets. In Europe and Japan, top quality organic food receives a premium price. There is also a growing convergence between the gourmet food marketplace and the organic marketplace in Europe. Processors such as Neil Strayer of Growers International are students of these trends, and work hard to help their growers produce high quality organic grains. While many processors do not require that their growers adopt specific agronomic practices, they do work closely with producers, organizing educational workshops, publishing production manuals, and offering advice.

What is 'quality' in the organic marketplace? How do you measure it? Traditionally, the quality of wheat is captured by characteristics such as protein level, bushel weight (density), and Hagberg falling number (the higher the falling number, the better the bread will hold together). These grading criteria do not vary between conventional and organic products. However, organic products which meet the same criteria receive a much higher premium.

The preferred quality criteria for Grade 2 (or better) hard red spring wheat or Canadian Western Amber durum are:

- Protein: 12.5% for hard red spring wheat, 12.0% for durum
- Falling number: 320 (basis Hagberg)
- Moisture: maximum 14.5%.

However, quality requirements for wheat will vary depending on the end use, with bread quality wheat, pastry wheat, kosher bread wheat, and feed grade wheat all varying in protein levels and other characteristics.

While protein level and falling number help define wheat quality in the conventional marketplace, you can't just transfer white bread production methods and values into speciality bread production, according to Robert Beauchemin of La Meunerie Milanaise. If your goal is to provide the consumer with superior flavour and aroma, you need to be concerned, not primarily with the protein content or falling number (though these are important), but also with the quality of both the amino acid and the gluten. These are both influenced by growing practices which affect soil quality, soil temperature and moisture levels.

La Meunerie Milanaise is involved with the Quebec Ministry of Agriculture in a research program which studies the impact of fertilization, crop rotation, and other agronomic practices on grain quality. The study is linked with research efforts in France.

For criteria such as flavour and aroma, variety might be the critical factor. Stu Fleishhaker of Speerville Mills in New Brunswick plants small amounts of a few

different heritage wheats. Because these varieties have not been developed in the high-input regime common for commercial varieties, they may have better flavour and aroma. At some point, it may be possible to market wheat by variety.

Growing organic wheat

Regardless of these caveats, there are recommended practices for growing organic wheat in Canada. And, according to Neil Strayer of Growers International, there is a direct correlation between following recommended practices (with some leeway for individual microclimates) and the quality of the product. Neil says that he can tell early in the season who will have the best quality product. One key in wheat production is to avoid weathering of the crop, which causes pre-sprouting and lowers the falling number. It's important, therefore, to combine the crop early. If it's damp, don't delay the harvest until it dries. Harvest as soon as it is ready, and immediately aerate and dry the grain.

Another key, especially in the semi-arid prairies, is maintaining soil fertility. Complex rotations which include oilseeds, pulses, cereal and green manure crops, are required for a good product. It is recommended that a green manure crop be planted every fourth year. Livestock manure can also be an important part of soil fertility. Supplementation with rock phosphorous and potassium is recommended.

Growing organic soybeans

For organic soybean production, several management practices are crucial. As always, soil quality is the prime determinant of crop quality, and the soil must have adequate levels of available nitrogen to produce high protein beans. High levels of organic matter and effective legume inoculants result in high levels of nitrogen fixation, and high levels of protein in the beans. Jon Cloud of Cloud Mountain recommends *Bradyrhizobium japonicum* strain 532C. Growers must ensure that the inoculants are not genetically modified.

A well-designed crop rotation is essential to control weeds and pests while maintaining soil fertility. Mix warm-season (corn, soybeans) and cool-season (small grains, canola) crops in the rotation. Include a perennial crop, such as a 2–4 year hay crop that is cut and harvested a few times per year. Regular removal of top growth through cutting will weaken perennial weeds. Another option is a five crop rotation of corn, soy, cereal, legume green manure, and a fifth crop that is varied from year to year.

Because high protein soybean varieties have non-spreading stems which do not provide ground cover, weed control methods such as scuffling is critical. Although labour-intensive, hand weeding the weeds about to go to seed is important to reduce the astronomical number of weed seeds that can be added to the seed bank in the soil. Good weed control can make all the difference in grading.

The difference between No. 1 and No. 2 grades is largely appearance, particularly staining. Most staining results from the thick moist stems of weeds splattering during combining. Also, combining at night causes a combination of dew and dust to stain soybeans. This can cause No. 2 grade beans to be demoted to feed grade.

Variety and seed quality

If you want to sell your product to processors, it's important to pay attention to variety and seed quality. When choosing a variety, think about the strengths and limitations of

your farm, as well as the market. What varieties do buyers want? While it is a good idea to grow several varieties, some buyers may require variety purity.

With each generation, seed quality becomes a little more variable. To maintain seed quality, plant seed from an outside source every few years. This is especially important for soybeans and hard red spring wheat. In soybeans, the percentage of dark hilums may increase; for wheat, average protein levels may decrease. Soybean varieties for the processing market should have protein levels greater than 40%, resistance to splitting and true yellow hilums. Dark hilums, even just 5% in a load, will cause the whole lot to be sold as feed.

Harvesting field crops

When combining, stop the combine after 100 feet and estimate how much of the crop you're leaving on the ground. Missing 10% can greatly reduce your profits. For example, if you produce 36 bushels of soybeans per acre instead of 40, and your break-even point is 20 bushels per acre, you've lost 25% of your profit by leaving 10% on the ground. Adjust your settings appropriately.

However, consider this advice as well. Dropping the combine header into the ground causes dirty seed coats and can be costly due to the loss of a premium price. Rather than harvesting a load of dirty soybeans and risking rejection, it's okay to miss a few pods at the bottom of the plants and have a clean load of beans. According to the Clarkson Grain Company in the U.S., more soybeans are rejected for poor appearance and dirty seed coats than for any other reason.

Keep your grain free from contamination. Corn, small stones and nightshade berries are difficult to separate from soybeans. Hand pull nightshade and corn plants from your soybean fields. If soybeans are planted after corn, make sure the combine doesn't pick up old ears.

If you have a problem with *fusarium*, some recent research at the University of Guelph suggests a way to improve your grain. By increasing the air blast to the maximum speed possible, many *fusarium* infected kernels (which are typically smaller and lighter than sound kernels) will be blown out the back of the combine. This may cause a small loss of good kernels, perhaps up to two bushels/acre. However, the researchers concluded that a yield of 70 bushels/acre of milling quality wheat is more valuable than 72 bushels/acre of feed or salvage grade wheat.

It is hard to separate hairy vetch, buckwheat and oilradish from milling grains. Don't grow these crops immediately before milling crops in your rotation. Also, ensure that spelt is pure from other cereals such as fall rye. Again, handpicking volunteer grains may mean the difference between food grade or livestock feed.

Make sure your bins and trucks are clean before harvesting a new crop. This is also important to reduce contamination from genetically-modified crops. Feed grains should contain less than 2–3% foreign grains. It is essential that feed grain not be contaminated with ergot (which can cause abortions in livestock).

Moisture levels

Moisture content is a critical component of crop quality, affecting storage, flavour, aroma and other culinary qualities. High levels of moisture result in deterioration in storage, growth of mould, and the development of toxins and rancidity.

Recommended moisture levels are: 11–14% for soybeans, 16% for processed corn, 12.5% for milling grains, and 15% for feed grains.

Most moisture is held in dockage, which also reduces air circulation by filling air pockets between stored grains. (Dockage is material that must be removed from the grain by cleaning, such as weed seeds, bits of straw, parts of insects, broken grain and seeds from other crops.) A good tip is to combine wet areas later than the rest of the field. Though this will take longer in the short-term, it reduces the risk that whole lots will be rejected because a small amount of wet grain turns rancid.

The best practice is to aerate grains and crib-dry corn. Aerate during good dry autumn days, rather than at night or in wet weather. Aeration will both reduce moisture content, and prevent condensation, which can lead to mould development.

In Atlantic Canada, most grain is harvested in damp conditions. This necessitates on-farm storage which blows air through the grain to achieve good drying. This is even more important when there is a high percentage of dockage.

Mechanical drying should be slow and at low temperatures, ideally around 32°C (90°F), and definitely less than 38°C (100°F). Ensure that lots of air circulates through the bin. The guideline is: if you stick your head into the top of the bin, your hat should fly off!

For soybeans, field drying to 13–14% moisture is recommended. Level off bins to provide a uniform grain temperature. Start the fan when first filling the bin and run it for about six weeks until the grain reaches temperatures of 2–5°C (35–40°F). This eliminates moisture, insects and growth of mould. Monitor the temperature through the winter and aerate in early spring to 2–5°C (35–40°F) for long-term storage.

On-farm storage

On-farm storage is highly recommended. On-farm storage makes it easy to send samples to the Grain Commission to determine protein levels and other properties. Buyers will often want a second sample as well. Sending accurate samples lets a farmer make a sale without the crops leaving the barn. Without on-farm storage, farmers risk hearing the bad news at the processing plant, and paying to ship the grain back home or to another processor.

On-farm cleaning

According to Tom Manley of Homestead Organics, dockage is a highly overrated issue, mainly because processors will clean the grain. It's important to realize that dockage should be removed at the combine, not with a cleaner. Rotary cleaners can increase the split rate or damage the grain. However, on-farm cleaning is recommended in the following cases:

- there is more than 4% dockage;

- the grain is moist;
- the processing plant is far from the farm, so shipping dockage will be expensive;
- there is little room in the bin; or
- the grain will be fed to livestock on the farm, and you wish to reduce dockage.

Conclusion

It is very difficult for processors to pick up small amounts from individual growers. Thus, Robert Beauchemin of La Meunerie Milanaise advises growers to form co-ops or commercial groupings. Such organizations can store the grain (clean, dry, sort and accumulate inventory), so that there is an even flow of product to the processor over time. Like other processors, Robert tries to sell when market prices are good, or at least not bad, in order to receive a good average price over the year. When there is an even flow of product, processors are better able to blend the crop to meet the needs of their buyers, and provide a good return for the growers.

The growth opportunities for organically grown grain are enormous. For example, the market for bulk organic feeds could grow by a factor of ten over the next few years, if enough product is available. But there is probably even more opportunity on the export level—to Europe, the U.S., and South and Central America. These are markets for value-added products, not for raw grain. And, to return to the theme of this article, these are markets which demand **high quality** organic products.

8

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Sources: This article is largely based on conversations with Jon Cloud (Cloud Mountain), Robert Beauchemin (La Meunerie Milanaise), Neil Strayer (Growers International), Stu Fleishhaker (Speerville Mills), and, most importantly, Chapter 17 of the *Organic Field Crop Handbook* (based on a talk by Tom Manley of Homestead Organics, entitled ‘A processor’s view of organic grain quality control at the farm gate’ which was presented at the Guelph Organic Conference on January 29, 2000).

For further information, refer to the following chapters of the 2nd Edition of the *Organic Field Crop Handbook* (Canadian Organic Growers, 2001):

- Chapter 17: “Producing high quality organic field crops” (pp.131–138);
- Chapter 22: “Cereal crops” (pp. 176–200); and
- Chapter 23: “Pulses” (pp. 201–224).