Seed Development and Germination

by Jack Kittredge

Sources for this information include theseedsite.co.uk, Ohio State University, and Oregon State University

Seed Development

Seeds develop from ovules in the female part of the plant after they have been fertilized, or pollinated, by pollen from the male parent plant. This is sexual reproduction and the seeds contain the genes of both the male and female parents.

The ovules are the embryos from which the seed will develop. At the time of pollination, they are very small compared to the mature seed. Without being pollinated, the ovules will not develop into seeds.

Pollination can be accomplished by cross-pollination or by self-pollination.

Cross-pollination occurs when pollen is delivered to a flower from a different plant. Plants adapted to outcross or cross-pollinate often have taller stamens (the male reproductive organ) than pistils (the female reproductive organ) or use other mechanisms to better ensure the spread of pollen to other plants’ flowers.

Self-pollination occurs when pollen from one flower pollinates the same flower or other flowers of the same individual. It is thought to have evolved under conditions when pollinators such as insects were not reliable vectors for pollen transport, and is most often seen in short-lived annual species and plants that colonize new locations. Plants adapted to self-fertilize often have similar stamen and pistil lengths. Plants that can pollinate themselves and produce viable offspring are called self-fertile. Plants that cannot fertilize themselves are called self-sterile, a condition which mandates cross pollination for the production of offspring.

Each pollen grain contains a vegetative cell and a generative cell that divides to form two sperm cells: the male gametes. Pollen is transferred from the stamen by the process of pollination. In 80% or more of the cases this involves transfer by one of 200,000 species of living agents, most of which are insects but include birds and bats. Of the cases of abiotic pollination (that not involving an animal vector) the vast majority is by wind, with some by water for aquatic plants.

Once reaching the pistil, or carpel, the pollen is caught by hairs, flaps, or other obstructions in the stigma, or receptive tip. The pollen germinates in response to a sugary fluid secreted by the stigma. The vegetative cell then produces the pollen tube, a protrusion from the pollen grain which carries the sperm cells within its cytoplasm. This tube is the transportation medium of the male gamete to reach the egg cell.

The germinated pollen tube must drill its way to the bottom of the ovary to reach the ovule. Once the pollen tube successfully attains an ovule, it delivers the two sperm cells with a burst. One of them fertilizes the female gamete (the egg cell) to form an embryo, which will become the future plant. The other one fuses with both polar nuclei (created in the ovary by the process of cell division which created the ovule) to form the endosperm, which serves as the embryo’s food supply. The endosperm is rich in starch, proteins and oils and is a major source of human food (e.g., wheat, barley, rye, oats, corn). Finally, the ovary will develop into a fruit and the ovules will develop into seeds.
We can often judge how close the seeds are to being ripe from the size or color of the fruit or seedpod. Unripe seeds are soft, white or green, and enclosed in a hard green fleshy fruit or pod. When seeds are ripe and mature they change to brown or green, develop a hard covering, and the seedpod dries out and changes to white or brown. It eventually splits to release them.

Producing seeds uses a lot of the plant’s energy. If the plant is dead or dying, it will not have enough energy to complete the process. This is one of the reasons you are unlikely to be able to get seeds from cut flowers. The plant needs to be able to gather food while it is developing seeds, and the seedpod needs to remain attached to the parent plant until the seeds are fully developed.

Development of the seeds, from pollination to shedding of the ripe seeds, can take several weeks or even months, but seeds gathered before the process has been completed will not be viable.

Seeds and Germination

Most seeds contain less than 20% water, as opposed to about 80% in growing tissues. Most of the limited water in seeds is bound to macromolecules, so that little is available for metabolic reactions. Cellular membranes are disorganized under these conditions. Because the water potential of seeds is extremely low they are capable of drawing water from soils that have too little water to support normal plant growth. As the seed imbibes water, cell membranes reorganize and metabolism begins. The seed may not germinate at this point, however. In addition to water, many seeds require a period of cold exposure (stratification) or leaching of inhibitors by water before germination is possible. This applies particularly to wild species; many cultivated plants have been selected for ease of germination.

Many seeds require light for germination; much of our understanding of this phenomenon derives from experiments with lettuce seeds in which germination is stimulated by red light and inhibited by far-red. These seeds, if buried in the soil, will not germinate unless the soil is turned over so that they are exposed to light. This is part of the theory behind “no-till” crop production and recent ideas that it might be a good idea to plow at night.

The radicle or root is usually the first part of the embryo to emerge from the seed coat. After this, different structures emerge, depending on the species. The most fundamental structural difference is between a monocot and a dicot.

A monocot has only one seed leaf (monocot is short for ‘monocotyledon’. A cotyledon is a seed leaf, and ‘mono’ means one). This seed leaf is usually the same shape as the adult leaf, long and thin, and the leaf veins nearly always run parallel to the central midrib. Sometimes the adult leaves are pinnate, as in many palms, but the veins are parallel on each leaflet. There are several monocot plant families that are instantly recognizable. Many food plants are grasses, so crops like wheat, oats, barley and corn are all monocots. Palms, Orchids, and most bulbous plants are monocots.

A dicot has two cotyledons (dicot is short for ‘dicotyledon’, and ‘di’ means two). The seed leaves are usually rounded and fat, because they are the two halves of the seed. The first true leaves can be many different shapes, from long and thin to rounded or palmate. Most trees and shrubs and many garden annuals and perennials are dicots, and there are many more species of dicots than there are monocots.

Seeds need a supply of food to support the embryo plant until it can collect its own food. This is the reason for the endosperm. With some exceptions, in monocots, this is inside the seed coat but separate from the cotyledon. In dicots, the cotyledons contain the endosperm.
Becoming an Organic Seedsman

by Frank Morton as interviewed by Jack Kittredge

I’m a self-trained seedsmen, I grow 7-8 acres of organic seeds on a 50 acre organic farm in Oregon. I’m business partners with the people who run the vegetable farm. My wife and I and our workers produce the seeds that we sell to seed companies – pretty much all the seed companies that supply organic farmers. Johnny’s, Fedco, High Mowing, Burpee, Territorial.

Our catalog at www.wildgardenseeds.com lists 156 varieties, plus several seed mixtures, from 28 crop species. We concentrate on salad greens because I used to be a salad green grower, I’m one of the originators of the idea of plastic bags of salads. I started selling to restaurants in 1983. I shipped a lot to the east coast using recycled packaging and UPS delivery. That’s how we paid for our farm. In the process I was also breeding varieties. That seems like a specialized skill, but if you realize it, in the past farmers bred everything – starting 10,000 years ago.

I started breeding as a fluke. I started keeping my own seeds – it seemed the natural thing to do. Self-sufficiency seemed natural. I was learning as I went along. Accidently I had a cross pollination between a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It occurred spontaneously. Accidently I had a cross-pollination between a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf.

I realized this is where new varieties come from. It is a cross between a red romaine and a green oak leaf. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously. It was a red oak leaf. I realized that there had been a red and green lettuce. It appeared spontaneously.

When I saw all these new varieties, that hadn’t been in the parents. There was new genetic diversity. There were new greens and reds, that hadn’t been in the parents. There was new genetic diversity. There were new greens and reds, that hadn’t been in the parents. There was new genetic diversity. There were new greens and reds, that hadn’t been in the parents. There was new genetic diversity. There were new greens and reds, that hadn’t been in the parents. There was new genetic diversity. There were new greens and reds, that hadn’t been in the parents. There was new genetic diversity. There were new greens and reds, that hadn’t been in the parents. There was new genetic diversity.

The only way to learn what makes a cabbage is to know your plants if you are going to breed seeds. For anyone doing breeding, the concept of self-pollinate versus cross-pollinating is crucial. Self-pollinating plants such as wheat, lettuce, purslane, and sweet peppers pollinate themselves. Heirloom tomatoes cross-pollinate but modern ones usually self-pollinate. I am growing a huge variety of lettuce this year – 35 varieties. I make them by cross-pollinating varieties – growing lettuce side by side and holding the flowers together. Then, after 10 generations of self-pollinating, you get 99% similarity – essentially they are clones. Plants which self-pollinate in nature don’t seem to develop inbreeding depression, or loss of vigor, the way naturally cross-pollinating species do when you force them to self-pollinate.

The reason is that cross-pollinating plants are like people. The population that we come from has a lot of deleterious, recessive genes. In normal populations of humans or of corn most of the genes that are deleterious are recessive. Because they are rare they tend to be paired up with the dominant gene. So the bad effect never shows up. By mating in large populations of people or corn you try to encourage cross-pollination. The plant makes an effort to encourage this. In corn, for instance, the male and female parts are far apart to discourage self-pollination. The tassel (male) is way up on the top of the plant. The silks are down on the ears (female). It practically guarantees that genetic mixing will occur.

In plant breeding for agriculture you have crops that naturally cross-pollinate -- carrots, cabbages, squash -- but about 80 percent are self-pollinated. About 30-40 percent are cross-pollinated. Then there are ones that are in between.

Self-pollinating plants don’t have the deleterious genes. There is a lot of debate about which kind of pollination came first. A lot of scientists thought cross-pollination did. But they have shown recently that self-pollination is very old.

Tomatoes and peppers are in the middle. You can self-pollinate a pepper for many years without that inbreeding depression. The same with a tomato. But in nature they cross readily. The tomato and pepper, of course, got taken from their home in South America to Europe and the same pollinating insects...
were not there. So those plants that were more likely to self-pollinate were the ones to make seeds. It’s a survival strategy. If you don’t make seeds, you’re out!

What we have seen is that if you go to the Andes, where peppers and tomatoes are native, they cross-pollinate. But if you follow drainages and go up in elevation, their numbers decrease until when you reach certain altitudes there won’t be tomatoes. Then there will be new ones in different valleys. The mountains are wonderful for breeding this diversity. So selection occurs within populations that favor self-pollination.

They are not necessarily using the same genes as the tropical tomatoes or peppers. It might be that in these new environments the deleterious genes become favorable. When plants leave where they originated that is when self-pollinations occurs. The same thing happens when you breed them across the world.

A few things do not cross -- beets, Swiss chard. One beet plant will not produce seed. Chicory is the same. Whereas an endive plant is 100% self-pollinated. Spinach normally has male and female plants. But if you remove all the males, the females will make their own pollen.

Breeding for Organic Plants

Conventional farms have an environment moderated by chemical inputs. The nutrients are soluble in water so roots don’t have to compete. On the disease and insect fronts, if you are spraying fungicides plants don’t need resistance to disease. Same for insecticides. If those diseases aren’t part of the growing environment, of course, you can’t breed for resistance to them. Breeding should be done in the area of intended use using the farming practices expected to be used. If you are breeding for chemical agriculture, use those chemicals on the breeding farm.

Plant breeding for organics has to take place in an organic environment.
There are traits we want in organics—such as roots. Organic growers need plants with extensive roots because they are putting down organic fertility which is widely distributed and you need roots which are extensive and have lots of root hairs. Not every plant is the same in the ability to pick up calcium, for instance. So ask how is the fertility applied.

Another trait is tops, as in carrot tops. A lot of hybrid carrots have small tops. I’ve heard farmers complain you can’t even bunch them! Carrot tops make the carrot grow. They also shade out weeds. Getting carrots established requires forming a good leafy canopy to slow weed growth.

I breed kale so I ask people what shape of a kale plant do they want. How tall? There is a class of dwarf kale with short stems. It has less stalk and more leaves. In cold areas you want short dwarf kale because it can hide under the snow and not freeze. When I ask people in Oregon, they want tall kale. There is no snow cover here, but we do get rain and that makes mud and short plants get muddy. Bacteria also splash up with mud and can cause disease. Finally, tall plants are easier to pick.

Organic growers tend to produce food in agriculturally marginal areas. So in Vermont or New York you have really different environments than around Davis, Calif. Breeders in Davis are thinking about the production centers of the crop. So to the extent that organic agriculture is local, you need to breed to know the local situation. The centers of breeding are not breeding for these marginal areas. They are breeding for the Salinas valley or for spinach growers in Arkansas or Texas. I would like to see local breeding for the Salinas valley or for spinach growers there. Breeders everywhere.

To the extent that something is locally bred and the environment is unmoderated by chemicals, there to the extent that something is locally bred and the environment is unmoderated by chemicals, there is no difference between organic and conventional seed. But nobody is doing local breeding except the organic breeders. It is a skill that is accessible to everyone. You don’t need a degree in plant breeding to do it.

Books for organic farmers on plant breeding are scarce. I would recommend two. One is Seed to Seed, published by the Seed Savers Exchange. It is quite outdated and needs to be revised. I understand that the Organic Seed Alliance is collaborating with them on revising it. The other is Breed Your Own Vegetable Varieties by Carol Deppe, published by Chelsea Green. It has had 2 editions. It shows you anybody can do it. It has a lot of breeder stories and is illustrative of how you can go about a breeding project.

Breeding is all just practice. Cleaning is part of it. You winnow and screen and do that again and again. There are some easy exercises if you are interested in plant breeding. I suggest growing two radishes to seed side by side. Grow one long white radish and one red round one. Let them cross, then keep them separate and keep the seeds. Grow those out to be round and pink. They all will look the same—you have created a hybrid. But save and plant that seed and the next generation is incredibly diverse in color and shape. Mendel did this a hundred and fifty years ago with peas!

But it all takes time. That is what discourages people. That is why you need to do it in conjunction with regular gardening. Save a few, let them cross, if it catches your interest you won’t let go.

Also, if you want to experiment in genetics without waiting a year, there is company in Wisconsin called Fast Plants. They have come to me for genetic resources. It is one guy who worked at the University of Wisconsin and got an idea for breeding plants on his desktop under lights. He bred a mustard genotype that grows fast and continued to select for fast growth. He now has seed to seed mustard in 28 days! He then took those and crossed them with plants showing many colors and shapes. He sells them to schools, so children can learn about genetics through several generations in one school term. They also use them in space for experiments in growing in orbit under microgravity.

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Plant Breeding and Seed Saving at Tobacco Road Farm

by Bryan O’Hara

Tobacco Road Farm is primarily a vegetable growing operation. Over the last twenty years or so we have saved seed from numerous crops and worked to develop more beneficial varieties for our growing conditions here in Eastern Connecticut. These efforts have been undertaken for a number of reasons, including to improve productivity and to provide an interesting endeavor in our agricultural pursuits. These efforts have led to a more harmonious relationship with our natural environment as well as more vegetables and also profit.

A major benefit to our seed saving has been improved germination and vigor of the seedlings and crops. This vigor comes from our ability to select the most vigorous plants to supply the seed as well as freshness of the seed and our ability to interbreed the seed crop. In selecting specimens for seed saving we generally will rogue out small or otherwise inferior plants while still maintaining a larger genetic pool of superior specimens. Size of seed can be selected during the cleaning process to secure the largest and heaviest. Seed freshness is also certain. As an example, seed harvested from a kale crop in July can be seeded in the same month of July. This freshness cannot be secured from commercial sources where age of seed is not even known by the purchaser.

Beyond selection, breeding crops for vigor generally takes advantage of large genetic pools to provide hybrid vigor. Often these crops are diverse in appearance and are referred to as “land races”. Examples of our land races include – mizuna, tatsoi and maruha, all bred together with seed of the offspring saved for many successive years. These mizuna-like plants are faster growing and hardier than any of...
their original parents and have diverse leaf shapes and colors. It is an excellent selection for winter salads. Another example of a land race grown here is our watermelons, which originally came from a Polish neighbor many years ago. This melon is a very highly productive melon that produces melons of different color green rinds from green striped to a more solid, lighter green color. All the melons have excellent flavor and the markets have accepted these melons’ appearance. Vigor is derived from the genetic diversity in out crossing crops. Out crossing crops are those that readily breed with other plants, that is, are not self-pollinating. Out crossing crops are generally those crops that are pollinated by wind or insects. In the self-pollinated crops like tomatoes, seed is simply saved from the healthiest few individuals as the need for diversity is much less. This gives us the ability to readily maintain pinnacle specimens in self-pollinated crops like tomatoes or peppers.

While crop vigor is certainly a major benefit of seed saving, the ability to select for the desired characteristics is also very helpful. Some of our efforts have been to improve cold tolerance, improve coloration or lengthen harvest periods. In the case of cold tolerance, we took a variety of arugula and overwintered them in the middle of December. This variety had about a 10% survival rate. We saved the seed from this 10% and replanted them the next fall. These plants survived winter almost 100% and were much less prone to damage in freezing temperatures. This is our standard fall and winter arugula.

An example of lengthening harvest times is our effort to breed a true biennial kale. In this case it was noted that about 5% of Konserva kale plants will not flower in spring in an effort to have them flower in their third spring. This project is ongoing and is difficult because of its long growth period and low plant count. Leading to low diversity. With the benefit of having produced kale, however, that does not bolt in spring — and accumulate — higher levels of natural proteins and other compounds that inhibit disease development. This unique mode of action gives growers an effective new option for bacterial spot, late blight, early blight, target spot, downy mildew, powdery mildew, gummy stem blight, and a number of other diseases. And adding Regalia to your rotation is an ideal resistance management strategy. The fact is, nothing else works like Regalia.

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Often we save seed simply to preserve varieties that are no longer commercially available, such as the Siegfried leek or presto cress. These varieties are further adapted to our farm’s environment by our selection of them and kept vigorous with high populations for breeding. Sometimes we will re-invigorate existing commercial varieties. For example, Dwarf Scotch Kale from commercial sources seemed to be lacking vigor; perhaps the seed that was being offered was old. We grew out a large population and secured a vigorous fresh seed. Also, hybrid seed can be stabilized. Many hybrids are quite true to type if succeeding generations are grown. Here stabilization may require several years of breeding to secure a consistent variety. High plant populations are important to maintain diversity for our crossing crops using this process. Or if diversity in plant type can be tolerated, a land race type of crop may be successfully started from a commercial hybrid source.

Large volumes of seed are often produced, and most can be saved for many years. This allows us to produce seed in different years that would have cross breeding problems if grown during the same season. Large volumes of seed are also useful for reducing seed expenses, and gives us the ability to seed very heavily if desired. This allows for broadcast seeding of salad green crops, or seeding vegetables for cover crops.

Seed production has also resulted in an increase in beneficial insects and therefore a reduction in insect pests. This occurs because the production cycle of crops to seed often results in a food source and habitat for these insects. An example is the Cotesia Wasp, a predator of cabbage caterpillars. This wasp lays its eggs on the caterpillar. The larvae burrows into and then consume the caterpillar. The larvae then emerge, pupates and new wasps emerge. The pupal stage generally occurs on the leaf of the cabbage family, pupae are seen as small white cocoons, often in clusters. The wasp feeds on the nectar of cabbage family plants. We have overwintered the pupal cocoons in collards and seen the wasps emerge the day the collards started to flower in the spring. Now what if all the cabbage family residue had been tilled in the fall. Would any pupae that survived have anything to eat when they emerge as wasps?

This relationship of the crops full growth cycle providing both the necessary habitat and nectar source for the proliferation of the appropriate beneficial insects led to a new understanding of crop production. These crops offer us much in the way of their usefulness. Therefore, in return, we should help them to proliferate and evolve through seed production — a simple, effective relationship.

In terms of how we produce seed, probably the most important factor is soil fertility. A well-balanced soil that can sustain healthy plant growth through to seed production is critical to achieve large, vigorous seed. Soil overly rich in nitrogen and other vegetative growth elements will not yield high quality seed, nor will a soil deficient in necessary nutrients. A fertile soil also helps with weed control, which is critical in a long term crop like a seed crop. Often seed crops are grown with an organic mulch like leaves, straw or hay to assist weed control and provide for better soil. The growing practices for the straw or hay need to be ascertained in order to avoid hazardous herbicides, herbicides known to damage vegetable crops.

In terms of the growth cycle of plants, it seems best to grow crops for seed in their natural patterns. The vast majority of vegetable crops are either summer annuals or winter annuals. Summer annuals are generally frost sensitive crops which are seeded in spring or summer and produce seed by fall. Tomato, pepper, squash, melon, bean, pea, okra, basil and amaranth are examples of summer annuals. Winter

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**“30 whitetail deer crossing my vegetable farm...”**

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A couple of years ago I had a herd of 30 whitetail deer crossing my land. Their game trail went right through a field where I was planning to plant corn. Rather than put up a fence, I decided to use your new granular Plantskydd product. I dumped 40 lbs in a drop spreader and pulled behind my garden tractor, and put down a 3-foot border around my field. Next, I rubbed out the tracks on the game trail so I could see how effective Plantskydd was. The deer always crossed during the night. Well, the next morning there was not a track to be found. And none for the rest of my growing season!

I have a small truck farm where I grow vegetables to sell at Farmer’s Markets as well as to supermarkets. Deer just love beet tops — I have had them eat a 100 foot row in one night! Last year, when my beets came up, I put some granular Plantskydd in a spreader and applied it around the outside row of the beets. The deer didn’t eat a bite. The key is to get the product down before the deer start nibbling. Later in the spring, my pickers came and told me the deer had been eating the zucchini. I took out the spreader and made one trip around the patch applying Plantskydd, and the deer stayed out until after harvest.

We have such a deer problem in the valley that, when I tell folks in my garden seminars about your product, they jump right on it. Hooper’s Garden Center, in Kalispell, Montana, sent one of their customers to me, desperate to see if I could help them save a $30,000 investment in flowers that were to be planted for a special event on a large estate. I sent them to the CHS Country Store (also in Kalispell), where they proceeded to clean all the Plantskydd Granular off the shelf. The estate put in an order for 50 more 20 lb bags this year.

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**Mizuna land race in flower**

Photo by Bob Doty
annual crops generally start growth in spring or summer or later, and flower and produce seed the following spring. Lettuce, carrot, beet, the cabbage family, onion, leek, parsley and many others are in this group. Often they are mistaken for biennials, but this is inaccurate as their growth period is only one year, generally from summer to the following summer, an annual cycle. A true biennial like burdock starts its growth in one summer, forming a small root. This crop then spends the entire next year growing a larger root which spends a second year underground and then flowers the next summer, a full two year growth cycle.

It is critically important to understand this winter annual cycle in order to grow high quality seed in our environment. Winter annuals seeded in summer or fall and grown through winter and allowed to flower in spring have consistently grown seed free of seed borne diseases and are vastly more prolific than a winter annual sown in spring which then flowers in summer. Lettuce has been a perfect example of this with prolific overwintered production and next to nothing of quality from spring sowings. This is not to say that you cannot produce seed from spring sown winter annuals. Some winter annuals will generally not flower in their last summer if sown in winter or spring, such as cabbage, kale, carrot, beet, parsley, onion etc. Others will perform as summer annuals from a winter or spring sowing such as broccoli, lettuce, mustards, cilantro etc. and produce seed in their first summer.

Often crop cycles are staggered in order to produce pure seed from similar crops that will readily cross breed – for example, mizuna may be sown in October for an early flowering seed crop, where a late sowing in December of tatsoi will flower late enough in the spring to miss the mizuna’s flowers. Crops can also be separated by harvesting, which delays flowering, or by distance, such as another field entirely.

In the case of selecting the best plants for seed collection, rogueing generally occurs. This is especially important in the out-crossing crops where large populations are maintained. In rogueing, plants are removed which are weak or otherwise do not meet our requirements. In the land races where vast diversity is tolerated and even encouraged, rogueing is performed even less and is limited to very undesirable traits, such as hairiness in a salad crop. In self-pollinated crops much less rogueing takes place and seed is simply saved from the superior specimens, though if we are really trying to “clean up” a variety we will use rogueing to give better isolation.

The basic process for most seed crops is to cut seed stalks when the first basal seed pods are just starting to shatter. These basal seed pods generally have the best seed so it is important not to let many of them shatter before harvest, yet they also need to be at full maturity. These seed stalks are then brought into a shade cloth covered hoop tunnel and allowed to dry either hanging from the hoops in bunches or spread out on benches. Once dry they are stomped upon in a large sheet metal pan. The bulky materials are then removed from the top. The seed and chaff is then poured from one smaller pan to another through various sized screens, both too large and too small for the seed to pass through. This removes the vast majority of the chaff.

The seed is then winnowed by pouring from one pan to another in front of a fan. If done carefully almost all chaff and small light seed can be removed in this manner. The seed is then left for a day or two in a very dry location to allow any insects to leave. The seed is then stored in airtight glass gallon jars in the dark with desiccant packs inserted into the jars.

For summer fruits the seeds are simply removed from the melon, bean, pepper or squash and dried before storage. In the case of the tomato, the seed and pulp is removed and allowed to ferment for several days, then washed, dried and stored.

All of these efforts have seemingly led to increased profit since the benefits are substantial. However, no cost benefit analysis has ever been done here. Seed production does require additional planning, labor, and observation and may be too much to embark on for many labor-strapped farms. Even small, well placed efforts, however, may have a dramatic effect. This could lead to more seed developed for our specific region, and if distributed and shared with other regional farms would create greater self-reliance in our means of production.

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The Natural Farmer

Winter, 2011-12

The Organic Seed Rule

by CR Lawn

Seed is an essential living component of organic systems. The use of organically-grown seed that is adapted to organic systems and free of contaminants is critical to overall organic integrity.

Few in the organic movement would take issue with such noble sentiments. But the dream that organic farmers use only certified organic seeds, while salutary as an end goal, is of no help in navigating the way there.

From the get-go, the Organic Seed Rule has been one of the most controversial features of the NOP, for it had no precedent in the decentralized certification operations that the NOP replaced. In effect, it called for an entire industry to develop out of a vacuum, a pertinent fact that puts the Organic Trade Association’s (OTA) impatience at the slow pace of industry development in perspective. In railing at a too-slow increase in organic seed use since implementation of the NOP, OTA failed to appreciate why 11 years transition time has been insufficient to allow production of organic seed to catch up to the demand. Given that it takes a minimum of 7-10 years using classical breeding to develop a new variety or to stabilize an hybrid, and that the organic method rightfully, in my opinion, forbids certain faster breeding techniques, organic seed development represents the ultimate form of slow food.

NOP regulations 205.2 and 205.204 establish a requirement that certified operations use organic seed and planting stock, but allows an exemption if these are “not commercially available in an appropriate form, quality or quantity to fulfill an essential function in organic production. Price cannot be a consideration.” While many in the organic industry lament the lack of clarity inherent in the “commercial avail-

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My experience at Fedco Seeds gives lie to the first contention. I have found that reasonably priced or-
ganically grown seed of good quality flies off the
shelf. Not only is it purchased by certified organic
farmers, who are required to look for it under the
NOP rule, but it is also chosen by growers of non-cert-
tified farmers and gardeners who are under no such
obligation. That’s because organic is far more than
a market niche, it is a social and ethical movement.
Much of the demand for organic seed preceded
the Rule. It sprang from grass roots ethical choices
made by the pioneering generations of the move-
ment and enthusiastically embraced by the next. To
test this contention I conducted a small survey. I
found that our customers chose to purchase organic
seed 38.1% of the time, even though only 26.5% of
our listings were certified organic, and even though
organic seed cost 2.3 times as much.

The second contention is harder to refute. I can
point to numerous capacity building initiatives un-
dertaken by entrepreneurs in the last decade, howev-
er — by us, by our friendly competitors, by our sup-
pliers and by growers — and I believe that these will
continue to grow in the decade to come. Given the
ever-increasing demand for quality organic seed at a
fair price, there are tremendous investment opportu-
nities even with the Rule as it is. To those would-be
suppliers who might hesitate, I would advise: don’t
wait for an iron-clad Rule. High Mowing didn’t
wait, Family Farmers Seed Co-operative didn’t wait,
we didn’t wait to invest. Our biggest need in the in-
dustry is for more quality wholesalers in the States.
Assess the market and take the risk. We’ll be knock-
ing at your door!

Last year the Organic Seed Alliance, as part of its
first State of Organic Seed Report, conducted a sur-
vey of 1,027 organic farmers in 45 states, finding
that by far the biggest obstacles to greater use of or-
ganic seed are the lack of availability for the specific
varieties wanted (for 79% a moderate or significant
factor) and the lack of sufficient quantity of avail-
able seed (50%).

The quality of available organic seed is quite un-
even. The best varieties, such as those bred and
produced by Frank Morton and Gathering Together
Farm, those originating from Cornell University’s
farmer-bred collaborations, and some releases from
Europe where organics developed much earlier
and faster than in the States, were trialed and bred
specifically under organic conditions. These are
worth every penny of their price and more. Fedco’s
seed receivers, however, can recite a litany of hor-
rors to attest that some organic seed growers need
additional technical assistance and seed-cleaning
capacity to get up to snuff. In recent years we’ve
invested tens of thousands of dollars to bolster our
lot grow-out and trials research, and our condition-
ing capabilities, to respond to these glaring needs.

Unfortunately, the OSA chose to downplay seed
quality issues in their report, dismissing the signifi-
cance of the 21% of growers (more for vegetable
seed) who reported significant problems, particular-
ly of germination, emergence and trueness to type.
The survey results showed a serious asymmetry,
with only 3% of seed users having more problems
with untreated conventionally grown seeds com-
pared to 23% having more problems with organic
seed. Since growers are paying a premium of any-
where from 1.5 to ten times the price for organic
seed compared to conventional, they have a reason-
able expectation that its quality should be at least as
good.

Which brings us head-to-head with perhaps the most
problematic feature of the Rule: price. Fully 41% of
organic farmers in the survey admitted taking price
into consideration in their seed selection, despite the
express prohibition of the Rule. It is from this statis-
tic that the “shrinker” argument gains traction. Let’s
look at this from the farmers’ perspective. Farming
is one of the highest arts. The ability to observe and
choose varieties best suited to one’s climate, soil
conditions and marketing needs is one of the distin-
guishing characteristics of the skilled practitioner.

Take away the farmer’s right to choose and she is
little better than a serf.

The best farmers choose whatever varieties will
offer the highest value. What factors determine
value? Price, satisfaction with the supplier (acces-
sibility, prompt and accurate service), the genetics
of the cultivar, its consistency, its quality compared
to other strains and similar varieties, its ability to
fill the required marketing niche. As the price for
achieving certification, organic farmers are expected
voluntarily to ignore price; to give up a key factor in
determining value, which is a huge sacrifice. To
quote the OSA report “There is a long and unfortu-
nate history in agricultural policy of treating farmers
unfairly...in order to benefit consumers, retailers,
food companies, processors, financiers and suppliers
of agricultural inputs” (read seed companies). If the
organic movement is not to repeat this tragedy, how
will it reconcile a Rule that asks its farmers to make
such a sacrifice with the lofty desiderata of keeping
organic agriculture “farmer-driven and farmer ori-
ented”? There are no easy answers.

The Rule as stated presents seed companies like
mine with a dilemma as well. Aware that organic
farmers are required to source organic seed, we take
on an added burden whenever we consider adding
an organic cultivar. Because organic farmers are
forced to consider it if we offer it, we must make
doubly sure that it is of sufficient value to justify the
price we’d charge for it. If not, our clear duty to or-
ganic growers is to leave it out of our catalog.

At present, certifying agencies are inconsistent in
applying the rule for sourcing organic seed. Some
are much more stringent than others, but the trend
is toward increasing stringency. Many still maintain
a minimum requirement that farmers search at least
three sources, a requirement that could be clearly
inadequate depending which sources are chosen and

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how thoroughly they are searched. Others ask for a pattern of continued improvement in the percentage usage of organic seed. Although both the Organic Seed Growers and Trade Association (OSGATA) and OTA, in their 2011 recommendations to the NOP, endorse the percentage usage test, it is at best a crude measurement of compliance, requiring certifying agents to have a significant degree of seed industry knowledge to apply fairly. As a farmer, I could be making progress toward greater organic seed use even while my percentage use is dropping. How could that be? Let’s look at Carmen pepper. Johnny’s introduced Carmen pepper in 2006 when it won an All-America Award. For the past five years it has been available only in conventional seed. 2012 is the first time organic seed will be available. This is typical for the industry; with few exceptions, new cultivars usually show up first as conventional offerings and several years elapse before organic seed is available. Should growers who purchased Carmen the past five years have been penalized by certifiers? How about those who want to stay at the cutting edge by continuing to try new varieties that sound superior but are available only in conventional seed?

Or let’s suppose that I have specialized in heirloom tomatoes. Shopping 2011 catalogs from Seeds of Change, High Mowing, Johnny’s and us, I found 63 different organic listings for heirloom tomatoes. My certifier could have reasonably insisted on 100% or near 100% organic seed usage for heirloom tomatoes. However, now my market has changed and it demands shell peas and hybrid watermelons instead of tomatoes. For the latter I could find only three organic options in the four seed catalogs; for the peas, just seven. Unless my certifier is knowledgeable about the seed market, it will unfairly take me to task when my market changes to peas and melons or to hybrid summer or winter squash. In particular, how am I supposed to hybrid summer or winter squash. In particular, how am I supposed to

come to support the organic industry’s longtime push for a national database of organic seed availability, provided it is used as a tool to benefit farmers in making selections rather than as a cudgel to enforce the Rule high-handedly, and provided it observes the following caveats:

1) Seeds are live products. Their availability is in constant flux, new developments are continuous. The database will be worthwhile only if it is carefully and knowledgeably maintained and kept current.

2) For that reason it will be costly to keep up and for farmers and seed companies should not be asked to bear these costs. Public funding must come from the NOP.

3) Although I am in favor of requiring organic farmers to search this database as part of their organic sourcing, it is only a starting point. It cannot replace a more detailed search through seed catalogs, and wise farmers searching for value will not use it as a short-cut.

4) The mere mention of an available variety on this database is insufficient to require a farmer to purchase that variety as such a listing is no guarantee of quality or suitability of purpose. Certifiers may not use this listing to force farmers to purchase specific varieties or deal with seed companies with whom they do not prefer to patronize. OSGATA’s recommendation to NOP places primary responsibility on farmers, not certifiers, to determine varietal suitability for a given specific purpose and seed quality sufficiency, recognizing the complex nuances of seed issues.

Well kept, wisely used and fairly applied, such a database can become a valuable tool, not only to farmers to source to varieties, not only to certify to assess progress in organic seed use, but also to the entire organic industry to identify areas of insufficient supply and develop responses. Applied unfairly, it could become a bureaucratic nightmare for organic farmers. Though it might be our sextant in navigating to edge by continuing to try new varieties that sound superior but are available only in conventional seed?

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different strains of the same variety. If you don’t believe me, try planting arugula, Scarlet Nantes carrots or Cherry Belle radishes from 6 or 8 different seed companies. Put them alongside each other and you will see variation. Varieties are alive, constantly evolving with their environment. Seed companies and their seed stocks are different, too.

Equivalency is American Seed Trade Association (ASTA) sophistry at its worst. Its implementation would turn organic farmers into captives of the seed industry. It is nothing more than a scheme to enrich seed companies at the expense of organic farmers. I cannot imagine why any skilled farmer would ever want his/her choices to be so restricted. Wisely, OSGATA elected to eschew all references to equivalency in its recommendations to the NOP. Equivalency has one further fatal drawback. In a worst case scenario in which the organic industry abandoned its familiar refrain. While I, too, look to the eventual day that our organic farms are 100% organic from seed to table, while I, too, respect those high organic ideals, I also remember from Economics 101 that setting the bar higher in the form of stiffer regulations restricts entry to the market. While all sorts of persuasive public policy benefits are advanced to productions, I would argue that now is not the time to close all loopholes and make it absolute, or even to greatly intensify enforcement efforts at the expense of our farmers. Instead let’s focus most of our energies on expanding capacity in ways that will benefit rather than hurt organic farmers. As we build infrastructure, develop and refine skills, we will expand our productive capabilities, opening up ways to increase the quantity and quality of good organic seed. As the supply expands over time to approximate the demand, we will experience more favorable winds, more opportunities to navigate more directly toward that shore of all-organic closure: CR was on the OSGATA Policy Committee that drafted its latest recommendations to the NOP.

Disclaimer: The views expressed herein are neither those of OSGATA nor of Fedco Seeds, Inc. but represent only those of the author.

CR Lawn founded Fedco Seeds in 1978. Full disclosure: CR was on the OSGATA Policy Committee that drafted its latest recommendations to the NOP. 

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Biodynamic Seeds at Turtle Tree

by Jack Kittredge

Eastern New York, between the Hudson River and the Berkshires, is Biodynamic country. Hawthorne Valley Farm, Roxbury Farm, and Copake’s Camphill Village are among the important institutions in the area that follow the biodynamic philosophy. And because of the unique features of Camphill Village, it has become home to a thriving organic seed company, Turtle Tree Seeds.

The company was started by Beth and Nathan Corymb in Minnesota, at the headwaters of the Mississippi. They chose the name based on the Native American belief that the North American continent is a turtle with a tree, which is the Mississippi, on its back.

In 1998 the Corymbes came to Camphill Village in Copake, looking for a home for the company. They brought with them the roots they used for perennials and started putting seed crops in the ground. After discussion, the community decided the company would be a good fit. There is a lot of handwork involved in processing seeds, and Camphill Village has lots of hands. Plus they have a vegetable garden, a dairy, and an herb garden. So Nathan and Beth gave Turtle Tree Seeds to the Village.

Ian Robb, who was a farmer at Camphill Village before becoming active in the seed company, has a long history of biodynamic growing. He explains why the company and the Village make such a good combination: “When you talk about Turtle Tree as a seed company, people could imagine that it is a thing unto itself. That is oversimplified. We can function because we are in the center of a Biodynamic support group. How could we be a sustain-

able seed company if we didn’t have cows to give us manure? To be just a seed company, I don’t know how it could be sustainable unless you have a farm organism around it. We’re extremely lucky. We have a dairy farm for manure, an herb garden and a vegetable garden where we can trial varieties. We have 250 member residential community which can taste our food. When we grow squash we can extract the seeds and still feed 200 people with the part we aren’t using. To take us out and plunk us somewhere else, I don’t think it would work.”

Lia Babitch, another of the Turtle Tree staff, is a bright young woman who is fascinated with seeds.
She got her training in a biodynamic apprenticeship producing seeds for lettuce, chard, onions, leeks, tomatoes and cucumbers. She has continued to educate herself during the two years she has been at Turtle Tree. She explains what it means to a part of such a community: “I’m a volunteer – I’m not paid, but my needs are all met by the community. If you volunteer here you get rent and board, generally in a shared house with people with and without developmental disabilities – sometimes with a family, sometimes not, sometimes with a small team. But part of living here is supporting people with developmental disabilities.”

“Health care covered by the community,” she continues. “There are vehicles if you need to drive somewhere. After three years they also make some provision toward retirement or toward your next step. And there is needs-based help as well. If I need to visit my ailing mother I could go to the community and ask for travel money and time off. They would try to figure out a way to make that possible. We try to put something aside each year for that kind of need. There is a really rich cultural life. There is a lot of music that goes on, an ensemble that meets every Monday has gone down to Park Avenue and played there, for instance. All the property is owned by the community. Sometimes people come who just want to live in a place like this!”

Turtle Tree staffing changes every year as different volunteers come to work there. Right now there are seven full time workers, two of whom are developmentally disabled and two who are brand new apprentices, and 20 part time workers. Ian does the germination testing and organizes the fine seed cleaning. He also does the bookkeeping and bill paying, and coordinates the shipping. Lia is responsible for the gardens and the rough cleaning of the seed. Eli, who has just been hired, is going to take responsibility in those areas too, especially the fine seed cleaning. Lia is also responsible for the catalog and public relations. The apprentices work one in the shop and one in the garden.

“We get a lot of questions about seed saving,” Lia says, “and I try to answer them all and encourage people to do it. We get school groups which will come by and want to learn about it. They come for a day or even a few hours. But if you are going to volunteer here you have to be interested in the whole package and living here in the community. Sometimes it is hard for people to uproot their lives that way. Some people love it, but it’s also a lot of work.”

The Village has three different growing plots, each of which has completely different soils. This makes it an excellent place to isolate and grow particular crops. Some plots are good for first year onions, for instance, but second year onions don’t do well there. Turtle Tree is still learning about the best places to grow out particular crops, and on ways to record and make that kind of information accessible to the Village growers.

In order to provide isolation they sometimes plant an early variety early, and a late one late, so they won’t be flowering at the same time. Of course there are many crops and varieties that the Village cannot effectively grow, sometimes because of climate, sometimes soil, sometimes weeds or disease.

“We can’t grow carrots, for instance,” Lia says, “We can grow the roots, but we would have to send them out the second year because of all the Queen Anne’s Lace here. It is botanically the same plant as the carrot. Its pollen would contaminate our seed. Beth and Nathan are now in Nebraska, where they don’t have Queen Anne’s Lace, so that is a good place to grow carrots out the second year. This is a good place to select for disease resistance, however, since we have so many diseases here.”

“A number of the brassicas are really hard for us to get,” she continues. “They are possible to grow here, but they’re really hard. There are ways to get rid of some of the diseases, but they take a labora-tory, which we don’t have. The Northwest is a great place for them, and we have a couple of growers there who grow brassicas for us. There are a few things we still have to get from Europe – some of the herbs, for instance.”

Lia estimates that they grow about half of Turtle Tree’s varieties in Copake, getting the rest elsewhere.

“We have a network of about 15 active growers,” she says, “of whom maybe 8 are growing for us in any given year. That involves growing out a crop and getting it to the point where they can box and mail it. It is usually dried seed, removed from the plant. You can usually dry seeds on a sheet in your greenhouse or just in a shady location in a dry climate. For biennials, we buy the roots.”

“Most of our seed growers are not just growing for us,” she continues. “They are also serving a CSA or are market gardeners. We want them to select their best for us, so we offer good money. They are all biodynamic, although not necessarily certified.”

Demeter, which is the biodynamic certification organization, certifies all Turtle Tree’s seed. In the last few years, however, for small growers Demeter has done a great change to their certification system. Instead of paying each year for certification, farmers are certified

the natural farmer winter, 2011-12
He says they get calls from them, asking questions about their customer base that save their own seed. Ian figures that there is probably a small percent of growers participating in a lending library way. Then there are the seed libraries, and Southern Exposure is also in a community, for instance. Lia explains: “Being able to outgrow weeds may be important in an organic situation, where in a non-organic management. Conventional seed companies don’t do that. One of the reasons Turtle Tree and other organic or biodynamic seed companies are important for organic growers is that they are selecting seeds for organic management. Conventional seed companies don’t do that.

Lia explains: “Being able to outgrow weeds may be important in an organic situation, where in a non-organic system they may use herbicide so that would not be so important. We’re really interested in selecting for good flavor, for good storage quality, and for being able to grow well without a lot of inputs. We apply a lot of compost, but we don’t force feed nitrogen. So the plants have to be able to grow well in a natural system.”

It is tricky to do good flavor selection on crops like peas and beans, she says, because once you have eaten them it is too late. But you can taste other seeds from the same plant and since peas and beans mostly inbreed (pollinate themselves), you can figure one pod on the plant will be much like another. With pumpkins, for instance, some growers eat them it is too late. But you can taste other seeds from the same plant and since peas and beans mostly inbreed (pollinate themselves), you can figure one pod on the plant will be much like another. With pumpkins, for instance, some growers eat them. But you can taste other seeds from the same plant and since peas and beans mostly inbreed (pollinate themselves), you can figure one pod on the plant will be much like another. With pumpkins, for instance, some growers eat them.

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Camphill resident Peter sorting oat seeds with tweezers

photo by Jack Kittredge
There are many variations in how plants are pollinated, Lia continues, and you have to work with many of them before you grasp the details. There are some things you can get from charts – isolation distances for plants, for instance. You have to keep a plant certain minimum distances apart from other varieties of that species to prevent pollination, and that distance is easy to look up. But, as we are learning with GMO crops, the only real isolation is if you want to grow on the moon. Otherwise you are not growing in isolation!

“Isolation from relatives is important,” Lia states. “But there are other factors to consider when you are setting up a garden to raise seed. You need to consider the height of the surrounding plants to get proper airflow for drying the seeds. If you are growing lettuce to eat it will always be low to the ground. But if you are growing it for seed, it will get four and a half feet tall. So if you have corn, then lettuce, then a pole bean, you might not have enough air flow to dry things. You need to vary the height. That drying also helps prevent disease.

“For squash,” she continues, “we do a full section, maybe 40 to 50 feet wide, in 50 foot rows. That way pollination is encouraged. And we wouldn’t have any relative nearby. This valley is pretty good because first of all it is a valley and not a lot comes in from outside. Also it is covered in trees and hills, which makes it frustrating for growing because it is not great soil for vegetable production. But for seed production it is pretty good because you don’t want to give the plant the easiest ride. If you do, you are just seeing what it will do in the best possible conditions. You want to make sure it is being put through its paces – it is able to grow in difficult conditions. It was healthy and vigorous and strong in conditions which makes it frustrating for growing because it is not great soil for vegetable production. But for seed production it is pretty good because you don’t want to give the plant the easiest ride. If you do, you are just seeing what it will do in the best possible conditions. You want to make sure it is being put through its paces – it is able to grow in difficult conditions. It was healthy and vigorous and strong in conditions that were not ideal.”

Cleaning, or separating the seed from its surrounding husk or other protective membrane is, of course, one of the fundamental tasks in this business. Much of it is done mechanically, using the principle that one of the best proxy for selection in that case is weight.

For this purpose, another device is handy. It is a canister at the bottom and lifted to various heights and heavy things go into a bin at the bottom of the machine. You can adjust the speed of the threshing pads, the strength of the blowing air, and the size of the screens.

Once the seeds are removed, they are usually sifted through various screens to separate them by size. For seeds of the same size, however, some will be more or less viable. The best proxy for selection in that case is weight.

For this purpose, another device is handy. It is a small adjustable blower. Air is sucked in through a fine screen in the bottom of the machine, and a setting at the top allows more or less air to escape, adjusting the pressure within. Seeds are put into a canister at the bottom and lifted to various heights by the air flow. The heavier ones never travel far before falling of their own weight. Lighter ones, however, are lifted further and trapped in two cylinders at the top.

A final process used at Turtle Tree is handwork. It takes a certain kind of person to enjoy sorting seeds with tweezers, Lia admits, but some of the community residents in the Camphill Village are very detail oriented and perfect for the work. They use magnifiers and bright lights to pick out the most viable seed by its visual characteristics. It is a learned skill, but some of the qualities they are sorting by are size, color, and proper appearance.

“Other seed companies do most of this mechanical-ly,” she says. “Machines do it fairly well. But I’ve often noticed that when I open other seed packets it is not what we would call ‘packing ready’

“Seeds which aren’t dry-seeded,” Lia explains, “but have a wet fruit around them – such as all the cuurbits, tomatoes, and peppers -- present a special problem. With those you have to get rid of the membrane around the seed before it can dry. A lettuce seed dries as it matures. But a tomato seed stays damp as it matures until you dry it. So the processes are different.”

“We scoop the seeds out of the tomatoes first,” she continues. “We’re lucky here to have lots of hands and we can use the rest of the tomato for making tomato paste or whatever. Then we ferment the seeds, as we do with cucumber seeds, (the other wet-seeded crops like the squashes don’t need the fermentation process). The fermentation breaks down the membrane around the seed, as well as kills many seed-borne diseases. The acidic fermentation environ-ment (which is really just seeds in tomato juice in a jar) makes it hard for disease organisms to surv-ive. We stir it occasionally. The fermentation starts on its own, from organisms which exist on the to-mato. If it is a ninety-degree week it takes maybe 36 to 48 hours. If it is more of a seventy degree week, it might take 72 hours. At a certain point you can tell it is done – the membrane is broken down and the seeds are ready. After that, we rinse off the bits and allow a water winnowing. The heavier seeds sink faster, and you can pour off the lighter ones. You re-
One step every seed company has to do before packaging the seeds is to run germination tests.

“Some seeds, notably peppers and eggplants,” Lia explains, “have dormancies. Some plants need the dormancy to be broken by cold, so you need to put them in the refrigerator or freezer for awhile. Some need scarifying -- rubbing -- so that the outside protection is damaged and water can get in. That happens naturally in the earth over the winter from the grinding caused by freezing and thawing. Some have a time delay -- they don’t like to germinate right away. In tomatoes the membrane contains things that prevent the seed from germinating too fast. Many seeds have requirements before they can germinate, but if we need to do a germination test in the fall, we use either cooling or a chemical solution to break dormancy.”

“The USDA puts out standards,” she continues, “for how you do germination tests for various plants. These two machines are germinators. One is set at 20˚ Celsius (68˚ F) and the other is set at 20˚ at night and 30˚ (86˚ F) during the day. They also have lights. The seeds are germinated on these blotter papers. A few plants need nutrients to germinate, but most don’t. Beans and peas and cucurbits are pretty clean and ready to pack.

Some need to be rubbed because they tend to stick together when drying. Once dry, there might be a few small or discolored ones to pick out, but they are clean and ready to pack.

The germination rate for each lot of seeds (the seeds needed to produce the germination year) is printed on the package. Turtle Tree makes sure the legal minimum germination rate, though. Some seed companies don’t. Some don’t even open pollinated seeds.

“BUT I think we shouldn’t expand a huge amount,” she continues, “I wouldn’t want to be a multi-million dollar a year business. We would need more mechanization. Why we fit so well here is that at our scale there is lots of handwork. Not only in the seed handling, but also hand digging our beds in the spring when it is too wet to use a tractor. There was this crucial moment this spring when everything had to get in. So we said to the garden people: ‘You use the tractor and we’ll do the handwork this year.’ If we were a lot bigger, that wouldn’t be possible.

The same with cleaning the seeds. We would have to mechanize to handle the load. The community is only a certain size and doesn’t plan to get bigger. We would have to have more outsiders employed. Right now we have Ian and another full time employee, and one part time employee, but the rest of us are volunteers and live in the community.”

Ian says sales picked up immediately once the company began marketing on the Internet. He feels their prices are competitive with similar companies. They base their rates on the competition, rather than their costs, however. He says that just like a farmer at a market, you can’t always charge what the product is worth if others are selling it for less!

Robb reflects on the changes he has seen as a grower, and why he feels seeds are so important: “I came to America in 1981. There was little organic and no biodynamic growing here then. I was even growing hybrids in my CSA in Amherst. I still meet many growers in farmers markets who do the same -- the idea of even open pollinated seeds is a big step. I was growing for 10 years in Amherst before I first heard of them.”

He farmed for 28 years before getting involved in Turtle Tree. He thinks that farming for an extended period is necessary before one can grow good seed.

“That is where it should start,” he insists. “You need to grow vegetables before you grow vegetables out to be for something, to push what you are for. Now many might have changed over the years, but you can put all your energies against something, but to be for something, to push what you are for. I think this is the next big thing. I don’t think we need to explore CSAs or community farms anymore. They’re doing all right. We need to work on the next problem. All the young people who are interested in agriculture, how many are just passing through and will become doctors and lawyers? And how many will save and breed seeds as a profession?”

“One of my strongest memories,” he continues, “was when I was at Brookfield Farm in Amherst many years ago. We were connected to Hampshire College and they were bringing over groups from developing countries to get ideas to take back. There was a group of women from Bolivia visiting, with their beautiful costumes and hats. They asked many questions and admired many things. Then one of the women said to me: ‘Where do you get your seed from?’ At that time it was Fedco and Johnny’s. That concept was foreign to them. They wanted to see my seed bank. I could see their disappointment. They were thinking: ‘This is a nice man, he has a wonderful farm, but he doesn’t know where his seed is from.’ That was enough to get me thinking. I wanted to be so self sufficient, but something as basic as seed I didn’t control.”

The Natural Farmer
An Organic Seed Bag Label - Demystified!

The label on a bag of certified organic seed is a complex legal document, carefully designed to satisfy several complex sets of requirements. The New York Seed Law and the Federal Seed Act, as administered by New York Dept of Ag and Markets, specifies the information that must be on the seed quality portion of the label, and the USDA National Organic Program, as administered by certification agencies, specifies the information that must be on the organic portion of the label. Seed companies then use additional label information to describe the variety, offer valuable agronomic tips, or cover their own liability.

This information should be clearly visible on each bag of seed. Some companies sew or stick the label to the bag, while others stamp or print this information on the bag itself. Regardless of how it is attached, the purity (% pure seed and % contaminants) and the germination of the seed should be clearly readable, along with the seed lot number (for traceability), the seed company and its address.

Purity - New York law requires that seed companies clearly identify the composition of the contents of the bag - both the intended crop seed and also any contaminants such as weed seeds, other crop seeds and inert material (broken seed, chaff, or dirt).

To obtain this information, New York Ag & Markets recommends that seed companies pull a composite sample of each seed lot, using a standard technique developed by AASCO (American Association of Seed Control Officials), to insure that an adequately representative sample of the seed has been evaluated.

When a seed sample is analyzed, weed seed and other crop seeds are identified, and determined to be "noxious" or not. A low percent of most weed species is tolerated, but some common weeds are considered so undesirable that they are termed "prohibited noxious weeds" and are not allowed in commercial seed.

Other less undesirable weeds are considered "regulated noxious" and must be identified separately on the label. Weeds can be considered noxious because they are difficult to remove from small grains after harvest (vetch, wild onion and garlic) or because they are invasive, overly competitive, or toxic to animals (corn cokchle). Any farmer/processor who has battled with trying to get vetch, cockle or garlic seed out of small grains after harvest can certainly understand why it is much better to avoid having them in the seed lot to begin with!

Germination - all bags, packets and bulk seed sold in New York must state % germination and a test date that is within 9 months of the date of sale. This does not imply that all seed sold must be fresh "current year" seed, because it often is not. But if seed is carried over from a previous year, it must be re-tested in the calendar year of sale, and tagged with the current germination rate.

This germination labeling requirement applies equally to seed you buy from a farmer dealer, from a seed company, or from Walmart - this is New york state law. New York has requirements for minimum germination for most species, below which the seed must be clearly labeled as being inferior quality. New York Ag & Markets employs seed inspectors whose job involves visiting seed companies, farmer dealers, and retail stores throughout the season to take random samples that are sent to the NY Seed Lab in Geneva. The results are matched to the stated information on the label and if there are discrepancies, the seed company is required to re-tag, or in severe cases, stop selling the seed.

Certain species, such as clover, alfalfa and other legumes, typically produce some hard seed. These are live viable seed, but have a hard impermeable seed coat and often take longer than one year to grow. Other species, such as many grasses, exhibit a different type of dormancy and may also not germinate the first year. These types of seeds are considered live seed, but on the label, the % dormant or hard seed must clearly be distinguished from the germination rate.

Seed companies are allowed to put additional information on a label such as seed coat size, phlegm plate recommendations, days to maturity, inoculant date, and agronomic suggestions.

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**Limitation of Warranty**

NOTICE TO BUYER: Distributor warrants that the seeds conform to the descriptive statements on the seed tag or label, within recognized tolerances. THIS EXPRESS WARRANTY EXCLUDES ALL OTHER WARRANTIES EXCEPT THOSE SPECIFIED IN WRITING. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE LABEL DESCRIPTION. By acceptance of the seed, Buyer agrees that the Distributor is not responsible for losses incurred by the Buyer in any event to which the seed is sold. The Distributor shall not be liable for loss of crops or for any other damage or loss, whether to the seed, the land planted and/or its crops, or any other property. The Distributor's liability is limited to replacement of the seed or the value thereof. The Distributor shall not be liable for any consequential, special, or indirect damages.

The grower must, under the terms of this limitation of warranty, follow the label directions and use the seed only in accordance with the label instructions. Any systemic fungicide or insecticide must be applied in accordance with local and state regulations and/or label directions, and the grower must be fully aware of the hazard(s) involved in using any chemicals. A grower using this seed, by acceptance of the seed, agrees that the Distributor and supplier(s), if any, are not responsible for any loss or damage to crops or property caused by the grower failing to comply with the label directions or with applicable state and federal regulations.

The grower agrees to immediately notify Distributor of any loss or damage to crops or property, and to provide Distributor with a full and complete description of such loss or damage, including a photo showing the seed lot and the label. The grower further agrees to provide Distributor with a full and complete statement of the results of any tests performed on the seed and the crops, which tests must be authorized by Distributor. The grower agrees to return the grower's unused seed sample to Distributor. The grower agrees to return to Distributor any samples of seedlot(s) to be tested and any records associated with the sample(s) of seedlot(s) to be tested. The grower agrees to pay for the cost of any tests performed on the grower's behalf by Distributor, including but not limited to any order charges, testing fees, and costs for mailing the test results. The grower agrees to pay for the cost of any other costs incurred by Distributor in connection with the grower's use of the seed.

For any claim for loss or damage to crops or property, the grower agrees to file a claim in accordance with and under the provisions of the applicable state and/or federal laws, and the grower agrees to provide Distributor with copies of all correspondence, lab reports, and other documentation related to any loss or damage claim.

The grower agrees to promptly notify Distributor of any injury or damage to crops or property, and to provide Distributor with a full and complete description of such injury or damage, including a photo showing the seed lot and the label. The grower further agrees to provide Distributor with a full and complete statement of the results of any tests performed on the seed and the crops, which tests must be authorized by Distributor. The grower agrees to return to Distributor any samples of seedlot(s) to be tested and any records associated with the sample(s) of seedlot(s) to be tested. The grower agrees to return to Distributor any samples of seedlot(s) to be tested and any records associated with the sample(s) of seedlot(s) to be tested. The grower agrees to pay for the cost of any tests performed on the grower's behalf by Distributor, including but not limited to any order charges, testing fees, and costs for mailing the test results. The grower agrees to pay for the cost of any other costs incurred by Distributor in connection with the grower's use of the seed.

**Organic Seed Treatment**

Organic farmers should use OMRI-listed seed treatments to show they are organically approved. If you use any non-organic, non-GMO seed treatment, you must be sure to document your search in writing for organic seed of the same type and be prepared to justify your choice to use non-organic seed. Most seed bags also include some form of disclaimer in very small print. Essentially, this disclaimer states that if the seed does not perform as the farmer thinks it should, compensation is limited to the original purchase price of the seed, and that by buying and planting the seed, the farmer has already accepted these terms. The disclaimer also describes the process a farmer must use to place a claim. Most seed companies will only accept claims if the farmer returns the seed bag and provides a photo of the seed. The grower is responsible for the cost of any tests performed on the grower's behalf by Distributor, including but not limited to any order charges, testing fees, and costs for mailing the test results. The grower agrees to pay for the cost of any other costs incurred by Distributor in connection with the grower's use of the seed.
Organic Seed Alliance Studies State of Organic Seed

by Kiki Hubbard

Organic Seed Alliance (OSA) is a national non-profit organization established in 2003 to advance the ethical development and stewardship of seed. OSA grew out of Abundant Life Seed Foundation (founded in 1973) after its founders realized that the agriculture community was losing seed knowledge – how to manage and improve our seeds as we were losing seed as a diverse resource.

Today, through research and education, OSA works with farmers and other seed professionals to restore and develop seed varieties for current needs while safeguarding plant genetic resources for future generations. Our mission is to meet the best needs of farmers is to engage them in creating regional, decentralized seed systems. And we advocate for policies that impact the integrity of the seed systems we support.

We employ traditional breeding techniques, including organic seed production, and for- profit private funding sources, including grants received from federal programs, private foundations, and individual contributions.

In 2009, OSA set out to take a snapshot of the burgeoning organic seed sector. We knew organic agriculture is a diverse industry and that organic food increased, but was organic seed keeping pace? What were the barriers to building seed systems that met the diverse needs of organic farmers, and how do we overcome them?

These were just some of the questions behind OSA’s State of Organic Seed project, an ongoing effort to monitor the status of organic seed systems in the U.S. Our report provides the first comprehensive analysis of organic seed usage on U.S. farms, research investments, and private funding sources. Collaborators have hosted workshops for farmers across the country to learn more. (For more information, please contact Michael Glos at mag22@cornell.edu.) Eventually farmers across the country will stand up to the new crossing in the field, relying on the farmer’s expertise to select the best material as the farmer gets to intimately know the material over the course of the season.

We strive to produce varieties that have the broad genetic plasticity necessary for continual adaptation to shifting climatic, environmental, and energy constraints. This diversity allows them to be selected for local environments. They will stand up to the new crossing in the field, relying on the farmer’s expertise to select the best material as the farmer gets to intimately know the material over the course of the season.

There are many benefits to expanding organic seed systems. For starters, seed bred under organic conditions provide organic farmers with the optimum genetics to produce healthy and productive crops. Seed is the critical link in organic production, and provides farmers the genetic tools to confront day-to-day challenges in the field. Organically bred seed also provides food processors, companies, and retailers with improved traits that organic consumers value, including nutrition, flavor, and other beneficial traits. We believe the benefits are even greater. The challenges of resource depletion, climate change, and population growth require ongoing improvements in agriculture, including innovation in plant breeding to deliver beneficial traits that address these issues. Organic farming and organic seed systems are well suited to address the ecological and agricultural challenges of growing a socially, culturally, and environmentally responsible manner.

Further investments in organic research and breeding we will see exponential improvements that recognize local conditions, systems, and business models. Seed needs, including regionally adapted seed varieties that are suitable to a range of growing seasons, resist important crop diseases, and have enhanced flavor and nutrition.

That’s why OSA’s research and education programs are helping farmers to restore the skills needed to produce organic seed. Our work responds to the urgent need to protect our genetic resources for future generations while ensuring farmers have adequate seed choices to feed their communities. Expanding knowledge and skills for developing alternative seed production and distribution networks at the community level is one solution that lays the foundation for long-term, transformative change.

One example of these alternative networks is the Northern Organic Vegetable Improvement Collaborative (NOVIC). NOVIC brings together researchers and organic farmers in northern states to breed new varieties, identify the best performing varieties for organic agriculture, and educate farmers on organic seed production and plant variety improvement. The collaborative includes researchers and educators from OSA, the U.S. Department of Agriculture, and four universities: Washington State University, Oregon State University, University of Wisconsin, and Cornell University.

NOVIC’s regional breeding projects focus on traits important for season extension, flavor and horticultural traits crucial to organic agriculture. Plant breeding projects are underway in five states – Minnesota, New York, Oregon, Washington, Wisconsin – and focus on five vegetable crops. The breeding goals include broccoli (heat tolerance, marketable uniformity in an open-pollinated variety); carrot (cold-tolerant, weed-competitive, ‘Nantes’ type); snap pea (heat-tolerant, disease resistant, stringless variety); sweet corn (good cold soil emergence in a sugar enhanced variety); winter squash (long term storability).

NOVIC is committed to education and shared resources. Collaborators have hosted workshops for farmers to gain skills in seed production and plant variety improvement. Participants are also developing publications and a national database of organic variety trials results through eOrganic (to be shared with the public on www.eXtension.org).

In the Northeast, breeding efforts at Cornell University are focused on squash and peas, and trialing continues for all six crops mentioned above. (NOFA farmers interested in participating in on-farm trials should contact Michael Glos at mag22@cornell.edu.) Eventually farmers across the U.S. will have access to new varieties to better meet compliance with organic regulations and through new resources that help identify which organic varieties perform well in their region. The collaborative is an example of a working model that the organic community can replicate and evolve to collaborate and build infrastructure for developing and distributing organic seed.

We employ traditional breeding techniques, including population improvement, controlled pollination, and family selection. We use many of the same techniques that conventional breeders use in public breeding programs and in the seed industry. However, our breeding program is based on principles that generally

In our participatory breeding work, there is a true and equal partnership between a farmer and a plant breeder. The farmer understands how the crop responds to the challenges of their environment and the agronomic traits needed to excel under those conditions. They also know what horticultural traits are essential for their markets. The classical plant breeder knows how to isolate those traits and how to test the new crosses in the field, relying on the farmer’s expertise to select the best material as the farmer gets to intimate know the material over the course of the season.

We strive to produce varieties that have the broad genetic plasticity necessary for continual adaptation to shifting climatic, environmental, and energy constraints. This diversity allows them to be selected for local environments. They will stand up to the new crossing in the field, relying on the farmer’s expertise to select the best material as the farmer gets to intimate know the material over the course of the season.

As an organic community, we need to keep challenging the threats to the integrity and expansion of organic agriculture, especially consolidation of market power and genetically engineered organisms. But we also need to devote attention to real solutions, including organic seed systems that restore farmers’ power and genetically engineered organisms. But we also need to devote attention to real solutions, including organic seed systems that restore farmers’ role and rights, ensure new varieties are available and shared for breeding purposes, and provide a diversity of healthy food now and into the future.

We hope you’ll join us in this important work.

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State Of Organic Seed 2011 (excerpts)

These are excerpts (selected by Jack Kittredge) from the Executive Summary and sections on history of seed in the organic movement, and concentration in the seed industry. For a copy of the full report, visit www.seedalliance.org

State of Organic Seed (SOS) is an ongoing project to monitor the status of organic seed systems in the United States. The project aims to develop diverse stakeholder involvement in implementing policy, research, education, and market-driven activities that result in the improved quality, integrity, and use of organic seed. Organic Seed Alliance (OSA), a national non-profit organization committed to the ethical development and stewardship of the genetic resources of agricultural seed, facilitates the project with the belief that developing and protecting organic seed systems is a top priority for organic food and farming.

This report is the first comprehensive analysis of the challenges and opportunities in building the organic seed sector. A planning team of farmers, non-governmental organizations (NGOs), certifiers, and food and seed industry representatives directed project activities. To collect information from a broad and diverse group of stakeholders, OSA and its partners conducted a series of surveys with farmers in 45 states, and gathered questionnaires from researchers, certifiers, food and seed industry representatives, and farm and food policy experts. OSA also hosted a full-day SOS Symposium to discuss data and prioritize next steps.

Why is the State of Organic Seed project important?

The USDA’s National Organic Program (NOP) standards require the use of organically produced seed. Yet, even with the organic industry’s impressive growth, the organic seed sector has not caught up to meet this demand. There is a limited availability of appropriate organically produced seed for a variety of reasons, including cutbacks in public plant breeding programs, lack of investments from the private sector, seed industry consolidation, and ongoing disagreement regarding implementing NOP requirements pertaining to organic seed, among others.

Concentration in the seed industry is another challenge. The seed industry has consolidated quickly, concentrating the ownership of seed resources through corporate acquisitions and mergers and the restrictive use of utility patents. In addition to placing constraints on germplasm, this consolidation has decreased the number of regional seed and genetics firms with the potential to serve organic markets. Alternative intellectual property models that enhance innovation while protecting investments must be explored.

Key findings: Organic seed systems are improving but require increased attention and resources.

SOS data shows that organic seed systems are developing. Farmers report increased attempts to source organic seed and more pressure from certifiers to do so. Research in organic plant breeding has increased slightly, with increased attempts to source organic seed and more pressure from certifiers to do so. Research in organic plant breeding has increased slightly, with increased attempts to source organic seed and more pressure from certifiers to do so.

Still, challenges and needs loom large for expanding organic seed systems. While this project captured an array of priorities that varied by crop, region, and perspective of different professional sectors, overarching priorities are clear, including the need to:

• Develop seed systems that are responsive to the diverse needs of organic farmers through increased public-private collaboration.
• Refine understanding of organic plant breeding principles and practices.
• Engage the National Organic Program in policy initiatives that move organic seed forward.
• Reinvigorate public plant breeding with an emphasis on the development of cultivars that fit the social, agronomic, environmental, and market needs of organic agriculture.
• Protect organic seed systems from threats of concentrated ownership of plant genetics.
• Protect organic seed systems from threats of contamination from genetically engineered traits.
• Improve sharing of information in the areas of organic seed availability, lack of availability for specific varieties and/or traits, and field trial data.
• Create opportunities for organic farmers to work with professional breeders through trialing networks and on-farm plant breeding to speed the development of regionally adapted organic cultivars.
Organic seed has developed slowly, at a pace behind many other innovations in the organic movement. Modern U.S. organic farming can be traced back to the early work of the Rodale Institute in the 1940s. Organic farming gained proponents and practitioners throughout the next two decades, but it was not until the early 1970s that formal organizations developed, including California Certified Organic Farmers, Maine Organic Farmers and Gardeners Association, Tilth Association, and many other regional groups. In the early years these organizations focused attention on farmer education, certification standards, and research (e.g., field trials), but have had no public record of specific programs focused on seed system development.

In any history of seed we have to first recognize the 12,000 years of farmer and plant breeder innovation that existed before the advent of 21st century agriculture. We have been bequeathed an incredible living resource that is beyond economic valuation. We have no modern food crops, only modern variations on crops from the centuries before. From the diversity of grains, to the broad array of brassicas, we have been the beneficiaries of more than what we can ever give back. That said, it is our responsibility to leave this seed inheritance better than when we received it. The authors want to recognize the diversity of cultures, individuals, breeders clubs, and early scientists who observed, recorded, and preserved these varieties. They have left us with much to appreciate, protect, and improve.

The first Johnny’s Selected Seeds catalog was published in 1974. Johnny’s became a mainstay for organic gardeners and farmers, and was very likely the first seed company with its own certified organic research farm (1979). In 1975, two organizations with missions of conserving and distributing heirloom seed launched: Abundant Life Seed Foundation published its first seed catalog, and Seed Savers Exchange (originally “True Seed Exchange”) published its first yearbook annual newsletter (which became the yearbook). These organizations, along with companies such as Peace Seeds (1975), Fedco (1978), and Territorial (1979) were suppliers to many organic farms, and indeed worked with organic farmers to save and promote heirloom varieties.

While no studies from this period indicate farmer preferences or behavior in purchasing seed, it is likely that organic farmers in the 1970s and 1980s used heirloom varieties much more than their conventional counterparts. This preference was likely tied to a philosophical response to the conventional agricultural industry, as organic farmers were opposed to the negative environmental, economic, and social justice impacts of industrial conventional agriculture, while valuing diversity, local systems, and the sovereignty that comes with a “do it yourself” approach to life. Along with concerns about genetic diversity, early organic advocates were also concerned about the economic and nutritional value of their crops and expressed concerns that conventional breeding systems favored the development of crops with heavy chemical inputs.

The focus in the organic movement on open-pollinated (OP) and heirloom varieties is apparent in that many of the first seed companies serving the organic vegetable market primarily sold heirloom seed. Seeds of Change (1989) is considered by many to be the first company that only offered certified organic seed, and it was nearly twenty years before the company offered hybrid varieties. A scan of commercial organic vegetable seed catalogs in 2010 continues to show more OP and heirloom varieties than hybrid varieties. In conventional seed catalogs, the majority of options are hybrids, with few if any OPs available (for crops in which hybrids are available.) Interest in using hybrid vegetable varieties has increased among organic farmers, yet the market offers very little in hybrid options. The certified inorganic hybrid market is an exception to the OP-Hybrid ratio, with major organic corn seed dealers offering primarily hybrid seed. These dealers are even breeding new parent lines specifically for organic systems. There is talk of U.S. vegetable seed companies developing organic parent lines and exit the market but the small U.S. market at present comes primarily from European firms.

The majority of organic breeding projects funded through USDA programs are also focused on OP development (see Public Initiatives section). This may in part speak to a “do it yourself” value that remains among organic farmers, as well as a desire to decentralize seed systems and increase farmer involvement. However, organic farming is diverse, and requires varied approaches to seed. Not all farmers want to or could save seed, and not all favor OPs. The seed saving movement has pointed out that the shift toward hybrid varieties resulted in a reduction in crop and genetic diversity, and was a by-product of the monoculture approach to agriculture. We do not wish to dismiss, or that the seed industry dropped OP varieties in favor of hybrids to have customers who had to return for the next generation of seed. However, hybridization and in and of itself is only a tool, one used often in creating OP populations. Many organic farmers rely on and arestrengths of OPs. However, OP seed systems are to move forward and provide high quality organic seed to meet the needs of diverse organic farmers, then we will need diverse varietal offerings, including both OP and hybrid seed.

While the appreciation of seed saving and heirloom varieties by early organic vegetable farmers may have been a factor in the slow development of certified organic hybrid varieties, the factor continues to slow investment in organic hybrids likely has more to do with investment and access to germplasm. The development of breeding lines for organic systems requires time and significant resources, and seed industry professionals who gave input for this report have stated that they have been slow to make such investment due to concerns that they will not be able to recoup costs. These financial risks are real not only for hybrid development but for improvements or breeding of new OP varieties, which also require large amounts of time and resources to deliver a finished product. One factor that has slowed investment in organic breeding is uncertainty regarding the implementation of the National Organic Program (NOP) rule as it pertains to seed. In particular, there is concern that allowing organic farmers to use certified untreated seed will create a loophole without sufficient auditing, oversight, and metrics to determine if or when allowances should be denied, or the allowance itself removed from the rule.

The lack of investment from the private seed sector in organic seed is directly related to this regulatory quagmire around seed. It is not the only reason for inadequate investment, but one that must be addressed for the seed sector to gain confidence in delivering varieties appropriate for organic agriculture. The seed sector fears the cost of unsold organic seed due to farmers claiming a lack of equivalent variety and requesting allowances for conventional untreated seed. In the scenario, seed companies stand to lose huge investments in breeding, production, and marketing expenses.

Farmers also fear they will be forced to purchase organic seed that is not equivalent or does not meet quality standards. The NOSB attempted to give guidance in addressing these concerns and others, but initially it gained no traction at the administrative level of the NOP. Fortunately there are signs that the new NOP leadership will provide more clarity and the leadership will provide more clarity and the lack of confidence the market at present comes primarily from European firms.

Regulatory History of Organic Seed in National Organic Program:
Prior to the NOP in 2002, farmers who purchased organic seed did so based on philosophical or agronomic reasons, as there was no federal regulatory requirement to do so. A brief review of the development of organic standards shows that, from the start of the federal program, there was recognition that seed
The Natural Farmer

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There are problems with determining compliance time. ASTA’s proposed transitional deadline for variety and species certification is over and organic producers will be required to select the American Seed Trade Association (ASTA) members also issued a statement to evaluate the grower’s position. Thus there is a danger of haphazard decisions central database to tell them what varieties are available in organic form. Many certifiers are calling for a • Most organic certifiers are not well informed on the varieties of organic seed • Organic growers are reluctant to use organically produced seed because of the • The NOP responded that while some comments identified the seed and planting stock requirement as unreasonable, they had chosen not to change the standard, stating: “The objectives of spurring production of organically grown seed and promoting research in natural seed treatments are compatible with the NOP’s purpose of facilitating commerce in organically produced and processed food. We designed the practice standard to pursue these objectives while preventing the disruption that an ironclad requirement for organically produced seed and planting stock may have caused.”

The NOP rule became effective in October of 2002. There was an immediate backlash from farmers on certain aspects of the rule, including the price of organic seed. Some farmers reported that their seed bills would triple, and that the certifying fee was not as expensive as the extra cost of organic seed. Within the first few years of the seed requirement farmers also began to voice concerns about the quality of organic seed, with complaints in the media and at conference discussions about germination rates and varietal off-types. Complaints from the seed industry also emerged almost immediately. The American Seed Trade Association’s Organic Seed Committee noted these issues fourteen months after the rule became law. The following are direct quotes of their concerns:

• Organic growers are reluctant to use organically produced seed because of the higher cost over conventional seed.
• While some producers are meeting the organic seed requirement on their clients when there are equivalent varieties available, other certifiers hesitate to do so. Some of these certifiers have said they would not force growers to use organic seed if the price difference was over a certain amount—even though the NOP has confirmed in a letter that price is not a factor in determining whether an organic seed is “commercially available.”
• Most organic certifiers are not well informed on the varieties of organic seed that are commercially available. Many certifiers are calling for a central database to tell them what varieties are available in organic form.
• When a grower claims to a certifier that he needs a particular variety for which there is no equivalent organic seed, most organic certifiers are not well equipped to evaluate the grower’s claim. The grower’s supplier is likely to base his decision on the most likely offspring of “specimens” that are commercially available and that may not be organically certified. A new round of discussions and public comment periods to further develop a guidance statement on organic seed.

The final document – “Further Guidance on Commercial Availability of Organic Seed” – was approved in November of 2008 with the intent of having an “increased level of compliance with Title 7 Part 205 National Organic Program (205.204[c]) (the seed section of the rule). The introduction states: “This Joint Committee acknowledges that only a small proportion of the seed currently used by organic farmers is certified organically grown seed. Also that, many certifying agents do not believe they have been given viable guidance for their role in verification procedures concerning organically grown seed availability. The Committee now offers adjusted guidance that we hope will bring clarity to the issue and accelerate the utilization of organic seed in all sectors of organic crop production.”

The document goes on to give specific guidance to the NOP, Accredited Certifying Association (ACA) and to certified growers for their specific “role in increasing organic seed usage.” The development of the guidance statements received mostly favorable comments from the seed industry, mixed comments from accredited certifying agencies (with some very opposed and others supportive), and no comments directly from farmers.

Particularly polarizing was the following recommendation to the NOP: “Emphasize to ACA’s that organic seed usage by clients must be monitored and improvement in percentage usage is expected and must also be monitored. Documentation of the levels of organic seed usage and evidence of improvement in the percentage vs. total seed usage by the ACA’s clientele should be audited as part of the NOP accreditation reviews.”

Also controversial was this recommendation to ACA’s: “Maintain and submit upon request to the National Organic Program documentation of the organic seed usage status (current percent levels as compared to historical levels of usage by acreage) of each certified operator.”

Comments made by the National Association of State Organic Programs (NASOP) were emblematic of those ACAs who responded negatively to the guidelines. Miles McEvoy, NASOP President at the time (now director of NOP) wrote in his comment letter, “The suggestion that organic growers and certifiers maintain records on the percentage of organic seed usage by acreage is unworkable. The additional recordkeeping requirements will not increase the availability of organic seeds.”

The letter points out a burden in both record keeping and increased cost in certification. Going into further detail in a breakdown of the guidance document by sections, McEvoy writes: “There are problems with determining compliance with the commercial availability of organic seed requirement by the percentage of organic seed used. The standards require the use of organic seeds if they are commercially available. The percentage of organic seed usage could decrease from one year to the next because the producer is planting different seed varieties that are not available organically. On the other hand if organic seeds are available then the producer should be using 100% organic seeds. A producer may be increasing the percentage of organic seed used but still be in violation of the organic seed requirement if they do not use organic seeds that are commercially available. Another complicating factor is that many diversified direct marketing operations do not calculate the acreage planted to their various crops. Calculating the percentage of organic seed used could be a recordkeeping nightmare and not lead to any greater adoption of organic seed usage. Organic seeds can only be used if they are commercially available.”

These NASOP recommendations – with hundreds of volunteer hours in research and writing, review, revisions, and further review and input from stakeholders over a three-year period – were approved and presented to the NOP in November of 2008. And yet, two years later, there has been no formal response from the NOP.

Current Situation with National Organic Program: Many of the certifiers we spoke with during the course of this project expressed a positive opinion that the NOP, under new leadership as of 2009, is taking actions to strengthen the integrity of the organic label, including encouraging greater enforcement of the
use of organic seed and that they expect additional input on seed from the NOP in 2011. Several ACAs report that they are strengthening their own policies and procedures regarding commercial availability of seed.

Oregon Tilth is one example of a certifying organization that has changed its approach to the seed issue. If a new farming operation applies for certification and has not performed a commercial availability search (contacting or searching through a minimum of three seed company lists/catalogs), Oregon Tilth’s previous practice was to give the producer “a reminder of the requirements for using organic seed and demonstrating commercial availability.” Beginning in 2010, Tilth started to issue a notification of noncompliance, asking the applicant to demonstrate that the seed was not available in organic form. If the operator fails to demonstrate this, Tilth now denies certification of that specific crop.

Kristy Korb, Certification Director of Oregon Tilth, states that “If it happened the next inspection there would most likely be denial of [certification for that particular] crop or suspension [of certification] if it was all crops or a pervasive problem. In a renewing client situation if it moves to suspension there would have to be ongoing issues from year to year, as otherwise we would simply deny that specific crop.”

NOP staff recently said they were in a “new age of enforcement.” The USDA Agricultural Marketing Service reports of “adverse actions” taken on organic producers and handlers provide examples of this commitment. In August of 2010, suspension of organic certification was issued to producers in Georgia and Oregon for “failure to use organic seeds or demonstrate absence of commercial availability.” In July, a New York producer was issued a suspension for using “seeds treated with a prohibited substance.”

While some may be encouraged by signs that ACAs are tightening procedures, we caution that regulatory enforcement will only be as good and fair as the information that all stakeholders have regarding commercial availability of seed. The goal from the perspective of SOS is not to move as quickly as possible to 100% usage of organic seed, but to move as quickly as possible to 100% usage of high quality organic seed that is optimal for organic farming systems. Certifiers, farmers, seed companies, researchers and the NOP itself all need more information. The development of a pubic database that allows all parties to search for seed availability, track allowances of conventional seed (including variety name or characteristics, volume of seed, and crop type), verify certifiers, and provide seed suppliers with information to promote and market their varieties was one of the highest priority actions requested by multiple stakeholders involved in this project (see “Priority Actions, Information-Perception” in section seven). Developing this public database is also in line with NOSB recommendations. Good regulation requires good information, and we do not have that at present.

Concentration in the Seed Industry: Implications for Organic Agriculture

Seed is not only an input for crop production, it is a natural resource that demands management in a manner that is ethical, sustainable, profitable, and effective in delivering agronomic adaptations for the diverse agricultural systems and markets within the U.S. Plant genetic resources were once managed and maintained as a public commons with intellectual property rights in the form of Plant Variety Protection Act certificates that were adequate to compensate private innovators, while allowing both farmers and other researchers to save seed, sell seed and further adaptation and the development of new characteristics within the crop. Diversity and competition thrived divided most of the twentieth century with public and private breeding programs delivering improved genetics to a broad array of farming systems. This changed dramatically when the Supreme Court upheld the decision of utility patents on living organisms. Large corporations that had little to no previous investments in seed and genetic traits rushed into the market to take advantage of this powerful intellectual property tool. This trend led to the highly concentrated seed industry that we face today.

Concentration in the seed industry has a negative impact on organic farming. It has resulted in decreased public and private research and development of varieties and breeding populations for minor markets, such as organic. As the industry consolidates, farmers have seen varieties sold in smaller volumes, often those that serve organic farming systems. In 2000, the world’s largest vegetable seed company, Seminis (prior to being bought by Monsanto), acquired several smaller international seed companies. The mergers resulted in a decision by Seminis to drop over 2,000 varieties from production in a single season, a trend that continues. The result has been fewer options for organic farmers, and for the researchers and seed companies trying to serve them.

Seed Industry Concentration:

The seed industry stands out as one of the most concentrated in agriculture. Once comprised of mostly small, family-owned companies, the industry is now dominated by a handful of transnational biotechnology/chemical firms. The top three firms, for example, account for more than 75% of U.S. corn seed sales. One firm’s patented genetic traits are in nearly all corn, soybean, and cotton acreage planted in the U.S. Vegetable seed is following a similar consolidation trajectory and is dominated by a single player – Seminis (Monsanto) – that dwarfs any competitor.

Rapid and extensive consolidation is a consequence of the following factors:

- Weak antitrust law enforcement allowed large firms to acquire and merge with a significant number of competitors.
- Supreme Court decisions paving the way for firms to patent plant parts, including seeds, traits, and described plant characteristics (and Congress has not acted to clarify the intent of the Plant Variety Protection Act);
- Federal legislation (1980 Bayh-Dole Act) encouraged the privatization and patenting of public research; and
- Funding for public plant breeding and cultivar development has dramatically reduced.

These factors have led not only to fewer choices in the seed marketplace, but also concentrated control over important plant genetics needed for research and development for all agricultural systems. This level of concentration has severe consequences for the organic community.

Impacts to Organic:

Organic farmers are underserved in genetics specifically adapted to their cropping systems, regions, and market niches, and experience a basic lack of availability of organic seed, with an even greater gap in varieties specifically bred under certified organic conditions. As private concentration and intellectual property control of plant genetics expand, the public sector weakens, innovation stagnates, and minor markets such as organic do not receive needed investments in seed system development.

Other consequences of seed industry concentration on organic agriculture are clear:

- Dominant firms do not serve organic interests: This is because the organic community embraces ecological alternatives to biotechnology and has deemed genetic engineering an excluded method in the National Organic Program (NOP). The organic and biotechnology sectors are generally in conflict with each other’s goals, objectives, practices, and values.
- Loss of regional independent seed companies: Companies that for decades served the regional needs of farmers by breeding varieties with agronomic traits adapted to very specific environments – including some that were serving or preparing to serve the organic market – have been lost with seed industry consolidation. What regional companies exist often struggle to get access to...
optimum parent lines, or when they can access them they are expensive with cost-prohibitive and restrictive licensing agreements. Firms such as Monsanto have a clear strategy of purchasing independent seed companies, many of whom once served the organic market with untreated conventional seed and certified organic seed. In general, these smaller regional independent companies have greater flexibility in serving local markets and minor markets such as organic. The loss of regional companies has limited the number of seed companies investing in conventional and organic, limiting not only availability, but also the continued research and development that all markets need to evolve and thrive.

Patents lock up important genetics: Patents hinder innovation by removing valuable plant genetic material from the pool of public resources breeders rely on. Breeders are restricted or prohibited from using patented varieties, traits, or tools unless onerous licensing agreements are signed and expensive royalties paid. The result is a public sector that lacks an ability to provide for – and an understanding of the underlying values and needs of – the organic market. For example, in field corn a utility patent was filed and granted to Hoegemeyer Hybrids (now owned by DuPont-Pioneer) for a trait they call ParaMaize. This trait has been bred and recorded in public research for decades, yet the flawed patent system has provided a single company the proprietary rights. This is a trait that the organic seed market is very interested in using, as it creates a characteristic in corn crops to accept only pollen from genetically similar plants. Such a trait can significantly reduce cross-pollination of organic corn crops from GE corn crops. Yet seed companies report that restrictive licensing fees make it cost-prohibitive for them to lease the trait from Hoegemeyer.

Conclusions: The trends described above put the integrity of organic agriculture at risk and hinder the success of this growing sector. Organic farmers already find it difficult to access quality certified organic seed. Varieties they once relied on have been abandoned as the industry consolidates. Seed companies looking to serve organic markets do not have access to genetic traits tied up by patents, or patent lines that are proprietary and held by larger firms. Public breeders looking to serve smaller markets such as organic are not encouraged to work on these projects, as they do not return high royalties on intellectual property to their universities. Concentration and the misuse of patents also have global impacts, as they encourage biopiracy – where indigenous knowledge of nature is exploited for commercial gain with no compensation to the indigenous people – of public resources and threaten food security. The system is broken.

Confronting industry concentration must be coupled with efforts to create an environment in which new innovators, private and public breeders, and entrepreneurs interested in organic seed systems have an opportunity to thrive. Investments need to be made both at the public and private (e.g., food industry) level. See Priority Goals section of this report for additional actions and policy recommendations regarding seed concentration.

Seed Saving on the Farm

by Roberta Bailey

When people visit my farm for the first time, one of the comments often made is that they are surprised by how little space it takes to grow seed crops. On the home scale it can be quite small. Erase the vision of acres of dry beans or fields of wheat. Picture a ten foot row of garden peas or a trellis of Morning Glories, ten tomatoes or peppers. On the farm scale, rows of seed crops can be intercropped with market crops.

You may ask why make the time in your extremely busy farm life to save seed? A bit more seed security may be one answer. How many times have you gone to order your favorite seed variety only to find that it is no longer available in any seed catalog? Or have you ever wished a certain crop was just a little harder or that plant did that one year? Are you concerned about Genetically Modified Organism (GMO) contamination? Are you having trouble finding pea seed that is not full of other types of peas (off-types)? Do your spring seed bills scare you? Are you looking to diversify your farm income? Or looking to get away from weekly deliveries and markets?

The seed industry continues to merge into a few very large multi-national corporations. When small companies are bought out, their locally adapted varieties are dropped in favor of varieties that perform well in many climates. If not for an upsurge of local seed saving efforts and of small seed companies specializing in hardy heirloom varieties, we would be left to grow varieties that do well in Texas and just barely produce in New England.

GMO contamination is a growing concern. It is increasingly more difficult to find clean corn, soy, and beet or chard seed. Even organic seed is getting contaminated by pollen drift from nearby GMO crops. Much of the beet and chard seed available in the seed industry is grown in or around the Willamette Valley. And Monsanto keeps trying to grow GMO sugar beets too.

Saving your own seed is not going to lower that spring seed bill by as much as we would all like but every little bit helps. Perhaps a greater gain comes from an increase in quality. Peas are a good example. Pea seed is fairly cheap. It can’t be turned into a fancy expensive hybrid. So pea growers are trying to produce it with as little cost as possible. And it costs money to pay the labor of rogueing the fields. So no one is walking the field pulling out the plants that are not true to type. However, you may ask, aren’t we saving variety? Not really. There are so many different varieties that have been lost to the seed pool.

Author with her seed crop of Lutz beets which have become difficult to find in the seed market. The roots were overwintered in a root cellar then re-planted in early spring.
and incur added labor time to avoid or sort out the problems.

It is worth the time and money to grow your own or at least buy organic seed produced on a small scale by farmers who are roguing their fields.

If you save your own seed, you always have that variety. I save Lutz beet, Blizzard snow pea, Mi-ragreen shell pea, Scarlet Keeper carrot, Beer Friend and Sayamusume soybeans because I was tired of going to my seed catalogs and finding that they were no longer available.

In New England, it is not possible or practical to save seed for everything we like to grow. It is possible to save seed from many crops. Our short growing season and cold winters limit us to plants that can mature seed in under 120 days. Peppers, tomatoes, peas and beans are an easy place to start.

When you save seed on your farm, it begins to adapt to your micro-climate and growing techniques. Often the seed that we buy has been produced under intensive chemical spray regimens. A conventionally grown cabbage seed crop may be sprayed ten times in its lifetime. The plants produced from that seed know how to grow best under those conditions. A plant grown on your farm in your soil and climate with your organic farm practices will adapt to those practices. The Czech Black hot peppers that I grow are now more uniform and produce more peppers per plant because I saved seed from the plants that had the best yields and the fruit shape I desired. My Bread Seed poppies no longer have any vents in the heads and the seed does not fall out of the heads when I harvest them. I am selecting a Russian variety of rice for early maturity in central Maine.

Growing seed as a cash crop can also be profitable. The seed can be the entire goal or it can be part of a value added system. I started saving seed from tomatoes because I was making sauce and removing the seed. I looked at all the seed and realized I could be selling it. One farmer who raises Long Pie pumpkins as a seed crop removes the seed then sells the pumpkins to a dog biscuit maker. Hot peppers can be grown for seed and the flesh made into hot sauce, salsa, or a chili paste to sell.

Value added products may fit well into your farm system or they may add more work than your life can support. A successful farmer is always looking at systems, figuring what works and what can be added, trying new things and scaling up the ones that fit well. On my farm, the Green Doctor cherry tomato seed crop is grown solely for its seed because that is the most efficient use of time. The pulp goes to the chickens. The Goldie tomato is a beefsteak with a solid core of pulp. I extract the seed and make a golden salsa from the pulp. Some of my pepper crops get ground up and the seed extracted while the pulp gets fed to the chickens. When chickens eat pepper pulp, their egg yolks turn scarlet.

Seed crops sometimes need more time in the field than food crops. Plan your field rotations accordingly. Peas planted for fresh eating are done 3-4 weeks before seed peas. When I save seed for farm use, I usually tie off a section of the row and do not pick any of it. Once the peas are all mature and dry I pick the entire section and save it for next years seed. Twenty feet of peas will usually yield at least one pound of seed. I plan my rows so that the seed section will not interfere with tilling and replanting of the next crop.

Some years I plant a long row of each variety and save all of it, harvesting enough seed for three or four years. Most seed will last three years, many will keep five to ten.

One needs to know some basics in order to save seed well. The web site savingourseed.org has very thorough seed saving information in free pdf download form. Here are some of the basics.
Plants are arranged by botanical class and within each class are families. Families are broken down into genus and species. When you see the latin name for a plant (Daucus carota, for carrot), that is the genus and the species. Such classifications help us identify plants and figure out if they will cross pol- linate or not.

Open pollinated varieties grow seed that will pro- duce the same true variety for generations. Hybrid varieties are the offspring of a cross between two parent varieties. The seed saved from a hybrid will not produce that same plant, but some genetic com- bination of the two original parents.

Some plants like peas, beans, soybeans, tomatoes, peppers, and lettuce are self pollinating. You can save the seed and it will grow true the next year. All of the fruit on the plant, big or small, have the same genetic make up. To maintain a full array of the plants genetic diversity, grow and save from twenty or more plants. If you save seed from one self-polli- nating plant it will grow fine but you are narrowing the genetic diversity.

Starting with self pollinated varieties is the easiest way to begin saving your own seed. If you decide to save some tomato seed, plant those plants as far away from your other tomatoes to reduce any inci- dence of crossing. Potato leaf varieties will cross with each other and the double blossoms can get pollinated by another variety. If possible, isolate va- rieties by about 25 feet.

Cross pollinated plants like brassicas, carrots, corn, beets, squash, cucumbers and melons rely on the pollen from other plants to produce viable fruit. They need much larger populations to maintain health and vig- or. Twenty five to one hundred plants are the mini- mum, and corn needs at least two hundred plants.

They need isolation distances of 250 feet to many miles. The easiest approach is to only grow one va- riety of a given genus and species. Tall barriers like a corn patch or row of trees can break insect flight patterns and help reduce the distances needed be- tween varieties that could cross pollinate. A physi- cal barrier such as a screen cage or row cover can keep the seed crop isolated. I use wire hoops and poly row covers on some seed crops to keep them pure. I also alternate years, growing one variety one year and another the next. My Lutz beet seed crop produced enough seed for 5-10 years leaving me free to produce other beet seed crops in the interim years.

Think about your spacing. A tomato or pepper plant does not need any more space as a seed crop, but a spinach or lettuce or carrot does. My beet plants took up close to 2 feet apiece. A lettuce plant will spread to 18 inches or 2 feet. I give my seed crops extra minerals (usually in the form of azomite) to help feed the seed production.

Good record keeping is essential. Label your seed- lings, then the planted rows, and the stored seed. Keeping a map as a back up record covers situa- tions where a critter eats the row marker or weather washes out the ink. When I harvest seed I label the harvest bucket and throw the row marker inside the container as well.

If you notice an ‘off-type’ plant or one which is very different from the other plants, it should be rogued or pulled out. Any diseased plants should be pulled. Roguing will keep your seed pure and healthy. Sometimes a variety takes a few years of roguing before no off-types are found. You can save the seed from an interesting off-type and grow it out the next year to see what happens. You may be on your way to creating a new variety or at least on a little bo- tanical adventure.

When you save seed you are changing the plant. It is adapting to your growing area and conditions. What are you selecting for? You may save from the dis- ease resistant plants. Or the highest yielding plants. Or the blemish free ones. Over time you can tailor your varieties to your own farm needs. Avoid sav- ing from the first lettuce plants to go to seed as you are selecting for lettuce that bolts early. Rather try to save from the ones that bolt last.

Yields vary widely with varieties. Generally 100 tomoato or pepper plants yield one pound of seed. A 300 foot row of soup peas yields 30-40 lbs seed. Thirty feet of broad seed poppies yields 1-1/2 lbs seed.

To grow seed for profit, try it on a small scale first to see if it fits into your farm operation and time con- straints. Some crops need little attention other than planting, weeding and harvest. I do all my pepper seed cleaning in late October, whereas tomato seed is an ongoing harvest throughout the late summer.

Seed companies usually contract with growers in the early months of the new year. Contact companies then to see if they want specific crops grown for them. Growing their crops with their seed stock is usually easier to arrange than growing a seed crop on your own then trying to sell it. Seed companies will want to trial any new varieties before picking them up. But they are often looking for farms to produce crops for them.

Some companies have a seed contract. Some are far less formal. Some have specific delivery deadlines and bonuses for early delivery or penalties for late delivery. Some will clean the seed. Others expect seed to be delivered completely cleaned. Some charge for the cleaning process. Get these terms spelled out.

Whether for farm use or for income, seed saving connects you with generations of farmers who saved their own seed. Your farm thrives on the results of the work of these ancestors. Is it time to select a few varieties for future profits or future generations?

by Bethany Schroeder and Suzanne McMinnis

Tompkins County has a population of 100,000 resi- dents, about 50,000 of whom live in the city and town of Ithaca. The rest make their homes in rural and semi-rural towns, hamlets, and villages through- out the county. Many, many residents garden for food or work small farms, and many hale from gar- dening and farming backgrounds.

Cornell, the single land-grant university in New York, is situated chiefly at the east end of the town of Ithaca, with project centers, fields, and green- houses found around and outside of the county. Seed saving at an institutional level, either in particular academic programs or specific greenhouses, is likely, without being publicly known. On the other hand, the Cornell Cooperative Extension program hosts a small, informal seed saving effort, and many casual growers use it. Otherwise, experienced grow- ers save seed in some measure at their own proper- ties.

Local seed savers cull for size, taste, weather hardi- ness, regional availability, disease resistance, genet- ic variation, and they invariably note the attraction of managing the earth, from the choice of plot and seeds to choosing the source of nitrogen. An infor- mal survey of area growers indicates that local gar- deners and farmers would appreciate an accessible and extensive seed saving program, and plants grown by them have the expertise to support such a project into maturity. Three profiles of Tompkins County gardens testify to individual skill and determination in saving and using seed.

Sean Dembrosky: Permaculture Gardener

When you visit edibleacres.org, you will see a lively and creative approach to getting food into the ground. Sean Dembrosky, chief designer and steward, started this enterprise in Trumansburg with a view to modeling responsible gardening behav- iors and giving others a place to see his ideas about permaculture principles in action. In exchange for True to form, Sean is for the most part a self-taught gardener. He took a weekend permaculture for- est farming intensive with Dave Jacke before fully starting the maintenance and further development of his own groves and hedgerows. Otherwise, he scours the web during winter months to learn more, meeting with local gardening enthusiasts, some well known and some not, to pick up new ideas.

One inspiration has been Steve Breyer of Tripple- brook Farm in Massachusetts. The farm, using or- ganic practices since 1904, includes more than 1000 perennial examples rated to Zone 5 hardiness. Breyer invites other gardeners, established and aspiring alike, to sleep in the greenhouse and work alongside him for a living wage. Another of Sean’s mentors
has been Erik Toensmeier, author of Perennial Vegetables. Toensmeier’s website includes growing tips and lists beyond the author’s original 100 edibles, as well as choices by climate and useful links for gardeners across the U.S. and elsewhere.

Sean says he primarily selects seeds from plants with the best yield and the greatest number of seeds. For example, in choosing kale seeds, he considers the plants in his garden with the largest leaves among plants that have demonstrated both hardiness to extremes in weather and resistance to predation. Along with the methods he has found to be easiest and most useful for seed saving, Sean is not averse to acquiring seed through the area’s seed bank housed at Cornell Cooperative Extension. “Germination rates might sometimes be low and I might not always have a lot of variety to choose from, but it’s a good way to use what’s locally available,” says Sean.

With a decidedly low-tech approach, Sean tethers and hangs ideal plants upside down in his airy equipment shed before broadcasting the thoroughly dried specimens onto raised beds. Called the “magic wand” approach, Sean shakes seeds onto the ground, loosely covers them with surface dirt, and then sticks the stems into the center of the planted area. “That way I am reminded of what I put into each bed,” he says.

An inveterate contributor of time and energy, Sean shares his techniques with the community through work on his property; education at the Veteran’s Sanctuary in Trumansburg; and, this autumn, through Freeskool programming, which will include sustainable farming practices.

Sean’s favorite vegetable seeds over the past several years have included orach, a lovely spinach-like leaf with great color; kales of all varieties, especially “krepe,” a combination of red Russian kale and rape; collard greens; spinach; dill; fennel; cilantro; parsley; calendula; borago; leeks; and heirloom tomatoes.

For more information go to: edibleacres.org, http://veteranssanctuary.blogspot.com/ and http://ithacafreeskool.wordpress.com/class-descriptions/

Teresa Vanek and Brent Welch: Market Farmers

Red Tail Farm, in Jacksonville, is a four-acre organic farm and the home of Teresa Vanek, Brent Welch, and their young son, Milan. Teresa and Brent have owned the land since 2004 and are close to finishing work on their straw bale house. The couple sells produce at two Ithaca Farmers Markets, as well as to a home delivery service and some area restaurants.

They also save seed from an heirloom tomato named Opalka, a luscious sauce tomato with very little seed and almost no water. Brent notes that Opalka is still available through the Seed Savers catalogue. Having been stung by the disappearance of a San Marzano tomato they really enjoyed, however, Teresa and Brent are careful with their Opalka seed, despite its availability elsewhere.

The seed garlic at Red Tail Farm includes German Red, German White, and what the farmers call Red Tail Farm Mix, a favorite with customers. Brent explains that one year their seed garlic got a bit mixed up, but they decided to market it cleverly and have found that customers love the variety in it. (Note to seed savers everywhere: never underestimate serendipity.)

The Red Aji dries nicely, too, another key feature that recommends it to Teresa and Brent. They use it mostly for cooking at home, but they have given thought to committing it to seed production, so enamored are they of this pepper. They have not found its match in seed catalogues over the years; hence, their seed saving efforts with this variety have been worthwhile.

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• For Young Calves, Growing Calves And Heifers
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Brent Welch of Red Tail Farm with tomatillo, garlic, and red peppers

“Agriculture...is our wisest pursuit, because it will in the end contribute most to real wealth, good morals and happiness.”

Thomas Jefferson to George Washington, 1787
Red Tail Farm also produces a favorite tomato with huge fruit but rather low yields. It makes a marvelous salsa verde, and Teresa and Brent share the fruit with some of their farmer friends. They hope other growers in the area will commit to growing it in the future, so that the “seed bank” for this variety can be preserved for this bio-region.

For more information go to: redgooseberry@yahoo.com

Thor Oechsner: Grain Farmer

The equipment at the Oechsner Farm in Newfield is the most obvious aspect of the operation. As owner Thor Oechsner points out, “Grain farming is equipment farming, and you have to know how to manage the machines if you’re going to succeed.”

Schooled in agriculture at Cornell in the early 1980s and auto mechanics at his own auto shop between 1989 and 1997, Thor sounds a grateful note at having learned the skills that make him the rare certified organic wheat farmer in this southern tier community. Although he demurs at the notion of formal sources, Thor does cite mentors such as Tony Potenza of Trumansburg, John Meyers of Ovid, and Klaus Martinis of Penn Yan. As Thor sees it, “They taught me farming and the principles of organic farm management,” he encouraged me to think about farming on my own terms.”

In addition to every manner of tractor and truck on this farm, the air screen cleaner in the main barn is a sight to behold. Standing almost 15 feet high, the massive wooden contraption, built in 1910, had been useful for many decades by the time Thor bought it in 2005. The primary machine used both to sift seeds for saving and to prepare wheat and other grains for milling, this cleaner has three screens of varying gauges, down to a third of an inch, and a strong fan to blow out light materials.

After Thor’s preparations, he sends the wheat on for milling at partner Greg Mol’s Farmer Ground Flours in Trumansburg. The flour is used to bake bread and pastries at Wide Awake Bakery in Mecklenburg (in which Thor has also invested) and at Ithaca’s food co-op, GreenStar. The flour is sold at increasing numbers of stores across the state and in New York City. Harkening back to more than a century ago when New York was called the nation’s bread basket, the entire Oechsner enterprise is focused on grain.

Along with growing and threshing, Thor has been saving seed for many years. For example, he saves and selects from among the most nutritional oats for animal feed. He also selects for disease resistance, agronomic traits and, at the same time, looks for good baking characteristics in the field products, all of which he employs through trial and error. Thor continues to search out different varieties of grain, including heirloom varieties, by researching a new seed each year and analyzing the results at the end of the growing season. He maintains files on seed types, both for inspection by the state and in order to compare his observations and experiences over time. He sets aside specific fields for seed saving, depending on the size of the grain and its overall health. Thor notes that it often takes a couple of years to be confident about a grain. “You can lose a lot of your investment, either due to bad weather or just by making the wrong bet on seed.”

One grain that Thor likes is a dark rye from Poland, which he says is good for milling. Varieties of wheat seed that have produced well include Glenn, land, which he says is good for milling. Varieties of rye that have produced well include Glenn, which he says is good for milling. Varieties of oats that have produced well include Glenn, which he says is good for milling.

The seed saving impulse is strong in people who work to wrest a living from the soil. Despite frantic schedules and a heavy workload, the interest in seed saving thrives across the seasons. As growers come to understand both the power and potential of seeds in the current climate of consolidation, their thoughts might naturally turn to a community-based seed bank. Nothing seems to compare to the piles of glorious seed catalogues that show up in the winter months to encourage a grower’s appetite, but the work of creating a community seed bank could well bring its own inimitable joy.

What would such an effort entail? First, growers would have to know each other well and trust one another’s abilities—not only regarding the growing of plants for seed but also in terms of record keeping. Ideally, they would then need to make an extensive effort to document soil types in order to optimize the seed production of different plants on each farm. They would need to analyze current research on the influence of soil, climate, and other environmental factors. Keeping track of quantities and varieties of seed and ensuring proper storage and viability records would demand a consistency of purpose, and the group or collective would necessarily have to be clear about expectations from season to season, as more varieties of seed were included in the bank.

Reflecting on an initiative this seemingly complex, we might do well to consider that throughout the Third World, local seed saving has been the basis of survival for centuries. Although not widely known, the knowledge is available. Perhaps we just need to believe that the future of our food is safest when it is in our own roughened and soil-stained hands.

Betheny Schroeder is a founding member of TC/Local (tclocal.org), a long-time writer for hire, and a newly committed food grower in Ithaca, New York. She can be reached at midwifepix.com. With her husband, Lynn, Suzanne McManus owns Earth Walk Farm in Dryden, New York. She can be reached at earthwalk-farm@gmail.com. The authors thank Kristina Strain for advice in developing this article.

Thor Oechsner with a “new” air cleaner

A Seed Bank from the Ground Up

The bulk tanks and cell counts from the milk company, the NOFA Vermont Winter Conference in 2010.

For external application to the udder only, after milking, as an essential component "The Natural Farmer Winter, 2011-12"

"The main benefit of Udder Comfort" is the milk quality," says fifth generation dairy farmer Leon Corse. He and his wife Linda and their daughter Abbie milk 50 to 60 cows at Corse Farm Dairy in southern Vermont, which was certified organic in 2008. “Since we’ve been organic, we get pretty terrific quality premiums, and that made SCC an even greater focus than it was before.

"Historically, our SCC was up in the 150 to 200,000 range. Our numbers for the last 12 months show averages of 95,000 and as low as 75,000 in the first few months of 2010. It’s been a gradual decline since we’ve been using Udder Comfort consistently.

"We use Udder Comfort on any cow with a known high SCC, unusual swelling or any flakes. We apply it after both milkings for a few days. We monitor bulk tanks and cell counts from the milk company, and we test suspicious quarters and also all fresh cows for SCC levels. If high, we put Udder Comfort on for 2 to 4 days to take care of it.

"I was asked to give a quality milk presentation at the NOFA Vermont Winter Conference in 2010. Part of my preparation was to figure out our quality results for 2009. The interesting number I came up with was: On 956,000 total pounds shipped, we received $26,187 in quality premiums for all 4 months of our milk. That made SCC a very significant portion of that.

"Initially, I was somewhat skeptical about what to expect from using Udder Comfort, but I’m glad I was willing to give it a try because we are totally happy with it. The best way to see what it does, is to pick out a couple cows that have got a cell count problem and try Udder Comfort on them, and see what you get for results.

Red Tail Farm also produces a favorite tomato with huge fruit but rather low yields. It makes a marvelous salsa verde, and Teresa and Brent share the fruit with some of their farmer friends. They hope other growers in the area will commit to growing it in the future, so that the “seed bank” for this variety can be preserved for this bio-region.

For more information go to: http://www.smallworldfood.com/about/farms/oech-nsen-farm/
The seed bank of India’s Green Foundation Biodiversity Conservation Center in Thally, Karnataka. Note the seeds saved in jars and those still drying in bunches hanging from the rafters.

This issue contains news, features, and articles about organic growing in the Northeast plus a special supplement on Organic Seeds.