Revised Proposed Transition Program for Boulder County GE Farmers - May 30, 2019

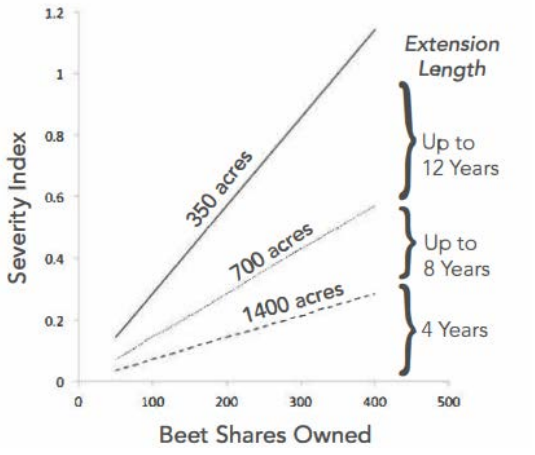
In November 2016, Boulder County decided to phase out the planting of genetically-engineered (GE) corn, GE sugar beets, and neonicotinoid pesticides on county-owned open space. Approximately ten (10) broad-acre open space tenant farmers in Boulder County are now faced with the challenge of transitioning away from GE corn by the end of 2019, and GE sugar beets and neonics by the end of 2021. The GE ban has caused consternation and fractured the local agricultural community. Most of the GE farmers in Boulder County are unhappy with the decision to ban GE crops from production. With pressure to transition rising, few farmers show any signs of trying out new crops. At the same time, the county has not yet identified economically viable alternatives. The county stands to lose the stewards of the land, and the producers stand to lose the land they lease from Boulder County. To address this impasse, the Boulder County Parks & Open Space (BCPOS) department proposes a revised transition program that extends the GE ban deadlines in order to provide more time to co-discover economically viable alternatives to GE crops for broad-acre production.

The goal of this proposed program is to rapidly identify economically viable and regenerative alternatives to GE crops and neonics while working simultaneously to scale back existing GE production acres. Regenerative production practices will be explored in field trials. Transition to organic will be offered as pathway forward, but not mandated. This transition program is for farmers who want to retain their open space leases and wholeheartedly pursue economically viable alternatives to GE crop production. This program is not an effort to "kick the can down the road" on the GE ban, but rather a roadmap to pursue viable alternatives to GE crops. Producers should not plan for the GE and neonic ban to be revoked or extended in the future. The current ban deadlines will remain in effect for farmers that do not opt-in to this revised transition program.

Extensions for Existing GE Corn, GE Sugar Beet, and Neonic Bans

The proposed program offers a two-year extension on the ban of GE corn (through 2021), a four-year extension on the ban for GE sugar beets (through 2025), and limits the use of neonics beyond the current ban (2021) solely to the obligatory seed coatings that accompany GE seeds. For GE corn, there are economically viable non-GE corn varieties and growing practices immediately available, both organic and conventional. But, there is no obvious replacement for beets yet. Beet growers do not have a non-GE seed option or marketplace and they are obligated to fulfill their shares under contract with the Western Sugar Cooperative. Moreover, BCPOS encouraged the purchase of sugar beet shares, further complicating matters and setting up for an "about-face" that could severely affect several farmers. They cannot retire their shares, and selling them is not an easy option given the depressed value of beet shares currently. The tenant growers that own a high number of beet shares and depend largely or solely on access to county land will be disproportionately affected by the ban and put at significant financial risk. The current ban essentially takes away their livelihood.

Mad Agriculture (Mad Ag) examined risk exposure by creating a simple "severity index" (SI), which is the ratio of acres a tenant owns in beet shares to acres they have in private land holding. In other words, it is the ratio of their obligation to grow beets for the cooperative and their ability to fulfill that obligation by using their own farmland. For some, their sugar beets shares only demand 8-12% of their privately held land, so they could fulfill their obligation with relative ease. For a couple of other farmers, the situation is grave: their sugar beet obligation requires an estimated 30% and 70% of their land annually, respectively. Because sugar beets are part of a four-year rotation, tenants cannot



fulfill their beet-share obligation on their own land, and the ban exposes them to high financial risk. The figure (see above) shows the relationship between beet shares and the SI, where the lines represent scenarios of private land holdings at 350, 700, and 1400 acres.

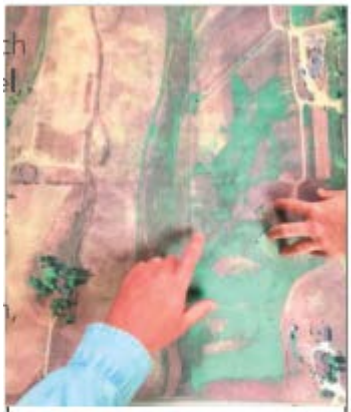
To participate in the revised transition program, farmers must share their information on beet share ownership and private land acreage holdings, which would be kept confidential. The additional four year beet extension would be accompanied by aggressive efforts by the county, in partnership with the tenant, to sell off or retire remaining beet shares (eliminating the obligation of tenants to grow for Western Sugar Cooperative) and replace that farm revenue through alternative crops. If these efforts are initially unsuccessful, BCPOS does recommend reserving the option to employ a one-time extension beyond 2025 for those very few tenants who scored "high" on the severity index and who demonstrate meaningful action to resolve the dilemma of their contractual beet share obligations.

This extension of the timeline phasing out GE corn and sugar beets will help de-risk the shift away from GE crops by allowing more time to grow GE crops while other crops and production practices can be discovered in parallel. Farmers who want to participate in this program and use the new deadline extensions would need to sign a new lease with the county by the end of 2019. Furthermore, the program will require participating farmers to simultaneously engage in the other activities described below. These activities will provide meaningful financial and technical support in the form of county cost-share support for crop and soil health experiments, workshops, field days, enterprise budget comparisons, monitoring outcomes, access to USDA-NRCS cost-share monies, and risk and market analysis in order to help develop customized pathways for successful transitions.

Part 1: Farm Vision & Field Trial Action Plan (June 2019 - April 2020)

Farm Vision for Individual Farms

The transition program will be offered on a farm-by-farm basis because each farmer has a different farm (acreage, soil type, etc.), vision, enterprise model, infrastructure, equipment, and appetite for change. The Mad Ag process begins with developing a Farm Vision (Year 1). It is critical to go through this process so we can best understand how new non-GE crops and practices fit within the management and enterprise models of the farm now and into the future.



Year 1 will focus on developing farm by farm transition plans and field trials to discover economically-viable, non-GM crops.

In this phase, Mad Ag will spend ample time with individual producers to listen, learn, and work on-farm to understand the history of their operation, vision for the farm, exchanging stories and ideas, building trust and camaraderie and a deep sense of their current enterprise models. By the end of Year 1, Mad Ag will develop an action plan for research trials. Their process is an effort to collectively discover what crops and practices hold the most promise for economic and ecological win-wins on a farm-by-farm basis. If farmers want to transition some or all of their land to organic, Mad Ag can also help guide that process. While field trials for new crops and practices are an important focus of 2020 and 2021, we expect to implement practices as early as fall of 2019 to accelerate learning.

Barriers to Non-GE Crop Adoption

Over the course of the project, Mad Ag will identify and overcome barriers to non-GE crop transition. Change is hard for most farmers because margins are tight, capital is limited, and markets are tightly defined. Moreover, the modern agricultural economy and culture is woven tightly by corporate and governmental interests that control the supply and pricing of inputs (i.e., seeds and chemicals) and outputs (i.e., commodity pricing), as well as insurance and subsidy programs. Though many farmers are frustrated and exhausted by the current system, there is limited flexibility to try something new because of major barriers to adopting new products, practices, and/or markets.

For each farm, Mad Ag will provide a systematic review of barriers on production and market access using a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis. Production barriers include everything from equipment needs, access to knowledge and funding (i.e., Natural Resources Conservation Service [NRCS], municipal, and grant monies) to de-risk new practices. Market barriers would include an analysis of potential product offtakes and missing elements to build new supply chains (e.g., alternative grain elevator or regional malting facility for craft beer). Mad Ag will work to develop offtake and distribution for non-GE crops, such as developing forward-contracts at attractive pricing to increase the economic viability of non-GE crops. Market access may also depend on new infrastructure, and they will evaluate strategic investments into grain storage, equipment for harvesting and post-processing, a regional malting house, and other support mechanisms, such as a dedicated source for technical advice for new crops, and more.

Technical Assistance: Workshops and Field Days with Producers and Buyers

Mad Ag will run a series of workshops to support broad-acre farmers in the transition to new crops and unfamiliar markets. Workshops provide a deep dive into specific topics, problems, and opportunities, and will be industry-only (offered to GE tenants and regional farmers) to create a judgement-free environment for detailed discussion. These workshops are not about "going back to farm school," but rather exposure to new crops, techniques, and markets emerging on the Great Plains, yet currently outside our community. Producers will be required to attend at least eight of the offered workshops and field days in 2019-2021.

Possible workshop topics and subject matter experts to host in 2019-2021:

Workshop 1. The Future of Pulses from Garbanzos to Field Peas with Steve Tucker (Agriforce Seed).
Workshop 2. Profitable transition from GE corn with John Kempf.
Workshop 3. Access non-GE corn markets in the High Plains (Ranchway, Curt Sayles).
Workshop 4. Large-scale Crop and Livestock Integration with John Haarman.
Workshop 5. Specialty Grain Markets with Ardent Mills.
Workshop 6. Specialty Pulses Markets with David Oien (Timeless Seeds).
Workshop 7. The Risk, Rewards, and How-To of Hemp Markets for CBD.
Workshop 8. Cover Crops on Western Dry and Irrigated Land with Meagan Schipanski (CSU).
Workshop 9. Profitable Organic Grain Production with Roy Pfaltzgraff.

Workshops and Field Days (see Part 2) are important for collective learning among project stakeholders. Field days will be provided so tenant farmers can see, learn and adopt successful practices and crops. Collective learning is much more powerful than isolated experimentation. The Boulder County tenant farmers are already a strong community, so it will be easy to host field days across individual farming operations.

Part 2: Field Trials and Farm Plans (Fall 2020 - Spring 2023)

Field trials will explore crop suitability for production and market utility, including spec tests to determine offtake value.

In Year 1, field trials will be initiated with fall crops like winter wheat and cover crops, with up to three acres of cost-share available per farmer. In Year 2, each producer will be required to plant at least three non-GE crops with at least three acres dedicated to each crop. In Year 3, each producer will be required to plant at least 10 acres of two non-GE crop options. During Years 2, 3, and 4, we will organize at least two field days per year for farmers to visit other farms to learn about what crops and practices are working, or not. In Year 4, for those farmers that decide to transition some acreage to organic, we will ensure organic purchase agreements (see Market Development).

The goal of Years 2 and 3 is to test new crops and practices. Promising crops include non-GE corn, forage, pulses (e.g., lentils and dry beans), hemp, ancient/heritage/specialty grains, malting barley, and alfalfa, as well as opportunities for livestock-crop integration, and more. Crop options will be determined on a farm-by-farm basis by the farmer with the help of Colorado State University (CSU) Extension, BCPOS, Mad Ag, and the Steering Committee. The field trials will be designed to optimize economic and ecological returns.

This project will cover the costs of seed, inputs, and post-processing for the field trials up to $400/acre/year, whereas the farmer will need to cover the cost of equipment use, labor, and water. The figure of $400/acre/year is roughly 75% of the average direct cost for irrigated and non-irrigated agriculture in Colorado, based on enterprise budgets developed by CSU Extension. We believe that a significant cost-share for field trials is warranted because there are different risk profiles for different crops and there is risk of total loss in experimentation.

A Focus on Regenerative Agriculture

These photos of Boulder County open space in April 2018 illustrate the vulnerability of land to wind and water erosion due to current practices of agriculture. While many of the tenant farmers use no-till and other consrvation practices, there is always room to improve. Part of the goal of this transition program is develop systems that restore soil health, which can help improve fertility, water holding capacity and increase long-term finanical viability. In both pictures, valuable resources are being lost, affecting the health of the land and profitability of the farm.

A strong emphasis will be placed on regenerative agriculture, which focuses on using crops and practices to restore and sustain soil health, which in turn protects and enhances both natural resources and farming communities. Regenerative agriculture practices can help reduce long-term input costs and restore the soil resource base of Boulder County open space. According to Gabe Brown, an international leader in the broad-acre regenerative agriculture movement, the five guiding principles of regenerative agriculture are:

1) Minimize disturbance.
2) Leave no bare soil.
3) Maximize diversity.
4) Keep a living root in the soil for as long as possible.
5) Livestock integration.

Many of the Boulder County open space tenants are using regenerative practices such as no-till, crop rotations, livestock integration, minimizing chemical use, and actively managing residue. There is, however, much to be learned and enhanced (see right). Wind erosion and limited water

infiltration are indicators that soil health can be improved. This project provides an excellent opportunity to test crops and additional regenerative practices, including companion cropping, polycultures, cover crops, compost and manure applications, pasture cropping, and more.

Monitoring Outcomes

What does success look like in the next several years? Our goal is to discover economically viable, non-GE crops grown with regenerative practices. We will compare the economic, social, and ecological outcomes of GE corn and sugar beets to alternative crop systems, and develop enterprise budgets for each crop. With input from the Steering Committee (see below), a matrix of resource metrics and observations will be compiled to track the impacts of soil health practices and alternative crops. Observations and measurements will be recorded on an annual basis and follow a triple bottom line approach to consider environmental, social, and economic outcomes. Environmental considerations include soil health (as measured by the Cornell University Comprehensive Soil Test and water infiltration), water efficiency, and chemical use among other factors. Social considerations include regional food supply and input sourcing. Economic considerations include crop yield, production costs, market revenues, and profits. The economic key performance indicators will be costs and revenues, including gross and net economic margin per acre. The most important metric is the net economic return per acre, as opposed to maximum crop yield per acre, which is often prioritized. We will look to reduce costs while improving revenues through access to new markets. Full transparency and monitoring of the per acre costs and revenues on existing GE crops will be required by farmers for an accurate analysis.

Market Development: Premium Offtake for Specialty Crops

The industrial farm economy is grim: farm income is at an 18-year low and commodity prices are bottomed out. Yet there are a variety of bright spots in the marketplace to pursue, including specialty crops, organic certified production, and direct offtake to brands that seek direct connections with farmers. For example, the demand for organic small grains and corn has seen double-digit growth year-on-year for the past decade, with 200-400% premiums. Shifting to organic is a big transition, and Mad Ag can help guide that process for interested farmers. Mad Ag is also deeply connected to natural and organic food brands working to regenerate their supply chains and pay premiums. Mad Ag is actively connecting brands directly to farmers, and will offer these market connections to Boulder County tenants on a farm-by-farm and crop-by-crop basis.

Farm Plans to Ensure Success Beyond Project

By the end of 2021, each farmer will be better equipped to transition away from non-GE corn. Mad Ag will develop a farm plan with each participating tenant producer, outlining how non-GE cropping and conservation practices fit within the larger farm system. They will map crops and practices in space (i.e., mapping) and time (i.e., 3-5 year action plan with Gantt chart). In 2022, the project will enter the Implementation and Adaptive Management phase. The work of Mad Ag will begin to wind down, and further guidance on non-GE crops and production practices will shift to the BCPOS staff. This transition will be natural, as BCPOS will be intimately involved in this project every step of the way. In 2022, Mad Ag will reduce, yet maintain, engagement to provide guidance on farm-by-farm basis to help solve issues that emerge across the non-GE supply chain from soil to market-offtake.

Developing Access to NRCS Support

There are a variety of technical and financial resources potentially available through the NRCS to provide further support for this project (Years 1-4) and beyond. Farm plans that Mad Ag develops are designed using the NRCS Conservation

Planning model, a process developed by the USDA to help farmers solve their resource concerns by educating, designing, and cost-sharing (~50%) the implementation of regenerative conservation practices. The NRCS has a wide portfolio of conservation practices proven to enhance soil health and sequester carbon like cover crops, compost application, conservation tillage, prescribed grazing, irrigation improvement, contour buffer strips, and more. Most broad-acre farmers are familiar with the NRCS and have used EQIP funds to install irrigation equipment. Field trials will be designed to activate existing technical and financial resources to de-risk the implementation of regenerative practices. The NRCS can also help guide and pay for the transition from conventional to organic production if a producer would like to explore this option. Mad Ag will work closely with NRCS Planner Sylvia Hickenlooper to create conservation plans that serve as farm plans (mentioned above) so farmers can access NRCS cost-sharing on the implementation of regenerative agriculture on a farm-by-farm basis.

In parallel with this project, Mad Ag is also working with Boulder County, the City of Boulder, CSU Extension, and NRCS to pursue additional funding from other USDA programs, namely the Conservation Innovation Grants (CIG) and Targeted Conservation Program (TCP). Both CIG and TCP opportunities represent additional financial and technical resources to supplement and enhance support for this project, providing additional cost-share to expand field trials beyond what is outlined here.

Mad Agriculture Deliverables

1. Written farm vision for each farm, including barrier analysis and research trial action plans.
2. Organize and execute at least ten workshops to provide technical support for new crops and practices.
3. Facilitate steering committee and stakeholder meetings to guide design of field trials.
4. Implementation of field trials – project management from start to finish, designing and managing the field trials with producers, and developing the budget for field trials.
5. Organize six farm field days for producers to visit other farmers and research plots.
6. Develop market offtake with each farmer for non-GE crops.
7. Develop enterprise budgets to examine the cost-competitiveness of non-GE crop systems.
8. Measure the social, environmental, and economic outcomes of the field trials.
9. Develop farm plans outlining a 3-5 year action plan for growing/selling non-GE crops beyond Year 4.

Participation Agreement

Producer Commitment: Participation in the transition program requires tenants to abide by all existing Boulder County lease stipulations including Cropland Policy Amendment 13 that describes the phase out of GE corn, GE sugar beets, and neonicotinoids. Failure to abide by these policies during or after the transition program would result in the loss of lease and repayment of transition subsidies allocated by the county during the transition program. Tenants agree to participate in good faith and earnestly utilize this program as an opportunity to explore potential improvements to their farm operations, including working with Mad Ag to create farm visions and design field trials. Tenants must attend eight of the workshops provided. Farmers will share their information on beet share ownership and private land acreage holdings, which would be kept confidential. Tenants agree to partner with Boulder County to sell off or retire remaining beet shares, if need be, and replace that farm revenue through alternative crops. Full transparency and monitoring of the per acre costs and revenues on existing GE crops will be required from farmers for an accurate analysis.

Boulder County Commitment: BCPOS will participate in the implementation of the field trials, including assistance in design and choosing crops and practices. Provide support and promote the on-farm field days. Provide space for and

participate in workshops and steering committee meetings. BCPOS will take the lead in developing solutions to retire and/or sell beet shares, especially for the tenants with fewer acres of private ground.

Team Roles and Responsibilities

Mad Agriculture

- Philip Taylor (Project Lead) - Project coordination, lead on farm vision, steering committee engagement.
- Tanner Starbard (Project Manager) - Lead on field trial implementation, enterprise budget development and farm planning, and project management.
- Clark Harshbarger (Soil Health Expert) - Lead on field trial design, monitoring regenerative outcomes.
- Brandon Welch (Market Development) - Lead on market development and SWOT analysis.

Boulder County Parks & Open Space I CSU Extension

- Vanessa McCracken - Assist in communication, workshop logistics, field days, design and evaluation of field trials with non-GE crops, and stakeholder representative for NRCS CIG and TCP opportunities.
- Blake Cooper - Assist in choosing future crops and practices, field implementation including planning, planting, monitoring, harvest, post-processing, and offtake development.
- Adrian Card - Educational and technical resource advice and design on field trials enterprise evaluation.

Project Evaluation and Steering Committee

Toward the conclusion of each year, the steering committee will conduct a meeting to review progress based on the intentions and metrics outlined in this proposal. Following that meeting, there will be a public hearing before the Board of County Commissioners (BOCC) where BCPOS and Mad Ag review progress before decisions are made to finance the next year's work. This will provide additional opportunity for public engagement and communication.

Steering Committee – This committee will be composed of subject matter experts, an affected tenant, a BCPOS representative, and a member of the Parks & Open Space Advisory committee or other representative of the public selected by the BOCC. This committee will help guide and evaluate progress and success of the transition program.

- Paul Schlagel (Farmer) - Representative for Boulder County tenant farmers affected by the ban.
- Meagan Schipanski (Asst. Professor) - Focus on water use efficiency, cover crops, soil health.
- Gene Kelly (Dep. Dir. Colorado Agricultural Experiment Station, Associate Dean for Extension) - Focus on bringing state-level resources (i.e., technical, market, and financial) to the project.
- Sylvia Hickenlooper (NRCS Soil Conservationist and Conservation Planner) - Focus on NRCS support.
- Mark Easter (Natural Resources Ecology Laboratory, CSU) - Guidance on carbon-beneficial practices.
- Blake Cooper (BCPOS Agricultural Resources Division Manager) - Representative for BCPOS.
- Member of POSAC or other public representative selected by the BOCC.

Project Budget & Evaluation

The total estimated budget of this four-year project is $823,900.

Part 1: Farm Vision & Field Trial Action Plan (2019-2020)

Written Farm Vision and Field Trial Design with Action Plan (on-farm meetings, design, staff support)	$177,900
Workshops & Travel (guest stipends, travel, lodging, food and staff support)	$26,000
Steering Committee and Stakeholder Meetings	$12,000

Part 2: Field Trials & Farm Plans (2020-2023)

Field Trial Implementation (on-farm activity, management, monitoring, and staff support)	$192,000
Field Trial Cost-Share to Research Trials	
Year 1: Up to 30 acres of field trials ($400/acre cost-share)	$12,000
Year 2: Up to 90 acres of field trials ($400/acre cost-share)	$36,000
Year 3: Up to 200 acres of fields trials ($400/acre cost-share)	$80,000
Monitor Regenerative Outcomes and Crop Quality Testing	$20,000
Six Farm Field Days (two each in years 2, 3, and 4)	$6,000
Developing Market Offtake for each Farm (years 2 - 4)	$76,000
Develop Enterprise Budgets for non-GE/GE crops (years 2 and 3)	$65,000
Farm Plans for non-GE Action Plan Beyond Year 4	$121,000