

SOIL HEALTH AND URBAN FARM PRODUCTIVITY: FULL PROPOSAL FOR 2017 WESTERN SARE COMPETITIVE GRANTS RESEARCH AND EDUCATION

1.0 PROJECT PARTICIPANTS

Principle Investigator:

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Producers:

1. Meg Caley - Co-Founder, Director of Farming Operations and Education, Sprout City Farms
2. Nick Gruber - Owner and Operator, Produce Denver
3. Fatuma Emmad - Sister Gardens Farm Manager, Groundwork Denver
4. Brien Darby - Manager of Urban Foods, Denver Botanic Gardens
5. Beverly Grant - Manager, Mo' Betta Green Marketplace

Outreach Partners:

1. Blake Angelo - Manager of Food Systems Development, City and County of Denver, Office of Economic Development
2. Bill Stevenson - Director of Cooperative Development, Rocky Mountain Farmers Union

2.0 SUMMARY

2.1 Question

How do sustainable agricultural practices and inputs impact soil health on urban farms and therefore the volume and nutrition of produce from those farms? Do the improvements in soil health lead to improved nutrition and increased production which positively impacts the profitability of urban farms? Is the steady improvement of soil through sustainable farming a sufficient reason to invest in extending tenure for urban farms?

2.2 Education and Outreach

The University of Colorado Denver, Department of Landscape Architecture will host an annual symposium and discussion to present the results of the prior year's testing and the trends over previous years as the study progresses. This will be a forum for sharing results between urban farmers as well as strategizing ways to use the results to impact policy and funding in order to extend tenure for urban farms in the Denver metropolitan area. The researchers will prepare journal articles, conference presentations, and white papers that convey the results of our testing as well as the conclusions which can be drawn from them.

2.3 Problem, Context, and Impacts

There is an ever increasing interest in urban agriculture, which not only provides local produce but also provides the experience of growing food and an understanding how we are attached to

our land. Only urban agriculture can provide these latter aspects of agriculture for the majority of the population which lives in cities, and its growth as field of endeavor shows how much interest there is in growing food in cities. However, urban agriculture faces significant financial obstacles related to maintaining sufficient land tenure to become and remain financially viable. Urban farmers spend significant amounts of time looking for and procuring land, and then too frequently lose access to that land after they have invested their time and capital in improving the soil over a number of years. This loss of access to improved land negatively impacts the profitability of farmers. It is our goal to demonstrate these negative impacts by establishing the positive value of sustained tenure in quantitative terms. Our ultimate goal is to provide an argument that will support expanding tenure for urban farmers based on the connection between tenure, soil health, nutrition and productivity.

2.4 Importance of Project

Securing reliable land tenure is the single most difficult administrative concern in urban farming. An argument which ties tenure to the viability of farmers in the urban context by establishing its relationship to production volume will help by influencing funders and policy makers. Further tying increased tenure to nutrition will supplement this argument from a public health perspective. Increasing awareness of sustainable agricultural practices and impact on nutrition in an urban setting where the majority of people can engage these issues will have significant impact on their awareness of the value of sustainable agricultural practices in peri-urban and rural agriculture as well, and assist in directing the market to support sustainable agriculture at a regional and national scale. In this way, supporting sustainable urban agriculture will indirectly support the expansion of sustainable agricultural production in rural areas adjacent to the Denver metropolitan area.

2.5 Approach

To document the positive impacts that the long-term care for soil has on productivity and nutrition, the Project Team will conduct a rigorous time-series analysis that correlates sustainable agricultural practices in an urban setting to positive changes in soil health, productivity, and nutritional content of output. The Study Objectives are described below in Section 3.0, and Materials and Methods in Section 6.0.

2.6 Proposed Solution

The Project Team proposes a public-health related argument for increasing efforts to procure long-term tenure for urban producers by showing how lengthening tenure improves profitability of urban farms by correlating improved soil health resulting from sustainable practices with production volume.

2.7 Potential Significance and Expected Outcomes

This study has the potential to establish the long-term benefits of sustainable agricultural practices in an urban context and its connection to the nutritional value of the food produced as well as the profitability of urban farmers. The ultimate significance of this establishing this connection will be to provide a concrete basis for the argument that urban farmers need access to more durable land tenure. The Project Team includes individuals with involvement in funding, policy, and land access that will help us craft this argument and present it in the appropriate venues.

3.0 RELEVANCE TO SUSTAINABLE AGRICULTURE

The project and potential measureable outcomes, as outlined in the Objectives listed in section 4.0 below, are relevant to federal definition of sustainable agriculture and the goals of Western SARE because the project will:

- demonstrate how increased land tenure for urban farms can provide increased productivity and nutritional output;
- demonstrate how increased land tenure, and the practices of sustainable, chemical free farming results in improvements to soil health;
- demonstrate how increased land tenure for urban farms results in increased profitability year-over-year; and,
- propose ways to enhance the quality of life for farmers and society as a whole through advocating for securing long-term land tenure for urban farms by focusing on connections with organizations and government officials who can impact land tenure through funding mechanisms, policy enhancements and/or land reservation.

The project is economically viable because improved soil health and productivity associated with increased tenure positively impact profitability and therefore an increase the long term viability of urban farms. It is environmentally sound since the use of sustainable, chemical free farming practices will result in maximized resource efficiency and decreased environmental contamination. Finally, the project is socially responsible because increasing access to locally and sustainably produced food will positively impact public health outcomes.

4.0 OBJECTIVES

Research Objectives:

1. Demonstrate a positive correlation between continued land tenure, sustainable farming inputs and practices, and improvements in soil health, productivity and nutritional output (year over year, and cumulative; begin March 2017; end October 2019 with possible extension through October 2021).
2. Demonstrate a positive correlation between successive seasons of sustainable farming inputs and practices and the profitability of urban farming (begin March 2017; end October 2019 with possible extension through October 2021).

Education Objectives:

1. Evaluate these correlations through a collaborative annual seminar presentation of results with the farmers included in the project team, additional farmers in the area and a broad range of stakeholders (begin December 2017; end December 2019 with possible extension through December 2021).
2. Disseminate our findings to farmers to help guide their inputs and practices toward increased health that results in positive outcomes (begin December 2017; end December 2019 with possible extension through December 2021).
3. Use our findings to advocate for securing land tenure for urban farms. Focus on connections with organizations and government officials who can impact land tenure through funding mechanisms, policy enhancements and/or land reservation (begin December 2017; end December 2019 with possible extension through December 2021).

5.0 STAKEHOLDER INVOLVEMENT

Partner Producers

Each of the following partners have identified new or existing sections of the specified farms to be utilized for the duration of the study:

Sprout City Farms - Meg Caley, Co-founder and Director of Farming Operations and Education



Denver Green School Farm



Dahlia Community Farm

Sprout City Farms (SCF) envisions a thriving local food system within the Denver metro area supported by a network of accessible city farms which nourish, and are nourished by, their surrounding community. Their mission is to cultivate educational urban farms that engage and strengthen communities, and their work is guided by the following core principles: create opportunities for all people to have equal access to fresh produce and the knowledge of how to produce it themselves; build urban farms that provide access to the outdoors and exposure to how food is grown, especially in communities that have limited green spaces, as well as preserve local ecological systems; cultivate safe community spaces where residents come together to build relationships around food; and, foster long-term relationships based on trust, inclusion and collaboration that respect the integrity of local neighborhoods.

Plots at three farms operated by SCF, in various stages of establishment, will be utilized for the study:

- Mountair Park Community Farm in Lakewood, Colorado: three successful seasons as of 2016,
- Denver Green School Community Farm in Denver, Colorado: seven successful seasons as of 2016, and
- Dahlia Community Farm in Denver, Colorado: one successful season as of 2016

Produce Denver - Nick Gruber, Owner and Operator



Moon Dog Farms

Produce Denver aims to help Denver move toward a sustainable community where yards are productive, beautiful spaces. Through their passion for simple, long term design, they help make growing plants easy and economical, and are working to put Denver at the forefront of water conservation, local food production, and sustainability.

Produce Denver's Moon Dog Farms (operated in partnership with the Mercury Café), located on land owned by Denver Housing Authority in Denver, Colorado, will be utilized for the study. Moon Dog Farms has been in various states of operation for several years; however, successful cultivation has only occurred for two years as of 2016.

Groundwork Denver - Fatuma Emmad, Sister Gardens Farm Manager



Sister Gardens

Groundwork Denver was incorporated as a non-profit in 2002 to work with residents of lower-income neighborhoods implement projects that improve the environment, while also building diverse community involvement and providing leadership and job training opportunities. Groundwork Denver’s programs address air quality, water quality, access to parks and open space, energy efficiency and more.

A new section of Groundwork Denver’s Sister Gardens at Aria, previously operated by Urbiculture Community Farms and with one year of successful cultivation, will be utilized for the study.

Denver Botanic Gardens - Brien Darby, Manager of Urban Foods



Mariposa Farm (study section)

Denver Botanic Gardens is committed to increasing access to fresh, healthy food through a number of community-based projects. With management from Gardens’ agricultural experts, Mariposa residents have volunteered with the maintenance and harvesting of the Mariposa Urban Farm, located in their development. Residents volunteering with the program receive a share of the produce every week. Produce from the farm is also sold at a weekly, low-cost farm stand that also accepts EBT payments. Leftover produce is distributed free of cost to low-income Denver Housing Authority residents.

A new section of Mariposa Urban Farm, established in 2016, will be utilized for the study.

Mo’ Betta Green Marketplace - Beverly Grant, Founder and Operator



Seeds of Power Unity Farm

Mo’ Betta Green Marketplace started as a collaboration between Stapleton Master Community Association and Forest City Stapleton, featuring a regular evening market Conservatory Green Park and Plaza, with the goals of achieving food literacy, environmental stewardship, and social responsibility. A pioneer in the urban food movement, especially in the neighborhoods called food deserts, Beverly educates people about food as medicine and gets involved with local food policy.

Beverly’s Seeds of Power Unity Farm, located in Denver, Colorado, will be utilized for the study. Seeds of Power Unity farm was established successfully in 2016.

Other Stakeholders

In addition to the involvement of the partner producers who are excited to engage this range of tests and help establish the argument for extended tenure that we are expecting to make, the Project aims to inform and address stakeholder-identified needs included, but not limited to:

City and County of Denver’s Office of Economic Development (OED) 2030 Food Plan, in cooperation with Denver’s Sustainable Food Policy Council (SFPC): “The Denver Food Plan will likely encompass strategies for improving healthy food access, as well as targeting business development and job creation related to the city’s food system” (CCD 2016a).

City and County of Denver’s Office of Sustainability 2020 Sustainability Goals: The 2020 Sustainability Goals focus on 12 resource areas and set goals for the City and County of Denver as well as the community at-large, including the goal of “growing and/or processing at least 20% of food purchased in Denver within Colorado” (CCD 2016b).

Denver SFPC’s mission of “fostering food security for all community members and to promote a healthy, equitable and sustainable local food system (from production to distribution to access) with consideration for resource conservation, energy efficiency and waste recovery” (SFPC 2016).

The creation and proliferation of urban farming land trusts similar to those established in other parts of the country, including: the Southside Community Land Trust (SCLT) in Providence, Rhode Island, whose mission is to “provide access to land, education and other resources so people in Greater Providence can grow food in environmentally sustainable ways and create community food systems where locally produced, affordable, and healthy food is available to all” (SCLT 2016); the Oregon Sustainable Agriculture Land Trust (OSALT) in Portland, Oregon, which “holds farmland and urban gardens for the purposes of research and education on sustainable agriculture” (OSALT 2016); and, Equity Trust in Amherst, Massachusetts who, in 2013 launched an initiative within their Farms for Farmers Program to explore and address the issue of land tenure for urban agriculture (Equity Trust 2016). See also Yuen 2014.

Rocky Mountain Farmers Union (RMFU): “Our job is to provide our members with the tools they need to be profitable, to build better futures, and to have a voice that is heard by local, state, and national policymakers” (RMFU 2016).

Relevant topics, objectives, and areas needing additional study, as identified in previous Western SARE funded projects, including but not limited to:

“...characterizing effective crop planting and rotation schedule to maximize plant production and economic return for farmers in the urban environment can be studied.” (Wagstaff 2015).

Evaluating “the interactive effects of several cover crops and compost application upon soil health, crop yield, and farm economics in degraded urban soils” (Liebman 2013).

Provide additional research “addressing the frequency with which farmers are securing tenure in areas where agricultural land prices are defined by non-agricultural uses (i.e. residential development)” (Schwartz 2007).

Examining “the socio-economic and ecological components of sustainable agricultural landscape systems”, and increasing “public (farmer and consumer) knowledge and appreciation of the socio-economic and environmental benefits to the community of the agricultural landscape” (Havens 2001).

6.0 MATERIALS AND METHODS

The Principal Investigator will provide each producer with the following:

- seeds or starts for the designated three crops, normalized across test sites (one tomato variety, one kale variety and one carrot variety);
- designated planting density; and,
- market scales and calibrated seeders to be used across the sites.

Each producer has identified an existing and/or new section at each of the farms described above in Section 5.0 to be utilized for the study, and agreed to the following for the duration of the study:

- grow the same three crops in the designated sections for the duration of the study (seeds or starts to be provided; section sizes vary by site);
- plant seeds at a designated normalized density;
- facilitate access for soil testing twice per growing season (once in spring and once in fall, prior to amendment);
- record and provide produce weights during harvest for crops grown in the designated section (lb/ft²);
- record and provide soil amendment inputs (lb/ft²); and,
- facilitate access to plant samples for nutritional analysis mid-harvest for each crop

Two different soil tests will be administered for each site twice per season. The first test will be a complete soil analysis offered by Logan Labs to include: pH, organic matter, base saturation, total exchange capacity, Mehlich III extractable sulfur, phosphorous, calcium, magnesium, potassium, sodium, boron, iron, manganese, copper, zinc, aluminum, soluble salts, chloride, bicarbonate, water soluble phosphorous, nitrate and ammonium. The second test will be a qualitative soil analysis offered by Living Soils laboratory, which includes a qualitative analysis using direct microscopy and a system of calculations to provide not only a profile of the soils micro-ecosystem, but also an approximation of biomass of Bacteria and Fungi.

Nutritional analysis will be performed by Covance Laboratories on one sample of each type of produce from each of the seven sites (21 tests per season). Each sample will be analyzed using a cost-effective test for calcium, copper, iron, magnesium, manganese, potassium, phosphorus, sodium and zinc. In addition, carrots will be tested for biotin, vitamin A and vitamin B6; tomatoes for vitamin C and vitamin E; and kale for vitamin K and vitamin A. Analyses were selected according to both cost effectiveness and likelihood that foods tested could provide significant percentages of dietary requirements.

Data will be compared across all sites and over time in order to look for correlations between progression of soil health, productivity, and nutritional content of output.

7.0 PRODUCER & AG PROFESSIONAL EDUCATIONAL ACTIVITIES

An annual symposium will be held with local producers and other professionals that are integral to the production of food within the Denver metropolitan area, including planning and other government officials, non-profit leaders, and researchers. The results of the years testing results will be presented at this symposium, and workshops will be hosted on issues related to land tenure for urban and peri-urban farmers in the area. These workshops will be output-oriented and will generate additional perspectives and insights into issues related to length of tenure. It is

also the intent to use these workshops to generate positive steps toward securing durable tenure. As appropriate, these workshops will become the basis for white papers, policy statements and submissions to peer-reviewed journals. Many of the members that will be included in this symposium are already members of Denver's SFPC and/or Colorado's COFSAC and we will coordinate with ongoing efforts in these groups. This symposium will be hosted by the Colorado Center for Sustainable Urbanism, housed in the College of Architecture and Planning at the University of Colorado Denver.

8.0 SCHOLARLY PUBLICATIONS & EDUCATIONAL MATERIALS

The results of the testing and workshop outputs will be used to generate short fact-sheets describing the benefits of durable tenure for urban and peri-urban farmers. In addition, once enough data has been collected to support quantitative projections, worksheets will be produced that farmers, landowners, and funders can use to project the benefits of extended tenure agreements. Whitepapers will be distributed locally through COFSAC, the SFPC, the Center for Sustainable Urbanism at the University of Colorado Denver, and the Rocky Mountain Farmer's Union, as appropriate. Fact-sheets and worksheets will be distributed directly to farmers by the researchers as well as through the above mentioned organizations.

There are many journals that would be appropriate for the dissemination of this research, and they fall roughly into two categories: those focused on agricultural production and those focused on the production and distribution of urban land. Articles submitted to these journals would be focused on the readership of each. Below are lists of the three most promising journals in both categories:

Journals focused on agricultural production:

Renewable Agriculture and Food Systems
Agriculture and Human Values
Journal of Sustainable Agriculture

Journals focused on the production and distribution of urban land:

Journal of Environmental Planning and Management
Landscape and Urban Planning
Landscape Research

9.0 PRODUCER ADOPTION

It is expected that the producers will use the factsheets and worksheets produced from this research to not only outline their business plans and project the benefits of increased land tenure, but also in their negotiations for access to land – whether the land-holder is a public agency, a private entity, or non-profit organization. Researchers will offer individual support to customize and utilize these resources for local producers, as requested. The annual symposium will be used to distribute these resources, but also verify that the information is presented in a manner useful to agricultural producers through collaborative conversations and the use of an approved survey (such as the Survey Instrument). After being vetted by local producers, these resources will also be made available to the general public nationally.

10.0 BUDGET & JUSTIFICATION

(SEE JUSTIFICATION AND BUDGET SPREADSHEET)

11.0 LITERATURE CITED

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