

Contribution from Walter Goldstein on Friday night, February 12, 2021, to the Youth Section in North America “Open-Pollinator Future Lab: a conversation across North America on Youth+Agriculture.”

There are at least three worsening crises. There is the crisis of climate instability which is coupled with global warming and catastrophic shifts. There is a human health crisis associated with lifestyle shifts, chronic illnesses, mental illnesses, degenerative diseases, and pandemics. And the third crisis has to do with a degeneration of the life forces in the soil, the purity of our water, and the nutritional value of the plants we eat.

These three crises are interlinked and have primarily to do with our needs for individual development and the prevalent immature societal paradigm. We unleash and flock to technologies that promise us greater powers and efficiency. These technologies are exploitive, attractive, lucrative, and convenient, short term. Collectively, we refuse to foresee or ameliorate their longer-term impacts on us, on the Earth, and on future generations. Around these new technologies, capital becomes concentrated in the hands of sanguine investors but money largely rules where the money flows. Many potential actors are locked into institutional machines and their jobs do not allow ethical decisions but rather decisions that perpetuate their institutions and maximize profitability or dominance. Big institutions, whether they are companies or universities or USDA, are increasingly calling the shots in agriculture.

I would like to share with you three discoveries and actions I am involved with that are critical for addressing these crises with healthy agricultural solutions literally from the ground up. This are: 1) partnership breeding, 2) direct observation of the life of the soil, and 3) finding new forms for commercialization and cooperative work. This work I am going to tell you about is new and incomplete and it needs help from younger people to thrive and grow into the world.

The first is breeding and seed. You may know that as the art of breeding dies out in the agricultural community, I and others, including some young people in the organic movement have begun taking back our crops. You may have heard that our food has become progressively less nutrient dense as we implemented chemical farming and bred for yield. You probably know of problems with food allergies and interest in older kinds of crops that may not be allergenic.

You probably are also all familiar with genetic engineering where genetic material is taken from one organism and put into another. This has allowed the predominant use on this continent of genetically engineered corn and soybean crops that tolerate the herbicide roundup. Roundup has become the most used pesticide on the Earth and is associated with degenerative diseases and widespread pollution.

Aside from that, what you probably don't know is that breeding is becoming more and more unnatural. In order to speed up the process of breeding, hybridized plants are tricked into forming 'haploid' seeds with only the maternal set of chromosomes. Those haploids are grown

out and forced to double their chromosomes in order to make a normal plant. Aside from that this is a painful process to watch, we really have no idea of the long term consequences on the plants and on humans. But the process is faster than normal breeding, it lends itself to factory production, the resulting plants are stable and they can be easily patented. Therefore all the big companies do it. Furthermore, CRISPR gene editing is just around the corner for tailoring the genetics of our plants. The worst is that we will soon not know whether a plant is engineered in this way or not.

Plants have been defined at Universities as genetic machinery that should be programmed by clever scientists. Manipulative biotechnologies are looked at as being necessary tools in the face of the Climate crisis. As a consequence of this genomic focus, humans are being separated from plants. Breeding has become a laboratory-driven exercise with genomics where people live in front of screens and robots and cameras are assigned the task of making observations. All this happened because the art of human/plant dialogue has not been properly valued and cultivated because it is not seen to be 'hard' materialistically based science. Nevertheless, it is what has brought us healthy agriculture in the first place and is the fruitful source for future healthy breeding.

We practice partnership breeding at the Mandaamin Institute. Critical is that the human pays attention to what the plants do in the field. The human is a partner in the breeding process. It is important that we know our role, do a good job with observing, reasoning, choosing environments and the best parents, and making the right crosses and selections. The plant and microbial partners are the biologically creative element. Under our low input, biodynamic conditions, the plants undergo a process which we call *emergent evolution*. Plants adapt to new environments and stress by throwing out new variation and patterns in tandem with epigenetic shifts and rearrangements of their chromosomes. At the Mandaamin Institute we are harnessing this more respectful approach with corn, the Earth's most grown cereal crop. New patterns of storage proteins in their grain have appeared that increase the nutritional value of our grain tremendously. In our breeding process the plants became more nutrient efficient, partnering with bacteria that help them obtain minerals and nitrogen that make the grain much more nutritionally valuable. They therefore become less dependent on nitrogen fertilizers.

Nitrogen fertilizer is widely used to grow corn and the nitrate from it leaches down and pollutes our wells and lakes or it is converted into nitrous oxide, a potent greenhouse gas. We are polluting the water and the sky with the way we grow corn nowadays. Making nitrogen fertilizer is incredibly energy intensive. It takes the energy equivalent of 17 gallons of diesel fuel to make the nitrogen fertilizer needed to grow an acre of corn. But *our new corn fixes nitrogen* with the help of bacteria from the air and seems to respond negatively to nitrogenous fertilizers.

Soil Life. Unfortunately, we don't know the life that we depend on. And society does not have a language for it and there are taboos that keep us from paying attention. The soil is alive or dead to various degrees and the human being can develop a real relationship to it by actively

observing it through the year. The form of the soil, whether it is brick like and massive and hard, or crumbly and alive, reflects the ebb and flow of this life. There is an inner life to the soil and the human being can be an instrument for detecting and speaking for it by meditating in a focused way on what the soil is like. A language will emerge in us as we study it together and develop an objective soul to soil connection.

My experience has been that the life in the soil degenerates through the growing season. The plants appear to live from this soil life in a kind of parasitic way, depleting it. If the soil is fertilized with organic manures, particularly in the fall, there is the chance for a re-enlivening of the soil to occur. Forces from below become particularly active in November transforming the soil again and filling it with high quality life if the soil has been adequately manured in the past,. If the soil is filled with that high quality life the crops will have great taste and value for the human.

In that regard, I would like you to join me in research on your own soil and crops. Our protocol is described in detail on the Biodynamic Association website at: <https://www.biodynamics.com/experiencing-life-quality-our-soils>. If you are inclined to study the life of the soil and the Earth please note: Mike Biltonen and I would like to schedule our first Zoom meeting with participants on March 5th at 6 to 7 PM Central Time, for an introductory session, which should be followed by meetings every month starting then for each Friday of the month. These would be hour long sessions where people would succinctly relate findings and questions. Mike would manage the first one using his Zoom account. Please contact Mike for the Zoom link if you wish to participate. His email is mikebiltonen@gmail.com.

Third, new social forms. The seed world is incredibly competitive. Intellectual property issues and profits sync with greater emphasis on patents and commodification of crops. Orphan crops, not profitable enough for the companies, are neglected. There do not exist platforms for cooperative development of crops across institutions and no framework for helping small scale breeders. In that context we are working with the Northern Plains Sustainable Agriculture Society to develop a Quality Crop Association and the Nokomis Gold Seed Company. We hope to form the latter as a perpetual trust that could attract impact investors without the investors being able to change the intentions of the company.

Biography:

My life reflects my desire to form myself as a key to resolve the problems that I see.

I was born in 1953. Throughout my childhood I had a love for nature. I felt that there was an enormous wisdom in all living things and I wanted to understand it and apply it to resolve the problems that I knew would face humanity and the Earth as time went on. In 1972 I discovered Anthroposophy and Biodynamic agriculture while trying to find myself in southern California. I was 18 years old. That started me into a process of trying to shape my life so that I could have an

impact and be of some help for the coming problems. It led me to working on various organic and biodynamic farms.

In 1976 I completed a bachelors degree in Botany in Seattle and thereafter left for Europe to do research studies at different biodynamic research centers in Switzerland, England and Sweden. I had good mentors there in the form of Herbert Koepf and Bo Pettersson who provided a example of agricultural scientists with insight that were living by principles they believed in.

On the way I met my wife, Bente, and was married with her 1980 in Norway. We returned to Washington State to attend the agricultural university where I was able to earn a masters and doctorate in Agronomy and to do research on new crop rotations and effects of biodynamic preparations.

In 1986 I joined with others in Wisconsin to start Michael Fields Agricultural Institute and served as research director there for 25 years. In that time my wife and I purchased a 35 acre farm, where we bred sheep, corn, and fruit trees and raised kids. My wife began farm school programs with Dana Burns and then continued that for over two decades in the form of a small company called 'Farmwise'.

In 2011 I left Michael Fields to start a new non-profit organization in Wisconsin called the Mandaamin Institute with the help of friends. There we work on the farms of cooperators and mainly breed corn. We breed for enhanced nutritional value (nutrient density) and for nitrogen efficiency under low input, biodynamic conditions. At the Institute we develop and practice 'Partnership Breeding'. This entails a different attitude, where we work with corn and its microbial endophytes as partners, to breed corn that the world needs.

We partner with companies and farmers and universities to do research in Wisconsin and neighboring states. We have an extensive network and lead efforts in public breeding of corn for organic throughout the country. This year we are rolling out our first commercial releases. Our corn has much higher nutritional density which strongly affects its value as food and feed, and can lead to a reduction in the use of harmful feed additives. Furthermore, we believe that some of our corn fixes nitrogen from the air with the help of microbes. This is very important because it could lead to reduction in the use of nitrogen fertilizers which are polluting water and air and contribute a potent greenhouse gas. Now our corn also yields competitively to conventional hybrids on organic farms, but without needing the same chemical inputs.

Part of our dilemma now relates to how to commercialize what we have and to work with other breeders according to the principles we believe in. We seek to provide an alternative to the normal venture capital route by building an association with others in order to protect our core set of values. Our target is forming business forms such as a perpetual trust, to give the right form to relationships. Engagement with the Northern Plains Sustainable Agriculture Society (Verna Kragnes) and with the Foundation Organic Seed Company are important parts of how we inch forward. Finding funds to do our work is a perpetual challenge, engaging me in fund raising

for federal grants and foundation grants for at least a quarter of my time. We are by no means well off, but somehow, we manage to be opening up the door to a new future.

Another dilemma is how to grow the right people to take this effort into the future. I am getting older and cannot keep up the physical work. I do have some good technicians and farm help, but we need to find people who can grow the inner side and management work in a leading way. Clearly, people who can take on such a venture do not grow on trees but have it in their hearts and it must be cultivated, even in the face of financial uncertainty.

If you are interested in our work and helping to foster it in some way, feel free to contact me at wgoldstein@mandaamin.org and to visit our website www.mandaamin.org.