How I Became a Plant Breeder

by Frank Morton

In 1983, my third spring as a market gardener, I was looking over a flat of lettuce grown from my first saved seed. The year before, I had allowed my peas, beans, and two lettuces to "run to seed," as my mother would have put it. This flat was the third sowing I had made from a bag of 'Salad Bowl' lettuce seed, a commercial green oakleaf type, and my attention was drawn to a single red plant in the midst of 199 green ones. It was a "Red Salad Bowl," and I knew exactly how it came to be. I had grown 'Red Winter Cos' (a rare French heirloom, at the time) alongside the 'Salad Bowl,' and this was a cross! A little light came on—this plant could make seed for a new lettuce! It would be unique to my little farm near Seabeck, Washington. I set that seedling into a special place and allowed it to flower and make seeds—only 65 seeds as it turned out...because it was so late in the season when the cross had appeared. Had it appeared in the next sowing, no seeds would have been borne.

I planted all 65 seeds the next spring, expecting to see a flush of "Red Salad Bowl" lettuces, but instead, up came a rainbow of genetic variations that I had no idea existed. There were indeed some variations on red salad bowls, but also green salad bowls, and bronzed red splashed oakleafs, and oakleaf romaines in red, green, blushed, and speckled patterns, and some romaines in brilliant green with fine crenelations along the leaf margins, and red splashed versions of romaine with wavy margins...and on and on in 65 variations of form, color, texture, flavor, size, and adaptation. I had the realization in a vivid rush, "This is where new varieties come from..."

As that season passed I recognized crosses in other seeds that I had saved the year before. Mizuna X Purple Pac Choi, Red Russian X Siberian kale, Treviso X Castlefranco chicory, and I had an epiphany standing in the middle of my garden—"If I kept doing this... for 20 years...I could have a

seed company with a unique collection of plant varieties, all my own selections, all bred within an organic farming system...and people will want that."

At that time, in 1984, I had just embarked on a career as a wild salad gardener, inspired and guided by Mark Musick, the originator of The Wild Salad of Seattle, forerunner to the entire prepared cut-salad industry that we know today. Mark showed me how he collected wild greens like chickweed, wild mustard, dandelion, lambs quarters, and purple vetch, along with edible flowers of mustard, nasturtium, borage, and winter pea. He had these strange salad crops from Europe, arugula and mache, grown from seeds given to him by an itinerate chef—and heirlooms like Red Russian kale that came from tiny seed sources, Abundant Life Seed Foundation, Peace Seeds, JL Hudson. Most importantly, because I farmed deep in the hills, he shared how he packaged the greens and blossoms and used UPS to ship them 60 miles to Seattle from his farm in the foothills of the Cascades. He explained the guiding principle of introducing new foods into any culture—"Chefs always want something new." Chefs introduce foods to the rest of us. With these insights and information, Mark Musick handed me a career.

My agricultural method of the time was an evolving clash between the 'do everything' approach of John Jeavons and the Biodynamic-French intensive method (that emphasized planning, extensive soil preparation, and thoughtful plant associations), and the 'do nothing' approach of Masanobu Fukuoka's natural farming system (that emphasized natural reseeding, naturalizing vegetables and fruits, intercropping with white clover and grains, and extensive use of straw mulches). When these approaches were combined with salad growing, seed saving, plant breeding, and selection, the results were astounding in terms of crop diversity and seasonal salad quality. Volunteers of every kind inhabited the fertile margins, and naturalizing species like chicory and dandelion became part of the leys. The beds were densely (trans)planted with greens for salad, followed by a seed crop from the best plants within each crop. These seeds planted the next year's crop, and crosses, off-types, and segregating populations could all be used for seasonal salad mixes. Cropping and selection occurred under natural conditions without protection from weather, disease, or insects, and the selection criteria were all judged during harvest of the crops. Best individuals within each planting were marked with a small stick at each repeated harvest. The primary selection criteria were eating quality, vigor, seasonal hardiness, intense pigmentation, leaf thickness, texture, smoothness, resistance to disease and insects, and an appealing appearance.

By 1990, Karen and I had lived in Oregon two years, and most of our salad crop was breeding material. Lettuce, kale, mustard, orach, quinoa, endive, chicory, parsley, cress, calendula, and amaranths—all of it was being used in our salads mixes, and all of it was being crossed up and sorted out into useful varieties and genetic populations. As the seasons changed, the crops changed by species and variety, giving us insight into a broad range of adaptive traits and the cultivars that had them. At the same time, our farm ecosystem was buzzing with the kind of deep biodiversity that arises when you allow plants of many species to mature through their whole life cycle. Many kinds of flowers

blooming over long periods creates a nursery for beneficial insects of all kinds, and our continuous interaction with these plants afforded ongoing lessons in which flowers feed which insects at what time of year, and what insect pests are controlled by which insect predators. We learned to harvest from the entire life cycle of plants; seedling salad, blanched leaves from the growing points, the tender shoots of bolting stems, immature flower buds, edible blossoms, and finally the seeds from the most vigorous, repeatedly selected, individuals.

The farmscape created by this salad production, plant selection, seed bearing enterprise could be overwhelming to visitors, prompting questions like “Where’s the salad?” What began in early spring as a 2-dimensional vegetative palette would grow into a 6 foot thick 3D matrix of interwoven blooming species by midsummer. The ongoing salad harvest was at the leading edge of this rising wall of inflorescence. Eventually, seed harvest would begin where salad harvest had started in spring, clearing space for a new crop in a new season. With every cycle of soil preparation a new flush of seedling volunteers, shattered from previous seed crops, would appear. We considered these as useful weeds we could count on—to be there, to be edible, to be easier to control than other weeds, to include some seasonally appropriate plants that could be used as crop, to include some exceptional individuals that may show themselves under adverse conditions of cold, heat, disease, insect infestation, or any of nature’s eventualities. These volunteers might be turned under as green manure, thinned/selected to become a crop, or weeded away by shallow cultivation just prior to transplanting in a new crop. Inevitably, at least a few eye-catching volunteers survived to be tested by the season alongside the intended crop. Sometimes we found great genetics by this random-appearing process, but always, this generated biodiversity wild enough to unsettle the well organized minds of commercial agrarians, and so that question... “Where’s the salad?”.

By fall 1993 our little house was stuffed by boxes of seed saved over a decade. Much of that inventory was packet-sized, an archive of unfinished breeding, samples of parentage, unused seed from each generation of dozens of experiments in crossing varieties, crosses between wild species and cultivars, unlikely mixes of Brussels Sprouts, broccoli, cabbage, and ornamental kale. However there were also gallon bags of nearly finished varieties, “genepool mixes” that were reservoirs of potential varieties, quinoa that had adapted itself without much direction from me, wildling species we were using in salads, and heirlooms that were once rare, now bulging out of boxes. One evening, probably while getting a box of seed out of her way, Karen said, “I think if you are going to keep growing seed, we are going to have to start selling some.” And so it was announced, the time had come to put that old epiphany to practice. At the kitchen table we typed out a seed catalog of the craziest offerings ever presented, made a color photocopy cover showing a mature dandelion seedhead ready to fly, and ran off 500 copies at Kinkos. I sent a copy to every seed company we had ever purchased from, and we heard back from a few.

My education as a plant breeder has been through several stages. The first one, just described, was based primarily on direct experience with the repeated life cycles of plants and their insect cohorts. I also read the twenty volumes of Luther Burbank’s life and work, which does not really qualify as an education in breeding these days (“Can you learn anything reading those?” one well known breeder asked). But Burbank was inspiring beyond belief, and made me believe anything was possible, given enough tries. Persistence pays.

The second phase of my education as a breeder began with a long phone conversation, circa 1996,

with John Navazio. He was a recently minted Ph.D. plant breeder from the University of Wisconsin, working at Garden City Seeds in Missoula, Montana. Garden City was an early adopter of the regional seed perspective, and the first alternative seed company to add a schooled breeder to their staff. John wanted to talk about kale, and the trials GCS had performed on all the available kales on the market. Our Ruso-Siberian type kales had done better than anything else in the plots, and our 'White Russian' kale in particular was both the best flavored kale (by staff vote), and the only kale to survive the Montana winter. I replied with something apologetic, acknowledging that the variety wasn't completely uniform...and John stopped me mid-sentence. He liked the variation, the genetic diversity within the population. He said that was the real power in the seeds. The remaining plasticity meant that wherever those seeds were planted, the better fit genetics would rise to the fore, and anyone selecting their own seeds from them would be well ahead. This was the first affirmation of my intuitions about selection for organic systems. John and I would go on to develop a friendship and mutual educational relationship, him teaching me the fundamentals of modern plant breeding and field trial methods, me teaching him from persistent personal experience with the repeated life cycles of dozens of plant species and their variations.

By the end of 2001, Karen and I were out of the salad greens business, and were selling seeds to about a dozen catalog companies. Many of our crops were now being grown at our friends' Gathering Together Farm, and in 2002 we made a joint business out of Wild Garden Seed from Gathering Together Farm. By combining the knowledge from 20 years of seed practice with the infrastructure, equipment, and land base of a 50 acre organic produce operation, we were able to keep up with a growing demand for organic seed from our catalog customers. Part of the engine for this demand was our collection of original varieties of greens and leafy vegetables inspired by our salad days, which were still coming into fruition. But I realized that it was time for a restart on our breeding parentage with disease resistance in mind, and at Navazio's suggestion, I applied for a grant from the Organic Farming Research Foundation to conduct a 3 year disease nursery trial on lettuce, that came to be known as Hell's Half Acre. In a disease nursery, you try to make everything sick to death, and it looks like Hell. We used the information and surviving seeds derived from the trial itself to create the lettuce gene pools that we still use today to derive new varieties every year. During this same era we began a project to improve vigor in an heirloom kale, Lacinato, which included making crosses with other varieties, one of which created our Lacinato Rainbow. In 2003, Joelene innocently asked if we could make an OP Italian pepper from an F1 hybrid, and thus was launched the ongoing pepper project, which is still producing new varieties and improving on the original ones. The quinoa that I began growing in 1984 as two diverse populations became 3 kinds, and now 6 kinds, which are now being grown all over the world. And so it goes.

For me, becoming a plant breeder has been like falling down a rabbit hole. One passage leads to the next, and characters along the way have made all the difference. I am fortunate to have been accepted and helped along by the generosity of public breeders that took my work seriously, answered my questions, and clued me in. Equally, the seed companies that recognized potential in

new varieties derived from organic farming systems, elevated my confidence and kept me replanting every year, even when there was no profit to show for it. Working with plants on this level becomes its own reward. The plant is so generous in its willingness to change in ways that serve the needs of others, as long as reproduction occurs. Seeing the evolution manifest from generation to generation always reminds me of the simple lesson in nature, that transformation is the essential pattern, and that creation is never done.

Nothing is finished.

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