Notes from "**Getting started in seed production**" with Andrea Berry and Dan Brisebois. 9am, Friday, Restigouche room.

- **Dan Brisebois (Tourne-Sol Cooperative) and Andrea Berry (Hope Seeds)**

First in a series of workshops through the day.

- Andrea runs a small seed company based in Belleisle, NS.
- Hope Seeds, offering certified organic, sustainably grown, heritage and open pollinated garden seeds. Growing what they sell, with several other organic and sustainable farms in Eastern Canada working and selling for the company.

- Andrea started the Eastern Canadian Organic Seed Growers Network with Dan a few years ago, noticing that few growers were farming seeds in the region other than potato and grain seeds.

- She has conducted workshops, a seed symposium in Moncton last October, (very successful). Four workshops have been done at ACORN events.

- She is here to talk about the basics of seed production. Can "grow from there."

Overview of topics to discuss: Lifecycles and flowers; cross-pollination; wet vs. dry seeds; seed-production on your farm; resources.

Plant lifecycles

- Annual, Biennial and Perennial. Annual – grows from a seed to *producing* seed in one growing season (ie. lettuce, cukes, tomatoes, basil); Biennial completes seed to seed in two growing seasons (ie. leeks), these plants require a dormancy period to trigger switch, and can be tricked. Perennials (ie. cranberries, asparagus, blueberries, Egyptian walking onions) sometimes take a few years before producing profuse seed.

Flowers

- "Perfect" flowers – a botanical term used to describe a plant having male and female parts on same flower, "imperfect" flowers have separate sexes. Andrea took one formal botany course in school.
- Examples of plants with "perfect" flowers: tomatoes, beans, lettuce, brassicas, mustard.
- Imperfect: squash, corn, asparagus, pears, spinach, beets, chard. Most vegetables are perfect flowers.

Cross-Pollination

- How do you figure out if plants will cross pollinate? "I want my butternuts to stay butternuts."

- Know the latin names of your plants. Know family, genus, species.
- Species - plants that interbreed easily. Dan went over example of Brassica family. Brassicaceae, Brassica olearacea. Slight chances of cross pollination among genera in the family, brassica species will readily cross if kept close enough. Discussed chromosome level of brassicas, sounds like polyploidy in this group. “Varieties” - e.g. different types of broccoli. E.g. cabbage and brussel sprouts can potentially cross.

Pollination game: Will they cross?

Buttercup and Butternut squash: no. they are two different species

Watermelon and Cantelope: no, they can grow them together.

Onions and Leeks: no. again, they are of two different species and will not cross.

Kale and Broccoli: no, if it’s Siberian or Russian kale; yes if it’s red russian or lacinato kale.

Explaining Seed Terminology:

Open-pollinated: acknowledges an uncontrolled pollination process, breeding true-to-type with each generation. The plants have stabilized their genetics over many generations, so when pollination is left open, they will stay true to type and won’t change characteristics. If left by themselves or in isolation, they will grow true to type, but still can’t grow in an area with a close relative. Open-pollinated plants are the most stable heirloom, heritage plants.

Hybrids: involves controlled pollination of 2 parent lines of the plant.

“F1 hybrids” – are more vigorous, uniform. It is impossible to get the same F2 generation. If you save and grow seeds from hybrid, only half will grow as the original hybrid did, and the rest will grow out as either one of hybrid’s parent strains.

“Selfers”:

Self-pollinating plants (involve perfect flowers, with no inbreeding depression e.g. lettuce, beans, peas, tomatoes, peppers, wheat)

Only about nine or ten plants are true selfers. They have tight flowers, are insect pollinated, and resist pollen from other species. If siblings cross, recessive genes can be expressed, but with selfers, those recessive traits have been bred out, and should be able to grow for several generations with no “bad” traits emerging. For example, with broccoli (a non self-pollinated plant), will get “bad”/mutated over three generations – with smaller heads, and less disease resistance.

“Crossers”:

Cross-pollinating plants feature both “perfect” and “imperfect” flowers, and suffer from inbreeding depression. Most plants are crossers (ie. corn, cherries, melons). Many are self-incompatible.

Selfers can cross-pollinate, and many crossers can self-pollinate. For example, when two tomato plants grow side by side, there is a chance that bees could transfer pollen. There are low chances of this, but it happens. Cucumbers are crossers that can be manually self-pollinated. When something crosses - most of what’s on the fruit is from mother plant. If you cross zucchinis and pumpkins, and mother is a zucchini, then the fruit will look like a zucchini. The next generation will get pumpkins. With beans - when you save seed from bean, you can’t tell if something has crossed till the next generation. The seed coat will come from the mother plant.

Isolation distances:

- How far apart should your plants be to ward against unwanted cross-pollination? The Organic Alliance website features a seed saving guide for gardeners and farmers.

Selvers are very inbreeding: for home use: 10’, commercial use: 20’

Selfers that are primarily inbreeding, with more open flowers, are easier to cross pollinate, with tight flowers it’s harder to do: for home use: 160’ commercial use: 320-640’

Crossers that are smaller, windblown pollinators need lots of room; pollen carried by insects can dry up faster: for home use: 1600’, commercial use: 1-2 miles.

- There are references for growing one crop (one seed lot) of each type per growing season. With a drier area, pollen can’t go as far before drying up and becoming unviable. One can shorten distances with barriers, such as greenhouses.

If you are growing large populations (1 acre or more), harvesting from the middle of a block can reduce the problem.

Alternatives to isolation methods:

- Timing: with two varieties of the same species, ie. one with early flowering and the other with later flowering, one can harvest seeds at different times to reduce chance of overlap.

- Physical barriers: if growing in tunnels or greenhouses, putting little bags over plants can help. If a self-pollinator like a tomato plant will pollinate itself, others won’t, such as cucumbers. The bags need to be an appropriate mesh size to stop pollen from transferring. Corn, spinach, chard, and beets are wind pollinated common crops that would need physical barriers, such as a hedgerow, greenhouse or barn.

- Hand pollination: is a skill that takes time to acquire. You tape flowers shut before they open during the day to ensure nothing else gets in. If there is a hole, it indicates that an insect has gotten in. Sometimes you have to start work at 4am in order to get there before a pollinator. After hand pollinating, you must seal the flower. For example, with squash, taping both male and female flowers shut.

Populations: a group of individual plants that can produce offspring.

-When growing seed, it's best to grow large populations to maintain genetic breadth and to allow for selection. Genetic bottleneck can quickly ruin a crop. Selfers have less problems with this as they are already less genetically variable. Crossers need big population.

- **How much to grow?**

Selfers: Minimum harvest: 10-20 plants (not fruit, save at least one fruit from each of 10-20 plants)

Ideal harvest: 80

Crossers: min: 80, ideal: 200

Anything from the cucurbit family readily crosses over short distances, and are evolved to have small populations so they act like selfers genetically but physically are crossers): min: 10-20; ideal: 80.

Harvesting with the "ideal" harvest range is better for maintaining populations over many generations. With crossers, you can lose a variety in 2-3 generations. With just 1-2 plants saved, you'll lose variety very quickly. You can buy other seed and cross what you need back in.

Suggestion: grow an even bigger population than you plan to harvest from so you can weed out unfavourable plants.

- You can't know if a seed crop is from a genetically diverse enough population (when buying seed) until you grow it.

Wet vs. Dry seeded crops:

Wet Seeds: tomato example. You want really ripe fruit before taking seed. With squash use a sieve to get seed, keep juice. let the pulp and seeds ferment in tub (or jar) in the sun for 2-6 days. This kills microbes and breaks disease cycles. Fermentation is one option: (hotter and shorter). Colder and longer is the best way for rid of disease. Hot fermenting seeds/pulp may get mouldy and smelly. Some people stir them and others don't. Heavier seeds may start to smell. Once ready, wash and remove the seeds, and dry them in nylon socks, squeezed regularly. Caution: mice will eat the seeds, if accessible. Takes about a day to dry. This typically happens mid to late August.

Seed crops for your farm (things to consider):

- Climate factors (e.g. temperature). The Maritimes often faces wet weather. Always consider max. and min. temperature. Pollination can be temperature-dependent. With heat units – are there enough for the season? Consider length of season. Precipitation: dry seeded crops are challenged in our climate because of the amount of rain we get. Day length: some crops are affected by day length. Spinach and certain onion crops are dependent on day length.

- Regional Considerations: consider the presence of disease in the area. e.g. Carlton County has late blight from lots of potato farms and it's hard to grow organic potatoes there. Is there a presence of wild species that can cross pollinate? e.g. cultivated carrots can cross with wild carrots. Consider the presence of cultivated crops in the area.

- Economic Viability: know your customer/company needs. Conduct suitability trials beforehand. If there's no market for the crop, you can't sell it. Learn to grow seed before you grow a lot of it. Consider: What crops can you and your system handle? Seed crops and food crops are different considerations, e.g. lettuce vs. lettuce seeds. If you can't sell all the seed you grow, ie. lettuce, can you grow them for the next season and make a profit that way?

Further resources:

ECOSGN. www.seeds.ca/ecosgn

Seeds of Diversity Canada: www.seeds.ca

Organic Seeds Alliance (OSA): www.seedalliance.org

Canada seeds act (CFIA).