



Proceedings of the 7th National Small Farm Conference

...Creating and Sustaining Small Farmers and Ranchers...

VIRGINIA BEACH CONVENTION CENTER • VIRGINIA BEACH, VA

September 20-22, 2016

PAGE LEFT
INTENTIONALLY
BLANK

PROCEEDINGS OF THE 7TH NATIONAL SMALL FARM CONFERENCE

Theme: *Creating and Sustaining Small Farmers and Ranchers*

Venue: *Virginia Beach Convention Center, Virginia Beach, VA*

Date: *September 20-22, 2016*

THE 7TH NATIONAL SMALL FARM CONFERENCE WAS HOSTED BY



WITH THANKS TO OUR SPONSORS



Proceedings of the 7th National Small Farm Conference

The 7th National Small Farm Conference, "*Creating and Sustaining Small Farmers and Ranchers*", was hosted by Virginia State University, in partnership with Virginia Tech and various agencies from the U.S. Department of Agriculture. During the conference, presenters shared successes in small farm and rancher activities, as well as innovative ideas in research, extension and outreach to strengthen collaboration and partnerships among state specialists who work to ensure that small farmers and ranchers continue to have a place in a rapidly changing socio-economic environment. The conference also served as a forum to discuss the results of research geared towards addressing challenges facing small farmers and ranchers. Strengthening and expanding partnerships created at the six previous National Small Farm Conferences was a priority for the Virginia Beach meeting. The 7th National Conference consisted of short courses, oral and poster presentations, exhibits, success stories, and educational tours within the environs of the City of Virginia Beach, and the Eastern Shore of Virginia.

Proceedings Committee

- Denis Ebodaghe (*USDA-NIFA*)
- Dave Lamie (*Clemson University*)
- Laban K. Rutto (*Virginia State University*)
- Kim Niewolny (*Virginia Tech*)
- Nii Tackie (*Tuskegee University*)
- Reza Rafie (*Virginia State University*)
- Scott Elliott (*USDA-NIFA*)
- Beth Nelson (*University of Minnesota*)
- Shaniqua Armstead (*USDA-NIFA*)
- Ngowari Jaja (*Virginia State University*)

Welcome to the 7th National Small Farm Conference

Dear Conference Participants:

On behalf of the conference planning committees, our conference host Virginia State University in partnership with Virginia Tech, conference sponsors, land grant colleges and universities, community-based organizations, USDA Agencies, small farmers and ranchers, foundations, State Small Farm Program Coordinators, other public and private sector organizations, other stakeholders and customers, welcome to the 7th National Small Farm Conference. The conference's theme, "***Creating and Sustaining Small Farmers and Ranchers***," provides a forum to discuss programs and services that have been created as well share strategies to sustain more farmers and ranchers. For discussion at this conference are issues raised by stakeholders from land grant colleges and universities, community-based organizations, farm communities and others working with small farmers and ranchers. Sustaining programs is of essence if we are to promote and encourage innovative ideas that can be replicated in order to enhance economic opportunities and improve the quality of life for small farmers and ranchers nationwide. This conference builds upon the successes of previous conferences held in Nashville, Tennessee in 1996; St. Louis, Missouri in 1999; Albuquerque, New Mexico in 2002; Greensboro, North Carolina in 2005; Springfield, Illinois in 2009; and Memphis, Tennessee in 2012. This is a train-the-trainer conference consisting of several preconference short courses and program efforts focusing on critical areas such as marketing opportunities, traditional and alternative enterprises, food production and safety, risk management, urban agriculture, outreach, training and research and extension priorities.

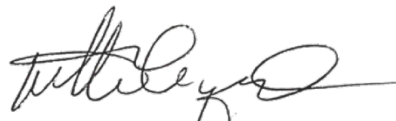
Tuesday's opening plenary begins with greetings and remarks to set the tone and direction of the conference while providing opportunities for networking. On Wednesday, the highlights include a keynote followed by farmers' panel on small farm opportunities and challenges, and closing out the afternoon with educational tours. Thursday highlights presentations from series of tracks, networking lunch followed by a closing session, entertainment and drawings.

Many thanks to the faculty and staff at Virginia State University for hosting this event in partnership with Virginia Tech and USDA agencies, conference sponsors, the local Planning Committee, the Conference Planning Committee, and others for their hard work over the past two years in planning for the 7th National Small Farm Conference.

Sincerely,



Denis Ebodaghe, Ph.D.
Conference Chair &
National Program Leader for Small Farms



William Crutchfield
Conference Chair &
Director, Small Farm Outreach Program
Virginia State University

Keynote Speakers



Dr. Gregory Parham, Assistant Secretary for Administration

Dr. Gregory L. Parham was appointed Assistant Secretary of Agriculture for Administration in June 2013. Prior to this appointment, he was designated Acting Assistant Secretary and served as the Administrator of the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS). Previously, Dr. Parham served as APHIS' Associate Administrator and as the Deputy Administrator for Marketing and Regulatory Programs - Business Services, after joining APHIS as the agency Chief Information Officer. He began his Federal career as an Epidemic Intelligence Service Officer with the Public Health Service at the Centers for Disease Control. He joined USDA in 1982 and has worked for several USDA agencies including: the Food Safety and Inspection Service, the Extension Service, the Cooperative State Research, Education and Extension Service, and the Office of the Chief Information Officer.

Dr. Parham holds a masters degree from the Johns Hopkins University in administrative science and doctorate and bachelor degrees from the Ohio State University in veterinary medicine and microbiology

A native Ohioan, Dr. Parham resides with his family in Mitchellville, MD.



Kirk Hanlin, Assistant Chief of NRCS

USDA Secretary Tom Vilsack appointed Kirk Hanlin as Assistant Chief of NRCS in July 2013. As Assistant Chief, he is central to the agency's leadership team, providing oversight and guidance for implementation of NRCS programs which help protect the environment, preserve the nation's natural resources and improve agricultural sustainability through voluntary conservation on private lands. NRCS has more than 10,000 employees across the country and a budget of about \$4 billion.

Before joining NRCS, Kirk served in the Clinton White House for eight years and was appointed by President Bill Clinton in 1997 as Special Assistant to the President. In this role he worked directly with the President and was responsible for briefing him daily on issues related to events both domestically and internationally. Kirk was also responsible for coordination and ongoing communication with all levels of individuals and groups related to the President's daily activities.

He also has extensive experience in the private sector, including serving as Vice President and adviser to the CEO of UAI, Inc. and Executive Vice President and Senior Adviser to the CEO of EnerGenetics Energy LLC. Kirk has more than 30 years of executive level experience in the government and private sector.

Kirk is a native of Hancock County, Illinois growing up on the banks of the Mississippi River in a family with generations of both farmers and towboat captains. His roots have given him a deep appreciation for protecting the land and rivers for future generations. Kirk earned an associate degree from Southeastern Iowa Community College and a bachelor's degree in political science from Western Illinois University. Kirk maintains two homes – one in Arlington, Virginia and one overlooking the Mississippi River in Nauvoo, Illinois.

Table of Contents

	PAGE
Welcome Remarks	ii
Keynote Speakers	iii
<u>TRACK# 1: Traditional and Alternative Farm Enterprise Development and Practices, Including Protected Agriculture (PA) and Urban Agriculture Opportunities for Small Farmers</u>	
<i>Trees and Livestock Together: Silvopasture Research and Application for Virginia Farms.</i> Gregory E. Frey, John H. Fike, Adam K. Downing, Marcus M. Comer, Timothy A. Mize and Christopher D. Teutsch	1
<i>Strategies to Enhance the Sustainability of Small-Scale Goat Production.</i> Uma Karki	8
<i>Introduction of Vegetable Soybean (Edamame) as an Alternative Crop in Southside Virginia.</i> Laban K. Rutto, Shuxin Ren, Cliff C. Somerville, Theresa Nartea, Chris Mullins, Guo-Liang Jiang and John K. Raiford	14
<i>Specialty Crop Production Initiatives with Limited Resource Farmers in Texas.</i> Peter A. Y. Ampim, Billy Lawton, Russ Wallace and Aruna Weerasooriya	19
<i>Using Row Covers to Improve Sustainability of Vegetable Crop Farmers in Temperate and Tropical Climates.</i> Ramon Arancibia	26
<i>Characterizing High Tunnel Microclimate in Hardiness Zone Seven and Eight of North Carolina.</i> Sanjun Gu, John E. Beck and Joseph A. Moore	29
<i>Small Farms: Alternatives to Meet New Challenges from Changing Climate Conditions.</i> Cynthia Rice, Buddhi Gyawali, Marion Simon, Louie Rivers Jr., and Bijesh Mishra	35
<i>The Promise of Urban Agriculture: Policies and Planning in Support of Commercial Urban Farms.</i> Anu Rangarajan and Molly Riordan	41
<i>Sustainable and Urban Agriculture Program (SUAP) at Virginia State University.</i> Leonard Githinji	46
<u>TRACK# 2: Sustainable, Organic, and Locally Grown Food Production and Food Safety</u>	
<i>Optimizing Nitrogen Management on Organic and Biologically-Intensive Farms.</i> Douglas Collins, Andy Bary and Tuong Vu	50
<i>Extension of Local Food Production in Idaho Using High Tunnel Technology.</i> Jennifer Jensen, Ariel Agenbroad, Tony McCammon and Steve Love	56
<i>Principles Guiding Practice: A Case Study Analysis of the Principles of Sustainable Agriculture for Diverse Farms.</i> Marilyn E. Swisher, Kelly N. Moore, Christine Kelly-Begazo and Kaylene Sattanno	61
<i>The Benefits and Challenges of Machinery Sharing Among Small-scale Fruit and Vegetable Growers.</i> Linda Naeve and Georgeanne Artz	65
<i>Sustaining Interest: GAPs Outreach for Small Scale Direct Market Produce Growers.</i> Meredith Melendez and Wesley L. Kline	70
<i>Success Beyond the Workshop: Reinforcement with On-Line and Take Home Resources for Estate and Farm Transfer Planning.</i> Robin Brumfield and Meredith V. Melendez	73

TRACK# 3: Land Grant University, States, Private Colleges Role in Sustaining Small Farmers and Ranchers

<i>Food Safety Outreach Program.</i> Dawanna James-Holly	77
<i>Nebraska Extension Partners with other Organizations to Provide Educational Opportunities for Beginning Farmers, Educators and Consumers.</i> Kathie Starkweather, Gary Lesoing, Wyatt Fraas, Jessica Jones and Vaughn Hammond	79
<i>Hops in Virginia - Progress and Challenges.</i> Laura Siegle and Holly Scoggins	81
<i>Creating Farmer Networks: A Tool for Supporting Vibrant Farm Communities.</i> Maud Powell and Melissa Fery	84
<i>Putting Your Small Farm to Work - The Business Side of OSU Small Farm Colleges.</i> L. Tony Nye and Jeff C. Fisher	87

TRACK# 4: Outreach Training, Research and Risk Management Priorities for Underserved Audiences

<i>The Agricultural Alternatives Project: Helping Farmers Make Better Management Decisions.</i> Jayson K. Harper and Lynn F. Kime	90
<i>Beginning Farmers and Ranchers 2.0: Scaling up to Profitability.</i> Cindy Fake, Roger Ingram, James Muck and Daniel Macon	94
<i>Farm Beginnings Provides Practical Education for Beginning Farmers.</i> Gary Lesoing, William Powers, Wyatt Fraas, and Connie Fisk	100
<i>Building Capacity for Beginning Farmer Start-up and Sustainability across Virginia: A Collective Impact Approach.</i> Kim Niewolny, Lorien MacAuley, Thomas Archibald, Natalie Cook and Allyssa Mark	103
<i>Choosing the Right Tool for the Job at Hand: A Review of Business Planning and Business Model Development Approaches for Farm & Food Enterprises.</i> Dave Lamie, Gary Matteson, Stanley Green and Diana Vossbrinck	108
<i>Developing Personal Risk Management Plans for Limited Resource Farmers.</i> Laurence Crane, Albert Essel, Nelson Brownlee, James Hartsfield and Edoe Adbodjan	110
<i>Addressing Inequitable Participation of Socially Disadvantaged Farmers in USDA Programs: Survey Result.</i> Oluwarotimi Odeh, Fidelis Okpebholo and Yapo G. N'Guessan	115
<i>Working with Refugees in Community Gardens.</i> Wayne Long	120
<i>Using Business Organizations to Limit Risk and Plan for the Future.</i> Sarah Everhart	124
<i>Electronic Newsletters that Clients Actually Read.</i> Donna Coffin	128
<i>A Call for Open Systems in Design and Manufacturing of Agricultural Machinery.</i> Locky Catron	132

TRACK# 5: Marketing Opportunities and Challenges for Small Farmers and Ranchers

<i>Increasing Small Farm Access to Retail Markets: Opportunities and Challenges in the Intermountain West.</i> Colette DePhelps, Soren Newman and Cinda Williams	135
---	-----

<i>Lulus Local Food: Connecting Producers to Retail Consumers.</i> Molly W. Harris and Chris Cook	140
<i>Opportunities and Challenges Facing Agritourism Operators in California.</i> Shermain Hardesty and Penny Leff	143
<i>Economic Outcomes and Viability of Agritourism Operations in Colorado and California.</i> Martha Sullins and Shermain Hardesty	148
<i>How Federal Marketing Orders and Marketing Agreements Can Help Your Business.</i> Michael Durando	153
<i>Beyond Fresh and Direct: Exploring Specialty Food Market Opportunities for Small and Medium-size Farms.</i> Larry Lev, Laurie Houston, Gail Feenstra, Shermain Hardesty, Robert P. King, and Jan Joannides	158
<i>Increasing Farmer Self-Confidence in Direct Marketing Outlets through Experiential Learning Activities.</i> Theresa Nartea and Michelle Mosely	162
<i>Marketing Alternative Agriculture Commodities: S.A.P.S. (Simple, Attractive, Packaging, Sells).</i> Helen Brooks	165
<i>Linking Multifunctional Agri-enterprise Development to Small Farm Opportunities.</i> Kathleen Liang	169
 <u>TRACK# 6: Innovation in Collaborations and Networking for Small Farm Program Development, Research, and Evaluation</u>	
<i>Farmers Forum: A Platform for Farmers Sharing Innovation.</i> Beth Nelson, Joan Benjamin, Dan Perkins and Julie Perkins	173
<i>Cultivating Success™ Idaho: A Collaborative, Multi-dimensional Approach to “Growing” A New Crop of Small Acreage Sustainable Farmers and Ranchers Statewide.</i> Ariel Agenbroad, Iris Mayes, Cinda Williams and Colette DePhelps	177
<i>A Systems Approach to Fostering New Farmer Innovation: Exploring the Influence of Social, Cultural, and Human Capital Systems for Beginning Farmer Success in Food and Farming Systems.</i> Keiko Tanaka, Kim Niewolny, Lorien McCauley, Krista Jacobson, Margarita Velandia, Steve Hodges, Emily Sorensen, Annette Wszelaki and Heather Hyden	182
<i>Learning off the Land: Developing Collaborative Farm Internships for Washington State.</i> Laura R. Lewis and Kellie Henwood	186
<i>Enabling Networking with Economic Developers and Planners with a Local Farm and Food Profile.</i> Noah Ranells, Laura Lauffer and Enoch Sarku	188
<i>Tricks of the Visual Delivery Trade: Bringing Expertise to the Small Farmer with One Click.</i> Priya Jaishanker and John Munsell	193
<i>The Beginning Farmer Resource Network of Maine.</i> Tori Lee Jackson	198
<i>High Value/Specialty Crops & Innovative Production Systems.</i> Ramiro E. Lobo, John P. Hewlett and Jose Fernandez de Soto	200
<i>A Cohort-Based Approach to Supporting Farmers in Measuring Costs, Making Informed Business Decisions, and Enhancing Farm Viability.</i> Tanya Murray	205
<i>From Barley to Drink: A Guide to Farm Based Breweries and Distilleries.</i> James Matson, Julia Schlosser, Jessica Shaw and Chris Cook	209

<u>TRACK# 7: The Role of Small Farmers and Ranchers in Addressing Food Security and Food Deserts; Agroecology and Design of Climate Change-Resilient Farming Systems</u>	
<i>Small Farms, Sustainability and Environment: Current and Future Outlook.</i> Srinivasa Rao Mentreddy, Ali Mohamed and Denis Ebodaghe	215
<i>The Dry Farming Collaborative: Growing without Irrigation in the Maritime Pacific Northwest.</i> Amy Garrett, Heidi Noordijk and Dana Kristal	221
<i>Enjoying the Essence of Regenerative Agriculture.</i> Ngowari Jaja	225
<i>Improving and Protecting Soils, Building Your Farm, and Sequestering Carbon with Value-Added Biomass Products.</i> Harry Groot, Katie Fernholz and Scott Bagley	228
<i>Shade Effects on Forage Nutritive Value and Ergot Alkaloid Concentrations: Implications for Silvopasture Use.</i> Kelly Mercier, Chris Teutsch, John Fike, John Munsell and Gregory Frey	232
<i>The Organic Germplasm Consortium: Preserving and Developing Plant Genetic Resources that Advance Agricultural Diversity and Resiliency.</i> Laura R. Lewis and Micaela Colley	237
<i>Sorghum: A Low-Input Alternative Crop for Small Farms.</i> Maru Kering, Laban Rutto and Vitalis Temu	239
<i>Growth and Yield Response of Eragrostis tef to Mid- and Late-Season Harvest Regimes.</i> Vitalis Temu, Ariel Coleman and Maru Kering	243
<u>USDA Agricultural Workshop Series</u>	
<i>Grant Do's And Don'ts: From Application Submission to Grant Close Out.</i> Adriene Woodin	248
<i>A USDA, Discussion of Grant Programs Provided by the Rural Business-Cooperative Service.</i> Alexis Solano	252
<i>Today's Farm Safety Net Protects the Future of Agriculture.</i> Michael Alston, Sharon Hestvik and Griffin Schnitzler	255
<i>AgDiscovery 2016: Investing in the Future of American Agriculture.</i> Sophia L. Kirby and Tammy H. Lowry	259
Author Index	261

Trees and Livestock Together: Silvopasture Research and Application for Virginia Farms

Gregory E. Frey (USDA Forest Service, Southern Research Station); **John H. Fike** (Virginia Tech); **Adam K. Downing** (Virginia Cooperative Extension-Virginia Tech); **Marcus M. Comer** (Virginia Cooperative Extension-Virginia State University); **Timothy A. Mize** (Virginia Cooperative Extension-Virginia Tech); **Christopher D. Teutsch** (Virginia Tech Southern Piedmont Agricultural Research and Extension Center)

Abstract

Silvopasture is the intentional combination of trees, forage, and livestock on a parcel of land to optimize multiple outputs and has been shown to have benefits for production in various parts of the world. There is strong interest in silvopasture in the Southern United States, likely driven by multiple motivations. However, silvopasture practices have not been adopted or studied widely in Virginia or surrounding states, and lack of familiarity and information is a key hurdle to adoption. Potential adopters need research in order to make sound establishment and management decisions, but researchers typically need a reasonable pool of adopters to justify the expense of research studies. Still, a team of scientists in Virginia and neighboring states has pooled resources to move forward with research on establishment methods, biophysical interactions, economics, and perceptions of stakeholders. One small research site began in western Virginia in 1995, but since 2012, the effort has expanded to include new research and extension sites in other parts of the state, outreach and support to farmers interested in establishing parcels on their land, and training and surveying of technical service providers. We will present preliminary results and practical considerations gleaned from these early activities.

Introduction

Silvopasture combines trees, livestock, and forage on a single parcel of land. Silvopasture can be distinguished from similar uses because it involves planning and management of all three system components, instead of leaving one or more of these unmanaged. For example, simply “turning livestock into the woods” is neither planned nor managed, and can lead to negative impacts such as transport of pasture nutrients into the forest, tree damage, and soil degradation (Brantly 2014). Likewise, having sparse trees in a pasture can cause concentration of nutrients and parasites in the loafing areas around the trees. “Forest grazing” can be managed to limit and control livestock-forest interactions, but only involves managing the livestock component; trees and forages are not directly manipulated (Brantly 2014). This limits growth of a healthy forage layer that could act as a buffer to prevent damage to tree roots.

In addition to avoiding the pitfalls of sparse trees in a pasture, turning livestock into the woods, and forest grazing, well-planned and -managed silvopasture in environments similar to Virginia can potentially increase forage production relative to traditional pasture in some situations (Buerghler *et al.* 2005) and alter forage nutritive value in both beneficial and detrimental ways

(Buergher *et al.* 2006). Shading and shelter from trees provides relief from heat or cold for livestock (McDaniel & Roark 1956), leading to potential overall economic benefits (Clason 1998; Frey *et al.* 2012). There is strong interest in silvopasture in the US South (Workman, Bannister, & Nair 2003), possibly driven by multiple motivations. First, concerns about water quality have led to livestock exclusion from streams, so there is a search for alternatives to streamside areas to reduce heat stress on livestock. Second, producers perceive hotter summers¹. Third, producers have increased interest in local sustainable agricultural systems. However, silvopasture practices have not been adopted or studied widely in Virginia. Potential adopters need information in order to make sound establishment and management decisions.

A team of scientists and practitioners in Virginia has pooled resources to move forward with research on biophysical interactions, economics, and perceptions. This paper summarizes some early efforts to gain insights about establishment and management of silvopasture.

Current Research in Virginia

Five silvopasture research sites have been established so far (others under consideration). Thus far, these sites have utilized cattle, or have not been open to livestock yet, but there is potential to utilize small ruminants at these or other sites in the future:

- Kentland Farm (Blacksburg, VA) – planted hardwood (black walnut [*Juglans nigra*])
- Shenandoah Valley Agricultural Research and Extension Center (Steele's Tavern, VA) – thinned hardwood (black walnut and other species)
- Southern Piedmont AREC (Blackstone, VA) – thinned pine (loblolly [*Pinus taeda*]) and hardwood (oak [*Quercus* spp.]); planted loblolly pine with variable alley spacing; forage testing under shade structures
- Catawba Sustainability Center (Catawba, VA) – planted hardwoods (walnut, oak, and American chestnut [*Castanea dentata*] based system with trainer trees)
- Clermont Farm (Berryville, VA) – planted hardwoods (walnut, oak, and American chestnut based system with trainer trees)

We conducted an electronic survey targeting all Agriculture and Natural Resource Extension Agents in Maryland, West Virginia, Virginia, North Carolina, South Carolina, and Georgia. 138 agents responded to questions about: environmental attitudes and concern, the economic viability of silvopasture systems, the social aspects of adopting and managing a silvopasture practice, the knowledge level of agents on technical comprehension of silvopasture, and agent demographics.

¹ Data from the National Oceanic and Atmospheric Administration (<http://www.ncdc.noaa.gov/cdo-web/search>) show that average highs, lows, and monthly temperatures for July at Richmond International Airport were all 1.5 to 2.2 F higher for the period 2010-2015 than for 1981-2010 (data summary available from authors).

Mixed-method interviews of 20 researchers and technical service providers were conducted in 2013-14 about silvopasture characteristics and potential economies of scale. We also are planning observation and case study documentation of silvopastures on private land.

A Silvopasture Typology for Virginia

Virginia lies in the overlapping area of the Southeast, Mid-Atlantic, and Appalachian regions, leading to wide varieties of agro-ecological conditions and farmer types. This poses opportunities and challenges, as there are numerous decision points and underlying (often difficult to alter) characteristics which deeply affect establishment and management methods, and the potential type and magnitude of benefits and costs of the system. Our survey and interviews, along with our own observations from establishing the research sites, led us to identify eleven characteristics that differentiate silvopasture systems:

- Primary Activity, Prior to Silvopasture (Forest/Timber or Livestock)
- Reason for Owning Land/Farm (Lifestyle/Income or Investment)
- Scale (Smaller or Larger scale)
- Tree Type (Hardwood, Mixed, or Pine)
- Tree Regeneration (Naturally-regenerated or Planted)
- Forage Type (Tall fescue [*Festuca arundinacea*], Alternative forage, or Mix)
- Livestock Type (Small ruminants, Cattle, or Other)
- Establishment Method (Thinned forest, or Trees planted into pasture)
- Tree Arrangement (Scattered trees or Rows and alleys)
- Motivation (Focus on livestock or Tree product important)
- Tree product (Nuts, fruits, etc., or Timber)

It is reasonable to group silvopasture systems by establishment method, tree type, and motivation as these three factors have the largest impact on the establishment and management activities undertaken:

Thin pine or hardwood stand; focus on livestock

Often undertaken in small scales, timber is not a principal output of this system. Trees are retained primarily for shade. Other potential drivers may include erosion control and other benefits.

Thin pine stand; balance livestock with timber production

Thinning is viewed as an important tool in pine management for timber; thinning to introduce silvopasture is more intense. The compromise toward greater timber production supports greater long-term returns at the expense of annual animal output.

Plant pines or high-value hardwoods into a pasture and limit access to livestock; balance livestock with timber production

Planting trees into pasture offers flexibility in design and implementation in terms of configuration and species selection.

Lessons Learned

As noted previously, we have interviewed and surveyed researchers and technical service providers. Furthermore, our observations from our own work to establish silvopasture research sites and conversations with individual producers has provided insights. The following are some preliminary results and observations from our work, and lessons learned that may help future practitioners. In some cases, these “lessons learned” are preliminary or anecdotal – they have not been comprehensively vetted through a scientific process, so they may be incomplete or applicable only to certain sub-populations, but still we believe they are helpful at this stage.

Perceptions of landowners

1. Many landowners and service providers know very little about silvopasture. Landowners do not know enough typically to form a positive or negative opinion about silvopasture. Service providers often have negative opinions – perhaps based on their previous experiences with “turning livestock into the woods” or similar not-silvopasture, practices.
2. The time scale for timber management is hard to fathom for producers whose business is based on annual production.
3. Producers perceive lost production by adding trees to pasture as a negative. Many of these producers are not managing any woodlands of any size, so thinning is not an option.
4. Some producers who are also forest landowners are eager to experiment and may try thinning small forest parcels. Care for and management of the trees often has been secondary for these landowners, but some do seem to place more emphasis on tree management after watching their initial silvopastures develop. As a group, those who thin stands generally appear to have been in agriculture longer, and many of them have histories with both agriculture and forestry, compared with those who plant trees into pasture. This method may be effective to learn by trial and error and to increase livestock production, but may provide limited numbers of potential adopters because many landowners do not own forestland.
5. In our experience, producers who have planted hardwood trees into pastures generally are younger and express a desire to do something different than traditional livestock production. They may also have fewer acres to work with, so “two-story” agriculture is a means of increasing the productivity of their land base (as opposed to thinning, which is seen as a means to expand the land base). We have less experience in Virginia with those who plant pines to create silvopastures than with those who plant hardwoods, but this

group may be somewhere in between the “thinners” and hardwood planters in terms of available resources and motivations.

6. Landowners are not likely to convert all their pasture operation to silvopasture. Silvopasture is generally seen as one component of a broader rotational system.

Establishment from thinned stands

1. Challenges with these systems include managing tree selection and quality for short or long-term returns. On small land areas with low total timber volume, particularly with low-quality trees, the timber values may be unattractive to loggers, particularly if the best trees are being left for silvopasture.
2. It is possible to over-thin. Timber value can be affected by the thinning, as heavy thinning may be more financially rewarding in the short term but this must be weighed against the effects on the remaining trees, which can be stressed by too heavy tree removal. Risks include epicormic sprouting of hardwoods² and bending due to the loss of support from surrounding trees. However, it may not be a big issue for producers whose goal is to create sheltered sites for livestock, and in some markets there is not a large discount for the resulting lower timber quality. Over-thinning is less of a risk for pine stands in terms of timber quality but wind-throw or shearing does occur on these over-thinned stands, particularly on sites that receive heavy winds, are not suited to good tree root development, or both. Knowing the site and its potential for such conditions is important when making thinning decisions.
3. Tree stumps remaining after harvest can limit the use of equipment commonly employed for lime and fertilizer application, forage establishment, clipping, and hay making. Ideally remaining stumps should be at the soil level to facilitate equipment use.
4. Logging residues can pose a dilemma. If left whole, tops and branches impede equipment and livestock. If chipped and left as mulch, the decomposition process of this high-carbon wood can immobilize nitrogen, temporarily leaving less nitrogen available for forage growth. Chipping and removing results in a loss of future soil organic carbon. Options to manage this include prescribed burning and soil fertility amendments.
5. Furthermore, soil fertility and pH can be quite low to begin with in forested areas. This can limit forage establishment and productivity. Soil tests should be undertaken to determine optimal amounts of soil inputs. Developing a vigorous, productive forage stand under pines can be economically challenging unless resources such as poultry litter or biosolids are readily available as soil amendments.

² Epicormic sprouts are from previously dormant buds underneath the bark, usually lower on the trunk than the active buds. Epicormic sprouting is an indicator of poor health since it usually occurs in response to a shock such as injury or disease, and reduces the value of the tree for timber by introducing knots. It does not occur in all tree species; in the US South it is more common in hardwood species.

6. Sustainability and replacement of the current stand of trees needs to be considered. After the thinning, remaining trees may experience mortality from the shock. For species that resprout from the stump (some hardwood species), one option to mitigate these concerns may be to protect from livestock some of the re-sprouts or seeds that germinate to become the next stand. However, not all sprouts can be left or the tree stocking will be too high.
7. Thinning existing pine stands perhaps provides some of the greatest flexibility and ease both in terms of stand uniformity and for configuring the remaining trees to meet desired infrastructural/logistic or aesthetic needs.
8. The use of controlled grazing is an essential part of silvopasture management and should be considered a key part of the silvopasture establishment plan.

Planting trees into pasture

1. Hardwoods can be difficult to establish from seedlings under optimal conditions, but particular challenges occur where trees face competition from the existing forage base. Pines are potentially less challenging. Still, killing the sod around the seedling tree with a chemical or mechanical treatment is important for the seedling's survival and productive growth. In some cases irrigation may be necessary.
2. High levels of vegetative cover also can provide shelter for small rodents which damage tree roots. Using tree tubes or other protection can add expense to hardwood tree establishment but may be essential in sites where heavy predation from rodents or deer is an issue. Tree tubes are not considered necessary or economical for pine plantings, but depending on species these also can be heavily predated by deer. Three dimensional fencing can be an effective and relatively cost efficient way of keeping deer off trees.
3. Trees must be protected until they can sustain livestock damage. In some cases, an entire paddock might be fenced off, and livestock excluded for a number of years. However, most producers are not enthusiastic about losing an entire paddock for multiple years, so options to protect trees as individuals or small groups should be identified. For example, trees in linear rows can be fenced for a period to create alleys with forages that are still available.

Forage growth in shade

1. Managing tree cover can be a long-term issue in silvopastures. Moderate levels of shade (40% full sun) can benefit animals and forages alike, but as shade levels increase above about 50 or 60% full sun, forage productivity likely will decline. This may or may not be an issue as the animal welfare benefits provided by shade and shelter can compensate for forage production losses. Whether it is economical to thin (or prune) trees at strategic

times to maintain light to the forage understory will need to be assessed on a site by site basis.

2. Forage species selection can be important in offsetting the effects of shade as well. A mix of forage species may be effective, and legumes may help manage some fertility issues. Orchardgrass (*Dactylis glomerata*) may be more tolerant to a low light environment, but use of shade tolerant species must be considered in terms of the whole farm, e.g., if the silvopasture site is to be grazed in winter, fescue for stockpiling may be preferred.

References

- Brantly, S. (2014). Forest grazing, silvopasture, and turning livestock into the woods. AF Note - 46. 4 pp. Lincoln, NE: USDA National Agroforestry Center. Retrieved from: <http://nac.unl.edu/documents/agroforestrynotes/an46si09.pdf>.
- Buergler, A. L., Fike, J. H., Burger, J. A., Feldhake, C. R., McKenna, J. A., & Teutsch, C. D. (2005). Botanical composition and forage production in an emulated silvopasture. *Agronomy Journal*, 97(4), 1141-1147. DOI: 10.2134/agronj2004.0308
- Buergler, A. L., Fike, J. H., Burger, J. A., Feldhake, C. M., McKenna, J. R., & Teutsch, C. D. (2006). Forage nutritive value in an emulated silvopasture. *Agronomy Journal*, 98(5), 1265-1273.
- Clason, T. R. (1998). Silvopastoral practices sustain timber and forage production in commercial loblolly pine plantations of northwest Louisiana, USA. *Agroforestry Systems*, 44(2-3), 293-303. DOI: 10.1023/a:1006267114962
- Frey, G. E., Fassola, H. E., Pachas, A. N., Colcombet, L., Lacorte, S. M., Renkow, M., Pérez, O., & Cubbage, F. W. (2012). A within-farm efficiency comparison of silvopasture systems with conventional pasture and forestry in northeast Argentina. *Land Economics*, 88(4), 639-657. DOI: 10.3368/le.88.4.639
- McDaniel, A. H., & Roark, C. B. (1956). Performance and grazing habits of Hereford and Aberdeen-Angus cows and calves on improved pastures as related to types of shade. *Journal of Animal Science*, 15(1), 59-63.
- Workman, S. W., Bannister, M. E., & Nair, P. K. R. (2003). Agroforestry potential in the southeastern United States: perceptions of landowners and extension professionals. *Agroforestry Systems*, 59(1), 73-83. DOI: 10.1023/A:1026193204801

Strategies to Enhance the Sustainability of Small-Scale Goat Production

Uma Karki (Tuskegee University)

Abstract

The majority of goat producers in the United States are small-scale farmers. The sustainability of these farms is becoming more and more challenging with continuously changing scenarios, such as increasing competition from a globalized market and changing climate with more extreme weather conditions. To remain sustainable, these small farms need to be more efficient, productive, environmentally sound, and socially appealing. There are several strategies that can be helpful in making small-scale goat operations sustainable: 1) lowering the costs of production by improving pastures and grazing systems, 2) selecting suitable breeds to match the management conditions and market demand, 3) developing necessary facilities and a management approach to minimize disease and parasite problems, 4) keeping records, doing basic economic analysis and business planning, 5) diversifying farm commodities, 6) involving young generations in the farm, 7) approaching and getting support from all possible sources e.g. Natural Resources Conservation Service, US Department of Agriculture, and others, 8) developing the required herd size to meet economic expectations, 9) exploring and implementing the best marketing strategies, and 10) getting continuous education.

Background Information

Goat farming is becoming popular among small-scale farmers as a part-time business, since it requires a low initial investment in comparison to many other livestock enterprises. Moreover, because of goats' smaller size compared to large ruminants, retirees or people approaching retirement age are comfortable initiating goat farming as an enterprise to continue their active lifestyle and earn some side income. Currently, there are 149,000 goat farms (USDA-NASS, 2013) raising 2.62 million goats in the country with meat goats being the largest category (2.095 million head) followed by dairy (357,000 head), and Angora (150,000 head) (USDA-NASS, 2016a). Goat meat has a niche market for different ethnic and faith-based groups: Asians, Hispanics, Africans, Muslims, and people from the Caribbean (Kebede, 2005). This market is growing with the increasing ethnic population (Jones, 2003; Solaiman, 2007). Future demand for goat meat in the United States is expected to increase greatly as Hispanics and Asians are projected to account for 33% and 8%, respectively, of the U.S. population by 2060 (U.S. Census Bureau, 2012). Moreover, because of lower total and saturated fat and cholesterol content in goat meat as compared to chicken, beef, pork, and lamb (Table 1), health conscious meat consumers may opt to eat more goat meat in future resulting in even higher demand.

Table 1. Nutrient composition of meat: goat and other (per 3 oz.)

Nutrient	Goat	Chicken	Beef	Pork	Lamb
Calories	122	162	179	180	175
Fat (g)	2.6	6.3	7.9	8.2	8.1
Saturated fat (g)	0.79	1.7	3.0	2.9	2.9
Protein (g)	23	25	25	25	24
Cholesterol (mg)	63.8	76.0	73.1	73.1	78.2

Source: Correa, 2016.

The current demand for goat meat is not fulfilled by domestic production. There were 731,600 heads of goat slaughtered in the country from January to August 2016 (USDA-NASS, 2016b). A significant amount of goat meat is imported, especially from Australia. In 2015, 17,626 metric ton of goat meat was shipped from Australia to the US (MLA, 2016). These data show that there is still a huge gap between the demand for and domestic supply of goat meat. Most of the sheep and goat farms are small with 75% of the farms having less than 49 acres (USDA-NASS, 2015). These farmers need to be knowledgeable and skillful to make their operations sustainable.

Sustainable Production System

A production system should be profitable, environmentally friendly, good for society, and have continuity with long-term implications to be sustainable. Each of these principles of sustainable production is briefly described below:

- *Profitable*: An operation needs to be profitable to become sustainable. Producers will not continue production if their operations are running at a loss. An operation should be initiated on a sound economic basis and feasible business plan to be profitable.
- *Environment friendly*: A production system should not have any negative impact on the environment, such as air pollution, water contamination, soil erosion, and greenhouse gas emission.
- *Good for society*: Production practices should provide employment and income, healthy food, fresh air, and clean water for a good quality of life.
- *Stewardship*: All resources such as land, trees, soil, water bodies, animals, insects, and microorganisms should be well taken care of to meet the requirements of the current generation and maintain these resources in good shape to support the lives of future generations.
- *Interconnectedness*: People need to understand the ideas of interconnectedness of different components of a production system and embrace practices that do not hurt any component.
- *Continuity*: An operation should be continued generation after generation, for which new generations need to be trained and involved in the operation.
- *Long-term implications*: Sustainable practices have long-term implications.

Strategies for Sustainable Goat Enterprises

Economic Sustainability: For making a goat operation profitable, it should be initiated on a sound economic basis with a realistic business plan. A good record of costs and incomes needs to be kept and analyzed for soundness of the business. In addition, one needs to have all the basic structures and facilities as listed below for a pasture-based goat operation.

- Pastures: These should be developed so that enough forage is available to feed animals before bringing them to the farm. Pastures must be fenced properly on the perimeter to contain animals and prevent wildlife or predators, and cross-fenced for rotational grazing. To extend and expand the grazing opportunity, one can utilize woodlands by converting these into silvopastures or woodland grazing with necessary fencing, and establishing watering and supplementary feeding facilities.
- Facilities: Provision should be made for continuous supply of **fresh water** to the animals. Goats must have access to **natural shade** and **shelter** to protect them from the extreme weather conditions, e.g., hot summer, cold winter, strong wind, and rainstorms. A **handling facility** is required to control and capture animals when needed, such as for medication, hoof inspection and trimming, castration, and pregnancy diagnosis. A **weighing facility** is needed for determining the proper dose of medication, finding out animals' growth/weight for evaluating their performance, and marketing to determine a fair price. **Hay and concentrate feeders** are required in pastures if animals need to be supplemented. A salt and trace mineral mix in suitable **mineral feeders** should be provided to fulfill the animals' daily mineral requirements. Feeders should be roofed to avoid possible damage and waste from rain. **Quarantine facilities** are required to quarantine new and/or sick animals.
- First-Aid Set: This set should be handy in all farms to take care of animals and farm crews in case they get injured.

Other aspects of bringing economic sustainability to a goat operation are herd management, health care, market diversification, and product diversification, each of which is briefly described below.

- Herd Management: Goat operations should begin with a productive and healthy herd that is well adapted to the local environment and farm conditions. Unwanted males should be castrated within a month of their birth to prevent undesirable breeding. Only a required number of selected males should be kept in the herd (1 male for 30 to 50 females). Well performing animals with less health problems must be selected and used in the breeding program, and animals with poor performance must be culled. Hooves need to be inspected regularly and overgrown hooves trimmed. Body condition score should be maintained between 2.5-3.5 on a scale of 1-5. Goats must be monitored every two weeks for symptoms

of anemia associated with barber pole worm infestation and goats with a score of 4 or 5 must be dewormed (see online resources for more detail:

http://www.tuskegee.edu/sites/www/Uploads/files/About%20US/TUCEP/Livestock%20Program/ParasiteWorkshop_Proceedings.pdf). Initial and booster doses of the required vaccinations (*Clostridium tetanus* and *C. perfringens* types C and D – CD&T) should be administered on time to protect goats from these diseases. Newborns should ingest enough colostrum within 24 to 48 hours of birth to get enough antibodies from their mothers so that they are protected from the threat of diseases (see online resources for more detail: <http://www.tuskegee.edu/sites/www/Uploads/files/About%20US/TUCEP/Livestock%20Program/Colostrum%20feeding.pdf>). All goats need to have scrapie tags; contact USDA, APHIS for this (http://www.aphis.usda.gov/animal_health/animal_diseases/scrapie/approved-tag-co.shtml; 1-866-873-2824).

- **Market Diversification:** To get a reasonable price for live animals and their products, a sustainable approach would be to diversify the market outlet such as conventional marketing channels, cooperatives, websites and social media, local restaurants and groceries, and school lunch programs.
- **Product Diversification:** Producing different species of livestock or integrating livestock with crops, vegetables, bees, mushrooms, or fruits will bring more economic and environmental sustainability.

Environmental Sustainability: There are numerous ways of managing a goat operation in an environmentally friendly manner. Some of these ways are briefly described below.

- **Integrated Management of Pests:** Pests can be disease causing organisms, parasites, pasture weeds, and unwanted insects. An integrated approach of pest management involves providing enough nutrients to keep desirable plants and animals healthy, minimizing stress, building stronger immune systems in animals (through vaccination, colostrum feeding, selection and breeding), and minimizing chemical use.
- **Rotational Grazing:** This system provides a period for pasture plants and soil to recover from previous grazing pressure (trampling and defoliation) in order to maintain a healthy pasture stand. Grazing should be initiated when forages are well grown and attain the grazing height, and stopped when the stubble height is 4-5". See online resources for more details: <https://www.youtube.com/watch?v=wq9wTE7-HkA>, http://www.tuskegee.edu/sites/www/Uploads/files/About%20US/TUCEP/Livestock%20Program/Year-RoundPasture_Handbook.pdf

- **Soil Conservation:** Soil erosion can be minimized by reducing the tillage, providing ground cover with pasture plants, and implementing a sustainable grazing management plan.
- **Water Quality:** Can be maintained by minimizing soil erosion and by preventing chemicals, fertilizers, manures, and other forms of farm waste from getting into surface water bodies (rivers, lakes, ponds) or leaching into the underground water. For this, there should be no tillage or minimum tillage, and farm waste and byproducts should be handled properly. Development and maintenance of riparian buffers and keeping the ground covered (by planting cover crops and developing year-round pastures) can reduce water contamination.

Soil Nutrient Management: Nutrient management in pastures is necessary to maintain productivity and soil health. Good soil is home to numerous flora (plants) and fauna (animals), and the basis for animal and human life. Nutrients taken away through the removal of biomass need to be put back into the soil in the form of compost and/or fertilizers. Nutrient addition along with pH adjustment should be based on soil test recommendations. Incorporation of leguminous crops into pastures is beneficial as these crops, with the help of *Rhizobium* bacteria, can fix atmospheric nitrogen into the soil, making it available to plants. Pasture stands containing 33% or higher leguminous crops do not require the application of commercial nitrogen fertilizer (Ball et al., 2007). Good nutrient management of pastureland is necessary for both economic and environmental sustainability.

Farm Safety and Risk Management Plan: A detailed plan for securing all the lives in the farm should be developed and implemented. Farm premises need to be clean and devoid of hazardous materials. All farms must have an estate plan in place.

Adaptation to Climate Change: The Earth's changing climate is indicated by rising temperatures, shifting patterns of snow and rainfall, occurrences of more extreme climate patterns, such as heavy rainstorms and record high temperatures. Producers need to be prepared to adapt to the impact of climate change by making necessary modifications in their operations. Some of those include: 1) modifying structures (shelters, storage, buildings, panic space) suitable for expected change in climate; 2) selecting animal species and breeds more suitable to changing climate, i.e., more resistant to extreme climatic conditions, food availability, and diseases and parasites; 3) planting forages that can perform well under a wide range of weather conditions, such as drought, heat, cold, and flooding; 4) developing irrigation facilities for pastures; 5) incorporating hardy tree species in the grazing systems to provide shade to the grazing animals; and 6) developing a disaster management plan and implementing it when needed.

References

- Ball, D. M., C.G. Hoveland, and G.D. Lacefield. 2007. *Southern Forages*, Fourth ed. International Plant Nutrition Institute (IPNI), Norcross, GA.
- Correa, J. E. 2016. Nutritive value of goat meat. Alabama Cooperative Extension System, UNP 0061. Retrieved from <http://www.aces.edu/pubs/docs/U/UNP-0061/UNP-0061.pdf>
- Jones, K. 2003. Meat goats: a growing industry. Economic Research Service, USDA. Retrieved from: <http://usda.mannlib.cornell.edu/usda/ers/LDP-M//2000s/2003/LDP-M-08-26-2003.pdf#page=13>
- Kebede, E. 2005. Goat Meat Demand in the U.S. and Goat Meat Marketing Potential in the Southeast: George Washington Carver Agricultural Experiment Station, Tuskegee University.
- MLA. 2016. Australian goat: Industry summary 2016. Meat and Livestock Australia. Retrieved from http://www.mla.com.au/files/56e3384c-9468-42a6-85ef-a5ed011656ca/MLA_Australian-Goat-Industry-Summary-2016.pdf
- Solaiman, S. G. 2007. Comparing goat production economics on different production systems in the Southeastern U.S. Retrieved from: <http://www.boergoats.com/clean/articles/solaiman/2007-11feedcompare.htm>
- U. S. Census Bureau. 2012. U. S. Census Bureau projections show a slower growing, older, more diverse nation a half century from now. Retrieved from <http://www.census.gov/newsroom/releases/archives/population/cb12-243.html>
- USDA-NASS. 2013. Farms, land in farms, and livestock operations 2012 summary. National Agricultural Statistics Service, Agricultural Statistics Board, US Department of Agriculture. Retrieved from <http://usda.mannlib.cornell.edu/usda/nass/FarmLandIn/2010s/2013/FarmLandIn-02-19-2013.pdf>
- USDA-NASS. 2015. 2012 Census of agriculture highlights: Sheep and goat farming. Retrieved from https://www.agcensus.usda.gov/Publications/2012/Online_Resources/Highlights/Sheep_and_Goat/Sheep_and_Goat_Farming.pdf
- USDA-NASS. 2016b. Livestock slaughter. National Agricultural Statistics Service, Agricultural Statistics Board, US Department of Agriculture. Retrieved from <http://usda.mannlib.cornell.edu/usda/current/LiveSlau/LiveSlau-09-22-2016.pdf>
- USDA-NASS. 2016a. Sheep and goats. National Agricultural Statistics Service, Agricultural Statistics Board, US Department of Agriculture. Retrieved from <http://usda.mannlib.cornell.edu/usda/current/SheeGoat/SheeGoat-01-29-2016.pdf>

Introduction of Vegetable Soybean (Edamame) as an Alternative Crop in Southside Virginia

Laban K. Rutto, Shuxin Ren (Virginia State University Agricultural Research); **Cliff C. Somerville, Theresa Nartea, Chris Mullins** (Virginia State University Cooperative Extension); **Guo-Liang Jiang** (Virginia State University-Agricultural Research); **John K. Raiford** (Virginia Department of Corrections)

Introduction

Vegetable soybean, commonly known as ‘edamame’ is immature soybean harvested at 80-85% pod fill and consumed as a vegetable. Edamame cultivars are bred for higher sugar content, bigger seed, higher protein content, and lower concentrations of non-digestible sugars. However, the agronomic requirements for vegetable soybean vary little from those for grain type soybean except at harvesting, and during postharvest handling and processing.

Although the United States (US) is a major producer and exporter of grain type soybean, it is a net importer of vegetable soybean with Taiwan and China supplying most of the product sold in the US. Traditionally, edamame production in the US has been limited to hobby and small-scale growers, but large scale edamame processors and packagers like JYC Foods (Houston, TX) that have recently come online confirm the viability of edamame as a cash crop (Ashlock et al., 2011). These large scale domestic processors are well placed to claim a share of US market demand projected to exceed US\$20 million in 2005 (Lin, 2001).

The factors that have prevented US agriculture from meeting domestic demand include a much smaller market relative to that of grain type soybean, limited supply of locally adapted varieties, and lack of technical information on edamame production and postharvest handling. However, edamame has continued to gain a following among US consumers causing it to be classified as one among products highest in demand but hardest to find (Ernst and McNulty, 2001).

Edamame breeding and variety development initiatives at different US institutions have

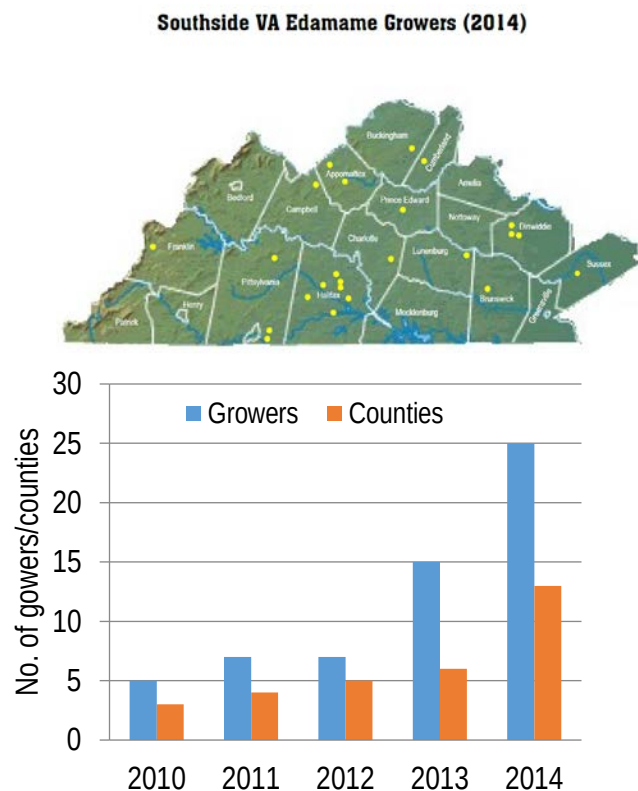


Fig. 1. Map and graph showing edamame grower numbers and distribution within Southside Virginia counties.

met with considerable success. Breeders at the USDA-ARS (Beltsville, MD) developed ‘Moon Cake’ (Devine et al., 2006), and work at Virginia State University (VSU) has resulted in three varieties: ‘Asmara’, ‘Randolph, and ‘Owens’ (Mebrahtu et al., 2005a; 2005b; 2007).

It is against this background that the Alternative Crops Program at VSU, through agribusiness grants from the Virginia Tobacco Region Revitalization Commission is working to build capacity and develop infrastructure for production, processing and marketing of VA edamame.

Description of Need

Most small farmers in Southside and Southwest Virginia that relied on tobacco as a cash crop before the quota buyout of 2004 are currently struggling. A lot of them have moved on to commodity soybean, fresh produce, or hay, but some farms have fallen out of crop production. It is widely recognized that agriculture must lead economic and community revitalization in this part of the state and this project addresses the need for crop and income diversification.

Projection Methodology

Working with local Virginia Cooperative Extension agents, the project identifies and recruits small growers (most of them former tobacco farmers) to grow, process, and market vegetable soybean. Through the project, VSU scientists and agents provide technical (and limited material support) and assist with market development. In return, growers are responsible for providing land, equipment, inputs, and for managing the crop with the understanding that they will retain proceeds from sale of the crop. Further, it is agreed that participating farms will be available to serve as venues for training other growers on edamame production, processing, and marketing. Thus far, the project has worked with about 30 growers in more than 15 Southside counties (Fig. 1), and assisted more than 20 other growers in non-tobacco Virginia counties.



Fig. 2. Harvesting, processing and packaging equipment purchased from Mitsuwa Co. Ltd., Japan.

Project Milestones

- Purchase of equipment: Through support from the TRRC, the project has purchased edamame harvesting and processing equipment to support production in Southside counties. These include three (3) stationary threshers, one (1) motorized walk-behind harvester, one (1) sorter/cleaner, one (1) washer, and one (1) dryer. These units, along with a weighing balance equipped with a hopper were sourced from Mitsuwa Co. Ltd, a Japanese company specializing in edamame equipment (Fig. 2). Within the first three years of the project we saw the advantages of addressing the needs of larger markets in addition to local direct sales that were the original focus of the project. For this, we are in the process of acquiring two (2) ASA-Lift GB1000 green bean harvesters to facilitate faster harvesting for bulk processing.

- Construction of edamame processing facility: We constructed a processing facility in Farmville, Prince Edward County to facilitate centralized handling and value addition of edamame. The facility is adjacent to the Prince Edward Community Cannery and to benefit from additional equipment available at the cannery. The sorter/cleaner, washer, dryer, and weighing balance are housed in the processing facility. When complete, the processing facility will also be equipped with cold storage for preserving market-ready edamame before delivery.

Table 1. Average prices for the different marketing forms of the edamame crop.

Edamame Product	Average Price
Pod (fresh)	\$2.00 - 3.00 per lb.
Shelled (fresh/frozen)	\$5.00 - 8.00 per lb.
Pod (bulk frozen)	\$0.50 per lb.
Dry (seed)	\$2.50 - 7.00 per lb.
Dry (Commodity)	\$12.00 - 15.00 per bushel (60lb.)

- Market development: The project continues to work with growers to identify different markets for VA edamame. Growers working with the project have been able to sell edamame in different forms and at different prices (Table 1). Thus far, markets have included CSAs and farmers markets, food companies e.g. Produce Sources Partners, local supermarkets and online. One

advantage of edamame is that in the event the beans cannot be sold as fresh produce, it can be harvested and sold as commodity soybean. Currently, the project is negotiating with a wholesale buyer in North Carolina to contract project growers to supply in-the-pod frozen edamame.

- Establishment of linkages: We realized at the onset that the project would benefit if we worked together with other public and private interests working on agriculture in the target region. To this end, we have entered into working arrangements with the following institutions:

- County of Prince Edward: The County administration permitted the siting of the processing facility within the grounds of the Community Cannery and continues to support the project.

- Virginia Department of Corrections (VADOC): The project supports offender training and rehabilitation at VADOC by working with the Agribusiness division to impart skills on edamame production as a vegetable and for seed.
- Virginia Foodworks: As a project partner, this non-profit organization is working with us to develop alternative processes for adding value to vegetable soybean.
- Delight Soy Inc.: This North Carolina business is working with the project to build a reliable pipeline for good quality and affordable vegetable soybean seed.

Challenges and Lessons Learned

We have found out that introducing a new crop is fraught with unforeseen challenges and calls for long-term dedication and focus. The following are some that we have faced:

- Harvest window: High quality edamame has a narrow harvesting window and growers have to be vigilant in monitoring the crop. We found vegetable growers to be more attuned to this requirement than even the most experienced of commodity soybean farmers.
- Marketing logistics: Although there is evidence of market demand, the challenge of uniting growers with buyers at the right time was more difficult than anticipated. Freezing the edamame may be the only way to ensure a majority of the crop is eventually sold.
- Seed production: Some edamame cultivars are prone to shattering and harvesting for seed needs to be done before the crop is fully mature. This also eliminates the option of harvesting the crop for grain when a market for fresh edamame cannot be found.

Although some research has been done on edamame agronomy (e.g. Sanchez et al., 2005; Zhang and Kyei-Boahen, 2007; Mebrahtu and Mohamed, 2006), and consumer preference (e.g. Wszelaki et al., 2005), there is little information on market or value-chain analysis of edamame as a crop. This is an area for which we are seeking expertise and collaboration.

References

- Ashlock, L., H. Chaney, P. Chen, and H. Medders. 2011. Edamame marketer plans to contract with Arkansas farmers: State would be first to grow vegetable soybeans on commercial scale. *University of Arkansas Division of Agriculture News Release*.
- Devine, T. E., J. E. McMurtrey, T. Mebrahtu, T. S. Abney, P. Donald, D. E. Starner, F. M. Hashem, and R. B. Dadson. 2006. Registration of 'Moon Cake' Vegetable Soybean. *Crop Science* 46: 1810–1811.
- Ernst, M. and S. McNulty. 2001. Edamame marketing factsheet. *University of Kentucky Cooperative Extension*. 13 July, 2003.

- Lin, C-C. 2001. Frozen edamame: Global market conditions. p. 93–96. In: T.A. Lumpkin and S. Shanmugasundaram (Compilers), *2nd Int. Vegetable Soybean Conf.*, Washington State Univ., Pullman.
- Mebrahtu, T. and A. Mohamed. 2006. Genetic variation for green pod yield and quality among vegetable soybean genotypes. *Journal of Crop Improvement* 16: 113-130.
- Mebrahtu, T., T. E., Devine, P. A. Donald, and T. S. Abney, 2007. Registration of ‘Owens’ vegetable soybean cultivar. *Journal of Plant Registrations* 1: 95-96.
- Mebrahtu, T., T. E. Devine, P. Donald, and T. S. Abney. 2005a. Registration of 'Asmara' vegetable soybean. *Crop Science* 45: 408-409.
- Mebrahtu, T., T. E. Devine, P. Donald, and T. S. Abney. 2005b. Registration of 'Randolph' vegetable soybean. *Crop Science* 45: 2644-2645.
- Sánchez, E., K. Kelley, and L. Butler. 2005. Effect of seedling emergence on Edamame production. *HortTechnology* 15: 672-676.
- Wszelaki, A. L., J. F. Delwiche, S. D. Walker, R. E. Liggett, S. A. Miller, and M. D. Kleinhenz. 2005. Consumer liking and descriptive analysis of six varieties of organically grown edamame-type soybean. *Food Quality and Preference* 16: 651-658.
- Zhang, L. and S. Kyei-Boahen. 2007. Growth and yield of vegetable soybean (Edamame) in Mississippi. *HortTechnology* 17: 26-31.

Specialty Crop Production Initiatives with Limited Resource Farmers in Texas

Peter A. Y. Ampim, Billy Lawton (Prairie View A&M University Prairie View, TX); **Russ Wallace** (AgriLife Extension & Research, Lubbock, TX); **Aruna Weerasooriya** (Prairie View A&M University Prairie View, TX)

Abstract

Production of specialty crops, especially fruits and vegetables, has not been a major focus for limited resource farmers in Texas. Knowing the potential financial gains of producing specialty crops, Prairie View A&M University has initiated a research and extension program on specialty crops to teach limited resource farmers how to grow these crops sustainably and successfully to improve their farm incomes. From the beginning, the initiative focused on strawberries and specialty melons. This paper focuses on on-farm organic strawberry trials conducted with limited resource farmers over a period of two years. As first time strawberry growers, participants were trained on how to grow, care for, and market their produce. The results show that these farmers could produce quality strawberries provided they managed their crops well. The income potential varies based on how successfully a farmer produces the crop and the quantity produced. Revenue reported by farmers in this study based on cultivating less than 1000 plants and selling the fresh berries for at least \$5.00 per pounds ranged between a couple of hundred to a few thousand dollars depending on the level of success of the farmer. The presence of a market owing to consumer interest in local produce and their willingness to pay higher prices especially for organic products presents strawberry production as a promising opportunity for farm diversification and income improvement for Texas limited resource producers.

Introduction

The majority of limited resource producers in Texas are engaged in the cattle industry producing beef cattle and hay. Though some also produce traditional commodity crops, very few are involved in the production of specialty crops, defined as fruits and vegetables, tree nuts, dried fruits and nursery crops including floriculture (The Specialty Crops Competitiveness Act of 2004). Studies have shown that diversification of farm operations including growing non-traditional crops improve farm incomes and helps to support their existence (Barbieri, 2009). Changing agriculture in Texas is exposing farmers to increasingly substantial challenges (Barbieri, 2009). As a result, expanding farm operations to encompass specialty crops as well as developing new and improving entrepreneurial skills are of particular interest to farmers especially those who live very close to large urban areas because of the market potential for their produce. New opportunities to earn income are important because a reasonable proportion of Texas farmers make less than \$25,000 per annum (USDA-NASS, 2014). At the same time, Texas is home to some very diverse and highly populated metro areas in the country like Houston, Dallas, Austin and San Antonio that present a huge potential market for specialty fruits

and vegetables. In addition, southeast Texas has subtropical climatic conditions which bodes well for growing a range of high value and nutritious traditional and non-traditional fruit and vegetable crops. Therefore, the target of the research and extension program at Prairie A&M University is to prepare limited resource farmers to understand and take advantage of the niche market opportunities available to them. This paper discusses the learnings, successes, challenges and experiences of limited resource farmers who were engaged in the production of strawberries as first time growers.

Approach

Selection of Farmers

The farmers who participated in the project were selected mainly from southeast Texas based on their willingness to engage in extension programs and interest in working on a new product. The profiles of the farmers, some description of their farm area dedicated to the strawberry project and their production practices are provided in Tables 1 and 2.

Table 1. Profile of limited resource farmers' engaged in the project

Farmer	Principal Operator(s)	Marital Status	Description of people involved in farm operations	Age	Education of Principal Operator (s)
A	2	Married	Husband and wife	>60	College educated, retirees
B	1	Married	Husband and wife	>60	Veteran not college educated
C	1	Single	Operator and farm hand	>50	Not college educated
D [†]	1	Married	Operator and farm hand	>60	College educated, retiree
E [‡]	1	Married	Operator and farm hand	>50	College educated

[†]Participated only in Year 1 trials

[‡]Participated only in Year 2 trials

The farm locations were generally flat land with gentle slopes with mainly sandy loam soils.

Table 2. Description of their farms

Farm	Texas Location	Size (A)	Production Type
A	Eagle Lake	0.18	Beyond organic, open field
B	Hempstead	0.17	Organic, open field
C [†]	Hempstead	0.05	Organic, high tunnel; open field
D [‡]	Grapeland	0.18	Organic, open field
E [¶]	Nacogdoches	0.05	Organic, high tunnel

[†]Planted in a high tunnel in Year 1 and switched to open field in Year 2

[‡]Participated only in Year 1 trials

[¶]Participated only in Year 2 trials

Farmer Training and Demonstration Trials

Extension programs including field days were organized to train the limited resource producers on how to grow and care for strawberries since all the participating farmers were first time growers. They were also taught marketing techniques. The trials occurred over two years (i.e. 2013-2015) and were mainly on-farm side by side comparisons of strawberry varieties. All the trials were conducted using plastic mulch and drip tape. Selection of plant nutrition and crop protection products were left to farmers to make but they were encouraged to follow label specifications where applicable and the standard procedures established for the project. Table 3 summarizes their choices for nutrient management and pest control. Weed control was achieved mainly using mechanical methods like hoeing, hand pulling around strawberry plants, weed eating and tilling in between rows.

Table 3. Nutrient and pest control products used by limited resource farmers during trials

Nutrient Sources	----- Pest Control -----		
	Insecticides	Fungicides	Vertebrate Control
Compost	Bt products	Neem oil	Fence barriers
Compost tea	Sea tea + compost tea mixture		Barn owl houses
Crabshell	Diatomaceous earth food grade dust		Glue board
Fish emulsion	Texas ant hill eliminator		Wood ash
Liquid seaweed	Insecticidal soap, neem products		
Molasses	Henbit extract		

Several different varieties of strawberries were used by the producers over the two year period. Albion, Benecia, Camarosa, Camino Real, Chandler, Festival, Radiance and San Andreas were used for the trials in the first year while Camarosa, Camino Real, Chandler and Festival were used in the second. Participants received an equal number of strawberry plugs of each variety for their trials. Each received 125 plugs per variety in Year 1 and 250 plugs per variety in Year 2. The strawberries were given 1-2 inches of water per week depending on rainfall.

Results and Discussion

Profiles of Farmers Involved in the Study

Currently the average age of the US farmer or rancher is about 58 (USDA-NASS 2014). This implies the age range of the farmers selected, though not consciously planned, mirrors the national trend. It also brackets State trends because a study conducted in Texas on farm diversification found that over 55% of the survey respondents were 55 years and older (Barbieri, 2009). The composition of the farm operators and their work history also reflects State and National trends (Barbieri, 2009; USDA-NASS 2014).

Strawberry Yields

The discussions on yield is based mainly on the results of Farmers A, B, C in the first year and farmers A and B in the second year (Figs. 1, 2 and 3) because (1) Farmers D and E did not participate in both years (2) both Farmers D and E lost their crops early in the season to devastating attacks by cutting ants and, spider mites and anthracnose respectively; and (3) Farmer C lost most of his crop to anthracnose and black root rot diseases in Year 2. The reason for running the project for a period of two years is because the strawberry initiative was

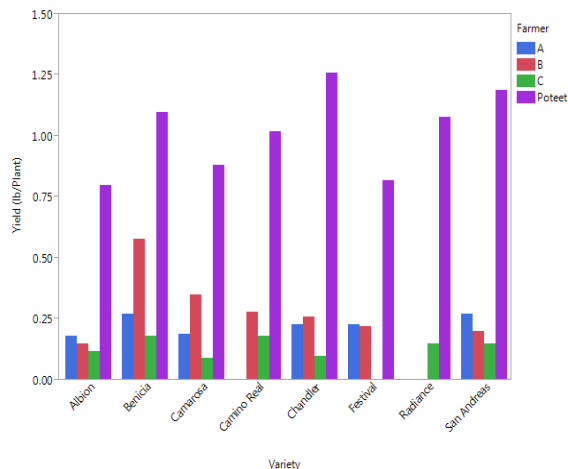


Fig. 1. Yields of first time limited resource strawberry growers compared to that of experienced farmers in Poteet in Central Texas. Varieties with less than four bars implies not all farmers in the study grew that variety.

supported for two, one year funding periods by the Walmart Foundation as a collaborative project between AgriLife Extension and Prairie View A&M University. During Year 1 trials, the pounds of strawberry produced per plant for the varieties ranged from 0.19 to 0.23 for Farmer A; 0.22 to 0.35 for Farmer B and 0.09 to 0.18 for Farmer C (Fig. 1.). These yields were much lower than the 0.8-1.26 lb/plant yields obtained by experienced producers at Poteet in Central Texas (Fig. 1) who have been growing strawberries for years. However as first time growers their yield levels were encouraging. Observations in Texas indicate strawberries planted in a high tunnel typically yields more

than those planted in the open field but that was not observed in our Year 1 trials. Contrary results were obtained in the Year 1 trials because all the open field operators (Farmers A and B) reported higher yields than Farmer C who grew his strawberries in a high tunnel. A plausible reason for this could be substantial loss of berries to rodent consumption and some spider mite infestation during the season as reported by Farmer C. It must also be noted while Farmers A, B, C live on their farms and were very near to their trials, Farmer C chose to not directly manage his crop, leaving this to an employee who was not an experienced grower. That may have affected early disease and pest incidence detection and control intervention. Farmers A and B on the other hand, have farming as their primary occupation and therefore monitored their fields more carefully and put in place early prevention hence they did not lose as much crop to vertebrate and insect attack. Across trials, the pests and insects incidences reported include deer, raccoons, mice, birds, pill bugs, ants, lady moths and spider mites. A farmer also reported the occurrence of leaf blight. Farmers D and E who lost their crops do not live on their farms possibly affecting their abilities to detect and prevent pest and diseases early.

Both Farmers A and B improved their yield per plant for the four strawberry varieties studied in Year 2 though Farmer A showed much more improvement than Farmer B (Fig. 2). Even though both suffered losses (Fig. 3) due to widespread disease prevalence exacerbated by too much spring rainfall and related environmental factors, these results seem to indicate that, with appropriate training and technical support, limited resource producers are capable of growing new and challenging to manage crops successfully. The relatively lower improvement observed for Farmer B is probably due to the fact his trial was heavily impacted by spidermite and anthracnose attack leading to complete loss of the camarosa variety (Fig. 2).

The losses observed in the two years of the strawberry trials with limited resource organic producers seems to suggest that their pest and disease control programs were not very effective.

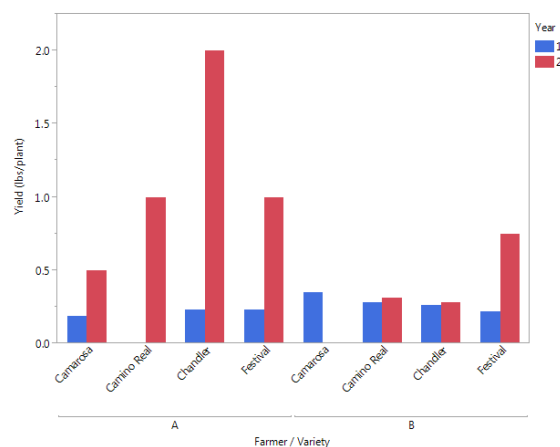


Fig. 2. Yields produced per plant by two limited resource farmers in two successive years. No data is shown for Camarosa because that farmer lost all the plants for this variety.

This leaves room for further research into developing more effective organic programs. The most losses across trials were observed in Year 2 (Fig. 3). Farmers C and E completely lost their crops while Farmers A and B suffered crop losses ranging between 30-50% and 51 to 90% respectively. Though Farmer A hit the production levels (> 1.25 lb/plant) considered to be profitable by industry experts in terms of total yields per plant for some of the varieties, 30-50% of the harvest was not marketable emphasizing the need for a more robust organic pest and disease control program.

Strawberry Marketing and Potential Income for Organic Growers in Texas

While there is risk associated with producing strawberries, there is also great potential for gains because of the high interest for locally grown produce and the willingness of consumers to pay higher prices for them especially if grown using organic methods. Most of the farmers sold their fresh berries at Farmers' Markets except Farmer A, who sold berries through a personal Community Supported Agriculture (CSA) outlet. They also made strawberry jam with their culls and sold them separately. All these Farmers sold their berries for at least \$5.00 per pound which is \$2.00 to \$3.00 higher than retail prices. This kind of pricing could compensate for lower yields to make organic strawberry production operations profitable. Reported and estimated earnings of Farmers A and B in this study are also suggestive.

Farmer A reported sales of \$5000 in Year 1 and \$2190 in Year 2. Farmer B did not report revenue but based on reported yields and price per pound of marketable berries, he most likely made \$1,187.00 in Year 1 which was his good year and \$355.00 in Year 2 when he suffered up to 90% loss of his berries. Given that these farmers grew less than 1000 plants because of plant losses during the growing season, including strawberries in the farm operations of limited resource farmers may be a good way to diversify their operations and boost income.

Experiences and Learnings of the Participating Farmers

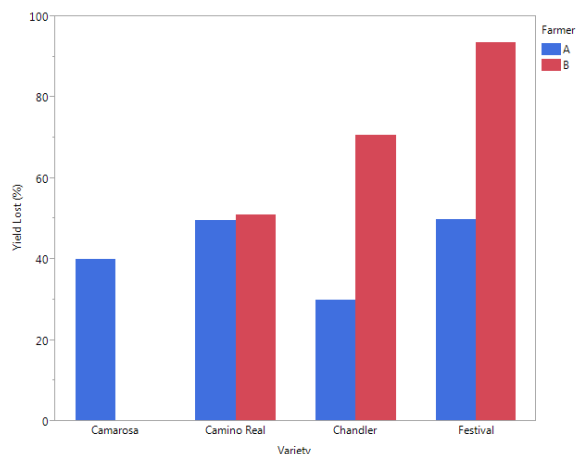


Fig. 3. Strawberry yield losses incurred by two limited resource growers for four strawberry varieties over two successive years. Camarosa has only one bar because Farmer B lost all his plants and had no yield to report.

The overall outlook of the Farmers' on their two-year journey of learning to produce and market strawberries was positive despite the various challenges ranging from weather, pest and disease conditions they encountered in the process. Their sentiments are well captured in the comments they made at the end of Year 1 trials:

Farmer A – “Thank you for allowing our farm to participate in the project. We enjoyed learning the process of strawberry production from the professionals as well as our own extensive research reading to enable us progress in our

trial. We will continue to research feasible methods to grow organic strawberries with quality and yield so small acreage farms can produce a profitable crop”.

Farmer B – “It was an exciting time here on the farm caring for strawberries. There were lots of skepticism on whether organic methods could work. However, I feel we accomplished our production goal and produced large aromatic and colorful strawberries. They sold well at the Tomball Texas Farmers' Market. The fresh scent of locally grown strawberries is all people talked about. This shocked me. We and the market vendors felt proud to know that Texas A&M and Prairie View A&M Universities are working jointly to bring local strawberries back to Texas. We are honored to be part of National Strawberry Initiative”

Farm C – Very educational, I never dreamed that growing and harvesting a fruit like strawberry could be so rewarding. So many people were happy to get fresh locally grown berries. Learning to take care of the harvested berries was also interesting. The yield was great for the time invested. There was very little disease”. All these farmers have also expressed their interest to continue to grow strawberries.

Conclusions

Strawberries can serve as a channel of income for limited resource producers in Texas because there seems to be a market for locally grown berries and their production is feasible as demonstrated in this study. However, it must be noted that in this study, success with growing strawberries was depended on how focused and how well the farmers managed their trials. Those who paid more attention to their crops and managed them better received better results. Those that did a poor job either due to long distance to their trials or to other competing interests completely lost their crop or had yields below par. The on-farm approach used in this study and the trainings offered the farmers through one-on-one visits, field days and other training programs broaden their knowledge base, presented peer-to-peer interaction opportunities and facilitated the development of a support system that helped them in their two year journey of learning to grow a new crop. The crop losses reported especially in Year 2 due to pests and diseases reveals the need for helping the farmers develop more robust, practical and effective pest and disease control options for their organic operations to make them more profitable.

Acknowledgements

The funds used to support the trainings and trials were provided by the Walmart Foundation through the University of Arkansas.

References

- Barieri, C. and E. Mahoney (2009). Why is diversification an attractive farm adjustment strategy? Insights from Texas farmers and ranchers. *Journal of Rural Studies* 25:58-66.
- H.R. 3242 (108th): Specialty crops competitive Act of 2004, Pub L. 108-465, 108 Stat. 3882 (2004). Available from <http://uscode.house.gov/statutes/pl/108/465.pdf> (Accessed 08/07/2016).
- USDA-NASS (2014). 2012 Census of Agriculture, AC-12-A-51. Available from https://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_1_US/usv1.pdf (Accessed 08/07/2016).

Using Row Covers to Improve Sustainability of Vegetable Crop Farmers in Temperate and Tropical Climates

Ramón A. Arancibia (Virginia Tech., Eastern Shore Agricultural Research and Extension Center)

Introduction

Sustainable intensification of the specialty crops industry and urban agriculture involves the application of modern technologies to improve profitability, environmental stewardship, and social wellbeing. To improve productivity, farmers frequently use intensive production systems such as mulches, row covers and high tunnels to protect against low temperatures and extend the production season of high value crops. Row covers have the advantage over high tunnels of being movable to allow for rotations with cover crops and maintain the use efficiency of the system. Row covers are mainly used in spring to protect warm season specialty crops against light freezes and then removed. The use of row covers in summer, fall and winter is rare. Here we discuss additional benefits of row covers that are largely unknown to farmers, but can improve productivity throughout the year and sustainability of the production system.

Row covers are made of slit or perforated transparent polyethylene film and semitransparent spun-bonded plastic fabrics of various thicknesses depending on the manufacturer. They can be used as floating blankets or as low tunnels over wire hoops or other material to protect crops from cold/freezing temperatures and to extend the growing season (Fig. 1 and 2). Row covers have been used on occasion to exclude insects thus reducing the incidence of pests and consequent damage to crops. Insect nets made of plastic material with various meshes (holes/square-inch) have also been used to exclude pests. Nets have been used to cover the air inlet in greenhouse and as cover for net-houses and low tunnels. Plastic films are practically no longer used as row cover because of water condensation that promotes foliage decay. This problem is rare with spun-bonded fabrics because they are permeable and allow air flow with little condensation.



Figure 1. Floating blanket over strawberries. Mississippi, spring 2014



Figure 2. Row cover over wire hoops to cover kale. Virginia, spring 2016

Season extension

The thickness of the row cover is associated with the capacity to protect against freezing temperatures. Manufacturer specifications indicate the temperature differences the material can offer depending on thickness, but environmental conditions may also play a role in their performance. Studies have shown that row covers effectively increase air and soil temperatures and therefore, protect against mild freezes early in the spring and late in the fall and winter. In addition, row covers enhance vegetative growth (Fig. 3) that results in increased yield (Arancibia, 2015; Arancibia and Motsenbocker, 2008). However, farmers stop using it as soon as the risk of a freezing event has passed.

Micro-environmental conditions

Row covers can also be used to reduce environmental stresses, but are rarely used after the risk of a freezing event has passed, and during the summer in temperate climates as well as in tropical areas. The thought is that there is no risk of freezing temperatures and that the high temperatures inside the low tunnels in sunny days may affect the crop. However, studies with cucurbits and solanaceous crops in Louisiana, Virgin Islands, Mississippi, and Virginia have shown that low tunnels covered with spun-bonded fabrics enhance vegetative growth even when maximum air temperatures are over 120°F (Fig. 3, 4 and 5) (Arancibia, 2012; Arancibia and Motsenbocker, 2008).

Row covers modify the micro-environment under the tunnel reducing overall plant stress due to reduced light intensity and wind, which results in reduced evapotranspiration and water requirement (Arancibia, 2009; Arancibia, 2012; Arancibia and Motsenbocker, 2008). Therefore, vegetative growth under row covers is enhanced which may shorten the production cycle in leafy vegetables (Fig. 5) and increase the yield in cucurbits and solanaceous crops. Using row covers; however, may be challenging in crops that require insects for pollination, so timing for row cover removal is critical. Shorter production cycles in leafy crops may allow for additional crop cycles in the season which may increase land use efficiency and profitability. In addition, the yield increase in crops grown under row cover may also increase production efficiency and profitability.

Insect and viral diseases transmitted by insects

Row covers act as physical barriers against insect pests and viral diseases transmitted by insects. Large insects such as worms (butterflies and moths), sting bugs, beetles, etc. can be easily excluded from the crop with lightweight row covers and insect nets (Figs. 6). The most common



Figure 3. Watermelon with and without row cover. Louisiana, spring 2000



Figure 4. Puerto Rican sweet peppers with and without row cover. Virgin Islands, summer 2006

virus-transmitting insects are small pests such as aphids, whiteflies and thrips that can effectively be excluded with row covers. (Arancibia 2007; 2012). They transmit Potyviruses (aphids), Criniviruses (whiteflies), and Tosposvirus (thrips) which are the most common viruses that affect vegetable crops.



Figure 5. Kale production with and without row cover. Virginia, summer 2016



Figure 6. Cucumber with and without row cover with high incidence of worm. Virgin Islands, summer 2006

Conclusions

There is growing interest in local and organic production of vegetable crops where fresh vegetables are sold at the farm or farmer markets. Among the main challenges facing rural and urban small vegetable farmers are pests, water supply and cost, and wind that affect crop growth and yield. Row cover can overcome these limitations since it acts as a pest and wind barrier and reduces evapotranspiration and water requirements. In addition to yield increase, row covers may reduce the time crops reach commercial size/maturity and increase crop cycles per unit of space, so land/roof top use efficiency may improve significantly. Consequently, considering that row covers are more affordable than high tunnels and have the potential to be used throughout the season, they can very well improve the economic sustainability of vegetable crops farmers.

Bibliographic Information

- Arancibia, R.A. 2007. Rowcover reduces insect infestation and increases growth and yield of cucumber in the U.S. Virgin Islands. *HortScience* 42:850
- Arancibia, R.A. 2009. Microclimatic factors associated with enhanced plant growth under rowcover. *HortScience* 44: 1132
- Arancibia, R.A. 2012. Rowcovers in Vegetable Crops Production in Tropical and Temperate Climates. *HortScience* 47:S107
- Arancibia, R.A. and W. Evans. 2015. Rowcover Modifies Microclimatic Conditions and Increased Cilantro Yield in Virginia. *HortScience* 50:S198.
- Arancibia, R.A. and C.E. Motsenbocker. 2008. Differential Watermelon Fruit Size Distribution in Response to Plastic Mulch and Spunbonded Polyester Rowcover. *HortTechnology* 18:45- 52

Characterizing High Tunnel Microclimate in Hardiness Zone 7 & 8 of North Carolina

Sanjun Gu, John Beck, Joseph A. Moore (North Carolina A&T State University)

Introduction

High tunnels are unheated, plastic covered structures that provide crop protection from some potentially hazardous weather events as well as controlling environmental conditions. High tunnels are proven season extension tools for small farmers. These low-tech, low-cost structures with one layer of plastic will advance one hardiness zone, and an additional layer (the row cover) inside a high tunnel will provide another zone of protection in the Midwest. This protection, however, has not been tested in the Southeast United States. In addition, research on microclimate factors in high tunnels have been limited, which makes the recommendation of high tunnel management a challenge. The objectives of this project were to characterize high tunnel microclimate in zone 7 & 8 of North Carolina, and to provide a general guideline for the feasibility of growing warm-season and cool-season vegetable species, as well as strawberries, in the high tunnel environment.

Materials and Methods

High tunnels and locations. We used three 30' x 96' high tunnels in Greensboro (hardiness zone 7) and three 30' x 96' high tunnels in Goldsboro (zone 8) (Figure 1). High tunnels in Greensboro had single-layer polyethylene films while they have double-layer films in Goldsboro.

Data collection. Spectrum[®] data loggers and sensors were placed in high tunnels in fall, winter and spring of 2014 & 2015. Measurements of air temperature and humidity, soil temperature and moisture, leaf wetness, solar radiation (SR, 300-1100nm) and photosynthetically active radiation (PAR, 400-700nm) took place automatically every 30 minutes. Soil temperature and moisture in the strawberry high tunnel were measured in raised beds covered with black plastic mulch all the time, while they were measured in raised beds without plastic mulch in January and February in vegetable high tunnels. Soil types are Enon fine sandy loam and Wickham loamy sand at Greensboro and Goldsboro sites, respectively. Crops in the high tunnels were managed organically. Efforts were made to maintain the high tunnels at the optimal temperatures of 60-68°F for cold-season, and 68-85°F for warm-season vegetables. High tunnel ventilation started when temperatures reached around 65°F for cold-season, and 85°F for warm-season vegetables. Row covers were used when night temperatures were expected to be lower than 50°F.

Data analyses. SpecWare 9.0[®] was used to download data from data loggers and to calculate leaf wetness, temperature extremes, growing degree days (GDDs) and frost free days.

Results and Discussions

Air and Soil Temperatures. Ambient temperature was always higher in high tunnels than in the field. Minimum temperatures inside high tunnels were 10-20°F higher than in the open field, indicating the advancement of hardiness zone by at least one. This advancement varied between the locations and years. (Figure 2 & 3).

Ambient temperature in high tunnels during winter quickly exceeded 100°F when it was sunny outside meaning that if the tunnels were not ventilated (data not shown), crops could suffer severe heat stress.

Growing degree days were much higher in high tunnels. For example, GDDs at 50 °F in Greensboro (Table 1) in December, January and February 2014 were 187%, 124% and 148% higher than that in the open field, respectively. Higher GDDs means possible earlier maturity and harvest for most vegetable crops.

High tunnels delayed the occurrence of the first fall frost and the last spring frost. In 2014, although the first fall frost came much earlier than usual, the first frost was still delayed by more than two weeks (Table 2).

Soil temperatures at the 3-inch depth were above 40 °F in winter indicating the feasibility of growing and harvesting cold-resistant vegetable species and strawberry in high tunnels in winter. However, soil and ambient temperature were not high enough to permit the growing of warm season vegetables.

Solar Radiation. Light as the main source of energy for crop production is affected by season. In high tunnels, it is also affected by the plastic covers. One-layer polyethylene plastic blocked 53% of SR and 50% of PAR in the month of December (Table 3). On average, 28% of SR and 37% of PAR were lost from October 2014 to April 2015 in Greensboro (Table 3). Double-layer plastic could block more than 50% of SR and PAR (Table 3). Use of single-layer plastic for winter production is suggested although more research is needed for a complete recommendation.

Humidity. High tunnels shield off rain and could have an enclosed environment if totally closed. Air and soil moisture mostly comes from irrigation and is controlled by ventilation. Data indicated that relative humidity could be high, and diseases favored by a humid environment might be a problem if the tunnels are not properly ventilated (Table 4). When row covers were used, leaf wetness was higher than 6 ohm-meters for extended periods suggesting the necessity to remove row covers during the day, and to ventilate high tunnels even during the winter.

Conclusions

The following conclusions are drawn from this study:

- High tunnels could provide 1-2 hardiness zone protection in Zone 7 & 8.

- Frost free days increased at least by five weeks.
- Growing Degree Days are greatly enhanced in high tunnels so plants will mature earlier.
- Overwinter production of cool season vegetables is possible in high tunnels.
- Overwinter production of warm season vegetables is impossible in high tunnels.
- Humidity in high tunnels is high if ventilation is not done appropriately.
- More research is needed on the pros and cons of single- vs. double-layer plastic cover for high tunnels.

Tables and Figures

Table 1. Growing degree days at 50°F in Goldsboro.

	Field	High Tunnel	Difference	% Increase
October	430.5	543.3	112.8	26%
November	124.3	260.8	136.5	110%
December	70.3	202.0	131.7	187%
January	45.3	101.5	56.2	124%
February	34.4	85.2	50.8	148%
March	198.3	258.3	60.0	30%
April	405.6	458.2	52.6	13%

Table 2. The 1st fall frost and last spring frost in high tunnels (Greensboro).

Fall 2014			Spring 2015		
Open Field	High Tunnel	Difference	Open Field	High Tunnel	Difference
11/3/2014	11/19/2014	17	4/5/2015	3/19/2015	18

Table 3. Plastic cover affects Solar Radiation (SR) and photosynthetically active radiation (PAR). Unit: ratio of measurements of inside high tunnel/open field.

	Single-layer plastic		Double-layer plastic	
	SR	PAR	SR	PAR
November	0.64	0.56	0.41	0.40
December	0.53	0.50	0.31	0.28
January	0.77	0.68	0.52	0.55
February	0.90	0.69	0.53	0.52
March	0.68	0.64	0.48	0.45

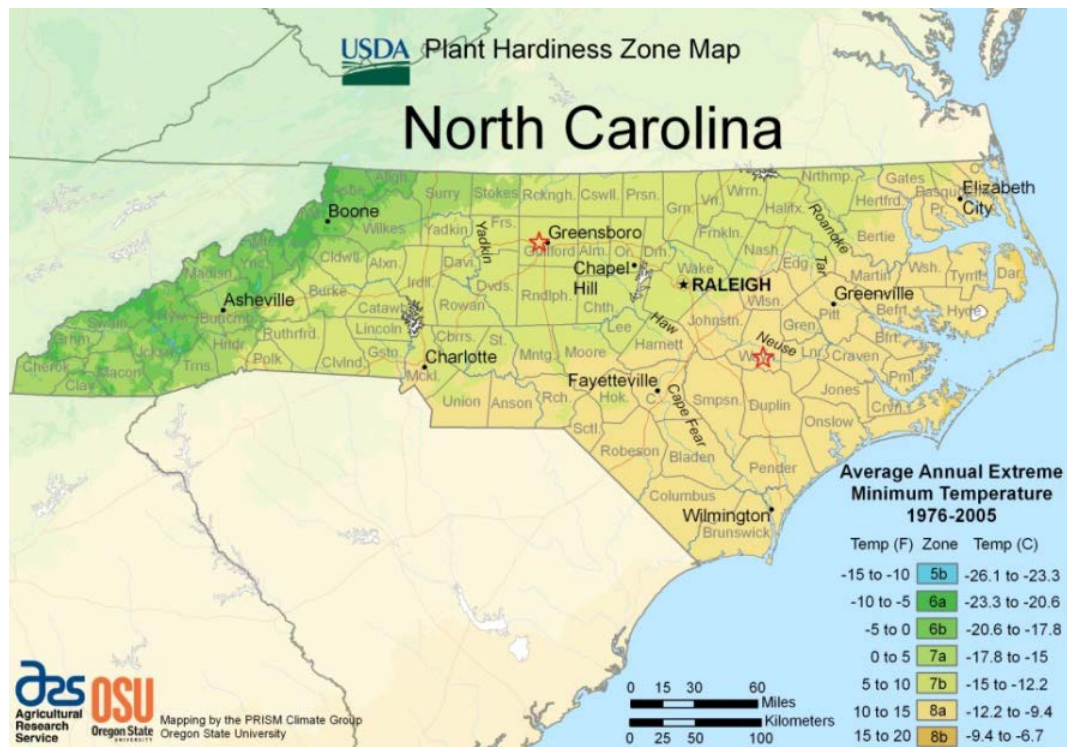


Figure 1. The cold hardiness zone map of North Carolina and test locations (stars).

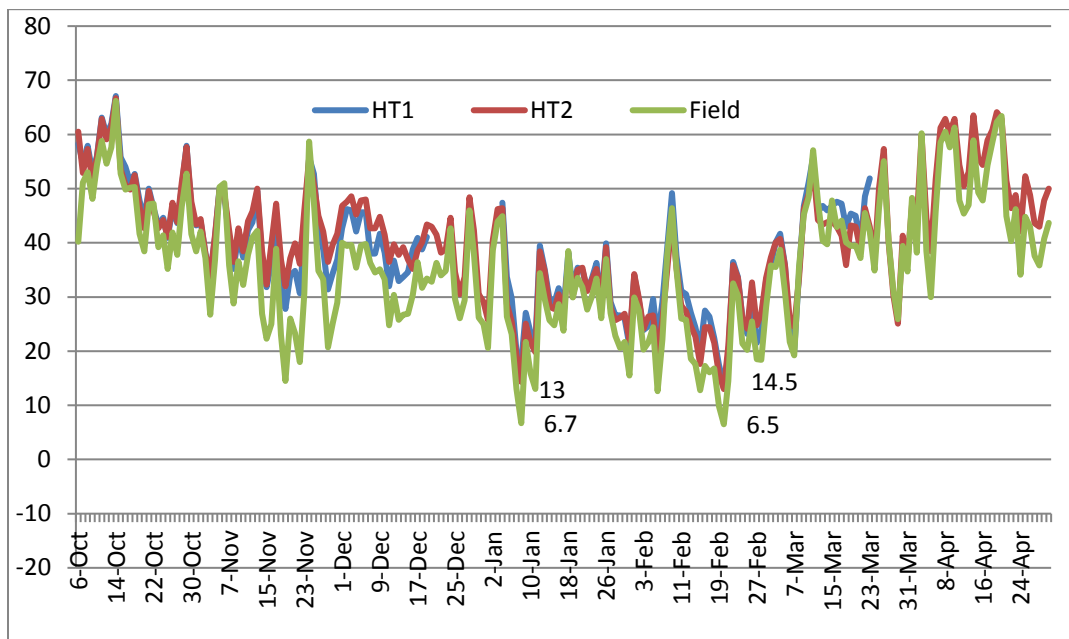


Figure 2. Low Temperatures in High Tunnels and Open Field 2014.10-2015.4 in Greensboro. HT: high tunnel.

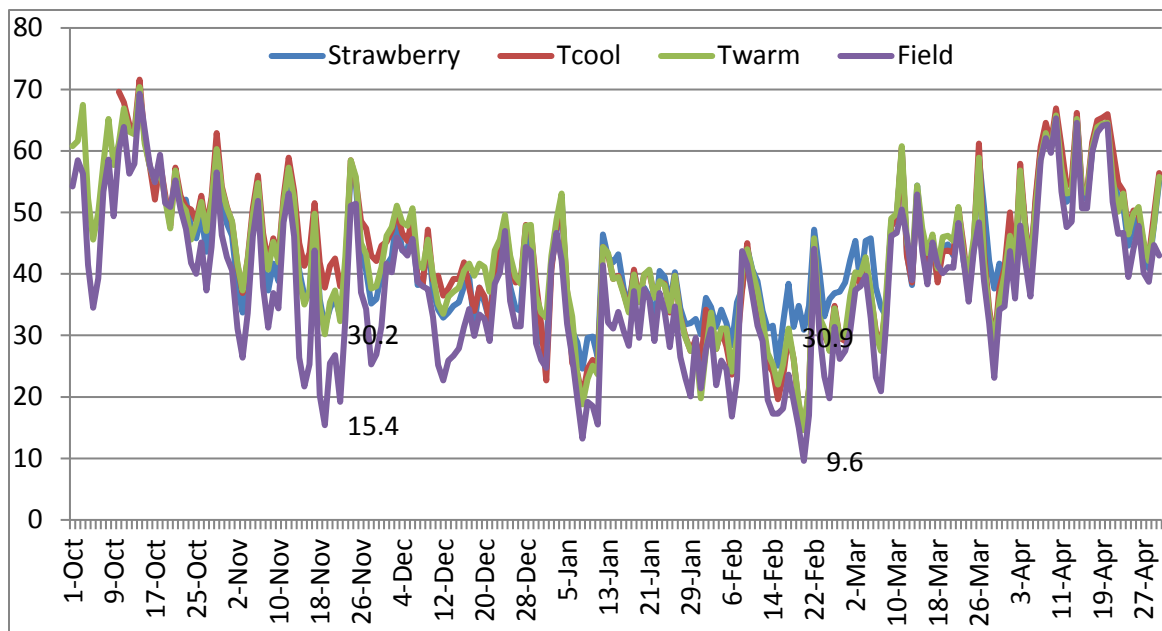


Figure 3. Low Temperatures in High Tunnels and Open Field 2014.10-2015.4 in Goldsboro. Strawberry: strawberry high tunnel. Tcool: cool season vegetables high tunnel. Twarm: warm-season vegetable high tunnel.

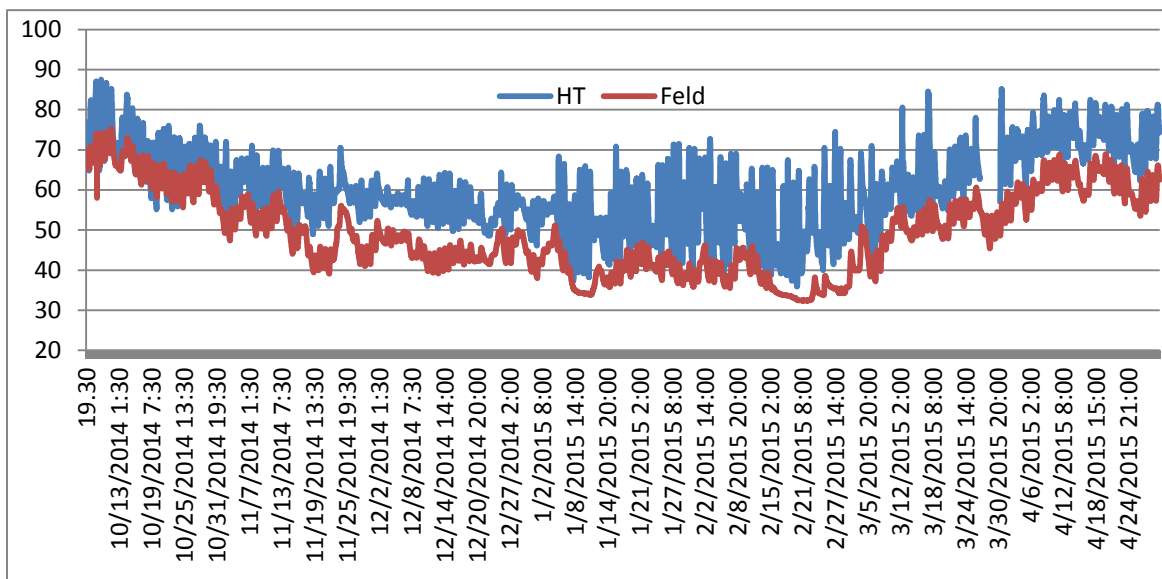


Figure 4. Soil temperatures in strawberry high tunnel (Greensboro). HT: high tunnel.

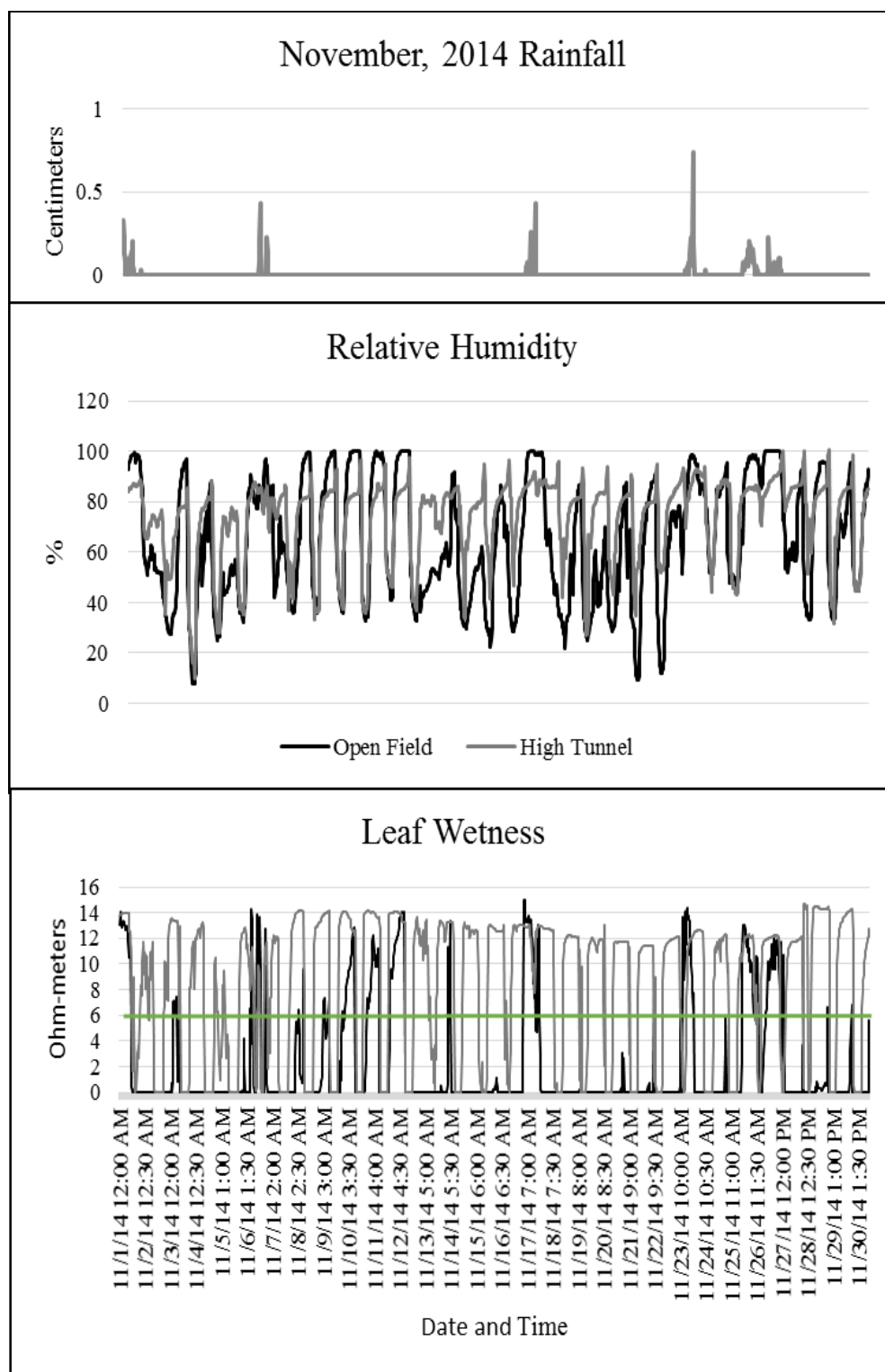


Figure 5. Rainfall, relative humidity and leaf wetness in high tunnel and open field (Greensboro) in November 2014.

Small Farms: Alternatives to Meet New Challenges from Changing Climate Conditions

Cynthia Rice, Buddhi Gyawali, Marion Simon, Louie Rivers Jr., Bijesh Mishra (Kentucky State University)

Abstract

Exploration of alternative methods of farm production is necessary if small, socially disadvantaged producers are to compete with larger conventional farms. Ideas such as organic, sustainable, bio-intensive, silvopasture, inter-cropping and other methods such as no-till and low till are new concepts which are not necessarily something a large farm can implement but that a small farm could adopt and use as a selling point or for financial growth. Development of apps to educate, train, and connect with others (farmers, wholesalers, value added resellers, retailers, etc.) allow farmers to explore options which may increase their brand and marketability. This presentation is based on years of reading, researching and practical applications as new techniques and information became available and evidence supporting climate change was documented. No one site or person molded the thought processes behind this paper but hundreds of talks, webinars, seminars, classes, papers and images influenced the writing of this paper over the decades. Heartfelt thanks to the many pioneers and their work in sustainability.

Introduction

Climate change and its effects are an increasing source of concern for nations. Addressing climate change issues that face farmers, and alternatives for regaining productivity and profit are the focus of this paper. In the past several years, workshops and training have dealt with financial management, know-how or practical farm management and education in new practices or new areas of growth in farm production. There was a typical pattern which was followed in an annual cycle dealing with animal and plant production and harvest with occasional new technology or practices. Times change and so do needs – today's farmers need to adapt in order to remain viable in the face of climate change. Training and workshops must similarly change to keep up with the new REALITIES of hotter and drier weather as well as changing rainfall patterns.

Factors Affecting the Changing Face of Farming

Farmers are traditionalists in many areas of their work such as always planting in the spring and harvesting in the fall. Unfortunately, things don't remain the same, especially with accelerating climate change. The long term effects of climate change will be manifested in changing vegetation patterns and variations in species composition as both invasive and native species recede from the south and advance to the north. What this means is that species such as apples which require a certain amount of chilling time, will become less productive where they

currently are and will become more productive in areas north of current orchards, how far north only time will tell.

Small farms are uniquely suitable to adapt to climate change. Many small areas/plots allow for many different growth patterns. Different markets and niches including wholesale, restaurants, retailers and ethnic/cultural markets are available to absorb seasonal produce. Small farmers are naturally positioned to be leaders in new techniques as different methods are tried at small scale. They are also leaders in crop introductions as alternative crops are tried and market bases are developed. Due to their involvement in growing specialty or alternative crops, they are able to develop relationships with local restaurants as new crops are provided for signature dishes.

Farmers are caught in unplanned and unexpected situations. By the very nature of farming, weather is one of the driving factors of agricultural production. Issues such as drought and flooding, cooler and hotter temperatures and possible wet and dry monsoon planting seasons are becoming important factors of farm decision making. These situations are causing farmers to suffer reduced yields or crop loss. These weather occurrences can be devastating to planting and harvesting schedules and the frequency with which they occur may lead to farmers losing their farms due to continued economic loss. Small farmers can adjust easier to unplanned and unexpected situations. They can plan short and long term solutions such as developing micro-climates and planting different crops with different needs at different times. By planting smaller plots/area, farmers do not place all their revenue resources in one or two major crops. Continued cropping at a manageable scale requires fewer workers who work throughout the year meaning less need for training/retraining. With production able to occur almost year round, especially with season extender devices such as greenhouses, loss of one crop does not lead to loss of all revenue due to several revenue streams.

Footprint/Carbon Sequestration

A bio-diverse environment will include a cycling of nitrogen and carbon into and out of the ground (hopefully more in than out) as well as organic matter which will add to the fertility year after year. When farmers interact locally, less fuel and better tasting food which is allowed to ripen individually combined with other factors helps to reduce their carbon footprint. Small farms have a small carbon footprint with lower transportation costs, also. They are more involved in their local community in areas such as local fertilizers/animal waste, local storage, local sales, local customer base with less competition and local value added products.

Alternative Maintenance

In terms of alternative maintenance, allowing crop residue to stay in place as organic matter will lower labor costs, lower chemical costs, lower irrigation/water costs, lower fertilization costs, increase bio-diversity, and contribute to a healthier environment. Other alternative maintenance

practices such as weeds left as shade, support and trap crops (bio-control) with taller growth helps to provide a living mulch which retains moisture at ground level. With more organic matter there is more fertile land and less of commercially produced fertilizers can be used in effect conserving dwindling resources. Small farms are more likely to be bio-diverse allowing a healthier environment with more micro-organisms in variety and quantity and generally tend to use environment friendly practices.

Polyculture

For small farms, the capability of moving from a monoculture to a polyculture practice allows the work to be divided into segments to deal with different crops types. Harvests and planting can be done at different times or continually in small segments, which is well suited to a small farm. Farmers can have a continuing source of revenue which can allow them to budget better and borrow less. They can also, plant earlier and later in the season even through the winter months by use of crop extenders which allows them to produce more than previously possible. Small farmers can use innovative approaches such as hydroponics, aquaponics, high and low tunnels, as well as greenhouses, hoop houses, and row covers (different seasons and different crops). Using these crop extenders at different times enables small farmers to achieve continuous or near continuous cropping. Polyculture allows for more types in smaller quantities which could be spread out over a longer period to adapt to climate change issues such as reduced and increased (monsoon type) rainfall levels. With polyculture, fertilizer is used in smaller quantities on crops needing it (no/less nitrogen loading into waterways). Planting and harvesting can be spread over multiple microclimates for better production. The loss of a crop does not mean the loss of all income and farmers are better able to absorb and deal with smaller losses. Polyculture can result in multiple schedules with better labor management and continued employment.

Dry Farming vs Irrigation

A major consequence of climate change will be drier and hotter weather and less rainfall. Traditional crops may not survive or may produce less without additional water or water retention methods. Alternative crops requiring hotter temperatures or less water may be the new cash crop. Small farms can apply spot irrigation where it is needed based on crops currently growing in a specific location. Small plots can prevent or limit erosion because of the different water requirements and irrigation timing. Crops can be placed where they can do best, based on microclimate and nutrient need. Raised beds can be developed for intensive gardening, special needs such as acid or alkaline soil and to drain and/or retain excessive water/moisture allowing faster planting in rainy seasons. In-ground (below ground level) planting where water can be trapped for plant use, and prescriptive mulching are all possible on small farms.

Low Till/No Till

Less disturbance of soil leads to less work and more results. Fertility will increase due to crop residue being composted back into the soil and less time is spent on plowing, disking, and other practices associated with conventional tillage. More organic matter is retained cutting down on the amount of imported organic fertilizer that may harbor disease pathogens or invasive plant seeds. This will also give native plants a chance to multiply improving biodiversity within and above the soil. Less erosion and more moisture retention can occur because the soil is able to retain the structure which contributes to less drainage away from the soil and more drainage down into the soil. Small farms can allow micro-organisms' habitat to expand enriching the soil because smaller plots may be less subject to tillage. Due to differing planting cycles, the farmer can allow soil structure to regulate through thaw and freeze cycles creating air pockets letting gas exchange with the atmosphere. In such small farms, the soil is also able to store up water within the different layers of soil and nutrients increase due to organic matter accumulation.

Natural Fertilizers, Pollinators, Alternative Crops and Crop Rotation

Due to small spaces, synthetic fertilizers can offset the balance of the soil leading to only one crop being suitable for an area. Depletion of specific nutrients due to crop needs can be offset by crop succession. Chemical persistency is not generally a problem as naturally occurring fertilizers break down easily. Pollinators thrive in a no/low chemical environment, which is a high priority in the face of bee decline through colony collapse and destruction of butterfly habitats. Small farms also may be more organically inclined. They tend to have limited use of additional fertilizers as they strive for sufficient organic (as in non-synthetic, not as in US organic standard) production. Natural compostable organic matter is often used with no additives and are not generally hazardous in amounts used. Natural components provide nutrients with usually no residue and GAP (good agricultural practices) is often used. With fertilizer being naturally produced there are often no additional costs and the absorption of waste into the soil releases nutrients back into the soil quicker without bringing in additional salts from commercial fertilizers. This in turn helps with the natural pH balance.

Pesticides/Herbicides/Fungicides/Insecticides vs Biocontrol

With current commercially produced pesticides/herbicides/fungicides/insecticides containing synthetic and often persistent chemicals, many small farms are looking at bio-control as a viable replacement especially since these commercial products, while not harming the current crop, may adversely affect future crops, thus limiting crop rotation possibilities. With the commercially produced products, long term effects may not be known as evidenced by even popular items being pulled off the shelves. If they must be used then a localized, non-drift specialized and not broad spectrum product is recommended but on a small farm drift can affect other crops, animals or even people. Synthetic or lab produced may be shelf stable causing

chemical persistence in soil and water and may be linked to pollinator decline which decreases some crops' yields. So, generally small farms have little or no pesticides/herbicides/fungicides /insecticides use and look to bio-controls which are less damaging to the environment. With no commercial treatments, a proper growing environment where bio-controls are dominant allows plants to develop resistance to micro-organisms or be protected by trap crops, predatory insects, birds and other organisms.

Animal or Plant, or Animal and Plant

Animals may need different housing requirements such as taking advantage of coolness from earth (regulating with cool pipes or partially sheltered by earth to insulate from heat or cold). Positioning structures and watering areas to create cool spots are possible in small farms in relation to small plot usage. Small farms can take advantage of micro-climates through strategic building and vegetation placement (trees, shrubs, and water/irrigation ditches). Work animals and plants as a holistic approach (chicken tractors, movable paddocks) to enhance the production capabilities of small farms. Small farms can work animals into landscape or plants into microclimates which exist (orchard, forest, north slopes) or are created reducing controlled housing or man-made housing with their requirements. Free roaming or paddock roaming allows waste to be spread over land fertilizing ground, and preventing methane buildup while lowering contributions to greenhouse gases. Lower feed requirements due to pasturing animals letting them forage crops and natural food which builds muscle not fat. Using animals to help maintain the health of the land is a natural cycle which usually is environment friendly. Nutrient balance in food with little or no run off into water sources or escape into the atmosphere is a positive aspect of holistic farming which again is a practice well suited to small farms.

Invasives vs. Natives

Invasives such as kudzu, honeysuckle, and many weeds which thrive in the southern states may start to appear in Kentucky as natives migrate northward. If invasives establish themselves then small farms can find uses for them as non-cultivated food or forage. As soils dry out and barren patches appear invasives will enter unless farmers are prepared with heat tolerant alternatives. Small farms being bio-intensive leave little or no ground bare so there is less room for invasives. Little or no herbicides use will help the ground from becoming bare and keep native plants in place. Natives usually provide an ecological service such as deep root penetration to aerate soil. Natives thrive in soils which provide the nutrients/substances they need. The natural cycle of succession plants as planting area moves from bare ground to perennial increasing fertility (annual, biennial or perennial) so small farms can plan and use multistory plantings as natural succession takes place.

Historical/Traditional and New Norm

Traditional farming practices still are very much a presence. It will continue to be used for many years, but to feed the growing population there will be less imports as markets get more competitive. By adding small farms to the mix, they add to food security, help to keep prices low in comparison to other countries. With the climate changes occurring, traditional big farms may well become unfeasible to operate and having small farms already in place will ease the transition. Hoop house, high tunnel, row covers can mediate unusually high or low temperatures. Raised beds for new drainage problems can help mitigate changing rain patterns by better drainage and less disturbed earth can hold more moisture reducing irrigation needs. Smaller areas are easier to spot check to catch the onset of diseases due to too much or too little rain. Small farms are able to mulch easier or set berms or wells around plants to keep water in a set area. Based on size of areas small farmers may hand pollinate or attract pollinators with plants.

Conclusion

Farmers must become more resilient and seek ways to cope with the coming change while continuing to make a decent living. Plans put in place now will be refined and be able to provide food and income as climate change accelerates. Small farmers will become leaders on the forefront of food security for our communities and the nation. Climate change is real and farmers have to become more aware and react to the problems facing them (severe weather including drought and flooding and unusual high and low temperatures). Small farmers are more resilient to the effects of climate change and their experiences and skills to cope with the adverse effects of climate change can be useful for making larger farms resilient and sustainable.

The Promise of Urban Agriculture: Policies and Planning in Support of Commercial Urban Farms

Anu Rangarajan (Cornell University Small Farms Program)

Abstract

As urban and suburban farms have proliferated around the United States in the past decade, much attention has been paid to their youth engagement, community development, educational and other social impacts. Yet there have been few assessments of how these farm-based social enterprises, which face narrow margins and high risks while growing produce, can thrive based on the sales of their products alone. Often, strong relationships with nonprofit and philanthropic sources have helped urban farms survive, but what can be done to encourage their self-sufficiency for a promising future?

Through a study commissioned by the Local Food Research & Development Division of USDA Agricultural Marketing Service (AMS), we interviewed farmers, policy-makers, urban planners, funders, and nonprofit and community organizers engaged in local food systems and urban farming to uncover the policies, resources, and future research and development needed to support the development of urban farms. We will review examples from case study farms to present relevant farm models, planning policies, and partnerships that point the way toward fulfilling the promise of urban agriculture.

About the Small Farms Program

The Cornell Small Farms Program helps farmers get expert assistance to facilitate all phases of small farm business development, from initial growth to optimization to maturity. We envision a future where diverse and vibrant urban and rural farms build human capacity, revitalize communities, supply regional food systems, and foster ecological resilience in a changing world.

About the Study

The Cornell Small Farms Program (SFP) wrote and has continued to update its *Guide to Urban Farming in New York State*, a resource guide for those considering beginning an urban farm that covers everything from finding land and soil-testing to community relations, marketing, and regulations.

Owing to the reputation that SFP has built, we were invited to submit a proposal to the Division of Local Food Research and Development at USDA-AMS. The Division, which manages the Farmers Market Promotion Program and the Local Food Promotion Program grants, had been asked about its support for urban farms - which it had previously not considered because of USDA's rural mandate. The report from our USDA-AMS study will make recommendations for how USDA can support commercial urban agriculture through its grant-making programs. The study, entitled "The Promise of Urban Agriculture," will evaluate factors that have contributed to or inhibited the success of commercial urban agriculture; determine policy, investment and community actions that could foster development of commercial urban

agriculture; and identify strategic research, training, extension and education needs to advance commercial urban farming.

The case study-based report will offer quantitative and qualitative data on farm viability, taking into consideration the views of farmers, planners, non-profit organizers, and customers.

Definitions & Methods

We have developed the following definition of “commercial urban agriculture” to focus on those farms that are producing at an appropriate scale for sale through multiple distribution channels:

- Commercial: earned revenue greater than \$10,000 through multiple direct and wholesale channels, whereby income earned from product sales accounts for a sizeable portion of earned revenue.
- Urban: includes peri-urban areas; using Weeks' (2010) definition, urban and peri-urban places are "concentrations of people whose lives are organized around nonagricultural activities," where agriculture is not a primary land use, and there may be competing land uses.

Using recommendations from colleagues, professional networks, and through conversations with urban agriculture leaders, the PIs identified eight advisors with expertise in food systems planning, community organizing, city planning, farmer education, advocacy, food business development, and the economic and social impact of urban farms to advise its progress, review its interview protocols, provide feedback on case study farms, and review findings.

To date, over 150 farmers, researchers, foundation representatives, municipal and federal government officials, and community advocates have been interviewed for the study. The PIs have visited more than 50 farms in 16 cities to observe their operations, learn about their missions, and evaluate the extent to which they fit the criteria of “commercially viable.”

At a Glance: Case Study Farms

The final report will include 14 case studies on farms, and another 6-8 case studies on “emerging trends”: cities with pro-urban-farm policies or new models that have not yet reached viability.

The report, currently being written, synthesizes these findings and will provide recommendations for grant-making, as well as areas where further research is needed.

At a Glance: Farm Finances

Earned revenue per square foot = 14¢ to \$12.63

- Highest per sf farms (>\$2) incorporated some controlled environment enterprise—hydroponics, sprouts, mushrooms—sold through direct wholesale (restaurants, grocery stores)
- Years of farming experience, years in business, and business structure were not significant factors
- Lowest per \$/sf farms contributed the highest proportion of produce to household consumption.

Farm product sales as a percentage of total revenue: 9-100%

- Nonprofits had the smallest % of total revenue
- Four for-profit farms earn 100% of total revenue from product sales
- Other sources of farm revenue for for-profits include on-farm events and farm services for-hire
- 10 of 14 farms earned a profit (other sources of farm revenue included)

At a Glance: Policies and Resources

Farmers are largely self-taught, but seek resources

- 8 of 12 farm managers are self-taught, but seek enrichment education
- 5 previously worked on rural farms; 2 on urban farms
- Majority say they want commercial urban farming educators
- Previous training/farm experience not correlated to \$/sf

Community support for farms high overall, but municipalities are mixed in their support for urban agriculture

- Generally, zoning amendments and urban agriculture ordinances positively impacted farms, though some said they restricted activity

Farmers' policy recommendation: reduce costs

- Make paths toward cheap, legal, long-term or permanent land tenure
- Most financially stable farms had cheap, free, or subsidized land
- Lower water hook-up costs and water rates for urban farms
- Better educate funders about costs and benefits of urban farming
- Farmers want mini-grants, not loans: fear of debt

Preliminary Findings

Based on farm interviews, visits, and expert-interviews, several themes emerged regarding farm viability and needed resources, policies, and education to improve farm viability.

1. Land access, tenure, and cost are often the largest difficulty of farming in cities
2. Viable commercial urban farmers focus on niche produce (e.g. salad greens, garnishes), not whole-CSA or calorie crops (impacts food access and security)
3. Legal structure decision (for-profit, non-profit) is difficult, and the cost of social entrepreneurship is high
4. Water costs (connectivity, rates, surcharges) for urban farms are inordinately high for agriculture

Finding #1: Land Access

Many case study farms achieved land access due to extraordinary circumstances:

- Side Yard Farm, Portland, OR: low-cost land access in perpetuity due to agreement with neighbors who do not want to profit from their land

- Little City Gardens, San Francisco, CA: successive land-owners have not been able to develop the parcel due to environmental factors: farm stays for free as de facto maintenance crew
- Love Is Love Farm at Gaia Gardens, Atlanta, GA: housing development offers free land to farmer with maintenance budget, equipment, and few restrictions on use

Difficult to get access to vacant land, even when programs to do so exist:

- Brother Nature Produce repeatedly unable to get land from Detroit Land Trust, despite a program to do so
- Our School at Blair Grocery and New Orleans grappling with vacant land still technically “owned” by residents who did not return to Lower 9th Ward ten years post-Katrina

Finding #2: Niche Produce

“There’s a certain pride in growing some calorie crops versus just garnishes. Garnishes are not very impressive. I don’t think I’d still be doing this if all we did was grow garnishes.” *Ben Flanner, Brooklyn Grange*

Yet the highest-grossing and highest \$/sf farms focus on **specialty products** like salad greens, sprouts, and garnishes.

Many small-acreage farms grow full-CSA or more calorie-dense crops to supply very small CSAs (10-20 members) or their own home/employee consumption.

- Those that focus on full-CSA-type crops have access to more land and/or are subsidized in another part of their operations (e.g. Springdale Farm’s 5-acre plot with a house purchased through tax abatement, Love Is Love Farm’s free access to land and maintenance budget, Mellowfields Urban Farm’s 3-year rolling lease at \$1/year).

Finding #3: Social Entrepreneurship

“We would get so many calls from teachers asking if they could bring their kids by. We would allow it, but it’s nonproductive, right? But a lot of the kids in the area can’t afford *any* fee... We don’t turn them away. It’s kind of our civic duty. If we’re as passionate as we are about it, then we have to catch these kids.” – *Paula Foore, Springdale Farm, Austin, TX*

- Six of 14 farms have some sort of education component, which is why two are for-profit/non-profit hybrids and one spun its education program off into a separate non-profit.
- 11 of 14 farms regularly offer tours, but most do not charge money for them
- Community development—interacting with neighbors, community groups, and the local food movement—and time not farming due to these activities make it difficult earn a profit.

Finding #4: Water Costs

Access to water for irrigation can be difficult, or prohibitively expensive:

- e.g. Baltimore: farmers who adopt lots from the city often do not know whether there is a water hook-up until they have the lot.

- Many terrestrial farms pay sewage and stormwater taxes on their irrigation water, which can be up to 2/3 the water bill

Changes to city water policies have benefitted the bottom line of urban farmers:

- Little City Gardens petitioned the San Francisco Public Utilities Commission, and received a \$7,000 grant to cover water meter installation costs.
- Portland, OR has changed its water billing policy to remove stormwater fees from meters used for agricultural irrigation.
- The Baltimore Department of Water allows all Adopt-A-Lot gardeners and farmers access to irrigation water (where available) for a flat \$120 fee for the season.

What is the Promise of Urban Agriculture?

Much more than food production:

- Case study urban farms aim to educate youth and adults, teach farming-skills and job readiness-skills, build community in their neighborhoods, and **get people interested** in knowing where their food comes from.
- Sales of produce from urban farms, even at a commercial scale, are often **supplementary** income or **a part of a larger business plan** that may include landscaping, catering, event-hosting, educational workshops, and more.
- Most farms **do not aim to feed the city**; rather, to provide a space for city-dwellers to explore the potential and excitement of agriculture.

“It always feels important for me to clarify when we talk about this as a for-profit business--that's definitely our funding strategy. That's how this stays afloat. But it still **feels only secondary to what's happening here...** Selling of vegetables and marketing of edible flowers and arranging of bouquets is **not so much our product as our currency: the way that we allow for the space to exist.**” - Caitlyn Galloway, Little City Gardens

Sustainable and Urban Agriculture Program (SUAP) at Virginia State University

Leonard Githinji (Virginia Cooperative Extension-Virginia State University)

Abstract

Food deserts are defined as low-income neighborhoods where a substantial number of residents have low access to a supermarket or large grocery store. They are also defined as areas with limited access to affordable and nutritious food. In Virginia, a high percentage (>17%) of the population live in food deserts and hence it is imperative to mitigate the situation by increasing urban food production. To accomplish that, urban dwellers should receive continuous education on various techniques of food production that includes hands-on training. Virginia State University (VSU) has an established program that offers comprehensive urban agriculture education across the state that targets gardeners, urban farmers, and extension educators. The program is engaged in conducting regular workshops, field days, and hands-on training on various urban agriculture topics, as well as developing and disseminating educational resources. The short-term outcomes for FY 2015- 2016 includes ≥ 200 individuals receiving awareness; ≥ 100 individuals receiving in-class training; and ≥ 20 individuals receiving hands-on training in urban agriculture. The medium-term outcomes includes ≥ 40 individuals changing behavior towards urban agriculture; ≥ 35 individuals making decisions to start urban agriculture projects; 5 faith or community based organizations starting community gardens; and 3 schools establishing school gardens. The expected long-term outcome is $\geq 25\%$ increase in fruits and vegetable production; $\geq 20\%$ reduction in cost of fruits and vegetables; ≥ 15 increase in local incomes; $\geq 10\%$ increase in urban food security; and $\geq 10\%$ reduction in Food Deserts in Virginia.

Introduction

Food deserts are defined as neighborhoods that lack fresh foods, especially fresh fruit, vegetables, and other healthy whole foods, and are often found in impoverished areas (American Nutrition Association, 2015). An alternative definition of food deserts is geographic areas where residents' access to affordable, healthy food options is restricted or even nonexistent due to lack of grocery stores that sell fresh produce and healthy food options within convenient travelling distance (Food Empowerment Project, 2017). The limited access to supermarkets, supercenters, grocery stores, or other sources of healthy and affordable food may make it harder for some Americans to eat a healthy diet (USDA Economic Research Service, 2017). Without access to healthy foods, a nutritious diet and good health are out of reach and communities maybe missing the basics that make neighborhoods livable (Treuhart, S. and Karpyn, A. 2010). According to the USDA Economic Research Service (2017), there are many ways to measure food store access for individuals and for neighborhoods, and many ways to define which areas are food deserts. These

measures include: accessibility to sources of healthy food, as measured by distance to a store or by the number of stores in an area; Individual-level resources that may affect accessibility, such as family income or vehicle availability; Neighborhood-level indicators of resources, such as the average income of the neighborhood and the availability of public transportation. Food deserts are often associated with high incidence of diet-related health challenges such as obesity. The other defining characteristic of food deserts is socio-economic, as they are most commonly found in communities of color and low-income areas. Some studies have reported that wealthy districts have several times as many supermarkets as poor ones do and that grocery stores in poorer neighborhood are usually smaller and have a smaller selection of fresh produce (Food Empowerment Project, 2017). The choices of accessible food are severely limited not only by the options available to them but also what they can afford. Unfortunately many food deserts contain very many fast food chains selling low quality meat and dairy food products that are high in fat, sugar and salt. The processed foods sold in such convenience stores alongside liquor stores combine to exacerbate the problem of unhealthy choices (Food Empowerment Project, 2017).

The United States Department of Agriculture reports that about 23.5 million Americans currently live in food deserts, including 6.5 million children. In Virginia, approximately 17.8 percent of the population lives in a food desert, with food desert pockets existing in every region of the state. According to the Food Desert Study Report (2014), Richmond was identified as the largest food desert for a city its size in the United States in 2012. It is imperative to mitigate the situation by increasing urban food production. To accomplish that, urban dwellers should receive continuous education on various techniques of food production that includes hands-on training.

Initiatives of Sustainable and Urban Agriculture Program at Virginia State University

Virginia State University has an established program that offers comprehensive urban agriculture education across the state that targets gardeners, urban farmers, and extension educators. The conceptual framework for the capacity building is outlined in Figure 1.

The program is engaged in conducting regular workshops, field days, and hands-on training on various urban agriculture topics, as well as developing and disseminating educational resources.

Measurable Outcomes

The outcome of the Sustainable and Urban Agriculture Program at Virginia State University is summarized in Table 1. The short-term outcomes are those directly tied to an intervention, measured at the end of the program or soon after a project or activity has been completed. They refer to changes in parameters such as knowledge, attitudes. Intermediate outcomes are those measured within several months after the end of the project or activity and include actions by participants based on what they learned. Long-term outcomes are measured a year or several years after project completion and include changes in conditions, policies, or organizational structure.

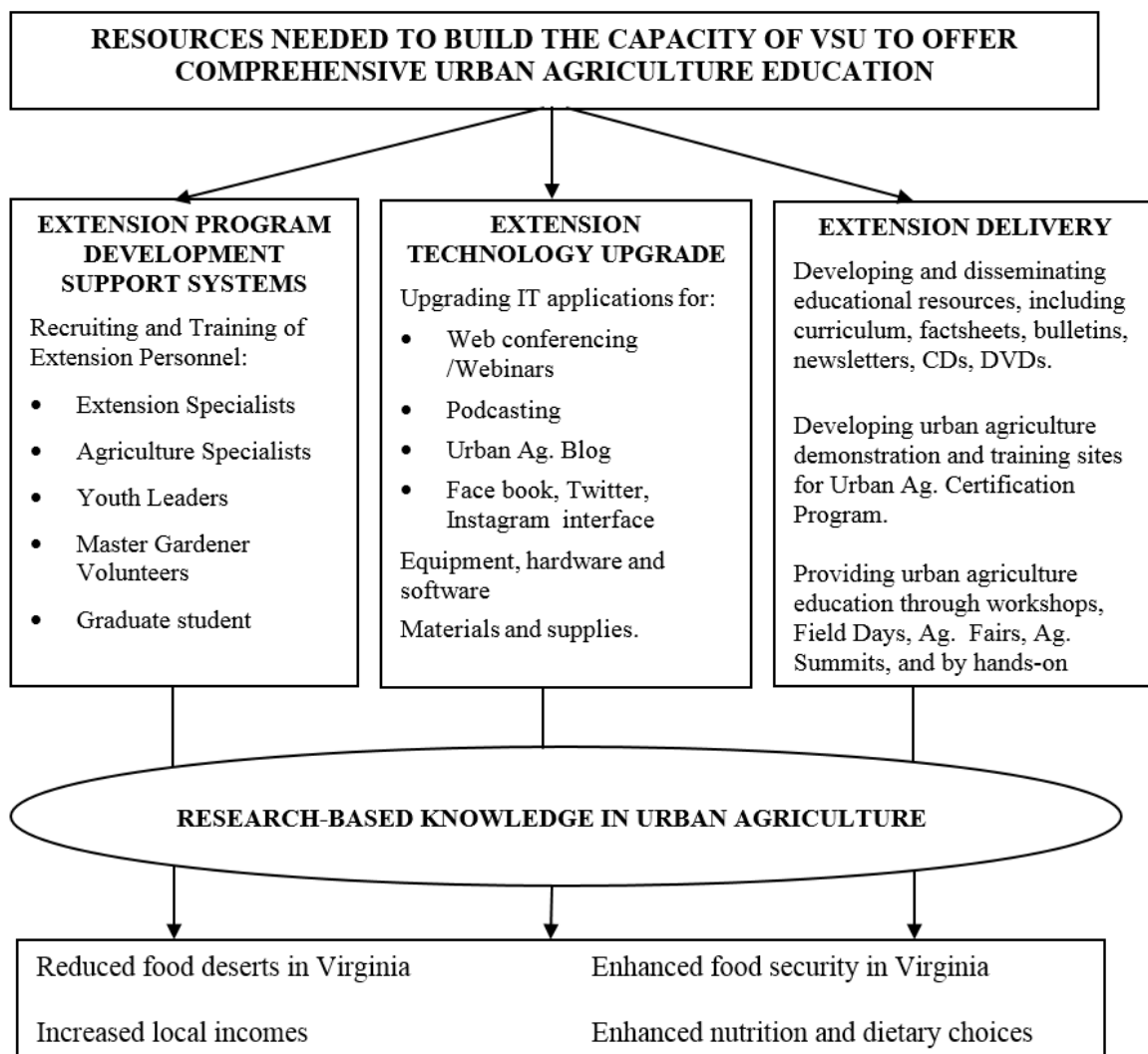


Figure 1: The conceptual framework for the VSU sustainable urban agriculture education program

Short-term outcomes include at least 200 individuals made aware of the sustainable and urban agriculture program at VSU; at least 100 participants received in-class training in urban agriculture; and at least 20 participants received hands-on training in urban agriculture. The medium-term outcomes include at least 40 participants changing behavior towards sustainable and urban agriculture; 35 participants making decisions to start urban agriculture projects; 5 community based organization starting educational gardens; and 3 schools establishing school gardens. The program estimates that it will lead to at least 25% increase in fruits and vegetable production; at least 20% reduction in cost of fruits and vegetables; at least 15% increase in local incomes; at least 10% increase in urban food security; and at least 10% reduction in Food Deserts in Virginia.

Table 1: Outcome metrics for the VSU sustainable urban agriculture education program

Description of outcome variable	Type of outcome	Metrics
Individuals receiving awareness	Short-term outcomes	≥ 200
Individuals receiving in-class training		≥ 100
Individuals receiving hands-on training in urban agriculture		≥ 20
Individuals changing behavior towards urban agriculture	Medium-term outcomes	≥ 40
Individuals making decisions to start urban agriculture projects		≥ 35
Community based organizations starting community gardens		≥ 5
Schools establishing school gardens		≥ 3
Increase in fruits and vegetable production	Long-term outcomes	$\geq 25\%$
Reduction in cost of fruits and vegetables		$\geq 20\%$
Increase in local incomes		≥ 15
Increase in urban food security		$\geq 10\%$
Reduction in Food Deserts in Virginia		$\geq 10\%$

References

American Nutrition Association. 2015. Nutritional Digest. Volume 38, No. 2.

<http://americannutritionassociation.org/newsletter>

Food Desert Study Report. 2014. <https://www.alce.vt.edu/dept-news/food-desert-report.pdf>

Food Empowerment Project. 2017. Food Deserts. <http://www.foodispower.org/food-deserts/>

Treuhart, S. and Karpyn, A. 2010. The Grocery Gap: Who Has Access to Healthy Food and Why It Matters. http://thefoodtrust.org/uploads/media_items/grocerygap.original.pdf

USDA Economic Research Service. 2017. Food Access Research Atlas.

<https://www.ers.usda.gov/data-products/food-access-research-atlas/about-the-atlas/>

Optimizing Nitrogen Management on Organic and Biologically-Intensive Farms

Douglas Collins, Andy Bary, Tuong Vu (Washington State University Extension)

Abstract

Organic farmers face a difficult problem in managing nitrogen: the magnitude and timing of nitrogen mineralization from organic matter cannot be easily predicted. Soil texture and management history both influence soil N-mineralization potential. Well-managed plant-soil systems are tightly coupled; they are balanced in terms of nitrogen availability and nitrogen uptake. Uncertainty about nitrogen fertility can lead to N deficient or N saturated systems caused by excessive and insufficient fertilizer applications. Too little fertilizer compromises yield and profit while over-application leaves nitrate in the soil that is prone to leaching during winter and poses a threat to water quality. A study was conducted with 5 organic vegetable producers across Washington State in 2016. Nitrogen contribution from organic matter and the economic benefit of 5 different rates of fertilizer application were assessed with broccoli. Through this ongoing research we will be able to place dollar values on the importance of optimizing soil nitrogen fertility. Growers will be able to more accurately estimate nitrogen mineralization from soil organic matter and adjust fertilizer applications up or down accordingly.

Introduction

Many direct-market farmers rely on organic nitrogen fertilizers that cost \$5 to \$9 per pound of plant available nitrogen. This can cost \$1,000 to \$1,800 per acre for heavy-feeding crops. Soil building practices such as incorporating leguminous cover crops and amendment with composts and manures can reduce fertilizer need. Disturbed soils and soils low in organic matter can experience dramatic increases in productivity following organic matter addition. Also, judicious use of organic amendments can maintain or enhance yields in soils with relatively high native productivity (Evanylo et al., 2008). However, it is difficult to quantify the extent to which fertilizers can be reduced based on past practices.

Fast, simple, and cheap methods to predict N mineralization are desirable for farmers, especially those that rely on soil building practices such as cover cropping and manure for soil fertility. Certified organic farmers are encouraged to use these methods to build soil and are required to use only organic sources of nitrogen for fertility. Depending on N content of organic fertilizers and amendments, only small amounts of N may be made available in the year of application while the bulk is likely to contribute to the organic matter pool (Gale et al., 2006).

Sullivan et al. (2008) described a site-specific method for growers to estimate N mineralization potential by plant uptake over the course of a growing season using a “zero-N” plot. A more rapid method with the potential to predict N mineralization before the growing season is the

Solvita™ colorimetric test for soils (Solvita Inc., Woods End, MA). The method has been correlated with other methods of determining carbon dioxide concentration (Haney et al., 2008). In addition to correlating 24-hour respiration with a 24-day incubation, Haney et al. (2001) also found strong correlation with forage uptake in fine sandy loam soil. The efficacy of these tests for predicting nitrogen mineralization has not been widely tested in field conditions, especially in western Washington.

The goals of the current study were to estimate optimum soil nitrogen fertilizer rates in organic broccoli production and evaluate how well nitrogen mineralization predictive tests estimate available nitrogen across five organic farms.

Methods

Field Trials: An experiment to assess nitrogen contribution from organic matter and the economic benefit of five different rates of fertilizer application was performed with 5 organic farms. Two farm sites were located near Royal City in central Washington (Sites 1-2) with a semi-arid climate. Three farm sites were located in western Washington (Sites 3-5) with a maritime climate.

Fertilizer rates were determined through interviews with cooperating farmers and by consulting broccoli production guides. At each farm, organic feather meal fertilizer (11%N, 0%P, 0%K) was applied at 0, 60, 120, 180, and 240 lbs N/acre in a randomized complete block design with 3 replications.

Certified organic broccoli transplants were prepared at a central location and transplanted following ground preparation and fertilizer application. Transplanting occurred in central Washington on 14 April 2016 and on in western Washington on 17 and 18 May 2016. Plant spacing was determined by individual farmers and was similar at sites 1,2,3, and 5. Site 4, the smallest farm planted broccoli at Weather stations were set up at each site to record air temperature for calculation of growing degree days.

Soil Analyses: Soils were sampled before planting broccoli and analyzed for bulk density (BD), water-holding capacity, organic matter (OM), nitrate-N, P, K, and pH. Soil nitrate-N was more intensively sampled by sampling at 0 and 28 days after transplant (DAT) and at harvest (between 71 and 79 DAT). In addition to laboratory analysis, soil nitrate was also analyzed with a field nitrate testing kit (EM Quant™). Nitrogen mineralization predictive tests were done for soils collected in spring before planting. Predictive tests included the Haney test (performed at Ward Labs, Kearney, WA) which includes both 24-hr CO₂ respiration (Solvita™ test) and predicted available nitrogen calculated from Solvita™ and weak acid extraction of mineral nitrogen. Other predictive tests were 42-day aerobic nitrate (NO₃) mineralization at 22 and 35 °C (incubated soils sampled at 0, 7, 21, and 42 days), and 7-day anaerobic ammonium (NH₄) mineralization at 40°C.

Crop Yield and N uptake: Marketable broccoli yield was taken from each plot. Additionally, three adjacent broccoli plants from each replication of each treatment were destructively harvested and combined into a single sample and analyzed for biomass, total N and total C.

Statistical Analysis and Interpretation: The average of 3 field replications was calculated for bulk density, basic soil analyses, Haney tests, 7-day anaerobic NH₄ incubation, and seasonal soil NO₃ with EM Quant™. The aerobic NO₃ mineralization rate (lbs NO₃ day⁻¹) was calculated by fitting a linear model with nitrate mineralization versus days of incubation and averaging the rate across replications. Broccoli yield and above-ground biomass were fit to linear models for each site. The statistical significance of fertilizer effect was tested with analysis of variance and means were separated with Tukey's HSD.

Results and Discussion

Despite the different climates, growing degree days (GDD_{7.2}) were similar at sites 1-4 and ranged from 652 to 701. Site 5 required more days to reach first harvest and accumulated 802 GDD_{7.2} (Table 1). Site 5 was a silt loam while the other sites were sandy loam, fine sandy loam, or very fine sandy loam.

Table 1. Climate, soil properties, and plant density at organic farm sites in Washington State, 2016.

Site	Climate	GDD _{7.2} to first harvest	Days to first harvest	Soil Type	BD g cm ⁻³	Plants acre ⁻¹
1	Semi-arid	701	71	Royal very fine sandy loam	1.10	17,424
2	Semi-arid	~700 ¹	71	Taunton fine sandy loam	1.24	17,424
3	Maritime	652	71	Yelm fine sandy loam	0.93	16,228
4	Maritime	679	72	Alderwood gravelly sandy loam	0.89	23,522
5	Maritime	802	79	Nooksack silt loam	1.06	16,228

¹The weather station at Site 2 was compromised, but GDD were likely similar to Site 1. GDD_{7.2}=Growing Degree Days with base temperature of 7.2 C

Soil organic matter ranged from 2.0% to 7.7% and pH ranged from 5.8 to 7.8 (Table 2). Organic matter was higher and pH was lower in the soils from the western Washington maritime climate than in the soils from the semi-arid climate in central Washington. Tests to predict N mineralization were consistent in their ranking of the soil sites with the exception of Site 5. The Haney tests predicted greater N mineralization from Site 5 than Sites 1 and 2, while the aerobic and anaerobic incubations predicted less mineralization from that soil than Sites 1 and 2 (Table 3). The Solvita test and 7-day anaerobic incubation showed the greatest range of potential mineralization among soils.

Table 2. Basic soil analysis from each site prior to planting.

Site	pH	NO ₃ -N mg/kg	P mg/kg	K mg/kg	OM %	Ca	Mg	B
1	7.7	3.2	86.9 ^a	195.2 ^c	2.8	11.0	1.7	0.3
2	7.8	1.1	18.9 ^a	235.6 ^c	2.0	7.8	1.4	0.2
3	6.0	3.0	206.0 ^b	207.0 ^d	7.5	8.1	1.4	0.6
4	7.1	6.2	102.9 ^b	255.2 ^d	7.7	12.7	1.7	0.3
5	5.8	3.0	25.2 ^b	68.2 ^d	3.5	6.7	1.4	0.5

^aOlsen P test, ^bBray P test, ^cOlsen K test, ^dNH₄OAC K test

Table 3. Results of nitrogen mineralization predictive tests.

Site	Haney Tests		45-day aerobic incubation, 0-6 inches		7-day anaerobic incubation, 0-6 inches
	Solvita CO ₂ -C day ⁻¹	Predicted N min lbs acre ⁻¹	NO ₃ lbs a ⁻¹ day ⁻¹		NH ₄ mg kg soil ⁻¹
			22 °C	35 °C	40 °C
1	12.8	11.7	5.1	11.2	40.5
2	18.8	9.1	6.2	11.0	55.2
3	116.2	53.3	8.3	24.7	113.4
4	60.9	46.9	5.3	10.8	100.2
5	40.2	18.0	2.7	8.0	9.0

At Site 1, broccoli transplants in several plots were completely lost to rodent damage, so Site 1 data was not included in above ground biomass or marketable yield analyses. Fertilizer rate had a significant effect ($p < 0.05$) on above ground biomass at Sites 2 and 4, but not Site 3 or 5 (Figure 1). Fertilizer rate significantly affected marketable weight at Sites 2-5 ($p < 0.05$; Figure 2). For aboveground biomass, Site 4 had the steepest slope in response to increasing fertilizer. Sites 4 and 5 had steeper slopes than Sites 2 and 3 for market weight. Soils with greater N mineralization

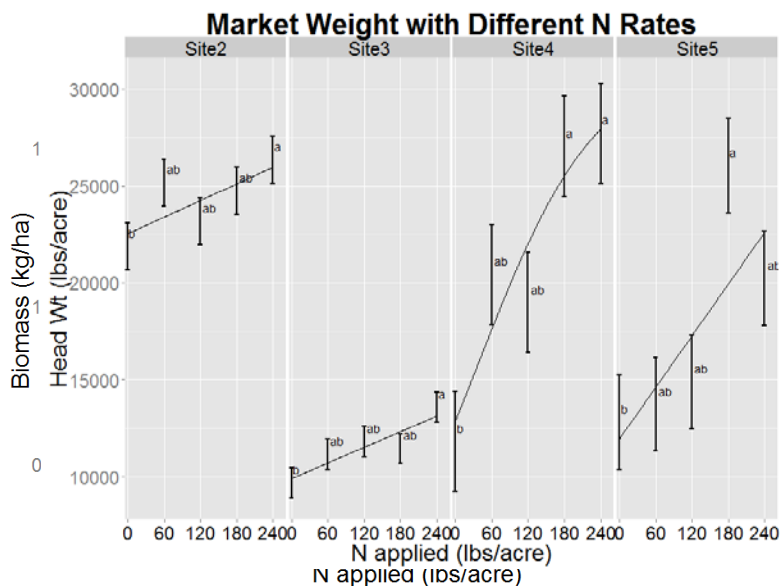


Figure 2. Market weight with different N rates. A linear model was the best fit for all sites and only Site 4 could be fit to a nonlinear logistic model, which is shown.

potential (e.g. Site 3; Table 3) should have had less response to fertilizer than sites with lower N mineralization potential values (e.g. Sites 1,2, and 5). The high response to fertilizer at Site 5 is predicted by the low N mineralization potential. Site 4 had a surprisingly high response to fertilizer given the high predicted N mineralization potential. This farm plants broccoli more densely than the other sites (Table 1) and the more dramatic fertilizer response could be explained by intraspecific competition. Site 3 had a similar response to Site 2. The relatively low response at Site 3 is predicted by the high N mineralization potential, but the low response at Site 2 is surprising.

That a linear model fit best for market weight at all sites suggest that N was not applied at a high enough rate to find the rate where N availability did not limit market weight. However, fall soil nitrate levels are another indication of appropriate nitrogen application rate; leaving excess nitrate in the soil after harvest can degrade water quality. Soil nitrate at 30 ppm or greater is considered high and equates to about 105 lbs $\text{NO}_3\text{-N a}^{-1}$. Sites 4 and 5 had excess nitrate in the soil with fertilizer application greater than 60 lbs N acre^{-1} . These soil nitrate values are based on the EM Quant quick test and are being validated by laboratory analysis. Economic analysis is also underway and the experiment will be repeated in 2017.

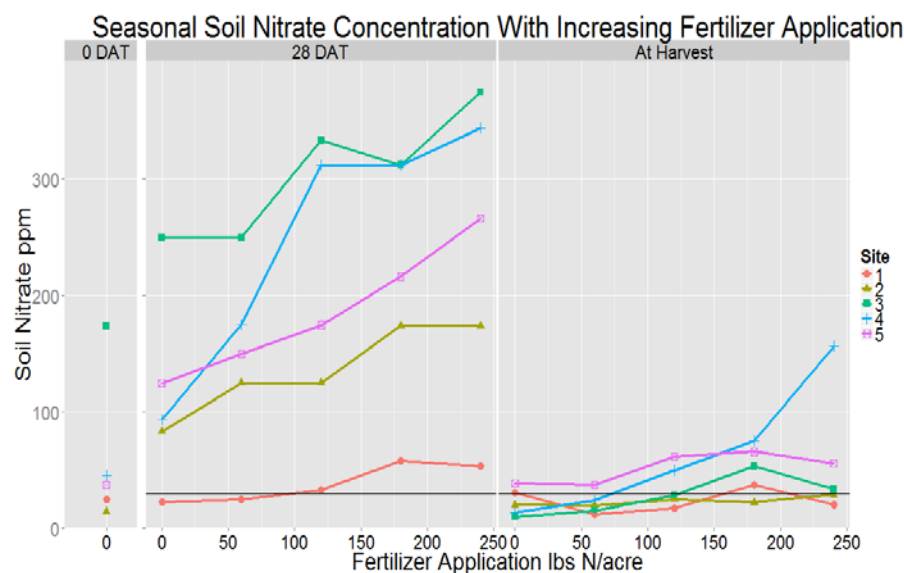


Figure 3. Seasonal soil nitrate concentration with increasing fertilizer application. Horizontal line represents 30 ppm.

References

- Evanylo, G., C et al. 2008. Soil and water environmental effects of fertilizer-, manure-, and compost-based fertility practices in an organic vegetable cropping system. *Agriculture, Ecosystems & Environment* 127:50–58.
- Gale, E.S., D.M. Sullivan, C.G. Cogger, A.I. Bary, D.D. Hemphill, and E.A. Myhre. 2006. Estimating Plant-Available Nitrogen Release from Manures, Composts, and Specialty Products. *Journal of Environment Quality* 35:2321.
- Haney, R.L., W.F. Brinton, and E. Evans. 2008. Soil CO₂ Respiration: Comparison of Chemical Titration, CO₂ IRGA Analysis and the Solvita Gel System. *Renewable Agriculture and Food Systems* 23:171–176.
- Haney, R.L., F.M. Hons, M.A. Sanderson, and A.J. Franzluebbers. 2001. A rapid procedure for estimating nitrogen mineralization in manured soil. *Biology and Fertility of Soils* 33:100–104.
- Sullivan, D., J.P.G. McQueen, and D.A. Horneck. 2008. Estimating nitrogen mineralization in organic potato production. *Oregon State University Extension* EM 8949-E.

Extension of Local Food Production in Idaho Using High Tunnel Technology

Jennifer Jensen, Stephen Love, Ariel Agenbroad, Tony McCammon, Wayne Jones, Stuart Parkinson, Lance Ellis (University of Idaho Extension)

Abstract

This presentation will report on three case studies of farmers involved in a season extension research project where high tunnels were used to enhance production through length of growing season and diversity of crops. One of the goals of this project is to increase knowledge and skills needed to effectively use high-tunnels. Along with other objectives, this project aimed to research to identify superior crops and crop cultivars for use in Idaho high tunnel production. The project engaged three Idaho producers in geographically and climatically diverse regions in research and field trials using high tunnels for season extension of horticultural crops. The team evaluated crops identified by producers to be of significant economic potential as new or year-round enterprises. The project started in 2013 with crop data (crop value and monetary return) being collected in 2014, 2015 and 2016. Three farmers had trials of different crops at each of their high tunnels, working the high tunnels into their existing farms. One grower compared the high tunnel structure with her use of smaller hoop houses and black plastic. Another grower utilized the high tunnel to grow hot peppers that would not otherwise have matured without season extension. The third farmer evaluated high-value medicinal and homeopathic plants. Outcomes from this project include two farmers who have been able to produce crops that otherwise would not have been productive in their regions. The other grower has been able to determine which crops grow better in the high tunnel as compared to other season extension techniques.

Introduction

High Tunnel Use in Food Production

Defining a High Tunnel: High tunnels, which may also be called hoop houses or unheated greenhouses (Carey et al., 2009), are structures that are tall enough for a person to stand up in (Blomgren and Frisch, 2007). High tunnels are covered in a single or double layer of polyethylene greenhouse film (Carey et al., 2009). The design of the structure can vary (for example: gothic or Quonset) and may be built as semi-permanent, movable or temporary structures (Carey et al., 2009). High tunnels are unheated and are passively ventilated growing structures (Blomgren and Frisch, 2007; Carey et al., 2009). Although the high tunnels do not have permanent heating systems, portable heaters may be used when temperatures drop below expected values (Hunter et al., 2012; Carey et al., 2009). Despite the lack of heat, the polyethylene film may remain on single span structures for winter protection of hardy crops (Blomgren and Frisch, 2007; Carey et al., 2009).

Larger high tunnels may be designed to allow for tractor tillage while small high tunnels may utilize walk-behind rototillers (Lamont, 2009). The cropping system may also utilize row covers inside of the high tunnel for additional crop protection (Lamont, 2009).

Benefits of a High Tunnel: A high tunnel can extend the growing season and protect crops from cool temperatures or other weather events such as wind rain or hail while being relatively inexpensive to construct (Lamont, 2009). A number of crops can be grown successfully in high tunnels, but some of the main crops grown in high tunnels appear to be tomatoes, cucumbers and peppers (Lamont 2009, Carey 2009). Growers can utilize these season protective structures to obtain earlier yields which have a greater value at the market (Hunter et al., 2012).

High Tunnel Research: Research of high tunnels has been conducted in the United States on varied topics from crop production (Carey, et al 2009; Wallace et al., 2012; Waterer, 2003; Hunter et al., 2012), to varying temperatures within a high tunnel (Wein, 2009), to the economics of a high tunnel (Galinato et al., 2013; Waterer, 2003). From an informal survey of extension specialists, the top crop grown is tomato, while cucumbers and peppers are also very common. Idaho and Montana, were not represented in the survey. Neighboring states, such as Washington and Utah have conducted research on crops such as lettuce (Wallace et al., 2012) and tomatoes (Hunter et al., 2012). Carey et al. (2009) note that because the high tunnels are so easily influenced by the local environmental conditions, local research and extension efforts can be valuable (Carey et al., 2009).

Extension of Local Food Production in Idaho Using High Tunnel Technology Project

The goal of this project expands on previous research on high tunnels and to increase the knowledge of high tunnels and their uses for local food production in Idaho. The project was developed at the request of food producers on small farms in south Idaho. Surveyed food producers indicated that the major obstacle in producing food year-round in Idaho was the short growing-seasons typical of Idaho's climate and that season extension is essential for local food production in Idaho (Cruz and Salant, in review).

The full project aims to research a superior design for high tunnels in particularly windy locations and to highlight growers' use of crops and cultivars that can be grown under high tunnels to increase food production and profitability. This presentation will just focus on the case studies of the farmer cooperators involved in the project.

Methods

A team of eight University of Idaho faculty members and a producer experienced in on-farm research and education worked together to form the goals and necessary materials for this project. The objective for the crop performance research is to identify crops and cultivars appropriate for production in high tunnels and to extend the growing season for currently grown, high-value crops through the use of high tunnel technologies (Love et al., 2013). The team aims to complete these objectives by reviewing existing research on high tunnels, collaborating with

producers to set up crop trials and collect data for three years, and by providing producer and professional education through field days or tours.

Originally the team hoped to work with four small farms located in northern, southwestern, and southeastern Idaho for the crop performance research. The northern site is in Sandpoint, Idaho where Greentree Naturals certified organic farm is located. Crop trials began in the summer of 2014. The following year, 2015, crop trials began at two new small farms that had agreed to participate in the project. Onsen Gardens, in Buhl, Idaho and Next Generation Organics, in Homedale, Idaho began participating in the crop performance research and the educational aspects of this project. The extension educators on the team worked with the farmers to collect temperature information using Hobo 8K Pendant® Temperature/Alarm (Waterproof) Data Logger with solar reflectors both inside the high tunnels and outside. The team also worked with the cooperating farmers to collect yield information as it related to sales and profit.

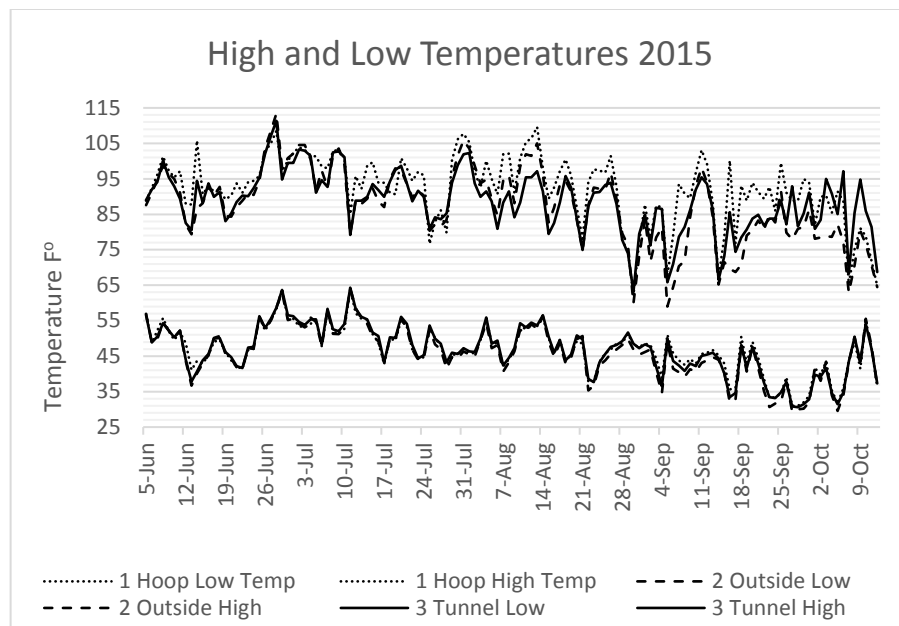
Case Study

Greentree Naturals – Sandpoint, Idaho

History of the farm: Diane Green and Thom Sadoski have been running Greentrees Natural as a certified organic farm since 1992. Greentree Naturals Farm is located 12 miles northeast of Sandpoint. The cultivated area on the farm is approximately 2.5 acres, but continues to grow. After starting out selling excess produce at a farmer's market in 1990, they slowly expanded to include selling to restaurants, a CSA subscription service and on-farm research and educational events (DePhelps et al., 2005). Diane Green sells organic vegetables, herbs and flowers.

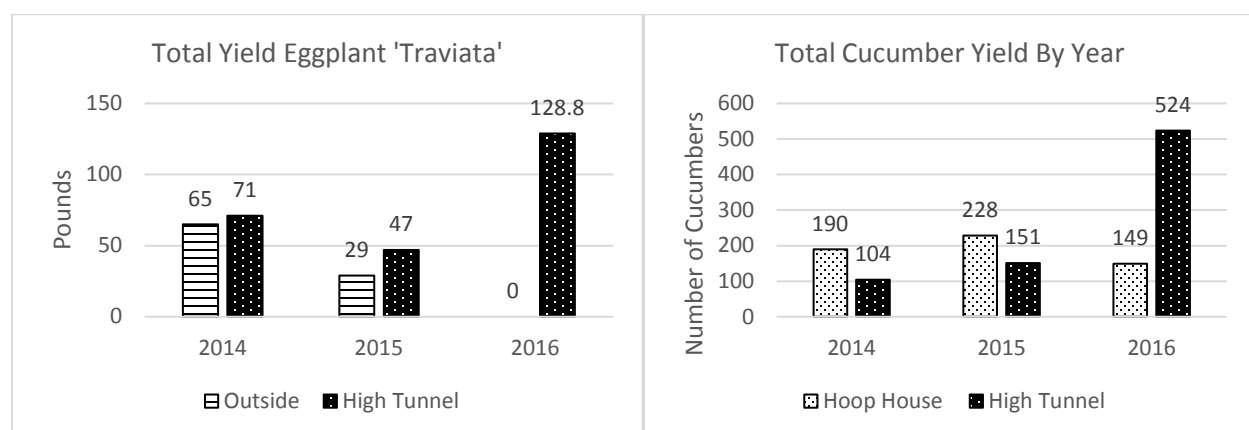
Use of High Tunnels: Greentree Naturals Farm has utilized smaller sized hoop houses (approximately 13' wide with varying lengths) for crops such as cucumbers, peppers, and tomatoes. Although these would technically fit the description of a high tunnel (Blomgren and Frisch, 2007), a larger sized high tunnel was installed for this project. This structure will hence forth be referred as the high tunnel. The high tunnel is 24' x 48' and is a gable style from Northwest Garden Domes. The high tunnel is used to grow cucumbers, eggplant, basil, peppers. For this presentation we will be focusing on the high tunnel cucumbers compared to the hoop house cucumbers and the high tunnel eggplant compared to eggplant grown outside. It is noted that the eggplant grown outside is grown with a black plastic mulch to help retain heat. The cucumber cultivar is 'Green Fingers' and the eggplant cultivar is 'Travaita'.

Temperature Results from Project: At Greentree Naturals Farm we wanted to record the temperatures from the high tunnel, hoop house and outside. A temperature sensor was located in each location on a stake about 1.5 feet high to measure the air temperatures around the plants. These sensors were set to record the temperature every half hour. From this, you can see the high and low temperatures in each location in the following figure for 2015.



Yield Results from Project: Eggplant ‘Traviata’ was evaluated inside and outside the high tunnel. ‘Traviata’ is a high yielding, traditional bell shaped eggplant. This cultivar showed the highest yields in the trials conducted by the Agricultural Experiment Station of the University of Rhode Island in 2013. The eggplant both inside and outside was grown with a black plastic mulch. Both had drip irrigation. According to some seed catalogs, ‘Traviata’ is suited to both greenhouse and field production. At Greentree Naturals Farm, the eggplant had greater yields in the high tunnel as compared to outside each year.

Cucumber ‘Green Finger’ is the cultivar that was used in this project. These plants were grown in the high tunnel and the hoop house. Again, they both had black plastic mulch and received drip irrigation. These results varied by year. In 2014 the plants in the hoop house yielded greater number of cucumbers than the plants in the high tunnel. Reversely, in 2016, the plants in the high tunnel yielded greater numbers of cucumbers.



Conclusions

This study on Greentree Naturals Farm showed that high tunnels or other structures can have an impact on production of vegetables. It was not the intent of this farm to extend the growing season beyond the frost dates, but rather improve production during the normal growing season. The eggplant grew particularly well in the high tunnel, especially in 2016. From the farmer, Diane Green, “The eggplant, hands down thrive and produced exceptionally better in high tunnel than outside in black plastic.”

The results from the cucumber were mixed. A closer look at the economics of the production might help determine if one structure is more profitable than another. The small hoop house structure is relatively expensive even compared to a high tunnel. Greentree Naturals estimates that they spent about \$600-\$700 to construct the 13' x 36' hoop house while the high tunnel cost approximately \$3,300 (not counting labor).

Further research on crop production and the economics of high tunnels should help farmers determine if they are right for their farms in Idaho. It does seem clear though that a farmer is able to have greater yields, thus increasing the amount of locally produced food available, by having high tunnels.

References

- Blomgren, T and T. Frisch. 2007. High tunnels: Using low-cost technology to increase yields, improve quality, and extend the season. August 19, 2016.
<https://www.uvm.edu/~susagctr/resources/HighTunnels.pdf>
- Carey, E., L. Jett, W. Lamont Jr., T. Nennich and M Orzolek. 2009. Horticultural crop production in hightunnels in the United States: A snapshot. *HortTechnology* 19(1): 37-43.
- DePhelps, C., C. Williams, J. Foltz, J. Potter and K. Faunce. 2005. Profitability through diversification on Greentree Naturals Farm. September 26, 2016.
<http://www.nwdirect.wsu.edu/studies/dianegreencasestudy.pdf>
- Galinato, S. and C. Miles. 2013. Economic profitability of growing lettuce and tomato in western Washington under high tunnel and open-field production systems. *HortTechnology* 23(4): 453-561.
- Hunter, B., D. Drost, B. Black and R. Ward. 2012. Improving growth and productivity of early-season high-tunnel tomatoes with targeted temperature additions. *HortScience* 47(6): 733-739.
- Lamont, Jr., W. 2009. Overview of the Use of High Tunnels Worldwide. *HortTechnology* 19(1): 25-29.
- Wallace, R., A. Wszelaki, C. Miles, J. Cowan, J. Martin, J. Roozen, B Gundersen and D. Inglis. 2012. Lettuce yield and quality when grown in high tunnel and open-field production systems under three diverse climates. *HortTechnology* 22(5): 659-667.
- Waterer, D. 2003. Yields and economics of high tunnels for production of warm-season vegetable crops. *HortTechnology* 13(2): 339-343.

Principles Guiding Practice: A Case Study Analysis of the Principles of Sustainable Agriculture for Diverse Farms

Marilyn E. Swisher; Kelly N. Moore (University of Florida); Christine Kelly-Begazo (University of Florida Cooperative Extension); Kaylene Sattanno (University of Florida)

Sustainable agriculture has gone from a controversial idea to a highly successful United States Department of Agriculture (USDA) program, the Sustainable Agriculture Research and Education Program (SARE). Two themes characterized the early controversy about sustainable agriculture. One was the discussion of the role of contemporary technology in agriculture, with proponents arguing in general for less reliance on chemical and on-farm inputs. This controversy has re-emerged recently in the discussion of agro-ecology and sustainable intensification as strategies for sustainable agriculture. The other was a robust discussion of the role of small farms in sustainable agriculture. This discussion also continues, spurred in part by the continuing decline in number of farms in the United States and the “greying” of the farm population. Between 2007 and 2012, the number of farms declined by 4.3 percent and the number of farmers aged 55 and older increased (USDA, 2014).

The University of Florida hosted fourteen agricultural professionals participating in the SARE Fellows program in 2011. The Fellows program is a partnership program between SARE and the National Association of County Agricultural Agents. The objective is to enhance understanding of sustainable agriculture among fellows so that they can create new programs in their work to better address the needs of local clientele. Participants are selected through a competitive process and supported to participate in four, week-long training programs over a two year period of time, one in each of USDA’s four regions. Four of each cohort of participants are Extension agents who are experienced in sustainable agriculture and want to expand their expertise (see <http://www.sare.org/Professional-Development/Fellows-Program/About-the-Fellows>).

The 2011 fellows participated in a guided discovery learning process on six agricultural operations that many in Florida consider good examples of sustainability. The objective of the process was to identify the principles that the operators use to guide their specific management decisions, including decisions with economic, environmental and social consequences. The seven operations included large and small farms, organic and conventional, livestock and crop enterprises, and traditional and direct sales marketing approaches. One of the main questions that participants addressed was the degree to which these small and large farms differ with regard to the principles on which they operate. Three of the operations were small and three were large, ranging in size from one acre to 300,000 acres. They included a mix of agronomic, horticultural and livestock enterprises, used a wide variety of market chains, and were under both family and corporate ownership and management.

The week-long learning experience focused on differences in principles and underlying philosophies of the farmers rather than specific practices. Much of the literature about small farms and about sustainable agriculture focuses on practices and how scale of operation interacts with practices. The goal in this project was to examine the underlying approach to farming taken by these successful farm operations to determine whether we could identify commonalities and differences among them. We used comparative case studies as the basis for the discovery learning process. Comparative case studies are both a research method and a strategy for learning because they foster a deep and reflective consideration of how to interpret what is observed and challenge the observer to examine, assess and perhaps change his/her own prior perceptions and mental models. They are particularly useful as a way to approach the learning experience for adults who bring a wealth of prior experience and knowledge to the learning process (Peterson, DeCato & Kolb, 2015; Roessger, 2014; Zepke & Leach, 2002). Applying the central concepts of directed discovery learning, we provided background information about each operation. The participants studied the information prior to arriving at each operation and worked in small groups to create a set of questions to ask the manager(s) about the underlying philosophy and principles that guide the management prior to spending one to six hours on site. The information was analyzed in the small groups after the visit, and a summative analysis was completed after all seven sites were visited.

Although these operations are very diverse in terms of characteristics like size, enterprise mix, capitalization, technology used, marketing strategies and manager experience, the study showed consistent similarities in the principles that guide their decision-making and nine broad principles of sustainable agriculture were identified (Moore et al., 2016). Most of the contemporary theoretical concepts about social, economic and environmental sustainability are reflected in the operating principles of these businesses. These principles are not “rules” about how to run a sustainable operation. Rather, they are components of an emerging model of how farmers use and create sustainable agriculture on their operations. Taken as a whole, the authors believe that these principles provide useful ideas about the everyday practice of sustainable agriculture that are generalizable across many kinds of farm operations (Table 1).

The commonalities in principles, norms and values far outweighed the differences among the farm operations studied. Three overarching themes are especially important for small farmers who look to creating sustainable farm operations.

Table 1. Nine generalizable principles of sustainable agriculture guiding farmers' decision-making regarding their operations*

1	Sustainable farmers anticipate change—they recognize, accept, plan for, and create change.
2	Sustainable farmers recognize and identify limitations and resources and create a strategy to develop their resources and to minimize and overcome limitations.
3	Sustainable farmers build strong, mutually beneficial relationships with individuals, institutions, and organizations based on a sense of responsibility to the community and the need to give back to the community.
4	Sustainable farmers invest in their employees to create a loyal, dedicated, and engaged workforce that shares responsibility for the success of the farming operation.
5	Sustainable farmers are not satisfied with average business practices or products; high quality characterizes every component of their businesses.
6	Sustainable farming operations are management-intensive, distribute responsibility and decision-making among all employees, draw upon diverse skill sets in management, and integrate management functions and decisions across the farm operation.
7	Sustainable farms are businesses first and foremost, but profits are used to both grow the business <i>and</i> address broader social and environmental goals.
8	Sustainable farmers take appropriate risks, incur reasonable debt, and make investments based on mid- to long-term challenges and opportunities.
9	Sustainable farmers have a passion for farming reflected in their dedication, integrity, and honesty as professionals, but their passion is <i>practical</i> because they understand that the success of the business makes it possible to pursue their passion.

*Taken from Moore, Swisher, Kelly-Begazo et al., 2016, p. 68.

One is that recognizing risks and opportunities and adopting a flexible, adaptive approach to farming that can change to meet the changing economic, biological, and social environments are critical characteristics of all of these farms. These farmers are masters of creating mid- to long-term strategies based on the assumption that they will need to face change imposed upon them and that they must be able to create change to be successful. Changing consumer food preferences, for example, created market opportunities for these farmers that were critical in their success. Rather than resist or deny the power of the consumer driven economy, they embraced it. Their approach to dealing with other kinds of changes was similar. They were proactive in recognizing changes in the resource base, especially availability of water for agriculture, and were taking active steps to adjust to a changing climate and changing policies governing the management of critical resources. Another somewhat surprising theme that spans several of the principals was that these farmers draw fewer distinctions between the “strictly economic” and “social responsibility” than one might anticipate. While they are clearly all businesspeople – they run their farms to make a living – the degree to which service to the community, earning respect and trust from neighbors, business partners, and employees and “doing the right thing” were enmeshed in their business philosophy was a trademark of their operations. This was true regardless of size of farm, although the practices they used in their “social-economic” philosophy

of farming differed. Third, not surprising, all of these farmers were passionate about farming, not just as a profession but as a way of life.

The importance of these themes suggests that many of the ideals of small scale and family agriculture remain embedded in U.S. agriculture among farmers respected for the sustainability of their operations. Perhaps there are more similarities between farms concerned about sustainability in the broadest sense of the term than there are differences due to size or type of operation. This learning experience also has important implications for teaching about sustainable agriculture, whether in the formal classroom setting, through Extension, or in a non-profit organization. What we learned suggests that we should concentrate on principles and norms as well as the specific practices of sustainable agriculture because they appear to play a guiding role in the ability to translate between sustainability as an idea and as a practice and because they help us identify what farmers have in common, regardless of the many differences among individual farm operations. They may provide a framework for more strategic thinking about how to ensure the future of small farm agriculture.

References

- Moore, K.N., Swisher, M.E., Rodriguez, J.C., Blevins, M., Hogan, M., Hunter, L., Kelly-Begazo, C., Komar, S., Mills-Wasniak, S. & Redhage, D. (2016) Principles guiding practice: A case study analysis of the principles of sustainable agriculture for diverse farms. *Journal of Agriculture, Food Systems & Community Development* 6(3), 61-89.
- Peterson, K., DeCato, L. & Kolb, D.A. (2015) Moving and learning. *Journal of Experiential Education* 38(3), 228-244.
- Roessger, K.M. (2014) The effects of reflective activities on skill adaptation in a work-related instrumental learning setting. *Adult Education Quarterly* 64(4), 323-344.
- United States Department of Agriculture, USDA. (2014) *U.S. Farms and Farmers*. 2012 Census of Agriculture, Preliminary Report Highlights. Available at https://www.agcensus.usda.gov/Publications/2012/Preliminary_Report/Highlights.pdf
- Zepke, N. & Leach, L. (2002) Contextualised meaning making: One way of rethinking experiential learning and self-directed learning? *Studies in Continuing Education* 24(2), 205-217.

The Benefits and Challenges of Machinery Sharing Among Small-scale Fruit and Vegetable Growers

Linda Naeve, Georgeanne Artz (Iowa State University)

Throughout the U.S., interest in local foods is growing, among both consumers and producers. As the household consumer demand for locally produced food grows, so does the demand from businesses, such as restaurants, schools, supermarkets, and other institutions. To scale up their production level, meet the growing demand and increase profitability, local fruit and vegetable growers need to find ways to increase labor or improve labor efficiency through mechanization and other labor saving innovations.

Given the financial constraints faced by small-scale growers, particularly those who are new to agriculture, there is a strong interest in sharing machinery in order to reduce costs. Evidence from a survey of fruit and vegetable growers undertaken in January, 2012 supports this notion. Seventy percent of the respondents answered they would consider sharing equipment with other growers.

Small-scale growers face some unique challenges for sharing machinery. Relative to row crop operations, there is greater diversity of specialized equipment used by fruit and vegetable growers, such as small tractors, transplanters, bed shapers, planters for multiple-sized seed, mulch layers, mulch removers, rotovators, potato, and root crop diggers. Leasing, renting or custom hiring machinery can be a lower cost option, but in many regions these options simply do not exist for the range of specialized equipment used in small-scale fruit and vegetable production.

Sharing among these growers typically involves a greater number of producers who are geographically dispersed, making transportation and logistics of scheduling use more complex. Finally, many specialty crop growers are new to agriculture and are not experienced equipment operators. This raises an additional question of the necessary skills required to safely and properly operate machinery which may be shared.

These issues were addressed through a case study conducted in 2013 with small-scale fruit and vegetable producers in Iowa by faculty and staff at Iowa State University. The study, funded by the Leopold Center for Sustainable Agriculture, worked with five groups of producers on different types of equipment sharing strategies to develop cases and best practices associated with machinery sharing. The objective of the equipment sharing project was to create awareness of alternative strategies for equipment ownership that growers can implement in their operations to enhance profitability and reduce risk when scaling up production.

Project Description

In February, 2013, applications were sent out to producers and producer groups. Applicants were required to identify a specific piece of machinery to be shared and to name a group of two or more farmers interested in participating in the sharing agreement. The study worked with five groups which were required to develop a machinery-sharing agreement and follow it as they shared their specific piece of machinery throughout the 2013 growing season. The groups also completed and provided time-use logs and financial records for their shared equipment and provided input and suggestions regarding the operation of their specific equipment-sharing model. The researchers assisted the groups in developing their sharing agreements. Templates were provided for their equipment-use time logs and financial records and an orientation teleconference was held to discuss procedures, timelines, and project requirements. An electronic survey of the 21 participating farmers was conducted after the first growing season to gather information on the effectiveness, growth and sustainability of their machinery-sharing group and agreement. Case studies were developed and published in an Iowa State University Extension and Outreach Publication, *Machinery Sharing Manual for Fruit and Vegetable Producers*.

Available as a downloadable pdf at: <https://store.extension.iastate.edu/Product/Machinery-Sharing-Manual-for-Fruit-and-Vegetable-Producers>.

Discussion

Why Share?

The first thing to understand is why growers would incorporate machinery sharing in their production system. The primary reason many producers consider sharing machinery is the potential for reduced costs. The access to farming equipment can improve productivity and quality, and replace expensive or hard to find labor. In many cases, owning a share of a high-priced machine reduces individual investment and invested capital. However, the possible benefits of shared use extend beyond the cost savings. Sharing may frequently be one of very few, or the only means by which a small-scale grower can feasibly acquire use of equipment used infrequently that is relatively expensive, since owning this type of equipment individually is cost prohibitive. Higher capacity equipment can reduce the time spent to complete critical operations (e.g., planting or harvesting before rain), thus significantly reducing production risk and even facilitating expansion.

Beyond the potential for cost savings, sharing can lead to a number of other potential benefits. Working in a group can allow members to specialize in the tasks they are best at or most enjoy, which can improve labor productivity. Group members share ideas and expertise that improve production practices on all members' farms. Co-ownership or shared leasing of a machine can create opportunities for custom work, adding an additional income source for small farmers.

Collaborating can help smaller farmers attain some advantages of larger farms, such as access to volume discounts on inputs, and better terms for obtaining credit, storage, services and marketing and distribution opportunities. Equipment sharing can lead to collaboration in marketing or selling farm products; for example, the group may be able to attract specialty contracts that pay premiums for delivery of a larger amount of product.

What to Share?

Not all equipment lends itself easily to a sharing arrangement. In general, equipment for which the timing of use is critical or which is needed very frequently for relatively long periods of time would be challenging to share with other growers. In contrast, the types of equipment needed only once or a few times per year and for which the timing of use is more flexible are good candidates for a sharing agreement. For example, the window of opportunity for using a plastic mulch layer could be a few weeks, giving partners the flexibility needed to move the equipment between farms. There are exceptions to this rule, however. One of the cases in our study jointly purchased and shared a mechanical weeder. Weed control is an on-going task throughout the growing season and a fairly time sensitive task. The three growers involved in sharing the mechanical weeder were able to structure an agreement that overcame the challenges involved since their operations were small and they were located in close proximity. The members of this group agreed that a small group size is important when sharing the mechanical weeder; they felt due to the frequency and timing of its use, they could not accommodate additional members.

Another important consideration in choosing equipment to share is compatibility with other equipment owned by members such as tractors. Compatibility of the equipment between the member farms is also a concern. Will the equipment work with all partners' plant and row spacing, for example? In addition to operating expenses such as fuel, other shared expenses may include labor needed to operate the equipment, other materials such as plastic for the mulch layer or totes for a berry harvester, and the costs of transporting the equipment between members' farms.

How to Share?

There is no "right" way to organize a machinery sharing arrangement. They range from very informal, "handshake" agreements, to highly structured business entities. The appropriate organizational structure for any given group will depend on group goals, the extent of shared resources involved, and the nature of the relationship between partners.

Individual ownership: Sharing does not necessarily need to involve joint ownership of machinery. Group members may individually own pieces of equipment and agree to share their use. For example, one grower might own a mulch layer, while another owns a transplanter. They could agree to contribute the equipment for use by the group. This type of arrangement is simple

in that, while the equipment is shared, the costs of owning, maintaining, insuring and housing the machinery are borne by the individual owners.

Joint ownership: Group members jointly acquire the equipment to be shared, either by leasing or purchasing the machinery together. Typically, group members each contribute a portion of the cost of the machinery, if purchasing outright, or the necessary down-payment, if financing the machine. These upfront costs may be shared equally among group members.

Operating Agreement Considerations: An operating agreement is a written document that outlines the specifics of how an equipment sharing arrangement will work and outlines the key rights and responsibilities of each member in the arrangement. A basic operating agreement for any business type includes language about the parties involved, management of the business, member voting procedures and rights, and dissolution. There are four very general categories of issues that should be addressed within an operating agreement: 1) operational issues, 2) division of benefits and costs, 3) financing issues, and 4) strategic issues.

With Whom to Share?

One of the most important, and often most challenging, aspects of forming an equipment sharing arrangement is finding partners you can trust and with whom you can communicate and work with effectively. One way to think about the types of characteristics you might seek in potential partners is to consider both similarities and complementarities. For some aspects of the farming operation you will want to find like-minded partners. It may be advantageous to have partners who complement each other and their operations. If members bring different skills, strengths, and interests to the group, the total may be greater than the sum of the parts. For example, if some members do not like bookwork and numbers, including a partner who enjoys these tasks could provide a real benefit.

Conclusion

The study revealed six common themes, or lessons learned when it comes to forming and sustaining a successful equipment sharing group.

1. Trust and good communication are important factors for making shared equipment use successful. This is extremely important when the partnerships are forming. Transparency about what type of equipment is being purchased to share, who will store it and what are the costs to operate and maintain the equipment is critical to build trust and a good business relationship. Also, plant and row spacing needs of the equipment may need to be communicated early in the planning so the machine and crop spacing are compatible.
2. Compatibility matters when choosing partners for a sharing arrangement, growers should consider both similarities and complementarities of the farms and people involved. One

group interviewed works because they are all beginning farmers who have skills, strengths, and interests that complement each other. This good embodied the idea that “the sum may be greater than the parts.”

3. Consider the complexity of the equipment. Unlike a lawn mower that works the same in most backyard situations, farm equipment does not perform the same from field to field, under a variety of soil types and terrain and when pulled by different sizes and types of tractors.
4. Distance matters. It is typically assumed that close proximity will make sharing equipment easier by reducing transportation costs and allowing the equipment to be used more frequently. However, in certain situations, long-distance sharing can make sense. One advantage of long-distance sharing is conflicts over scheduling can be avoided if there is enough variation in the growing seasons of participating farms and the equipment is used only once per season.
5. Not everything is worth sharing. In addition to considering the cost of mileage and time spent in transport, it is important to think about the labor required, the need for timeliness, and the difficulty of the task the machine would perform.
6. Greater partnerships can evolve. There is a lot of potential for small-scale fruit and vegetable producers to expand their partnerships beyond machinery sharing. A natural extension would be to cooperatively purchase transplants and supplies, such as crates, boxes, and bags, to reduce the unit costs as well as shared marketing of the product.

Additional Information

Artz, G., & Naeve, L. (2016). The benefits and challenges of machinery sharing among small-scale fruit and vegetable growers. *Journal of Agriculture, Food Systems, and Community Development*, 6(3), 19–35. <http://dx.doi.org/10.5304/jafscd.2016.063.003>

Artz, G., Naeve, L., & Edwards, W. (2014). *Machinery sharing manual for fruit and vegetable producers*. Available from <https://store.extension.iastate.edu/Product/machinery-Sharing-Manual-for-Fruit-and-Vegetable-Producers>

Sustaining Interest: GAPs Outreach for Small Scale Direct Market Produce Growers

Meredith Melendez, Wesley Kline (Rutgers NJAES Cooperative Extension)

Abstract

Outreach to farms in New Jersey on the topic of food safety and third party audit compliance began in 1999 at the request of fresh produce growers. The Rutgers On-Farm Food Safety team has reached over 6,000 growers since then. The team provides education through regional workshops, industry meeting presentations, timely blog posts on the Rutgers Plant and Pest Advisory and farm food safety walkthroughs. Partnerships with Extension Agents, industry organizations, non-profits, and state agencies have been imperative to have a broad reach to a diverse audience. Participation in national committees focusing on produce safety allows for greater understanding of regulatory changes and food safety science impacting the produce industry. Collaboration is key to providing up-to-date research and education for NJ growers. Multi-platform programming is necessary to achieve trust from growers, maintain interest in outreach and foster a commitment to fresh produce safety by growers.

The Rutgers On-Farm Food Safety Team was formed in 2012, after the signing of the Food Safety Modernization Act (FSMA) into law by President Obama. The team is composed of two County Agricultural Agents, one Extension Food Science Specialist, one food science Postdoctoral associate, and the Bureau Chief for Markets and Grading with the New Jersey Department of Agriculture. Prior to 2012 food safety outreach to fresh produce growers was offered by one County Agricultural Agent who spent half of his time focused on food safety outreach. The team was broadened and formalized in 2012, with none of the members focusing solely on produce safety. Regulation of the fresh produce industry has been historically left to buyer requirements, through third party audits. The implementation of the Food Safety Modernization Act Produce Rule has dramatically increased the need for produce safety education nationally. Regardless of regulations produce growers need to understand risks of produce contamination.

Methods

The goal of the Rutgers On-Farm Food Safety Team is to educate fresh produce growers on the risks of human pathogen contamination in production and postharvest activities. This education is tailored to their needs, and includes FSMA compliance, USDA Third Party Audit compliance and farms who will not be impacted by regulation or inspection. Farmer attendance at these educational workshops can be difficult to achieve, especially workshops focusing on non-regulatory or non-buyer required food safety topics. Collaboration with agricultural organizations in NJ and the region is important in increasing grower familiarity with food safety concepts. This is achieved through short presentations at regional and commodity specific meetings, regular posts on the Rutgers Plant and Pest Advisory, and a trade show booth at state

and regional events. Visibility at statewide events such as the Farm Bureau Convention, the Northeast Organic Farming Association NJ Winter Conference and the New Jersey Agricultural Convention allows us to interact with a wide ranging audience. The New Jersey Department of Agriculture has been a key partner in this education, as it oversees the New Jersey Food Safety Task Force, USDAs Third Party Audits in the state and will likely implement the Food Safety Modernization Act Produce Rule inspections. The New Jersey Food Safety Task Force is comprised of members representing State agencies, the grocery industry, wholesale produce buyers, the Jersey Fresh program, produce growers, the Farm Bureau, Extension and others. These annual meetings are informative for all participants on the food safety needs of the produce industry and helps guide the development of programming and outreach. It has been helpful to understand all levels of the produce industry and to have support from these sectors when applying for funding or conducting educational outreach. Information gleaned from these meetings is used to shape our outreach as well as keep producers informed.

Certificate based workshops are offered annually throughout the state during the winter months. Varying locations allow us to provide education regionally, increasing participation in the workshops. Workshops are tailored to audience needs, with advertisements indicating the focus of each workshop. Support materials are handed out as hard copies and provided on USB drives. These materials include sample information log sheets, sample standard operating procedures, cheat sheets for conducting risk assessments, food safety plan templates and other supporting documents. Focus areas for these workshops are Good Agricultural Practices (GAPs) for non-audited and regulated farms, USDA Third Party Audit Preparation and FSMA Produce Rule Compliance. The GAPs workshop is a one day workshop with four hours of food safety presentations and three hours of hands on farm food safety plan writing. The USDA Third Party Audit workshop is a seven hour workshop focusing on audit standards, risk reduction measures and the latest farm food safety research. The Bureau Chief for Market and Grading at the New Jersey Department of Agriculture participates in the workshop and is on hand to answer audit questions from the audience. During the winter of 2016/2017 we will begin to offer FSMA Produce Rule certificate trainings. These trainings are required for compliance with the FSMA Produce Rule, and we will utilize the Produce Safety Alliance FDA approved training curriculum. Six of these workshops will be offered throughout the state and are full day workshops, with the option of a second day for farm food safety plan writing.

Once a produce grower has attended food safety training they are eligible for a food safety walk through by one of the County Agricultural Agent team members. These walkthroughs can serve several needs, such as assisting beginning farmers in making infrastructure and field location decisions based on produce safety risks; evaluating established produce operations for risk; providing a mock audit which is required by the USDA Third Party Audit; and as a FSMA readiness review. In previously conducted walkthroughs the discussions and information shared has led to reduced contamination risk through modified farm practices, and a greater understanding of grower needs relating to produce safety.

Discussion and Conclusion

Surveys are conducted at each of the live workshops and annually through an online survey poll. Results indicate that the Rutgers On-Farm Food Safety Team is reaching a diverse audience of fresh produce growers statewide. This outreach is helping to reduce risk associated with eating fresh produce grown in NJ through the understanding of how produce can become contaminated and how to implement risk reduction measures. As local, state and federal regulations impact fresh produce growers the Rutgers On-Farm Food Safety team will continue to provide relevant and timely outreach to support the NJ fresh produce industry.

- During the 2015/2016 winter months farmer audiences were addressed throughout the state at the Farm Bureau Annual Conference, the NJ Agricultural Convention, the North Jersey Vegetable meeting and the Northeast Organic Farmer Association NJ winter conference. An additional 19 talks were given at regional and commodity specific meetings.
- During the 2015/2016 winter months 6 one-day workshops were held by the Rutgers On-Farm Food Safety Team to educate growers on USDA Third Party Audits, the Food Safety Modernization Act Produce Rule and Good Agricultural Practices. 60 paper surveys were returned by participants. Returned surveys indicated that 77% of respondents had attended previous Rutgers food safety workshops and 23% were first time attendees.
- Resources were developed to assist producers with their food safety plans and decisions including food safety plan templates, and cheat sheets on developing Standard Operating Procedures and risk assessments. These resources and other relevant materials were provided on a USB drive. 57% of survey respondents (n=30) indicated that they had utilized the USB device within two months of the workshop. 53% of survey respondents (n=30) indicated that they had utilized the food safety plan template provided to them at the workshop.
- Over 40 farms statewide have participated in on-farm sampling to evaluate risk in individual production systems. 92% of survey respondents (n=13) indicated that the sampling results were beneficial to implementing risk reduction practices on their farm.
- During the 2015 growing season 17 Rutgers Plant and Pest Advisory blog posts were written to provide timely reminders regarding food safety risks on New Jersey farms. 95% of survey respondents (n=20) who read the blog indicated that these posts were helpful to them.
- Survey responses (n=30) showed the top five changed practices as a result of attending Rutgers On-Farm Food Safety Team programming were: 1) worker health and hygiene training 2) equipment sanitation methods 3) water testing methods and/or frequency 4) produce packing methods 5) harvesting activities.

Success Beyond the Workshop: Reinforcement with On-Line and Take home Resources for Estate and Farm Transfer Planning

*Robin G. Brumfield, Meredith V. Melendez, Nick Polanin, Jenny Carleo, Barbara O'Neill
(Rutgers University Cooperative Extension)*

Abstract

A recent survey of New Jersey farmers (n=137) showed that almost 75% of respondents expected to pass down their farm to their children, and yet in another survey, only 16% had a transition plan, 40% had written goals, and 50% had wills. How can these expectations possibly be met without 'breaking the silence' and planning for the future they prefer? We developed the Preparing for Later Life Farming program to assist multi-generational New Jersey farm families with education and resources in estate and transition planning with funding from a USDA/NIFA award and Northeast Extension Risk Management Education grant. With additional support from the New Jersey Department of Agriculture and Farm Bureau New Jersey, we developed a dynamic training program to introduce concepts and communication strategies in a traditional setting. We launched the program in 2015 with 65 producers attending one of three consecutive eight-hour workshops held regionally across the state. We provided all program materials to attendees on flash drives and launched the website, <http://laterlifefarming.rutgers.edu>, to provide on-demand access to presentations and videos as references and to reach a larger audience. Post workshop, six month, and one year follow-up surveys revealed substantial knowledge gains and actions taken by these farm family participants. The website has logged over 200 video views, and survey respondents have requested the workshop be repeated periodically to reinforce what is presented online. Utilizing these communication techniques to educate clientele on estate planning has proven highly successful in getting this important conversation started back at the farm.

The Need

A 2012 survey of 137 New Jersey farmers who had participated in an *Annie's Project New Jersey* farm business management program showed that 69% had an interest in learning more about estate planning, yet only 16% had a written transfer plan. Seventy-one percent of those same respondents indicated that they expected to pass down the farm to their children, while only 40% of them had written down goals, and only 50% had wills. Farmers are aware of a need for farm succession plans, but indicate a lack of time and knowledge about how to do so.

The Program

Our *Preparing for Later Life Farming* program focused on this need by assisting multi-generational farm families with estate and transition planning (Melendez, et al., 2016). We offered eight-hour, one-day workshops in three locations in early 2015. Sixty-five producers attended the workshops. Presentations focused on farm transfer methods; financial decision-making strategies; finding legal and financial experts; and communication skills in beginning the

farm transfer discussion with family members and business partners. We recorded course materials and presentations and archived them online (Rutgers, 2016) so that participants could continue with farm estate and transition plans and to allow us to take the information beyond the classroom and into the homes of farm families unable to attend live workshops.

Curriculum

We recognized that Rutgers was not the first Extension program to develop estate and farm transfer programming; therefore, our project team utilized materials created by others. The primary resource for our program was the Pennsylvania Farm Link workbook titled “Planning the Future of Your Farm” (Pennsylvania Farm Link, 2013). Since this workbook contains references specific to Pennsylvania regulations, our Rutgers team developed a New Jersey addendum. We used workbook chapters as reference points for each of the talks, pre-workshop self-assessments, and group work. Upon registration for the course, we mailed participants a hard copy of the materials and emailed them a five-page self-assessment. This self-assessment, from the “Planning the Future of Your Farm” book, covered the following topics: rating family values, rating your comfort level, sketching your lifestyle plan, and estimating income and expenses. We asked participants to complete these assessments prior to the workshop. Assessment completion ensured that the participants had at least thought about some of the realities of their farm transfer and estate plan before the workshop.

The program agenda included the following presentations:

1. Welcome and Introduction to Program Resources
2. Talking with Your Family About Transitioning Your Farm
3. Identifying Goals and Objectives (group work)
4. The Do's and Don'ts for Successful Family Estate Transfers
5. NJ Farm Estate/Transfer Examples
6. Planning the Family Meeting (group work)
7. Identifying Financial Needs for Now and the Future
8. Identifying Future Financial Needs – Personal
9. Identifying Future Financial Needs- Business
10. Identifying Income Sources
11. Financial and Legal Realities of Farm Transfer
12. Finding Your Expert Team – Financial and Legal Advisors

The first barrier to developing a farm transfer plan is often family communication. The required discussions for developing a plan have the potential to inflame existing disagreements or create new ones. We used the “Who Will Get Grandpa’s Farm” videos (Purdue University, 2012) to show different types of communication, and how some forms of communication can be more productive than others. After watching each video, we guided participants in a discussion about the strategies and experiences depicted.

We created a supplemental to-do list to help participants identify the next steps to take in their farm estate and transfer plan. This to-do list included space to write down tasks that participants identified as needed to be done and a timeframe for completing them as they followed the workshop presentations.

Participants received a USB drive pre-loaded with handouts, PowerPoint presentations and supplemental materials. Our goal was to make resources as easy to access as possible. Materials included in the USB were a PDF copy of the PA Farm Link workbook, trade publications on the topic of estate planning, and Extension publications from Iowa State University, the University of Minnesota, Montana State University, and Rutgers University. We created New Jersey specific worksheets and provided them on the USB including: Choosing Your Team of Advisors, Identifying Personal Financial Needs, Identifying Retirement Income Sources, and Digital Assets Inventory.

At the end of the workshop we asked each participant to write three to five goals they planned to achieve in the next three months on a postcard. We collected the postcards and mailed them back to each participant three months after the workshop. This step served as a reminder to their desired progress, with the goal of prompting them to continue their planning.

We created a Preparing for Later Life Farming workshop website where materials, PowerPoints and videos of each of the presentations are available for viewing and download (<http://laterlifefarming.rutgers.edu/workshop/>). This website serves as an information resource for participants and allows the materials and presentations to reach an audience that was not able to attend the live workshops. In the first three months after the website was created, the presentation videos were viewed over 200 times. Participant survey results indicate that they are referring to these videos post-workshop to review information while continuing to work on their estate and transfer plans.

Results

The Preparing for Later Life Farming workshops had a total of 65 participants. Eighty percent of participants responded to an evaluation distributed at the end of the workshop to assess their knowledge gain. Each question was ranked on a scale of one to five, with one being poor and five being excellent. Knowledge gain was most strong with participants' ability to communicate with family members, skills to identify expert help, and understanding potential pitfalls in the estate transfer process.

We conducted a post-workshop survey six months after the workshop via SurveyMonkey online to evaluate progress made on estate transfer plans after the end of the workshop. Twenty-nine percent of workshop participants responded to the survey indicating that:

- 85% held a family meeting
- 100% located important estate documents needed

- 85% identified financial goals for the near future
- 65% identified financial goals for the far future
- 65% identified personal financial needs
- 65% identified business financial needs
- 50% evaluated their net worth
- 80% met with a lawyer and/or financial advisor

One year after the workshop we conducted a final online evaluation to assess participants' confidence in their estate and transfer plan development, usefulness of materials provided, and general feedback. Seventeen percent of participants responded indicating:

- 100% of responding participants found the paper handouts useful
- 80% of responding participants found the USB device materials useful
- 60% of responding participants watched at least one of the presentations online
- 40% had watched more than one presentation online.

These surveys found that workshop participants continued progress on their estate and transfer plans in the year after the live workshop. The one-year post-workshop survey data show that participants utilized technological resources including the USB drive, Rutgers' Later Life Farming Website, and Purdue University's videos to progress on their plans. Easily accessible materials in multiple formats facilitate the continued progress on farm estate and transfer plans and can easily be incorporated into future Extension estate and transfer plan programming.

References

- Melendez, M. V., N. Polanin, J. Carleo, R. G. Brumfield, and B. O'Neill, B. 2016. Beyond the Workshop: Continuing Estate and Transfer Plan Development by Providing Technological Resources. *Journal of the National Association of County Agricultural Agents* (NACAA). ISSN 2158-9429, Vol. 9, No. 1. <http://www.nacaa.com/journal/index.php?jid=626>.
- Pennsylvania Farm Link. 2013. Planning the Future of Your Farm: A Workbook Supporting Farm Transfer Decisions. <http://www.pafarmlink.org/succession-transition.html>.
- Purdue University. 2012. Who Will Get Grandpa's Farm? <https://ag.purdue.edu/programs/areyouprepared/grandpafarm/Pages/default.aspx>
- Rutgers, The State University of New Jersey. 2016. Later Life Farming. <http://laterlifefarming.rutgers.edu/>.

Acknowledgements

This material is based upon work supported by USDA/NIFA under award number 2012-49200-20031 and the Northeast Extension Risk Management Education program. Advertising support was provided by the New Jersey Department of Agriculture and Farm Bureau New Jersey.

Food Safety Outreach Program

Dawanna James-Holly (USDA- NIFA-IFSN, Division of Food Safety, Washington D.C.)

Abstract

Food safety is a diverse field in which regulatory controls are critical to the success of public health as a whole. In fiscal year 2015 and 2016, the Food and Drug Administration (FDA) proposed several major rules to implement the Food Safety Modernization Act (FSMA). These rules will significantly impact growers, small farmers and ranchers by introducing new verification activities across the US and abroad. The implementation framework offers opportunities to incorporate preventative training approaches across industry, academia and government (<http://www.fda.gov/Food/GuidanceRegulation/FSMA/ucm461513.htm>).

In this session, innovative methods designed by USDA-NIFA in partnership with FDA-Center for Food Safety and Applied Nutrition (CFSAN) will be introduced to reach small processors, beginning farmers, and new ranchers towards a holistic training strategy. Attendees will gain an overview of a newly established educational infrastructure encompassing a national coordination center and 4- large scale regional centers to implement the FSMA rules.

In fiscal year 2016, USDA-NIFA released the Request for Applications (RFA) <https://nifa.usda.gov/funding-opportunity/food-safety-outreach-program> for the Food Safety Outreach Program (FSOP). FSOP builds upon the national infrastructure to focus on the delivery of customized training to target audiences. To this end, grant proposals were solicited from local communities, to include those from community-based organizations, non-governmental organizations, food hubs, farm cooperatives, and other local groups. Applicants were eligible at each of three levels: *Pilot Projects*; *Community Outreach Projects*; and *Multistate Education and Training Projects*.

In addition, awardees are required to report program outcomes (self-assessments, lessons learned, best practices, and/or other metrics) to the 4 established regional centers. This is to ensure that activities and efforts undertaken by all FY2016 awardees are well integrated with the national infrastructure. Both NIFA and FDA are actively facilitating communication and interaction among project teams and regional centers. Partnership opportunities with new grantees present mechanisms for extension networks to expand their knowledge, skills and abilities towards FSMA compliance.

Applicant categories consist of the following:

Pilot Projects – Up to \$50,000 each

These projects will support the development of potentially high-risk and high-impact food safety education and outreach programs in local communities, addressing the needs of small,

specialized audiences from among the various target groups. Pilot projects will focus on building the capacity of local groups to identify very specific needs within their communities, and to implement appropriately-customized food safety education and outreach programs to meet those specific needs. For example, Pilot Projects may target non-traditional, niche, or hard-to-reach audiences. Where needed, regional centers will provide support and assistance for Pilot Projects by aiding in the development of mechanisms for reporting program outcomes.

Community Outreach Projects - Up to \$150,000 each

These projects will support the growth and expansion of already existing food safety education and outreach programs currently offered in local communities. In addition, these projects will enable existing programs to reach a broader target audience, or to expand to new audiences. These projects will enable existing education and training curricula to be modified to ensure that they are consistent with new FSMA rules and to make sure that they meet the needs of expanded audiences. New audiences may include those from a variety of agricultural production and processing systems.

Multistate Education and Training Projects - Up to \$400,000 each

These projects will support the development of multi-county, state-wide or multi-state programs. For example, these projects will support collaborations among states not necessarily located within the same regions, but having common food safety concerns, or addressing common commodities. Potential applicants must have an established track record of working with target audiences, and must be capable of developing and modifying food safety training curricula to meet new FSMA rules for a variety of agricultural production and processing systems.

Nebraska Extension Partners With Other Organizations to Provide Educational Opportunities for Beginning Farmers, Educators and Consumers

Kathie Starkweather, Wyatt Fraas (Center for Rural Affairs); Gary Lesoing, Jessica Jones, Vaughn Hammond (University of Nebraska-Lincoln)

In 2010 the Center for Rural Affairs, University of Nebraska-Lincoln Extension and the Nebraska Sustainable Agriculture Society received a USDA Beginning Farmer and Rancher Grant. These organizations have partnered together on different educational opportunities to assist people interested in learning more about sustainable farming practices.

In 2013 the grant funded six Beginning Farmer Workshops across Nebraska. Three of the workshops focused on the value-added livestock enterprise of Organic and/or Grass-fed Beef, while three others focused on fruit & vegetable production. The workshops consisted of a morning and afternoon session. In the morning we had successful producers discuss their operations. In the afternoon financial management was discussed. Representatives from Farm Service Agency (FSA) discussed their loan programs and a successful organic producer focused on the use of spreadsheets to monitor the finances of his operation, cash flow, and farm business planning on the farm.

These beginning farmer/rancher workshops had an impact across Nebraska. Seventy-three people participated in these workshops across Nebraska and learned about different sustainable farming practices and farm business planning. An added benefit of these workshops was the education of FSA staff on fruit and vegetable production principles plus the strategies used in the production and marketing of grass-fed and organic beef.

During the summer we had two Beginning Farmer Tours in outstate Nebraska. Forty-two participated in these tours that visited value-added and diversified agricultural enterprises.



These represent tour stops on one of the tours we held for beginning farmers. The first photo represents a grass-fed beef ranch. The second photo shows how an organic farmer plants cover crops into row crops. The third photo shows a certified kitchen that was opened in a small town.

In 2013 and 2014, Nebraska Extension held three small farm workshops in eastern Nebraska. These workshops had a major emphasis on small scale food production for the farmer and had 108 participants. In a survey for these small farm workshops, n=91, 72% were likely or very likely to grow something new.

On two local food systems tours in 2014-15, n=47, participants increased their knowledge of local food systems 63 percent. Other SARE sponsored tours helped Educators learn more about local food systems in Nebraska. Consumers participated to increase awareness of what goes into local food production in Nebraska at different scales.

Consumers and educators trained on local food systems get to appreciate all that goes into production and marketing of local food. This will encourage them to support and promote the use of local food, which in turn will help sustain the small farmers that produce it.



These photos represent different size farmers and local food producers in Nebraska. The first photo on the left represents a large scale grass-fed organic beef producer that markets his beef locally and also wholesale regionally and nationally. The middle photo represents a small family farm that produces organic row-crops, but also produces and sells naturally raised lamb, chicken and pork. They sell at their own on-farm store, locally at farmers markets and also sell lamb to the University of Nebraska-Lincoln to use in their cafeterias. The photo on the right is a high-tunnel of a long-time vegetable/flower producer in Nebraska that markets through several farmers markets, CSAs, and groceries.

Hops in Virginia – Progress and Challenges

Laura A. Siegle (Virginia Cooperative Extension-Virginia Tech); **Holly L. Scoggins** (Virginia Tech)

Hops are the female flowers of *Humulus lupulus*, a hardy perennial that dies back to the ground each winter. The flowers are called “cones” and within each cone, surrounded by papery bracts, are glands that produce lupulin: a yellow, sticky substance full of acids and oils that gives the bittering, aroma, and antimicrobial properties essential to beer making.

The interest in hops has been driven by the expansion of the craft brewing industry. The Virginia craft brewing industry is growing rapidly and demand for locally-grown ingredients has increased due to value systems favoring locally-grown materials. Heavy media coverage of the economic impact of the craft beer industry along with the appeal of participating in the supply chain has attracted both established farmers (also vineyard and nursery owners) as well as those with little to no agricultural experience into growing hops. Interestingly, Virginia was a major producer of hops in the 1800s but the industry moved west, first to the upper Midwest, and then settled in the Pacific Northwest (PNW). The high desert area of Washington State around Yakima is the leading region of U.S. production; in 2015, Washington producers were responsible for 75% of all hops grown in the country, with Oregon second (2015 National Hop Report, USDA National Agricultural Statistics Service). In 2014, the market value of the U.S. hop crop was \$260.6 million. It rose to \$345.4 million in 2015 (2015 National Hop Report, USDA National Agricultural Statistics Service).

The transition of primary production to the PNW and conversely the challenge of commercial hop production in the mid-Atlantic can be explained by the crop’s physiology as well as other challenges. But renewed interest in hops as a specialty crop for small farms has driven demand for regionally relevant, research-based production information.

According to a 2015 USDA report, the average yield in the U.S. was 1,807 pounds per acre, but observed yields in Virginia and the mid-Atlantic are typically just a fraction of this average. Hop yield is maximized by longer days, and as a result, the majority of the world’s hop production occurs between the latitudes of 35 and 55 degrees (Source: USA Hops). Vegetative growth of hop vines (called bines) and lateral breaks (sidearms) occur as days lengthen. The bulk of cone development occurs on sidearms. Tall trellises, up to 19’, encourage optimum biomass to form before daylength shortens to trigger flowering. As Virginia (and the mid-Atlantic region) falls below 40 degrees latitude, our shorter days do not allow for this kind of vegetative growth before the days shorten to the critical daylength for flowering. As a result, yields are reduced as compared to the PNW.

Pathogens and pests. Hops are susceptible to numerous fungal, bacterial, and viral pathogens as well as a multitude of pests. Humid conditions, warmer temperatures, and higher rainfall common to the mid-Atlantic exacerbate these issues. Downy mildew (*Pseudoperonospora humuli*) can be especially devastating to the crop. Preventative spray programs, whether with conventional or organic products, are necessary to keep fungal diseases in check. Integrated pest management practices and frequent scouting are essential.

Available cultivars. Proprietary (and highly marketed) cultivars such as Citra, Simcoe, Amarillo, etc. were developed by private companies and are only available to select, licensed growers in the PNW. Growers in the mid-Atlantic can access publically available cultivars, developed mostly by the USDA, Washington State University, and Oregon State University. Again, these were selected for suitability to conditions in the PNW. Performance in the mid-Atlantic for many of these cultivars is unknown.

Costs of establishment. Tall trellis construction (site prep, 20-24' poles, steel cables, anchors, irrigation, etc.) and plants can easily exceed \$10,000 per acre. Small farms with a few acres of production do not benefit from the economies of scale experienced by PNW growers. Return on investment can be negligible, especially during the first several years of plant establishment; this sort of lag can be more than some small farmers can tolerate.

Resources for growers (and potential growers). Hops are a niche crop, with little production and marketing research or outreach especially outside the PNW. As noted previously, a portion of this information is not applicable to the mid-Atlantic. Here, growers need to cultivate relationships with brewers to sell hops produced, or package and sell to the homebrewer market. Despite the increasing number of small commercial growers in the region, educational resources for the industry were non-existent prior to 2013.

Progress! A few Virginia growers formed the Old Dominion Hops Cooperative in 2011. At that time, there was no Extension or university support available. In 2013, a team of agents and specialists met with growers to formally assess needs, initiate efforts to build university resources for the new industry, and collaborate in growing the Old Dominion Hops Cooperative. From 2013 to 2016, this faculty team has spoken at nearly a dozen hops workshops, co-organized the inaugural South Atlantic Hops Conference in partnership with North Carolina State University (<https://www.eventbrite.com/e/2017-south-atlantic-hops-conference-tickets-26084925715>), worked with the media, developed university hops program social media sites (<https://www.facebook.com/HopsVT/?fref=ts>), maintained a hops subject-matter website (<http://www.ext.vt.edu/topics/agriculture/commercial-horticulture/hops/>), written seven publications for growers, conducted annual grower surveys and a brewer survey, and provided an in-service training to fifty Extension agents. The team has also fielded dozens of questions from commercial growers and has provided guidance to dozens of prospective growers. Today, the

Old Dominion Hops Cooperative has many members actively engaged in commercial production (<http://www.olddominionhops.com/>).

Cultivar trials and additional research are taking place at Virginia Tech (VT) and Virginia State University (VSU). External funding has been essential to these efforts. Support from the Virginia Agricultural Council, Virginia Department of Agriculture & Consumer Services, the United States Department of Agriculture, and university resources at VT and VSU have all contributed to the hops research and outreach program. Grower support has helped secure funding, and the team has a strong commitment to providing research and resources to help grow this niche crop in both Virginia and the mid-Atlantic. Through three years of extensive partnership with the industry, this faculty team has observed firsthand the numerous challenges and opportunities that await new growers and the pitfalls that can discourage small commercial growers.

Creating Farmer Networks: A Tool for Supporting Vibrant Farm Communities Educational Objectives

Maud Powell, Melissa Fery (Oregon State University Extension-Small Farms)

Program Objectives

The educational objectives of this project were to:

- Train a total of 40 agricultural professionals on the nuts-and-bolts of developing successful farmer networks in Washington, Idaho, Oregon and Montana. Trainings occurred in 4 locations, with an average participation of 10 individuals per site.
- Hold four half-day meetings with pilot women farmer networks in Washington, Oregon, Idaho and Montana.
- Hold 16 consulting sessions (four with each state partner) with leaders of the pilot women farmers' network. There were additional consulting sessions as needed with a minimum of 10 during the second and third years of the project.
- Produce an on-line and paper toolkit for developing farmer-to-farmer networks. The toolkit includes information on the relevance and impact of farmer networks, facilitation manual, and outreach materials including sample fliers and brochures, a list of potential activities for farmer networks, sample list of class offerings, a list of options for organizational structure of the network, an explanation of on-line social networking opportunities and other resources available to farmer networks.

Program Activities

We used a variety of activities to successfully implement this project. We did extensive outreach to partners in Idaho, Washington, Oregon, and Montana helping to build new relationships between university extension and nonprofit professionals. We conducted research for the toolkit, which incorporated many sources of information including our own experience in conducting farmer networks. We spent a large portion of time writing, compiling and editing the toolkit until the publication date. We conducted outreach to encourage agricultural professionals to attend workshops in all four states. We conducted four workshops that were dynamic and that encouraged participation and interaction between attendees. We distributed toolkits for free to all agricultural professionals in the four states. It is also available on our website (<https://catalog.extension.oregonstate.edu/pnw638>). We conducted online surveys of women farmers and agricultural professionals to assess impact of the project.

Teaching Methods

Teaching methods used during the course of this project consisted of trainings, one-on-one mentoring, the creation and dissemination of a toolkit, two conference sessions and a webinar.

During the training sessions for agricultural professionals, we used PowerPoint presentations that included multiple case studies to bring the information to life. Additionally, we divided participants into small groups and had them engage in role-playing sessions, then reflected on their experiences and insights with the entire group. During the steering committee sessions with new women farmers' networks, we had the groups brainstorm topics and skills they would like covered during subsequent network meetings. Sessions were interactive and teaching conducted included many specific examples of successful networks.

Results

There were many results associated with this project. The toolkit, "Creating Farmer Networks: A Toolkit for Promoting Vibrant Farm Communities" was published in February of 2013 by Oregon State University's Extension and Experiment Station Communications department and is now available for download through the OSU Extension Catalog. The publication is a 54-page Pacific Northwest Extension publication, which ensures its wide distribution throughout the Northwest. The toolkit includes topics like planning your network, recruitment, network development including structure, communication, programming, evaluation, tips for success, common problems and facilitation resources. We also included many examples of surveys, outreach materials and links to more resources. The toolkit was distributed for free at all workshops in Montana, Idaho, Washington, and Oregon.

The project resulted in the creation of three additional women farmer networks in the Pacific Northwest. We also held a 75-minute session at the OSU's Small Farms Conference in Corvallis in February of 2013. 61 people attended the workshop. It was titled: Starting a Farmer to Farmer Network. Melissa Matthewson, Maud Powell, and Melissa Fery all led the session and it was evaluated by participants. We traveled to Montana, Idaho, Washington and northern Oregon to hold workshops in March and April of 2013. The first workshop was for agricultural professionals in which we presented on the toolkit that had been created. 62 combined agricultural professionals representing various sectors of agriculture participated in the workshops in Washington, Oregon, Montana and Idaho. All participants received a copy of the toolkit. We have uploaded a copy of the agenda as well as PowerPoint® presentations from the workshops. Much of the workshop was interactive with role playing and small group exercises. Groups were diverse and the setting was intimate creating a nice workshop for agricultural professionals. We also facilitated a half-day steering committee meeting with regional women farmers to begin their launch of the local women farmer network in all four states. We worked closely with partners in each state to narrow in on a region and a target audience so as to reach our intended outcomes and audience. There were 84 combined participants in Montana, Oregon, Idaho and Washington.

In addition, OSU Extension Service faculty (Maud Powell and Melissa Fery) were invited to teach a workshop, Finding Support through Farmer-to-Farmer networking at the 4th National Conference for Women in Sustainable Agriculture in Des Moines, Iowa in November 2013. This venue provided an opportunity to extend the reach of the network toolkit to a national level. The workshop was well received by Extension educators and other agriculture professionals attending the conference. This was also an additional accomplishment not written into the grant. Finally, Melissa Fery and Maud Powell conducted a webinar for agricultural professionals titled, "Farmer Networks: Getting Started and How Can They Help?" The webinar was based on the toolkit and was part of an Oregon Food Bank project.

Impact Statement and Evaluation

We conducted an assessment of agricultural professionals who participated one year after the workshops. We sent the agricultural professionals an online survey with questions that could earn both qualitative and quantitative data for use in assessing impact. The data is summarized here.

Agricultural Professional Impacts

22% of respondents (agricultural professionals who took the network training) are currently involved with a network and 41% said this was after the SARE training. 33% of respondents plan on still beginning a network in the future. Some examples of networks that are currently in formation include: a peer-to-peer network for information sharing and on-farm workshop series; a network for Palouse area producers centered on conservation and precision farming; new farmers and farmers in priority watersheds; small producers for a local institutional market. 17% of respondents have used the toolkit after the trainings. Uses included: a guide for initial meeting topics; as a resource guide; and as a guide for revamping an existing network. 81% of respondents said they intend to use the toolkit in the future.

Women Farmer Impacts

According to respondents, benefits of participating in a network include: networking (26%), Education (24%), Mentoring (14%), Socializing (13%). Ninety two percent of respondents plan to stay involved with their network; 87% have increased knowledge after participating in a network; 83% have increased networking, while 80% feel more connected with their farming community. All of these are important aspects of farmer networks.

Putting Your Small Farm to Work - The Business Side of OSU Small Farm Colleges

L. Tony Nye, Jeff C. Fisher (The Ohio State University Extension)

Introduction

Landowners want to attain a greater understanding of production practices and requirements, economics of land use choices, assessment of personal and natural resources, marketing alternatives and the identification of assistance.

Small farms also meet many challenges and circumstances that will affect their potential productivity and profitability.

Ohio State University Extension has developed a comprehensive farm ownership and management program based on increased information requests from new and small farm owners.

The agricultural landscape of today is very different than it was 20 years ago. Farms today are getting fewer in number and the ones that are left are growing in acreage. However, there is a small group that is growing rapidly. The “Small Farmer” is a term used for individuals who are practicing agriculture on a very small amount of acreage, usually under 100 acres. Many of these farmers are new to agriculture and are looking to begin a different lifestyle.

The Mission of Small Farm Programs

To provide a greater understanding of production practices, economics of land use choices, assessment of personal and natural resources, marketing alternatives, and the identification of sources of assistance.

Small Farm Program Objectives

- To improve the economic development of small family-owned farms in Ohio.
- To help small farm landowners and families diversify their opportunities into successful new enterprises and new markets.
- To improve agricultural literacy among small farm landowners not actively involved in agricultural production.

Highlighted Education Programming

The New and Small Farm College: Started in 2005, the program focuses on new and small farm landowners in Ohio seeking comprehensive farm ownership and management programming. The college consists of up to 20 hours of classroom time and a single-day tour of various small farms is utilized to demonstrate:

- Getting started in the planning process
- Sources of assistance
- Agricultural legal issues
- Insurance considerations for the farm
- Inventory of natural resources
- Financial and production record keeping
- Crops and horticulture production
- Animal Production
- Marketing

The curriculum was enhanced to include business plan development providing participants a definitive strategy to develop their small farm and prepare them to apply for a loan. The modified curriculum included interactive lessons to create mission statements with goals and objectives, balance sheet and cash flow statements, marketing and business plans, and an executive summary. An additional session for military veterans was added to provide information on sources of assistance and gather input from those veterans on their needs.

Small Farm Conferences and Trade Show: This program began in 2009 with the inaugural Small Farm Conference and Trade Show; **“Opening Doors to Success”** held at the Wilmington College Campus, Wilmington, Ohio. This program effort has grown to two conferences, adding the second conference, **“Living the Small Farm Dream”** held most recently in Wooster, Ohio in 2016.

These intensive conferences are set up to provide small farm owners the opportunity to explore options for their land use from over 35 different comprehensive seminars taught by Extension professionals and industry leaders on a wide variety of agricultural enterprises. Seminars focus in the areas of aquaculture, farm management, forages & pasture, livestock (exotic and traditional), horticulture (fruit and vegetables), natural resources, Sustainable Agriculture Research and Education (SARE), organic production, marketing, and much more. To date, more than 1000 small farm land owners and enthusiasts have attended these conferences.

Results

Since the program's inception in 2005, 783 individuals and 584 farms representing 52 Ohio counties and beyond have completed the college. Just this year alone farms were represented from Ohio, Indiana, Virginia and Alaska. Participants represented 17 counties, with 44 percent of participants being female and 78.9 percent as new clientele to Extension programming. The average farm size was 27.7 acres owned, with an average ownership of 9.7 years. Post surveys indicated 66.7 percent of the participants developed or changed their farm use plan after attending these colleges. The participants rated the overall program a 9.02 out of a 10-point

scale, with 10 being best. Ninety-six percent of all participants responding would recommend this program to others, and 96.5 percent felt the program met or exceeded their expectations.

Responses to post conference surveys indicated 42.7 percent of the attendees were women and another 4.45 percent represented minority farmers. Forty (39.9) percent of respondents considered themselves part-time farming operators, and 22.3 percent were not yet engaged in an agricultural operation. Also, 90 percent indicated the subjects and content of the conferences would help them to improve the profitability of their farm enterprise(s). As a result of attending, 81.5 percent of the survey respondents indicated they would add an additional enterprise, increase production, enter into a new market such as a farmer's market or CSA, or buy/rent more acreage.

Participant Testimonies

Feedback from our clientele indicate that OSU Extension, through such Small Farm programming efforts, is impacting lives throughout Ohio. Examples of testimonies include:

"It takes 8 weeks to open the door, but by the end you are ready to walk through it." D. M.

"If it wasn't for this program, the family farm would still not have a mission statement. This started a much needed conversation." N. S.

"This is an amazing program that anyone who is even considering agriculture should take first. The wealth of information is wonderful." R. N.

The Agricultural Alternatives Project: Helping Farmers Make Better Management Decisions

Jayson K. Harper (Pennsylvania State University); Lynn F. Kime (Pennsylvania State University Cooperative Extension)

Introduction

Small farms are a big audience for Extension. Although average farm size in the USA has increased since the last Census of Agriculture in 2007 (average farm size in the United State was 175.6 hectares in 2012, an increase of 3.7%), a significant proportion of farms can be classified as small from either the standpoint of size or value of sales. Nationwide, 38.6% of farms contain less than 50 acres and 42.5% have sales of less than \$5,000 per year. Over 68% of all farms have sales under \$25,000 annually. Median farm size in the USA is only 80 acres. These data demonstrate that small farms are an important part of the US agricultural economy. The average age of 58.3 years for farmers points out the looming impact of aging farmers on US agriculture. It also points out the need for various programs to encourage and support the next generation of farmers.

Pennsylvania has a higher proportion of small farms than the rest of the USA. Average farm size is only 130 acres and median farm size is 68 acres (Table 1). Over 39% of Pennsylvania farms are less than 50 acres and 41.8% have sales less than \$5,000. In contrast to the declining number of small farms nationwide, both the percentage of farms with less than 50 acres and those with sales less \$5,000 actually increased in Pennsylvania from 2007 to 2012.

The Agricultural Alternatives Project at Penn State

This project focuses on how Extension can effectively support the entrepreneurial ambitions of small farmers. The focus of the this effort has been on developing enterprise fact sheets and various supporting materials which encourage farmers to think through all the issues involved in owning and operating an agricultural business and what to consider when choosing enterprises. Since its inception in 1992, this project has focused on providing the resources farmers need to help them through the complexities of enterprise selection. The major product of this project has been the *Agricultural Alternatives* publication series.

This publication series, which currently contains 65 publications, strives to help producers analyze production alternatives by providing a balanced assessment of crop and livestock enterprises that might be suitable for small-scale and part-time farming operations. These publications discuss marketing alternatives, production issues, governmental regulations, risk management options, and contain detailed cost of production estimates (enterprise budgets). These budgets are developed to assist the reader with identifying the expenses they will incur if

they choose to pursue the enterprise. A column for their estimated figures is included so they may adapt the budget to their operation.

Table 1. Size, value of sales, and operator age characteristics of small farms in the United States and Pennsylvania.

	2012	2007
<u>United States</u>		
Total farms	2,109,303	2,204,792
Average farm size (acres)	434	418
Median farm size (acres)	80	80
Average farmer age	58.3	57.1
Sales < \$5,000	42.5%	46.1%
Sales < \$25,000	68.2%	71.1%
< 50 acres	38.6%	38.7%
<u>Pennsylvania</u>		
Total farms	59,309	63,163
Average farm size (acres)	130	124
Median farm size (acres)	68	65
Average farmer age	56.1	55.2
Sales < \$5,000	41.8%	35.0%
Sales < \$25,000	65.0%	71.8%
< 50 acres	39.3%	37.5%

Source: USDA National Agricultural Statistics Service, 2012 Census of Agriculture.

Each of the enterprise publications also has a list of typical initial resource requirements (ie. how much land, labor, and capital is needed to get started) and a list of commodity organizations and farmer support organizations. Because the publications are not meant to be detailed production guides, each publication contains a “For More Information” section. This section contains additional sources of information, including web sites that the reader can access for more in-depth information (usually other Extension resources). One possible outcome after reading a particular publication will be to dissuade the reader from pursuing an enterprise that may not be suited to their abilities or resource base. Encouraging farmers to think through the enterprise selection process in a logical way may stop many from making expensive mistakes that could arise from decision making based on emotion rather than sound economics.

To support the enterprise oriented publications, there is also a set of publications covering agricultural business management topics. These include: developing a business plan, financing a small-scale or part-time farm, starting or diversifying an agricultural business, owning and

leasing agricultural real estate, managing agricultural machinery and equipment, understanding agricultural liability issues, insurance for agricultural businesses, budgeting for agricultural decision making, preparing farm income taxes, forming farmer cooperatives, community supported agricultural businesses, managing a market outlet, fruit and vegetable marketing options, and managing an agricultural tourism business. There is also a publication discussing organic vegetable production and certification and two publications on irrigation and water management.

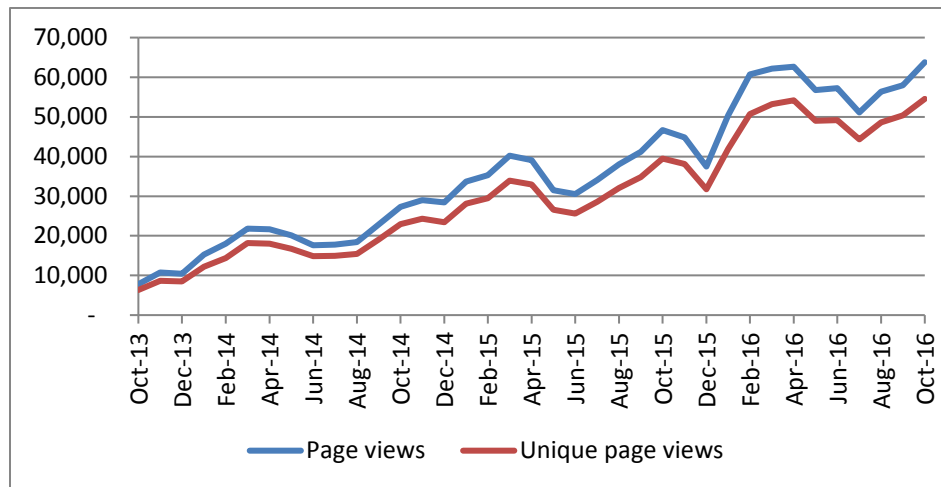
To serve Hispanic audiences, 17 of the publications have been translated into Spanish. This group has been a rapidly growing audience for Extension in Pennsylvania. The web site also has customizable enterprise budgets in PDF format for all of the publications which focus on enterprises. Using these budgets, farmers can generate their own cost of production estimates which can then be used as part of a business development plan. Producer videos are also available for 13 of the enterprises, so users can get additional insights from other farmers on how to successfully manage the enterprise. The videos are 3-5 minute interviews with a farmer discussing an individual enterprise; more videos are in the process of being developed for additional enterprises.

Because county extension offices regularly receive inquiries from clientele for information about how to produce specific crops or livestock, the *Agricultural Alternatives* series is frequently used by county educators as a first step to assist their clients with this process. These clients need complete and balanced information about the enterprise they are considering. Existing producers who are considering diversifying their operations or have underutilized land also use the publications when researching their options. Although the *Agricultural Alternatives* publications have been developed with Pennsylvania's small-scale and part-time farmers in mind, these publications are widely used with all types of farm audiences and are also of interest to the general public. These publications have also been used extensively in the extension programs conducted in neighboring states and are accessed both nationally and internationally through the Internet. Several of these publications have been used as part of the curriculum in Extension 4-H and high school vocational agriculture programs in Pennsylvania.

Initially, the publications in the *Agricultural Alternatives* series were distributed as paper copies. Over the entire time of the project, approximately one-half million paper copies have been distributed. Paper copies are still available and are regularly used as supporting materials at farmer meetings. However, even back in the early 1990's many of the *Agricultural Alternatives* publications were available on-line. The vast majority of people now access *Agricultural Alternatives* publications through the Internet. Users can read publications, access the PDF budgets, and watch producer videos on-line. They can also download PDF versions of the publications that are the same as the paper versions available through traditional sources. Since a

large revamping of the Ag Alternatives website (<http://extension.psu.edu/business/ag-alternatives>) in late 2013, use of the website has increased 5 to 6 fold (Figure 1).

Figure 1. Monthly web site access statistics for *Agricultural Alternatives*, October 2013-October 2016. (<http://extension.psu.edu/business/ag-alternatives>)



Source: Author's data

Some of the challenges associated with the *Agricultural Alternatives* publications are updating publications which are out-of-print or require revisions, expansion of resources to include additional enterprises and business management topics, continually updating and improving the website, and gathering feedback from users (via an on-line survey). It is also a challenge to organize the necessary people to write and update the publications. The authors know the success of the publications and most use them as part of their own educational programs, but it is extra work for people with other major commitments. The authors of the publications in the *Agricultural Alternatives* series include extension and research faculty from the Pennsylvania State University and land-grant institutions from neighboring states, county extension educators, and farmers. By sharing their expertise, they make the *Agricultural Alternatives* series possible.

Beginning Farmers and Ranchers 2.0: Scaling up to Profitability

*Cindy Fake, Roger Ingram, James Muck (University of California Cooperative Extension);
Daniel Macon (University of California, Davis)*

Introduction

Over the last decade, many extension, non-profit, and grant funding programs have emerged to serve beginning farmers and ranchers. While many programs focus on training start-up farmers, few programs target farmers with four to 10 years of experience. The four- to 10-year period is critical in the evolution of most farms; where growing to scale determines long-term success.

Operational scale, measured by farm income, gross sales, acreage, or head number, is often a major determinant of profitability and economic viability for farms and ranches. Indeed, USDA has stated that “Profitability measures are strongly associated with farm size” (Hoppe, 2014; USDA, 2007). However, some small farm experts disagree. Professor Emeritus John Ikerd of the University of Missouri, avers that “...small farms can earn far greater income per dollar of sales than can conventional large farms” (Ikerd, 2008).

Despite the growing number of US small farms, there is little data about the scale needed for a profitable operation which provides a living wage for the owner. The intensive, diversified systems characteristic of small farms make the scale issue more complex. Available markets, labor cost and availability, local or regional economies, and other considerations all factor into the calculation. As a result, benchmarks for scale may vary considerably from region to region.

Improving small farm economic viability is a core part of University of California Cooperative Extension Placer/Nevada’s agricultural extension mission. We have delivered beginning farming and farm business training for over a decade and learned that operational scale is critical to profitability and long-term economic viability for foothill producers. However, achieving an economically viable scale is a complex process and there are few tools or curricula to help producers determine the right scale. In 2012, we began developing training and tools for analyzing scale and operational efficiency. Helping producers understand scale and the risks of not being at scale and with scaling up are vital to the success of individual farms and ranches and the long term sustainability of our agricultural community.

Placer and Nevada Counties are located in the Sierra Nevada foothills of Northern California. 32% of producers are beginning farmers and ranchers, having operated a farm or ranch for 10 years or less (Ahearn and Newton, 2009, USDA, 2014). The area has a diversity of small farms and ranches, 38% are less than 10 acres in size; 81% less than 50 acres (USDA, 2014).

Agricultural production includes a wide range of specialty crops: fruits, nuts, vegetables, and ornamentals; and a diversity of livestock species, including cattle, sheep, goats, pigs, and poultry.

Many foothill farms are mixed operations with a variety of crops and/or livestock. Most producers sell primarily into local and regional food systems. The lack of efficiency and economies of scale inherent in highly diversified small farms often constrain profitability. Building to a viable scale is a challenge, because of high land and labor costs and development pressure. Local farm data and analysis suggests that 10 to 40 acres (depending on type of production) or gross sales of \$140,000 to \$220,000 are needed for an operation to be profitable and provide the median local income. However, more data is needed to refine these estimates.

This paper presents the results of a telephone survey of small-scale foothill producers in the process or intending to scale up. It describes the challenges they face in scaling up and lessons learned from analysis of profitability and scale of small farm businesses.

Scale Survey

In summer 2016, we conducted a telephone survey of producers about farm and ranch scale. Our goal was to understand the parameters of farm and ranch operational scale in the Sierra Nevada foothills. Our objectives are to:

- Identify scale impacts on profitability and farm/ranch economic viability
- Understand the considerations and obstacles in building to scale
- Use the information gathered to develop benchmarks for various types of operations and
- Develop scale-focused curriculum and training for area producers

We invited producers via e-mail several weeks ahead of time and sent them the survey questions. Then we called each one directly and asked if they were willing to participate. The survey consisted of 17 questions, and administering it over the phone took 15- 20 minutes if the producer had a good idea of his/her numbers or had looked at the questions ahead of time.

The sample pool was current owner/operators of commercial farms or ranches in Placer, Nevada, and surrounding counties. In order to participate, respondents needed to have been in business for at least one year and be able to provide farm/ranch sales, expense, profit, and salary data for 2015. Our original pool was slightly larger, but a few were disqualified because they were not selling in 2015 or did not have the necessary records. Most beginning farmers who were eligible had at least 3 years in operation. 56 farmers were eligible and included in the sample, and 31 completed the survey, a 55.4% response rate.

Table 1. Survey Demographics

Survey Participant Demographics				
Age	<35	35-50	>50	
	12.9%	35.5%	51.6%	
Gender	Female	Male		
	35.5%	64.5%		
Years in farming	0-2	3-5	6-10	>10
	3%	29%	23%	45%
Business training	UCCE classes	Other	Any	None
	64.5%	36%	81%	19%
Production	Veg	Fruit	Livestock	Flowers
	65%	55%	29%	16%

Survey Results

The survey results reflect the diversity of types and scale of agricultural operations in the foothills. Respondents reported a wide range of Total Farm Income or Gross Sales for 2015: from \$900 to \$1,000,000. 32.3% of respondents reported less than \$25,000 in income, while 35.5% reported \$100,000 or more. The range in farm income reflects to a degree, the range of experience among the respondents. We estimate that gross sales of \$140,000 to \$220,000, depending on the type of operation, are needed to make the Placer/Nevada median per capita income of \$34,000. Only 17.6% of the Beginning Farmers and ranchers reported farm income over \$100,000 and thus were on track to make or made the median per capita income in 2015. 57% of experienced farmers (more than ten years in business) met that benchmark.

Table 2. Farm Income from Scale Survey compared with 2012 Ag Census (USDA, 2014).

	2012 Ag Census	Survey Respondents
Farm Income		
<\$25,000	85.0%	32.3%
\$25-50,000	7.3%	6.5%
\$50-100,000	3.2%	25.8%
\$100-250,000	1.8%	25.8%
>\$250,000	2.8%	9.7%
Profitability (net gains)	24.8%	85.7%

The differences between our survey sample and the USDA Ag Census were somewhat unexpected. However, the Ag Census includes data from all landowners reporting \$1,000 or more in sales, so it includes many lifestyle or “hobby” farms. The scale survey was conducted

with a sample (1.5% of the census) of professional producers who had adequate financial records to answer the questions.

All survey respondents expected to earn money; at a minimum to cover expenses and taxes (9.7%). 41.9% expected a part-time income (less than half-time); and 48.4% expected a full time income. 90.3% of survey respondents paid themselves a salary. 85.7% reported net gains (profit), as opposed to the 24.8% net gains reported in the 2012 Ag Census. The survey results also point to the importance of business and economic training – 67.7% of respondents had participated in one or more UCCE business-related courses, 80.6% had some business classes or training. 19.4% had no business training at all.

Despite the high proportion of profitable operations, 67.7% of survey respondents want or think they need to scale up their operations. They cite a variety of reasons including increasing farm income, making farming a full time job, to be able to afford hired labor. Others state that there are markets available for their products, so they wish to scale up to take advantage of those opportunities, and some of the beginners are still building their business and believe they need to grow to scale.

Survey respondents were asked to identify the actions they need to take to scale up. 74% cited a need to identify new markets or expand existing markets. 71% said they needed to buy equipment and many stated the need to improve efficiency through mechanization. The same proportion (71%) needed to improve infrastructure, including fencing, irrigation, packing sheds, and cooling facilities. 68% stated the need to hire and train labor. 61.3% needed to plant more acres to increase scale.

We also asked respondents to rate the primary obstacles to scaling up their operations. Time was the obstacle ranked the highest (8.00 out of 10), by the highest number of respondents (87.1%). This may be due to the fact that owners provide most of the labor on many of these operations as well as the fact that many have off-farm work as well. 83.9% cited available labor as an obstacle, but it was ranked somewhat lower at 6.81 out of 10. Risk of going into debt was ranked very high at 7.65, but only by 54.8% of respondents.

77.4% of respondents cited regulations as an obstacle, ranking it 6.58. Cashflow and capital investment funds were each identified as obstacles by 18 respondents (58.1%), and were ranked 6.72 and 6.67, respectively. Knowledge/skills, market access, and land were also identified as obstacles by 58.1%, but were the lowest ranked at 5.44, 5.39, and 5.33, respectively. The low ranking of land as an obstacle is due, in part, to the larger percentage of respondents being crop producers. Access to cropland is rarely an issue in this area, but adequate contiguous land for livestock is a major obstacle for scaling up operations.

Lessons Learned about Farm Scale

We have learned a number of key lessons from providing Beginning Farmer, business planning, and economic analysis training for over a decade. The first is that successful producers are those who operate their farms or ranches as businesses; track their finances carefully; analyze their enterprises for profitability; and plan for profit and to pay themselves a salary, not just what is left over at the end of the year.

Second is that building to a profitable scale is difficult for small operations in the foothills because of the high cost of labor, lack of capital for building the business, and the lack of ag infrastructure to help farmers process their products or get them to wholesale markets. In the foothills, land is rarely a constraint for crop producers, but contiguous land for livestock is a major obstacle.

The key to profitability for a small operation is systematizing and building efficiencies in labor, production, marketing, and other aspects of the business. Many small farms manage production risk through product diversity. However, financial risk may increase as a result of that strategy. On a small scale, a diverse product line reduces efficiency and may be a barrier to profitability. Limiting the number of crops or livestock diversity is often the pathway to profitability. Diversifying markets does increase profitability and reduce risk, however.

Next Steps

We have just completed a baseline survey to characterize farm scale and develop profitability benchmarks for small agricultural operations in the foothills. It provides data from a cross section of producers who manage their operations as businesses and thus the majority are profitable and able to earn the median income for the area. However, the 2012 Ag Census shows very different picture of Placer/Nevada farm economics. We intend to do a much broader online survey of Placer/Nevada producers this fall. We will also be conducting producer focus groups this winter to delve more deeply into some of the questions raised in the survey. In collaboration with these producers, we will use the information gathered to develop benchmarks for profitability and economic viability for foothill farms and ranches. We plan to develop a “Building to Scale” curriculum based on the data collected and lessons learned from our business trainings and the survey.

References

- Ahearn, Mary and Doris Newton. 2009. ***Beginning Farmers and Ranchers***. EIB-53, U.S. Department of Agriculture, Economic Research Service. Available at: <http://www.ers.usda.gov/publications/eib-economic-information-bulletin/eib53.aspx>
- Hendrickson, John. 2005. ***Grower to grower: Creating a livelihood on a fresh market vegetable farm***. Center for Integrated Agricultural Systems, University of Wisconsin-Madison College of Agricultural and Life Sciences. Available at <http://www.cias.wisc.edu/wp-content/uploads/2008/07/grwr2grwr.pdf>
- Hoppe, Robert A. 2014. ***Structure and Finances of U.S. Farms: Family Farm Report, 2014 Edition***. EIB-132, U.S. Department of Agriculture, Economic Research Service. Available at <http://www.ers.usda.gov/media/1728096/eib-132.pdf>
- Ikerd, John E. 2008. ***Crisis and Opportunity: Sustainability in American Agriculture***. Small Farms: Perceptions versus Realities. University of Nebraska Press.
- USDA Census of Agriculture. 2014. ***2012 Census Volume 1, Chapter 2: County Level Data***. Available at https://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_County_Level/California/
- USDA Economic Research Service. 2007. ***Structure and Finances of U.S. Farms: Family Farm Report***, EIB-24. U.S. Department of Agriculture, Economic Research Service. Available at http://www.ers.usda.gov/media/201439/eib24d_1_.pdf

Farm Beginnings® Provides Practical Education for Beginning Farmers

Gary Lesoing, Connie Fisk (University of Nebraska-Lincoln); Wyatt Fraas (Center for Rural Affairs); William Powers (Nebraska Sustainable Agriculture Society)

Nebraska Extension along with partnerships with Sustainable Agriculture Research & Education (SARE), the Center for Rural Affairs, and the Nebraska Sustainable Agriculture Society has offered eight Farm Beginnings® Programs since 2005. This Program is an educational training and support program designed to help people who want to evaluate and plan their farm enterprise. Farm Beginnings® participants engage in a mentorship experience and network with a variety of successful, innovative farmers, and attend practical, high quality programs, farm tours and a sustainable agriculture conference. The program is unique in that several successful farmers participate as presenters, explaining firsthand the nuts and bolts of their farming operation. At the 10 classroom sessions, information is presented on holistic management, goal setting, farm planning, government programs and resources, marketing, financial management and developing a business plan. Most of the classes have farmer presenters who have been successfully farming sustainably for several years. UNL Extension Educators and representatives from other agencies, i.e. the Farm Service Agency (FSA) and the Nebraska Department of Agriculture also present information.



The class starts in early winter and goes into the spring. It is held on Saturdays for best participation. During the second session, we tour and meet with a long time organic farmer and tour other farms as well. (Photos above illustrate these tours) Cost of the class is \$500, but there are scholarships available for up to \$200, which includes a flexible payment schedule. The SARE Publication “Building a Sustainable Business” and the Midwest Organic & Sustainable Education Service (MOSES) Publication “Fearless Farm Finances” are used as resources. Participants give a presentation and are encouraged to develop a farm and business plan for the last class.

The summer farm tours following the class room sessions, sustainable Ag conferences participants attend, mentorships and internships are important components of the Farm Beginnings® Program. Following summer tours, participants are asked if they want to have a

mentor. Some have worked as interns on farms before starting their own farms. Farm Beginnings[®] class members are provided one year free membership in the Nebraska Sustainable Agriculture Society and they are provided free admission to the annual sustainable Ag educational conference. Through communication with established sustainable farmers and attending conferences and tours, participants become part of a network of sustainable farmers and consumers.

Farm Beginnings[®] classes have been held in four locations in southeastern Nebraska. In the past five years we have had 29 farms complete Farm Beginnings[®] and 23 or 79% are involved in production agriculture at some level. When participants complete this course they will receive a certificate which qualifies them for Financial Management Training for FSA loans.

While Farm Beginnings[®] has provided significant benefits to many beginning farmers in Nebraska, it has not been without challenges. We could not generate enough interest to hold class in west central Nebraska. Competition with other organizations offering similar type classes at much lower costs has impacted our participation. It requires a significant amount of time and effort to organize and hold the class.

Some of the benefits Farm Beginnings[®] has provided to its participants include:

- 1) Lessons on the principles of holistic and sustainable farming from successful farmers in Nebraska.
- 2) Membership in a network of sustainable producers in Nebraska and surrounding states.
- 3) The opportunity to continue to learn from experienced sustainable farmers and mentors as they develop their different enterprises.
- 4) Introduction to a network of friends, mentors, and entrepreneurs who share the same values.

The Farm Beginnings[®] Program has had a significant impact on sustainable agriculture and the local food system in Nebraska and beyond. The Farm Beginnings[®] Program has helped develop new leaders in sustainable agriculture and local food network in Nebraska. Several Farm Beginnings[®] graduates are active in the Nebraska Sustainable Agricultural Society. Fifty percent of the classes are women farmers. The program has educated people about sustainable agriculture and helped identify people who will continue to be advocates and supporters of sustainable agriculture for years to come.

One of our farmer participants Dan Hromas, is a disabled American Veteran. He completed the class successfully, received a USDA Beginning Farmer loan and began raising chickens to produce eggs and has recently purchased a small farm for his operation. He has served as the spokesperson for the Farmers Veteran Coalition, appearing on television and being a keynote speaker at events, telling his story.

I have initiated a blog which has highlighted and will continue to highlight Farm Beginnings[®] graduates that are producing local food in the region. The link to the blog is: <https://saremansagnews.wordpress.com/>. Farmers I have highlighted include: Gerdes Heritage Fowl – Dan Gerdes, Chisholm Family Farm – Andy Chisholm and Union Orchard-Clint Wostrel.

I would like to share several quotes by past Farm Beginnings[®] graduates that describe the benefits of the program

“This program had a huge impact. I have improved my business plan, my overall efficiency and I continue to try new ideas I thought to not be possible.”

“This program has helped me organize my activities and efforts, helping me to understand what the important tasks were.”

“It has had a tremendous impact on our operation and we have developed a holistic goal for our farm/life and are excited about where we are going.”

“I found it to be an excellent way for someone such as myself, with no farm background, to understand the planning, scheduling, budgeting and marketing aspects of farming... For anyone who has a desire to improve the quality of the land around them, I would strongly encourage them to take the Farm Beginning[®] class. They will be glad they did.”



The photos above illustrate different components of the Farm Beginnings[®] Program. In the photo on the left, on a Diversified Ag. Tour in South Central Nebraska, Jon Yoachim a Farm Beginnings[®] graduate hosts a farm tour and explains his grazing system. He also serves on the Board of the Nebraska Sustainable Agriculture Society. In the middle photo, the class visits West Blue Farm each year. Deb Welsch moves cattle from one pasture to another in their rotational grazing operation. Her husband Dave teaches a session in Farm Beginnings[®] on financial management and record keeping. The third photo shows the operation of a recent graduate, Dan Gerdes, who raises 200 ducks for egg laying. He sells duck eggs through several different outlets in southeast Nebraska for \$5-7/dozen.

Building Capacity for Beginning Farmer Start-up and Sustainability across Virginia: A Collective Impact Approach

Kim Niewolny, Lorien MacAuley, Thomas Archibald, Natalie Cook, Allyssa Mark (Virginia Tech)

Introduction and Literature Review

The Virginia Beginning Farmer and Rancher Coalition (VBFRC) seeks to improve opportunities for beginning farmers and ranchers to establish and sustain viable agricultural operations and communities in Virginia. This is accomplished through the development and enhancement of whole farm planning curriculum and training, online resources, farmer-to-farmer mentoring networks, and capacity building opportunities for coalition partners. The VBFRC is comprised of farmers, extension and university faculty, community-based service providers, and governmental agency professionals in a coalition model, where decision-making and responsibility for activities is decentralized and shared among coalition partners. The VBFRC views its role through the lens of Kania and Kramer's (2011) collective impact (CI) framework, by providing support for partner organizations to work together on the same issues to effect social change. For Turner, Merchant, Kania, and Martin (2012), this approach is designed to inform collective work by supporting aligned activities, establishing shared measurement and practices, and mobilizing resources.

The CI framework is based on the presence of five key elements: (1) all participants should have a common agenda or goal, (2) use shared measurements for success, (3) have mutually reinforcing activities (rather than duplicating efforts), (4) maintain continuous communication, and (5) have a backbone support organization that coordinates and enables the mutual effort (Kania & Kramer, 2011). As the Collective Impact Forum (CIF; 2016) states, "rules for interaction from collective impact create an alignment within complex relationships and sets of activities which, when combined with shared intentionality, causes previously invisible solutions and resources to emerge" (p. 4). The CIF points out that CI makes emergent solutions possible in complex systems where there is no predetermined solution. In this paper, we detail how the principles of CI have been used to coordinate collective efforts and to serve as a conceptual tool for evaluation of the VBFRC.

The role for evaluation in collective impact efforts addresses complexity (CIF, 2016; Niewolny & Archibald, 2015). On one hand, CI promotes shared metrics for success in all work towards a given social problem or issue. On the other, the activities of the backbone organization can be evaluated in their own right. Assessments in CI thus pose unique challenges (Turner, et al, 2012). The goal of evaluation in CI is not to seek to measure isolated impacts, but rather to "collect, track, and report progress" (Hanley Brown, Kania, & Kramer, 2012, p. 4) towards the common goal. For Kania and Kramer (2011), this type of evaluation effort will need to "focus on the relationships between people and organizations over time" (p. 6), rather than take a snapshot to simply measure success or failure. So, we discuss how CI guides the evaluation effort by

promoting a continuous feedback loop in a process, or formative, evaluation (see Mertens & Wilson, 2012) to inform the future work of the VBFRC, while promoting more informed collaborative efforts of individual partners, to lead to success in the overall social goal.

Methodology

This evaluation employed a constructivist paradigm (Lincoln & Guba, 1985), as meaning is generated collectively in our decentralized coalition model. Thus, qualitative interviews (N=32) were conducted with VBFRC member participants throughout the summer and fall of 2014. Each interview was approximately 45-60 minutes, was audio-recorded and transcribed verbatim for accuracy, and was subsequently analyzed throughout 2015. Because VBFRC members are agricultural leaders and professionals, they act as key informants for both the VBFRC and the general state of agriculture in Virginia. Member participants answered questions about their participation in the coalition; including the coalition mission, inputs, activities, outcomes and impacts (i.e., the logic model, see McLaughlin & Jordan, 2010); diversity of participation within the coalition; perceptions of successes for farms and for the coalition; and on perceptions of critical issues facing beginning farmers in Virginia.

Analysis of interview data was conducted through a process of thematic coding (Peräkylä, 2005). All text was coded in Atlas.ti qualitative data analysis software for emergent themes surrounding the coalition's logic model, the constructs of collective impact theory, and for emergent ideas surrounding diversity and other issues for beginning farmers. Data was then compiled and analyzed for meaning. In this paper, we focus on findings through Kania and Kramer's (2011) collective impact framework, which served as a theoretical lens during analysis, and is the undergirding rationale for the VBFRC.

Findings

Here, we share some key findings from our larger VBFRC evaluation effort. Our interview data analysis showed that continuous communication with a diverse array of stakeholders works to keep others informed of the initiatives of VBFRC and the agricultural service provider community. Findings show how partner organizations connect to and mutually reinforce efforts to solve complex issues for beginning farmers. This approach allows for emergent ideas, not only about VBFRC activities themselves, but also how members may hone their individual programming efforts to complement other statewide beginning farmer efforts to work towards the common goal. The VBFRC also provides a network with "rules of interaction" (CIF, 2016, p. 4), in order to engage partners and collaborators to work together for sustained social change. All of these elements work in concert to describe how the VBFRC is effective as a network approach to addressing the complexity of beginning farmer issues in the food system.

Importantly, members expressed the comparative suitability of VBFRC to undertake the position of a network of many organizations, due to singularity of purpose as facilitator, which adds to its ability to bring together a diverse array of partners. For example, one said:

[VBFRC has] brought all different types of people together that would never have been brought together before, and like I said, there's not another organization in the state that's doing that.

So, VBFRC, having begun with the CI framework as a guide, has established its role as a facilitator of collaborative efforts, which is unique in Virginia. This collaboration is also due to the common agenda of Coalition members, and many members discussed the alignment of the VBFRC mission with the work of their own individual efforts, mentioning similarities in overall mission, scope and target audience, and types of activities. Members pointed out that the continuous communication platforms facilitated by VBFRC promoted networking and trust building among those who are doing similar work. The VBFRC allows members to view each other as collaborators on a mutually valued social issue, rather than competitors. As the below participant said:

I think that building the relationships have been, you know, there's not a lot of opportunities to do that with people who have like-minded missions, like-minded principles. So it just provides a really good bonding experience and all that kind of stuff. So networking is really important I think.

Through continuous communication, participants also recognize that they have mutually reinforcing activities, and are aware of each other's programming and education efforts enough to know how they fit into a larger vision for social change. Most participants expressed in some way that VBFRC promotes collaboration with other individuals and organizations that are "pieces of the overall puzzle," rather than duplicating efforts. One member said:

We have definitely appreciated the opportunity to engage with others who have the same end goals but have completely different visions/agendas and different skill sets and approach.

Partners expressed how VBFRC has allowed open communication between parties who would not necessarily come together to strategize on beginning farmer issues. This allows, in turn, new and emergent solutions to be considered. As one member expressed:

As long as everybody respects what each one's doing, and understands, that's probably the key... what always happens in any kind of diverse situation is that no matter what a person's going to hold up they have to have a community respect and community civility that communication can occur. And good solutions on all sides come out.

Importantly, partners are also thinking about how their individual mutually reinforcing activities could and should work in concert, and talked about the wide array of locally specific knowledge

one could access through the VBFRC to tackle problems. For example, one said:

The thing we've got to figure out is how to get them [other members] all working with the same knowledge, or working in sync at the same time. They are the ones that understand their community; they understand the diversity in their community, they understand the geographic differences... I think all of those need to work together on this process.

Partners expressed that by coming together and sharing information, they feel part of a larger comprehensive effort for social change for beginning farmers, and emergent solutions are thus made possible to address issues facing beginning farmers. As one member said:

What I love about it is the comprehensiveness... that it's this multifaceted approach...you've got just lots and lots of ways that they've really tried to tackle. And I think having a Coalition behind it, it's like you've multiplied the efforts.

Partners have described the unique value of the VBFRC as a collaborative approach to address the challenging start-up and sustainability issues facing beginning farmers in Virginia. Allowing for a diverse set of partners to network, build trust, and learn how their work is mutually reinforcing towards the common goal is foundational. Most notably, this collaborative space allows for emergence of ideas to better address complexity in the food system.

Discussion and Conclusion

Beginning farmer and rancher issues are complex, and there are no easy solutions (Niewolny & Lillard, 2010). For Kania and Kramer (2013), in complex issues without a predetermined solution, a diverse set of perspectives must be accessed, and collaboration must be carefully fostered, in order for new types of solutions to emerge. Because VBFRC facilitates continuous communication for members, and provides established rules of engagement for civil discourse on issues, members access different knowledge sets, and new learning happens. Due to the networking and trust-building that results from the neutral space for dialogue, possibilities for new collaborations have emerged. The work of VBFRC is therefore a valuable asset in addressing the complexity of the issues that face beginning farmers and ranchers in Virginia.

In the continuous communication of a CI-based effort, a continuous feedback loop is necessary to constantly improve efforts within and outside of a backbone support organization (Kania & Kramer, 2011). According to the CIF (2016), CI-based work should “create a learning culture that enables the group to use meaningful, credible, and useful qualitative and quantitative data for continuous learning and strategic refinement” (p. 2). Because the VBFRC has continually reported evaluation efforts to members, and sought and received feedback, a culture of evaluation has been formed, leading to a feedback loop and continual improvements.

As Kania and Kramer (2013) said, “at its core, collective impact is about creating and implementing a coordinated strategy among aligned stakeholders” (p. 7). Our CI-based

evaluation effort enables us to conceptualize how the VBFRC is effectively coordinating strategy to align individuals, agencies, and organizations in working to improve opportunities for beginning farmers and ranchers in Virginia. The VBFRC does this by providing a neutral space for civil discourse, which allows a diverse set of actors to collaborate, network, and build trust, and allows emergent ideas to be considered. Our CI-based evaluation effort both guides the future direction of specific VBFRC activities, while also informing how individual efforts of members are a part of the larger work to address the pressing issues facing beginning farmers and ranchers.

References

- Collective Impact Forum. (2016). Collective Impact Principles of Practice. Retrieved from: <http://collectiveimpactforum.org/resources/collective-impact-principles-practice>
- Hanley Brown, F., Kania, J., & Kramer, M. (2012). Channeling change: Making collective impact work. *Stanford Social Innovation Review*: 1-8.
- Kania, J., & Kramer, M. (2011). Collective impact. *Stanford Social Innovation Review*: 36-41.
- Kania, J., & Kramer, M. (2013). Embracing emergence: How collective impact addresses complexity. *Stanford Social Innovation Review*: 1-7.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry* (Vol. 75). Thousand Oaks, CA: Sage.
- Peräkylä, A. (2005). Analyzing Talk and Text. In Denzin, N. & Lincoln, Y. (Eds.). *The SAGE handbook of qualitative research* (3rd ed.). (pp. 869-886). Thousand Oaks, CA: Sage.
- McLaughlin, J., & Jordan, G. (2010). Using Logic Models. In Wholey, J. S., Hatry, H. P., & Newcomer, K. E. (Eds.). *Handbook of practical program evaluation* (3rd ed.). (pp. 55-79). San Francisco: Jossey-Bass.
- Mertens, D. M., & Wilson, A. T. (2012). *Program evaluation theory and practice: A comprehensive guide*. New York: Guilford Press.
- Niewolny, K. & Lillard, P. (2010). Expanding the boundaries of beginning farmer training and program development: A review of contemporary initiatives to cultivate a new generation of American farmers. *Journal of Agriculture, Food Systems, and Community Development*, 1 (1), 65-88.
- Niewolny, K., & Archibald, T. (2015). Collective impact in/for adult education: A framework for collective action to address community complexity and resilience. In *Proceedings of the 56th Annual AERC Conference*. Kansas State University: Manhattan, KS.
- Turner, S., Merchant, K., Kania, J., & Martin, E. (2012). Understanding the value of backbone organizations in collective impact: Part 2. *Stanford Social Innovation Review*, 25-32.

Choosing the Right Tool for the Job at Hand: A Review of Business Planning and Business Model Development Approaches for Farm & Food Enterprises

R. David Lamie (Clemson University); Gary Matteson (Farm Credit Council); Stanley Green, Diana Vossbrinck (Clemson University)

Small farm and food businesses are often advised to engage in careful business development planning, culminating in a formal written business plan. Doing so provides opportunities for the entrepreneur to refine their vision, goals, objectives, to illuminate realities related to market potentials, supply chain dynamics, staffing, cash flow, and profitability, as well as to secure funding in some cases.

Many entrepreneurs are intimidated by this process, often due to lack of experience with business plan development. And, it is likely that many businesses do not reach their full potential due to their lack of a formal business plan.

Many approaches and tools have been developed to assist these businesses through this process. The website www.farmbiztrainer.com provides information on more than 30 examples. But, there is a lack of practical advice available for business planning educators/trainers/facilitators to help them make informed choices about which tool to use for specific situations. Nor is there much advice on how various tools might be used in sequence (or simultaneously) to assist businesses through their developmental process.

On September 22, 2016, Gary Matteson of the Farm Credit Council and David Lamie of Clemson University delivered the titled presentation at the National Small Farm Conference in Virginia Beach. This presentation provided a motivation for support for applied research focused on providing insights and advice to those who work directly with these emerging businesses. The results of this work have direct applicability to those designing and/or implementing educational business development programs, as well as to the businesses themselves, as they go through the process of choosing business development and planning tools.

A Trainers' Resource Guide (available at www.farmbiztrainer.com) was presented that was initially developed as part of a USDA-BFRDP Educational Enhancement Grant. The purpose of that project was to compile existing resources to help support new and beginning farmer programs in their efforts to integrate farm business management practices into their programs. This site contains significant resources on farm financial record keeping, business plan development, and good advice and tools for motivating and supporting new and beginning farmer program participants to successfully adopt these good business practices under the premise that such practices were measurable and transferable.

Workshop participants, who were predominantly new and beginning farmer program directors and affiliates, were queried in order to obtain a better understanding of how important they viewed business plan development within their programs, how successful they were in facilitating business plan development in their programs, and what might be reasonable goals for business plan development. All participants indicated that business plan development was a stated program goal. However, they admitted that not many of their participants were actually creating formal business plans, despite their good efforts to motivate and support participant efforts. The consensus was that perhaps only 30 percent of their participants were developing business plans. All agreed that it was not the responsibility of the trainer to actually develop these plans, but the responsibility of the participant. There was clear support for the need to look further into these issues going forward.

In this context a different approach to business planning was presented, the Business Model Canvas (BMC). The BMC is a strategic management and lean startup template for developing new businesses or improving existing ones. It is a nine block diagram that describes the logic behind how a business functions. The BMC is being used as an alternative method to teach new and beginning farmers in South Carolina with early indications of success. It is being used in combination with the Farm Credit Council's One Page Business Plan and the University of Minnesota's Ag Plan template to help participants to organize and assimilate the multitude of ideas they are generating about their businesses and to test out ideas. Current thinking is that this is an effective approach with the early stage new farmer entrepreneur who will not likely take the time to develop a comprehensive traditional business plan, at least not until this is required of them by external funders.

Certainly, additional work needs to be done to more fully understand how these tools can be used effectively across a wide variety of settings. More work also likely needs to be done to better understand how results might differ depending on the skillfulness of the trainer. Better understanding of these factors will likely lead to better training results, including the development of a greater number of quality business plans. This, in turn, is likely to contribute to enhanced and sustained business viability for participants of agribusiness training programs.

Developing Personal Risk Management Plans for Limited Resource Farmers

Laurence Crane (National Crop Insurance Services); *Albert Essel* (Lincoln University);
Nelson Brownlee and *James Hartsfield* (North Carolina A&T State University); *Edoe*
Adbodjan (South Carolina State University)

Abstract

The project goal was to assist Limited Resource and Socially Disadvantaged farmers in North and South Carolina StrikeForce counties in responding to risk, by developing their own personal risk management plans. Education consisting of three sequential workshops in each location (Lumberton and Clinton, NC; Bowman, SC - 9 total) supplemented by personal assignments and individualized counseling was delivered via a partnership of subject matter experts and local educators. Participants were expected to spend at least 20 hours completing homework assignments after each workshop (60 hours total).

The primary outcome was for participants to develop the skills and to understand their own operations well enough to establish a written goal for each of the five areas of risk specific to their farm, delineate for each goal at least three specific actions to reach those goals, and commit to follow through and implement their personal risk management plan.

Educators supported and monitored their progress throughout and interviewed each participant at project end, recording the number of actions completed. Attendees reported spending an average of 66.9 hours each completing homework assignments (69.0 in Clinton, 67.02 in Lumberton, 65.02 in Bowman).

There were 76 participants who accomplished all actions they had specified in their Personal Risk Management Plans by the end of the reporting period. An additional 18 participants had delineated some actions to be accomplished outside the time frame of the project, like restructuring a loan at payment time.

Results suggest this concentrated, participatory approach to education increases the likelihood of long-term behavioral change.

Project Overview

Applied education consisting of three sequential workshops, supplemented by personal assignments and individualized counseling, was delivered via a partnership of subject matter experts and local educators.

Workshops

Nine, day-long (6 hours, 54 hours total) sequential workshops were conducted at two locations in North Carolina (Lumberton, Clinton) and one location in South Carolina (Bowman). For each location, the same producers attended all three workshops. It was expected that a minimum of

30 producers and 3 educators would participate at each location for a total of 90 producers and 9 educators. Workshops included formal presentation, demonstration, in-class topical assignments, and group discussions. Workshop activities were sequential and built upon each other with specific homework (individual study) assignments conducted following each workshop.

Individual Homework Assignments

The three homework/ supervised individualized study assignments were designed to take approximately 20 hours each (60 hours total) to complete. The State Coordinators (SC) and Local Educators (LE) worked with producers in small groups during portions of the workshops to build relationships, enhance learning, and followed-up individually between the workshops to provide assistance, ensure that homework assignments were completed, and to prevent producers from becoming discouraged and/or losing interest in the project.

Personal Risk Management Plan

Each participant was expected to develop a personalized risk management action plan for each special emphasis risk topic (production, marketing, financial, human, legal) over a period of time following the initial workshop. This required each participant to evaluate the risk situation of their operation in each of these five areas, set goals for managing these risks, interact with allied professionals (e.g. loan officer, crop insurance agent, estate planning adviser, etc.), and develop specific strategies to measure and manage risk. The homework assignments were designed to reinforce concepts and principles taught in the workshops, and tailored to help them develop their own personal risk management plan.

End Result

By the end of the third workshop each participating producer had established a meaningful written goal for each of the five areas of risk specific to their farm, had delineated for each goal at least three specific actions to take to reach those goals, and committed to follow through and implement their personal risk management plan. The LE supported and monitored their progress following each workshop and interviewed each participant at the end of the project and recorded the number of actions completed.

Over 100 producers attended the day-one workshop, and 94 completed all three workshops in their location and prepared a Personal Risk Management Plan by the end of the last workshop. Attendees reported spending an average of 66.9 hours each completing homework assignments (69.0 in Clinton, 67.02 in Lumberton, 65.02 in Bowman).

There were 76 participants who accomplished all actions they had specified in their Personal Risk Management Plans by the end of the reporting period. An additional 18 participants had delineated some actions to be accomplished outside the time frame of the project.

This concentrated, participatory approach to education, with sequential workshops and individualized one-on-one follow-up, provides participants with an opportunity for sustained support as they master the skills taught in the workshops, increasing the likelihood of long-term behavioral change.

Keys to Success

The project leaders have learned through experience that a concentrated, participatory approach to education increases the likelihood of long-term behavioral change, and is consistent with the philosophy that behavior changes are more likely with sustained personal support. The following nine components were considered essential keys to the success of this project.

1. *Formed and worked with Steering Committee:* We assembled steering committees in each state consisting of the project leaders and educators in the Strike Force counties. They provided valuable leadership to the implementation of the project and helped ensure that the Statement of Work was followed and that the project objectives were met.
2. *Involved local Extension Educators:* Involving local educators was a significant step in meeting project objectives. These individuals were intimately familiar with the growers in their counties and have a long history of working with them. It was through the personal recruitment by these local educators that we were able to identify producers who were willing to make the commitment up front to attend three workshops and complete a minimum of 60 hours of homework assignments.
3. *Conducted needs assessment of producers:* Working with the local educators we were able to accurately assess the needs of the growers in the early stages of the project. This assessment informed the project leaders about the current economic conditions, production and marketing practices, and risk management challenges.
4. *Tailored workshop content to local needs/interest:* Building upon the needs assessment, workshop content and instruction was tailored to the specific interests and needs to the local area. The examples and case study were more meaningful and effective because of the early input received through the needs assessment. Attention during the workshops and application through the homework assignments was improved because the examples used to teach and explain concepts were ones the audience could relate to.
5. *Participant involvement; discussion; writing:* Traditional classroom instruction was an important part of each workshop. Following the instruction on each major topic, participants were grouped by the commodities they produced and were given discussion topics to apply the concepts just presented to the group as a whole. Workshop leaders, assisted by the local educators, monitored the discussion to help them remain focused and ensured that each person participated.
6. *Followed up on an individual basis to provide encouragement and assistance:* Following each workshop the local extension educators were expected to make one or more contacts

with each of the participants they had recruited to offer assistance, encourage action, and help keep the participants motivated. An important secondary outcome of this project was the potential long-term working relationships between the farmer participants and the local educators that was developed and fostered during these personal contacts.

7. *Required active participation by attendees:* Throughout the project, participants were expected to be actively involved. All activities (workshop presentations, group discussions, individual work) were designed to encourage participation and personal application. One very important indicator of success was the strong participation by the participants who returned each time, had completed homework assignments, and actively participated in each of the three workshops.
8. *Required accountability at each phase of project:* At the beginning of the last two workshops participants were expected to report on their homework assignments, and engage in a discussion about lessons learned and further application of the principle being taught. Throughout the project each participant had established five goals and identified 15 specific actions they would take to meet their risk management goals. The local educators followed up and recorded the activity of each participant in accomplishing these actions.
9. *Recognized participant accomplishments:* At the conclusion of the last workshop, participants were presented with a certificate recognizing their accomplishment of completing 18 hours of classroom instruction and 60 hours of homework and individual study assignments. At the conclusion of the last workshop several farmers commented orally and on the written evaluation form that they were grateful for the opportunity to participate, had learned more than expected, and wished the series could continue on a regular basis.

Producer Quotes

“The Risk Management class has helped us to become more aware of the need to establish a local market, and provided us the skills to do so. We had been selling locally, mostly to friends and relatives. As part of a class assignment, we began to look into more stable markets. Now we have widened our sales to Daycare Centers and Churches, which are more reliable and constant markets. We would have never thought of these markets without the help of the risk management class. We came up with these ideas through brainstorming with our group, and completing the homework assignments. We have become more aware of what we have to do to reach our goals for the farm.” (*Vegetable farmer from Hampton County, North Carolina*)

“This workshop was very beneficial to me. I learned many recordkeeping techniques and procedures to help my farm run properly and efficiently. Learning about all of the risk areas has been very informative and helpful. This workshop actually helped us resolve a very necessary legal risk in that we had our wills written up since attending the workshop.” (*Vegetable Farmers*)

from Orangeburg County, South Carolina)

“My wife and I found the Risk Management Project very beneficial in a number of ways. It caused us to view our farm as a business and not just a hobby. It forced us to improve our record keeping, and to inventory the resources on our farm. We discovered that we have a lot of equipment not being fully utilized. Also, being a certified organic farmer, this risk management project has helped us to stay on point with everything that we put in the ground making it easier for us to file for our recertification. This project also made sure that we kept up with our insurance. This has proven to be very important.” (*Organic Farmers from Robeson County, NC*)

Educator Quotes

“The Risk Management Training has been a great benefit for producers in Southeastern North Carolina. They worked on case studies and homework assignments that assisted them in better managing their farm operations. Many of the producers have completed their short-term goals detailed on their risk management plans and are working on their long-term goals. It has been very rewarding to see the producers apply the information they learned during the training.” (*Nelson Brownlee, Area Farm Management Agent, North Carolina Cooperative Extension*)

“This risk management training helped our small farm producers get an understanding on how to be more efficient through careful planning, setting goals, decision making and managing risk in the best way to overcome internal obstacles. The overall workshop training was a valuable asset to all the producers we service in my respective counties. I think the topics discussed are critical and essential to the success of any farming enterprise and risk management is a good overall tool. Without good risk management- we will have no farmers to service because they will not exist.” (*James Hartsfield, Area Farm Management Agent, North Carolina Cooperative Extension*)

“Over the years, I have been involved with many educational interventions in agricultural risk management for socially disadvantaged producers and educators who conduct programs for underserved audiences. The response that we received from these producers in North and South Carolina during this series gives me hope that for once we have hit the target. The energy, enthusiasm and desire to learn tools for managing farm risk among the participating producers was exhilarating and infectious.” (*Dr. Albert Essel, Lincoln University; Project Co-Director*)

“It was a very rewarding experience to lead this project and to work with these capable and receptive farmers. This educational model of a series of workshops, with associated individual homework study assignments monitored by local educators, hit a receptive note. This concentrated and hands-on approach to education typically leads to long-term behavioral change and is consistent with the philosophy that behavior changes are more likely with sustained personal support. This project changed the participants’ behavior in a positive way.” *Dr. Laurence Crane, National Crop Insurance Services, Project Director*

Addressing Inequitable Participation of Socially Disadvantaged Farmers in USDA Programs: Survey Results

Oluwarotimi Odeh (California State University, Stanislaus); *Fidelis Okpebholo* (Virginia State University); *Yapo G. N'Guessan* (Jean Lorougnon Guede University, Daloa, Cote d'Ivoire)

Introduction

Food demand in the United States of America (US) continues to increase, while the total number of farmers has decreased from over six million in 1910 to just over two million in 2007 (National Farmers' Coalition, 2011). The national average age of farmers in the US is 57 years and a recent projection shows that 25% of these farmers will retire between now and 2030. A recent government report (New Virginia Economy) shows that Virginia agriculture and forestry annually contributes over \$70 billion to the state economy and employs about half a million people, including about 55,000 farmers.

The US government's attempt to boost agricultural production and support the agricultural industry's capacity to meet the growing food demand has primarily been through the United States Department of Agriculture (USDA). With an annual budget of about \$149 billion, the USDA offers programs to strengthen the American agricultural economy, build vibrant rural communities and secure a stronger future for the American middle class.

Our study examined the inequitable participation of socially disadvantaged Farmers and Ranchers in USDA agricultural programs. The specific objectives were to:

1. Collect and analyze information on socially disadvantaged farmers and ranchers in selected counties in Virginia.
2. Conduct outreach activities to identify root causes of failure to achieve equitable participation in USDA agricultural programs by Socially Disadvantaged Farmers and Ranchers, as well as development of recommended solutions.
3. Develop and deploy improved strategies for outreach and technical assistance.

Review of Previous Studies

Previous studies have examined the impacts of extension programs in assisting limited resource farmers in Virginia (Akobundu et al, 2004). Most of these studies have demonstrated challenges faced by socially disadvantaged small holder farmers and various attempts by the US government to address these problems. However, such attempts have not been successful in ensuring that these farmers participate in several programs designed primarily to address their challenges and increase farm profitability.

As stated in the 2008 Farm Bill, a **"Socially disadvantaged Farmer or Rancher"** is a farmer or rancher who has been subjected to racial or ethnic prejudices because of their identity as a

member of a group without regard to their individual qualities. Groups historically subjected to racial or ethnic prejudice include African Americans, American Indians or Alaskan natives, Hispanics, and Asians or Pacific Islanders (USDA-NRCS, 2009).

Methodology

Over 400 surveys were administered to farmers and ranchers, extension service providers and USDA agency staff in Virginia. Additional data were sourced from two follow up workshops for farmers and service providers, several one-on-one meetings and focus group meetings.

This study covered socially disadvantaged farmers, ranchers and landowners in 20 of the 134 counties and independent cities in Virginia. A two-stage approach was used in this study.

Results and Discussion of Findings

Analyses of findings of the study led to a compilation of factors limiting the participation of socially disadvantaged farmers and ranchers in USDA Agricultural programs. A total list of forty-five (45) strategies generated from the analyses proposed for addressing and enhancing participation of these farmers and ranchers in USDA agricultural programs include the following:

Stage 1 Result

Socially Disadvantaged Farmers and Ranchers: There is a tremendous lack of knowledge or understanding among respondents about who the expression, “socially disadvantaged”, refers to. The lack of understanding appeared to have misled farmers to think that agricultural programs for “Socially Disadvantaged Farmers and Ranchers” do not apply to them. Most of the farmers sampled believed that the expression is derogatory and they did not want to be “labeled”.

Cumbersome Application Process: An overwhelming majority (98%) of respondents reported that the application processes for government agricultural programs were too cumbersome and confusing. Most respondents expressed frustration and discontent about their experiences with the application processes, citing more customer friendly loan application processes in commercial banks as a contrast.

Inadequate Communication/Marketing/Outreach Efforts: Respondents reported lack of awareness about many of the programs and blamed lack of communication with the relevant groups who need the services. Inadequate outreach effort was also cited as one of the major factors limiting the participation of socially disadvantaged farmers and landowners in government agricultural programs. They expressed disappointment at the poor customer service of government agency staff as one of the major obstacles to more participation in government agricultural programs. Some of the respondents reported receiving conflicting information from

some of the government agencies administering the programs. This is an indication of poor inter-agency communication.

Lack of Technical know-how: The respondents lacked the technical knowledge to access information about the programs from the online sources, hampering completion of the applications. Respondents also expressed lack of knowledge about farm management and farm transition arrangements.

Lack of Trust: Respondents expressed distrust of government officials and programs because of past unpleasant experiences and disappointments. A majority stated that they have participated in several white elephant programs in the past and expressed wariness about similar government programs that promise help and assistance. Others stated that they experienced discrimination based on their economic status and or race.

Rural-Urban Migration: Rural-urban migration of the youth in the rural communities was also identified as one of the challenges limiting the participation in government agricultural programs. Of the respondents, 68% reported willingness, or the lack thereof, by children to take over the agricultural enterprise as a major factor in their decision on whether or not to continue farming.

Stage 2 Result

As a follow up on the findings in Stage 1, a hands-on workshop was organized for fifteen (15) socially disadvantaged farmers with no history of participation in USDA agricultural programs. Topics covered in the workshop included 1) How to participate in USDA programs; 2) Farm Loan programs; 3) Farm Insurance programs and; 4) Record Keeping.

Respondents (93%) reported that the workshop provided them with an opportunity to learn more about USDA programs. All participants rated the usefulness of the workshop as average to excellent (66%). This means participants found the workshop at least useful to them. All participants reported that the workshop increased their knowledge on how to participate in USDA programs. Majority (60%) of workshop participants stated that Farm Loan programs presentation was the most relevant topic. A vast majority (87%) expressed their readiness to participate in some of the programs discussed. Overall, all the participants (100%) indicated a willingness to participate in future workshops. This suggests that, apart from finding the workshop useful, they were willing to participate in other programs presented in the workshop

Major Findings

Major findings of this study include the need for strong outreach and technical assistance programs in rural communities to enlighten socially disadvantaged constituencies about specific programs developed to assist them. Public Land Grant 1890 and 1862 institutions have a huge

role to play in this regard. Some of these institutions will need to evaluate and revamp existing outreach programs to meet the needs of the target population. For instance, with a growing Hispanic population in U.S. agriculture, considerable effort should be made to work with local leaders and non-profit organizations to reach and enlighten the population. A similar effort should also be employed in dealing with the African American farmers through faith-based organizations. That is, more effective and targeted marketing/outreach strategies are needed to reach the existing socially disadvantaged farmers and ranchers, and also the young, prospective agribusiness entrepreneurs in the communities right from middle and high schools.

Furthermore, public institutions can also provide free or low cost technical assistance to these farmers. A key strategy that appears to have worked quite effectively in the past is one-on-one, hands-on training to help farmers and ranchers to develop valuable skills that they can use immediately. Adult learners are quite pragmatic and prefer acquiring knowledge they can apply to solving their immediate problems.

Revising the “Socially Disadvantaged Farmers and Ranchers” expression may also need to be considered by policy makers. Findings from this study suggest that adopting expressions like “Historically underserved” or “Socially underserved” could be one of the changes needed to increase the level of participation by target groups in government agricultural programs. Such an increase in participation would enhance their productive capabilities and add value to local communities.

Recommendations for Policy, Practice & Future Directions for Research

With the increasing global food demand and the decreasing and aging population of labor force engaged in agriculture, every resource will be required to meet the growing need. This presents tremendous opportunities for all farmers and ranchers. It is therefore important for socially disadvantaged farmers and ranchers in particular, to take advantage of available government programs to support productive enterprises in food production. Local leaders could play a useful role in encouraging the youth and the unemployed to consider opportunities in the agribusiness industry.

It is also important that 1890 land grant institutions revamp their outreach and technical assistance programs to more actively promote the participation of socially disadvantaged farmers and ranchers in USDA programs. Concerted effort should be made to work closely with USDA agencies in engaging and promoting agriculture at the middle and high schools, to build a new generation of farmers that can take over existing agribusiness operations from their parents or establish new viable ones.

Further, as previously mentioned, revising the “Socially Disadvantaged Farmers and Ranchers” label to a more neutral expression like “Historically underserved” or “Socially underserved” may have need to be considered by policy makers.

Finally, there is need to develop a tool-kit of effective strategies for boosting active participation and farm productivity of socially disadvantaged farmers across the nation. This should be done through collaborative partnerships between land grant institutions, USDA agencies and local, community based organizations.

References

- Akobundu, E, Alwang, J, Essel, A, Norton, G. W and A. Tegene. “Does Extension Work? Impacts of a Program to Assist Limited-Resource Farmers in Virginia”. *Review of Agricultural Economics*, Vol 26, Number 3, 2004: Pages 361-371.
- National Farmers’ Coalition Report: Building a Future with Farmers: Challenges faced by young American Farmers and a National Strategy to Help Them Succeed.
<http://www.youngfarmers.org/newsroom/building-a-future-with-farmers-october-2011/>
Accessed 9/26/2012.
- New Virginia Economy. <https://commerce.virginia.gov/media/3501/new-virginia-economy-12052014.pdf> (Pg. 14). Accessed 5/06/16.
- United States Department of Agriculture – Natural Resource Conservation Service
<http://www.csrees.usda.gov/about/offices/legis/25fact.html>.

Working With Refugees in Community Gardens

Wayne Long (University of Kentucky Cooperative Extension)

Since the early 1990's, more than 25,000 refugees have relocated to Louisville, Kentucky (Ryan, 2014). Per Catholic Charities data, Louisville is home to 73% of the refugees living in Kentucky. Most of these refugees are from Cuba, Iran, Somalia, Bhutan, Burundi, Congo, and Burmese. The Jefferson County Public Schools list 123 languages spoken in their schools, highlighting the scope of refugees and immigrants living in Louisville (JCPS Facts, 2016).

Many refugees come to the United States with a farming background. Being settled in a city, these farmers have no access to land and limited capital that they could use to secure the landed needed to farm. Refugees also face language barriers and lack the knowledge of local markets that is needed to succeed at market gardening or farming.

The Jefferson County Cooperative Extension Service manages 11 community gardens. Three of these gardens have a high refugee population with people from Somalia, Bhutan, Burundi, and Burma. At the 7th Street Community Garden, which is approximately 5 acres, 75% of the garden plots (173 plots, 30' x 30') is used by refugees. The Southside Community Garden (96 plots, 20' x 30') is made up entirely of refugee gardeners. The Millers Lane MSD Garden is used as an incubator farm. On this 2.5 acres, participants have access to large plots that are 3,125 square feet. "Most of the harvest goes to local supermarkets, restaurants, and farmers markets" (Common Table & Common Earth Gardens, 2016). Including family members, these gardens are feeding approximately 1,000 refugee families.

This successful and growing program took careful planning and plenty of groundwork to the lay foundation for sustainability. In 2012, the University of Kentucky was awarded an USDA Beginning Farmer Grant. Extension Specialists worked closely with local Extension Agents in Louisville to establish a program that was focused on refugee small and beginning farmers. These classes, hosted at a local community center that caters to refugees' needs, taught farming and gardening basics. While many of the refugees were farmers, adjusting to a different climate, soils, insects and diseases could prove challenging. These classes used the garden as a hands-on learning tool and a common frame of reference for people from several different countries. Class topics included: plant selection, site selection, disease, insects, compost, efficient water use, weed management, and marketing. Participants were divided into groups based on language and interpreters worked with the groups to translate for the teachers.

The grant ended in 2014, and since that time the Extension Office has committed to continuing the program. Extension works with partners like Louisville Metro Parks and Recreation, the Metropolitan Sewer District and the Louisville Metro Council to provide land access in community gardens. By working with partners who specialize in refugee and immigrant

resources, like Catholic Charities and Americana Community Center, the Extension Office is able to reach out to an important segment of the population of Louisville that can be difficult to reach in traditional venues. Through this work, additional projects have been initiated. Most recently, refugees from Ethiopia contacted the Extension Office looking for access to land to grow teff for use as a grain to produce flour for injera, a popular bread-like food in their native country.

While language might be the first barrier that comes to mind there are other reasons that working with a refugee population can prove difficult. Basic demographic information can be difficult to obtain. The population tends to be transient, so reliable addresses and phone numbers can be difficult to obtain and keep updated. Engrained gardening practices can be difficult to change. For example, over watering that was necessary in sandy soils in Somalia, resulted in flooded gardens.

While adjustments are always being made to deliver the best experience for all gardeners, some best practices have been established.

1. Partnerships - By working with great partners with complementing missions, the Extension office has been able to reach a wider audience and expand programming. Catholic Charities and their employees have been instrumental in reaching out to refugees, many times calling each refugee or even visiting the homes of refugees for garden sign ups or to deliver meeting announcements. In addition, a second grant that partnered the Extension Office with the University of Louisville was used to create gardening guides in 5 languages, among other urban agriculture work. These gardening guides are available for free at:
<http://louisville.edu/cepm/projects/brownfields-and-safe-soil/gardenguide>.
2. Using members of the refugee community as interpreters - In a practice that started with the Beginning Farmer Grant, the interpreters the Extension office uses typically come from the refugee community in Louisville. These are trusted fellow countrymen of the refugees and bring a level of trust that might not be found with other interpreters. In addition, they act as liaisons for their communities and express the needs for Extension to address.
3. Bringing the community together - Each garden is a community. The Extension office requests that gardeners work together in common areas of the garden to keep things looking tidy. This leads to building relationships between refugee groups as well as natural born citizens. Produce is often shared with neighboring gardens and has introduced unique crops, like bitter gourds and tea, to the gardens. With a common goal of producing food, other barriers like language become smaller.

4. Educational programs - The educational programming began with the Beginning Farmer Grant and the Extension office continues to offer classes to refugee gardeners. Now, the classes are offered in the garden, rather than the community center, in an effort to address specific concerns and to meet gardeners where they are. Class topics include: production, water efficiency, soil quality, environmental issues, composting, mulching, harvesting and more. These classes also allow for maintaining partnerships and building relationships with refugees.
5. Garden sign ups - In addition to classes in the garden, annual signups are also held in the gardens to ensure that gardeners have every opportunity to reenroll in the program. Typically, agreements for re-enrollment would be mailed, but given that addresses and phone numbers can be unreliable year to year for the refugee population; these are now handled mainly in the garden. Signups also begin earlier, during the fall, which increases attrition, since during the winter the office may lose some contact with the refugees.
6. Niche crops - As mentioned above, refugees bring with them crops and usages that may be unfamiliar. Finding markets and opportunities to produce these crops has been another focus of the Extension office. For example, refugees from Ethiopia needed land to grow teff, which is typically used as a forage crop here. They are growing teff for the grain and plan to sell the flour and other goods. The Extension office made available a section of the Farnsley Moreman Community Garden for the project. In addition, the Extension office has helped to find a mill that can process the grain.
7. Patience - Working with a population who has a different language and cultural norms can cause confusion for both parties. Patience is necessary. There is much to learn on both sides.

The Jefferson County Extension Service will continue to develop partnerships with agencies that are working to improve the lives of existing and new arrival refugees. Additionally, we will expand availability of land for refugee (and other) growers to scale up so they may take advantage of the thriving local food system in Louisville.

We will provide educational programming that will include the use of high tunnels to extend their growing season and take advantage of early season markets. There is strong support for developing research projects geared toward specific crops that already have a market but those products are sourced from other states/countries.

The relationship our office has built with the local refugee population goes beyond urban agriculture. 4-H and Family and Consumer Science Agents and staff are involved in many

Extension programs including health, nutrition and youth development that are focused in community centers and apartment complexes that are used by refugees.

We look forward to continuing the relationship we have developed with the refugee population and the partnership we have built.

References

Common Table & Common Earth Gardens. (2016). About Us. Retrieved from:

<http://grow.cclou.org/aboutrapp/>

JCPS Facts. (2016). Retrieved from:

<https://www.jefferson.kyschools.us/about/newsroom/jcps-facts>

Ryan, Jacob. (July 1, 2014). Influx of Young Refugees Pinches Kentucky Refugee Services Budget, WFPL. Retrieved from:

www.wfpl.org/influx-young-refugees-pinches-kentucky-refugee-services-budget/

Using Business Organizations to Limit Risk and Plan for the Future

Sarah Everhart (University of Maryland Francis King Carey School of Law)

Introduction

Sole proprietorships remain the most common way that family farms are owned in the United Statesⁱ, but farmers should consider forming other business organizations to own their operations. Business organizations can benefit farmers by limiting personal liability exposure and allowing for improved multi-person ownership structures, off-farm investors and easier transitional and estate planning. However, a farmer should not decide on what type of business organization to form without first consulting with his/her lawyer and accountant. The legal obligations and tax consequences of various business organizations can vary widely and should be thoroughly considered before formation. States such as, South Dakota, North Dakota, Oklahoma, Iowa, Minnesota, Wisconsin, Missouri, and Kansas have anti-corporate farming statutes which prevent farm operations from being owned by certain business organizations.ⁱⁱ Operators in these states should seek advice of counsel on the limitations of these laws.

Types of Business Organizations

Sole Proprietorship

Sole proprietorships are by far the simplest and easiest way for a farmer to own an operation. Although considered a business organization, a sole proprietorship is single person ownership of an operation. There are no business organization formation filings or other legal documents that are required to establish a sole proprietorship. The owner has full control over the assets of the organization and there is no need to segregate assets.ⁱⁱⁱ A sole proprietorship bestows no personal liability protection upon the owner and provides no transitional or estate planning value. There are also no tax benefits of owning an operation as a sole proprietor because the entity is not recognized for tax purposes and the owner is taxed as an individual. Further, sole proprietors are limited in terms of potential investments they can borrow to support farm operations. Given the simplicity of formation and use, a sole proprietorship is an appropriate business organization for a single farmer or a beginning farm with limited resources. However, even new farmers or farmers with limited resources should consider a business organization that offers some personal liability protection.

General Partnership

A general partnership is a business organization comprised of two or more persons who have agreed to carry on a business for profit.^{iv} State laws pertaining to partnerships vary depending on whether the state has adopted the Uniform Partnership Agreement or the Revised Uniform Partnership Agreement. Typically, general partnerships do not require a business organization

formation filing. A partnership agreement, the legal document which outlines the rights and responsibilities of the partners, is normally not required but is highly recommended.^v Normally, partners in a general partnership have an equal right to manage the partnership, absent a partnership agreement provision to the contrary. General partners should be wary of the potential for joint and several liability for the debts of the partnership.^{vi} This means, depending on the jurisdiction, each partner may be fully responsible for the debts of the partnership. Additionally, profits and losses of the partnerships are usually shared equally unless the partners have agreed otherwise in their partnership agreement. General partnerships are not taxed separately as an entity and the profits flow through to the partners for tax purposes.^{vii} Given the relative ease of formation and use, general partnerships are popular farming business organizations, but farmers should consider other business organizations that provide planning capabilities and personal asset protection before settling on the use of a general partnership.

Limited Partnership

A limited partnership is a partnership made up of at least one general and one limited partner. Limited partnerships normally require some type of business organization formation filing documents to be created and filed with the state tax department. A partnership agreement dictating the terms of the partnership arrangement is also required. Although limited partnerships may vary, they all share the common characteristics of a general partner with management authority, and a limited partner who invests in the partnership, but does not have the authority to manage. The general partner bears all of the risk for the actions and debts of the limited partnership. The limited partnership's liability is typically limited to the extent of his or her investment.^{viii} If a limited partner exerts management authority and acts like a general partner, he or she may lose the liability protection a limited partner normally enjoys. Further, profits and losses are allocated based on initial contributions to the partnership unless the agreement dictates otherwise.

The use of a limited partnership allows farm operators to have investors that can be beneficial to operators with off-farm or non-farming family members who want to be financially involved in an operation, but not share in management decisions. Limited partnerships are also a good option for transitional and estate planning. Limited partnerships allow for a general partner to control the partnership and its assets, while at the same time effectively transferring indirect ownership of portions of the assets to second and third generation family members who are limited partners.

Corporation

A corporation is an entity with all the rights of an individual owned by its shareholders who have basic voting rights. Corporations are formed by filing formation documents (Articles of Incorporation) and creating corporate by-laws to dictate the corporation's procedures.

Shareholders have personal asset protection and their liability for corporate debts is limited to the amount of their investment, unless the corporate veil is pierced.^{ix}

Corporations are managed by a Board of Directors and the Board must have regular meetings and keep records of their actions. Given the complexity involved in running a corporation, it may not be a smart business choice for a small operation to run as a corporation. However, corporations can be used effectively for transitional and estate planning by creating classes of stock that can be transferred either during life or upon death. This allows for transfer of assets without disrupting an operation. Corporations file taxes separately from their owners. Therefore, a farmer should fully understand the tax consequences involved in using a corporation prior to formation.

Limited Liability Company

A Limited Liability Company (LLC) is a hybrid business organization with attributes of both a partnership and a corporation.^x An LLC is formed by filing formation documents (Articles of Organization) with the state. An LLC also requires an operating agreement to dictate how the members, the equivalent of shareholders in a corporation, run the entity. Like corporations, LLCs are distinct corporate entities and the members have personal liability protection. However, LLCs, like partnerships are not treated as separate taxable entities and profits and losses flow through to the members.^{xi} An LLC's members may be individuals or other business organizations such as partnerships or corporations and contributions to the LLC can take any form. LLCs are generally considered to be more flexible to run than corporations and for that reason they are appropriate for operations of any size and offer transitional and estate planning advantages. Membership interests (the right to receive profits) are freely transferable, but the right to participate in the management of the LLC may only be permitted with the permission of the other LLC members depending on the provisions of the operating agreement. This attribute may be useful for a farm operator who desires to reduce their taxable estate, while retaining control over an operation. Operators should consult their individual legal counsel about how an LLC can be used for planning.

Conclusion

Forming business organizations can benefit farm operations of all sizes by reducing the personal liability exposure of the owners and operators. Further, certain business organizations can bestow tax planning benefits onto farmers. Additionally, forming and utilizing business organizations can accommodate future growth by allowing for outside investors and non-farming and/or out of state family members to be financially involved in an operation. Finally, business organizations can be valuable tools for transitional and estate planning and allow farmers to slowly transition out of an operation and/or gift away assets prior to death to lessen estate tax implications.

References

- ⁱTable 67- *Summary of Legal Status for Tax Purposes*, 2012 Census of Agriculture, UNITED STATES DEPARTMENT OF AGRICULTURE, available at https://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_1_US/usv1.pdf.
- ⁱⁱ Kaitlyn Trout, *You Can't Have Your Beef and Eat It Too: The Statutory Effect of Anti-Corporate Farming Acts On Family Farms and Beef Corporations*, 39 Okla. City U.L. Rev. 513, 514 (2014).
- ⁱⁱⁱ Carole R. Goforth, *An Overview of Organization and Ownership Options Available to Agricultural Enterprises- Part I*, NATIONAL AGRICULTURAL LAW CENTER, Jul. 2002, at 3, available at http://nationalaglawcenter.org/wpcontent/uploads/assets/articles/goforth_ownership1.pdf.
- ^{iv} *Id.* at 7.
- ^v Paul Goeringer & Ashley Newhall, *Using a Business Organization Structure to Limit Your Farm's Liability*, UNIVERSITY OF MARYLAND EB-422, Mar. 2015, available at http://drum.lib.umd.edu/bitstream/handle/1903/16325/Business%20Org_EB_422.pdf?sequence=1&isAllowed=y.
- ^{vi} *Id.* at 3.
- ^{vii} *Id.*
- ^{viii} *Id.*
- ^{ix} *Id.* at 4.
- ^x *Id.* at 5.
- ^{xi} *Id.*

Electronic Newsletters That Clients Actually Read

Donna Coffin, (University of Maine Cooperative Extension)

Through the years Extension educators have been charged with assisting people with research based information focused on client needs. They have always used a variety of

methods to communicate with their clientele including newsletters. Printing and mailing costs for surface mailed newsletters is no longer financially feasible with the average cost of mailing at \$0.50 for each newsletter.

	Pieces / year	Cost / year	Cost / piece
Surface mailed	12	\$6	\$0.50
Electronic	130,000	\$900	<\$0.01

Feedback on the number of clients who actually opened and read the newsletters was unknown with surface mailed newsletters. Extension staff have turned to electronic versions of newsletters to educate their clientele more efficiently with costs at 1% of surface mailings.

Feedback on newsletter readership is now available with the Constant ContactTM system.

Cost for the system runs less than \$900 a year for up to 10,000 clients who can sign up for one or more of the 10 newsletters produced by seven county and state offices. Currently we have over 7,000 clients in the system that used either the online signup website, QR code or shortened web address (bit.ly/PPfarming) to sign up for 8 newsletter and interest lists. Staff have access to 76 lists and can upload mailing lists from Excel spreadsheets.

76 Email Lists		Delete		
☐	★	List Name	Contacts	Date Created
☐	★	Gardening Newsletter	2353	Jul 24, 2007
☐	★	Farming Newsletter	854	Jul 24, 2007
☐	★	Beef Newsletter	696	May 6, 2011
☐	★	Cumberland County Beekeeping	639	May 10, 2016
☐	★	Farm Scoop	481	Nov 20, 2015
☐	★	Poultry List 11/25/15	448	Nov 25, 2015



Newsletter Sign up

Thank you for joining the University of Maine Cooperative Extension newsletter mailing list. We look forward to keeping you informed.

* Email Address

* First Name

* Last Name

* Address

Street Address

City

State/Province

Zip Code

* County

Please enter any questions

Specific topics of interest

Email Lists

☐ Beef Newsletter

☐ Dairy - All Maine Dairy Farmers

☐ Dairy - Organic Biz Contacts

☐ Equine

☐ Farming Newsletter

☐ Gardening Newsletter

☐ MGFN

☐ PSO MG Interest List

By submitting this form, you are granting: University of Maine Cooperative Extension, UMaine Cooperative Extension, Orono, ME, 04469-5741 United States, <http://extension.uma.edu/piscataquis/> permission to email you. You can revoke permission to mail to your email address at any time using the Subscriptions@uma.edu link, found at the bottom of every email. We take your privacy seriously (to see for yourself, please read our [Email Privacy Policy](#)). Emails are serviced by Constant Contact.

Editing of mailings is quick and easy with a number of online tutorials and live chat opportunities. Mailings can include text, images, pdfs, spreadsheets and links.

Time sensitive information can be sent immediately to these interest groups and others. Notification of newsletter emails can be shared with Facebook & Twitter accounts with one click.

The power of the electronic newsletter is that the authors can see how many folks open the emails and how many people click of the various links. In the last 3 months our open rates average 34% and click-through rate (when someone clicks on a link of interest in the newsletter) averages 22% while the industry average is 20 % and 8%. Extension's newsletters are opened, viewed and readers are interacting with the material presented at a rate higher than similar industries.

The most popular items accessed by clients include:

- New research that applies directly to farms
- Farm and garden events
 - Ag Trades Show
 - Maine Farm Days
 - Northeast Livestock Expo
 - Garden Field Day
- YouTube videos of how to demonstrations
- Weather links
- UMaine Extension publications
- Surveys



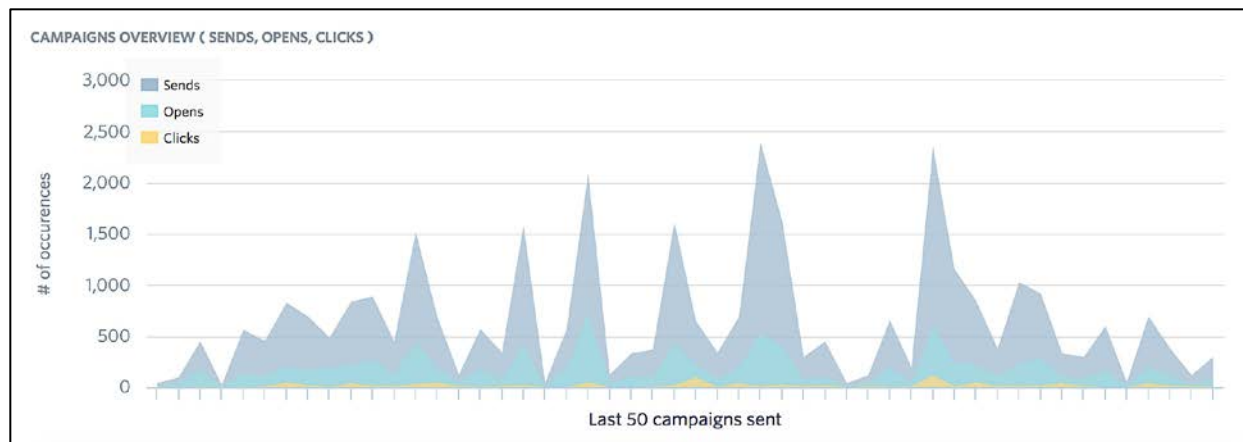
Opens by device



Mobile: 45%



Desktop: 55%

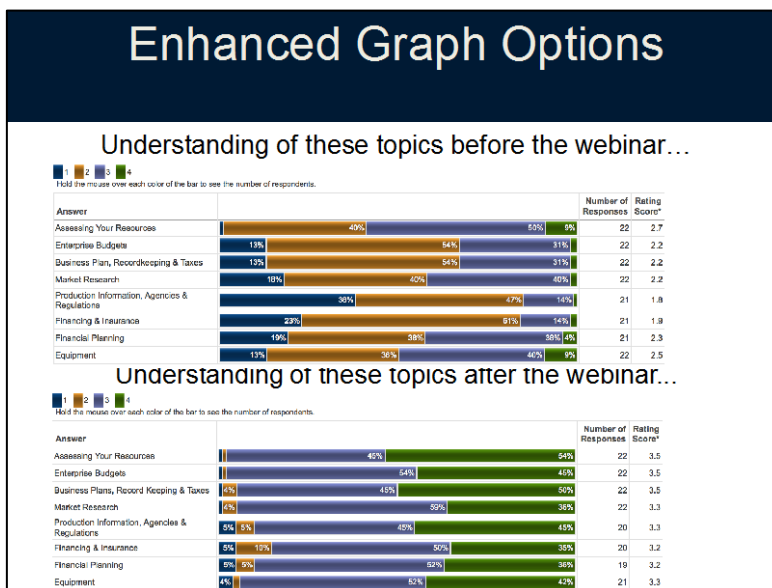


The electronic communication method is also evolving and reports on the type of devices clients are reading our newsletters on is now available. This is an important reminder that email, newsletters and any content sent electronically should be compatible with mobile devices.

Email Run History			
Sending Type	Sent	Run Date	Status
Original Send	758	9/28/2015 9:23 AM EDT	Successfully Sent

Click-through Stats		
Email Link	Unique Click-throughs	Click-through Distribution
http://bit.ly/PPfarming	1	1.5%
http://blog.uvm.edu/cwcallah/2013/03/20/coolbotstm-inexpensive-cold-storage/	21	32.3%
http://extension.umaine.edu/	0	0.0%
http://extension.umaine.edu/penobscot/	1	1.5%
http://extension.umaine.edu/piscataquis/	3	4.6%

In the years before electronic newsletters there was no way of knowing if recipients opened their newsletter and the types of articles or information to which they were drawn. Now that clicks on links are available we can get a sense of the type of information of importance to clients. For instance, this report shows that 32% of the clients that clicked on a link clicked for more information about the cool-bot system to cool vegetables.



Another valuable function in the Constant Contact TM system is the survey tool. We have used it to survey clients about interest assessment for prospective programs, to evaluate programs they have attended, as well as evaluate the newsletters they

receive. Clients can either complete a paper survey that staff can input or clients are given the link to go directly to the survey to input their answers. Results can show the impact of learning by assessing their knowledge of understanding of a topic before and after a program.

As a result of contact with UMaine Extension client has:	Percent
Adopted techniques to improve soil quality on farm and home gardens	90%
Improved efficiency on farm and home garden	81%
Expanded home garden area	81%
Increased consumption of foods produced from my garden	76%
Made more effective farm / business decisions	74%
Increased yields in home garden	73%
Improved animal health and well-being	70%

Results from the impact assessment from our last year's newsletters show that clients have acted on a number of things to improve their lives.

The Constant Contact™ email management system has proved to be an effective and efficient way for County Extension staff to remain in contact with their clientele and assess the relative use and impact of these communications.

- More timely
 - Can send to 1,000's at a moment notice
- More data
 - Number of opens
 - Number of clicks
 - Number of shares
- Effectiveness
 - Survey responses
 - Client opt-in and opt-out
- Cautions
 - Too many emails results in less readership
 - Irrelevant information results in more opt-out

A Call for Open Systems in Design and Manufacturing of Agricultural Machinery

Lucky Catron (Cleber LLC, Paint Rock, AL)

The world changed in 1981 when IBM announced the IBM P.C. - a personal computer that was built using a computer chip from Intel and an operating system built by Microsoft. The world of Open System Computing was created.

In 1981, there were no cell phones or the Internet, and we did not have Amazon. It is a different world today because open system standards have begun to displace proprietary systems. However, the world of small agricultural and light construction equipment has not witnessed similar change.

Globally, the traditional business model in the equipment industry has been continuously moving up the chain to provide increasingly high-tech and expensive products to the top portion of the market. The use of proprietary parts, patents, and vertical integration has left small farmers and ranchers without basic, affordable equipment necessary for maintaining livelihoods.

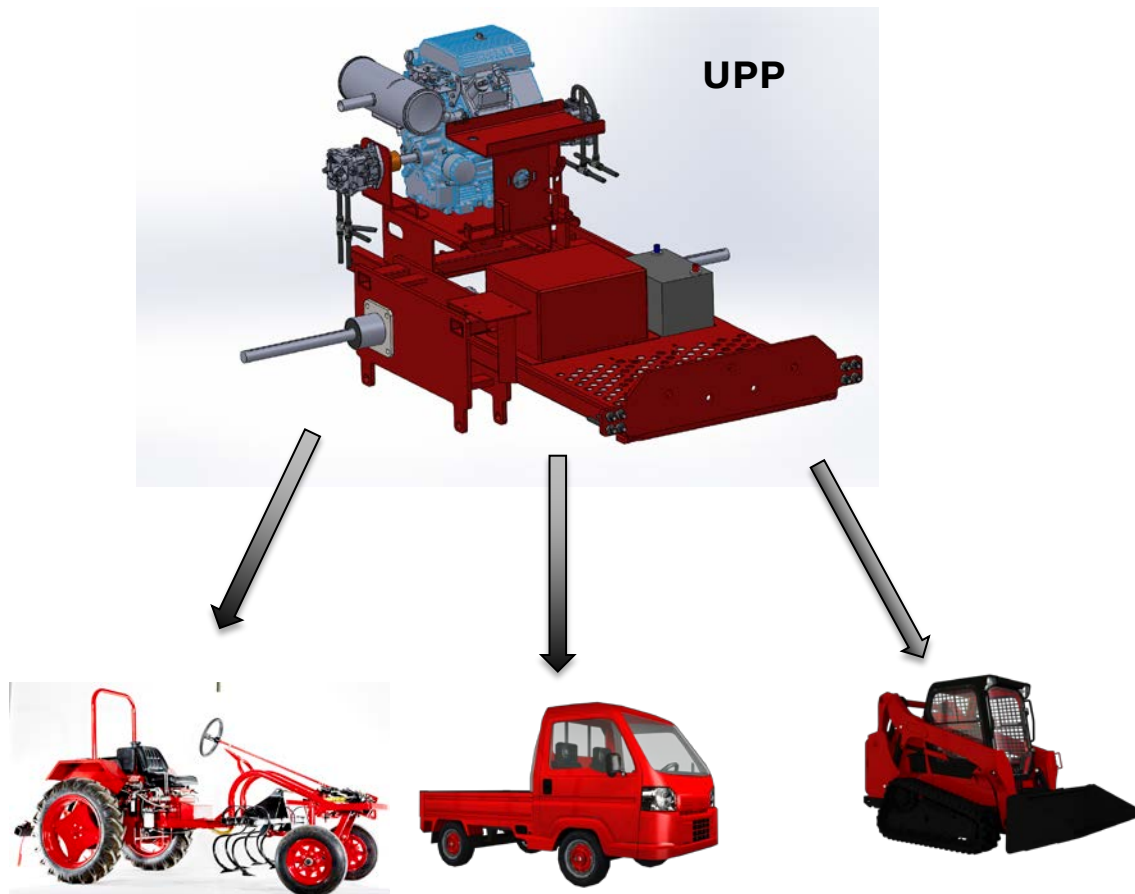
Established industry relies on legal measures to protect profits by locking in customers and hindering product advancement unless it is their own. The primary means of achieving this hindrance has been the use of patents.

The original purpose of patents was to protect intellectual property and ensure that creativity and hard work was rewarded. However, over time patents have become tools for holding market share and manipulating prices at the expense of the consumer. It is our observation that the misuse/overuse of patents, specifically in the equipment industry, has stifled innovation and in the process created product lines that are price restrictive to more than 80% of the world's farming population.

The base requirements of many pieces of equipment are the same and it is a disservice to the customer and a waste of research and development resources to use unique designs for each individual piece of equipment. However, individual developers/manufacturers have slightly modified each equipment in order to maintain market share and control prices.

The only solution to this problem is standard specifications for subcomponents and connections in farm equipment. Cleber, LLC has begun the process of transforming the industry by creating a new business model and a set of standards for the development of small farm and light construction equipment. The first component: the Universal Power Platform (UPP) will standardize the power systems for small agricultural and light construction equipment in order to lower prices across product lines.

The UPP can be used to build a small-scale tractor, excavator, skid steer, light truck, and more. The patent for the UPP will be licensed for free to anyone that licenses a derivative product for free, incentivizing the creation of a value chain for local products and services. This creates an ecosystem that encourages innovation and allows for true competition.



The purchase price is not only lowered for the customer, but the cost of ownership is significantly reduced. Because the UPP is developed using an Open System Manufacturing (OSM) model, the customer has the flexibility to buy off-the-shelf components and fix their own equipment. And as technology evolves, the purchased equipment can adapt because it is built from a common platform. Because equipment is not designed for obsolescence, it will last longer and has the opportunity to bring more value with time.

This is a model that benefits the customer and ensures that businesses operate based on value. For this model to transform the industry to one that is collaborative, accessible, and value-based, there must be international standards.

Learning from the standards development process of other industries, it is vital that these standards are not controlled by any entity that profits from them. The standards body must

consist of international NGO's, government agencies, and universities. International standards in agriculture would give these groups the opportunity to make a tangible impact on global food production. They have the research, field, and visionary capabilities to ensure the highest quality standards for the benefit of the *entire* market.

The starting point must be on the small scale because this is where no one is currently innovating. The vision, however, must move from mechanical to mechanical/digital to fully computerized equipment. The body will not only set the direction of goals, but will manage the patents included in this new open ecosystem.

We see universities playing a role similar to that played by the Advanced Risk Machine (ARM), a leader in technology standards development in the 80s. In 1985 ARM began developing the architecture for system on chips (SoC) makers. These chip companies currently provide components to the hundreds of mobile phone manufacturers around the world. The cell phone companies and app developers innovate at the high level to provide usable solutions, conveniences, and entertainment to our daily lives. Because ARM created a standard architecture that does not limit next level innovation, their designs exist in 95% of mobile phones worldwide. This, along with the standard network we call the Internet, standard operating systems, and open source computing, have created a world where there are now 7 billion mobile phones.

Universities could provide the research to develop the standard subcomponents and connections to be licensed for free or a small fee to all who want to innovate. Allowing standards to provide the starting point for innovation in small farm equipment would assure long term benefit to all the 570 million farmers of the world.

Increasing Small Farm Access to Retail Markets: Opportunities and Challenges in the Intermountain West

Colette DePhelps (University of Idaho Cooperative Extension); Soren Newman (University of Idaho); Cinda Williams (University of Idaho Cooperative Extension)

Introduction

In Idaho, low population densities and long transportation distances to urban markets present challenges for producers interested in selling their products direct or semi-direct to grocery stores and restaurants. In fall 2015 and winter 2016, we conducted surveys of small-scale vegetable, fruit, and livestock producers and Inland Northwest grocery stores and restaurants to gain a broader understanding of the current challenges and opportunities for buying and selling food [i.e., produced locally (100 miles) and regionally (400 miles)] in Idaho. We also interviewed producers, grocers, chefs, food distributors, and food hubs to build relationships and better understand the food distribution issues in different regions of the state. This white paper provides an overview of key factors that influence retailers' and restaurants' interest and willingness to buy local products and the challenges and educational needs of small-scale producers interested in selling into retail markets. A more complete discussion of this research and other recent research on increasing sales to local and regional retail and restaurant markets in Idaho can be found on the project website at www.uidaho.edu/cals-small-farms.

Buyer Survey

Sixty-seven restaurant and retail buyers participated in the survey conducted in the fall of 2015 (Figure 1). Of those, 93% indicated they were interested in increasing the variety of locally produced food products they purchase and 94% indicated interested in increasing the quantity of local food products they purchase. Figures 2, 3, and 4 summarize what survey respondents said motivates them to purchase local food or farm products, what product characteristics are important to them, and the challenges they face when trying to purchase local food products, respectively.

Producer Survey

In winter 2016, we surveyed small-scale producers in Idaho. Of the 73 producers who participated, 61% said they have annual farm sales under \$30,000, 20% said they have annual farm sales between \$30,000 and \$79,999. Nineteen percent had farm sales between \$80,000 and \$249,999. Most respondents' farms were between 1-9 acres or 10-49 acres, 38% and 30%, respectively (Figure 5). Of producers who responded to the survey, the largest percentage currently sell on-site (farm stand/U-pick) or at farmers' markets, 75% and 64% respectively. Many already sell to restaurants (45%) and retail markets, with 39% currently selling to food co-ops and 31% to independent natural food markets (Figure 6). Producers were asked to identify

factors that have challenged their ability to sell products locally or regionally. The top-four factors that challenged the greatest number of producers for selling locally were 1) ‘inability to produce a large enough quantity,’ 2) ‘lack of a predictable/dependable market,’ 3) ‘inadequate knowledge of buyers’ purchasing practices,’ and 4) ‘inability to supply products year round’ (Figure 7). Some producer challenges echoed top-rated buyer challenges (Figure 4). For example, ‘inability to produce a large enough quantity’ and ‘ability to supply products year round.’

Some other significant challenges to selling products locally and regionally did not rate in the top five represented in Figure 7, but are still of interest. For example, 27% of respondents said ‘lack of efficient distribution system for small/medium size farms’ and 32% said the ‘inability to access capital to expand production’ are challenges to selling products locally. Figure 8 shows the top-six educational needs identified by producer respondents: 58-60% identified learning more about ‘pricing based on product quality,’ ‘selling through a regional food hub,’ and ‘legal contracts and sales agreements’ as needs.

Overall, findings suggest that while some farmers are successfully selling local products to restaurants and retail markets, there is a growing opportunity for Idaho producers to sell through these markets. The challenges of growing year-round produce and scaling up production to meet the demand bring both opportunities and new educational needs for producers. Extension has a clear role in facilitating relationships between producers and buyers and providing education to assist producers with scaling up production, season extension, maintaining product quality, the mechanics of selling through distributors or food hubs, negotiating sales agreements, and pricing specific to these new markets.

Figure 1: Please select the option that best describes your business

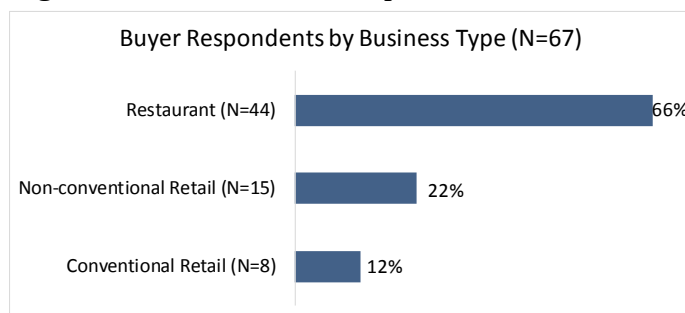


Figure 2: What motivates your business to purchase local food or farm products? Select all that apply

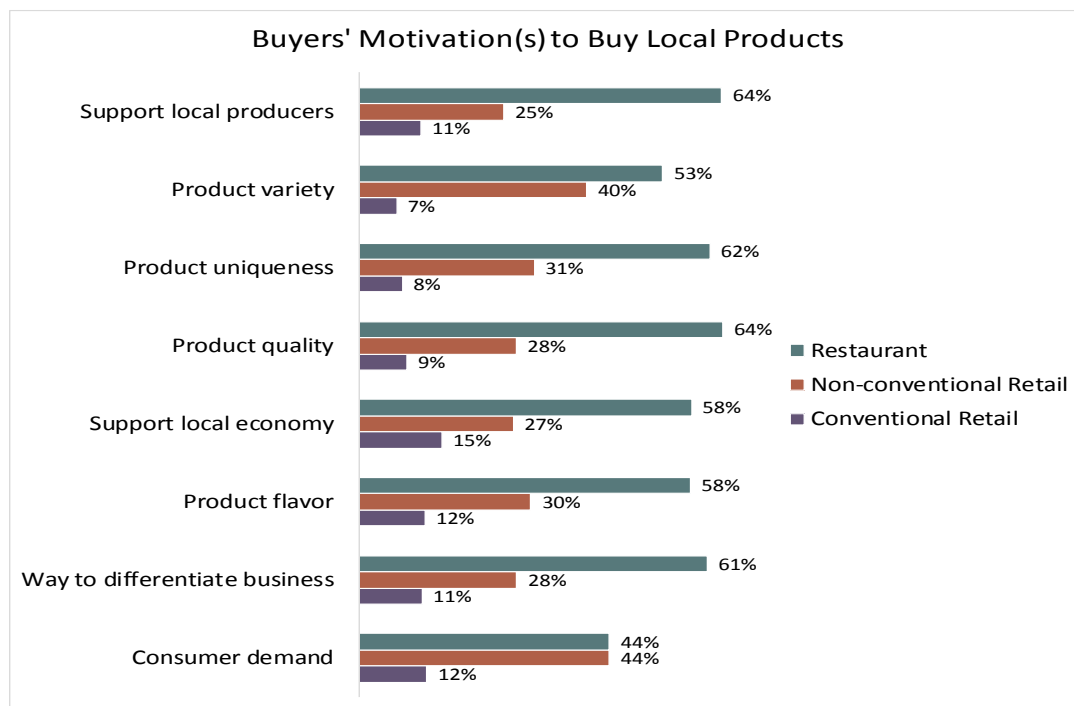


Figure 3: When purchasing food products, how important or unimportant are the following characteristics to your business?

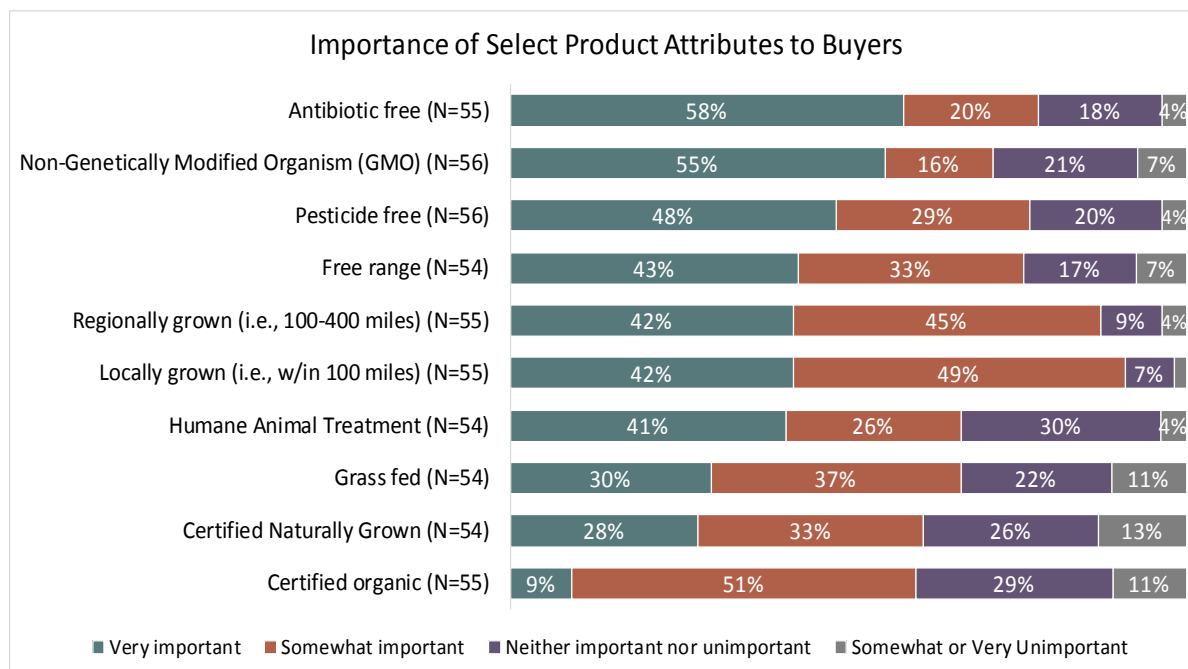


Figure 4: To what extent do the following factors challenge the ability of your business to purchase or use LOCAL food products (i.e., produced within 100 miles of your business)?

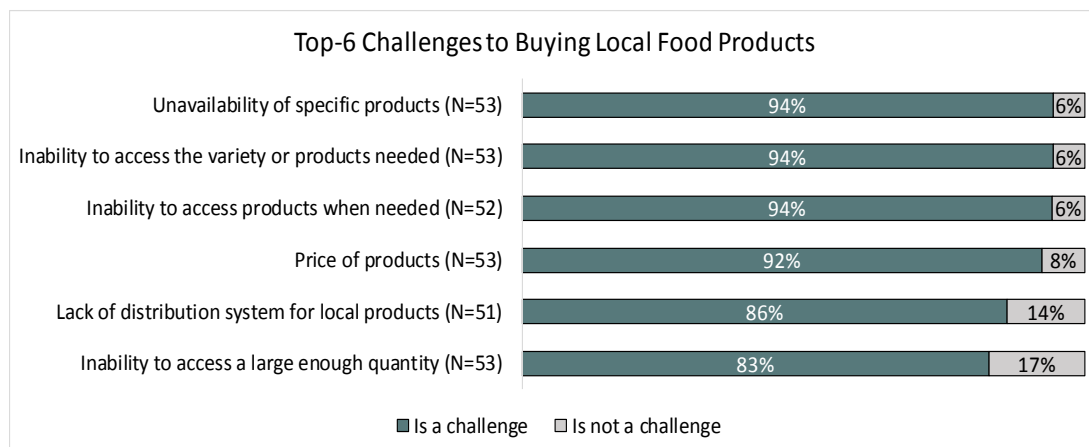


Figure 5. Percent of respondents by farm size in acres

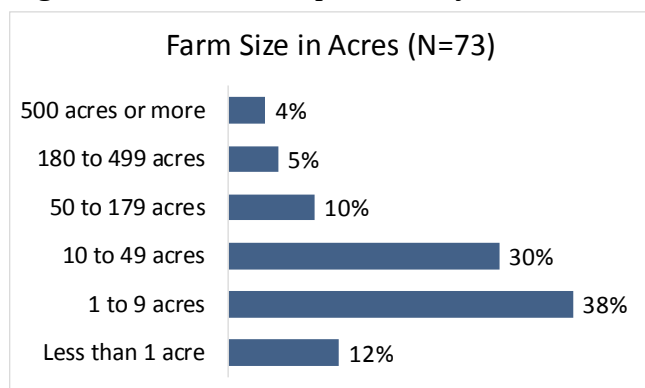


Figure 6. Current Direct and Retail Markets of Producer Respondents

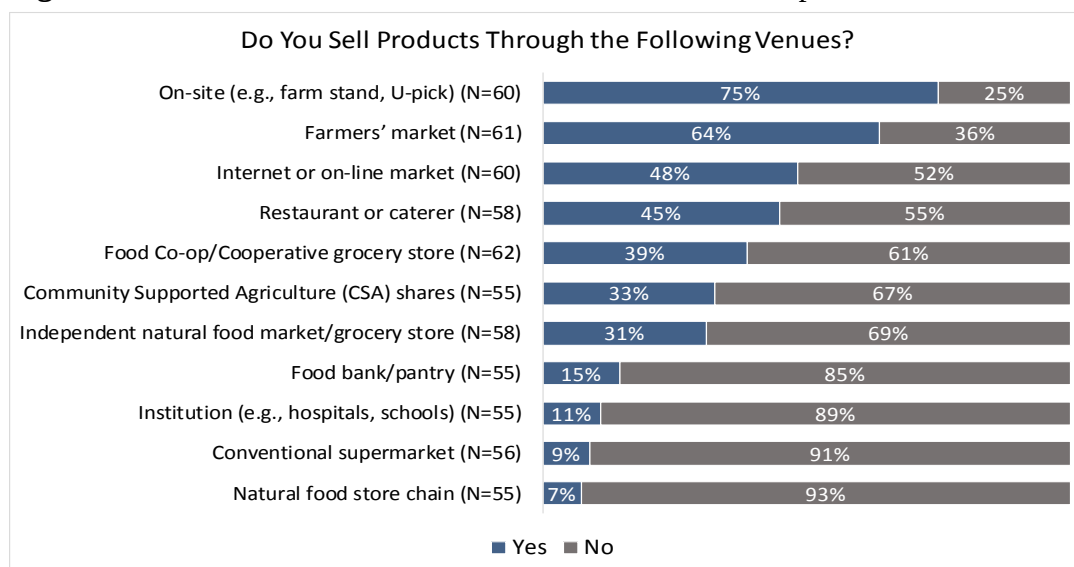
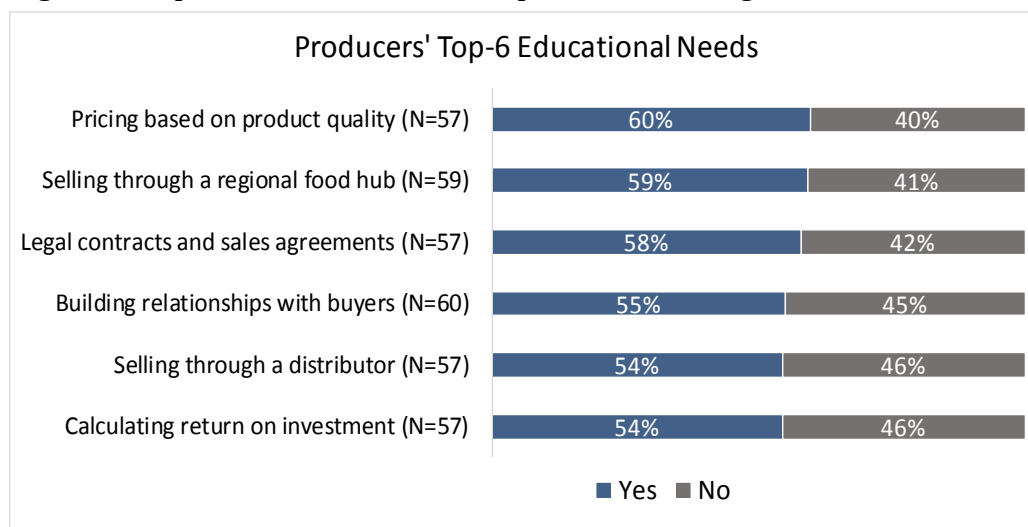


Figure 7. Select challenges of respondents selling into local and regional markets**Figure 8.** Top-six educational needs of producers wanting to sell into retail markets

Lulus Local Food: Connecting Producers to Retail Consumers

Molly Harris (Lulus Local Food, Richmond, VA)

Huge growth in local food presents barriers:

- Access to the market
- Inventory control

Lulus Local Food software

- Single point of entry for multi-level sales
- Supports CSAs and small farms online sales straight from the farm
- As well as service to multi farm hubs
- Well suited to reaching food deserts and underserved areas
- Virtual infrastructure for small farms to enter the marketplace with little to no initial investment

Lulus software provides infrastructure for:

- Hub Administrators
- Local entrepreneurs
- Community Food Councils
- Farmers markets
- CSAs
- Small family farms

History of how we got started

- October 2008 seasonal farmers markets were closing
- Farmers still had fall crops to harvest and sell and protein products available through the winter
- First hub was launched to 100 family members on November 1 and ran weekly sales through April through email orders
- Products sold from a dozen farms through the winter months
- In early spring we developed the first software program that allowed the program to expand into the summer season

First Lulus Local Food Hub

- With Lulus software to support inventory and sales data, the first hub, Fall Line Farms grew to support
- More than 50 farms
- Over 1000 customers

- Picking up from 5 pickup locations around the city

Lulus expansion into other areas

- Goochland County farmers market added a virtual Hub (Local Roots Food Co-op) to run parallel to their physical market, continuing sales year round
- Coastal Farms opens in the Tidewater region connecting farmers to customers in Virginia Beach and surrounding areas

Farmers quickly realize they can sell to multiple hubs and maximize their geographic reach

- CSA's begin selling preseason the crops that come in early before scheduled CSA customers begin picking up their orders, they can also sell out late fall crops that linger beyond the season
- Farmers that before had only sold wholesale to restaurants and grocers find that selling online is an easy way to break into retail market
- Small growers selling wholesale find retail sales allow them to retain the margins they need to grow their business
- Farmers with farm stores find that selling online allows them to gain access to customers outside their immediate community

How Lulus works for multi producer Hub Administrators

- Develops the network, recruiting producers and marketing to customers
- Reviews and approves producers applying to the market
- Sets up the sales cycles which can run daily, weekly or can be open all the time
- Manages sales tax, which once set up runs through all sales reports automatically
- Downloads remittance reports and makes payments to producers
- Sets up delivery locations and manages volunteers
- Posts credits to customer accounts for missing or damaged items
- Manages news reports and markets farms and products

How we work: Producers manage their own inventory and sales accounts

- Producers manage their inventory listings
- Producers determine their own pricing
- Sales cycles can be set up daily or weekly or can remain open all the time
- Producers download their orders as sales cycles close
- Producers select the delivery locations they wish to serve
- Producers can add inventory as needed or take down should they find they are short
- How we work, for individual small farm users
- Small farms can sell products online reaching large demographic area

- Farmers can post items as they come available and add to quantities as they sell out
- Protein items can be easily inventoried and quantities kept up to date automatically as items deplete from sales at multiple venues
- Small farms can easily expand sales by joining a local Hub where they gain access to larger customer base
- Data records are kept of all sales transactions from multiple venues while maintaining one inventory list

Marketing Opportunities

- Connecting with consumers is easy with our accessible database capturing contact information for geographic areas
- Posting news from the farm and alerts of new products
- Educating customers on health concerns as well as benefits of purchasing fresh local products from farmers they trust

Lulus Local Food advantages

- Innovative software that is user friendly and puts the farmer in control of the marketplace
- Farmers set their own prices and determine their own competitive advantage
- Products sold are inventoried and traceable back to the farm of origin, there are no substitutions
- Product descriptions are clear and lengthy, posted by the farmer to give accurate transparency to the customer
- The margins are allocated to the producer allowing for maximum return

Opportunities and Challenges Facing Agritourism Operators in California

Shermain Hardesty, Penny Leff, (University of California Small Farm Program)

Introduction

Agritourism has become increasingly popular in California with the rising interest in locally grown foods. The University of California Small Farm Program (SFP) has been conducting research and extension related to agritourism since the mid1990s. We define agritourism as “any income-generating activity conducted on a **working farm or ranch** for the enjoyment and education of visitors”. “Working farm or ranch” is purposefully bolded because the SFP considers agritourism to be an additional market channel for a working farm or ranch.

The wine industry is considered to be the “godfather” of agritourism in California. The revitalization of California’s wine industry began in the mid1960s with plantings of new vineyards and establishment of new wineries. Wineries in the Napa Valley and Sonoma County quickly began offering tastings at their wineries to market their wines. They added tours to demonstrate their grape and wine production methods, and honed their hospitality management skills to attract visitors. They also began collaborating to organize regional tasting events and wine competitions.

The growing popularity of wine tasting in California coincided with consumers’ increased interest in fresh and health-oriented foods, and protecting natural resources and biological diversity and family farms. Nationally, the passage of the Farmer-to-Consumer Direct Marketing Act of 1976 fostered the resurgence of direct marketing. In California, the Department of Food and Agriculture enacted regulations in 1977 that exempted farmers from packing, sizing, and labeling requirements for their fresh fruits, nuts, and vegetables and enabled them to sell only those products which they grow themselves at Certified Farmers Markets (Hardesty, 2007). As farmers developed relationships with their farmers market customers, many initiated community supported agriculture programs (CSAs), in which consumers paid for subscriptions for weekly or bi-monthly deliveries of fresh produce from the farm. These CSA programs often had an annual or bi-annual event at their farms for the CSA subscribers. Other farms built farmstands to sell their products, some organized farm dinners, and some even developed farmstay programs.

The University of California Small Farm Program’s Agritourism Efforts

The SFP began working on agritourism in the mid1990s with two purposes: enhance the economic viability of smaller-scale farms by diversifying their market channels; and connect the urban population to agriculture. In 1997, the SFP received a USDA grant to develop an educational outreach program on agricultural tourism in California. The University’s statewide Agritourism Workgroup, comprised of the University’s research and extension faculty, Cooperative Extension advisors and industry members (including farmers!) began holding

workshops around the state. In a 1999 newsletter, then-Director Desmond Jolly noted that agritourism involves linking agriculture to consumers, which "...requires a new set of skills that are somewhat different from those typical of more conventional agriculture." In 2000, the SFP launched its CalAgTour.org website, which currently provides a searchable directory of 710 agritourism operations across the state, along with a calendar of agritourism events. Farms can list their agritourism operations at no cost. In 2005, the leaders of the Agritourism Workgroup, Cooperative Extension Advisors Ellie Rilla and Holly George, published a 159-page handbook, *Agritourism and Nature Tourism in California*. The second edition was published in 2011; it is used extensively the workshops organized by the SFP's Agritourism Coordinator, Penny Leff, who was hired in 2009.

2009 Survey of California Agritourism Operations

Early in 2009, the Small Farm Program conducted its first statewide survey of agritourism operations after compiling a list of 1,940 potential agritourism operations. The topics covered included motivation for operating an agritourism operation, activities, marketing program, visitors, employees, revenues, profitability, challenges and future plans. The overall response rate was 29 percent; however, 40% of these respondents reported that they did not have an agritourism operation. Among the 332 with agritourism operations, 81 percent offered tours or lectures, and 78 percent had direct sales, 69 percent offered demonstrations, lessons, and participant experiences, and 51 percent had special event facilities. Forty-five percent of their revenues were generated from retail product sales, followed by U-pick revenues (12 percent), and fees for farm/ranch tours and field trips (9 percent) (George, et al., 2011). They reported that half of their visitors came from the same county as the farm, and 38 percent were from elsewhere in California. Forty-four percent of the visitors were adults without children and one-third were families with children. The operations' top three challenges were: (1) "other" regulations and legal constraints; (2) liability and insurance issues; and (3) local permitting and zoning regulations. In response of these results, much information about regulations and insurance has been incorporated into the SFP's agritourism workshops; the information is also posted on the SFP's website: <http://sfp.ucdavis.edu/agritourism/>. Additionally, there is usually at least one representative from a local regulatory agency at each workshop to present and/or answer questions. Dialogue between the agritourism operations and the regulators is always encouraged at these workshops.

2015 Survey of California Agritourism Operations

Between 2009 and 2015, consumer interest in locally grown foods continued to grow. The UC SFP partnered with Colorado State University on a NIFA-funded project, Place Based Innovation: An Integrated Approach to Agritourism Development in the Western US. The project included conducting a survey of agritourism operations in both states in 2015. The

overall purpose of the operations survey in California was to provide data for determining agritourism extension program priorities, by quantifying the extent of agritourism activities and identifying major opportunities and challenges that agritourism operators are facing.

After a list of more than 2,000 potential agritourism operations in California was compiled, 750 nonwinery operations and 500 winery operations were randomly selected to be surveyed. The questionnaire was mailed in March 2015; an online survey was also sent to 668 of the 1250 operations. Questions were similar to those in the 2009 survey; they covered agritourism operation motivations, activities, marketing program, visitors, employees, revenues, profitability, challenges and future plans.

One hundred and eighty-three mailed surveys and 48 online surveys were returned (18 percent response rate); 187 of these respondents indicated that they currently were agritourism operators. Their primary activities were very diverse, including direct sales, accommodations, farm dinner, festivals and other entertainment, outdoor recreation such as hunting, fishing and horseback riding; and educational activities such as jam making and wine tasting. Fifty-three percent generated at least \$25,000 in gross revenues in 2014. Direct sales generated 61% of the agritourism operations' revenues. Fifty-seven percent of the operations were open between 100 and 250 days during 2014. Thirty-one percent made at least \$25,000 in profit during 2014. The most significant challenges were similar to those in the 2009 survey; 35 percent identified other state and local regulations as very challenging (35%), followed by city/county zoning and permitting (29%), and then availability of operating or investment capital (19%), cost and/or availability of insurance (18%), and local and state taxes (17%). Overall, 54% of the operations wanted to diversify and/or expand their operations, including 64% of those that did not make a profit.

The AFRI-funded project also included an online survey of agritourism visitors; it was administered by TNS--a national research firm--using their consumer panel. One thousand and one agritourism visitors from the 17 Western states responded to the survey. For 74 percent of these visitors, agritourism was their primary trip activity; it was an add-on for 18 percent, and a spontaneous visit for only eight percent of the visitors.

We compared the travel information sources used by these visitors with the marketing tools used by the agritourism operations (Table 1). The two marketing tools the operations rated as most effective (word of mouth and website) were also the most popular information sources for the visitors. However, the operators appear to have overrated the effectiveness of their next three most effective tools—feature story, direct mail or email, and referrals from other businesses—since the visitors' usage rates for these information sources were low. Conversely, operators seem to have underrated the effectiveness of Facebook and Twitter—which ranked as the visitors' third most frequently used sources. Additionally, although the operations gave low

ratings to the effectiveness of tourism guides, print materials and Chamber/Visitors Bureau referrals, at least 80 percent of them used each of these marketing tools.

Table 1. Information Sources/Marketing Tools Used by Agritourism Visitors & Operations

	AGRITOURISM OPERATIONS		VISITORS
Information Source/Marketing Tool	% used	% rating very effective	% used
Word of mouth	98	64	44
Website	95	42	38
Feature story	85	37	11
Direct mail or email	74	35	9
Referrals from other businesses	92	32	7
Facebook and/or Twitter	85	26	22
Farm or wine trail association	81	26	NA
Highway sign	54	24	12
Sign outside business	87	23	11
Trip Advisor and/or Yelp	71	20	17
Paid advertising	73	19	12
Regional or state tourism guide	82	14	13
Print brochures, posters, fliers	81	14	16
Chamber of Commerce or Visitor Bureau referrals	82	12	8

The visitors were also surveyed regarding their agritourism activities. Their most popular activities were entertainment/special events and outdoor recreation (Table 2). Clearly, the distribution of the operations' revenues by activity category cannot be compared directly to the distribution of the visitors' activities; the visitors data relate to the 17 Western states while the revenue data pertain only to operations in California. Additionally, some activities have greater revenue generation capacity (such as lodging) than others. Nevertheless, these data suggest that California's agritourism operations may need to diversify their activities, particularly with entertainment/special events and outdoor recreation. This should be considered as an opportunity, rather than a challenge.

Table 2. Operation Revenues and Visitor Activities

ACTIVITY	% of Operations' Revenues Generated	% of Visitor Activities
On-Farm Direct Sales	65	22
Entertainment/Special Events	10	28
Outdoor Recreation	4	27
Educational Activities	14	22
Lodging & Other	6	1

Conclusions

The SFP has been working on agritourism research and outreach for twenty years. Agritourism enterprises in California are a viable source of diversification for farms and ranches, and they merit support from the University. By surveying both agritourism operations and visitors, it appears that California's agritourism operations need to update their marketing programs; "word-of-mouth" can be a very effective marketing tool. Therefore, social media, such as Facebook, Twitter, Yelp and Trip Advisor, need to be considered as the digital form of "word-of-mouth". Adding more offerings related to entertainment/special events and outdoor recreation, could also attract new visitors and increase the profitability of California's agritourism operations.

References

- George, H., C. Getz, S. Hardesty and E. Rilla. 2011. "California Agritourism Operations Are Growing." *California Agriculture*. 65:2, 57-65.
<http://californiaagriculture.ucanr.edu/landingpage.cfm?article=ca.v065n02p57&fulltext=yes>
 DOI#10.3733/ca.v065n02p57
- Hardesty, S. 2007. "Role of Direct Marketing in California." *ARE Update* 10:3.
- Jolly, D. 1999. Agricultural Tourism: Emerging Opportunity. *Small Farm News*.
<http://sfp.ucdavis.edu/pubs/SFNews/Summer99/emerge/> accessed 8/3/16.

Economic Outcomes and Viability of Agritourism Operations

Martha Sullins (Colorado State University Extension); *Shermain Hardesty* (University of California-Davis)

Introduction

There has been steady growth in the agritourism sector, as producers continue to make business investments to achieve a variety of different goals, and community resource providers (e.g. Colorado's Northeast Small Business Development Center), universities (e.g. University of California at Davis' agritourism program), and state agencies (e.g. Colorado Tourism Office, Heritage and Agritourism program) provide technical assistance to those businesses. USDA Ag Census data indicate that, from 2007 to 2012, the number of agritourism operations in the US grew by 42% overall. The number of operations in California increased in number by 148% to 1,699, while the number of Colorado operations increased to a lesser extent (by 27% to 864). At the same time average income per farm fell by 25% in California and 33% in Colorado but, in real terms, total income from agritourism nearly doubled from 2007 to 2012 in California, while decreasing by 22% in Colorado. This may point to more businesses entering the industry and heightened competition (from agritourism and other recreation sectors), possibly with varying financial viability and long-term business outcomes.

In 2014, a multi-institutional interdisciplinary research group (Colorado State University, University of Northern Colorado, University of California-Davis, and USDA's Economic Research Service) received a grant to explore the factors influencing the growth of agritourism activity in the Western US. In evaluating producer intentions and success, this project seeks to identify key community- and enterprise-specific factors that contribute to agritourism business success; help our multi-state project further identify agritourism hot spots; and provide guidance to develop business support infrastructure.

Data were collected for a two-state producer survey from February to June 2015, through identical online and mail surveys administered to two groups: 676 Colorado farmers and ranchers (yielding 143 total respondents) and 1,250 operators in California (yielding 230 respondents). Survey respondents who were identified as current agritourism operators totaled 72 in Colorado and 142 in California. For this analysis, agritourism operations were classified into 3 self-reported categorical levels of profit derived from their agritourism business: 1) no profit from agritourism realized in the preceding year; 2) positive profit, below \$25,000 per year; and 3) positive profit of \$25,000 per year and above.

Business Characteristics

There are some similar characteristics across agritourism businesses in Colorado and California. The average age of agritourism businesses in both states is 18 years, although there is more variability among Colorado businesses than those in California. Overall, the most profitable businesses have been in operation between 1.8 to 2.3 times longer than the businesses reporting no profit (see Table 1).

Table 1. Number of years in operation for agritourism businesses, by state

	Colorado		California	
Profit category	Average	Median	Average	Median
No profit	16	17	12	7
Profit <\$25K	13	12	16	11
Profit >=\$25K	28	18	26	27
Total	18	13	18	12

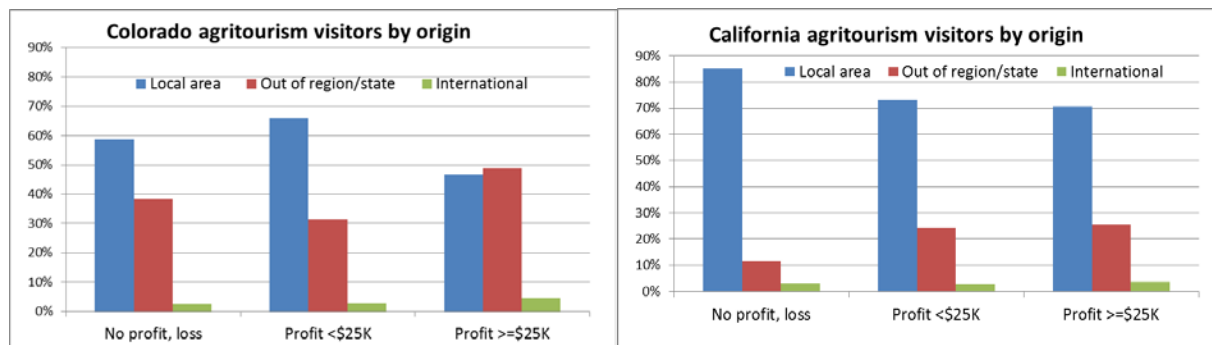
In each sample, approximately half of all businesses reported having total gross revenues from agritourism that exceeded \$100,000 per year but, for the most profitable businesses, this rose to two-thirds. Of the few demographic questions, none was important in explaining business profitability. For example, the age of the agritourism enterprise's decision-maker was similar in both states (55 years old in CO and 58 in CA), with no significant differences in age of operator among profit categories. Similarly, educational level did not vary according to business profitability; at least two-thirds of all agritourism business managers had a 2- or 4-year college degree.

Respondents reported on their total sales from agritourism by classifying them according to types of agritourism products and services in which they might engage: 1) on-farm direct sales; 2) accommodations/lodging; 3) entertainment/special events; 4) outdoor recreation (guided or unguided access); and 5) educational activities. In California, a greater percentage of operators relied on direct sales to generate revenues, compared to other types of activities (64% overall, compared to 50% in Colorado). However, our study showed that higher-profit agritourism businesses were more diversified; they typically had at least one other enterprise type besides direct to consumer sales) than their lower-profit counterparts.

Higher-profit businesses were open more days per year (26% more days than businesses that reported no profit), and those in Colorado had a much greater visitor volume (an average of nearly 12,000 visitors per year, compared to around 2,000 per year for no to low profit businesses). In California, the average number of visitors per year was not a differentiating factor among businesses; however, daily visitor traffic was significantly greater for high-profit

businesses (at 3 times the volume than for low- to no-profit businesses). Lastly, and especially in Colorado, higher-profit agritourism businesses had more out-of-state and international visitors, compared to those in other profitability categories, which drew more on local area traffic (Figure 1). Diversification in sales and customer base appears to differentiate higher profit businesses from those with lower profit levels.

Figure 1. Agritourism visitors, by state



According to our Colorado survey data, Table 2 shows that higher profit businesses also invested more to support the visitor experience than did less profitable businesses (these data were not available for California at this time).

Table 2. Agritourism operation expenditure detail per visitor, by profitability level (for Colorado only)

Profit level	Total expenditures /visitor	Hired labor expenses/visitor	Marketing expenses/visitor	Capital investments/ visitor
No profit	\$ 143.14	\$ 45.94	\$ 5.08	\$ 17.16
Profit <\$25K	\$ 83.17	\$ 25.34	\$ 10.04	\$ 31.68
Profit >=\$25K	\$ 314.17	\$ 125.13	\$ 16.63	\$ 40.78
Total	\$ 153.74	\$ 56.66	\$ 10.54	\$ 30.04

Looking at several variable and fixed cost expenditure categories, these agritourism businesses are spending more on labor to deliver the agritourism experience, as well as on marketing to promote it. In addition, they have incurred higher fixed costs to provide supporting infrastructure. Agritourism businesses reporting no profit also incurred higher expenditures, second to those reported by the highest profit businesses, but this expenditure does not appear to result in higher returns. Lastly, Table 3 shows that higher profit agritourism businesses in Colorado and California realized higher average returns per visitor and per day of operation, indicating that scale plays an important role in profitability.

Table 3. Average gross revenue from agritourism, per visitor and per day of operation

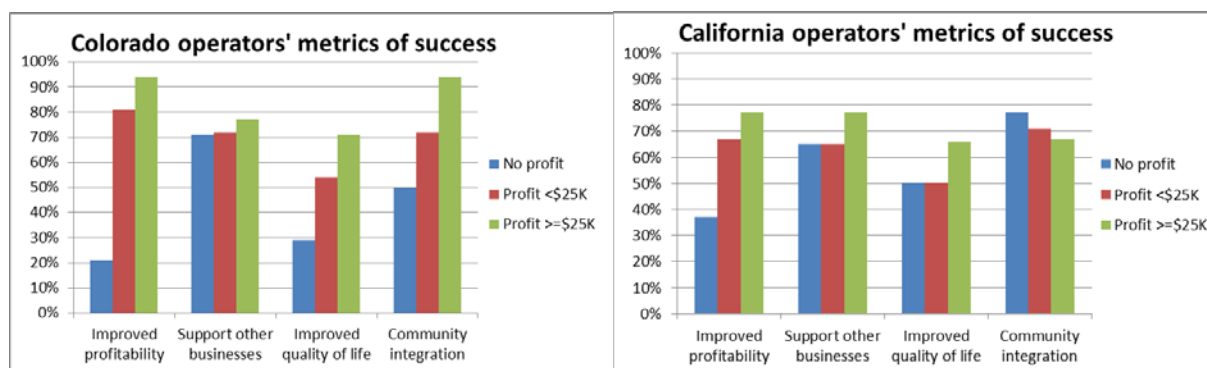
	Gross revenue per visitor		Gross revenue per day of operation	
	Colorado	California	Colorado	California
No profit, loss	\$ 100.26	\$ 24.36	\$506.90	\$330.66
Profit <\$25K	\$ 160.64	\$ 46.22	\$295.50	\$378.95
Profit >=\$25K	\$ 640.43	\$ 449.75	\$4,027.05	\$3,149.72
Total	\$ 276.02	\$ 158.22	\$1,329.89	\$1,234.16

Motivations for Engaging in Agritourism

Producers' stated motivations for engaging in agritourism varied somewhat by state although, in both Colorado and California, those who sought to improve their family financial situation were generally the most profitable (79% in Colorado and 78% in California). On the other hand, in Colorado 71% of those with no profit from agritourism were more motivated by ensuring a legacy for their heirs and providing education on agriculture than by any other factors. In California, connecting with consumers and creating a sales outlet for farm/ranch products were more important motivators for operating an agritourism business than any other factors.

Business Outcomes and Future Plans

Colorado agritourism operators in the highest profit category ranked all metrics of success (financial, personal and social) higher than did operators with lower or no profits (Figure 2). In California, the most profitable operators ranked all but feeling integrated into their community as high indicators of success for their agritourism businesses.

Figure 2. Operators' metrics of success

Regardless of profitability levels and state in which the business is located, more producers stated that their next steps were expansion or diversification and making additional investments in their businesses. In Colorado, 12% of respondents who reported no profit or a loss to their

business in 2014 indicated they were planning to close within the next five years. In California, 8% of no-profit businesses were planning to close, as were 2% of those with any positive profits.

Identified Obstacles to Business Success

At all profitability levels, producers listed competition from other recreational options in their region as among the least challenging aspect of operating their agritourism businesses. This is an interesting perception since other recreational activities could, indeed, be substitutes for agritourism; however producers may feel that the unique site or experience they offer differentiates their businesses from other recreation opportunities. Among the least profitable businesses, taxes, cost and availability of insurance and then access to capital were listed among the most challenging aspects. The most profitable businesses in our sample indicated that city/county permitting and zoning, and other state and local regulations were the most limiting factors for their businesses, perhaps since many of these had achieved a growth stage where expansion and diversification led them to more visibility within their community and, thus, potentially negative interaction with planning authorities.

How Federal Marketing Orders and Marketing Agreements Can Help Your Business

Michael Durando (USDA-Agriculture Marketing Service, Washington DC)

The U.S. Department of Agriculture (USDA) offers Federal marketing orders and marketing agreements for fruit, vegetable, and specialty crop industries. These programs can help small and entrepreneurial producers and handlers build marketing opportunities to succeed in a competitive marketplace. Marketing orders and marketing agreements contain risk-management tools to tackle existing and emerging concerns, facilitate research and educational opportunities, and encompass overall strategies for increasing farm income and commodity quality for consumers.

A marketing order or marketing agreement is an administrative set of rules through which producers and handlers in a particular industry and region can come together to develop strategies to fix issues of mutual concern. Marketing orders or marketing agreements are industry-initiated, industry-driven, industry-supported, and industry-administered. The role of USDA is to help industries implement the regulations to improve their marketing capabilities.

Benefits for Small or Niche Industries

- **Scaled to specification:** Each marketing order or marketing agreement is tailored to serve the smallest practical production area.
- **Customized programs:** Every commodity group has its distinct challenges. USDA works with each of the industries to tailor and continually update their handler regulations to meet their particular – and evolving – needs.
- **Enhanced marketability:** Industry members can combine their resources to fund promotional and research projects that benefit the entire industry and would have been difficult to achieve individually.

Applying Marketing Orders to the Food Safety Modernization Act (FSMA) Marketing orders can complement the Produce Safety Regulation requirements for growing, harvesting, packing, and storing produce. Marketing orders can equip industry with a viable tool to help meet these standards, as FDA views these programs favorably due to the inherent government accountability that is part of them.

Marketing Order Toolkit

Tool	Objective
Promotion and Advertising	Authorize generic promotion of the agricultural commodity and build demand in domestic and/or export markets.
Research and Develop	Conduct production and marketing research and development projects to reduce costs, improve yields, streamline product distribution, and boost trade and consumer demand.
Quality Regulation	Set minimum standards on product shipped to prevent inferior quality from depressing the market for the whole crop, assure customer satisfaction, and drive increasing consumer purchases.
Pack and Container Requirements	Ensure industry cohesion on labeling, size, capacity, weight, dimensions, and pack of product, helping ensure product integrity and quality in the channels of trade, while minimizing logistics and
Marketing Information	Collect and share industry data to equip individual producers and handlers to make the best possible production and marketing
Quantity Regulation	Help stabilize the flow of products placed in commercial channels during periods of exceedingly high or low volume to stabilize markets for industry and consumers.
Import Regulation	Ensure comparable quality regulations on authorized imported commodities to assure a consistently high quality product moving into the marketplace.

Marketing Order Tool	FSMA Application
Quality Regulation	Align handling practices to meet FSMA requirements by using mandatory inspection requirements and establishing standards to increase the quality of their product.
Marketing Information	Maintain records and proactive traceability for FSMA. Provide data- driven proof the industry is in compliance with FSMA.
Research and Development	Conduct research on food safety practices that minimize contamination and have the capability to focus on commodity or region specific considerations.
Promotion and Education	Coordinate or host required food safety training, and use Produce Safety Alliance or other FDA-recognized curricula.

Key Tools Authorized in 29 Active Marketing Orders

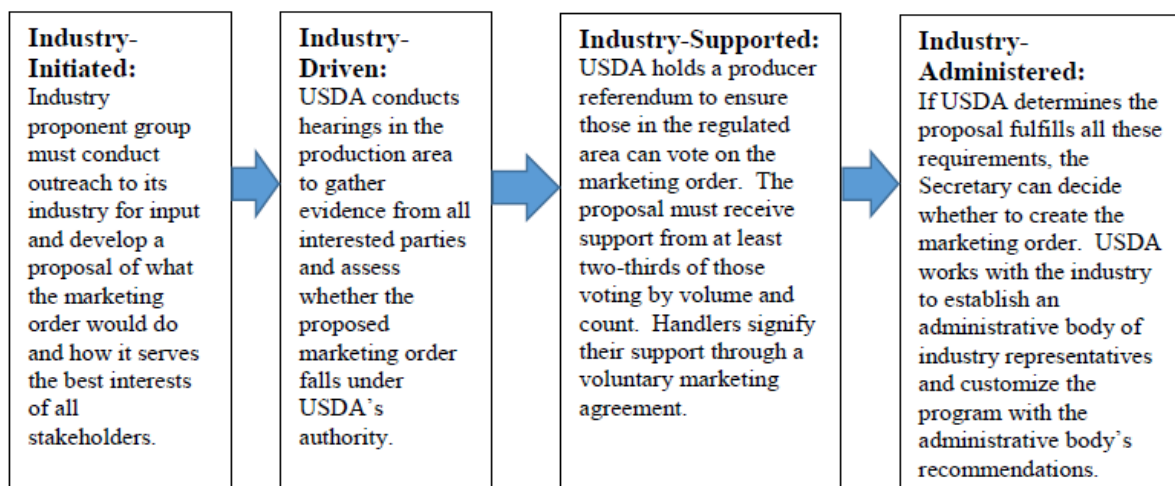
Commodity and Region	Grade	Size	Pack &	Research	Promotion	Import
FL Citrus	*	*	*	*	*	*
TX Citrus	*	*	*	*	*	*
FL Avocados	*	*	*	*	*	*
CA Kiwifruit	*	*	*			*
WA Apricots	*	*	*	*	*	
WA Sweet Cherries	*	*	*	*	*	
Southeast CA Grapes	*	*	*	*	*	*
OR/WA Fresh Pears	*			*	*	
Multi-State Cranberries	*	*		*	*	
Multi-State Tart Cherries	*			*	*	
CA Olives	*	*	*	*	*	*
ID/OR Potatoes	*	*	*			*
WA Potatoes	*	*	*			*
CO Potatoes Area II/Area III	*	*	*	*	*	*
Vidalia Onions				*	*	*
Walla Walla Onions	*	*	*	*	*	
ID/OR Onions	*	*	*	*	*	*
South TX Onions	*	*	*	*	*	*
FL Tomatoes	*	*	*	*	*	*
CA Almonds	*			*	*	
OR/WA Hazelnuts	*	*		*	*	*
CA/AZ/NM Pistachio	*					*
CA Walnuts	*	*				*
Multi-State Spearmint Oil				*	*	
CA Dates	*	*	*	*	*	*
CA Raisins	*	*		*	*	*
CA Dried Plums	*	*	*	*	*	
Multi-State Pecans	*	*	*	*	*	

National Small Farms Conference

Chart of Assessments vs Industry Value

Marketing Order Commodity	Assessment Rate/Unit		Industry Value in 2015 (\$1000)
FL Citrus	\$ 0.0080	Per 4/5-bushel carton	\$ 242,952
TX Citrus	\$ 0.0800	Per 7/10-bushel carton	\$ 67,215
FL Avocados	\$ 0.3500	Per 55-pound bushel	\$ 21,582
CA Kiwifruit	\$ 0.0400	Per 9-kilo volume filled	\$ 32,678
WA Apricots	\$ 0.7500	Per ton	\$ 9,721
WA Sweet Cherries	\$ 0.1500	Per ton	\$ 480,570
Southeast CA Grapes	\$ 0.0300	Per 18-pound lug	\$ 79,170
OR/WA Fresh Pears	\$ 0.4490	Per standard box	\$ 361,216
OR/WA Processed Pears	\$ 7.0000	Per ton	
Multi-State Cranberries	\$ 0.2800	Per barrel	\$ 254,412
Multi-State Tart Cherries	\$ 0.0075	Per pound	\$ 106,745
CA Olives	\$ 26.00	Per ton	\$ 72,904
ID/OR Potatoes	\$ 0.0045	Per hundredweight	\$ 263,814
WA Potatoes	\$ 0.0025	Per hundredweight	\$ 67,728
CO Potatoes Area II	\$ 0.0033	Per hundredweight	\$ 134,193
CO Potatoes Area III	\$ 0.0200	Per hundredweight	
Vidalia Onions	\$ 0.1300	Per 40-pound carton	\$ 79,058
Walla Walla Onions	\$ 0.2200	Per 50-pound bag	\$ 5,135
ID/OR Onions	\$ 0.0500	Per hundredweight	\$ 100,951
South TX Onions	\$ 0.0500	Per 50-pound equivalent	\$ 56,160
FL Tomatoes	\$ 0.0300	Per 25-pound carton	\$ 386,112
CA Almonds	\$ 0.0300	Per pound	\$ 5,891,930
OR/WA Hazelnuts	\$ 0.0050	Per pound	\$ 129,600
CA/AZ/NM Pistachio	\$ 0.0035	Per pound	\$ 1,593,400
CA Walnuts	\$ 0.0379	Per kernel weight pound	\$ 1,841,100
Multi-State Spearmint Oil	\$ 0.0900	Per pound	\$ 46,480
CA Dates	\$ 0.1000	Per hundredweight	\$ 34,510
CA Raisins	\$ 17.00	Per ton	\$ 624,007
CA Dried Plums	\$ 0.2800	Per ton	\$ 232,960
Multi-State Pecans	To be determined		\$ 560,216

Creating a Marketing Order



Marketing Order Highlights



Vidalia Onion Marketing Order: The Vidalia Onion Committee's promotional campaigns have been key to growing this niche commodity into a consumer favorite. In the most recent independent Federal Agriculture Improvement and Reform (FAIR) Act study, 88-percent of respondents demonstrated familiarity with the Vidalia brand. Furthermore, the Committee conducts research to identify consumer preferences and taste attributes, and solve production issues. The industry includes 80 growers and 40 handlers, with an assessment rate of \$0.13 per 40-pound carton.



Walla Walla Onion Marketing Order: The Walla Walla industry is small with only 21 growers and 9 handlers. Although it has a limited production season and shelf life, the Walla Walla Sweet Onion Committee achieves success through branded marketing and industry standards, including an annual Walla Walla Sweet Onion Festival, presentations at trade shows throughout the region, and promotional ad-buys in magazines and produce publications. It funds these activities through an assessment rate of \$0.22 per 50-pound bag.



Florida Avocado Marketing Order: With over 60 varieties and peak maturity from May to December, the Avocado Administrative Committee uses harvest timing and technology to ensure only mature avocados reached consumers. Its key Avocado Variety Enforcement Program unites variety identification specifications in Federal inspections with DNA-verification at USDA-approved laboratories for assurance that all green-skinned avocados in the United States are labeled appropriately to protect its 400 producers, 25 handlers, and \$22 million industry. The Committee funds these activities with an assessment rate of \$0.35 per 55-pound bushel container.



Florida Tomato Marketing Order: The Florida Tomato Committee partners with the State of Florida to create preventative measures to resolve food safety concerns. The Committee uses its research dollars to help create the Florida State's Tomato Good Agricultural Practices Program and assures all tomatoes in Florida undergo the same safe handling, production, and packing practices. With approximately 100 producers and 80 handlers, and an assessment rate of \$0.03 per 25-pound carton, the average annual return on investment for the marketing order is approximately \$5.87 on each dollar spent on the program.



Almond Marketing Order: The Almond Board of California became a global leader by utilizing production and health research, and addressing food safety throughout the supply chain. Working with the Food and Drug Administration, the Board used its quality regulation authority to pioneer a Salmonella testing requirement in handling operations. To ensure the continued access for California almonds to the European Union (EU), the Board pioneered the Pre-Export Checks Program for Aflatoxin testing on almond exports. The Board has increased consumer awareness of almonds by 20 percent since 2001, with a recent study showing that 61 percent of respondents have a favorable attitude toward almonds.

Beyond Fresh and Direct: Specialty Food Market Opportunities for Small & Medium-size Farmers

Larry Lev, Laurie Houston (Oregon State University); Gail Feenstra, Shermain Hardesty (University of California-Davis); Robert P. King (University of Minnesota); Jan Joannides (Renewing the Countryside)

Introduction

Small- and medium-sized farms are disappearing because many are unable to compete within increasingly globalized markets for agricultural commodities (Kirschenmann, et al., 2008). While their higher unit costs of production are certainly a disadvantage, another significant barrier is that buyers seek out larger producers to minimize their transaction costs. It is much cheaper administratively for a buyer to purchase 10,000 hogs from one farmer instead of 1,000 hogs from each of 10 farmers.

Developing a diverse set of alternative marketing channels that build upon the strengths and minimize the weaknesses of small and medium-sized farms represents a means of overcoming these challenges. The strong and growing consumer interest in fresh, local products delivered through farmers markets, retailers, and restaurants is frequently discussed in popular media and well documented in academic literature. In contrast, interest in and growth potential of processed specialty foods made from locally/regionally sourced ingredients produced by small and medium-sized farms has received much less attention. According to the Specialty Food Association (SFA), this sector encompasses: “Foods and beverages that exemplify quality and innovation, including artisanal, natural, and local products that are often made by small manufacturers, artisans, and entrepreneurs from the U. S. and abroad.” Food items in this sector are extraordinarily diverse and include products such as artisanal cheeses, shelf-stable and frozen fruits and vegetables, grain products, and cured meats. In 2015, the SFA estimated that specialty food sales exceeded \$120 billion and comprised 11% of total retail food sales. Small and medium-sized farms grow all of the farm products that can be used as key ingredients in these value-added foods.

Project Overview

This project investigates whether supplying ingredients and/or processed products to the specialty food marketplace represents an attractive outlet for regional small and medium-sized farmers and, if so, how these sales can be increased. Four broad ingredient categories are covered – dairy, meat, fruits/ vegetables/nuts, and grains. More specifically we:

- Assess the potential for small and medium-sized farmers to increase their viability by adding specialty food market sales to their portfolio of activities through a survey of specialty food manufacturers and in-depth interviews with manufacturers and farmers;

- Develop communication and distribution strategies and business practices for growers and processors to increase small and medium-sized farms' participation in specialty food markets;
- Conduct outreach activities that will enable: (i) small and medium-sized producers to initiate or increase their sales in specialty food markets; and (ii) specialty food manufacturers to initiate or increase their purchases of ingredients from small and medium-sized producers.

Survey results

We conducted a survey of 940 specialty food manufacturers in three regions (Minnesota/Wisconsin, Oregon /Washington, and California) and received 240 completed questionnaires for a response rate of 26%. In what follows we highlight key results and discuss their implications.

The manufacturers ranged in size from less than \$100,000 in sales to more than \$5,000,000 in sales. More than 2/3rds of the survey respondents indicated that they sold their products beyond the boundaries of their own state. **Implication:** Most manufacturers need to increase the scope of their sales beyond state boundaries to be economically viable because very local markets are too small for these specialized products.

Half of the survey respondents are sourcing the primary ingredient in their products directly from farms. More specifically, 23% of the manufacturers are vertically integrated (meaning that they produced the ingredient themselves) and an additional 27% purchase their primary ingredient from one or more farms(s). **Implication:** Many direct transactions between specialty food manufacturers already exist. This is important because we believe that small and mid-size farms can often gain a comparative advantage in markets that pay attention to where the ingredients originate.

We also asked about the nature and duration of the supplier/manufacturer relationship. Seventy-seven percent of the manufacturers indicated that they are in stable, long-term relationships with their key ingredient suppliers. **Implication:** Stable, long-term relationships are more attractive to both manufacturers and their suppliers.

The survey also allows us to examine differences by type of ingredient and by value of sales. We found that manufacturers who purchase dairy products are the most likely to be able to identify their specific farm suppliers and grain manufacturers the least likely. **Implication:** Some ingredients are more difficult to differentiate than others.

When it comes to sales volume, the smallest manufacturers are the least likely to be able to identify specific farm suppliers. **Implication:** We hypothesize that smaller manufacturers are

unable to enter into long term commitments with farm suppliers and instead purchase their ingredients through other types of channels such as commodity markets or discount chain stores.

We also asked the manufacturers to discuss the benefits and obstacles associated with purchasing from known farms and present those results in Figures 1 and 2. In both instances we differentiate between those farms who already follow this practice and those who don't. In looking at the benefits (Figure 1) the top four are quality assurance, trust, reliability, and traceability with each being selected by more than 80% of the manufacturers who can identify the specific farms who produce their ingredients. But it is very interesting to note that **the biggest differences in benefits** between those firms that buy from known farms and those that don't are four other benefits -- ease of communication, flexibility in logistics, strong marketing message, and source of differentiation. **Implication:** While all eight of these benefits are significant it may be the second set of four that deserve the most attention in terms of both further research and outreach

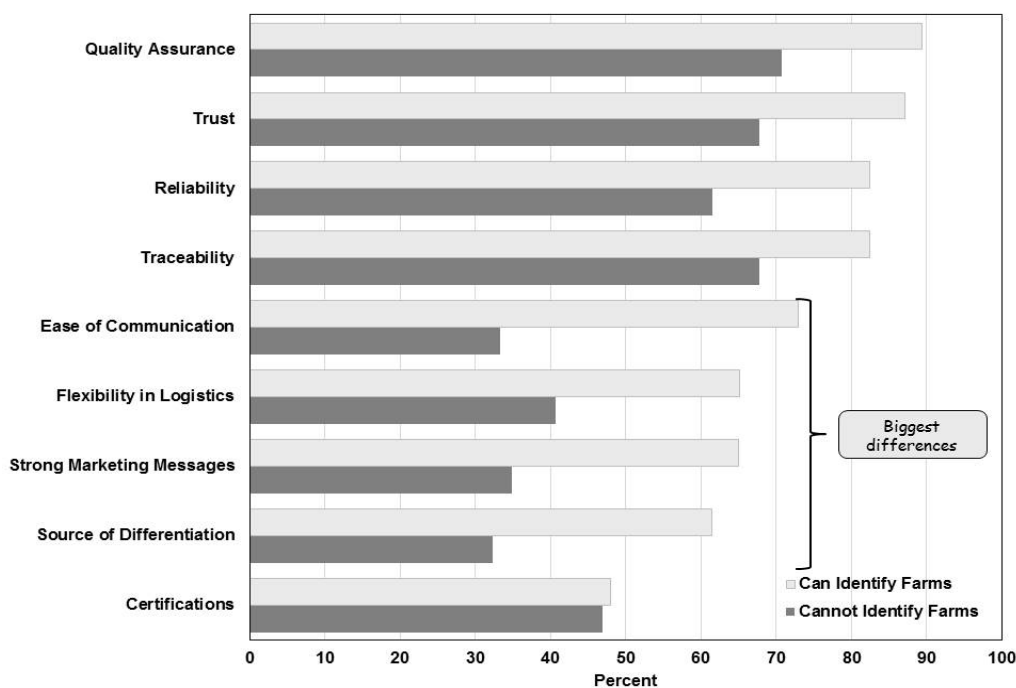


Figure 1. Major Benefits of Purchasing from Known Farms

Figure 2 presents the responses of these same two sets of manufacturers (those who can and those who cannot identify local farm suppliers) for 11 potential obstacles to purchasing key ingredients. The majority of firms currently doing this do not perceive any of these as major obstacles as none are selected by even 20% of that group of manufacturers. In sharp contrast, the top three obstacles (lack of year round supply, cost, and inability to meet food safety requirement) are selected by 50% or more of the firms who do not currently purchase from known farms and an additional four obstacles were selected by 40% or more of the firms in this

category. **Implication:** It will be important to better understand why this second set of firms perceives obstacles that most firms who currently source from known farms do not experience. To what extent is this caused by differences between the two sets of firms and to what extent is it a difference in perceptions?

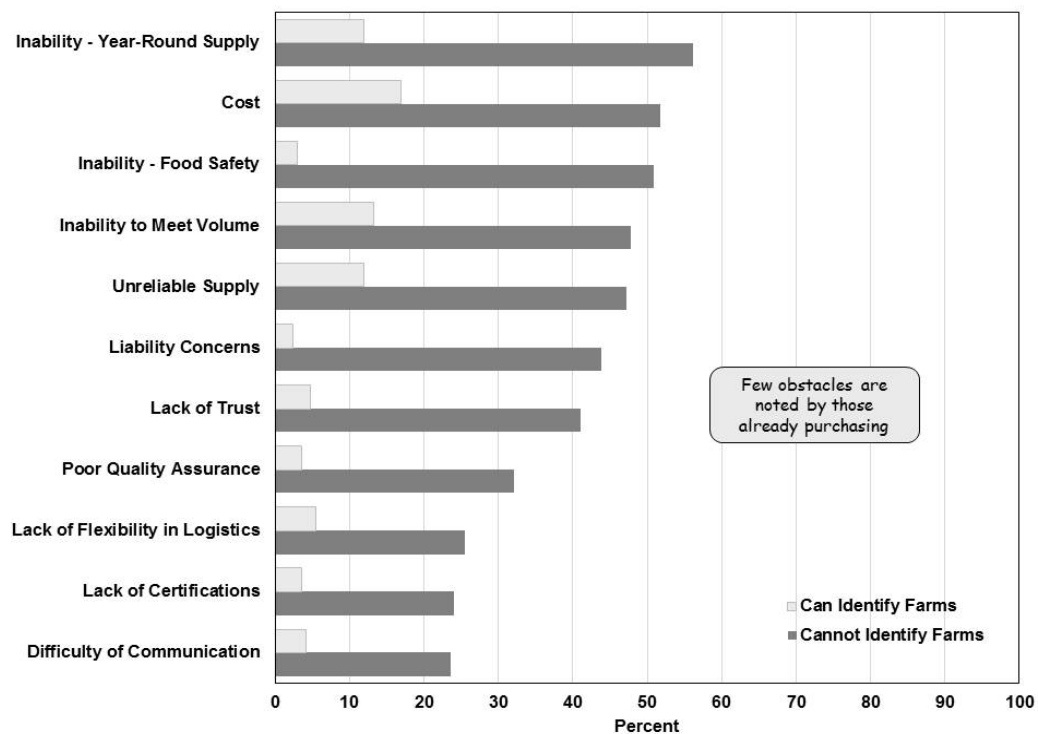


Figure 2. Major Obstacles to Purchasing from Known Farms

Conclusion

The specialty food sector offers attractive opportunities for some small and medium-size producers. To be successful, the producers will need to meet the specific needs of supply chain partners and final consumers. The project described in this paper will be developing educational materials for both producers and manufacturers to support this dynamic food sector.

References

Kirschenmann, F., Stevenson, G., Buttel, F., Lyson, T., & Duffy, M. 2008. Why worry about the agriculture of the middle? In T. Lyson, G. Stevenson, & R. Welsh (Eds.), *Food and the mid-level farm: Renewing an agriculture of the middle*. Cambridge, MA: The MIT Press.

Acknowledgements

This project was supported by Agriculture and Food Research Initiative Competitive Grant no. 2015-68006-22906 from the USDA National Institute of Food and Agriculture.

Increasing Farmer Self-Confidence in Direct Marketing Outlets through Experiential Learning Activities

Theresa J. Nartea (Virginia Cooperative Extension-Virginia State University); *Michelle V. Mosely* (Virginia State University)

Introduction

According to the 2012 Census of Agriculture, small farm operations comprise the majority of US farms selling fresh food products directly to consumers, with 75% of these operations earning less than \$5,000 annually (USDA NASS, 2014). Heightened consumer awareness of the quality and value of local food products has propelled national sales to nearly \$12 billion in 2014, with industry estimates indicating that the 2019 market value of local foods may reach \$20 billion (USDA, 2016). In order for small farm producers to capitalize on selling directly to consumers, they may need to cultivate new skills in direct marketing techniques.

Background

Direct to consumer sales have the potential of boosting on-farm income for small farmers. Essential marketing skills such as promotion (web presence, effective signage), product presentation (attractive market display), and planning (marketing plan) are necessary for small farmers to be successful in direct sales. Traditional agricultural extension educators with production expertise may be challenged in training small farm clients on practical direct marketing skills. In order to assist with this educational gap, several experiential learning workshops have been developed and field-tested to meet the need of small farm businesses to learn marketing skills. Extension educators should consider and improve skills in experiential learning methods and results driven teaching in order to increase their reportable educational impacts for small farm audiences who are interested in direct sales (Nartea & Newsome, 2008).

Purpose

The purpose of this report is to briefly describe experiential learning activities that extension educators may employ to effectively train small farmers on how to perform the following activities: 1) Write a marketing plan; 2) Create market signage; 3) Design a product display using a farm stand set-up; and 4) Develop a farm webpage. We will discuss existing reportable income impacts from extension agents who have taught these classes to limited resource and small farm clients. Readers will learn about available educational and evaluation tools to assist them in the successful planning, conducting and evaluation of these direct marketing trainings. Interested extension educators may also utilize and adapt developed curriculum and evaluation templates for use in their small farm outreach programs.

Educational Resources

Interested educators may adapt educational materials to conduct similar marketing classes on their own. The goal of these lessons is to empower both educators and small farmers in direct marketing skills necessary to increase farm income. Participant evaluation templates are available for each workshop program and may assist extension educators in developing required end of year impact statement reports.

Described in Table 1, below are four experiential workshop curriculum materials available to small farm educators. In 2016, the primary author placed all curriculum materials online. The reader is encouraged to check the URLs listed in the reference section of this paper in order to download the computer files directly to a personal computer (Nartea, 2016a; Nartea, 2016b; Nartea, 2016c; Nartea, 2016d). In the event, the reader is unable to download the online curriculum materials, a CD of computer files or a paper copy may be obtained by directly contacting the primary author at tnartea@vsu.edu, or 804-524-5491.

Table 1. Curriculum details

Experiential Workshop	Details	Available Materials	Reportable Impacts based on Template Evaluation
Write a Farm Marketing Plan	Length: 2 hours Size: 10-12 participants	Class flyer Lecture slides Handouts Evaluation	# Farmers with plan # Plans executed ↑ Farm income ↑ Market outlets
	Learning Objective: Each participant will complete a beginning farm marketing plan by the end of the class period.		
Paint your Farm Market Signs	Length: 3 hours Size: 5-10 participants	Class flyer Lecture slides Handouts Evaluation	# Farmers with signage # Signs created ↑ Farm income
	Learning Objective: Each participant will paint a farm market sign by the end of the class period.		
Set up an Effective Market Display	Length: 2 hours Size: 10-50 participants	Class flyer Lecture slides Handouts Evaluation	# Farmers with displays # Displays created # Displays improved ↑ Farm income
	Learning Objective: Each participant will set up an effective market by the end of the class period.		
Create your own Farm Webpage	Length: 3 hours Size: 10-15 participants	Class flyer Lecture slides Evaluation	# Farmers with webpage # Webpages created # Webpages improved ↑ Farm income
	Learning Objective: Each participant will create an active farm webpage by the end of the class period.		

Conclusion

There is potential to increase farm income of small farm operations through experiential marketing education. Providing hands-on training in market plan writing, market signage, market display, and webpage development may improve producer skills and confidence in the direct marketplace. Educators may benefit from utilizing available curriculum on experiential learning activities to train small farm business audiences in practicing and applying direct marketing skills to increase on-farm profitability.

References

- Nartea, T. J. (2016a). *Online access to market plan curriculum*. Retrieved from tinyurl.com/vsumarketclass1
- Nartea, T. J. (2016b). *Online access to market signage curriculum*. Retrieved from tinyurl.com/vsumarketclass2
- Nartea, T. J. (2016c). *Online access to market display curriculum*. Retrieved from tinyurl.com/vsumarketclass3
- Nartea, T. J. (2016d). *Online access to webpage development curriculum*. Retrieved from tinyurl.com/vsumarketclass4
- Nartea, T. J., & Newsome, A. J. (2008). *Utilizing experiential learning methods to teach practical direct marketing skills to small farm businesses*. Retrieved from http://www.nacaa.com/presentations/presentation_list.php?app_id=74
- United States Department of Agriculture National Agricultural Statistics Service. (2014). *Farmers marketing*. Publication ACH12-7. Retrieved from https://www.agcensus.usda.gov/Publications/2012/Online_Resources/Highlights/Farmers_Marketing/Highlights_Farmers_Marketing.pdf
- United States Department of Agriculture. (2016). *USDA results: Local and regional food systems*. Retrieved from <http://www.usda.gov/wps/portal/usda/usdahome?contentid=usda-results-local.html>

Marketing Alternative Agriculture Commodities: S.A.P.S. (Simple, Attractive, Packaging, Sells)

Helen D. Brooks (Alcorn State University Extension)

Introduction

The demand for more fresh fruits and vegetables; the increasing need for Farmers Markets, both locally and throughout the United States, allows the opportunity to market fresh fruits and vegetable as an added/value (Alternative Agriculture Commodities) in the Southwest Mississippi. The demand for alternative agriculture commodities has increased because families are eating healthier and looking for items that are locally grown.

Niche Marketing

When I talk about Alternative Marketing, I am speaking in terms of a **Niche Market** which is: *A portion of a market that you've identified as having some special characteristics and that's worth your time in marketing to.* One of the fastest growing Niche Markets is your local Farmers Markets. This is because according to the USDA, Agriculture Economic Research Service, 2010 the farmers and ranchers receive only 20 cents of every food dollar that consumer spends on food at home and away from home.

According to the same sources, as recently as December 2014, 15.8 and in 2016, 17.4 cents of every food dollar that consumers spend on food at home and away from home goes to the farmers and ranchers that produced the food.

- Lately, more and more people are looking at the importance of purchasing nutritious fresh food that comes right from the farmer's field in the community.
- This produce is not available on the supermarket shelves and still remains a desperately wanted and needed commodity.

Benefits of Farmers Markets

- Local people that want fresh food at an affordable price can convene at their farmer's market.
- The food for sale at these markets have been freshly picked and brought to the market the same or next day.
- When a fruit or vegetable is allowed to ripen naturally in the field it has a much higher nutritional content than the one that is picked early enough to compensate for transportation and storage.

Impact on the Community (Farmers Markets)

A report issued by the New Orleans Market Umbrella states that:

- For every dollar that is spent at the market a portion goes back into the local economy and is re-spent in the area.
- There are no stakeholders or parent companies or middle man that are receiving dollars back, so there is more cash that can flow into the local economy.
- Many urban communities where fresh nutritious foods are scarce gain easier access to food through farmers' market operations.

Impact on Consumers (Farmers Markets)

- Farmers markets allow consumers to have access to locally grown, farm fresh produce and the opportunity to personally interact with the farmers who grew the produce.

Impact on Small Farmers and Ranchers (Farmers Markets)

- Direct access to consumers at farmers markets provides an important supplemental source of farm income for many growers.

Healthier Lifestyle (Farmers Markets)

- Farmers markets allow for the selection of produce that have no preservatives or additives, which benefit those who wish to live a healthier lifestyle.

Opportunities (Farmers Markets)

- To receive federal funds
- To participate in federal funded programs (WIC & SFMNP)
- To promote healthier lifestyles
- To Increase the number of job and farmers.

Niche Marketing (Planning)

Before you choose any Farmers Market there are some questions you need to ask yourself.

- Do I have the time to both grow my produce AND handle direct marketing?
- Do I have the time to make my products AND handle direct marketing?
- Do I have the motivation and ability to learn about display, signage and other important aspect of successful direct marketing?
- Do I have the temperament to handle the contact with the public?
- Do I have the resources to purchase trucks, display equipment, tents etc.

Once you have made the commitment of selling at a Farmers Market, ask yourself...

- Is this Farmers Market a good fit for me?
- Who will my employees be and how will I train them to sell my products/produce?
- Do I clearly understand and agree with the rules of the Market?

- How am I going to compete against existing vendors and how will I stay competitive, year after year?
- How do I begin to build a customer base?
- What am I going to do with fresh market produce that does not sell?
 - Do I have alternatives such as stores or farm stands to move unsold produce after market
 - Can I turn some of my unsold produce into value added products such as jams, jellies, syrup, chow chows, sauces so it doesn't go to waste?

There is a need to train small local farmers how to visually market their products so it can be appealing at a distance when selling at the local farmers markets. In addition to preparing them to sell at the market, they will be introduced to SAPS (Simple, Attractive, Packaging, Sells) Project.

- **Simple** – because its clean and of quality, readable information and conforms to states regulations
- **Attractive**- because it shows that you gave quality time to show that caring has gone into how your product(s) look.
- **Packaging**- shows that you selected the appropriate bags, jars, containers, bottles etc... that best fits the product.
- **Sells/Sales** – the end results of Simple Attractive Packing (S.A.P.)

Simple & Attractive

- Simple and Attractive – Using your computer in printing your own labels
- Using labels from WalMart®
- Using you own pictures or ones from Avery that are online



Packaging

- Knowing what packaging to select for what product.
- Jams and Jellies
- Chow Chows /Cha Cha
- Syrup

- Honey
- Teas and Seasoning
- Reputation



Sells/Sales

- Reaping the rewards
- Low cost for simple, attractive packaging pays off with a wider income margin.
- **Example**
- Cost for Jellies
- Product Preserved Figs
- Product Figs free they grow every years with little or no maintenance (you pick them)
 - Quart jars – 15.00 to 20.00 or free in some cases
 - Sugar and Sure-Jell® \$10.00
 - Labeling \$5.00
 - Return 12 jars at 10.00 a jar \$120.00 profit can range anywhere from 85.00 \$100.00.

<https://www.pinterest.com/explore/market-stands/>

<https://www.pinterest.com/explore/market-displays/>

Linking Multifunctional Agri-enterprise Development to Small Farm Opportunities

Kathleen Liang (North Carolina A&T State University)

Introduction

Family farm enterprises in the U.S. face significant challenges from resource and opportunity constraints. Many family farms are actively seeking or creating new strategies to support farming operations and family life style. Multifunctional agriculture (e.g. agritourism, value added, direct sales, off farm jobs) in the U.S. has not been fully explored, although scholars have argued the long-term benefit of multifunctional agriculture offering services such as preserving working landscape and ecosystem goes beyond supplying traditional food and fiber. To understand how family farms endure market pressure and production limitations, a census-approach survey in New England was designed and implemented to (1) explore implications of multifunctional agriculture (MFA) and off farm income on small farm viability, (2) identify opportunities and challenges for small farms to engage in multifunctional operations such as agriourism, value added, and direct sales, and (3) discuss economic, social, and environmental impacts of MFA on small farms and their communities.

Methods

The survey process covered two stages through a collaboration with the National Agricultural Statistics Service New England division: (1) the first stage was a postcard mailed to all 25,000+ producers in New England to identify specific activities they participate in agritourism, direct sale, value added, and off farm jobs; (2) a follow-up survey was mailed to all postcard respondents plus additional random samples asking each respondents to identify their farm profile, entrepreneurial characteristics, operation, finance, management, labor, challenges, and future outlook of multifunctional operation.

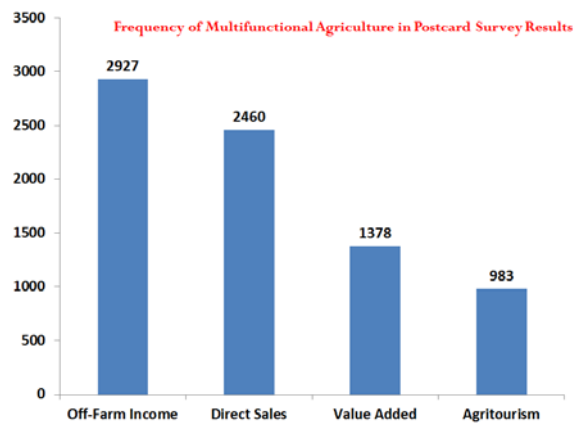
Results and Discussion

Results show that most New England farmers are middle age or older, male, well-educated and have middle to high incomes from off farm employment. This same group also farms small acreages, have low sales and over a third have losses from their farming activity. Direct sales seem to be the most popular option for small family farms, and this strategy includes farm stand, farmer's market, farm to institution, CSA, and other direct contact with buyers. Most of young producers are more willing to participate in multifunctional operation. Many farm households choose to practice MFA given their willingness to connect with local communities and customers, passion and their belief in preserving agricultural landscape, and commitment in agricultural education and services.

There is a benchmarking point when small farms are making decisions on whether or not to participate in MFA, and it depends on resources such as labor, time, and policy constraints. Many producers point out that engaging in multifunctional operations is time consuming, and they are not prepared or trained to deal with customer issues. For agritourism operators, there are serious concerns about safety, health, and insurance issues that producers are not aware of or for which they are not prepared. Most of the family farms could not afford to hire labor due to financial constraints. Many farmers are not willing to hire labor because of restrictions, legal barriers, training concerns, and management limitations. Most of the small farms with multifunctional operations rely on family members, relatives, friends, seasonal workers, or volunteers for help. It is noted that small farms could be profitable if they have effective management structures and if they offer sufficient seasonal products to fulfill buyers' need (including individuals, households, restaurants, and other institutional buyers). One of the most significant characteristics of successful multifunctional producers is keeping of clear and precise financial records.

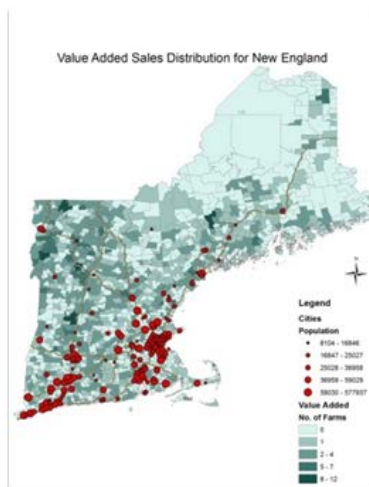
More than 90% of survey respondents rely on off farm income. Over half of respondents who receive off farm income also engage in multifunctional operations. Many farmers earn High to Medium levels (\$30,000 to \$80,000 in gross annual income) of off farm income (over \$80,000 in gross annual income) while sustaining losses or very low income from farming. Higher education levels relate to higher positions in off farm jobs. Geographic locations of farm enterprises seem to influence farming style, choices of multifunctional activities, and decisions in choosing off farm jobs. It is noticeable that farmers have a high potential to enhance economic mobility for their own families by participating in off farm jobs and multifunctional operations. Multifunctional farmers also contribute to intellectual mobility for the local economy by engaging in higher paid off farm jobs.

Finally this research also leads to mixed results whether encouraging multifunctional agriculture would directly add employment or new opportunities to a community particularly with respect to a balanced theme of economic, social, and environmental sustainability. Many producers respond positively to a supportive environment through best management practices. However there is need to identify more specific factors influencing producers' decisions to apply innovative strategies to support and improve long-term sustainability for farm, family, and community.



Summary of Multifunctional Farming in New England by Category
Screening Postcard Responses (Sample = 3,898)

Agritourism	# of Farms	Direct Sale	# of Farms	Value Added	# of Farms	Off Farm Income	# of Farms
Tour	563	Farm Stand	1243	Others	619	Full Time Job	1535
Events	401	Others	984	Syrup	480	Part Time Job	917
Others	236	Farmers' Market	632	Jam & Jelly	279	Another Business	753
Outdoor Activity	182	Restaurant	496	Pickled	206	Others	515
Zoo	88	Grocery Stores	396	Wool	188		
B&B	58	Pick Your Own	390	Candy	113		
		Institutions	234	Bread & Butter	89		
		Coop	233	Cheese	80		
		CSA	204	Ice Cream	54		
				Spice	43		
				Cream	29		
				Wine	25		



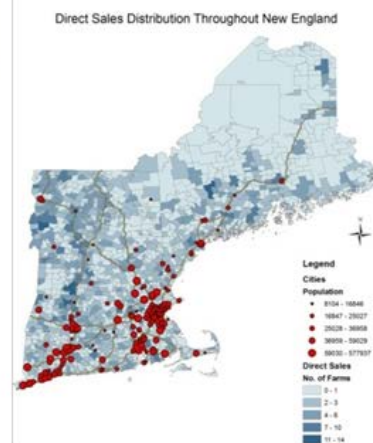
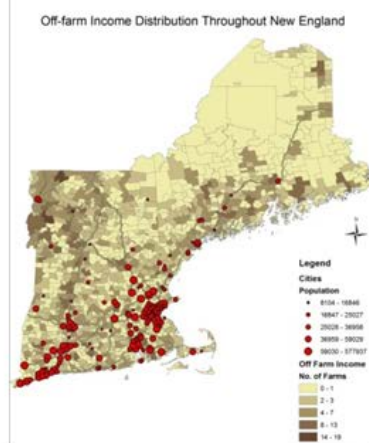
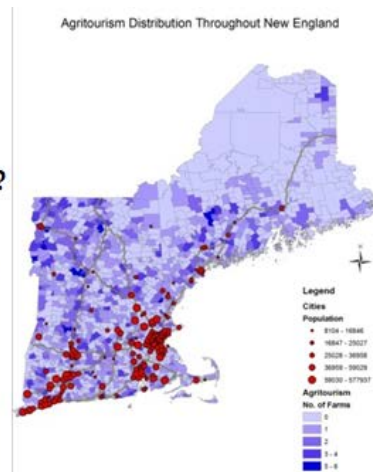
Factors influence farmers' decisions to participate in multifunctional agriculture?

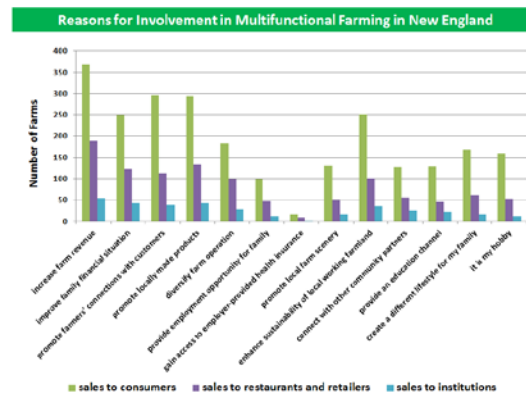
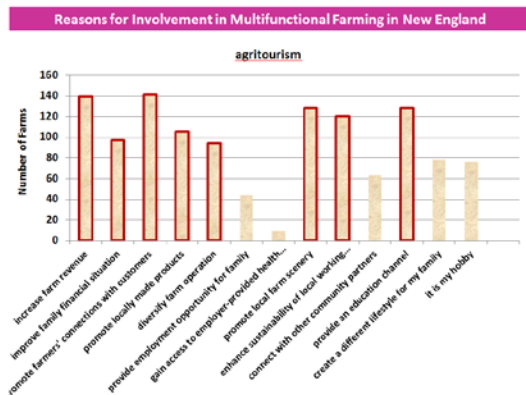
Population

Transportation

Access to information

Access to networks





References

- Liang, C. (2015). What Policy Options Seem to Make the Most Sense for Local Food? *Choices*, a publication of the Agricultural and Applied Economics Association. 1st quarter 2015, 30(1). Available online <http://www.choicesmagazine.org/choices-magazine/theme-articles/community-economics-of-local-foods/what-policy-options-seem-to-make-the-most-sense-for-local-food>
- Liang, C. (2015). Linking creative farming to economic mobility and rural development in New England, *Rural Connections*, Fall, pp. 42-44.
- Liang, C. & Dunn, P. (2014). Entrepreneurial Profile, Characteristics, Expectations, and Outcomes – An empirical Study to Compare Rural Entrepreneurs with Urban Entrepreneurs, *American Journal of Entrepreneurship*, Special Issue: Rural Entrepreneurship, Vol. 7, Issue 2, pp. 79-100
- Liang, C. & Dunn, P. (2014). Examining entrepreneurial characteristics, motivations, barriers, and outcomes for small versus large multifunctional farm enterprises in New England, *Journal of Business and Entrepreneurship*, pp 64-94.
- Brown, J., Goetz, S., Ahearn, A., & Liang, C. (2014). Linkages between community focused agriculture, farm sales, and regional growth, *Economic Development Quarterly*. Available online <http://edq.sagepub.com/content/early/2013/10/12/0891242413506610>

Farmers Forum: A Platform for Farmers Sharing Innovation

Beth Nelson (North Central Region SARE/University of Minnesota); **Dan Perkins, Julie Perkins** (Perkins Good Earth Farm, De Motte, IN); **Joan Benjamin** (North Central Region SARE/Lincoln University)

Proceedings

USDA-NIFA's national Sustainable Agriculture Research and Education (SARE) program is a grants and education program that funds innovative research on sustainable agriculture systems and practices. SARE projects emphasize farmer engagement throughout the process, from project idea generation to project design and implementation. Funded projects also have farmers involved in extending the research results through various outreach activities.

We know that farmers like to learn from other farmers. They prefer demonstrations, but if they're going to be lectured to, they'd prefer to hear a quick talk, preferably with lots of photos to show what was done, from a fellow farmer. They want to hear what happened and how the farmer plans to proceed, and be able to follow up and exchange information.

This type of interaction is what the North Central Region (NCR)-SARE Farmers Forum provides. While all of SARE's grants stress farmer engagement in researching innovation, the Farmer-Rancher grant program provides grants directly to farmers and ranchers to "explore sustainable solutions to problems through on-farm research, demonstration, and education projects."

The NCR-SARE program's Farmers Forum is an event that gives farmers, ranchers, and others the chance to share new information about sustainable agriculture practices based on findings from their own NCR-SARE grant projects.

The Farmers Forum was started in 1999 by *Small Farm Today* magazine for their National Small Farm Trade Show and Conference which was held annually in Columbia, Missouri. Farmer projects were featured and included grant-funded and self-funded projects. SARE assumed coordination of the Farmers Forum in 2005, using the event to showcase SARE grant recipients and their projects. Joan Benjamin, the NCR-SARE Farmer-Rancher grant program coordinator organized the Forum which quickly grew to be a major part of the conference, involving 25-30 speakers over three days. It provided an opportunity for grant recipients to present results to interested farmers and ranchers, and to develop skills in communicating their results; the Farmers Forum also helped to develop informal networks around topics—when a session ended, the moderator had to usher the speaker and the group of people waiting to ask questions out into the conference hall, in order to let the next speaker begin. It was not uncommon to look across the hall and see the clusters from the various talks deep in conversation an hour or two later. It built strong relationships with the host conference, and it led to greater awareness about SARE and especially SARE Farmer-Rancher grants in that area.

The success of the program led to demand for the Forum to be offered in other areas of the north central region in order to build those same strong relationships and networks. In 2014 we began a three-year trial of rotating the Farmers Forum around the region. We started in the eastern part of the region, and attended the 2013 winter conference of the Ohio Ecological Food and Farm Association (OEFFA) to explore having a Farmers Forum as one of the tracks at their 2014 conference. OEFFA staff was very willing, so we worked with them to craft an agreement that clarified how the program would fit into their conference. We hoped it would mutually benefit both organizations and boost awareness of their conference throughout the region, and of the SARE grant programs in the eastern part of the region. We identified potential speakers from recent grants in the Farmer-Rancher program, and also identified a few from our Research and Education grantees and Graduate Student grantees. We invited speakers who lived within 250 miles of the conference. This was done both to keep travel costs low, as well as to build localized networks. Even so, it enabled OEFFA to invite speakers who weren't on their usual list.

We agreed to jointly invite speakers, OEFFA set up the program schedule, and NCR-SARE worked with OEFFA's communication people to include information about the Farmers Forum within all of their promotional materials. NCR-SARE provided speakers with a presentation template that they could use and arranged to videotape presentations for posting on our YouTube[®] channel. We also had a grant-writing workshop given by the Ohio state SARE coordinator, Mike Hogan, at the end of the Forum. After the conference NCR-SARE produced an eight-page Farmers Forum Highlight summarizing each presentation. The Highlight was sent out as an insert in NCR-SARE's summer newsletter, and offered to OEFFA for posting on their website and mailing if they wished.



NCR-SARE FARMERS FORUM

OEFFA is excited to welcome the North Central Regional Sustainable Agriculture Research and Education (NCR-SARE) program's Farmers Forum to this year's conference. The forum will feature 21 farmers, educators, veterinarians, students, and others funded by NCR-SARE grants who will share information about their sustainable agriculture research, demonstration, and education projects.

The Farmers Forum will be offered as a special conference track, with additional projects featured in other tracks. Look for the SARE logo next to each Farmers Forum workshop description.

35th Annual OEFFA Conference



NCR-SARE Farmers Forum HIGHLIGHT

2014

THE NORTH CENTRAL REGIONAL SUSTAINABLE AGRICULTURE RESEARCH AND EDUCATION (NCR-SARE) PROGRAM'S FARMERS FORUM

21 FARMERS, EDUCATORS, VETERINARIANS, STUDENTS, AND OTHERS FUNDED BY NCR-SARE GRANTS WILL SHARE INFORMATION ABOUT THEIR SUSTAINABLE AGRICULTURE RESEARCH, DEMONSTRATION, AND EDUCATION PROJECTS.

THE FARMERS FORUM WILL BE OFFERED AS A SPECIAL CONFERENCE TRACK, WITH ADDITIONAL PROJECTS FEATURED IN OTHER TRACKS. LOOK FOR THE SARE LOGO NEXT TO EACH FARMERS FORUM WORKSHOP DESCRIPTION.

35th Annual OEFFA Conference

2014

THE NORTH CENTRAL REGIONAL SUSTAINABLE AGRICULTURE RESEARCH AND EDUCATION (NCR-SARE) PROGRAM'S FARMERS FORUM

21 FARMERS, EDUCATORS, VETERINARIANS, STUDENTS, AND OTHERS FUNDED BY NCR-SARE GRANTS WILL SHARE INFORMATION ABOUT THEIR SUSTAINABLE AGRICULTURE RESEARCH, DEMONSTRATION, AND EDUCATION PROJECTS.

THE FARMERS FORUM WILL BE OFFERED AS A SPECIAL CONFERENCE TRACK, WITH ADDITIONAL PROJECTS FEATURED IN OTHER TRACKS. LOOK FOR THE SARE LOGO NEXT TO EACH FARMERS FORUM WORKSHOP DESCRIPTION.

35th Annual OEFFA Conference

Figure 1. Part of OEFFA conference program.

Figure 2. 2014 Farmers Forum highlight.

Dan and Julie Perkins presented at two Farmers Forums, including the OEFFA Forum. They presented about their 2010 Farmer-Rancher grant project to develop equipment to be used to plant and harvest garlic.

Dan and Julie's perspective:

“Our SARE project focused on creating a garlic cart to ease labor in planting garlic. We worked with Purdue University engineering students to design a low-cost, tailored-to-our-needs machine that could be constructed on farm, a machine similar to more expensive electric or gasoline carts. Our first presentation as part of the Farmer's Forum was in Columbus, MO, just one year into the project. Julie and I gave the presentation together; it was fun and casual and allowed a good amount of time for questions. We connected with small farmers in the region and networked and shared techniques to improve our farm systems. The experience was so valuable that when asked to speak at the 2013 OEFFA, we jumped right in. The cart wasn't yet finished due to student turnover and design changes at Purdue, but we were able to show pictures and discuss the process up until that point. The audience, however, seemed most interested in learning more about our garlic operation, from cover cropping to planting to harvest to curing to marketing. We were able to make new connections, as well as hear from other garlic growers about their farming systems. No dollar value can be placed on the tips, techniques, and relationships we walked away with from these events”.



Figure 3. Planting hardneck garlic, strip tilled into cover crop.



Figure 4. BCS tractor cuts furrows, while garlic cart is used to seed hardneck bulbs during planting.

OEFFA had both speakers and attendees complete evaluation forms after the conference, and OEFFA staff met with NCR-SARE staff to debrief about the process following the conference. Overall, there were 25 to 75 attendees at most sessions, and presentations were well received. OEFFA staff felt that working with NCR-SARE to put on the forum worked well, provided financial help with the conference and provided them with new speaker possibilities, both for the 2014 conference and in the future. It also solidified the relationship between NCR-SARE and OEFFA, an important Ohio farmer organization.

Subsequent Farmers Forums have been held in conjunction with the Northern Plains Sustainable Agriculture Society in South Dakota in 2015, and with Practical Farmers of Iowa in 2016. All Farmers Forums have been similar, but tailored to meet the needs of the conference host each year. Having completed our first three years, and in response to increased demand from organizations to host the Forum, we are holding two one-day Forums this winter; in Kansas with the Kansas Rural Center, and in Illinois, with the Illinois Specialty Crop, Agritourism and Organic Conference. Through the Forums, NCR-SARE builds relationships with organizations throughout the region and assists those organizations in building and creating farmer-based networks around specific topics, leading to future collaborations and innovation.

Cultivating Success Idaho: A Collaborative, Multi-dimensional Approach to “Growing” A New Crop of Small Acreage Sustainable Farmers and Ranchers Statewide

Ariel Agenbroad, Iris Mayes (University of Idaho Extension); Colette DePhelps (Rural Roots); Soren Newman (University of Idaho); Cinda Williams (University of Idaho Extension)

Introduction

Idaho is a geographically large state, 83,570 square miles stretched across 44 counties, much of it rural with only a few concentrated metropolitan centers. Small farmers and ranchers are critical to the resiliency, economy, and food security of rural areas and necessary for local food access in urban sectors. Appropriate education, strong farmer-to-farmer networks and access to trustworthy resources are key to their initial and continued success.

In Idaho, the Cultivating Success™ Sustainable Small Farm Education Program has been working to meet these needs for over 15 years. In early 2016, with funding from the USDA-NIFA Beginning Farmer and Rancher Development Program, Cultivating Success Idaho broke new ground, launching a statewide effort to deliver education for new farmers, facilitate access to land, capital, and decision-making tools, and strengthen farmer-to-farmer mentoring. The first project was a concurrent, multi-part hybrid course, delivered live via webinar, in-person facilitation and farm tours at nine different sites across the state, the largest Idaho expansion of the program to date.

Throughout the course, we collected data via multi-stage evaluations of both participants and team members. This white paper focuses on the results of our evaluation, and highlights lessons learned throughout this innovative, collaborative course about our team capacity, effectiveness of delivery methods on meeting learner goals and objectives, and early indicators of impact on the Idaho small farm landscape.

Background

Cultivating Success is a collaboration between University of Idaho, Washington State University, and the Inland Northwest farmer-driven nonprofit organization Rural Roots. This collaboration enabled us to bring together people and resources from both University campuses, as well as a rich network of experienced farmers, to create curriculum, courses, apprenticeships and mentoring for community members and academic students interested in small acreage farming and ranching and agricultural entrepreneurship. Over the years, the program has focused less on the academic student and more on community members across both states, through engagement with Cooperative Extension. Washington State University Extension was an early adopter, with strong support from Extension faculty, clientele and the Small Farms program.

In Idaho, Cultivating Success programs, though extremely popular, were limited to the two or three locations where we had faculty or staff with expertise and resources to offer the programs. Providing expert research based information on a diversity of topics throughout rural Idaho can be challenging. Extension Educators in rural communities have diverse assignments and are often sole educators in their counties. While these Educators might be proficient in one area of expertise, such as livestock production, they might struggle to serve the needs of clientele in another specialization area, such as small farm direct marketing. Often, Idaho residents in rural communities have difficulty accessing technology. And lastly, traveling to urban centers to attend classes or events can be a challenge for residents in rural communities.

With a shift in new faculty hires and program prioritization, Idaho has begun to catch up. However, while multiple University of Idaho Extension faculty members across the state now have percentages of responsibility in small farms programming, the total is still less than 3.92 FTE.

Despite these limitations, we were committed to developing high quality, consistent education, outreach and support for small farms while still attending to our multiple programs and priorities. Our solution was to embrace technology that connects, not isolates, recruit farmer and advocate partners who deeply understand the needs and preferences of our audiences, and begin to create a statewide culture of collaboration, communication and support.

Methods

Using a collaborative approach to assemble a team of Extension Educators, program coordinators, nonprofit advocates and farmer experts, we planned a web-enhanced, intensive short course series focused on whole farm planning, sustainable crop production and sustainable livestock production. The course was based on existing Cultivating Success curriculum for the course *Sustainable Small Acreage Farming and Ranching Overview*, which has been taught in-person and online as an academic and community based course for many years, but never in the multi-site, hybrid format designed for 2016. This iteration, *Cultivating Success: Starting Your Sustainable Small Farm in Idaho*, registered a total of 170 participants at 9 locations.

The course was scheduled over three full day Saturday sessions, one each in January, February and March. The majority of instruction for these sessions was conducted via live, concurrent webinars delivered at nine hosted locations (usually an Extension facility). Each of the nine sites was hosted by a project team member with assistance from area farmers. Grant funding allowed us to compensate all host and presenter farmers for their time, which was key to their commitment to the project. Program attendees viewed live webinar lessons with breaks for questions, group discussion and individual work on activities designed to help them develop whole farm plans. Program attendees also had full access to an online course website on a Moodle platform, hosted by www.campus.extension.org, to provide additional information,

readings, discussion boards and continued support from Extension Educators, farmer mentors and project partners between sessions.

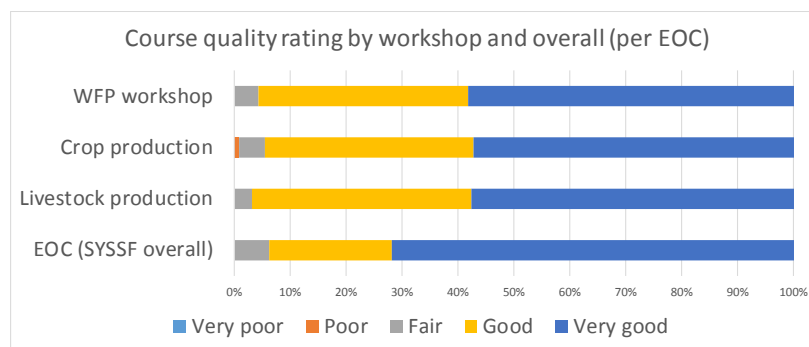
An evening wrap up/potluck event finished the classroom portion of the course in late March, and tours (focused on crop and livestock production) were scheduled by facilitators for each of the nine sites between March and June.

Results

After each course session and tour, participants in attendance completed a paper or online based evaluation. An end of course evaluation was sent to all participants after tours had completed, and project team members completed an additional survey on the collaborative process.

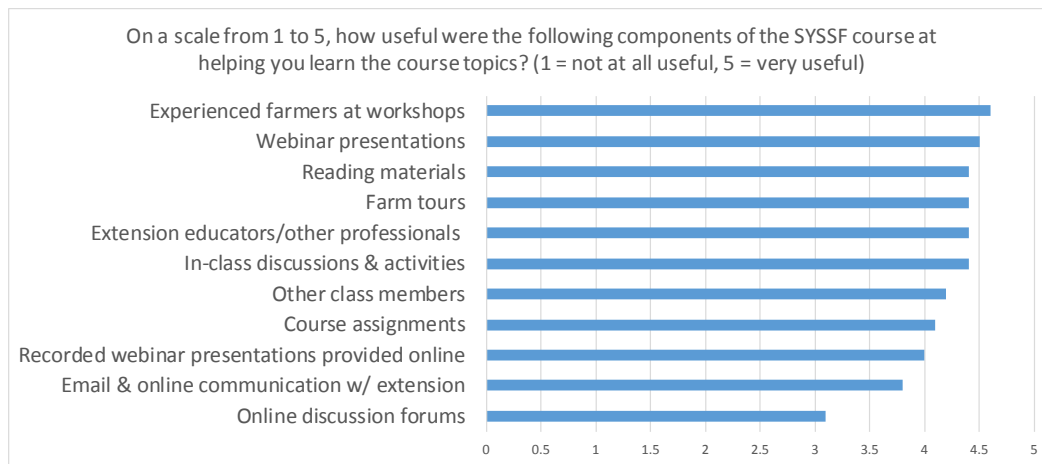
Participants rated the quality of the entire course highly across locations. Figure 1 summarizes results from the three individual workshop evaluations as well as the overall course (end of course survey).

Figure 1. Course Quality Rating by Workshop and Overall



Participants overwhelmingly found the presentations and interactions with experienced farmers to be most useful in helping them increase their knowledge on the course topics presented, followed by webinar presentations (by farmers and Extension faculty). Over 66% of participants had established a personal relationship with a farmer they met in the course, and 91% planned to follow up with one of the experienced farmers in the future. Next in usefulness, and nearly equal to each other, were the selected reading materials, farm tours, Extension educators/other professionals, and in-class discussions and activities. Of lesser use but still valuable were the online components of the course.

Upon completion of the course, 83% of participants surveyed had identified their farm goals, 86% had assessed their resources, 72% had evaluated an existing or potential enterprise, and 56% had drafted a Whole Farm Plan. Participants were more likely to begin farming in the next two years, add a new enterprise, or explore a new marketing option after course completion than they had been before.

Figure 2. Usefulness of Course Components (End of Course Survey).

When asked to specifically identify how the course had influenced participants' future farm plans or activities, answers tended to reflect the following:

- "Hearing tips from other farmers on what works & what doesn't. Trying to avoid making their mistakes!"
- "The course showed me options and opportunities that I was not even aware of or thought possible previously."
- "Helped me to set goals and plans and to start moving in the direction, albeit cautiously."
- "It gave me more encouragement to start a small farm and hope for success."

Suggestions for improvement also followed general themes: streamline communication, provide participants with more opportunity to interact with the farmer hosts and each other, and allow more time during the webinar days to complete assignments and worksheets.

Our team consisted of ten Extension Educators, two program coordinators, six farmers, and two nonprofit professionals. Most of us have experience working with teams on project work, but the coordination, organization and delegation of 20 team members took on new challenges for all.

Results of a mid-summer team evaluation indicated that overall, the team valued the collaborative approach and the emphasis on each individual's talents and points of view during the planning process and delivery of the course. They also appreciated the use of new technology, such as Zoom, that allowed us to videoconference easily and regularly. As the project moves forward, the team has agreed on improved ways to divide responsibilities more efficiently across all members, to improve and streamline communication, and to ensure that everyone has a better understanding of their own roles and responsibilities as coordinators, presenters, facilitators, leaders or mentors. The very short timeline between the initiation of the

grant and the subsequent planning and delivery of this multi-faceted program was one of our biggest challenges but our team proved adaptable, agile and committed to the process.

Conclusions

The *Cultivating Success: Starting Your Sustainable Small Farm in Idaho* course was successful in connecting a diverse, statewide team of educators, farmers and organizational leaders and building a strong foundation for future program work. It was also hugely successful in reaching new audiences and connecting these audiences with high quality, reliable education and information that eased some of our staffing and geographic barriers. We also introduced new and experienced small farmers and ranchers in nine communities to University of Idaho Extension, local resource providers, and each other, encouraging connection and potential local support networks.

Future activities for Cultivating Success Idaho will build on these successes with continuing education designed to further the efforts of participants who engaged in our 2016 course, while refining the course to be offered again in coming years to new audiences. As a team, we will seek more effective and efficient ways to communicate utilizing technology, and capitalize on our individual strengths.

We will also be following our 2016 graduates as they start their farms, expand their enterprises, grow their businesses and become integrated into our food system.

A Systems Approach to Fostering New Farmer Innovation: Exploring the Influence of Social, Cultural and Human Capital Systems for Beginning Farmer Success in Food and Farming Systems

Keiko Tanaka (University of Kentucky); *Kim Niewolny, Lorien MacAuley* (Virginia Tech); *Heather Hyden, Krista Jacobsen* (University of Kentucky); *Margarita Velandia* (University of Tennessee-Knoxville); *Steve Hodges* (Virginia Tech); *Emily Sorensen* (Virginia Tech); *Annette Wszelaki* (University of Tennessee-Knoxville); *Lilian Brislen* (University of Kentucky)

Introduction

Farmer aging and a decline in the number of farmers has created a sense of urgency around the next generation of farmers (Ahearn & Newton 2009). In this 3-year project, funded by the Southern Sustainable Agriculture and Education (SARE), an interdisciplinary team of 6 researchers from three universities examined challenges and needs of beginning farmers in the Upper Southeast by asking: What kind of farm systems do beginning farmers create and maintain? What types of knowledge about agricultural sustainability and sustainable farming do they rely on to construct their systems? What challenges do they face?

We conceptualized the farm system as the interaction of the biophysical, socioeconomic and cultural “maps” that guide farmers’ practice of certain styles from preproduction to postharvest. To answer the research questions above, we collected detailed data on three dimensions of beginning farm systems through 16 listening sessions (N=91) and 8 case studies (one case was eliminated for analysis): (a) farms (biophysical map), (b) farmers (socioeconomic map), and (c) perspectives on sustainability (cultural map). In this presentation, we only present findings from case studies, particularly our analysis of the “cultural maps” using the community capital framework (Emery & Flora, 2009).

Our Case Study Methodology

A “cultural map” provides a farmer with a distinct vision, conception, and justification of the components of 'good' farming practice and 'successful' farming, thus defining the lens through which all other maps are engaged. As a vital component of functioning systems, social capital mobilizes the biophysical and socioeconomic maps (Putnam, 2001; Vera-Toscano, Garrido-Fernández, Gómez-Limón & Cañadas-Reche, 2013). To understand how these systems work together, we used the community capitals framework (Emery & Flora, 2009) to guide our analysis with an additional application of social capital theory. For Emery and Flora (2009), the community capitals framework allows us to conceptualize farmer resources into seven distinct types, including: natural capital (e.g., biophysical, environmental), cultural capital (e.g., traditions, language), human capital (e.g., education, skills, health), social capital (e.g., bridging and bonding social relations, trust), political capital (e.g., political participation, community involvement), built capital (e.g., infrastructure), and financial capital (e.g., wealth, credit).

In this presentation, we report several key findings from our case study data to discuss how farmers access and use social, cultural, and human capital to build their farming systems. In each

state, three case studies of commercially-oriented, sustainable beginning farmers were carried out. We eliminated one case for analysis because the farmer did not meet inclusion criteria. For each case, we carried out 2 or 3 farm visits for in-depth interviews, which also included farm walks and the completion of financial worksheets. To understand the role of the cultural map, we applied the community capital system framework (see Figure 1) to analyze the social, cultural and human capital systems with which our beginning farmer case studies started and accessed over time in order to address labor, market access, management and bio-physical challenges on their farms. We accomplished this through a multi-level coding scheme, which included thresholds described by farmers in which a shift in how they were operating had to occur (Adger, 2000). This approach enabled us to capture “moments” when farmers accessed or mobilized, various capital systems to tackle their challenges and adjust their farming philosophy and management practices which underpin their biological and socioeconomic maps.

Findings

Our analysis is still in progress. Although each farm and farmer is very unique, we have observed some patterns, which will be presented below.

- 1. Farming philosophy matters.** One of the most important aspects of the farmers’ cultural capital system is his/her philosophy or worldviews. We found is that most beginning farmers have heroes/heroines (e.g., Wendell Berry, Joe Salatin, their own family member) to whom they aspire and follow in creating their own “sustainable” farm and to formulate self-identity as “sustainable” farmers.
- 2. Definition of success matters.** These worldviews guide farmers to select particular farming and marketing methods, and therefore their unique definitions of a successful farm operation. In turn, their choices in farming practices have concrete environmental consequences, such as soil management, while their marketing practices impact financial sustainability.
- 3. Thresholds reveal capital influences.** Beginning farmers reach certain points where they are forced to reevaluate the balance between their farming philosophy and farming practices and their strategy to negotiate/utilize diverse capital resources to mitigate biophysical, socioeconomic and cultural risks. For example, one case study participant explained this tension:

I was pretty stubborn on that stuff and would push through poor performance to achieve what I thought was the academic version and I would say that was my pattern for the first 4 years I was farming and then once...I don't know if it was all of a sudden, but it didn't take a long time once I started thinking this way. You know, I need to manage for animal performance, not for Joel Salatin's Farm or George Judy's farm or someone else.

Most common thresholds concern the questions of whether to scale up their farm operation and how many market outlets to maintain. All these decisions involve the purchase of additional tools

and equipment, hiring of seasonal labor outside their family, and the improvement of record keeping.

4. Labor challenges are unique. Across all eight case studies, labor was raised as a consistent challenge. At some points, they experienced a feeling of “burnout” as one participant commented:

It was just killing me. I was just doing too much acreage with it, and it was really hard, and I just didn't have the labor. I kind of hit a wall in 2010 with the drought.

Farmers complained about their difficulties in finding consistent, capable labor at a reasonable cost. Additional labor adds complexity to their farm operation, often requiring them to improve their management and bookkeeping skills. All eight farmers were struggling to balance their desire to expand their operations with an increased need for additional labor as the quote from one case study farmer shows:

All this labor doesn't account for me. I can say with confidence that I put in 80 hours per week. None of that is reflected monetarily. Also, I've realized that your labor force can't grow too much as a farmer because the margins aren't that wide.

5. Family and neighbor support is critical. Through our case study farmers, we found that a safety net offered by relatives and neighbor farmers reduce risks, thereby helping beginning farmers remain farming. Our case farmers avoided large loans by gaining access to farm land for free or at very low lease rates, and to farm machinery through equipment sharing with relatives and/or neighbors. A diverse array of labor support by these support networks also buffers financial risks for beginning farmers. Peer farmers who were not geographically close also served as cultural, social, and human assets. They were used as a learning community to teach beginning farmers “tricks of the trade” in building a sustainable farm which is commercially viable and socially cohesive in the community.

Lessons for Support Providers

The first lesson for support providers is a need to both widen and deepen their knowledge in farming and agricultural marketing so as to serve a broader range of clients with diverse goals. Our case studies show that no single definition or typology captures beginning farmers in the Upper Southeast region. Each beginning farmer uses a unique definition of success that frames his/her plan for building a commercially viable, sustainable farm enterprise. This poses a challenge to many service providers who tend to be familiar with particular types of farming operations, but not others. Support service providers need to be able to translate diverse definitions of sustainable farming into a wider range of farming and marketing practices.

Second, more support services are needed beyond farming and marketing techniques. To be successful, beginning farmers tap into a diverse range of capital systems to implement their plans. Available human, cultural, and social capital systems are often depended on their family,

education, and unique life experiences. From in-depth interviews with beginning farmers, we have learned the importance of constantly expanding these capitals beyond with what they started. For example, while market access is a challenge, developing and maintaining each market outlet is even more critical and requires relatives and peers who are willing to help out farmers and customers who constantly return to purchase their products. Support providers need to design and offer services to assist beginning farmers with building human, cultural, and social capitals.

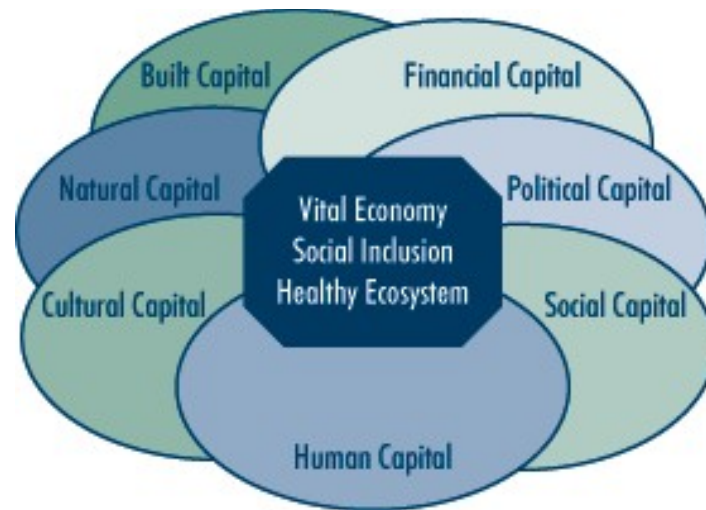


Figure 1. Seven Community Capital Systems
 Source: Emery, M. & C.B. Flora. (2006).

References

- Adger, W. N. (2000). Social and ecological resilience: are they related? *Progress in human geography*, 24(3), 347-364.
- Emery, M. & C.B. Flora. (2006). Spiraling-Up: Mapping Community Transformation with Community Capitals Framework. *Community Development: Journal of the Community Development Society* 37: 19-35.
- Putnam, R. (2001). Social capital: Measurement and consequences. *Canadian Journal of Policy Research*, 2(1), 41-51.
- Vera-Toscano, E., Garrido-Fernández, F. E., Gómez-Limón, J. A., & Cañadas-Reche, J. L. (2013). Are Theories About Social Capital Empirically Supported? Evidence from the Farming Sector. *Social indicators research*, 114(3), 1331-1359.

Learning Off the Land: Developing Collaborative Farm Internships in WA State

Laura Lewis; Kellie Henwood (Washington State University)

Introduction

Washington State University has created a Farmer Mentor Program that provides a multidisciplinary study into sustainable agriculture utilizing a collaborative curriculum shared among participating host farms. The program combines formal instruction with field-based internships on a host farm for up to nine months. Farm-based learning is supplemented by workshops in such diverse subjects as crop production, humane animal slaughter, water law, farm construction, value-added production and farm business planning and marketing.

Collaborative farm internship programs have been developing since 2007 in Jefferson County, Washington among farmers who wanted to share their farming knowledge with the next generation. This grass-roots effort was formalized with Washington State University Extension in 2011 with a more rigorous curriculum and robust intern enrollment. In doing so, interns are eligible to receive Continuing Education Units (CEUs) through WSU or academic credits through their accredited college enhancing their professional development goals. Farmers who wish to apply to be a mentor must have at least three years of farming and managerial experience, demonstrated educational on-farm curriculum, farm insurance, and a willingness to work closely with WSU. These requirements are essential for training the next generation of farmers. Once applications are submitted for farmer mentors, a committee comprised of WSU faculty, farmers, and partner organizations review and accept the applications.

Washington State University's role in the program has proven pivotal in terms of function. WSU provides organized curriculum development and best available science in organic and sustainable agriculture, coordination and administration, and tools for program evaluation. In addition, the professional and/or career mentorship is key to the development of each intern.

Structure

Each collaborative farm internship program operates on a trimester-like schedule. In the spring, typical activities include, soil prep, greenhouse work, seeding flats, planting, business planning, early harvesting and lambing. In the summer, typical activities include planting, mowing, weeding, harvesting, animal care and marketing. In the fall, typical activities include weeding, harvesting, food preservations, animal care, animal

slaughter and business planning. The interns come together on workshop days one day a week, or often twice a month. These workshop days are important for the development of their social network and collaboration. The other days of the week the interns remain on their host farms working directly with their host farmer. Each workshop is taught by farmers, WSU faculty, community resource organizations, and other subject matter specialists. Typically, each workshop begins with a morning lecture on the topic and ends with the practicum in the field.

Results

Since 2007, we have had 90 interns from 19 states graduate from our programs. Of those 90 interns, about 50% of them remained in the agricultural sector that includes farm labor, farm management, and only one is a farm owner. Approximately 35% remained in the food sector, with jobs such as local grocer or food delivery service. About 20% pursued more education or academia. In the Jefferson County FIELD Intern Program alone, about 60% of graduating interns remain in the county, bringing their education and experience to the community.

Enabling Networking with Economic Developers and Planners with a Local Farms and Food Profile

Noah Ranells (Farm Better Now, Efland NC); Laura Lauffer, Enoch Sarku (North Carolina Agricultural and Technical State University Cooperative Extension)

Introduction

Land use policies, consolidation, and a desire to lure larger industries to communities can place pressures on local agriculture and prime farmland. As a result, the value of local food systems in a community may be overlooked by economic development and planning staff and elected officials may not be aware of or able to easily obtain information on the benefits of a local food and farming system. Yet, consumers are increasingly interested in purchasing from local producers as evidenced by the growth of CSA's and direct to consumer sales. These marketing channels are essential to a resilient local food system and exert a positive multiplier effect in the local economy.

The Center for Environmental Farming Systems received funding from Sustainable Agriculture Research and Education (USDA SARE) program to describe the economic impacts of local agriculture across the state. Part of this project is the production of county and council of government infographics, Local Farms and Food Profile. These County & Regional Agricultural Profiles utilize 2007 and 2012 USDA census data to compare fifteen specific data points that show the change in agriculture production metrics affecting the local agriculture economy; the sixteenth data point comes from the NC Division of Public Health, which has compiled a list of functioning roadside stands, farmers markets and produce stands that is current through 2014. The profiles are designed for all 100 North Carolina counties and sixteen regional councils of government and serve to catalyze discussions among stakeholders on the topic of agriculture as economic development.

The intention is for users to find these infographics to be helpful tools in working with local government decision-makers, community members, and other food system participants. The goals are to provide a basic, visual overview of the agricultural economy in counties that is easy to share with collaborators who support local agriculture projects and policies. Agriculture educators and advocates, and farmers play a vital role in starting these conversations; these profiles can serve as a tool to support local food systems and boost economic development.

The graphics can serve as a starting point for larger discussions around local agriculture and local food systems, among a variety of stakeholders, and also for discussions about the nuts and bolts of that system.

This tool is one of the components of the Local Food Economies project, which provides resources for working with local governments, small business developers, and others to create

enabling business environments that support food system development. Case studies and a guide for local governments are also available, a video highlighting replicable economic development agricultural projects is in development. CEFS has also developed the Local Food Supply Chain Infrastructure Map, which provides county-level information on processing, distribution, storage, and market outlets for local products. All these resources, as well as infographics for each of the 100 NC counties and 16 councils of government, at www.localfoodeconomies.org.

County & Regional Local Farms and Food Profiles

Talking Points for Catalyzing Discussions around the Local Agriculture Economy: The profiles provide visual representations of the agricultural economy in each of North Carolina's 100 counties and all 16 council of government regions.ⁱ They are designed to be easy to share, print, and utilize in a number of different settings and for a wide variety of audiences.

The profiles are one component in a suite of resources developed by NC Growing Together's Local Food Economies initiative. NC Growing Together is a project of the Center for Environmental Farming Systems, a partnership of North Carolina Agricultural and Technical State University, North Carolina State University, and the North Carolina Department of Agriculture and Consumer Services.

Profiles can be shared with potential partners for local food system development, including:

- Planners
- Economic and agricultural developers
- Councils of government
- Local government boards of commissioners
- Agriculture advisory boards
- Soil and Water Conservation district boards
- Farmland preservation boards

Talking Points about the "Nuts and Bolts" of the Local Food System: The profiles are helpful in describing the elements, or "nuts and bolts," of the local food economy in your region. Direct-to-consumer sales, for example, are considered one indicator of a healthy local food system because they suggest that residents have the ability to come directly into contact with other community members who are growing their food, and they indicate that local farmers have a means to sell through local markets. Some USDA data even suggests that those farms with direct-to-consumer sales survive at a higher rate than other farms.ⁱⁱ

Examining changes in number of, and sales from, different types of farms can also yield insights into the local food economy, and opportunities to build on that economy. Capitalizing on a county or region's animal agriculture, for example, depends on having sufficient processing and storage infrastructure. This presents a possible opportunity for a local government to become

involved. Discussions based on data in the profiles can also lead to productive conversations on related issues including environmental sustainability and land use.

Before holding a group meeting or other convening to consider local food system development, generate a set of questions to provide a starting point for discussion, based on the data in the Agricultural Profiles. Some useful “starting point” questions might be:

- What data points are particularly striking, and what do the trends in these illustrate about overall change that is occurring in our County or region?
- Do the stakeholders in the room bring on-the-ground knowledge about particular data points? Or do we need others in the room who have more in-depth knowledge?
- How can local policies and plans impact a particular data point?
- How can we include agricultural stakeholders in strategic planning processes that would impact a particular data point?
- Are there opportunities for the Council of Government (or another regional entity) to provide institutional support—staff, pilot funding, etc.-- for an initiative that could mitigate loss and/or encourage growth in a particular data point?
- Each region in North Carolina presents a unique set of opportunities for sustainable economic growth entrepreneurship. Consider one example: When school systems purchase food from local farmers, students benefit from access to healthy fresh produce, farmers benefit from sales into local schools, and the community benefits because these local sales are spent at other local businesses. This type of local business opportunity keeps farms in production, maintaining North Carolina’s agricultural asset base both in terms of land and farming know-how. And it keeps dollars spent on food circulating among other local businesses.

Additional Information

Each county in North Carolina is home to a North Carolina Cooperative Extension office (<https://www.ces.ncsu.edu/local-county-center/>). Each of these offices serves as a local resource for more in-depth information about your local food economy.

CEFS’ Local Food Economies web page (<https://cefs.ncsu.edu/food-system-initiatives/local-food-economies/>) provides additional resources for communities and governments interested in developing local food economies, including videos, webinars, case studies, a local government planning & economic development toolkit, and business development resources for farmers and food entrepreneurs.

CEFS also maintains the Local Food Supply Chain Infrastructure Map, a searchable database of supply chain infrastructure for each county in North Carolina (<https://www.cefs.ncsu.edu/statewide-infrastructure-map.html>).

Local governments can also participate in the NC 10% Campaign, an outreach and education initiative that promotes increased procurement of locally produced items by institutions, businesses, and individuals. For more information, visit <https://cefs.ncsu.edu/extension-and-outreach/nc-10-campaign/>.

North Carolina Fruit and Vegetable Outlet Inventory The North Carolina Division of Public Health administers the North Carolina Fruit and Vegetable Outlet Inventory (NC FVOI). This inventory identifies farmers' markets, produce stands and road-side stands with predictable location and hours and where fruits and vegetables are sold.

[http://www.communityclinicalconnections.com/downloads/NC_FVOI_Overview_May2014_FI
NAL.pdf](http://www.communityclinicalconnections.com/downloads/NC_FVOI_Overview_May2014_FINAL.pdf)

For more information on these Farms and Food Profiles please contact Laura Lauffer at 336-285-4690 or ldlauffe@ncat.edu

ⁱ Data for the North Carolina Agricultural Profiles was largely drawn from the USDA Census of Agriculture, which is conducted every five years. Keep in mind that if a county has a data point stating "no data was available," that indicates a lack of response by farmers to the census surveys. Encourage farmers to participate in the 2017 census survey, and consider conducting your own county- or town-level farmland inventory to better understand where farms are located, what they grow, and what their primary market channels are.

Similarly, you may notice losses shown in the data from 2007-2012. While the profiles cannot provide specific reasons for those losses, it may help to look back over time to see if there are obvious reasons that could contribute to the decline. For example, if a farmers' market has closed or dwindled due to competition, fewer farmers may have an outlet for their products. If a large farm has closed down, been sold into development, or been passed on to younger generations who are no longer farming at full capacity, the overall county numbers may reflect this loss. And, if policies or programs have impacted farmers (such as a new requirement by buyers for particular third-party certification or a development plan that incentivizes the sale of farmland), those connections may be underlying causes of those declines.

ⁱⁱ [http://www.ers.usda.gov/amber-waves/2016-march/local-foods-and-farm-business-survival-and-
growth.aspx#.Vv5viOIrk70](http://www.ers.usda.gov/amber-waves/2016-march/local-foods-and-farm-business-survival-and-growth.aspx#.Vv5viOIrk70)

Acknowledgements

This material is based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award number RD309-122/4940246 through the Southern Sustainable Agriculture Research and Education program. USDA is an equal opportunity employer and service provider.



Tricks of the Visual Delivery Trade: Bringing Expertise to the Small Farmer with One Click

Priya C. Jaishanker; John F. Munsell (Virginia Tech)

Introduction

Opportunities to distribute educational materials are limitless with the internet at our fingertips, but how do we cut through the deluge of information to position small farming expertise and technical support provided by our programs? How do farming educators, Extension professionals, and other technical transfer specialists meaningfully share material in the competitive era of search engine algorithms and social media frenzy? More than two years ago, we embarked on a project at Virginia Tech to film forest farming experts. Our goal was to capture proven practices and competitively deliver educational online videos summarizing techniques, providing insights, and promoting products.

Our objective was to publicly disseminate quality information from trusted forest farming experts by harnessing the power of social media and producing vignettes that are effective in the video-on-demand (VOD) era. Through the camera's eye, we developed dynamic forest farming resources using creative cinematography and in-depth interviews that explore non-timber forest products cultivation across Appalachia and northward into Canada's St. Lawrence River estuary. With current mass media madness and informational overload in mind, we produced thematic video shorts bundled into one series allowing discretionary and punctuated viewing of particular informational components of interest.

What we learned throughout the project is that media competitiveness and video-based technical transfer involve much more than simply filming farming practices and professionals. Rather there is a temporal process that is complex and dynamic, allowing for robust production and high quality delivery. The process is referred to as the "six Ts" and results of its use in terms of viewership and feedback point to a high level of practicality and promotional success. We explain the six Ts process below and then provide a case example from a forest farming video series to highlight practical and promotional aspects. We conclude by describing next steps and future strategies related to filming and disseminating small farming practices in an era of VOD, social media, and busy people.

The Six Ts Explained

The six Ts include: (1) Tips and (2) Topics, which are steps of expert contact and coordination before filming; (3) Trust and (4) Testimonial, which are used to help experts and videographers select compelling content and high-quality delivery and filming; and (5) Time and (6) Tracking, which include post-filming strategies that enhance delivery and visual experience (Figure 1).

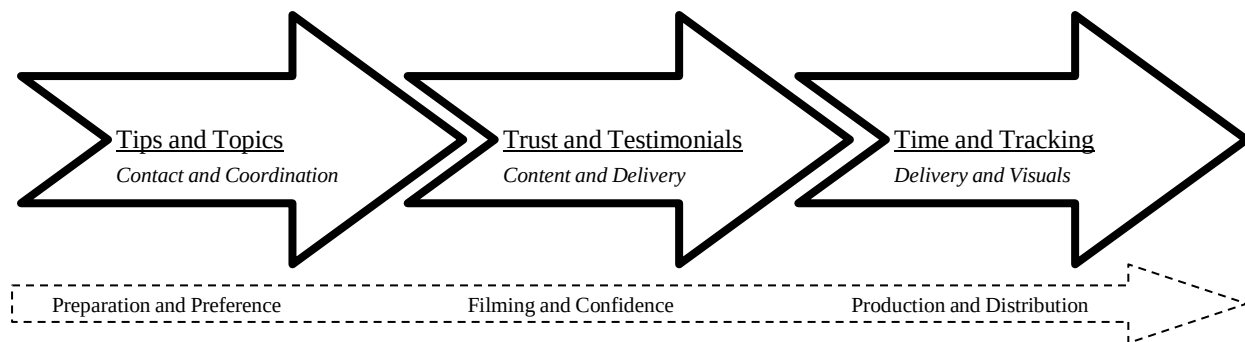


Figure 1. The six Ts are underlined in three arrows above and represent a process that occurs over time, the trajectory of which is annotated underneath using a dashed arrow from preparation and preference to production and distribution. Critical concepts for each set of two Ts are italicized and listed below them in the respective three arrows, which depict the concepts driving different steps of the six Ts process.

Tips and Topics

Tips and Topics drive the discovery process toward which different topics are selected for feature alongside associated technical experts and farmers who are willing to share their knowledge on camera. Different products, farming methods, and potential interviewees surface through social networking and general internet searches. Other investigative techniques to locate interviewees are possible, such as discussion at Farmers' Markets and reviewing farm informational flyers. The web can be used to identify individuals who produce or study unique crops and appear to have substantial expertise. Regardless of the nature or source of the Tips, follow-up phone calls and email inquiries help vet speakers and assess potential content.

During this interaction, Topics are explored with potential interviewees and, if suitable, the assessment can be used to confirm dates, locations, and activities to film. It is wise to both suggest topics and allow the interviewee to offer ideas, working real time to strike a balance between all possibilities if necessary. Coordination with multiple farmers, Extension professionals, and researchers around a single Topic can help achieve organizational efficiency and allow for scheduling multiple stops on regional road trips to document a great range of seasonal farming activities, extend reach, and reduce costs. Also possible is determining when potential interviewees may be together in one place where multiple interviews are feasible. From places near and far, continued conversation and outreach with the intended expert leading up to the time of filming helps maintain a connection and successfully reach targeted destinations (oftentimes down dirt roads and outside the range of cell phone service).

Trust and Testimonial

Establishing rapport with interviewees before the scheduled filming date helps increase comfort levels in front of the camera upon arrival. Clear communication of an agenda and desired

outcomes builds a level of Trust, improves efficiency in the field, and more adequately supports goals because such clarity ensures interviewees are better prepared to demonstrate cultivation processes or harvesting and livestock management methods, and prepare appropriate plant material or animal demonstration concepts and identify useful example sites. Keeping the production crew to a minimum and allowing for one-on-one semi-autonomous interaction between videographer and interviewee decreases potential social anxieties and limits distractions (i.e., too many cooks in the kitchen).

As sites are often unseen before arrival, preparation for any scenario is advisable. Extra photography equipment allows flexibility and can enhance creativity, as well as greatly improve mobility and adaptability. Assessment of the site topography and elevation, communication of site details with the interviewee, followed by efforts to narrow equipment to bring will improve production timeliness and efficiency. Camera equipment is becoming increasingly compact, allowing for greater flexibility when filming. Choosing gear that is best suited to your needs and location is a helpful preliminary step. Filming in urban settings, for instance, allows for better equipment transport, but city noise then becomes a factor to consider. Come prepared for any scenario and then finalize equipment choices upon site assessment.

Interviews should be conducted in a relatively informal fashion with the interviewee receiving questions well in advance of filming so as to adequately prepare their story, or Testimonial. The interviewee should not feel as though they are being cornered and required to provide what the videographer seeks. They should instead be made to feel that filming is intended to capture their perspective and experience. This is best encouraged from the beginning and attention to mutual respect for needs and boundaries and a tactful approach can lead to a useful comfort level and potential professional relationships with possibilities for future filming and networking opportunities.

Time and Tracking

Time and Tracking are the final two steps in delivering and promoting high-quality web-based video programs. Timely production and release is essential for transferring educational material tied to seasonal farming activities. To enhance production Time, thematic shorts ranging in length from five to eight minutes are produced. These cover essential questions, such as background information on products, where and how they are planted or managed, lifecycle issues, and how and when to harvest.

Fully produced videos are uploaded to YouTube once vetted and are then disseminated through multiple social media platforms including Facebook, Pinterest, and Twitter in order to reach a broad and more diverse audience base. Flickr houses all associated photographs collected during filming. Most of these platforms are linked to an email account created solely for the project that can be shared with collaborators. Initial set up of social media accounts generally requires a user name and password.

Many of these platforms are outfitted with internal analytics which allow content creators to analyze a variety of visitation and use metrics. Google Analytics can also be very helpful for understanding visitation. Data can be narrowed down to specified dates, videos, and viewership (subscribed vs. unsubscribed viewers). Analytics also allows comparisons to be made between videos and playlists. Insight into performance rates, demographics, playback locations, traffic sources, subscriptions and more can be very useful for demonstrating impact to funders and program evaluators. The comments section is also a place where key feedback can be tracked and used for demonstrating impact. Comment moderation is helpful in maintaining contact with subscribers, answering questions, providing viewers with further resources, and fostering a connection with the online community.

Case Study

One of our most popular video series featured ginseng cultivation in New York's Catskill Mountains. Email inquiries eventually led us to Robert Beyfuss, an independent ginseng expert who previously worked as the statewide American Ginseng Specialist for Cornell Cooperative Extension (Table 1). Ensuing conversation confirmed the content that would be filmed, the time, the place and the details to be covered in the interview. Ginseng seed planting occurs before the first frost. After ongoing conversation, Robert Beyfuss gave an expert interview with professional delivery detailing the ecology of ginseng, its lifecycle, the process of preparing a seed bed and planting ginseng seed. Furthermore, he had ginseng grown in three different ways to better illustrate the impact a natural forest setting has on root appearance. We produced five videos from the footage taken in the Catskills, the longest being under seven minutes. The videos were released in late 2013 and were broadcast throughout the social media platforms. Cumulative views to date on this series total 273,774 while "likes" are close to 1,000.

Table 1. The table below explains the video production and dissemination process for this case study broken down into each of the six Ts, ending in total estimated time spent on each step of the process. Outcomes, measured through analytics are displayed in the column at the end.

Tips and Topics	Trust and Testimonial	Time and Tracking	Outcome
<i>Time invested in the discovery of which product to film (in this case, ginseng), at what point in the season to film, and who the expert contact will be for that product. Existing networks provide a launch pad but extensive internet searches and follow-up phone calls can yield exciting results. In this instance, conversation with existing network members led to Robert Beyfuss who was scheduled to plant in the fall of 2013.</i>	<i>This step includes communication of targeted dates (peak autumn color provided a beautiful backdrop for this series), farming activities (planting of ginseng seed), and location (Catskill Mountains), as well as preparation for travel (car rental and hotel reservations), travel time and time filming. The relationship established with Robert Beyfuss has led to subsequent filming opportunities with him.</i>	<i>Time and Tracking includes time taken for video production, vetting, edits, upload, and promotion among social media platforms and eXtension site. Our hope was to release this series in timely manner so as to be impactful to viewers before and during the ginseng planting season. Several viewers left questions inquiring about seed vendors. We were then able to provide them further resources on where to acquire seed stock.</i>	<i>Measured over the course of the series' lifetime on the channel from 11/2013- 08/2016. YouTube analytics provides insights ranging from traffic sources, average watch times per video, likes, shares, and comments. One viewer commented, "Your expertise in your botanical experience with Ginseng is admirable. Great video. Well scripted. And heavy with good information."</i>
Estimated 15 hours for this series.	Estimated 120 hours.	Estimated 65 hours.	273,774 views to date

Conclusion

Tapping into the world of digital media and using the internet as a dissemination resource reinvents the classroom. Free, accessible, vetted content affords viewers and subscribers the ability to share and discuss at their convenience while increasing connectivity and exponentially impacting the landscape of education. The ability to capture and share the knowledge and expertise of individuals in remote corners of the farming nexus with interested viewers around the world is profound. The future of learning is here and the expansion and adaptation of these six tricks of the visual delivery trade can help to harness and broadcast unique insights and proven techniques in any field to the interested public. Video production along with the ethics and integrity upheld in true journalism can augment farming educational efforts and adapt a message fit for the classroom into a visual narrative fit for the world-wide web.

Analytics related to the 155 videos hosted on our channel indicate a current count of more than 670,000 views and nearly 4,000 subscribers in three years of availability. Viewers have left more than 500 comments over its lifetime and have shared content more than 1,000 times. Likely important in these results is that viewers can digest each video separately or watch them all together as a series. This short-format packaging better caters to our current and rising use of the internet as reported by The Nielsen Company. Viewing habits are evolving and VOD is becoming increasingly popular as it allows users greater flexibility in choosing and viewing content that fits their schedule. By tapping into this growing model of media consumption, we are able to bring quality farming educational content to viewers whose interests guide them to our channel.

The Beginning Farmer Resource Network of Maine

Tori Lee Jackson (University of Maine Cooperative Extension)

The Beginning Farmer Resource Network (BFRN) of Maine is a coalition of agricultural agencies and organizations working together to connect aspiring, beginning, and transitioning farmers to resources for farm business success. Members include:

- Coastal Enterprises, Inc.
- Cultivating Community
- Farm Credit East
- Land For Good
- Maine AgrAbility[®]
- Maine Association of Conservation Districts
- Maine Aquaculture Association
- Maine Department of Agriculture, Conservation and Forestry
- Maine Farm Bureau
- Maine Farmland Trust
- Maine Federation of Farmers' Markets
- Maine Organic Farmers and Gardeners (MOFGA)
- Maine Risk Management and Crop Insurance Education Program
- Maine Sustainable Agriculture Society
- Sea Grant - Maine
- USDA Farm Service Agency
- USDA National Agricultural Statistics Service
- USDA Natural Resources Conservation Service
- UMaine Extension

The network was formed in the summer of 2012 following a Sustainable Agriculture Research and Education (SARE) funded professional development workshop called *Reading the Farm*, directed by Dr. Ellen Mallory, Sustainable Agriculture Specialist at University of Maine Cooperative Extension. Agricultural service providers visited farms as a group and made recommendations based on their areas of expertise over the course of forty-eight hours. It was a very useful experience for the participating farmers and a revelation for the service providers. Each learned so much from the others over the course of those two days that before leaving, plans were made to meet regularly to become better-informed service providers.

Rather than a formal legal structure, BFRN operates on collective good will and the support of our respective agencies and organizations. The network maintains a website

(<https://extension.umaine.edu/beginning-farmer-resource-network/>) that serves as a “one-stop” resource for the roughly 2,000 beginning farmers in Maine and offers information on topics including:

- What to Consider First
- Learning How to Farm
- Searching For, Assessing, and Acquiring Land
- Planning and Managing Your Farm Business
- Planning for Facilities and Equipment
- Financing Your Farm Business
- Managing Risks
- Understanding Regulations and Taxes
- Managing Your Farm’s Woodlands
- Farming the Water: Aquaculture
- Marketing Your Farm Products
- Balancing Farm and Family
- Resources for Agriculture
- Resources Specific for Military Veterans
- AgrAbility: Addressing health, safety and prevention of injuries across the state of Maine-on the farm, on the water and in the forest.
- USDA programs for beginning farmers
- UMaine Extension New Farmer website

The website also provides information on upcoming events and workshops. Members meet six times each year and collaborate on workshops presented for beginning farmers at the Maine Agricultural Trades Show each January. In 2016, there were forty-three BFRN-sponsored workshops over two days.

In Maine, the number of beginning farmers is growing, and at the same time, we are seeing that farms in their first ten years of operation require differing kinds of support at various stages of development. Those in years 1-3 share certain characteristics, as do those in years 4-7, and 8-10. The 2012 Census of Agriculture saw a net loss of farms in the year 4-7 category, and BFRN is uniquely positioned to meet the needs of that particular subset of beginning farmers. Several projects have gotten underway to help reach farmers in those critical years, including another SARE Professional Development Project aimed at improving communication skills of everyone involved in a farm operation, titled: Focusing on Interpersonal Relationships for Greater Farm Viability, led by Dr. Leslie Forstadt and Tori Lee Jackson at UMaine Extension and farmer, Abby Sadauckas.

High Value/Specialty Crops and Innovative Production Systems

Ramiro E. Lobo (University of California Cooperative Extension); **John P. Hewlett** (University of Wyoming and Right Risk LLC); **Jose Fernandez de Soto** (University of California Cooperative Extension)

Introduction

Declining profit margins on traditional, perennial crops (primarily because of higher input costs, competition for resources and markets), combined with severe drought conditions, have seriously threatened the economic viability of many farmers in Southern California. Enterprise diversification is one of the most common strategies used by farmers to manage risks impacting their agricultural operations. In order to remain economically viable, local farmers are actively replacing non-profitable crops with alternative crops that are more efficient, whether by using less water than commonly grown crops or by generating higher returns per unit of water required for successful production. In addition, they are always looking for technologies or production systems that make their farms more efficient and more economically viable. However, identifying and evaluating new or specialty crops and assessing the impact of new technologies or production systems on farm profitability is a difficult and intimidating task for producers. These challenges and the risks involved, are even greater for small-scale agricultural operators who may have only limited access to resources and information, and operate under higher uncertainty.

San Diego County Agriculture

Agriculture is the fifth largest industry in San Diego County. According to the Agricultural Commissioner's 2014 annual crop report, there are 5732 farms in the county and these generate an estimated \$ 1.82 billion in direct sales. Sixty eight percent of these farms are nine acres or less in size, with a median size of only four acres. Most farms (92 %) are family owned with 77 % of farmers living on their property, and 27 % are operated by women. In addition to farming small acreages, local farmers grow more than 200 crops commercially and many of these are specialty, new, exotic or non-traditional crops for which production, economic, and marketing information is not generally available. The county agricultural industry is changing drastically in response to a number of trends including increasing demand and appeal for fresh, nutritious fruits (super foods); increasing demand and support for locally grown foods; increased concerns over food safety; and increased support for urban agriculture, expansion of controlled environment agriculture including greenhouses, tunnel culture, and container grown production.

Growers, large and small, are constantly searching for crops or enterprise alternatives they can add to their production mix to capitalize from these trends, increase their revenues and remain economically viable.

What are Specialty Crops?

The Specialty Crops Competitiveness Act of 2004 and the 2014 Farm Bill define specialty crops as ***“fruits and vegetables, tree nuts, dried fruits, horticulture, and nursery crops (including floriculture)”*** where eligible plants must be cultivated or managed and used by people for food, medicinal purposes, and/or aesthetic gratification to be considered specialty crops. Processed products shall consist of greater than 50% of the specialty crop by weight, exclusive of added water. However, the reality is that the definition of specialty crops is broader and they are defined in many different ways depending on what the intended use for the definition is and who is defining them. Our working definition of specialty crops is any crop that is not commonly grown in a particular region or area, one that is being grown under a different production system or under a protected environment.

Research and interaction with growers indicate that new or specialty crops with good, long-term profit potential often share a subset of characteristics including but not limited to adequately sized target market, extended production and marketing season, complementary to the farm operation, difficulty to grow (steep learning curve), high initial capital investment required, and good potential for value-adding activities. Although these factors are not equally important for every new or alternative crop, growers must address all of them to make a well-informed choice with their enterprise selection. Growers, on the other hand, must be able to assess the quality and availability of information related to market data research and analysis; on-farm research and development; trends (demographic, economic, health, etc.); crop adaptation to a specific location; pest and disease problems; supporting infrastructure and facilities; and, laws & regulations (i.e. permits and license requirements). Once the alternative crops are identified, growers must assess the crops’ potential for success given both their available resources and the risk factors identified. Furthermore, the adoption and successful production and marketing of specialty crops often requires the adoption of new technologies and production methods and this increases the grower’s exposure to risk.

Table 1: Challenges and Opportunities for Specialty Crop Production in Southern California	
Major Challenges Identified	Assets and Opportunities
Land/Water availability and prices	County demographics
Imports / Foreign competition	Size of local and/or regional markets
Growth and urbanization	Support for locally grown agricultural products
Aging Farmers/Succession planning	Educated, affluent consumer base
Laws and regulations	Well-developed infrastructure and support
Exotic pests problems/Quarantines	Market trends / Direct marketing opportunities
Farm labor supply, regulations and costs	Opportunities for value-added activities
Declining profits (high costs/low prices)	Excellent climate; year-round production

Methodology

Field research trials were established at various locations throughout Southern California including grower cooperators in San Diego and Ventura Counties, and University of California Research and Extension Centers in Orange and Ventura Counties as well. These research efforts included a combination of variety trials and demonstration plots to assess the adaptation and performance of various specialty crops and to demonstrate cultural practices and/or production systems needed for successful production. Most research efforts focused on field production of berry crops (blueberries, blackberries and strawberries), pitahaya or dragon fruit and other minor specialty crops including guavas, lychees, longans, passion fruit, and cherimoyas. We are evaluating the potential for commercial production of blueberries and pitahaya or dragon fruit grown in containers, under field and semi controlled environments to facilitate production of these crops in urban and peri-urban areas.

In addition, we have worked with collaborator agencies and organizations to demonstrate the feasibility of using innovative production systems including but not limited to protected environments (plastic culture, shade or hoop-houses, and greenhouses), hydroponics (NFT and other soilless culture), vertical growing systems, growth chambers, and grow socks. Finally, the field research efforts not only demonstrated, but justified, the need for the development and implementation of a parallel risk management education program to develop information and tools to educate producers about the many potential risks affecting their farming operations and to improve their decision making ability with regards to new crop or enterprise alternatives and new production systems or techniques.

Results and Outreach Efforts

Among the group of specialty crops evaluated, blueberries and pitahayas or dragon fruit, have proven to be profitable crop alternatives for growers in Southern California because of the exceptional consumer demand. As a result, interest among producers and the acreage planted to these crops has increased considerably over the past several years. However, both of these crops are expensive to grow, require high initial capital investment and have high production costs resulting mainly from intensive labor requirements for cultural practices. In addition, production of these and other specialty crops often require the use of new and diverse technologies and production systems thereby increasing the information needs of producers. In an effort to minimize the risks associated with these crops, our team developed and disseminated production, marketing, and risk management information about these crops; demonstrated innovative production systems and techniques (controlled environment agriculture-CEA using greenhouses, tunnels, etc., hydroponics or soilless culture; vertical growing systems, growth chambers, and container grown culture); and, developed risk management information and tools to help producers evaluate alternatives and make informed decisions.

A combination of extension and outreach methods including research field days, seminars, webinars, field demonstrations, one-on-one consultations, Online tutorials and distribution of plant material have all been used to reach and educate producers. More than 1000 farmers have participated in a total of 22 extension activities focusing on specialty crops production (primarily pitahaya or dragon fruit and blueberries) and innovative production systems over the past 5 years across Southern California (Orange, Riverside, San Diego and Ventura Counties). In addition, recognizing the need for risk management education, our team collaborated with Right Risk LLC. to develop risk management information and electronic tools to help producers mitigate risks in their farm operations. Eleven seminars were delivered as part of the Surviving in Ag Risk Management Education Series reaching more than 240 growers across the region. These efforts also resulted in the development of the Enterprise Risk Analyzer (ERA) and the Risk Scenario Planner (RSP): electronic tools that help producers estimate the benefits and costs of alternative risk controls and to evaluate alternative risk strategies. Presentations and consultations with farmers focused on the applications of the tools to evaluate hypothetical, yet realistic, management decisions that farmers faced. In addition, participants also had the opportunity to use and interact with the electronic tools, using their own data, by utilizing a mobile computer lab.

The Right Risk Enterprise Risk Analyzer tool takes traditional enterprise analysis one step further. After developing net return estimates by allocating all farm/ranch expenses and revenue to appropriate enterprises, break-even analysis is completed for both price and yield using risk-estimates provided by the user. Break-even data are presented in both tabular, as well as graphical form using probability density functions. **The Risk Scenario Planning** tool provides a template for the decision-maker to enter the financial effects of making proposed change(s) to their operation and follow a partial budgeting approach to evaluate the impact on the bottom line. The RSP then adds the ability for the decision-maker to further refine estimates for some of input values as uncertain numbers. This produces a more robust analysis of the proposed change and a more thorough understanding of the possible outcomes if the change is implemented.

Summary and Discussion

Despite the many challenges impacting small scale producers in Southern California and in many other regions of the country, there are many opportunities for economic success with specialty crop production. Producers of all sizes, but primarily small scale growers can benefit from adding profitable crop alternatives to diversify their farm operations and from reducing the uncertainty in their decision making in order to enhance the viability of their farm operations. Clearly, the integration of field research activities with traditional risk management education efforts has allowed us to help producers do this. Our research and extension efforts proved that blueberries and pitahayas can be profitable crop alternatives, demonstrated how to successfully grow these crops under diverse production systems, and provided information and tools that helped producers

evaluate crop alternatives and alternative risk controls in order to make informed decisions about the crops and/or production systems they adopted for their farm operations.

References and Resources:

- Lobo, R.E., L. Lev and S. Nakamoto. (2006) **“A Market Driven Enterprise Screening Guide A Market-Driven Enterprise Screening Guide.”** University of California Small Farm Program.
<http://sfp.ucdavis.edu/files/143914.pdf>
- San Diego County Agricultural Commissioner’s and Sealer of Weights and Measures. (2015) **San Diego County 2014 Crop Statistics and Annual Report.** San Diego County Agricultural Commissioner’s Crops Report.
- USDA-AMS. (2014). **“What is a Specialty Crop? - The Specialty Crops Competitiveness Act of 2004.”** USDA Agricultural Marketing Service.
<https://www.ams.usda.gov/services/grants/scbgp/specialty-crop>
- Hewlett, J., J. Parsons and R. Lobo. (2014). **“The California Right Risk Education Program”.**
<http://california.erightrisk.com/2016/default.htm>

A Cohort-Based Approach to Supporting Farmers in Measuring Costs, Making Informed Business Decisions, and Enhancing Farm Viability

Tanya Murray (Oregon Tilth)

Introduction

The Oregon State University Center for Small Farms and Community Food Systems, in partnership with Oregon Tilth, Inc., has developed a program to help farmers determine their operations' crop specific costs of production. The Cost Study Program is part of a larger, USDA NIFA-funded project focused on developing advanced instructional curriculum that addresses farmers' needs for business development skills required to create viable farm businesses that endure.

Target Audience

The Cost Study Program is geared towards farmers who are in the "refinement" stage of business development. These farmers have developed their crop production systems and have some degree of proficiency at producing crops. They are at the point of asking whether they can operate their farms sustainably and profitably. Currently, the program has been developed for annual vegetable crop production. We are also exploring how it might be adapted to work for perennials and potentially livestock in the future.

Program Goals

The primary goal of the Cost Study Program is to help farmers to determine crop specific costs of production and to use this information for farm business decision-making. We also aim to strike a balance between collecting data with enough granularity to facilitate meaningful decision-making and making the recordkeeping process as effortless and straightforward as possible.

How the Cost Study Program Works

Time Studies

Labor is a major cost for most diversified small farms.¹ This makes it vital to account for the labor that goes into producing crops. This program is based on using farmer-conducted time studies to establish the average amount of labor (time) that different production activities require on their farms. Using time studies can make accounting for labor less onerous because a relatively limited number of records are required.

¹ "For example labor expense for many small to acreage vegetable producers is 65-70 percent of total production expense." Fearless Farm Finance *Farm Financial Management Demystified*. Padgham, Dietman, Chase, Blanchard. Midwest Organic and Sustainable Education Service. 2012. p 108

To get started, farmers attend an orientation session before the beginning of the growing season. At the orientation session production activities that require time studies are mapped out. Time studies are categorized as either non-crop specific or crop specific. In the case of non-crop specific time studies, the crop is not the main factor that determines the amount of time an activity takes. This is true for the majority of production activities up to harvest and eliminates the need for tracking all the labor that goes into each different crop that is produced. Harvest and post-harvest handling, along with a few activities that can generally be categorized as “plant care” (trellising, pruning, staking, etc.), do vary from crop to crop and therefore require crop specific time studies.

At the orientation session a key conversation focused on how to get into the time study recordkeeping habit takes place. Farmers are highly encouraged to think through what their system for time study recordkeeping will be – down to the nuts and bolts of who will be conducting the time studies and how time studies will be recorded. The cohort structure is ideal for encouraging peer-to-peer accountability. The 2016 Cost Study Program participants signed up to share successes and challenges on a weekly discussion list. Farmers also have the option to receive regular (monthly) check-ins via email, text, or phone from the project coordinator.

Over the course of the growing season farmers collect time study data on their own farms.

Number-Crunching

In the early winter, farmers reconvene and enter the time study data they have collected into an Excel-based Cost Calculator tool. Average rates for various production activities are then applied to specific crops using the Cost Calculator. For example, for a carrot planting, a farmer might indicate that beds were disked twice, tilled and direct seeded once, irrigated eight times, cultivated six times, hoed twice and hand-weeded once. The average rate established in the time studies for each of these activities is multiplied by the number of times that the production activity happens. The Cost Calculator then uses an average wage rate (determined by the farmer) to calculate crop specific costs of production. Input costs, machinery costs, overhead costs, and marketing costs are also accounted for.

Results and Decision-Making

Farmers who complete the Cost Study Program will have the following information about each of the crops that they produce:

- Direct costs per unit.
- Percentage of total direct costs represented by each specific production activity and/or input.
- Overhead allocations per crop using percent of acreage, percent of direct labor hours, percent of sales and mixed allocation bases.

- o Net profits per crop in each market channel using current market channel prices.

A winter follow-up meeting will take place where farmers will evaluate their results and use them to facilitate key business decisions including changes to:

- o Crop production activities
- o Equipment and infrastructure investments
- o Crop mix
- o Scale
- o Market channel mix
- o Pricing

2016 Cost Study Program

In 2015 we ran a small pilot of the Cost Study Program to support our development process. In 2016 we offered six in-person orientation sessions and several call-in orientation sessions. 44 farms participated in orientation sessions. We saw some early attrition from farmers who realized they were not ready to participate in the program this season, a portion of whom were not a fit in terms of the target audience for this project. As of early August, 19 of the 44 farms that participated in orientation sessions were still engaged in the project. We expect that at least 25% of the farms that participated in orientation sessions will complete the program this year.

Farmer Feedback

Here's what farmers are reporting about their experience with the program:

"A new employee astutely noticed while looking over the time studies that it was taking him twice as long to harvest half as much poundage as me. Seems to be a little side benefit of keeping track: good, objective motivating information for workers."

"Tomato pruning and clipping seems to be consistently taking 1 min per plant per session. Already, knowing that figure is helping us schedule the task more effectively/realistically."

"The project is making me more aware of how to make the operation more efficient and we have taken some steps in that direction."

This feedback demonstrates that the value of conducting time studies extends beyond the end goal of determining crop specific cost of production. The time study process itself can be immediately useful to farmers for employee management, time management and identifying opportunities for production efficiencies.

Lessons Learned/Future Improvements

Two opportunities to improve the program stand out thus far. First, allowing for even more time before the season starts for farmers to set up their recordkeeping systems would likely help to get more farmers off to a strong start. Second, increasing the frequency of facilitator check-ins immediately following the orientation session would also serve to support farmers early on with establishing the time study recordkeeping habit.

What's Ahead for the Cost Study Program?

In 2017 we will be offering orientation sessions in an online format to a limited number of facilitated farmer cohorts. We plan to work with facilitators to gather feedback from a larger audience of farmers. We will also be developing a toolkit to support facilitators with implementing the program in the future.

From Barley to Drink: A Guide to Farm Based Breweries and Distilleries

James Matson, Julia Schlosser, Jessica Shaw, Chris Cook (Matson Consulting LLC, Aiken SC)

Introduction

From Barley to Beer: A Guide for On Farm Brewing is a study of a farm-based craft malting and brewing operation with moderate financial resources. The document provides basic direction/thought processes for expanding an existing brewery's operations into farm malting, as well as a general financial outlook for a three years of operations. While it explores specific issues particular to Virginia, many also apply to other regions nationwide. The following information was presented by James Matson at the 7th National Small Farm Conference and was excerpted from the main guide.

National Malt and Craft Beer Industries

The National Barley Growers Association recently reported that the United States is the eighth-largest producer of barley in the world. U.S. grain producers planted 4 million acres of barley from 2004 to 2008, representing a contribution of over \$750 million to the nation's economy. Now, most barley grown is intended for malting, thanks to the growing need for premium malts. According to industry analysis conducted in 2014 by the Montana Department of Commerce, for example,¹ craft breweries now consume nearly 20 percent of total malting barley production.

The US is in a craft brewing revolution, as shown by the increasing number of entrepreneurs entering the alcoholic beverage industry. According to a 2014 Gallup poll,² 64 percent of Americans consume alcohol, with almost half (41 percent) favoring beer, representing a huge opportunity for new and innovative ventures, especially with the growing demand for artisan products. While major commercial brands face challenges in increasing their business, craft brewers are capturing an increasing segment with their batches of high-quality, artisan beer. A *Fortune.com* article in 2015 reported on this growth that "American craft brewers now produce about one out of every 10 beers sold in the United States."³

Malting and Brewing Process

According to Briess Malt & Ingredients Company, a leading national grain and starch processor, the malting process consists of three main steps:

1. **Steeping:** the raw kernels are submerged in water to increase their moisture content. Once the kernels show their "chit," the beginning sprout rootlets, steeping is complete.

¹ <https://businessresources.mt.gov/Portals/94/shared/IDP/docs/MaltingIndustryAnalysis.pdf>

² www.gallup.com (Complete address available in Reference List)

³ <http://fortune.com/2015/03/16/craft-beers-volume-rising/>

2. **Germinating:** the sprouting barley is transferred to a germination compartment, where sprouting continues and the kernel is modified—the seed's starch reserves open. This process typically takes four to five days and is controlled by circulating temperature-adjusted, humidified air throughout the kernels.
3. **Drying:** before the kernel's starch reserves are exhausted, germination must be halted through a drying process. Base/standard malts are dried with a kiln, which develops a range of flavors in the malt. Specialty malts are typically kiln-dried for a longer period of time, roasted, or both. Once it is thoroughly dried and cleaned, the malt is ready for use.⁴

Potential Challenges for Barley Farmers

While *Barley to Beer* does not specifically focus on growing aspects of production, it is important to note that barley is considered a high risk crop. Some factors, such as high levels of humidity and unpredictable weather changes, can pose challenges for a newly established malting venture, sometimes resulting in crop failures and unreliable growing seasons.

Once harvested, producers must consider how the barley will be stored, as high humidity and wet weather can result in insect infestation and vomitoxin growth, a mycotoxin that commonly results in reduced quality and gushing in beer bottles. Most producers either choose sprays and fumigation (which can result in fewer sales due to the trend towards more natural products) or cold storage (which requires more equipment, but is more natural).

If a venture intends to sell their malted barley to other breweries, they will also need to explore product packaging options. Packaging and delivery will increase the cost of production. While feed barley is typically transported freely in a large truck or 18-wheeler, most malters and brewers prefer to purchase the barley as a packaged product (such as a one ton bag).

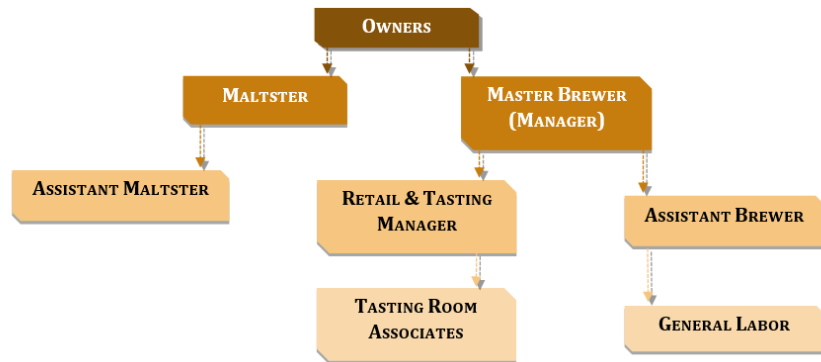
Along with challenges farmers may face in terms of production costs, they may also be constrained to the specific varieties of barley they can produce. Many brewers only seek local or premium product for their specialty beers. Not all barley varieties are available for public purchase and may be proprietary to a company or group. Grower groups may have access to more barley breeds that individuals could not access on their own.

Sample Malting and Brewing Personnel Hierarchy

Regardless of a venture's specific arrangement, all businesses share some basic personnel roles. For the purposes of this study, the venture has a dedicated Maltster who implements malting operations. The other minimum role requirements for a venture are typically Owner/Director, Master Brewer, Assistant Brewer, Retail & Tasting Room/Store Manager, Tasting Room/Store

⁴ www.briess.com/food/Processes/malttmp.php

Associates, and General Labor/Delivery Personnel. The business may also require outside expertise, including brewing consultants, accountants, and an attorney or compliance services.



Selling Beer: On vs. Off Premise Sales and Out of State Sales

Depending on the sales outlet a brewery chooses, they may need to adhere to different regulations, as set by federal and state governments. If an alcoholic product is sold *on-premise*, it is intended to be consumed on-site. This includes establishments such as restaurants, breweries, and tasting rooms. Conversely, *off-premise* sales refer to alcoholic products not intended for consumption on-site, and include locations such as specialty retailers and grocery stores. Should the venture choose to sell products out of state, additional certificates and/or licensing may be required. Before attempting to sell to any outside states, owners should contact the applicable alcohol control board for each state they intend to conduct sales.

Labeling Regulations

As part of national labeling regulations, all alcohol producers are required to apply for a Certification of Label Approval (COLA) from the TTB before selling products. A COLA helps ensure that a producer is creating, labeling, and marketing products in accordance with Federal laws and regulations. The typical wait time for approval is 90 days. For many alcoholic beverage products, the TTB requires a Pre-COLA Product Evaluation to determine if the proposed label represents the product adequately and does not mislead the consumer. The TTB will review ingredients and formulation, and may perform a laboratory analysis of the product.

Equipment Needs

A brewery will require multiple pieces of equipment for malting and brewing. The cost of equipment can reach over \$100,000. This cost will be determined by the size and type of equipment, so it may be necessary to consult experts on artisan brewing operations to provide advisement on the various options. Depending on available funds, the venture may opt to purchase new equipment or used, or processing equipment for higher or lower volumes of product.

Industry Examples

Wood's Mill Malt House is a “dirt-to-glass” malting facility. They malt only local barley and other grains, growing the majority of their inputs on their 300-acre farm and using traditional floor-malting methods in their 4,000 square foot malt house, which has the capacity to produce 6,000 pounds of kilned base malts per week. They have been successfully processing grains into high-quality malts for local home brewers, craft breweries, and distilleries since opening in 2014.

They also recently opened an on-site brewery and tap room, which serves craft beer made from farm-sourced ingredients, becoming one of the first breweries in the U.S. to grow, malt, and roast the grains and brew the resulting beverage all on the same property.

Rogue Ales was started in 1988, when a group of like-minded entrepreneurs opened a brewery and pub in Ashland, Oregon. Since opening, the brewery has won hundreds of awards for their products, and produced a wide variety of beers from pilsners to stouts to lagers. Both of Rogue's farm properties are located in Oregon, where they grow, harvest, and process their own hops, rye, jalapenos, pumpkins, hazelnuts, honey, and other inputs for their award-winning beers. Their barley farm, located in Tygh Valley, is a 3,800 acre ranch that houses the malting facility.

Financial Analysis

In the guide, the consultants created a basic model for three years of operations for an already established brewery in Virginia. The venture will begin operations with entirely retail sales, with wholesale being added later. With brand establishment, customer base increases, and wholesale accounts will increase to about 35% of sales by the end of year three. Estimated wholesale/retail split by the end of year three will be 65% retail and 35% wholesale.

Overall Sales: For ease of comparison, barrels are the units used when discussing sales and production. The brewery will sell approximately 1,150 barrels of product across multiple product lines in year one, equating to about \$800,000 in revenue. Sales rise to just over 1,450 sold in year two in conjunction with sales levels of just under \$900,000. This figure rises from year to year, ending just under \$980,000 in year three and barrel sales of about 1,750.

Pricing: The price of the product will change depending on the sales outlet and product size.

Product Pricing	Retail	Wholesale
On-Tap (By the 3 oz. flight)	\$2.50	N/A
Barrels	\$300	N/A
Bottles 12 oz.	\$2.00	\$1.00

Expenses: Expenses are presented for both variable (changing with production and sales) and fixed costs (reliable overhead costs). As shown in the following figure, variable and fixed expenses make up almost the same amount of overall expenses with variable accounting for 51% of all expenses and fixed expenses accounting for the remaining 49%.

Concluding Observations

With the success of the craft beer industry, the demand for inputs, such as barley and hops has increased as well. The National Barley Growers Association reports that most barley grown in the country is now dedicated for malting as it commands a premium price.⁵ Hops production is also growing, increasing 13 percent from 2012 to 2013, and overall value of the crops increasing 28 percent for the same years.

While the country is showing strong growth, these industries are still comparatively small in Virginia. Barley production placed Virginia 12th in the nation. The brewery outlined in the guide will require approximately 435 acres of barley during year one operations, rising to 500 and 575 acres for years two and three, respectively. The state is not considered a powerhouse when it comes to hop production, and only a minute portion of the overall industry is located in the mid-Atlantic.

As shown in the study, the price of hops and barley paid for by brewers has minimal effects on the operations of the business. Prices paid by brewers can change *drastically* without seeing significant effects on their income and cash flow. However, growers have a more nuanced road to selling their barley and hops to the brewers. A concern often expressed by potential growers is the ability to charge the highest price they can, without pricing themselves out of the market and causing brewers to look elsewhere for their hops and barley.

The baseline model shows hops prices of \$4.38 per pound and barley prices of \$2.88 per bushel. While these product prices will change over time, at the time of this study, these are the prices charged that satisfy both the grower and the brewer. Growers should conduct research prior to planting to have an idea of what current prices are and if those prices will satisfy their own financial needs and goals. Growers should, where possible, take advantage of the current market feelings towards “locally grown and sourced” food and beverage products. The recent rise in consumer desires for products grown locally means that growers have an opportunity to charge slightly higher prices than in previous time periods. Brewers are willing to pay a premium to add “locally sourced ingredients” to their marketing strategy as it tends to result in increased sales and goodwill amongst local consumers.

There is an increasing demand amongst consumers for variation in product offerings according to the time of year. For example, pumpkin flavored products have become significantly popular

⁵ <http://nationalbarley.com/>

during the fall season in recent years while more fruity or sweet beers sell well during the hot summer months. A brewery can take advantage of these consumer trends to boost sales and income.

Certain production losses are assumed to occur with respect to brewery operations. Expected production efficiency is about 85%, which includes losses from batch errors, contamination, human error, damage in transport or packaging, and other unforeseen circumstances.

A key factor for success will be the venture's location. While beer can be transported over distances, transportation costs can reach unsustainable levels should local sales prove less than an ideal. Ideally, a malting facility would be adjacent to the brewing facility, to save on transportation costs, although this may not be the case for every venture.

Recommended Startup Procedures

- Complete a business plan
- Consider a plan of alternative supply in the event of crop failure
- Significantly more growth will require additional production equipment
- Choose beers that do well with consumers and replace underperforming beers
- Consider an operation like a beer club where contracts are generated and sales are guaranteed
- Focus on maintaining cash flow and not maximizing profits
- Contact food safety personnel to maintain compliance with food safety related rules
- Consult with a trademark attorney
- Contact a marketing expert to help create a brand identity
- Implement quality control procedures before the beginning

Small Farms, Sustainability, and Environment: Current and Future Outlook

Srinivasa Rao Mentreddy (Alabama A&M University); Ali Mohamed, Denis Ebodaghe (USDA-National Institute of Food and Agriculture, Washington DC.)

Introduction

According to the US Census Bureau, a farm is “any place from which \$1,000 of agricultural products were produced and sold, or normally would have been sold, during the Census year.” Based on this definition, the number of farms in the United States (U.S.) has been steadily declining, falling from 2.21 million in 2007 to 2.07 million farms in 2015 as arable land is lost to urbanization. Concomitantly farmland also declined from 923 million acres in 2007 to 912 million acres in 2015. The average farm size for 2015 is 441 acres, up 3 acres from the previous year (USDA Census, 2012 & 2007). Small Farms are defined as those with annual gross sales of less than \$250,000 per year (USDA, 1998). This is the definition used in this article. Small farms account for 91 percent of all farms in the U.S. by this definition (USDA Census, 2007). Most U.S. farms are not only small but they also control a significant share of farm assets (U.S. Department of Commerce, 2002). However, low incomes and the need to maintain an adequate level of net income are the most cited problems faced by small farmers in the U.S. Small farms are diverse and are classified into different sub-groups (Hoppe et al., 2010).

How Agriculture Changes the Environment?

Agriculture is one of our greatest successes and also a major source of environmental damage. Current industrial agriculture, overly dependent on synthetic chemicals, is unsustainable as it uses fossil fuels and degrades water and topsoil. Major environmental problems associated with Agriculture include greenhouse gas production, soil erosion, sediment transport and deposition downstream, on-site pollution from overuse and secondary effects of fertilizers and pesticides, off-site pollution of other ecosystems, of soil, water and air. As the need for feeding the masses increases, agricultural production is being expanded to new virgin lands, leading to deforestation and loss of topsoil, and desertification. Excessive chemical use leads to degradation of aquifers, accumulation of toxic organic compounds and loss of biodiversity. Indiscriminate use of irrigation is a major cause of salinization of soil (“salting”). Some human impacts include farmland destruction, loss of soil fertility, reduced nutritional value of food, and decreased economic, social and cultural values (Horrigan et al., 2002). The impacts of industrial agriculture on the environment and human health have been comprehensively reviewed by Horrigan et al., (2002). The harmful effects of overuse of pesticides including a wide array of human ailments ranging from cancers to endocrine and reproductive dysfunction have been described.

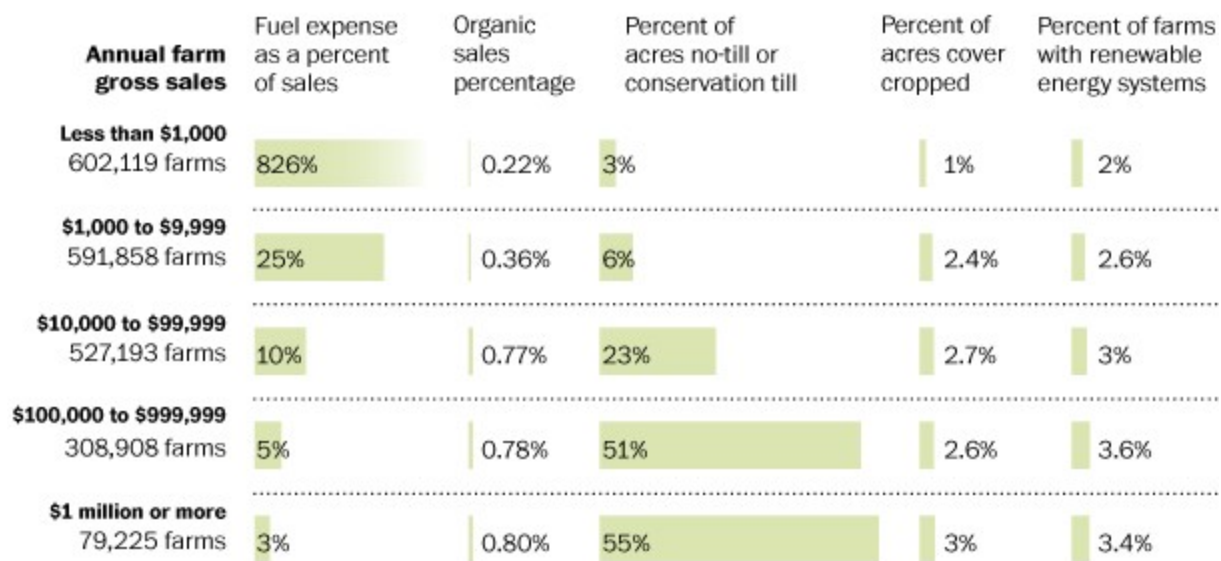
Does Farming Change the Biosphere?

Current industrial livestock production using grain and forage crops to produce meat makes animal production more resource intensive than other forms of food production (Halden and Schwab, 2008; Horrigan et al., 2002). Traditionally, American agriculture consisted predominantly of small family farms, but shifted to large industrial agriculture during the 20th century to meet increasing demand for meat, and to maximize profit by minimizing production costs. Industrial farming is a product of the post-industrial revolution era and began to grow in the 1920s (Gordon, 1996). This advancement in agricultural practice has increased efficiency in agricultural production at the expense of all agricultural environmental components including soil, water, and air. Where five acres of land was needed to produce enough to feed one person, industrial agriculture reduced it to only half an acre - a tenfold increase in productivity (Trewavas, 2002). The number of industrial farms has increased by 230 percent, from 3600 in 1982 to almost 12,000 in 2002 as the demand for food increased due to growth in the human population (USDA, 2008). The gigantic and rapid shift in agricultural production system changes land cover which results in i) changes in reflected light; ii) evapotranspiration from soil and plants; iii) the roughness of the surface due to alteration of soil texture and structure; iv) rate of exchange of chemical compounds, particularly increase in atmospheric CO₂ due to major user of fossil fuels and greater rates of decomposition caused by clearing lands. Monocropping to meet industrial and feedstock needs has led to the loss of diversity both above and below ground (Horrigan et al., 2002).

Every five years, the United States Department of Agriculture conducts an in-depth census of farmers, and the results identify differences among the many types and sizes of farms and ranches that grow our food. Ginger Harris, a USDA statistician, warns against reading too much into such large categories. "The differences may reflect differences in types of farming, rather than sizes of farms," she says. Nevertheless, the data do show that large farms incorporate some practices to a greater degree than small farms do.

Holistic Integration of Natural Resource Management with Food and Nutritional Security

Unsustainable agricultural systems have not been uncommon in the past. Historically, great civilizations rose, and thrived on agriculture and trade of agricultural commodities; and ironically these great civilizations also collapsed due to unsustainable agricultural expansion in response to population growth (Ponting, 1992). A remarkable example is the Mayan civilization (Anonymous, 2008). The current industrial agriculture is ominously unsustainable because it is also eroding natural resources, particularly precious top soil much faster than it is replenished by the environment and depends heavily on nonrenewable resources: primarily fossil fuels and fossil aquifers (Horrigan et al., 2002).



Source: 2012 USDA census, www.agcensus.usda.gov

Therefore, a shift in paradigm requires shifting from industrial farming to holistic, sustainable agriculture that mitigates or eliminates environmental harm associated with industrial agriculture. A holistic approach to agriculture ensures sustainable development through a conscious recognition of finite nature of resources, limitations on economic growth, and encourages equity in resource allocation. Sustainable agriculture prioritizes long-term goals of preserving topsoil, increasing plant and soil biodiversity, and improving rural communities, rather than only short-term interests such as profit. Sustainable agriculture is also site- specific, involving production practices that suit the environment, selection of locally adapted crops and varieties, and is dynamic and flexible enough to evolve to respond to changes in physical, environmental or socioeconomic contexts. Thus, sustainable agriculture is not a prescribed set of practices, but instead is a dynamic agricultural system that continually evolves as producers adopt practices in response to challenges with long-term and broad-based implications. Sustainable agriculture is consumer driven rather than a commodity and encompasses ecological perspectives in terms of nutrient and energy dynamics, and interactions among plants, animals, insects and other organisms in agroecosystems (Anonymous, 2009).

Sustainable Farming Methods or Practices

1. *Make use of renewable energy sources:* The first and the most important practice is the use of alternate sources of energy. Use of solar, hydro-power or wind-farms is ecosystem friendly. Farmers can use solar panels to store solar energy and use it for electrical fencing and running of pumps and heaters. Rivers can be a source of hydroelectric power

and can be used to run various machines on farms. Similarly, farmers can use geothermal heat pumps by digging beneath the earth and taking advantage of earth's heat.

2. *Integrated pest management*: This is a broad-based approach that aims at suppressing pest populations below the economic injury level by integrating all available pest control techniques. The different techniques are applied such that pest populations are kept at manageable levels while keeping pesticides and other interventions to levels that are economically justified and pose minimum risk to human health and the environment.
3. *Crop rotation*: Crop rotation is a tried and tested method used since ancient times to keep the soil healthy and fertile. Crop rotation has a logical explanation to it—crops are rotated in a pattern such that crops planted in one season replenish nutrients absorbed by the previous crop.
4. *Prevention of soil erosion*: While some erosion occurs naturally, farming tends to cause accelerated soil loss. Methods for mitigating loss of top soil from farmland include use of filter strips and buffers slow water speed, filter pollutants, and trap sediment, conservation tillage involving a reduction in practices that lead to soil disturbance, use of cover crops, and for pastures, balancing livestock numbers, forage, and water for a healthy farm and environment.
5. *Crop diversity*: Increasing the diversity of a crop rotation and cover crops increases soil health and soil function, reduces input costs, and increases profitability. This is because biodiversity is key to the success of any agricultural system. Lack of biodiversity severely limits the potential of any cropping system and increases disease and pest problems. A diverse and fully functioning soil food web provides for nutrient, energy, and water cycling that allows a soil to express its full potential.

Why Small Farms Are Better Environmental Stewards than Large Industrial Farms

For the past several years research has looked at sustainable agriculture as a potential solution to mitigating problems associated with industrial agriculture. Research has shown that: i) small farms are much more productive than large farms if total output is considered rather than yield from a single crop; ii) managing fewer resources more intensively, small farmers are able to make more profit per unit of output, and thus, make more of total profits—even if production of each commodity is less; iii) The inverse relationship between farm size and output can be attributed to the more efficient use of land, water, biodiversity, and other agricultural resources by small farmers. So in terms of converting inputs into outputs, society would be better off with small-scale farmers; iv) In traditional agroecosystems the prevalence of complex and diversified cropping systems is of key importance to the stability of peasant farming systems, allowing crops to be productive even in the face of various biotic and abiotic stresses; v) Traditional small-scale farmers tend to grow a wide variety of cultivars. Many of these plants are genetically heterogeneous landraces that are less vulnerable to diseases, pests, drought and other stresses; vi)

Locally grown food reduces the present average of 1,300 miles that food travels from “field to plate.” Transporting food over long distances uses tremendous energy: it takes 435 fossil-fuel calories to fly a 5 calorie strawberry from California to New York. “The Council on the Environment of New York City (CENYC).

Sustainable small farms are **Environmentally sound** as they promote biodiversity by preserving habitats, conserving natural resources, and reducing dependence on fuel and chemical inputs. They are **Economically viable** as they provide a living wage for farmers and farm workers. They thrive on direct marketing, form cooperatives, and grow alternative crops to cater to niche markets. They are better engines of “Grow Local, Buy local!” Small farms are **Socially responsible** as they contribute to community food security and positive quality of life.

The **Environmental focus** of small farms encompasses crop rotations, cover cropping, integrated pest and weed management, grazing and pasture management, waste management plans, smart water use (e.g., micro-catchments, small ponds and lakes on the farm, and roof water collection and utilization). Soil building and conservation is the key to success and sustainability of small farms.

The **future outlook** for small farms is bright with “Room to grow”. Some exciting ideas that can ensure the future sustainability of small farms include but are not limited to:

- a. *Community supported agriculture*: sustains both the farm and the farmer while providing wholesome, fresh, chemical-free produce to the consumer.
- b. *Naturally raised meat and dairy*: Meat, eggs, and dairy products from pastured animals provide lean meats that are low in fats, particularly bad cholesterol and are richer in antioxidants; including vitamins E, beta-carotene, and vitamin C. Furthermore, they do not contain traces of added hormones, antibiotics or other drugs (Rule, et al., 2002).
- c. *Agritourism*: small farms integrate livestock production with agriculture and agroforestry which make them attractive to tourists.
- d. *Farmers markets*: Small farms with diverse produce are often the ones sustaining farmers markets and are thus economic drivers in rural communities.
- e. *Niche markets*: Small farm owners sustain their farms by constantly adapting to market demands, innovating and diversifying crops. They often grow niche market crops that typically are small acreage crops.
- f. *Organic farming*: Small farms easily transition to organic farming systems and thus are more environmentally friendly than large farms. Their economic stability depends much on the production of organic produce that often fetches premium prices.

Conclusions

Small farms through better control and flexibility hold the key to agricultural sustainability. The USDA must put in place better support systems to safeguard small farm owners against the risks

of global climate change. Small farms can better adapt to and mitigate climate change effects better than large farms. Small farms can reverse environmental pollution and provide wholesome, chemical-free produce to sustain not only small farm families but also ensure stable, wealthy and healthy rural communities.

References:

- Anonymous, 2008. United States Government Accountability Office, “Concentrated animal feeding operations: EPA needs more information and a clearly defined strategy to protect air and water quality from pollutants of concern,” A Report to Congressional Requesters Highlights of GAO-08-944.
- Anonymous, 2009. Sustainable Agriculture Network. Exploring Sustainability in Agriculture: Ways to Enhance Profits, Protect the Environment and Improve Quality of Life. Available: [http:// www.sare.org/htdocs/pubs/explore/index.htm](http://www.sare.org/htdocs/pubs/explore/index.htm). (Cited February 4, 2017)
- Anonymous. 2008. Maya Rise and Fall - National Geographic Magazine. ngm.nationalgeographic.com/2007/08/maya-rise-fall/gugliotta-text. (Cited on February 4, 2017).
- Gordon, J. 1996. The chicken story, *American Heritage*, 47(5): 52–67.
- Halden, U.R. and J. K. Schwab. 2008. Environmental impact of industrial farm animal production. A Report of the Pew Commission on Industrial Farm Animal Production.
- Harun, S.M. R., and Ogneva-Himmelberger, Y. 2013. Distribution of Industrial Farms in the United States and Socioeconomic, Health, and Environmental Characteristics of Counties. *Geography Journal*, 2013 (2013), Article ID 385893. <http://dx.doi.org/10.1155/2013/385893>
- Hoppe, Robert A., James M. MacDonald, and Penni Korb. 2010. Small farms in the United States: Persistence Under Pressure. EIB-63. U.S. Department of Agriculture, Economic Research Service.
- Horrigan, L., R.S. Lawrence, and P. Walker. 2002. How sustainable agriculture can address the environmental and human health harms of industrial agriculture. *Environmental Health Perspectives*, 110 (5): 445-456.
- Ponting C. 1992. A Green History of the World. New York: St. Martin’s Press.
- Rule, D. C., K. S. Broughton, S. M. Shellito, and G. Maiorano. 2002. Comparison of Muscle Fatty Acid Profiles and Cholesterol Concentrations of Bison, Beef Cattle, Elk, and Chicken. *J. Anim. Sci.*, 80 (5): 1202-11.
- Trewavas, A. 2002. Malthus foiled again and again. *Nature*, 418 (6898): 668–670.
- USDA Census, 2007. Census of Agriculture. USDA-National Agricultural Statistical Services.
- USDA Census, 2012. Preliminary Highlight: U.S. Farms and Farmers. Census of Agriculture, National Agricultural Statistical Services.

The Dry Farming Collaborative: Growing without Irrigation in the Maritime Pacific Northwest

Amy Garrett, Heidi Noordijk, Dana Kristal (Oregon State University Extension Service, Small Farms Program)

Introduction

Farmers in the Western United States are becoming increasingly affected by climate change through reduced snowmelt, increased temperatures, and drought (Van Horne et al., 2013). Up to a 50% reduction in summer water availability is predicted in Oregon within 50 years (Nolan and Daley, 2006; Oregon Climate Change Research Institute interactive graphic), and many Oregon vegetable farmers using surface water for irrigation were cut off early during the growing season in 2015 with the drought.

“Our irrigation from Gales Creek was cut off the last week of June this year. It has never been this early before. We anticipate that early cutoff will become more frequent in coming years, so we would like to be less dependent on our irrigation water rights.” - Forest Grove, Oregon

“For the first time in our 28 years of farming, a water master came to our farm and told us to stop irrigating on Sept. 30 because the irrigation year had legally ended. With traditionally bountiful water little work has been done in the region on growing vegetable crops without water. Solving water issues in the future will require a multifaceted approach. Figuring out what we can grow without supplemental water would seem to be a very important facet.” - Philomath, Oregon

In addition, many new farmers have trouble finding land with unrestricted irrigation rights (Greenberg et al., 2016). It is becoming critical for the viability of farms in our region and the security of our food system to increase our knowledge and awareness of drought mitigation tools and strategies for growing with little or no irrigation. Dry farming refers to crop production during a dry season, utilizing the residual moisture in the soil from the rainy season, usually in a region that receives 20” or more of annual rainfall. Dry farmers work to conserve soil moisture during long dry periods primarily through a system of tillage, surface protection, and the use of drought-resistant varieties (Runsten and Mamen, 2014).

Project

The dry farming project initiated in 2013 with case studies of farms in Western Oregon (Garrett, 2013; Garrett, 2014) and Northern California that dry farm a variety of fruit and vegetable crops. Dry Farming Demonstrations were then established in 2015 and 2016 with support from the National Institute for Food and Agriculture’s Beginning Farmer and Rancher Development Program to show what these practices look like on the ground. In 2016 the ‘Growing Resilience: Water Management Workshop Series’ (funded in part by Western SARE) was organized to increase our knowledge and awareness of how Oregon growers are being affected by drought,

expand our toolbox of drought mitigation tools and strategies, and educate agricultural producers and professionals about management practices and strategies for farming with little or no irrigation. The Dry Farming Collaborative also initiated in 2016 to facilitate farmer-to-farmer information sharing as growers started to establish their own dry farming trials.

2015 Dry Farming Demonstration and Field Day

The 2015 Dry Farming Demonstration was implemented at an OSU site in Corvallis, which ended up being an extremely hot and dry year (Garrett, 2015). Squash, melon, potatoes, tomatoes, and dry beans survived the 2015 drought and a dry farming field day was organized that August. About 30 people were expected to come, but more than 100 growers and stakeholders affected by the drought and concerned about uncertain water supply in the future attended to learn more about growing without irrigation, do taste comparisons of dry farmed and irrigated melons and tomatoes, and visit with experienced dry farmers (Mortenson, 2015). Media coverage followed, with a groundswell of interest amongst growers throughout the region. Twenty-seven of the field day attendees participated in sensory evaluations and ranked the dry farmed watermelon and tomato higher than the irrigated in the categories of color, texture, and sweetness.

In a follow-up survey participants were asked, “Why is dry farming of interest to you?” The twenty-nine respondents answered as follows:

11% - I don't have water rights on my farm

11% - My well ran dry this year

86% - Other reasons

Other reasons cited: (Sustainability in a time of climate change; Conserving water, energy, and time; Weed management; improved flavor)

93% of the field day survey respondents intended to apply what they learned at the field day on their land. This result was a catalyst for the expansion of the project in 2016 to include participatory research with growers interested in trying dry farming on their land.

2016 Dry Farming Demonstrations

In 2016 the project expanded to three Dry Farming Demonstrations at OSU Extension sites including the Oak Creek Center for Urban Horticulture (OCCUH) in Corvallis, the North Willamette Research and Extension Center (NWREC) in Aurora, and the Southern Oregon Research and Extension Center (SOREC) in Central Point. A dry farming field day was held at each site in August. More than 200 participants attended one or more of the field days to learn more about growing without irrigation, observe roots from soil pits, visit with soil scientists and experienced dry farmers, and do taste comparisons of dry farmed and irrigated melons and tomatoes. The dry farmed watermelons ('Little Baby Flower' and 'Christmas Watermelon') and the 'Jory' Tomatoes from NWREC's dry farm trial ranked higher than the irrigated in the categories of color, texture, and sweetness.

Growing Resilience: Water Management Workshop Series

Workshops and field days (funded in part by Western SARE) on sustainable agricultural water use were organized for agricultural professionals and farmers including:

- Navigating Water Law and Restrictions in Oregon
- 2016 Dry Farming Field Days in Oregon – Corvallis, Aurora, Central Point
- The following sessions in this workshop series were video-recorded and are available online at <http://smallfarms.oregonstate.edu/wmws>
 - o Growing Without Irrigation
 - o Innovative Approaches to Catching and Storing Water
 - o Water, Soil and Carbon for Every Farm with Keyline Design: *Learning from the world's driest inhabited continent and its drought solutions* – Darren Doherty, Regrarians Ltd.
 - o Building Resilient Cropping Systems and Conserving Water

A follow-up survey was sent to participants in this workshop series and summarized with Qualtrics[®] (2016, Provo, UT. <http://www.qualtrics.com>). 71% of respondents plan to do something new or different as a result of the workshops they attended including:

- o Experimenting with or expanding dry farming efforts
- o Utilize and put more thought into cover crops and pollinator crops
- o Developing water storage systems
- o Test soil to assess and select a site for dry farming
- o Reduce water use and try deficit irrigation

Dry Farming Collaborative

The Dry Farming Collaborative is a group of farmers, extension educators, plant breeders, and agricultural professionals partnering to increase knowledge and awareness of dry farming management practices with a hands-on participatory approach. In the spring of 2016 ten growers expressed interest in hosting a dry farming trial. To facilitate communication and implementation of the on-farm trials in 2016, an email list was created (grew from 0 to 60+ members in 2016) and public group page on Facebook (grew from 0 to 110+ members in 2016) (Declaux et al., 2012; Tritz, 2014). Seeds and starts, many of which have had a history of being dry farmed, were distributed to trial hosts along with ‘grower input forms’ to record information about their site (soil type), crops (varieties, planting date, planting density), and results (harvest dates, yield). In addition, five-foot soil cores were pulled at eight of these dry farming sites. Soil type, texture, water-holding characteristics, and productivity ratings will be used to help explain the yield results. Field day participants also took part in sensory evaluations with side-by-side tastings of dry farmed and irrigated melons and tomatoes to assess color, texture, and sweetness.

Discussion

This data is being analyzed in the fall of 2016 and will be summarized to share at the first Dry Farming Collaborative winter grower's meeting in December 2016 as well as multiple farm conferences in 2017. Future directions for this project will be discussed along with the intention for this to be a collaborative model that could be adapted for participatory research projects in other regions. For more information visit the Dry Farming Collaborative page on Facebook or the Oregon Small Farms website (<http://smallfarms.oregonstate.edu/dry-farming-demonstration>).

References

- Desclaux, D., S. Ceccarelli, J. Navazio, M. Coley, G. Trouche, S. Aguirre, E. Weltzien, and J. Lancon. 2012. Centralized or decentralized breeding: The potentials of participatory approaches for low-input and organic agriculture p. 99-124. In: E.T. Lammerts van Buren and J.R. Myers (eds.) Organic Crop Breeding. Wiley-Blackwell.
- Garrett, A. Dry Farming Demonstration. Oregon Small Farm News. Summer 2015. Vol X No. 3.
- Garrett, A. Common misconceptions and key points about dry farming: Case study of dry farmer with more than 40 years of experience. Oregon Small Farm News. Summer 2014, Vol. IX No. 3.
- Garrett, A. Dry farming vegetables: One farmer's approach to building soil, conserving water, and producing great tasting tomatoes. Oregon Small Farm News. Summer 2013, Vol. VIII No. 3.
- Greenberg, K., L.L. Shute, C. Simpson. 2016. Conservation Generation: How Young Farmers and Ranchers are Essential to Tackling Water Scarcity in the Arid West. National Young Farmers Coalition (http://www.youngfarmers.org/wp-content/uploads/2016/02/NYFC15_water-report_Feb3_low.pdf)
- Mortenson, E. 2015. Researchers Give Dry Farming a Try. Capital Press.
- Nolin, A. and C. Daly, 2006. Mapping "At Risk" Snow in the Pacific Northwest. J. Hydrometeor, 7, 1164–1171.doi: <http://dx.doi.org/10.1175/JHM543.1>
- Oregon Climate Change Research Institute. CO2 vs change in Willamette River basin snow water equivalent. Available at <http://occri.net/climate-science/interactive-graphics-the-effects-of-elevated-co2/co2-vd-change-in-willamette-river-basin-snow-water-equivalent>
- Runsten, D. and Katy Mamen. "Dry farming". California Agricultural Water Stewardship Initiative (CAWSI). 10 November 2014. http://agwaterstewards.org/index.php/practices/dry_farming
- Tritz, J., 2014. Participatory Research: A Tool for Extension Educators. Journal of Extension, v. 52, no. 4, article #: 4TOT5.
- Van Horne, B., Strobel, M.L., and S. Hardegree. Climate Risks in the Northwest. 2013. USDA Regional Climate Hubs: Managing your risk in a changing climate. http://www.usda.gov/oce/climate_change/hubs/NorthwestFactSheet.pdf

Enjoying the Essence of Regenerative Agriculture

Ngowari Jaja (Virginia State University); *John Idowu* (New Mexico State University)

Introduction

In this era of sustainable agriculture, many producers, educators, environmentalists and others have focused on different aspects of farming. These include organic, sustainable, biological, Keyline and carbon farming, which when used, solely seeks to improve soil health. While the term regenerative agriculture is not as common, the idea has been around for decades.

What then is Regenerative Agriculture? Regenerative agriculture is a sub-sector practice of organic farming designed to build soil health or to regenerate degraded soils. It was seen as a long-term integrated approach that proponents used to build soil health, promote nutrient retention, and encourage pest and disease resistance. The practices associated with regenerative agriculture are related to organic farming, particularly with no tolerance for synthetic pesticides and fertilizers or other soil inputs that disrupt soil organisms. This is because regenerative agriculture views the challenges associated with conventional farming e.g. low soil fertility and soil erosion not as root problems, but as symptoms of an unhealthy soil. Thus, regenerative agriculture promotes improvement rather than depletion of agricultural resources. This is achieved by employing a non-traditional, holistic systems approach that is generally communal and mimics nature. Regenerative agriculture is farming the way nature intended!

Why is the world currently looking at Regenerative Agriculture? It has been noted that the loss of the world's fertile soil and biodiversity, pose a mortal threat to our future survival. If the trend is not reversed, the world will not only suffer serious damage to public health due to a qualitatively degraded food supply characterized by diminished nutrition and loss of important trace minerals, we will no longer have enough suitable arable land to feed ourselves. Without protecting and regenerating the soil on our billion acres of cultivated farmland, pasture and rangeland, it will be impossible to feed the world. Regenerative agriculture leads to healthy soil, capable of producing high quality, nutrient dense food, while simultaneously improving, rather than degrading land, thereby leading to productive farms, and healthy communities and economies.

Techniques

Regenerative Agriculture focuses on soil health, and the health of the soil largely depends on the organic matter quality and content. Therefore, techniques that help in increasing or maintaining the organic matter buildup of the soil, and that also helps introduce different sources of organic matter into the soil will aid regenerative agriculture by enhancing the health of the soil and sequestering carbon. Regenerative agriculture comprises an array of techniques including soils' natural functionality, holistic management, agro-forestry, carbon sequestration, animal husbandry,

and greenhouse gas reduction. Typically, these techniques use applications like cover cropping, conservation tillage, rotational grazing, composting, crop rotation, and pasture cropping among others. Cover crops and perennials ensure that bare soil is never exposed, and allows the grazing of animals in ways that mimic animals in nature. It also offers ecological benefits far beyond carbon storage: it stops soil erosion, re-mineralizes soil carbon, and protects the purity of groundwater by reducing pesticide and fertilizer levels in runoff. Perennial crops, livestock, fungus, and pollinators are integrated to produce abundant food, fiber, and fuel crops while restoring critical ecosystem services such as carbon sequestration, water purification and infiltration, nutrient cycling, and biodiversity.

General Steps for Regenerative Agriculture

The principles of regenerative agriculture can be applied regardless of the scale or type of land use operation. Many of the regenerative management practices used on farms and ranches can be duplicated in a much smaller area and in varied land operations. While there are many combinations of techniques that can be used to regenerate the soil, the following are significant;

- Minimize tillage ---practice conservation tillage
- Avoid or minimize the use of inorganic fertilizers, pesticides, and herbicides
- Opt for organic amendments
- Regular cover cropping or mulching the soil
- Regular application of compost
- Plant diversity and crop rotation
- Livestock integration and diversification

Conclusion

Regenerative Agriculture promotes soil health and invariably human health. Soil health connects to everything up the food chain/web, from plant and insect health, up to animal and human health. Health, therefore, truly begins with soils in which our food is grown. It is quite clear that in order to continue feeding a growing population, we must first feed the soil. One of the best ways to prevent global disaster, protect our health, and build a sustainable economy is through regenerative agriculture. It values the diversity of polycultures, in which animals and plants form a complex, symbiotic, robust system. As credited to Allan Savory, ultimately, the only wealth that can sustain any community, economy or nation is derived from the photosynthetic process—green plants growing on regenerating soil, as we look towards farming and agricultural productivity as nature intended. Moving forward, let us be reminded that “A nation that destroys its soils destroys itself.” ---Franklin D. Roosevelt.

Resources

Charles Eisenstein. We need regenerative farming, not geoengineering.

<https://www.theguardian.com/sustainable-business/2015/mar/09/we-need-regenerative-farming-not-geoengineering>

What is Regenerative Agriculture? Rodale Institute.

<http://newfarm.rodaleinstitute.org/features/0802/regenerative.shtml>

Why Regenerative Organic Agriculture? Generation International.

<http://regenerationinternational.org/why-regenerative-agriculture/>

Holistic Management. The Savory Institute. <http://savory.global/>

What is Biological Agriculture? Living Soils. YLAD.

<http://www.yladingsoils.com.au/ABoutUs/biologicalagriculture.html>

How Grazing Cows Can Save the Planet, and Other Surprising Ways of Healing the Earth.

<http://articles.mercola.com/sites/articles/archive/2014/01/12/grazing-cows-biological-farming.aspx>

How to Regenerate Soil Using Cover Crops and Regenerative Land Management.

<http://articles.mercola.com/sites/articles/archive/2014/12/14/regenerative-land-management.aspx>

Improving and Protecting Soils, Building Your Farm, and Sequestering Carbon with Value-Added Biomass Products

Harry Groot, Katie Fernholz, Scott Bagley (Dovetail Partners)

With support from a grant awarded by the USDA Forest Service's Wood Education and Resource Center, Dovetail Partners is developing the infrastructure for businesses to use proven technologies for adding value to organic biomass from urban or rural sources. The infrastructure resources are being made available to interested parties to develop businesses around one, two, or the entire suite of products. Three product lines/technologies have been developed:

- **Pyrolyzed biomass** adds value to low-or-no value feedstock as a locally-produced soil amendment or fuel by generating biochar and lump charcoal.
- **Zerosion-** to protect soils and keep water clean
- **Chipcrete-** for building, using woody biomass

Pyrolyzed biomass becomes either charcoal or biochar. Charcoal is used as a fuel; Biochar is a carbon sequestering soil amendment. They're both carbon-rich products made in an oxygen starved environment at relatively high temperatures using both stationary and mobile units as shown below.

The process also presents the opportunity to generate process heat. The production units come in a wide range of sizes and expense, using feedstock ranging from woody and agricultural biomass to bones, bedding, litter, and manures. The biochar can be used to enhance compost and mulch as well as be sold directly as an organic soil amendment; however retorts using chunky woody feedstock produce natural lump charcoal—which is reduced in particle size to make biochar.



Figure 1. Emptying a load of natural charcoal and biochar from the U.K. licensed, U.S. built, trailer-mounted Exeter retort.

- Charcoal is readily salable as a “local” and natural fuel.
- Biochar is a “wonder” compost enhancer and soil amendment with a long history of success, but minimal current use due to widespread lack of understanding of its benefits and its current high cost and poor availability.

Biochar:

- Increases the soil's water retention
- Makes nutrients more available over time
- Binds toxic materials and “cleanses” the soil and water like activated carbon
- Increases soil friability

Of particular note is an active and growing community of biochar producers at the farm-scale. Some are working together as “The Biochar Collaborative” to encourage and enable appropriately scaled biochar and charcoal production with innovative equipment and targeted marketing.

The Biochar Collaborative is an informal group of independent businesses working together with the following common objectives:

- Rural wealth creation.
- Exemplary natural resource management.
- Implementing carbon sequestration practices.
- Developing scalable integrated solutions.

The Biochar Collaborative's current focus in on:

- **Cooperative Marketing**
 - Exploring national branding
 - With Regional and Local personalization options
 - Discussing Aggregation with Regional Bagging and Distribution
- **Collaborative Research**
 - Soil Ecology Studies
 - In partnership with Virginia Tech and New Mexico State University
 - 22 growers in 13 US states
 - Wide variety of soils and crops
 - Common Garden Plots
 - Development of National Cooperative
 - For a distributed network of small/medium sized producer/growers
 - Sharing business, technology, and marketing

Zerosion is a patented, biodegradable, ground-armoring, erosion control product made using wood chips coated with a cementitious slurry.



Figure 2. Stationary TLUD-style pyrolysis retort with heat and syngas recovery; made from a 500 gallon propane tank by Restoration Technologies.

- Zerosion:
 - Can be blown (like straw.)
 - Can be placed (like concrete.)
 - Has “designer” mechanical properties (by adjusting the binder’s components)
 - Can include various additional components, like
 - Biochar,
 - Seed,
 - Soil Amendments, and
 - Inoculants.
 - Provides long-term soil protection and erosion mitigation.
 - Allows the buildup of silt to provide further dispersion of run-off’s energy.
 - Provides a medium for plant growth.
 - Will decompose over time.
 - If properly placed, will not blow-out like bales, coir, or silt fence.



Figure 3. Downstream berm to slow and spread water coming down steep embankment for AZ Department of Transportation trial.



Figure 4. Upstream gully being manually armored with Zerosion to stop roadbed undercutting and side-slope washout.



Figure 5. A Zerosion test plot with the product blown onto a mine tailing slope in both broadcast areas and stepped berms. Note the modest size of the application unit: a pick-up towable trailer-mounted blower, water/slurry mix tank, hoses, and pump. The chips were brought in a separate trailer, not shown.

Chipcrete: A similar formulation to Zerosion producing a durable, light-weight, load bearing-capable building system from local materials; currently being made from woody biomass (chips) and a cementitious binder.

- Chipcrete Building Material
 - Higher binder-ratio to increase lifespan and durability
 - outer layer added to shed water
 - Can be formed in-place, cast, or laid-up
 - Smaller footer requirements due to lower weight
 - Further testing is needed for Building Code approval and use in residential or commercial construction, but this technique is being used in on-farm applications...mixed in a concrete or mortar mixer and cast as blocks, or in slip-forms.



Figure 6. The different steps in building with Chipcrete.

Dovetail's extensive library can be accessed at www.dovetailinc.org/reports

For more information about this presentation or The Biochar Collaborative:

harry@dovetailinc.org

Acknowledgements

The work upon which this publication is based was funded in whole or in part through a grant awarded by the Wood Education and Resource Center, Northeastern Area State and Private Forestry, Forest Service, U.S. Department of Agriculture.

Shade Effects on Forage Nutritive Value and Ergot Alkaloid Concentrations: Implications for Silvopasture Use

Kelly Mercier; Chris Teutsch; John Fike (Virginia Tech)

Introduction

Silvopastures are an intentionally managed combination of trees and forage-livestock systems (Garret and Buck, 1997). Including trees in a grazing system can have many benefits, such as providing shade to livestock, increasing biodiversity and other ecosystem services, and making the farm more aesthetically pleasing while providing income stability and flexibility by diversifying revenue sources (Clason and Sharrow, 2000; Garrett et al., 2004). One challenge of silvopasture systems is that the inclusion of shade can affect many aspects of forage productivity, especially in regards to yield, nutritive characteristics, plant morphology, and botanical composition of the sward (Watson et al., 1984; Dodd et al., 2005). These factors ultimately affect grazing management.

Tall fescue is well adapted to Virginia and much of the eastern United States (Hannaway et al., 2009), and its popularity is due its mutualistic association with a fungal endophyte (Siegel, et al., 1984). This endophyte promotes drought and pest resistance, increased productivity, and the ability of the plant to withstand heavy grazing pressure (Bouton et al., 1993; Hoveland, 2009; Johnson et al., 1985). The endophyte produces chemical compounds that are toxic to cattle and can have devastating effects on contraception and weight gains (Steudemann and Hoveland, 1988). Environmental stressors such as shade may affect the plant's ability to partition resources to the endophyte.

The objective of this study is to understand shade effects on forage mixtures with the intention of applying these results to silvopastures. Particularly of importance are forage nutritive characteristics and ergot alkaloid concentrations under shaded conditions.

Methods

This study was conducted at Virginia Tech's Southern Piedmont Agricultural Research and Extension Center near Blackstone, VA. A randomized complete block design with four replications was paired with a two factor factorial treatment combination with shade level and forage mixture as factors. Three forage mixtures of varying species complexity were evaluated. A simple mixture of tall fescue and white clover acted as the control or standard pasture type in Virginia. The intermediate mixture consisted of orchardgrass and red clover added to the simple mixture, and the complex mixture had alfalfa, birdsfoot trefoil, and Kentucky bluegrass added to the intermediate mixture. Shade levels were as follows: full sun (control), 30%, 50%, and 70% shade.

Shade structures were created by laying snow fence on the tops and sides of wooden frames (16 x 8 x 3 ft) to create 50% shade. Thirty percent shade was created by removing every other slat

on the snow fence. Seventy percent shade was created by adding 30% shade cloth to the 50% structures. Shade levels were determined by recording photosynthetically active radiation (PAR) underneath the structures and in a nearby open area at the same time. Percent shade was calculated as follows:

$$\% \text{ shade} = 100 - [(PAR \text{ under structure} / PAR \text{ outside structure}) * 100].$$

Plots were 9 x 10 ft. and were planted into a conventional seedbed in April 2015. Fertilizer was applied according to soil test prior to establishment. Shade structures were then immediately placed over plots. Borders between plots were 6 ft. and alleys were 10 ft.

Plots were harvested when planted species reached approximately 15 in. to a residual of 3-4 in. using a Wintersteiger Cibus F small plot forage harvester (Salt Lake City, UT). Harvest occurred twice in 2015 (Jun 15 & Aug 6) and three times in 2016 (Apr 26, May 26, & Jun 27).

Three 250-g subsamples were collected at harvest. One was weighed fresh, oven dried for 3 days at 140°F, weighed dry, and ground using Wiley (Thomas Wiley, Philadelphia, PA) and Cyclone (Udy Corporation, Fort Collins, CO) mills to pass a 2mm and 1 mm screen, respectively. Nutritive value was estimated using near infrared spectroscopy. The second subsample was collected fresh and sorted into individual species components. Individual species were oven dried (see above) and weighed. Dry weights were used to calculate the relative contribution of each species to the botanical composition. The third subsample was collected at harvest, stored in coolers on ice (during harvest), and immediately frozen. Samples were then freeze dried and ground (see above), then analyzed for total ergot alkaloids at Agrinostics, Ltd. (Watkinsville, GA).

Data was analyzed over harvests and years. When treatment x year or treatment x harvest were present, data was analyzed by harvest. Main effects of shade and mixture are presented when no shade x mixture interactions are present. Statistical analysis was performed using PROC GLM (SAS Institute, Cary, NC) and regressions calculated using SigmaPlot 11.0 (Systat Software, Inc., San Jose, CA). Differences were considered significant at $\alpha = 0.05$.

Table 1. Neutral detergent fiber (NDF), crude protein (CP), and total digestible nutrients (TDN) by shade level for 2015 and 2016. Letters indicate statistical significance within harvest.

Harvest	% Shade	NDF	CP	TDN
June 2015	0	47.3 b	18.6 a	65.8 a
	30	51.1 a	17.8 a	62.8 b
	50	53.2 a	18.2 a	62.1 b
August 2015	70	53.5 a	18.7 a	62.8 b
	0	57.1 a	12.7 c	59.0 c
	30	55.3 a	14.5 b	60.2 bc
May 2016	50	55.6 a	15.4 ab	61.3 ab
	70	56.0 a	16.1 a	61.6 a
April 2016	0	44.3 c		
	30	49.5 b		
	50	49.2 b		
May 2016	70	53.4 a		
	0	43.7 c		
	30	50.7 b		
June 2016	50	53.8 a		
	70	55.6 a		
	0	45.9 c		
June 2016	30	52.7 b		
	50	52.4 b		
	70	55.6 a		

*Daily requirements CP: Lactating cow=11%, Dry cow=7.5%, 450 lb. steer=12%; TDN: Lactating cow=60, dry cow=50, 450 lb. steer=65.

Results and Discussion

There were shade x harvest interactions for all nutritive components in 2015 (reported here by harvest). Neutral detergent fiber (NDF) was increased under shade in June 2015, but showed no difference in August 2015. Crude protein (CP) was similar under all shade levels in June 2015 and increased with shade in August 2015. Average CP from each shade level exceeded the requirement for dry and lactating cows and growing steers (Ball et al., 2007). Total digestible nutrients (TDN) decreased with shade in June 2015 and increased with shade in August 2015. TDN values exceeded dry cow requirements but were not sufficient to meet the requirements of a growing steer in all shade treatments in 2015, with the exception of full sun in June 2015. Total digestible nutrients were adequate in all shade treatments for lactating cows in 2015 except for the full sun treatment in August 2015 (Ball et al., 2007) (Table 1).

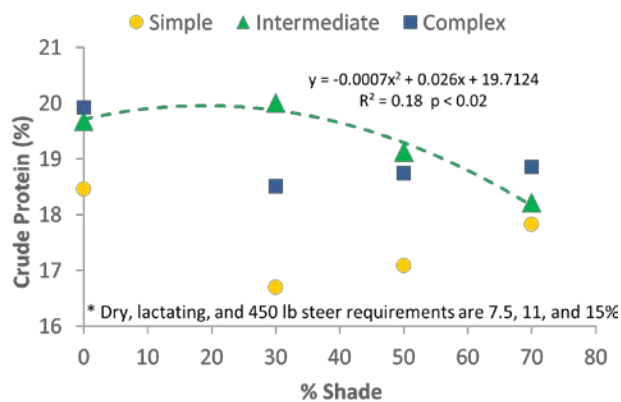


Figure 1. Crude protein for forage mixtures under varying shade levels in 2016.

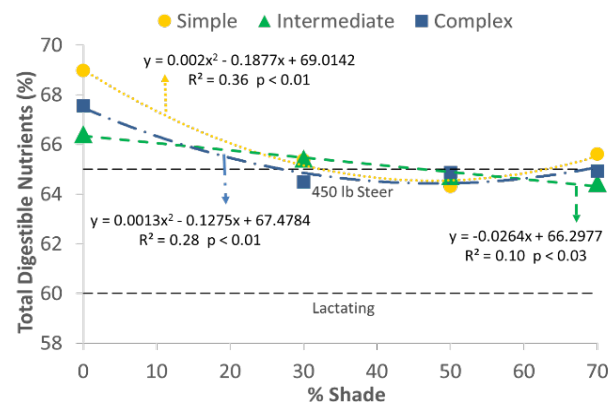


Figure 2. Total digestible nutrients for forage mixtures under varying shade levels in 2016.

In 2016 NDF had harvest x treatment interactions (data presented by harvest). However, there were no shade x mixture interactions; therefore, the main effects of shade are presented (no mixture effect). In 2016, NDF increased as shade increased (Table 1). In 2016, CP and TDN did not have a harvest x treatment interaction, therefore, data is presented averaged across harvests. However, there was a shade x mixture interaction for both. A quadratic relationship between shade and crude protein was found for the intermediate mixture only ($y = -0.0007x^2 + 0.026x + 19.7124$, $R^2 = 0.18$, $p < 0.02$). Shade and CP were not related for the simple and complex mixtures. Crude protein levels exceeded the recommendations for dry and lactating cows and growing beef steers (Ball et al., 2007) (Fig. 1). Total digestible nutrients for the intermediate mixture decreased in a linear ($y = -0.0264x + 66.2977$, $R^2 = 0.10$, $p < 0.03$) manner as shade increased for the intermediate mixture and a quadratic manner for the simple ($y = 0.002x^2 - 0.1877x + 69.0142$, $R^2 = 0.36$, $p < 0.01$) and complex ($y = 0.0013x^2 - 0.1275x + 67.4784$, $R^2 = 0.28$, $p < 0.01$) mixtures. Total digestible nutrient levels exceeded the requirements for dry and lactating cows and was generally sufficient for growing beef steers (Ball et al., 2007) (Fig. 2).

In general, forage nutritive characteristics were reduced beneath shade. Reduced PAR could have affected the ability of these species to photosynthesize at optimum rates.

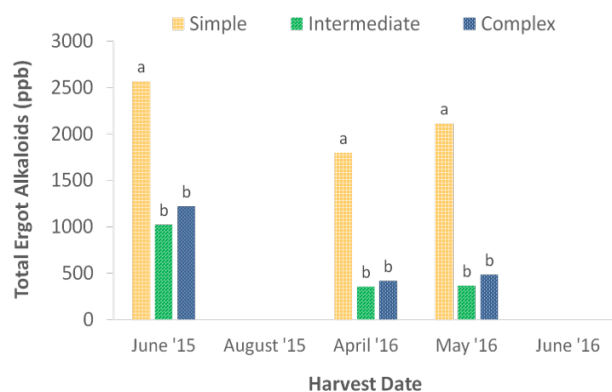


Figure 3. Mixture effects on total ergot alkaloid concentration per plot for June '15, April 16, and May 16'.

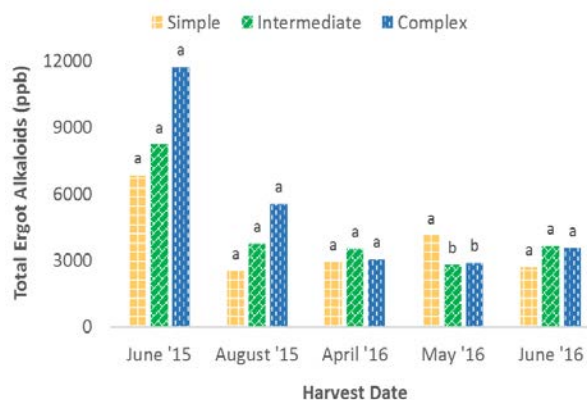


Figure 4. Mixture effects on total ergot alkaloid concentrations in tall fescue component for all harvests.

In both 2015 and 2016, a harvest x treatment interaction occurred for total ergot alkaloid concentration, therefore data are presented by harvest. On a per plot basis, concentrations were significantly higher for simple mixtures compared to intermediate and complex mixtures for 3 of the 5 harvests (Fig. 3). August 2015 and June 2016, however, had shade*mixture interactions. During these two harvests only the simple mixture's concentrations fit a linear regression as shade increased for June 2015 and August 2016 ($y = 10.568x + 393.87$, $R^2 = 0.4792$, $p < 0.01$ and $y = 12.122x + 953.58$, $R^2 = 0.2759$, $p < 0.04$, respectively). There were no main effects of shade in any harvest for the tall fescue component, and the mixture effect was only present in one harvest with simple mixtures having higher alkaloid concentrations (Fig. 4).

Botanical separations were performed to give an accurate representation of the tall fescue in each plot. Total ergot alkaloid concentrations were scaled to ppb for tall fescue only. These data had harvest interactions, but when broken down into individual harvests only mixture had an effect for the May 2016, with simple mixes having higher alkaloid concentrations.

Conclusions

General trends in our data indicate that as shade level increases, nutritive value decreases. This is likely related to photosynthesis being restricted at lower light levels. Our data also indicate that whole sward ergot alkaloid levels tend to be lower for the more complex mixtures when compared to the simple mixture and that shade had limited impact on ergot alkaloid concentrations in tall fescue. These findings indicate that growing tall fescue under shade should not increase tall fescue toxicosis and may even help to mitigate it by creating a microclimate in which other less well adapted forage species thrive.

References

- Ball, D.M., C.S. Hoveland, and G.D. Lacefield. 2007. Southern forages (4th ed.). International Plant Nutrition Institute. Norcross, GA.
- Bouton, J.H., R.N. Gates, D.P. Belesky, and M. Owsley. 1993. Yield and persistence of tall fescue in the southeastern coastal plain after removal of its endophyte. *Agronomy Journal* 85(1):52-55.
- Clason and Sharrow. 2000. Silvopastoral practices. In: Garrett, H.E., Rietveld, W.J., Fisher, R.F. North American Agroforestry: An Integrated Science and Practice. American Society of Agronomy, Madison, WI, pp. 119 – 148.
- Dodd, M.B., A.W. McGowan, I.L. Power and B.S. Thorrold. 2005. Effects of variation in shade level, shade duration and light quality on perennial pastures. *New Zealand Journal of Agricultural Research* 48(4): 531-543.
- Garrett, H.E., and L. Buck. 1997. Agroforestry practice and policy in the United States of America. *Forest Ecology and Management* (91): 5-15.
- Garrett, H.E., M.S. Kerley, K.P. Ladyman, W.D. Walter, L.D. Godsey, J.W. Van Sambeek, and D.K. Brauer. 2004. Hardwood silvopasture management in North America. *Agroforestry Systems* 61:21-33.
- Hannaway, D.B., C. Daly, M.D. Halbleib, D. James, C.P. West, J. J. Volenec, D. Chapman, X. Li, W. Cao, J. Shen, X. Shi, and S. Johnson. 2009. Development of Suitability Maps with Examples for the United States and China. p. 33-48. In: H.A. Fribourg, D.B. Hannaway, and C.P. West (ed.) Tall fescue for the 21st century. Agronomy Monograph No. 53. ASA, CSSA, and SSSA, Madison, WI.
- Hoveland, C.S. 2009. Origin and history. p. 3-10. In: H.A. Fribourg, D.B. Hannaway, and C.P. West (ed.) Tall fescue for the 21st century. Agronomy Monograph No. 53. ASA, CSSA, and SSSA, Madison, WI.
- Johnson, M. C., D. L. Dahlman, M. R. Siegel, L. P. Bush, G. C. M. Latch, D. A. Potter, and D. R. Varney. 1985. Insect feeding deterrents in endophyte-infected tall fescue. *Applied and Environmental Microbiology* 49:568-571.
- Siegel, M.R., M.C. Johnson, D.R. Varney, W.C. Nesmith, R.C. Buckner, L.P. Bush, P.B. Burrus II, T.A. Jones, and J.A. Boling. 1984. A fungal endophyte in tall fescue: Incidence and dissemination. *Phytopathology* 74:932-941.
- Stuedemann, J.A., and C.S. Hoveland. 1988 Fescue endophyte: History and impact on animal agriculture. *Journal of Production Agriculture* 1:39-44.
- Watson, V.H., C. Hagedorn, W.E. Knight and H.A. Pearson. 1984. Shade tolerance of grass and legume germplasm for use in the southern forest range. *Journal of Range Management* 37 (3): 229-232.

The Organic Germplasm Consortium: Preserving and Developing Plant Genetic Resources That Advance Agricultural Diversity and Resiliency

Laura R. Lewis (Washington State University); Micaela Colley (Organic Seed Alliance)

Overview

WSU Extension and the Organic Seed Alliance have partnered on the North Olympic Peninsula to develop a community germplasm system that is focused on selecting, screening, and managing organic plant genetic resources for the region. The aim of this project is to create an innovative community genebank model that will increase access and utilization of novel varieties and cultivars. The primary goal of the project is to enhance regional agricultural development and resiliency for small-scale, diversified farm systems through organic plant breeding, variety selection and improved seed management practices. The scope of this work includes plant genetic resource projects that will focus on four areas: breeding, research, education, and extension. The project is currently in the initial germplasm acquisition phase that includes selection of germplasm for curation from public and private sources, cataloging the collection, development of characterization and regeneration protocols, and a regional needs assessment with local farmers.

Background

Information about the mechanisms that influence agrobiodiversity can best be obtained through research and education that focuses on the connectedness of agrobiodiversity and farm systems from various disciplinary perspectives. Organic farmers throughout the Pacific Northwest and more regionally – the Olympic Peninsula have been engaged to identify goals and objectives that they feel will benefit their production systems. One of the primary constraints for organic farmers is access to germplasm that has been selected, screened, developed, and regenerated utilizing organic management practices. Through natural and artificial selection, plant populations continue to adapt and evolve to local and regional abiotic and biotic constraints. Farmers rely on germplasm as the primary resource for their economic and agronomic livelihoods, and organic production systems have marginal access compared to their conventional agricultural cohorts.

The primary goal of this project is to establish an organic germplasm repository that has regional significance for smallholder organic farms in the Pacific Northwest with low-input diversified systems. A secondary goal of this work is to partner WSU Extension, OSA and local organic farmers so that they are able to select and screen crop genetic resources for optimal geographic range dynamics of the region. Furthermore, the project will allow selected germplasm to evolve and adapt to low-input, organic management systems as well as climate change. Finally, this project will be a model system that can be replicated by other extension

programs in regions throughout the United States that are characterized by their small-holder, diversified organic farms.

The first phase of this program will be the creation of an organic germplasm repository in Jefferson County. Farmers will be involved in identifying species to introduce into the gene bank through meetings, electronic surveys and mailings. The second phase of the project will involve the establishment of these populations, both *in-situ* and *ex-situ*, as well as the development of crop descriptor sets for characterization and evaluation purposes. Farmers will also be interviewed to establish a baseline of on-farm diversity prior to having access to material from the organic repository. The final stage of the project will focus on providing public access to open source, organic germplasm for regional farmers. WSU Extension farm interns and support staff from Organic Seed Alliance will be partnered with organic farmers throughout the region to assist in the implementation of participatory plant breeding activities and regeneration of germplasm. A community gene bank model will then be implemented and participants will be able to deposit organic germplasm that was collected from their farms. Throughout this entire process, farmers will have access to research, education and extension resources developed by the project team.

Increased access and utilization of inter- and intra-specific agrobiodiversity is both an economic and social benefit to smallholder, organic farmers in the region. Research has demonstrated that increased utilization of agrobiodiversity, especially in low-input systems, improves crop yields and decreases biotic constraints such as disease and pest infestations. This would allow organic farmers to spend less of their resources (time and money) on managing production systems. There will also be a market benefit in terms of offering consumers, processors, and distributors more options for purchase. Currently, organic farmers in the United States have few choices in terms of access to germplasm that has been developed for low-input systems with high levels of heterogeneity. Improving access will allow farmers the social benefits that their non-organic cohorts have had for decades.

Sorghum: A Low-Input Alternative Crop for Small Farms

Maru Kering, Laban K. Rutto, Vitalis Temu (Virginia State University-Agricultural Research)

Abstract

In light of developments that have negatively impacted tobacco profitability, resource-limited producers in Virginia and beyond need an alternative low input, low risk and marketable crop. To optimize yields for traditional crops like corn, soybean, and tobacco, costly investments in production resources like fertilizer and irrigation is required. The increasing prevalence of sub-optimal rainfall and rising temperatures will increase the risk associated with production of these traditional crops. Therefore, to ensure profitability of crop production activities, drought tolerant, low input crops need to be included in the farming operation. Sorghum (*Sorghum bicolor* L. Moench) is a hardy drought-tolerant cereal crop that is able to use water and nutrients more efficiently and can produce good yields in marginal areas. US Grain Council statistics indicate that USA is the world's largest producer of grain sorghum for foreign markets. However, there is local market for sorghum as pet- and wild bird food source, as a corn substitute in animal feed, and as a starch source for food and brewing industry. The expanding US bio-energy and brewing industry provides market for sweet sorghum whose sugar-rich extractable juice is fermented to ethanol or used for the manufacture sorghum spirits and syrup. Bagasse, a by-product of juice extraction can be chemically treated to release more soluble sugars, burned for heat energy, or used as an alternative forage-source. Studies carried out at Virginia State University in recent years to evaluate productivity of both grain and sweet sorghum varieties showed promising results. Satisfactory yield potential and readily available markets make sorghum a viable crop for low income producers in the mid-Atlantic region.

Introduction

Climate change, increasing world population, and the resultant rise in demand for food has increased the need to expand cropping into marginal and other historically non-agricultural land, as well as a diversification of crops under production. To better utilize marginal land, crops that thrives in less than perfect conditions must be identified. Similarly, the transition away from fossil-based to more sustainable energy sources as seen increased expansion of the bioenergy industry and increased research on crops that can supply feedstock. Warm season grasses are capable of large biomass production and are better adapted to marginal and low fertility soils. Sorghum is a warm season annual crop with distinct morphological characteristics that adapt it to dry and hot environments. These traits include an extensive root system that can explore a larger volume of soil for moisture, the ability to go dormant during periods of extreme moisture stress, and a waxy leaf coating that limits water loss. Sorghum is reported to be the most widely adapted species among the cereal grasses for biomass and fuel production (Hons et al., 1986). Under moisture stress, sorghum is reported to maintain physiological activity close to that of plants with

sufficient moisture by increasing root length, density, and water-use efficiency (Zegada-Lizarazu et al., 2012).

Sweet sorghum whose stems are rich in fermentable sugars is reported to produce the highest estimated biomass and ethanol yield compared to perennial grasses such as switchgrass, big bluestem, and miscanthus (Propheter et al., 2010) and has better returns per unit area of land compared to sugarcane (Prasad et al., 2007). It produces more fermentable sugars and has higher nutrient and water use efficiency than corn (Hills et al., 1990; Putnam et al., 1991). The residual material, bagasse, can be hydrolyzed with acids to release more fermentable sugars (Sipos et al., 2009) or burned for heat and electrical energy (Monti and Venturi 2003).

Grain sorghum is a staple food and source of protein and energy in Asia and Africa (Owuama, 1997). In the developed countries including the United States (U.S), the largest producer of grain sorghum, 97% of the grain is used for animal feed (FAO, 1995). While the Mid-west and Southern Plains of Kansas, Oklahoma, and Texas account for most of U.S. grain sorghum production, its production in the southeastern U.S is still at its infancy. However, it is slowly taking a foothold in the region due to promotion by- and a ready market at Murphy-Brown LLC (Warsaw, NC), a subsidiary of Smithfield Foods, Inc. And while sorghum for beer is not popular in the U.S., it is the main grain for traditional alcoholic and non-alcoholic beverages in Africa (Asiedu, 1992). Sorghum kernel color, texture, structure, and hardness along with the nature and composition of starch affects milling characteristics and beer quality (Swanston et al., 1994). The huge U.S. brewing market may offer a ready market for sorghum grain for beer. The aim of our study was to determine yield potential of selected grain and sweet sorghum varieties in south-central Virginia.

Material and Methods

Field experiments were carried out at the Virginia State University Research and Demonstration (Randolph) Farm near Ettrick, VA (37° 13' 43' N; 77° 26' 22' W). Two independent studies were carried out; one for grain and another for sweet sorghum varieties. For sweet sorghum varieties, fresh stem yield, juice yield and juice sugar composition was determined at four nitrogen rates. For grain-type varieties, grain yield and quality response at three nitrogen rates was evaluated.

Results/Discussion

The experiments showed that both grain and sweet type varieties can grow and yield well in south-central Virginia (Figure 1a & b). The results also showed differences among sweet sorghum varieties in fresh stem biomass, and total sugar content and composition. Both sorghum types showed positive responses to nitrogen fertilizer application (Table 1).



Figure 1a. Grain-type sorghum



Figure 1b. Sweet-type sorghum

Table 1. Grain- and fresh stem yield across varieties in response to nitrogen fertilizer

N rate (Kg N ha ⁻¹)	Grain-type Seed yield (kg ha ⁻¹)	Sweet-type	
		Fresh stem (Mg ha ⁻¹)	Juice (L ha ⁻¹)
0		65.8	10505
30	3615		
40		76.9	12102
60	4309		
80		75.8	13812
90	4750		
120		93.0	17212

Conclusion

There exist a great potential for sorghum production in south-central Virginia. If markets became readily available, sorghum production would be an additional farm enterprise for small scale producers because of its low input demands and low risk of yield loss from adverse weather conditions like high temperature and low soil moisture.

References

- Asiedu, J.J. 1992 Sorghum and millet. In: Processing Tropical Crops, pp. 189-223. London: Macmillan Press Ltd.
- FAO, 1995. Sorghum and millets in human nutrition. *FAO Food and Nutrition Series* No. 27, pp 16-19. Rome Italy.

- Hills, F.J., R.T. Lewellen, and I.O. Skoyen. 1990. Sweet sorghum cultivars for alcohol production. *California Agriculture* 14:14-16.
- Hons, F.M, R.F. Moresco, R.P. Wiedenfeld, and J.T. Cothren. 1986. 'Applied nitrogen and phosphorus effects on yield and nutrient uptake by high energy sorghum produced for grain and biomass. *Agron. J.* 76:1069-1078.
- Monti, A., and G. Venturi. 2003. Comparison of the Energy Performance of Fibre Sorghum, Sweet Sorghum, and Wheat Monocultures in Northern Italy. *European Journal of Agronomy* 19(1):35-43.
- Owuama C.I., 1997. Sorghum: a cereal with lager beer brewing potential. *World Journal of Microbiology and Biotechnology* 13:253-260.
- Prasad, S., A. Singh, N. Jain, and H.C. Joshi 2007. Ethanol production from sweet sorghum syrup for utilization as automotive fuel in India. *Energy Fuels* 21:2415-2420.
- Propheter, J.L., S.A. Staggenborg, X. Wu, and D. Wang 2010. Performance of annual and perennial biofuels crops: Yield during the first two years. *Agron. J.* 102:806-814.
- Putnam, D.H., W.E. Lueschen, B.K. Kanne, and T.R. Hoverstad 1991. A comparison of sweet sorghum cultivars and maize for ethanol production. *J. Prod. Agric.* 4:377-381.
- Sipos, B., J. Réczey, Z. Somorai, Z. Kádár, D. Dienes, and K. Réczey. 2009. Sweet sorghum as feedstock for ethanol production: Enzymatic hydrolysis of steam-pretreated bagasse. *Applied Biochemistry and Biotechnology* 153:151-163.
- Swanston, J.S., N.S. Rao, V. Subramania, and K. Taylor. 1994. Influence of some aspects of grain quality on malting potential in sorghum. *Journals of Cereal Science* 19:91-97.
- Zegada-Lizarazu, W., A. Zatta, and A. Monti, 2012. Water uptake efficiency and above-ground biomass development of sweet sorghum and maize regimes. *Plant and Soil* 351:47-60.

Growth and Yield Performance of Teff (*Eragrostis tef*) at Mid- and Full-Season Harvest Regimes

Vitalis Temu; Ariel Coleman; Christos Galanopoulos; Laban K. Rutto; Maru Kering
(Virginia State University)

Abstract

A growing population of Ethiopians in America has increased demand for teff (*Eragrostis tef*) and created economic opportunities for producers in the mid-Atlantic region. Teff is a fast-growing drought-tolerant warm-season annual grass that can be grown as a forage and/or small grain crop. The gluten free grain has a complete amino acid profile and is rich in iron and calcium. Our objective is to identify agronomic practices suitable to teff production as a dual-purpose (forage; grain) crop. Effects of mid-season forage harvesting on regrowth and flowering of brown and ivory teff varieties were studied at Virginia State University (VSU) Randolph Farm. Each variety was seeded (about 0.5-cm deep; 30-cm wide rows) in 1 × 2 m plots arranged in a randomized complete block design. At the start of flowering, mid-season forage biomass was harvested by cutting at a height of 15 cm. Regrowth in harvested plots was monitored through bi-weekly sward height measurements and percent flowering scores. After seed maturity, biomass and grain yields were assessed in harvested (regrowth) and intact plots. Data were analyzed for effects of variety and harvest regime on forage biomass and grain yield. Both varieties had similar mid-season biomass yields (about 3900 kg DM ha⁻¹). Regrowth swards were nearly 30-cm tall as compared with 72 cm for intact plots. Results indicate a great potential for dual-purpose teff production in Virginia involving mid-season harvesting for forage followed by late-season seed production from the regrowth. Seed quality assessment and studies on alternative weed control strategies will provide additional information about appropriate management practices.

Introduction

Teff, a warm-season annual cereal indigenous to Ethiopia has gained popularity for summer forage and/or small grain production in the United States (U.S.), especially the western states. In other regions of the U.S., a small number of grain teff varieties are grown primarily for ethnic markets. As a grain crop, teff has great potential for improvement owing to a wide genetic variation among its germplasm accessions (Adnew et al., 2005). Its rapid establishment, drought tolerance, and lack of significant disease pressure also make teff a viable candidate as a spring smother crop for weed control in organic corn fields (Ketema, 1997). Under favorable conditions, teff germinates within 3-5 days, reaches full flower in less than 60 days, and is usually ready for harvest between 60 and 120 days (Ketema, 1997). Preliminary agronomic evaluation of its brown and ivory varieties at VSU produced encouraging results on growth and grain yield, but with significant weed challenges (Temu et al., 2013).

In recent years, there has been growing demand for teff among the Ethiopian population in the Mid-Atlantic region. The total number of Ethiopians in the region is estimated to exceed 1 million with over 500 of them in the Richmond and Norfolk metropolitan areas. All Ethiopians eat injera (a flat bread made from teff) as their staple diet. Currently, injera is imported from Ethiopia but not enough is brought in to satisfy demand. There is also high demand in the U.S. for unprocessed teff flour. For example, in 2014 alone, the Great River Organic Milling Co. imported teff from Spain and South Africa valued at approximately \$1,040,000. This means teff has potential as an alternative crop for small farmers in the mid-Atlantic region.

More importantly, teff offers unique nutritional benefits as a healthy gluten-free alternative grain. More than 2 million people in the US suffer from gluten intolerance associated with Celiac Disease (CD), a digestive disorder that affects nutrient absorption in the inner lining of the small intestine, and teff may be a viable alternative cereal food crop for them. The use of teff flour in leavened bread and cookies has also been reported (Mohammed et al., 2009; Kenney et al., 2011; Alaunyte et al., 2012; Coleman et al., 2013). Teff is regarded as a nutritional powerhouse that provides several nutrients and mineral elements that are often deficient in people's diets. For example, teff is higher in calcium, the most common mineral in the body, than any other cereal crop. It is also high in iron and has been credited for the low incidences of anemia in Ethiopia where teff is a major dietary constituent. The high lysine content in teff may also benefit individuals suffering from osteoporosis. Lysine is an essential amino acid that helps lower cholesterol, enhances calcium absorption, and the formation of collagen that is important for bones, cartilages, connective tissues, skin, and tendons (Ketema, 1997).

Teff can also be grown for forage. It is similar to Love Grass (genus *Eragrostis*), a natural forage grass in the mid-west and other parts of the U.S., and research-based information on its agronomic requirements will also open the opportunity for its cultivation as an alternative source of summer forage in Virginia.



Figure 1. Mid-season forage harvesting at early flowering stage.

Materials and Methods

The study was conducted at the VSU Randolph Research and Demonstration Farm located in Chesterfield County, Virginia (37° 13' 43' N; 77° 26' 22' W; and 45 m above sea level). The area had a 20 year June, July, and August average day temperatures of 30.2, 32.1, and 31.2 °C, respectively (Satellite N.O.A.A.,

2013). The field was disked and harrowed ready for late summer (mid-July) planting. Plots (1 ×



Figure 2. Fast growing brown and ivory grain teff stands at early flowering stage showing inter-row canopy closure.

2 m) were seeded at 0.5 cm deep and 30-cm row spacing. To improve seed-soil contact, the plots were compacted after seeding by driving a small utility vehicle over the rows. Weeds were controlled by tillage between, and manually within rows. Growth was monitored through bi-weekly

plant height measurements, row canopy expansion, and flower appearance. At the start of flowering, select plots were harvested to assess mid-season forage yield (Fig. 1). Fresh weights of grab-bag samples were recorded and moisture content determined after oven-drying for 48hrs at 72°C. Regrowth rate was monitored till the seed-filling stage, and sward heights were recorded in both harvested and intact (control) plots. Data were analyzed for effects of harvest regimes and variety on forage and grain yields.

Results

Both varieties grew fast enough to attain complete canopy closure of the inter-row spaces within 30 days (Fig. 2). For both the Brown and Ivory varieties, mid-season forage biomass (mid-August) averaged 3,990 & 3,900 kg DM/ha, respectively, but these were not statistically different. By mid-September, the full-season swards were more than 70 cm tall but only about 30 cm for the half-season regrowth. However, there was no statistical difference between varieties in the sward heights recorded (Fig. 3). In part, the fact that regrowth swards were appreciably shorter than their full-season counterparts explains their noted lesser lodging problems (Fig. 4). These wide differences in sward height between the mid-season regrowth and their full-season counterparts were also attributable to the prolonged summer dry-spell experienced.

Regrowth after the mid-season biomass harvest produced healthy swards that also set seeds even though they were less than half the sward height of intact (unharvested) plots. The regrowth swards also remained weed-free through seed maturity stage.



Figure 3. Healthy brown and ivory teff swards at seed-filling stage.

Conclusions

Results indicate that teff could be strategically grown in Virginia as a dual-purpose crop. This will involve a mid-season harvest in early summer for forage, followed by management of the regrowth for a late-season grain crop. The results also indicate that harvesting a teff stand at least once for forage at the early flowering stage can significantly suppress weeds during regrowth. In the study area, so far, there seems to be greater potential for successful dual-purpose production of the brown, relative to the ivory variety. However, more work is needed to determine the best time for the mid-season harvest to ensure enough time for regrowth and optimum grain yield.

Acknowledgements

Financial support for this study was provided by the Virginia Department of Agriculture and Consumer Services (VDACS). We would also like to acknowledge field staff at the VSU Agricultural Research Station for their support.



Figure 4. Sward height difference between mid-season regrowth and their full-season counterparts in late September.

References

- Adnew, T. Ketema, S. Tefera, H. and Sridhara, H. (2005). Genetic diversity in tef [*Eragrostis tef* (Zucc.) Trotter] germplasm. *Gen Resour Crop Evol* 52:891-902.
- Alaunyte I, Stojceska V, Plunkett A, Ainsworth P, Derbyshire E. (2012). Improving the quality of nutrient-rich Teff (*Eragrostis tef*) breads by combination of enzymes in straight dough and sourdough breadmaking. *J Cereal Sci*, 55(1):22-30.
- Coleman J., Abaye AO, Barbeau, W, Thomason, W. (2013). The suitability of teff flour in bread, layer cake, cookies and biscuits. *International Journal of Food Science and Nutrition*. 64(7):877-881.
- Kenney, E.S., Butler, C., Moore, C., Bhaduri, S., Ghatak, R., and Navder, K.P. (2011). The Effect of Substituting Teff Flour in Gluten-Free Sugar Cookies and Peanut Butter Cookies. *Journal of the American Dietetic Association*, 111(9), A63-A63.
- Ketema, S. (1997). Tef: *Eragrostis tef* (Zucc.) Trotter. Rome, International Plant Genetic Resources Institute (IPGRI).

- Mohammed, M.I.O., Mustafa, A.I., Osman, G.A.M. al. (2009). "Evaluation of wheat breads supplemented with Teff (*Eragrostis tef* (ZUCC.) Trotter) grain flour." *Australian Journal of Crop Science* 3(4): 207-212.
- Satellite, N.O.A.A. (2013). Information Service. National Climatic Data Center. *US Dept of Commerce*.
- Temu, V.W. and Kering, M.K. (2013). Growth and yield of Teff (*Eragrostis tef*) at wide and narrow spacing or broadcast in the Southern Piedmont, Virginia. ASA, CSSA & SSSA International Annual Meeting, Nov 3-6, 2013, Tampa, FL

Grant Do's And Don'ts: From Application Submission to Grant Close Out

Adriene Woodin (Awards Management Division, Office of Grants and Financial Management, USDA-NIFA, Washington, DC)

The Beginning

All potential applicants including small farmers and ranchers are encouraged to begin by visiting the National Institute of Food and Agriculture (NIFA) website to review current funding opportunities. This [link](#) directs all visitors to the NIFA grant announcements page from where the requests for application (RFA) and other relevant documentation can be obtained. When reading the RFA, attention should be paid to eligibility requirements (some programs have restrictions on eligibility), matching requirements, as well as checking the application due date.

Additionally, the following have to be taken into account when preparing an application to be submitted to NIFA: application guidelines (these are specific to each RFA), information to be provided, what forms to include and how to complete them, explanation of what is a valid signature on documents such as certifications, etc. The following steps must also be completed before an applicant can submit a grant request to NIFA through the [grants.gov](#) website: 1.) One time registration at [grants.gov](#); 2.) Obtaining a [Data Universal Numbering System \(DUNS\)](#) number; 3.) Registering with [System Award Management](#); 4.) Creating a [grants.gov](#) user name and profile. It is advisable to begin these process early as they take time.

Preparing the Application

In preparing an application, it is important to put together a narrative that addresses all the technical areas mentioned in the RFA. Whenever possible, supporting documentation for referenced data/statistics must be included as an appendix, and all cited material listed in the bibliography. The project budget must be realistic (base costs on actual prices/estimates) and explain the necessity of every expense in an accompanying budget justification document.

The Project Budget

Common allowable project costs include salaries and wages, materials or supplies, travel costs, meeting space rental, equipment purchases, publications, consultants, subcontracts, and indirect costs. Unallowable costs include expenses for construction or renovations, fixed equipment etc. (see more detailed breakdown below).

Allowable Expenses

Salaries and Wages: Allowable for project personnel-provide annual salary or hourly rate of pay, time commitment (number of hours, percentage of effort), and the task to be completed. Salary rates should be reasonable for the job category (any salary rates deemed excessive may need to be justified).

Materials or Supplies: A list of materials or supplies expected to be purchased and an estimated cost per item(s) must be provided.

Travel Costs: Total travel costs must be shown in the budget. Information on the purpose and destination of travel (if known) and how it relates to the project, number of trips, number of travelers, and cost per trip (use federal mileage rates provided at the [General Service Administration](#) website when estimating costs) must be provided in the budget justification.

Meeting Space Rental: For example, the cost of renting a meeting room at a community center or other facility. Information on the location of the facility and the cost should be provided. If the facility does not normally charge for usage, the costs of space rental for that location would be unallowable.

Equipment Purchases: It is important to provide details including the type (model) of equipment to be purchased, the purchase price, and how it will be used. General purpose equipment for the direct benefit of the project is allowable.

Publications: Number of publications and estimated cost should be provided. Allowable publishing costs are those directly linked to dissemination of project results e.g. bulletins, or page fees in a journal or other widely distributed publication.

Consultants: It is allowable to hire experts to render service in support of project objectives. A statement of work justifying the necessity (include minimum qualifications/certifications desired), number of hours, and the hourly rate of pay is required. Rate of pay for the consultant must not exceed \$76 per hour.

Subcontracts: When another entity will be helping to complete project objectives, subcontracts may be awarded. Include a budget with cost details, letter of commitment and statement of work (subcontractors do not have to meet program eligibility requirements).

Indirect Costs: These are facilities and administrative (F&A) costs. It is important to verify that the program allows for the charging of indirect costs (IDC). Some programs do not permit IDC, others limit the amount or recommend a federal rate, and others will accept a negotiated rate based on salaries and wages (a rate may be negotiated with the submission of appropriate documentation). In others, applicants may request for approval of a 10% “*de minimis*” rate. Applicants may also budget for IDC without an indirect cost rate. In such a situation, funds will be withheld by the agency pending approved rate agreement. Information on indirect costs can be found at: http://nifa.usda.gov/business/indirect_cost_process.html.

Unallowable Costs

Construction or renovation costs, purchase of fixed equipment, entertainment/celebrations /alcohol expenses, non-project specific equipment, purchase of buildings or land, overhead costs (clerical salaries, utilities, etc.), and end of award purchase of equipment or supplies are not allowed by most programs.

Successful Applications

Funded applications are selected by a peer-review panel. Proposals that are recommended for award are forwarded to the NIFA Awards Management Division (AMD) for review. The division verifies that all required information is included and also reviews the budget to ensure that all costs are allowable. Award documents are sent electronically to the recipient from the AMD (awards@nifa.usda.gov). The documents contain award terms and conditions (<https://nifa.usda.gov/terms-and-conditions>). Generally, NIFA allows the awardee to incur pre-award costs within the 90-day period immediately preceding the effective date of the award providing: the approval of pre-award spending is made and documented in accordance with the awardee's normal procedures prior to the incurrence of the cost(s); the advanced funding is necessary for the effective and economical conduct of the project; and the costs are otherwise allowable. However, as outlined in 2 CFR 200.308 (d)(1), all costs incurred before the agency makes the award are at the risk of the recipient. NIFA is under no obligation to reimburse costs if for any reason the: (1) award is subsequently not made; (2) award is made for a lesser amount than the awardee expected; or (3) award is inadequate to cover incurred costs.

Payment

Award funds made are available through the U. S. Treasury Automated Standard Application for Payments (ASAP) System. ASAP account information is provided with award documentation. Setting up an ASAP account is a multi-step process with time limitations.

Post Award Requirements

Annual financial and technical reports are required within 90-days of anniversary date. Technical reports are submitted via an electronic reporting system referred to as REEport. The final financial and technical reports are required within 90-days after expiration of the project.

Post-Award Actions

The following changes may be done without NIFA approval: 1) First time no-cost extension – NIFA must be notified via signed letter. 2) Budget modifications-changes must be within the scope or objectives of the project and must be for allowable costs.

These changes require NIFA approval: 1) Change in key personnel (Project Directors) 2) Fund releases-when funds were withheld 3) Second or subsequent No Cost Extension 4) Pre-Award

Costs more than 90 days preceding the start date of the award 5) Changes in the scope or objectives of the project 6) Subcontracts over 50% of the award or to a federal Agency (unless previously approved by NIFA at time of the award).

Grant Regulations

The National Institute for Food and Agriculture is governed by the Code of Federal Regulations section 2 CFR Part 400: Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (<https://nifa.usda.gov/regulations-and-guidelines>).

Other Useful Information

NIFA has several regional programs managed by universities offering funds. Such programs include sustainable agriculture, integrated crop protection, aquaculture, rural development, and risk management. Visit the NIFA webpage at: <https://nifa.usda.gov/programs> to search for available grants.

Contact Information

Team Leaders:

Rochelle McCrea: 202-401-2880 or rmccrea@nifa.usda.gov

Sondra Watkins: 202-401-4249 or swatkins@nifa.usda.gov

Bruce Mertz: 202-401-5062 or bmertz@nifa.usda.gov

Towana DeShazo: 202-401-4155 or tdeshazo@nifa.usda.gov

Branch Chiefs:

Susan Bowman: 202-401-4324 or sbowman@nifa.usda.gov

Adriene Woodin: 202-401-4320 or awoodin@nifa.usda.gov

The Value-Added Producer Grant Program: Assisting Farmers and Other Agricultural Producers for 15 Years

Alexis Solano (USDA-Rural Development, Washington DC)

The number of small farms in the United States has been steadily declining in the last few years. According to the National Agricultural Statistics Service's (NASS) 2012 Census of Agriculture, the total amount of land in farms has decreased from 954,752,502 acres in 1997 to 914,527,657 acres in 2012, or by 4.2%. Though the number of farms increased in each size category (as designated by NASS) from 1997 to 2007, by 2012 this trend was reversed. Table 1 shows the decline in the number of farms by size. Large farms, however, increased in number from 2007 to 2012. In addition, the number of farms in each sales category (again, as designated by NASS) also declined from 2007 to 2012, with the exception of sales from \$50,000 to \$99,999 and \$500,000 or more. The number of farms in these categories are shown in Table 2. The greatest decline occurred in the number of farms with sales of less than \$2,500.

This decline is due to the shift to large-scale farming. Simply put, large farms are getting larger. This may seem discouraging to those who operate small farms or are beginning farmers. However, this shift does not mean that small farms are becoming obsolete. Rural Business-Cooperative Service has a grant program, the Value-Added Producer Grant (VAPG) Program that may assist these farmers entering into new markets and expanding their businesses.

The VAPG Program was established by the Agricultural Risk Protection Act of 2000 and began awarding grants in 2001. A value-added product is one that meets at least one of the following criteria: 1) there is a change in the product's physical state; 2) the product is produced in a way that enhances its value; 3) the product is physically segregated; 4) the product is on-ranch or on-farm produced renewable energy; and 5) the product is locally produced.

For activities pertaining to the production or marketing of the value-added product, planning and working capital grants are awarded. Planning grants must be used for activities such as feasibility studies or business plans. Working capital grants may be used to pay for processing costs, salaries, and/or marketing and advertising costs. In 2001 the maximum amount of both the planning grant and the working capital grant was \$500,000. This amount, for either grant, has varied throughout the program's existence. For Fiscal Year 2016, the most a producer may receive for a planning grant is \$75,000; a working capital grant has a maximum amount of \$250,000. Recipients must demonstrate that they have funds that match the amount of the grant requested. For example, if the producer applies for a grant amount of \$50,000, that producer must show that he or she has available funds of \$50,000 when applying to support a \$100,000 project.

In order to receive a VAPG, the producer must be one of the following: 1) an Independent Producer; 2) an Agricultural Producer Group; 3) a Farmer or Rancher Cooperative; or 4) a

Majority-Controlled Producer-Based Business. Some of the other requirements include agricultural producers participating in the project to already be producing more than 50 percent of the raw commodity needed for the value-added product, US citizenship, entering an emerging market, and being legally able to accept the grant and perform the activities.

The program was revised with both the 2008 and 2014 Farm Bills. The 2008 Farm Bill expanded the definition of value-added product to include locally produced and marketed products and defined program requirements for Mid-Tier Value Chain projects. The bill allocated 10% of available funds to Beginning and Socially-Disadvantaged Farmers or Ranchers. Another 10% was allocated to ranchers or farmers whose projects would lead to the development of Mid-Tier Value Chains. Also, priority was given to beginning farmers or ranchers, socially-disadvantaged farmers or ranchers, and medium and small-sized family farms. The 2014 Farm Bill changes included priority for veteran farmers or ranchers and additional priority for group applicants who were benefiting farmers or ranchers included in the priority categories of the program.

For Fiscal Year 2015, there were 412 applicants, 282 applications were eligible, and 260 were funded. The average planning and working capital grant award were \$42,730 and \$148,081, respectively. The majority of the awards were working capital (83.4%). Figure 1 shows the awards by methodology and Figure 2 shows the awards by product type.

An analysis of VAPG recipients from 2001 to 2010 (currently being updated to include 2011-2015 recipients) showed that approximately 73% were still operating as of May 2014. The Small Business Administration has found that only one-third of small businesses survive after 10 years. When examining the VAPG recipients it was found that approximately 56% of 2001 recipients survived at least until May 2014. For the producers who received grants in 2002, 2003, and 2004, their survival rates are 61%, 68%, and 73%, respectively. Thus, the VAPG program has helped beginning and established farmers and other producers enter new markets and expand and sustain their businesses.

Table 1. Number of Farms by Size

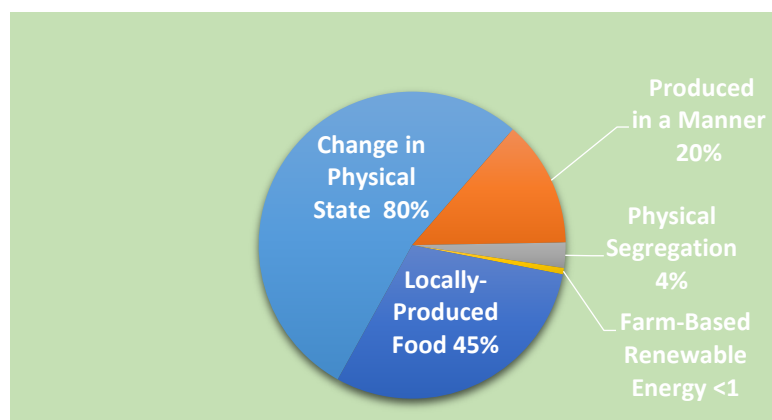
Size	2007	2012	% Change
1 to 9 Acres	232,849	223,634	-3.9575
10 to 49 Acres	620,283	589,549	-4.9548
50 to 179 Acres	660,530	634,047	-4.0094
180 to 499 Acres	368,368	346,038	-6.0619
500 to 999 Acres	149,713	142,555	-4.7812
1,000 to 1,999 Acres	92,656	91,273	-1.4926
2,000+ Acres	80,393	82,207	2.2564

Source: USDA NASS, 2012 Census of Agriculture

Table 2. Number of Farms by Sales

Sales	2007	2012	% Change
< \$2,500	900,327	788,310	-12.4418
\$2,500 to \$4,999	200,302	191,422	-4.4333
\$5,000 to \$9,999	218,531	214,245	-1.9613
\$10,000 to \$24,999	248,285	244,954	-1.3416
\$25,000 to \$49,999	154,732	152,873	-1.2014
\$50,000 to \$99,999	125,456	129,366	3.1166
\$100,000 to \$499,999	240,873	232,955	-3.2872
\$500,000+	116,286	155,178	33.4451

Source: USDA NASS, 2012 Census of Agriculture

Figure 1. Fiscal Year Awards by Value-Added Methodology**Figure 2.** Fiscal Year 2015 Awards by Product Category

Today's Farm Safety Net Protects the Future of Agriculture

Michael Alston, Sharon Hestvik, Griffin Schnitzler (USDA-Risk Management Agency, Washington DC)

Introduction

At the USDA's Risk Management Agency, we serve America's agricultural producers through offering effective, risk management tools to strengthen the economic stability of agricultural producers and rural communities.

The most visible way we do that is by operating and managing the Federal Crop Insurance Corporation. RMA was created in 1996; FCIC was founded in 1938. Through the FCIC, RMA provides crop insurance to American farmers and ranchers.

Crop insurance has changed as farming practices and products have changed. As the nation's premiere farm safety net, crop insurance now covers more crops and more counties than ever. Many beginning farmers and ranchers may not be familiar with crop insurance, and recent incentives such as reduced premiums and new coverage options to help them continue to be the future of agriculture.

Specifically, two new expansions for crop insurance open the doors for new farmers, as well as many small, diversified and organic farms: Whole-Farm Revenue Protection and Organic Price Elections.

Whole-Farm Revenue Protection

RMA's innovative Whole-Farm Revenue Protection policy allows producers to insure all of their farm's commodities under one policy (both crops and livestock). Whole-Farm includes a wide range of available coverage levels, provides coverage for replanting annual commodities, includes provisions that increase coverage for expanding operations, and allows the inclusion of market readiness costs in the coverage.

As the first crop insurance policy available nation-wide, Whole-Farm is tailored for producers who previously had limited access to a risk management safety net -- including producers of specialty or organic commodities and producers that market directly to consumers. Whole-Farm also recognizes the value of crop diversity, which directly supports the production of a wider variety of food, by providing a discounted premium rate based on the number of commodities on the farm.

The Coverage

Whole-Farm covers the revenue a farm operation is expected to generate during the insurance period from agricultural activity. All commodities produced by the farm are covered under Whole-Farm except timber, forest, and forest products, and animals for sport, show or pets.

The amount of farm revenue Whole-Farm insurance can protect is the lower of the revenue expected on the current year's farm plan or the five-year historic income adjusted for growth.

This represents an insurable revenue amount that can reasonably be expected to be produced on the farm during the insurance year. The five-year historic income is based on five consecutive years of Schedule F tax forms or other farm tax forms (it must be possible to complete a Substitute Schedule F form if the producer filed farm tax forms other than Schedule F). To address expanding operations, the five-year historic income can be increased by up to 35 percent to better allow growing farms the opportunity to cover their growth in the insurance guarantee.

To qualify for Whole-Farm, a producer must: be eligible to receive federal benefits; have no more than \$8.5 million in insured revenue; have no more than \$1 million expected revenue from animals and animal products or nursery and greenhouse products; and have no more than 50 percent of total revenue from commodities purchased for resale.

Risk Management for Small and Diversified Farms

Whole-Farm is designed to meet the needs of highly diverse farms that are growing a wide range of commodities, and for farms selling commodities directly to consumers. For diversified farms, Whole-Farm provides a premium rate reduction based on the number of commodities produced on the farm. For farms selling commodities through direct marketing, the Whole-Farm record keeping requirements have been modified to better reflect the type of records direct marketers keep as sales records. Sales/marketing records can be farm records that are kept during the sales year.

Whole-Farm also recognizes the risk management needs of beginning farmers and ranchers who have less than five years of their own farm tax forms. To make participation easier for more beginning farmers and ranchers, Whole-Farm reduces the required records from five to three historical years, plus farming records from the past year. Additionally, any beginning farmer and rancher may qualify by using the former farm operator's federal farm tax records if the beginning farmer or rancher assumes at least 90 percent of the farm operation.

Organics

RMA recognizes organic farming practices as good farming practices and continues to move forward in improving crop insurance coverage for certified organic and transitioning to organic producers to make viable and effective risk management options available. RMA provides protection from unavoidable natural perils such as drought, excessive moisture, hail, wind, hurricane, tornado, lightning, etc. and in addition, we cover damage caused by insects, disease, or weeds -- when good organic farming practices fail to provide an effective control.

Coverage is provided to certified organic acreage and transitional acreage and on the date acreage is reported, producers must have an organic certificate and organic plan; and transitioning to organic producers must have an organic plan (or written documentation from a certifying agent indicating an organic plan is in effect).

RMA has offered insurance coverage for organic crops since the 2004 crop year. The program has grown from 210,306 acres insured with a liability of \$38.1 million and 1,454 policies in 2004

to more than 1,043,403 acres insured with a liability of over \$649.7 million and 6,833 policies nationwide in 2015 crop year¹. Organic crop insurance continues to grow in new ways.

Price Elections

Organic farming has become one of the fastest growing segments of U.S. agriculture. USDA reported on May 19, 2016, that total organic sales hit a new benchmark of \$43.3 billion for 2015². To support producers and growth of the organic sector, RMA has created new crop insurance options to meet the unique needs of organic operations.

In 2011, RMA started offering crop insurance for organic producers to reflect market prices for four crops (corn, cotton, soybeans and processing tomatoes) and we found that this was one of most important steps we've taken to provide effective insurance coverage for organic crops and better risk management tools for organic producers. As of 2016, there are 57 crops with organic price premiums (price elections) and the list will keep growing with the more data we receive.

Looking at organic crops grown locally in Chesapeake City, Va., for the 2016 crop year, crop insurance is available for apples, barley, cabbage, corn, cotton, fresh market beans, fresh market sweet corn, fresh market tomatoes, grain sorghum, oats, peaches, peanuts, potatoes, processing beans and tomatoes; soybeans, tobacco and wheat. Whole-Farm Revenue Protection is available as well.

To demonstrate how RMA protects organic crops closer to the market value, here is an example of organic prices we offer for corn insured under Revenue Insurance in 2016 in Chesapeake City: The projected price for conventional corn is \$3.86 per bushel. For certified organic, the price is \$8.42 per bushel. If you have a contract price option (as mentioned below), for certified organic corn, the maximum contract price is \$12.63 per bushel; and for transitional to organic corn, the projected price is \$3.86 per bushel or a maximum contract price of \$7.72 per bushel.

Contract Price Option

To further expand opportunities for organic producers in 2014, a new crop-insurance pricing option was made available to certified organic producers who grow their crops under guaranteed contracts. This contract price option allows organic producers who receive a contract price for their crop to get a crop insurance guarantee that is more reflective of the actual value of their crop. In 2016, the Contract Price Addendum was expanded to allow transitioning to organic producers to use this option. There are 73 “crop types” eligible. To see the updated list, go to: http://www.rma.usda.gov/news/currentissues/organics/cpa_aligibility.html.

¹ RMA Summary of Organic Crop Insurance Business, May 2015.
<http://www.rma.usda.gov/data/sob/organic/2015organic.pdf>

² Statement from the Secretary of Agriculture on the Organic Trade Association Report, May 19, 2016.
<http://www.usda.gov/wps/portal/usda/usdahome?contentid=2016/05/0124.xml&contentidonly=true>

The CPA works with an existing plan of insurance by allowing a farmer the option of using their contract price instead of the RMA price election or projected price (as applicable). A farmer may contract a crop as a hedge against price fluctuations, because they are growing a differentiated product like food-grade soybeans, or because they are growing something with a premium price, such as a seed crop.

The CPA may be a good choice for a farmer with a contract for their certified organic crops or crops in transition to organic certification. Another important thing for farmers to consider -- and to clarify with their insurance agent -- is what the maximum contract price is at which they can insure their crop under the CPA. The limits are generally 2 times the conventional price or 1.5 times the organic price established by RMA.

Conclusion

Farming and farm products change to meet the market need, crop insurance will continue to adapt and strengthen its programs to meet the needs of our producers. A strong risk management safety net is good for all of us.

Agdiscovery 2016: Investing in the Future of American Agriculture

Sophia L. Kirby, Tammy H. Lowry (USDA Animal and Plant Health Inspection Service, Washington DC)

Abstract

AgDiscovery is a summer outreach program to introduce students to careers in agriculturally-related disciplines (plant and animal health and sciences, wildlife management, and agribusiness). The program allows students to reside on a college campus, and explore agriculture from university professors, scientists, veterinarians, and other professionals who work for the U.S. Government. It is a unique opportunity for students to gain a first-hand look at the many career paths in the agricultural science field. The program is designed to act as a forum to expose students to career opportunities at USDA, by stimulating and promoting advanced interest in, and knowledge of agriculturally-related fields of study. Students participate in hands-on learning workshops, laboratory, and field exercises, in addition to cultural and teambuilding activities.

Introduction

AgDiscovery is a free, two to four week program which targets middle and high school students. The Office of Civil Rights, Diversity, and Inclusion (OCRDI) provides administrative leadership over the AgDiscovery Program nationwide. Current key staff include: Mr. Kenneth Johnson, OCRDI Director, Ms. Sophia Kirby, OCRDI Deputy Director, and Ms. Tammy Lowry, AgDiscovery Program Manager, OCRDI. The program is facilitated by a host of presenters, including USDA professionals, university staff, veterinarians, scientists, as well as other experts in various agricultural and science industries. Each host university decides its program dates, the number of students to be selected for participation, and a specific area of discipline. The three categories of discipline include animal, agribusiness, and combination (animals and plants). Funding for the program is enabled through cooperative agreements, which covers the cost of dormitory housing at the respective college campuses, meals, laboratory, and activity fees, supplies, and local transportation for field trips taken during the camp session. The average cost for program funding is \$52,000. There is no cost for students to attend AgDiscovery, however, parents or guardians are responsible for any costs that may be associated with the child's travel to the university campus on opening day, and returning home at the conclusion of the program.

Background

AgDiscovery was implemented in 2002 as a pilot program with only one university partner, and in 2004, was established as a national program. AgDiscovery has expanded to 20 universities nationwide in 2016. Eleven AgDiscovery university partnerships are conducted at 1890 land-grant institutions, and six at 1862 institutions. Additionally, three new partnerships were formed

in 2016: Texas A&M University (an 1862 institution), Prairie View A&M University (an 1890 land-grant institution), and University of the Virgin Islands (a land-grant HBCU institution). AgDiscovery program objectives are to:

- Expose students to agricultural sciences through a series of workshops, labs, and field trips.
- Identify and recruit students to study agricultural sciences.
- Increase participants' awareness of career opportunities in APHIS.

The Application Process

Students are selected to participate via a competitive application process. Applications are reviewed and rated by panels at the partnering universities, and separately by APHIS headquarters personnel. The 2016 application period officially opened in December 2015. The final deadline for application submission was March 21, 2016. A total of 789 AgDiscovery applications were processed in 2016, and 296 students were selected for participation.

Conclusion

AgDiscovery remains a premier, student-focused outreach initiative in APHIS. Due to the level of interest received from various university officials, OCRDI anticipates further expansion of the program in the near future. Becoming a host university is a developmental process. The first step in the process is to request a meeting with the OCRDI Director, Mr. Kenneth Johnson. Secondly, a source of funding the program must be identified. A majority of funding is currently provided by APHIS programs, but universities may also contribute partial or full funding.

AUTHOR INDEX

- Adbodjan, Edoe 110
 Agenbroad, Ariel 56, 177
 Alston, Michael 255
 Ampim, Peter A. Y. 19
 Arancibia, Ramon 26
 Archibald, Thomas 103
 Artz, Georgeanne 65
 Bagley, Scott 228
 Bary, Andy 50
 Beck, John E. 29
 Benjamin, Joan 170
 Brooks, Helen 165
 Brownlee, Nelson 110
 Brumfield, Robin 73
 Catron, Locky 132
 Coffin, Donna 128
 Coleman, Ariel 243
 Colley, Micaela 237
 Collins, Douglas 50
 Comer, Marcus M. 1
 Cook, Chris 140, 209
 Cook, Natalie 103
 Crane, Laurence 110
 de Soto, Jose Fernandez 200
 DePhelps, Colette 135, 177
 Downing, Adam K. 1
 Durando, Michael 153
 Ebodaghe, Denis 215
 Ellis, Lance 56
 Essel, Albert 110
 Everhart, Sarah 124
 Fake, Cindy 94
 Feenstra, Gail 158
 Fernholz, Katie 228
 Fery, Melissa 84
 Fike, John H. 1, 232
 Fisher, Jeff C. 87
 Fisk, Connie 100
 Fraas, Wyatt 79, 100
 Frey, Gregory E. 1, 232
 Garrett, Amy 221
 Githinji, Leonard 46
 Green, Stanley 108
 Groot, Harry 228
 Gu, Sanjun 29
 Gyawali, Buddhi 35
 Hammond, Vaughn 79
 Hardesty, Shermain 143, 148, 158
 Harper, Jayson K. 90
 Harris, Molly W. 140
 Hartsfield, James 110
 Henwood, Kellie 186
 Hestvik, Sharon 255
 Hewlett, John P. 200
 Hodges, Steve 182
 Houston, Laurie 158
 Hyden, Heather 182
 Idowu, John 225
 Ingram, Roger 94
 Jackson, Tori Lee 198
 Jacobsen, Krista 179, 182
 Jaishanker, Priya 193
 Jaja, Ngowari 225
 James-Holly, Dawanna 77
 Jensen, Jennifer 56
 Jiang, Guo-Liang 14
 Joannides, Jan 158
 Jones, Jessica 79
 Jones, Wayne 56
 Karki, Uma 8
 Kelly-Begazo, Christine 61
 Kering, Maru 239, 243
 Kime, Lynn F. 90
 King, Robert P. 158
 Kirby Sophia L. 259
 Kline, Wesley L. 70
 Kristal, Dana 221
 Lamie, R. David 108
 Laufer, Laura 188
 Lawton, Billy 19
 Leff, Penny 143
 Lesoing, Gary 79, 100
 Lev, Larry 158
 Lewis, Laura R. 186, 237
 Liang, Kathleen 169
 Lobo, Ramiro E. 200
 Long, Wayne 120
 Love, Stephen 56
 Lowry, Tammy H. 259
 MacAuley, Lorien 103, 182
 Macon, Daniel 94
 Mark, Allyssa 103
 Matson, James 209
 Matteson, Gary 108
 Mayes, Iris 177
 McCammon, Tony 56
 McCauley, Lorien 103, 182
 Melendez, Meredith V. 70, 73
 Mentreddy, Srinivasa R. 215
 Mercier, Kelly 232
 Mishra, Bijesh 35
 Mize, Timothy A. 1
 Mohamed, Ali 215
 Moore, Joseph A. 29
 Moore, Kelly N. 61
 Mosely, Michelle 162
 Muck, James 94
 Mullins, Chris 14
 Munsell, John 193, 232
 Murray, Tanya 205
 N'Guessan, Yapo G. 115
 Naeve, Linda 65
 Nartea, Theresa 14, 162
 Nelson, Beth 173
 Newman, Soren 135,
 Niewolny, Kim 103, 182
 Noordijk, Heidi 221
 Nye, L. Tony 87
 Odeh, Oluwarotimi 115
 Okpebholo, Fidelis 115
 Parkinson, Stuart 56
 Perkins, Dan 170
 Perkins, Julie 173
 Powell, Maud 84
 Powers, William 100
 Raiford, John K. 14
 Ranells, Noah 188
 Rangarajan, Anu 41
 Ren, Shuxin 14
 Rice, Cynthia 35
 Riordan, Molly 41
 Rivers Jr., Louie 35
 Rutto, Laban K. 14, 239, 243
 Sarku, Enoch 188
 Sattanno, Kaylene 61
 Schlosser, Julia, 209
 Schnitzler, Griffin 255
 Scoggins, Holly 81
 Shaw, Jessica 209
 Siegle, Laura 81
 Simon, Marion 35
 Solano, Alexis 252
 Somerville, Cliff C. 14
 Sorensen, Emily 182
 Starkweather, Kathie 79
 Sullins, Martha 148
 Swisher, Marilyn E. 61
 Tanaka, Keiko 182
 Temu, Vitalis 239, 243
 Teutsch, Christopher D. 1, 232
 Velandia, Margarita 182
 Vossbrinck, Diana 108
 Vu, Tuong 50
 Wallace, Russ 19
 Weerasooriya, Aruna 19
 Williams, Cinda 135, 177
 Woodin, Adriene 248
 Wszelaki, Annette 182