2017 Urban and Small Farms Conference Program

Thursday February 23, 2017

	FSMA *Organized by:Karin Allen*	High Tunnels for Beginners *Organized by: Britney Hunter*	Strategy, Marketing, & Management *Organized by:Ruby Ward*
8:00 AM	**FSMA Overview** - Karin Allen, USU **pg. 178**	**Tunnel Types and How They Are Used** - Brent Black, USU **pg. 213**	**Small Changes for Big Profits: Understanding financial tools** - Ruby Ward, USU **pg. 251**
9:00 AM	**UDAF Resources and Approach** - Travis Waller **pg. 196**	**High Tunnel Site Selection Considerations** - Tiffany Maughan, USU **pg. 218**	
9:30 AM	**Food Safety Modernization Act (FSMA) Irrigation Aspects** - Niel Allen, USU **pg. 201**	**Unique Management Considerations** - Britney Hunter, USU **pg. 223**	**How to Use Tools to Make Decisions in Real Situations** - Luke Peterson and Ruby Ward **pg. 262**
10:00 AM	**BREAK**		
10:30 AM	**Aligning GAP and FSMA** - Shawn Olsen, USU Karin Allen, USU **pg. 208**	**Tunnel Designs and Northeastern Experiences** - Kathy Demchak, Penn State **pg. 233**	**Insights on Marketing Strategies in the Midwest** - Liz Maynard, Purdue University **pg. 269**
11:00 PM		**High Tunnel Information and Resources-** Britney Hunter, USU **pg. 247**	**How to Reach Potential Markets -** Panel of Potential Customers **pg. 271**
11:30 AM	**Summing Up and Q&A**	**Clicker Survey / Audience Feedback**	
Noon	**Lunch Break**		

2017 Urban and Small Farms Conference Program

Noon	**Lunch Break**		
	Government Agencies & Resources *Organized by:Ruby Ward*	**Stone Fruit Production** *moderated by:Teryl Roper*	**Management Cont.** Organized by: Ruby Ward
1:00 PM	**Whole Farm Revenue Protection** - Catharine Anderson, RMA **pg. 272**	**Introduction to Stone Fruit Production** Teryl Roper, USU **pg. 286**	**Lifestyle Branding: What can it do for you?** - Jen Wakeland **pg. 310**
1:30 PM	**Available Financial Resources for Small Farms -** Karli Salisbury, USU Allison Einerson and Summer Martin **pg. 276**	**Stone Fruit Production in Northern Utah -** Mike Pace, USU **pg. 292**	
2:00 PM	**UDAF - Utah's Own and Marketing -** Ryan Parkinson, Program Manager, Utah's Own **pg. 282**	**Stone Fruit Production in Southern Utah -** Rick Heflebower, USU **pg. 298**	**Creating a Customer Experience Through Branding -** Heber Valley Cheese **pg. 318**
2:30 PM	**BREAK**		
3:00 PM	**USDA - NRCS** Travis Mote **pg. 283**	**Training and Pruning Stone Fruit Systems and Practices** - Sheriden Hansen, USU **pg. 302**	**Using Market Reseach to Enhance Product Success** - Kynda Curtis, USU **pg. 319**
3:30 PM	**USDA-FSA: Loan programs for urban and small farms**- Steve Bartholomew, USDA **pg. 284**		
4:00 PM	**Rural Energy for American & Value added Producer Grants -** Barry Christensen, USDA **pg. 285**	**Stone Fruit Pests and IPM Practices -** Marion Murray, USU **pg. 309**	**Open Discussion About Small Farm Programs and Issues** **pg. 326**
4:30 PM		**Panel Discussion with All Speakers**	
5:00 PM			

FSMA Overview

Background Information:

Karin Allen
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Karin Allen is an Associate Professor in the Department of Nutrition, Dietetics and Food Sciences at Utah State University and serves as the Food Quality and Entrepreneurship Specialist for Cooperative Extension. Dr. Allen works with small food producers (both on and off the farm) to address food processing issues including labeling, safety, and regulatory compliance, as well as issues specific to agritourism and community supported agriculture operations.

Session Description:

A brief overview of the Produce Safety Rule and Human Food Rule portions of the Food Safety Modernization Act. This presentation will also focus on how to determine if your farm is exempt from some or all of the requirements under FSMA.

Overview of the Food Safety Modernization Act

Produce Safety and Preventive Controls Rules

Karin Allen, PhD
Food Quality & Entrepreneurship
EXTENSION UtahStateUniversity
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Background on FSMA

- Food Safety Modernization Act signed into law Jan. 4, 2011.
- Seven foundational rules
  - Preventive Controls for Human Food (Final rule Sept. 2015)
  - Preventive Controls for Food for Animals (Final rule Sept. 2015)
  - Foreign Supplier Verification (Final rule Nov. 2015)
  - Produce for Human Consumption (Final rule Nov. 2015)
  - Accreditation of Third-Party Auditors (Final rule Nov. 2015)
  - Mitigation Strategies Against Intentional Adulteration (Final rule May 2016)
  - Sanitary Transportation of Food (Final rule April 2016)

Rules Applicable to Farms

- Standards for the Growing, Harvesting, Packing, and Holding of Produce for Human Consumption ("Produce Safety Rule")
  - Addresses issues related to raw produce
- Current Good Manufacturing Practice and Hazard Analysis and Risk-Based Preventive Controls for Human Food ("Human Food Rule")
  - Provides updated definition of "Farm"
  - Addresses issues related to processing foods, including produce

Background on Human Food Rule

- FDA issued proposed rule on Jan. 16, 2013.
- FDA issued supplemental notice of proposed rulemaking on Sept. 29, 2014.
- Final comment period closed on December 15, 2014
  - About 9,300 submissions in response to both 2013 and 2014 documents

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Coverage of Human Food Rule

CGMPs apply to the manufacturing, processing, packing, and holding of food, except:

- Products subject to HACCP regulations (e.g. juice)
- Products subject to low-acid canning regulations
- Very small businesses
  - < $1M annually in total food sales plus the market value of food processed, packed, or held for a fee
- Farms and activities of farm mixed-type facilities that fall within the farm definition
- Certain defined low-risk activities conducted by small/very small businesses on farms

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"Farm" Definition

Primary Production Farm

- An operation under one management in one general, but not necessarily contiguous, physical location
- Devoted to the growing of crops, the harvesting of crops, the raising of animals, or any combination
- Pack or hold RACs (regardless of who grew or raised them)

Also provides definition of Secondary Farm and associated activities

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"Harvesting" Definition

- Cutting edible portion of RAC from plant
- Trimming part of RAC
- Other Examples:
  - Cooling, field coring, filtering, gathering, hulling, removing stems and husks, shelling, sifting, threshing, washing RACs
- Does not include anything that transforms RAC into a processed food or different commodity

Activities Not Covered under Farm Definition

- Manufacturing/processing that goes beyond activities within the farm definition
- Examples include:
  - Pitting dried plums, chopping herbs
  - Making snack chips from legumes
  - Roasting peanuts or tree nuts
- *However* – some of these activities may still be conducted by small businesses without triggering HARPC coverage
- Draft Guidance on FDA website "Classification of Activities as Harvesting, Packing, Holding, or Manufacturing/Processing for Farms" (August 2016)

Background on Produce Safety Rule

- FDA issued proposed rule on Jan. 16, 2013.
- FDA issued supplemental notice of proposed rulemaking on Sept. 29, 2014.
- Final comment period closed on December 15, 2014
  - About 36,000 submissions, including over 15,000 unique comments, in response to both 2013 and 2014 documents

New Regulations

- Agricultural water quality
- Biological soil amendments
- Domesticated and wild animals
- Worker training and health/hygiene
- Equipment, tools and buildings
- Sprout-specific regulations

We will be discussing many of these in more detail during the remainder of this session.

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Education, Outreach and Training

- Alliances
  - Produce Safety Alliance
  - Sprout Safety Alliance
  - Food Safety Preventive Controls Alliance
- FDA/USDA-NIFA Collaboration: National Food Safety Training, Education, Extension, Outreach, and Technical Assistance Program
- Training through Cooperative Agreements
- Utah Department of Agriculture and Food will take the lead to provide education and training, in partnership with USU Extension

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Coverage of Produce Safety Rule

Applies to all farms raising covered crops, except:

- Portion of crop that is "produce rarely consumed raw"

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Produce Rarely Consumed Raw

- Asparagus
- Some Beans
  - Black, Great Northern, Kidney, Lima, Navy, Pinto
- Beets/Sugar Beets
- Cashews
- Sour Cherries
- Chickpeas
- Cocoa/Coffee Beans
- Collards
- Sweet Corn
- Cranberries
- Dates
- Dill Seeds/Weed
- Eggplant
- Figs
- Ginger
- Hazelnuts
- Horseradish
- Lentils
- Okra
- Peanuts
- Pecans
- Peppermint
- Potatoes/Sweet Potatoes
- Pumpkins
- Winter Squash
- Water Chestnuts

Coverage of Produce Safety Rule

Applies to all farms raising covered crops, except:

- Portion of crop that is "produce rarely consumed raw"
- Produce for personal or on-farm consumption
- Produce intended for specific commercial processing to reduce pathogens
- Certain small farms
  - < $500k total food sales annually
  - Must be over half of sales made to local qualified end-users
- Very small farms
  - < $25k total produce sales annually

We would like to hold off on answering questions until after the other presentations.

We will revisit any remaining unanswered questions during the Q&A period at the end of this session.

Aligning GAP and FSMA

Shawn Olsen
Karin Allen

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GAPs – Good Agricultural Practices

- USDA program based on FDA's Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables
- Implemented in 2002
- Voluntary audits performed by USDA, State Departments of Agriculture, or other private companies
  - Many buyers may require GAP audits
- Overall food and worker safety requirements

GAP audits do not guarantee you are in compliance with FSMA!

FSMA – Food Safety Modernization Act

- FDA regulations that must be followed by produce growers
  - Some exemptions based on crops grown, farm size, and customer types
- "Produce Safety Rule" published in 2015
  - Standards for the Growing, Harvesting, Packing, and Holding of Produce for Human Consumption
- Mandatory inspections conducted by FDA or State Departments of Agriculture
- Specific regulations focused on microbial safety of food
  - Five major routes of contamination addressed
- Major emphasis is on evaluating/preventing risks and recordkeeping

Produce Safety Rule Focus Areas

- Worker Training and Health and Hygiene
- Agriculture Water (includes irrigation and postharvest water sources)
- Biological Soil Amendments
- Domesticated and Wild Animals
- Equipment, Tools, and Buildings

FSMA compliance does not guarantee you will pass a GAP audit!

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Worker Training and Health and Hygiene

FSMA

- FDA-accepted training for at least one food safety manager
  - One-time only
- Annual training for employees who contact produce
  - Must record name and date of attendees
- Appropriate training for all visitors and guests
  - Includes contractors, deliveries

GAP/GHP

- Designated food safety program manager
- Regular training for employees who handle produce, esp. before harvest time
- All employees and all visitors follow proper sanitation and hygiene practices

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Agricultural Water – Irrigation Sources

FSMA

- Development and Monitoring of MWQP
  - 20 samples within first 2-4 years to develop
  - 5 samples annually thereafter
- Maximum allowable levels of total *E. coli*
- Must monitor all sources of irrigation water

GAP/GHP

- Test at accredited lab for generic E. coli
- Test surface water at planting, peak use, and before harvest
- Test well water every 3 months
- Max levels similar to FSMA

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Agricultural Water – Postharvest Sources

FSMA

- Much stricter requirements than for irrigation water
- Any water sources during harvest or postharvest activities
  - Rinsing/washing
  - Cooling
  - Ice making
  - Postharvest fungicide or wax

GAP/GHP

- Potable (culinary) water must be used for rinsing, washing, cooling, ice making
- Water contact surfaces such as wash tanks are cleaned and sanitized
- Any water treatment (disinfectant) use is monitored

Biological Soil Amendments

FSMA

- Any fertilizers, etc. of animal origin
  - No human waste materials
- Must document that treatment is adequate
  - Testing not required if using an FDA validated method, must keep records of process
- Does not cover chemical soil amendments
- Raw manure requirements under review with USDA NOP

GAP/GHP

- Raw manure incorporated 120+ days before harvest
- Records of manure composting process, 131 F for 15 days, turned 5 times
- Record of manure testing
- Record of synthetic fertilizer usage

Domesticated and Wild Animals

FSMA

- Must monitor for evidence of wild life incursions
- Affected produce cannot be harvested and sold raw
  - Can be diverted to some other uses
- Monitoring and corrective action plan recommended
- Will domesticated animals come in contact with produce?

GAP/GHP

- Fields are monitored for signs of animals
- Measures taken to reduce opportunity for animals to enter fields
- Contaminated produce flagged for non-harvest
- Pest control, esp. rodents, in packing house very imp.

Equipment, Tools, and Buildings

FSMA

- Equipment and tools should be cleaned, and if possible, sanitized
- Buildings should prevent or minimize contact with pests or contamination
- Direct food-contact surfaces must be cleaned and sanitized
- Records must be kept

GAP/GHP

- Harvest containers and harvest tools should be kept clean and disinfected
- Light bulbs, glass should be protected from breakage
- Produce is covered during transportation
- Food contact surfaces are cleaned or sanitized

GAP requirements not included in FSMA

- Documented Farm Food Safety Plan
  - FSMA *recommends*, but does not require
- Designated food safety officer
  - But this person would ideally be the one attending the FDA-approved course
- Traceability records
  - Some on-farm food processing activities require traceability
- Pesticide residue testing
- Mock recall plan
- Farm Sewage treatment is done properly

Recommended additions to a GAP plan

The following activities can be added to an existing GAP plan over the next few years to move towards FSMA compliance

- Test 5 surface water samples per year, for total *E. coli* by EPA 1603
  - All water sources must be sampled individually, at the point most representative of their use
- Have one or more employees responsible for farm food safety attend Produce Safety Alliance training
- Develop a farm-specific food safety training program for employees
  - Generic plans can be used as a starting point
- Evaluate and document your current composting techniques against FDA requirements

KEY REQUIREMENTS:
Final Rule on Produce Safety

The FDA Food Safety Modernization Act (FSMA) Produce Safety rule is now final, and the earliest compliance dates for some farms begin one year after the effective date of the final rule (see "Compliance Dates" below). The rule establishes, for the first time, science-based minimum standards for the safe growing, harvesting, packing, and holding of fruits and vegetables grown for human consumption.

This rule was first proposed in January 2013. In response to input received during the comment period and during numerous public engagements that included public meetings, webinars, listening sessions, and visits to farms across the country, the FDA issued a supplemental notice of proposed rulemaking in September 2014. The proposed revisions were designed to make the originally proposed rule more practical, flexible, and effective.

The final rule is a combination of the original proposal and revisions outlined in the supplemental proposal, with additional changes as appropriate. The definition of "farm" and related terms were revised in the final Preventive Controls for Human Food rule, and the same definitions of those terms are used in this rule to establish produce safety standards. Operations whose only activities are within the farm definition are not required to register with FDA as food facilities and thus are not subject to the preventive controls regulations.

Below are summaries of some key requirements, compliance dates, and other information.

1. AGRICULTURAL WATER:

- **Water quality:** The final rule adopts the general approach to water quality proposed in the supplemental rule, with some changes. The final rule establishes two sets of criteria for microbial water quality, both of which are based on the presence of generic *E. coli*, which can indicate the presence of fecal contamination.
  - No detectable generic *E. coli* are allowed for certain uses of agricultural water in which it is reasonably likely that potentially dangerous microbes, if present, would be transferred to produce through direct or indirect contact. Examples include water used for washing hands during and after harvest, water used on food-contact surfaces, water used to directly contact produce (including to make ice) during or after harvest, and water used for sprout irrigation. The rule establishes that such water use must be immediately discontinued and corrective actions taken before re-use for any of these purposes if generic *E. coli* is detected. The rule prohibits use of untreated surface water for any of these purposes.
  - The second set of numerical criteria is for agricultural water that is directly applied to growing produce (other than sprouts). The criteria are based on two values, the geometric mean (GM) and the statistical threshold (STV). The GM of samples is 126 or less CFU of generic *E.coli* per 100 mL of water and the STV of samples is 410 CFU or less of generic *E.coli* in 100 mL of water.
    - The GM is an average, and therefore represents what is called the central tendency of the water quality (essentially, the average amount of generic *E. coli* in a water source).
    - STV reflects the amount of variability in the water quality (indicating *E. coli* levels when adverse conditions come into play—like rainfall or a high river stage that can wash waste into rivers and canals). Although this is an over simplification, it can be described as the level at which 90 percent of the samples are below the value.

- The FDA is exploring the development of an online tool that farms can use to input their water sample data and calculate these values.
- These criteria account for variability in the data and allow for occasional high readings of generic *E.coli* in appropriate context, making it much less likely (as compared to the originally proposed criteria for this water use) that a farm will have to discontinue use of its water source due to small fluctuations in water quality.
- These criteria are intended as a water management tool for use in understanding the microbial quality of agricultural water over time and determining a long-term strategy for use of water sources during growing produce other than sprouts.

- If the water does not meet these criteria, corrective actions are required as soon as is practicable, but no later than the following year. Farmers with agricultural water that does not initially meet the microbial criteria have additional flexibility by which they can meet the criteria and then be able to use the water on their crops. These options include, for example:
  - Allowing time for potentially dangerous microbes to die off on the field by using a certain time interval between last irrigation and harvest, but no more than four consecutive days.
  - Allowing time for potentially dangerous microbes to die off between harvest and end of storage, or to be removed during commercial activities such as washing, within appropriate limits.
  - Treating the water.

■ **Testing:** The final rule adopts the general approach to testing untreated water used for certain purposes proposed in the supplemental notice, with some changes. The rule still bases testing frequency on the type of water source (i.e. surface or ground water).

- In testing untreated surface water—considered the most vulnerable to external influences—that is directly applied to growing produce (other than sprouts), the FDA requires farms to do an initial survey, using a minimum of 20 samples, collected as close as is practicable to harvest over the course of two to four years. The initial survey findings are used to calculate the GM and STV (these two figures are referred to as the "microbial water quality profile") and determine if the water meets the required microbial quality criteria.
  - After the initial survey has been conducted, an annual survey of a minimum of five samples per year is required to update the calculations of GM and STV.
  - The five new samples, plus the previous most recent 15 samples, create a rolling dataset of 20 samples for use in confirming that that the water is still used appropriately by recalculating the GM and STV.
- For untreated ground water that is directly applied to growing produce (other than sprouts), the FDA requires farms to do an initial survey, using a minimum of four samples, collected as close as is practicable to harvest, during the growing season or over a period of one year. The initial survey findings are used to calculate the GM and STV and determine if the water meets the required microbial quality criteria.
  - After the initial survey has been conducted, an annual survey of a minimum of one sample per year is required to update the calculations of GM and STV.
  - The new sample, plus the previous most recent three samples, create a rolling dataset of four samples for use in confirming that that the water is still used appropriately by recalculating the GM and STV.
- For untreated ground water that is used for the purposes for which no detectable generic *E. coli* is allowed, the FDA requires farms to initially test the untreated ground water at least four times during the growing season or over a period of one year. Farms must determine whether the water can be used for that purpose based on these results.
  - If the four initial sample results meet the no detectable generic E. coli criterion, testing can be done once annually thereafter, using a minimum of one sample. Farms must resume testing at least four times per growing season or year if any annual test fails to meet the microbial quality criterion.
- There is no requirement to test agricultural water that is received from public water systems or supplies that meet requirements

established in the rule (provided that the farm has Public Water System results or certificates of compliance demonstrating that the water meets relevant requirements), or if the water is treated in compliance with the rule's treatment requirements.

2. BIOLOGICAL SOIL AMENDMENTS:

- **Raw Manure:** The FDA is conducting a risk assessment and extensive research on the number of days needed between the applications of raw manure as a soil amendment and harvesting to minimize the risk of contamination. (A soil amendment is a material, including manure, that is intentionally added to the soil to improve its chemical or physical condition for growing plants or to improve its capacity to hold water.)
  - At this time, the FDA does not object to farmers complying with the USDA's National Organic Program standards, which call for a 120-day interval between the application of raw manure for crops in contact with the soil and 90 days for crops not in contact with the soil. The agency considers adherence to these standards a prudent step toward minimizing the likelihood of contamination while its risk assessment and research is ongoing.
  - The final rule requires that untreated biological soil amendments of animal origin, such as raw manure, must be applied in a manner that does not contact covered produce during application and minimizes the potential for contact with covered prdouce after application.
- **Stabilized Compost:** Microbial standards that set limits on detectable amounts of bacteria (including *Listeria monocytogenes*, *Salmonella* spp., fecal coliforms, and *E. coli* 0157:H7) have been established for processes used to treat biological soil amendments, including manure. The rule includes two examples of scientifically valid composting methods that meet those standards. Stabilized compost prepared using either of these methods must be applied in a manner that minimizes the potential for contact with produce during and after application.

3. SPROUTS

- The final rule includes new requirements to help prevent the contamination of sprouts, which have been frequently associated with foodborne illness outbreaks. Sprouts are especially vulnerable to dangerous microbes because of the warm, moist and nutrient-rich conditions needed to grow them.
  - Between 1996 and 2014, there were 43 outbreaks, 2,405 illnesses, and 171 hospitalizations, and 3 deaths associated with sprouts, including the first documented outbreak of Listeria monocytogenes associated with sprouts in the United States.
- Requirements specific to sprouts include, for example:
  - Taking measures to prevent the introduction of dangerous microbes into or onto seeds or beans used for sprouting, in addition to treating seeds or beans that will be used for sprouting (or relying on prior treatment by the seed/bean grower, distributor, or supplier with appropriate documentation).
  - Testing of spent sprout irrigation water from each production batch of sprouts, or in-process sprouts from each production batch, for certain pathogens. Sprouts cannot be allowed to enter commerce until it is ascertained that these required pathogen test results are negative.
  - Testing the growing, harvesting, packing and holding environment for the presence of *Listeria* species or *Listeria monocytogenes*.
  - Taking corrective actions if spent sprout irrigation water, sprouts, and/or an environmental sample tests positive.
- Sprout operations will have less time to come into compliance with the rule than farms growing other produce. They will have one to three years to comply based on the size of their operation, with no additional time to meet the water requirements.

4. DOMESTICATED AND WILD ANIMALS

- The rule addresses concerns about the feasibility of compliance for farms that rely on grazing animals (such as livestock) or working animals for various purposes. It establishes the same standards for these animals as it does for intrusion by wild animals (such as deer or feral swine). Farmers are required to take all measures reasonably necessary to identify and not harvest produce that is likely to be contaminated.
  - At a minimum, this requires all covered farms to visually examine the growing area and all covered produce to be harvested, regardless of the harvest method used.
  - In addition, under certain circumstances the rule requires farms to do additional assessment during the growing season, and if significant evidence of potential contamination by animals is found, to take measures reasonably necessary to assist later during harvest. Such measures might include, for example, placing flags outlining the affected area.

- Although the final rule does not require establishing waiting periods between grazing and harvest, the FDA encourages farmers to voluntarily consider applying such intervals as appropriate for the farm's commodities and practices. The agency will consider providing guidance on this practice in the future, as needed.

- As was stated in the supplemental notice, farms are not required to exclude animals from outdoor growing areas, destroy animal habitat, or clear borders around growing or drainage areas. Nothing in the rule should be interpreted as requiring or encouraging such actions.

5. WORKER TRAINING AND HEALTH AND HYGIENE

- Requirements for health and hygiene include:
  - Taking measures to prevent contamination of produce and food-contact surfaces by ill or infected persons, for example, instructing personnel to notify their supervisors if they may have a health condition that may result in contamination of covered produce or food contact surfaces.
  - Using hygienic practices when handling (contacting) covered produce or food-contact surfaces, for example, washing and drying hands thoroughly at certain times such as after using the toilet.
  - Taking measures to prevent visitors from contaminating covered produce and/or food-contact surfaces, for example, by making toilet and hand-washing facilities accessible to visitors.

- Farm workers who handle covered produce and/or food-contact surfaces, and their supervisors, must be trained on certain topics, including the importance of health and hygiene.

- Farm workers who handle covered produce and/or food contact surfaces, and their supervisors, are also required to have a combination of training, education and experience necessary to perform their assigned responsibilities. This could include training (such as training provided on the job), in combination with education, or experience (e.g., work experience related to current assigned duties).

6. EQUIPMENT, TOOLS AND BUILDINGS

- The rule establishes standards related to equipment, tools and buildings to prevent these sources, and inadequate sanitation, from contaminating produce. This section of the rule covers, for example, greenhouses, germination chambers, and other such structures, as well as toilet and hand-washing facilities.
  - Required measures to prevent contamination of covered produce and food contact surfaces include, for example, appropriate storage, maintenance and cleaning of equipment and tools.

EXEMPTIONS

The rule does not apply to:

- Produce that is not a raw agricultural commodity. (A raw agricultural commodity is any food in its raw or natural state)

- The following produce commodities that FDA has identified as rarely consumed raw: asparagus; black beans, great Northern beans, kidney beans, lima beans, navy beans, and pinto beans; garden beets

(roots and tops) and sugar beets; cashews; sour cherries; chickpeas; cocoa beans; coffee beans; collards; sweet corn; cranberries; dates; dill (seeds and weed); eggplants; figs; horseradish; hazelnuts; lentils; okra; peanuts; pecans; peppermint;potatoes; pumpkins; winter squash; sweet potatoes; and water chestnuts

- Food grains, including barley, dent- or flint-corn, sorghum, oats, rice, rye, wheat, amaranth, quinoa, buckwheat, and oilseeds (e.g. cotton seed, flax seed, rapeseed, soybean, and sunflower seed)

- Produce that is used for personal or on-farm consumption.

- Farms that have an average annual value of produce sold during the previous three-year period of $25,000 or less.

The rule provides an exemption for produce that receives commercial processing that adequately reduces the presence of microorganisms of public health significance, under certain conditions.

The rule also provides a qualified exemption and modified requirements for certain farms.

- To be eligible for a qualified exemption, the farm must meet two requirements:
  - The farm must have food sales averaging less than $500,000 per year during the previous three years; and
  - The farm's sales to qualified end-users must exceed sales to all others combined during the previous three years. A qualified end-user is either (a) the consumer of the food or (b) a restaurant or retail food establishment that is located in the same state or the same Indian reservation as the farm or not more than 275 miles away.

- A farm with the qualified exemption must still meet certain modified requirements, including disclosing the name and the complete business address of the farm where the produce was grown either on the label of the produce or at the point of purchase. These farms are also required to establish and keep certain documentation.

- A farm's qualified exemption may be withdrawn as follows:
  - If there is an active investigation of an outbreak of foodborne illness that is directly linked to the farm, or
  - If FDA determines it is necessary to protect the public health and prevent or mitigate an outbreak based on conduct or conditions associated with the farm that are material to the safety of the farm's produce that would be covered by the rule.

- Before FDA issues an order to withdraw a qualified exemption, the agency:
  - May consider one or more other actions to protect public health, including a warning letter, recall, administrative detention, refusal of food offered for import, seizure and injunction.
  - Must notify the owner, operator, or agent in charge of the farm, in writing, of the circumstances that may lead FDA to withdraw the exemption, provide an opportunity for response within 15 calendar days of receipt of the notification, and consider actions taken by the farm to address the issues raised by the agency.

- A withdrawn exemption may be reinstated if (as applicable):
  - The FDA determines that the outbreak was not directly linked to the farm, and/or
  - The FDA determines that the problems with conduct or conditions material to the safety of the food produced or harvested at the farm have been adequately resolved, and continued withdrawal of the exemption is not necessary to protect public health or prevent or mitigate an outbreak of foodborne illness.

VARIANCES

The rule also permits states, tribes, or foreign countries from which food is imported into the U.S. to submit a petition, along with supporting information, to FDA requesting a variance(s) from one or more of the requirements of this rule.

- The rule enables a state, tribe, or country, if it concludes that meeting one or more of the rule's requirements would be problematic in light of local growing conditions, to request variances to those

requirements. The state, tribe, or foreign country must demonstrate that the requested variance is reasonably likely to ensure that the produce is not adulterated and provides the same level of public health protection as the corresponding requirement(s) in the rule.

- The final rule makes it clear that federally recognized tribes may submit a variance petition.
- The request for a variance must be submitted by a competent authority, meaning a person or organization that is the regulatory authority for food safety for the state, tribe, or foreign country.
- A foreign government does not need to have a systems recognition arrangement or equivalence agreement with the FDA to obtain a variance.
- The variance request must include relevant and scientifically valid information specific to the produce or activity. Information could relate to crops, climate, soil, geography or environment, as well as the practices of that particular region.
- Examples of types of variances that may be granted include a variance from the agricultural water microbial quality criteria for water used during growing covered produce (other than sprouts) using a direct water application method, a variance from the microbial die-off rate used to determine the time interval between the last irrigation and harvest and/or the accompanying maximum time interval; and a variance from the approach or frequency for water testing for water uses subject to the rule's microbial quality criteria.

COMPLIANCE DATES

Compliance dates for covered activities, except for those involving sprouts, after the effective date of the final rule are:

- Very small businesses, those with more than $25,000 but no more than $250,000 in average annual produce sales during the previous three year period: four years.
- Small businesses, those with more than $250,000 but no more than $500,000 in average annual produce sales during the previous three year period: three years.
- All other farms: two years.
- The compliance dates for certain aspects of the water quality standards, and related testing and recordkeeping provisions, allow an additional two years beyond each of these compliance dates for the rest of the final rule.

Compliance dates for modified requirements for farms eligible for a qualified exemption are:

- For labeling requirement (if applicable): January 1, 2020.
- For retention of records supporting eligibility for a qualified exemption: Effective date of the final rule.
- For all other modified requirements:
  - Very small businesses, four years after the effective date of the final rule.
  - Small businesses, three years after the effective date of the final rule.

Compliance dates for covered activities involving sprouts after the effective date of the final rule are:

- Very small businesses: three years
- Small businesses: two years
- All other farms: one year

ENVIRONMENTAL IMPACT STATEMENT

The FDA has also released the Final Environmental Impact Statement (EIS), which places the Produce Safety rule in the context of its likely impact on the environment, including human health and socioeconomic effects. The Draft EIS was published in January 2015. The FDA considered public comments submitted in the two months that followed in drafting the Final EIS. The FDA considered the findings of the Final EIS in finalizing the produce rule.

- The EIS evaluated actions that FDA proposed in the original and supplemental rules, as well as a number of alternative actions for each of the provisions identified as having the potential to result in significant environmental impacts. The provisions of the final rule represent FDA's preferred alternatives, which are detailed in a Record of Decision (ROD). The ROD addresses how the EIS findings were incorporated into decisions about the final rule. The agency's preferred alternatives are those that the FDA believes best fulfill the agency's statutory mission and responsibility, giving consideration to economic, environmental, technical and other factors.

- A significant beneficial impact on public health is expected due to the anticipated decrease in the number of illnesses tied to produce contamination.

- As in the Draft EIS, the Final EIS notes that any produce regulation that causes a farmer to use ground water instead of surface water could exacerbate existing groundwater shortages, although added flexibility in the water provisions make such a management decision unlikely.

- The Final EIS also concludes that Native American farmers may be disproportionately affected by any increases in operating costs necessitated by the produce rule since their average income is 30 percent less than that of other farmers.

ASSISTANCE TO INDUSTRY

The FDA is developing several guidance documents on subjects that include:

- General guidance on implementation and compliance

- A Small Entity Compliance Guide that explains the actions a small or very small business must take to comply with the rule.

- Other documents, including guidance on sprouts, are being considered and prioritized.

Plans for training and technical assistance are well under way. They include:

- Establishing the FDA FSMA Food Safety Technical Assistance Network, already operational, to provide a central source of information to support industry understanding and implementation of FSMA.

- The FDA is developing a comprehensive training strategy that includes collaboration with:
  - The Produce Safety Alliance;
  - The Sprout Safety Alliance;
  - The National Institute of Food and Agriculture in the U.S. Department of Agriculture (to administer a grant program to provide food safety training, education and technical assistance to small and mid-size farms and small food processors, beginning farmers, socially disadvantaged farmers, and small produce merchant wholesalers); and
  - Cooperative agreement partners (to develop training programs for sustainable agriculture and tribal operations).

- The FDA also plans to work with cooperative extension units, land grant universities, trade associations, foreign partners, the Joint Institute for Food Safety and Applied Nutrition (JIFSAN), and other stakeholders to develop a network of institutions that can provide technical assistance to the farming community, especially small and very small farms.

- FDA has entered into a cooperative agreement with National Association of State Departments of Agriculture (NASDA) to help with the implementation of the produce safety regulations.

MORE INFORMATION

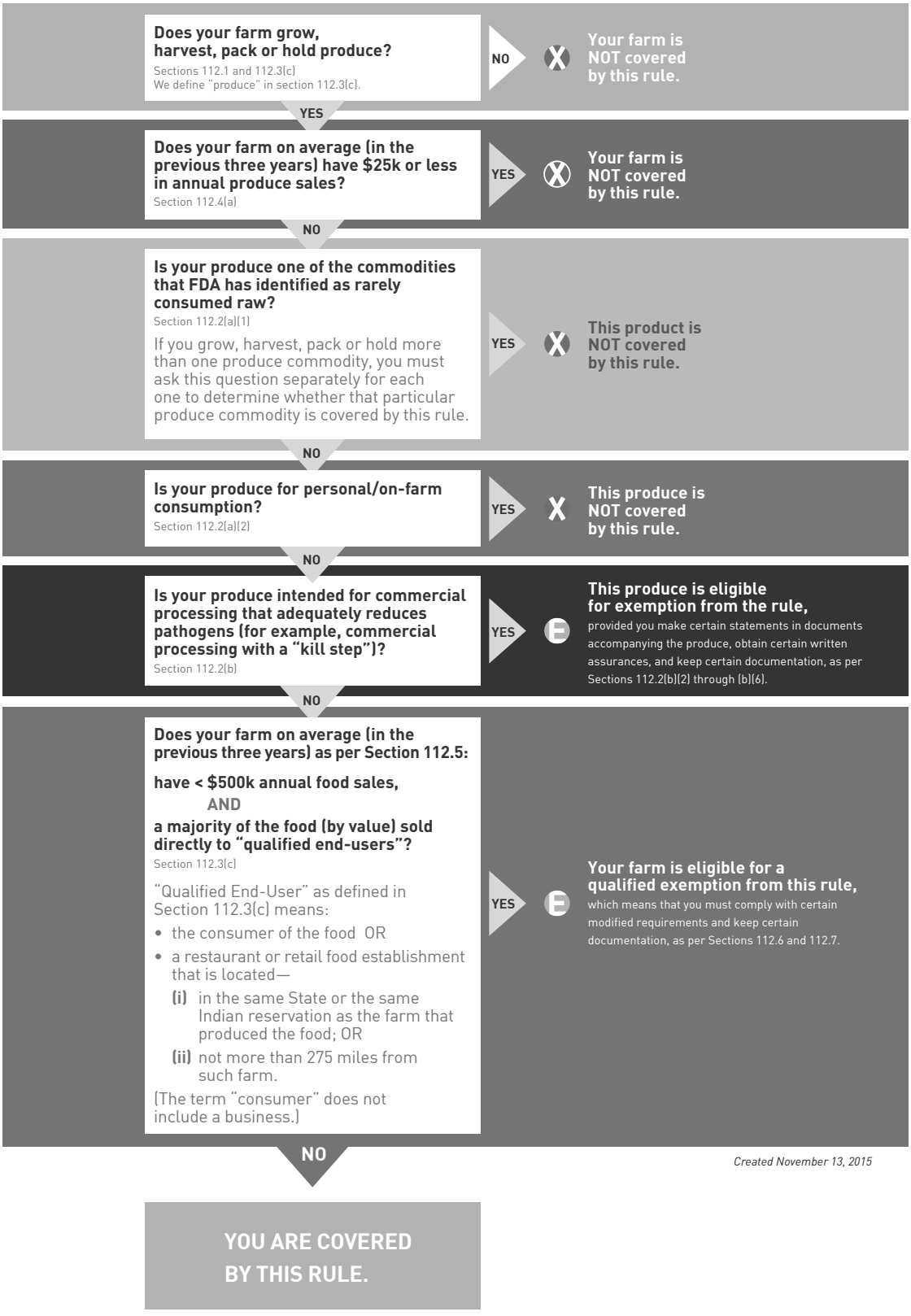
Visit http://www.regulations.gov/

FDA's Food Safety Modernization Act page at www.fda.gov/FSMA

STANDARDS FOR PRODUCE SAFETY

Coverage and Exemptions/Exclusions for 21 PART 112

The Preventive Controls for Human Food rule clarified the definition of a farm to cover two types of farm operations, primary production farms and secondary activities farms. The same definition is used in the Produce Safety rule (section 112.3(c)). Below are basic criteria that determine whether an operation that meets the definition of "farm" is subject to the produce rule.



Created November 13, 2015

UDAF Resources and Approach

Background Information:
Travis Waller
Utah Department of Agriculture and Food
twaller@utah.gov

Approaching the 3 year anniversary as being the director of the division of regulatory services at the UDAF. Prior to this, I worked in the private sector 9 years as the director of food safety and environmental affairs for Associated Food Stores. 4 years at the UDAF as a food and dairy compliance officer; 2 years as a research scientist at the USDA Western Cotton Research Laboratory in Phoenix Arizona. Graduated from ASU Tempe, AZ., with a BS degree in Biological Science.

Session Description:

Overview of the provisions of the PSR; UDAF's role - FDA PSR Grantee: UDAF's perspective on the rule.

Travis Waller
Director of Regulatory Services
Utah Department of Agriculture and Food

FSMA – PRODUCE SAFETY RULE

PRODUCE SAFETY RULE

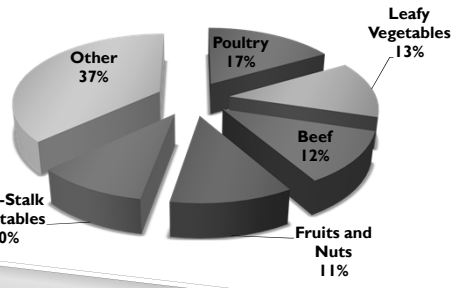
- Background Info
- Provisions of the Rule
  - Agricultural Water
  - Biological Soil Amendments
  - Sprouts
  - Domesticated and Wild Animals
  - Worker Training and Health and Hygiene
  - Equipment, Tools and Buildings
  - Exemptions
  - Compliance Dates
- UDAF Strategic Plan
- Produce Safety Alliance

BACKGROUND INFORMATION

- About 48 million people (1 in 6 Americans) get sick, 128,000 are hospitalized, and 3,000 die each year from foodborne diseases, according to recent data from the Centers for Disease Control and Prevention. This is a significant public health burden that is largely preventable.
- The food safety law (FSMA) passed by Congress on December 21, 2010 aims to ensure the U.S. food supply is safe by shifting the focus of federal regulators from responding to contamination to preventing it.

FOODS LINKED TO OUTBREAK-ASSOCIATED ILLNESSES, 1998 - 2008

(Other includes: Dairy, Pork, Fish, Eggs, Mollusks, Grains and Beans, Root Vegetables, Crustaceans, Sprouts, Oils and Sugars, Game, and Fungus)



CDC. Surveillance for Foodborne Disease Outbreaks – United States, 1998-2008. MMWR 2013;62(No. SS-2).

2014 CDC FBI SURVEILLANCE

Commodity	Etiology	Outbreaks	Illness	Hospitalized	Deaths
Seeded Vegetables	Salmonella	5	357	68	1
Fruit	Lm	2	37	36	8
Sprouts	Salmonella	1	115	19	0
Vegetables – Row Crops	STEC	6	105	18	0

Surveillance for Foodborne Disease Outbreaks United States, 2014: Annual Report

PROVISIONS OF THE PRODUCE SAFETY RULE (PSR)

- Agricultural Water
- Biological Soil Amendments
- Sprouts
- Domesticated and Wild Animals
- Worker Training and Health and Hygiene
- Equipment, Tools and Buildings
- Exemptions
- Compliance Dates

AGRICULTURAL WATER – TWO SETS OF CRITERIA

Operational Water

- No detectable generic E. coli are allowed:
- Washing hands
- Washing equipment
- Direct contact with produce
- Ice
- Sprout irrigation

Irrigation – based upon two values

- Geometric mean (GM) – 126 or less CFU generic *E. coli* per 100 ml of water (central tendency)

and

- Statistical threshold (STV) – 410 CFU or less of generic *E. coli* in 100 ml of water (variability)

AGRICULTURAL WATER

- UDAF to sub grant with USU to survey agricultural water
- Identify troublesome water sources and seek mitigation strategies.

BIOLOGICAL SOIL AMENDMENTS

Raw Manure

- USDA's National Organic Program Standards
- 120 day interval between the application for crops in contact with the soil

and

- 90 day for crops not in contact with the soil.

Stabilized Composts

- The rule includes two examples of scientifically valid composting methods that meet those standards. Stabilized compost prepared using either of these methods must be applied in a manner that minimizes the potential for contact with produce during and after application.

SPROUTS

- Prevent introduction of pathogens onto seeds or beans
- Testing spent irrigation water from each batch – test, hold ship.
- Testing the growing, harvesting, packing and holding environment for Lm
- Taking corrective actions when problems are detected.
- Documentation

- Academia and regulatory will work with sprouters to develop practical, doable measures

DOMESTIC AND WILD ANIMALS

- Farmers are required to take all measures reasonably necessary to identify and not harvest produce that is likely to be contaminated.
- Visually examine the growing area and all covered produce to be harvested, regardless of the harvest method used.
- Quarantine effected areas and do not harvest

- UDAF has a wildlife mitigation division who can help with not all, but some intrusive species (Federal/State Program)

WORKER TRAINING / HEALTH AND HYGIENE

- Exclude ill workers
- Toilets & Hand washing
- Training of employees
- Basic knowledge of food safety specific to the commodity being handled. ..training, policies, procedures.

- Educate before we regulate.

EQUIPMENT, TOOLS AND BUILDINGS

- Required measures to prevent contamination of covered produce and food contact surfaces include, for example, appropriate storage, maintenance and cleaning of equipment and tools.

PRODUCE SAFETY RULE EXEMPTIONS

- Produce that is not a raw agricultural commodity. (A raw agricultural commodity is any food in its raw or natural state). **Produce that will receive further processing.**
- The following produce commodities that FDA has identified as rarely consumed raw: asparagus; black beans, great Northern beans, kidney beans, lima beans, navy beans, and pinto beans; garden beets
- (roots and tops) and sugar beets; cashews; sour cherries; chickpeas; cocoa beans; coffee beans; collards; sweet corn; cranberries; dates; dill (seeds and weed); eggplants; figs; horseradish; hazelnuts; lentils; okra; peanuts; pecans; peppermint; potatoes; pumpkins; winter squash; sweet potatoes; and water chestnuts

EXEMPTIONS CONTINUED

- Food grains, including barley, dent- or flint-corn, sorghum, oats, rice, rye, wheat, amaranth, quinoa, buckwheat, and oilseeds (e.g. cotton seed, flax seed, rapeseed, soybean, and sunflower seed)
- Produce that is used for personal or on-farm consumption.
- Farms that have an average annual value of produce sold during the previous three-year period of $25,000 or less.

COMPLIANCE DATES

- Very small businesses, those with more than $25,000 but no more than $250,000 in average annual produce sales during the previous three year period: four years.
- Small businesses, those with more than $250,000 but no more than $500,000 in average annual produce sales during the previous three year period: three years.
- All other farms: two years.
- The compliance dates for certain aspects of the water quality standards, and related testing and recordkeeping provisions, allow an additional two years beyond each of these compliance dates for the rest of the final rule.

UDAF - STRATEGIC PLAN

- UDAF awarded $3.6 million grant to develop and implement Produce Safety.
- Year 1 - 3
  - Hire a Produce Safety Coordinator.
  - Development farm inventory.
  - Compliance training and certification of both producers and inspectors.
  - Sub award USU to hire a FSMA / Certified PSA Trainer (on farm training).
  - Sub award USU to continue conducting agricultural water survey.
  - Create an advisory group which will consist of regulatory, academia and industry stakeholders. Group will help with setting priorities and identifying areas of need.

STRATEGIC PLAN - CONTINUED

- Year 3-5
  - Regional Produce Safety Alliance (District)
  - FDA looking at mobile App – inspection, inventory, replace eSAF
  - Develop and implement regulatory standards
  - Inspector training and standardization
  - Credentialing – Safeguarding producer information from records request
    - FDA
    - NASDA
    - PSA
    - National Consortium on Produce Safety

GAP VS. PSA TRAINING

- GAP will give you the framework and tools needed towards being in compliance
- UDAF has both a GAP Certification and auditing program

- PSA Training will give you insight into what an FDA inspection will entail
- USU will be conducting PSA Training.
- Regulatory inspectors are required to take the PSA Training….hopefully along side Utah produce growers, so that everyone is on the same page.

FINAL WORDS

- GAP will definitely help you towards being in compliance
- PSA on Farm Training will enhance and further legitimize efforts
- FDA recognizes that state involvement is critical to implementation
- In conjunction with USU, UDAF's goal is to be a trusted resource to all Utah Produce Growers

- Our end goal is to educate before we regulate.

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Food Safety Modernization Act (FSMA) Irrigation Aspects

Background Information:

Niel Allen
Utah State University Extension
CEE Department, UMC 4110
Logan, Utah 84322
n.allen@usu.edu

Extension Irrigation Specialist Utah State University, Dr. Allen provides assistance to irrigation water users in Utah.

Session Description:

The presentation provides information on sampling and testing of irrigation water for E. coli, along with the results of about 300 water samples analyzed in northern Utah irrigation systems.

Food Safety Modernization Act (FSMA) Irrigation Aspects

Presented by L. Niel Allen, Extension Irrigation Specialist. Collaborators: Brent Black, Dan Drost, Karin Allen, Shawn Olsen, James Barnhill, Michael Pace, Diane Alston, Taun Beddes, Nancy Mesner and others

February 23, 2017

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Need for Research and Outreach

- Envision Utah survey concerning agriculture (Envision Utah, 2015).
  1. Dramatically increase production of fruits, vegetables, and dairy products in Utah.
  2. Increase Utah's production of grains and proteins to keep up with Utah's population growth.
  3. Improve Utah's food self-sufficiency.
  4. Improve Utahan's' access to healthy, locally grown food.
  5. Strengthen Utah's agricultural economy.
- Food Safety Modernization Act is complicated, expensive to implement and could impede the Utah's agriculture vision.

The Law - Food Safety Modernization Act

I didn't really print all 940 pages of the FSMA and the FSMA EIS

These Acronyms are from the first few pages

Part of the Food Safety Modernization Act

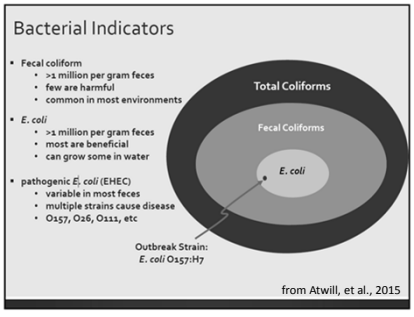
- **Federal Register** / Vol. 80, No. 228 / Friday, November 27, 2015 / Rules and Regulations – Part III
  - Department of Health and Human Services
  - Food and Drug Administration
  - 21 CFR Parts 11, 16, and 112
- Standards for the Growing, Harvesting, Packing, and Holding of Produce for Human Consumption; Final Rule
- The document is 217 pages and over 235,000 words.
- The Final EIS is 723 pages.
- Plus new documents and update coming out periodically

Produce covered under the rule are generally eaten raw, or do not get exposed to a 'kill-step' during further processing.

Produce grown in Utah may include: apples, apricots, blackberries, blueberries, broccoli, cabbage, **cantaloupe**, carrots, cauliflower, celery, cherries, cucumbers, endive, garlic, grapes, green beans, herbs (e.g. basil, chives, cilantro, mint, oregano, and parsley), honeydew and other melons, **lettuce**, mushrooms, nectarine, onions, peaches, pears, peas, peppers (bell and hot), plums, plumcot, radish, raspberries, red currant, scallions, snow peas, **spinach**, sprouts, strawberries, summer squash (e.g. patty pan, yellow and zucchini), tomatoes, walnuts, watercress and watermelon.

Relative Perspective of Bacterial Indicators

The determination is only an indicator.



from Atwill, et al., 2015

General E. Coli Criteria

- ***Water Used in Post Harvest Processing –*** No E. coli
- ***Irrigation Water*** **-** Geometric mean (GM) 126 or less CFU of generic *E. coli* per 100 mL of water and statistical threshold (STV) of samples must be 410 CFU or less of generic E. coli in 100 mL of water.
- ***Surface water source*** - Initial survey of ≥20 samples near harvest over 2 to 4 years, calculate GM and STV, then ≥5 samples/year thereafter.
- ***Groundwater source*** - Initial survey of ≥4 samples near harvest over 1 year, calculate GM and STV, then ≥1 samples/year thereafter.
- **Public Water Supply** - No testing is required if **compliant** public water system water is used for irrigation.

The Standard E. Coli statistics

- Geometric Mean
  - It is the *n*th root of the product of *n* numbers. That means you multiply a bunch of numbers together, and then take the *n*th root, where *n* is the number of values you just multiplied.
  - Example: $\sqrt[3]{2 * 8 * 4} = 4$
- Statistical threshold (STV)
  - Calculate the STV using this formula.
  - log(STV) = avg.(log values) + 1.282 ∗ std.(log values)
  - Or download spreadsheet http://wcfs.ucdavis.edu/

Remedies if E. coli Limits are Exceeded

- Allowing time for potentially dangerous microbes to die off on the field by using a certain time interval between last irrigation and harvest, but no more than **four consecutive days**. The use of the microbial die-off rate of 0.5 log per day between last irrigation and harvest is limited to four consecutive days. Example (if day 1 is 1000 CFU per 100 ml, day 2 drops 300 CFU, day 3 drops to 90 CFU, day 4 drops to 27 CFU).
- Allowing time for potentially dangerous microbes to die off between harvest and end of storage, or to be removed during commercial activities such as washing, within appropriate limits.
- Treating the irrigation water prior to harvest.

Sampling (bottle goes in opening down, then is turned over under water, and then brought up)

Taun would not wade the canal for front view pictures

Procedures

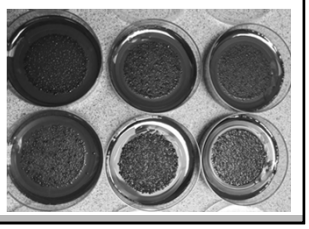
- After obtaining the sample keep sample cool until it can be processed. Cooler with ice packs then refrigerate (below 8° C).
- Process same day, 8 hour time frame from sampling.
- We processed almost 300 samples using various methods.
- Generally in the food industry – The standard is no E. coli which is much easier to determine than to count E. coli.

Testing for E. coli

- Objective is to determine number of colony forming E. coli in 100 ml of irrigation water.
- Direct Count (limited by how much water can be applied to growth media
  - Dilution for very high numbers of E. coli (no applicable for suitable ranges of E. coli)
  - Filtration for low number of E. coli (most suitable for FSMA standards
- Incubation at 35 degree Centigrade (95° F).

Testing of E. coli (direct count)

- Membrane Filtration (Miller Labs and MiChem Analytical Laboratory Inc. Ogden, Utah)
  - mTEC (EPA Method 1603, 2006) 42 page document of procedures, includes a list of 32 items to conduct the test **(FSMA Approved)**
  - Modified mTEC®
  - m-ColiBlue24®
- Petrifilm ® (3M product)
- Most Probable Number
  - Quanti-Tray®
  - Multiple tube test



E. Coli (Most Probable Number methods)

- Colilert Method (IDEXX)
  - Quanti-Tray® /2000: 97 wells, counts 2419 per 100mL
  - 49 large and 48 small
  - Bacteria growth media is mixed into water.
  - Uses all the water (no dilution or filtration)
- Reagent Colilert® or Colilert-18®
  - Yellow wells: Total coliform
  - Yellow and fluorescent wells: E. coli
  - 24 or 18 hour incubation at 35.0 ± 0.5˚C
- Most Probable Number (statistical number)
  - Because there could be multiple E. coli in a well.
  - Accurate in ranges that are acceptable? for irrigation water under FSMA
- Utah Division of Water Quality uses this method for assessing recreational waters

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Colilert Quanti-Tray method




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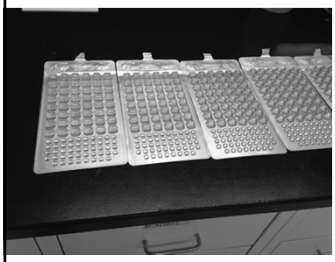
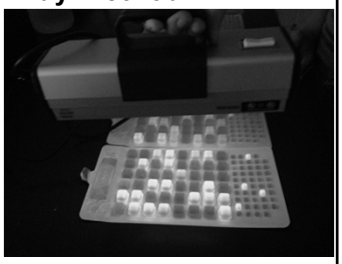
Colilert Quanti-Tray method

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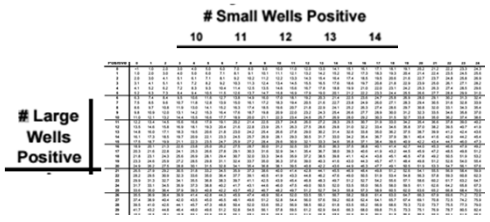
Lookup Most Probable Number on Table or Use Program to Get CFU E. coli/100ml



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Filtration of Sample for Petrifilm

- 47 mm filter (.045 µm filter)
- Soak film with 1 ml of deionized water
- Place filter (sterile forceps)
- Incubate 48 hours at 35° C
- Inspect under microscope (low power)
- There are a bunch of counting rules depending on how many colonies are formed
- Red colonies with gas are coliforms
- Blue colonies with gas are E coli.

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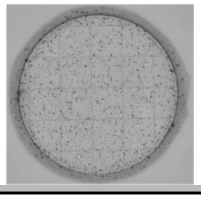
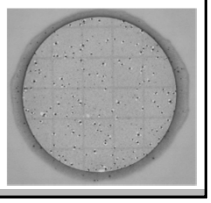
3M Petrifilm for counting colony forming E. Coli





What Method Is Best

- At this time we don't have a choice (EPA Method 1603). I did not find a lab to do that method.
- All methods have opportunity for errors
  - Sampling methods/locations and contamination.
  - Direct count is subject to human interpretation
  - Direct count methods are very dependent on procedures, such as filtration.
  - MPN method are based on probabilities

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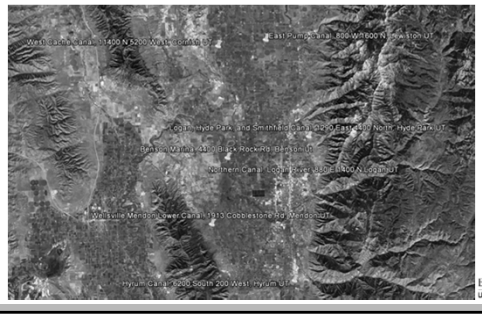
Cache County Sites



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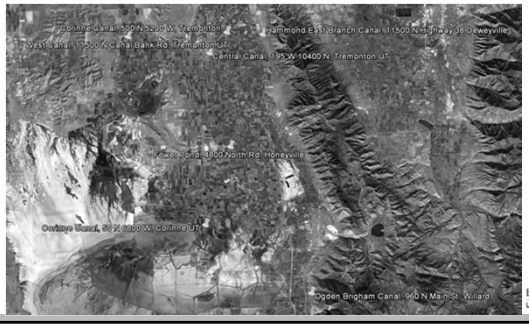
Box Elder County Sites



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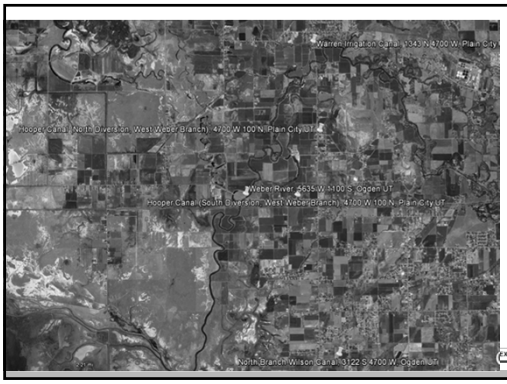
Weber County Sites



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Utah County Sites

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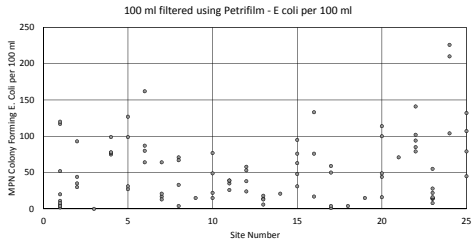
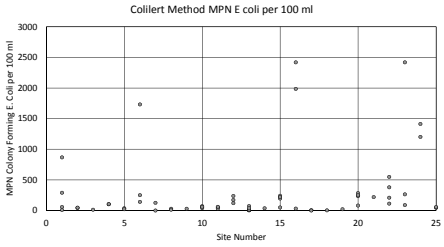
Summary of Results (Petrifilm)



Summary of results (Colilert Method)



E. Coli colonies per 100 ml (Counted on petri-film from 100 ml of water filtered through disk filter)

Site	No. Samples	Average	Geo mean
Cherry Hill Farm Pond, 16920 S 9700 W, Goshen UT	1	0.0	0.0
USU Student Organic Farm	1	0.0	0.0
South Shore Pond, Lincoln Beach Dr, Spanish Fork UT	1	4.0	4.0
Ogden Brigham Canal, 960 N Main St, Williard Ut	4	28.5	10.4
Logan, Hyde Park, and Smithfield Canal, 1290 East 4400 North, Hyde Park UT (Naomi Peak Vineyards)	4	12.8	11.8
Highline Canal, 2170 W Highline Canal Rd, Payson UT	1	15.0	15.0
Strawberry Canal, 6000W Strawberry Canal Rd, Santaquin UT	1	15.0	15.0
Wellsville Mendon Lower Canal, 1913 Cobblestone Rd, Mendon UT	8	21.5	15.7
Benson Marina, 4400 Black Rock Rd, Benson Ut	9	37.8	15.8
Mcmullin Pond, 5600 W Strawberry Canal RD, Santaquin UT	1	21.0	21.0
Fower Pond, 4800 North Rd, Honeyville Ut	4	28.8	23.3
Hammond East Branch Canal, 11500 N Highway 38, Deweyville Ut	4	43.8	28.1
Hooper Canal (North Diversion, West Weber Branch) 4700 W 100 N Plain City UT	4	40.8	33.4
Hooper Canal (South Diversion, West Weber Branch) 1150 S 5000 W Plain City UT	4	34.8	34.3
Hyrum Canal, 6200 South 200 West, Hyrum UT	4	43.3	40.9
Central Canal, 195 W 10400 N, Tremonton Ut	4	50.5	45.5
Warren Irrigation Canal (Tom Pavarro Diversion) 1343 N 4700 W, Plain City UT	5	64.6	52.4
Northern Canal, Logan River, 880 E 1400 N, Logan UT	3	75.3	55.6
Corinne Canal, 500 N 5200 W, Tremonton Ut	4	71.0	57.0
North Branch, Wilson Canal, 3122 S 4700 W, Ogden UT	5	62.6	58.4
Wayne Highline, 850 South 400 West, Springville UT	1	71.0	71.0
Corinne Canal 50 N 6800 W, Corinne Ut	4	82.3	81.7
West Canal, 11500 N Canal Bank Rd, Tremonton Ut	4	90.8	84.2
East Pump Canal, 800 W 1600 S, Lewiston UT	4	98.3	92.2
Weber River 5635 W 1100 S Ogden, UT	5	100.2	98.1
West Cache Canal, 11400 N 5200 West, Cornish, UT (Trenton)	3	180.0	170.3

Petri-film, filtered 100 ml

E. Coli (Most Proable Number) colonies per 100 ml of water - Colilert Quanti-Tray 2000 method.

Site Name and Location	site #	Count	Average	Geo Mean
South Shore Pond, Lincoln Beach Dr, Spanish Fork UT	18	1	2.0	2.0
Ogden Brigham Canal, 960 N Main St, Williard Ut	17	2	3.2	6.3
Logan, Hyde Park, and Smithfield Canal, 1290 East 4400 North, Hyde Park UT (Naomi Peak Vineyards)	13	6	22.4	11.7
Cherry Hill Farm Pond, 16920 S 9700 W, Goshen UT	3	1	12.2	12.2
Hammond East Branch Canal, 11500 N Highway 38, Deweyville Ut	8	2	20.5	19.2
Strawberry Canal, 6000W Strawberry Canal Rd, Santaquin UT	19	1	20.1	20.1
Corinne Canal, 500 N 5200 W, Tremonton Ut	5	2	28.2	26.9
Highline Canal, 2170 W Highline Canal Rd, Payson UT	9	1	28.5	28.5
Mcmullin Pond, 5600 W Strawberry Canal RD, Santaquin UT	14	1	35.5	35.5
Central Canal, 195 W 10400 N, Tremonton Ut	2	2	44.6	44.4
Hooper Canal (South Diversion, West Weber Branch) 1150 S 5000 W Plain City UT	11	3	47.9	46.1
West Canal, 11500 N Canal Bank Rd, Tremonton Ut	25	2	51.5	51.0
Hooper Canal (North Diversion, West Weber Branch) 4700 W 100 N Plain City UT	10	3	56.3	54.6
Benson Marina, 4400 Black Rock Rd, Benson Ut	1	4	305.6	101.8
Corinne Canal 50 N 6800 W, Corinne Ut	4	2	102.8	102.7
Fower Pond, 4800 North Rd, Honeyville Ut	7	2	62.7	125.4
North Branch, Wilson Canal, 3122 S 4700 W, Ogden UT	15	4	176.5	151.1
Hyrum Canal, 6200 South 200 West, Hyrum UT	12	3	177.2	170.6
Warren Irrigation Canal (Tom Pavarro Diversion) 1343 N 4700 W, Plain City UT	20	4	212.3	191.2
Wayne Highline, 850 South 400 West, Springville UT	21	1	218.7	218.7
Weber River 5635 W 1100 S Ogden, UT	22	4	311.7	263.7
Wellsville Mendon Lower Canal, 1913 Cobblestone Rd, Mendon UT	23	3	923.8	383.0
East Pump Canal, 800 W 1600 S, Lewiston UT	6	3	707.9	393.9
Northern Canal, Logan River, 880 E 1400 N, Logan UT	16	3	1479.4	537.4
West Cache Canal, 11400 N 5200 West, Cornish, UT (Trenton)	24	2	1308.5	1304.2

Colilert Quanti-Tray 2000 Method

Descriptive Summary

- The water coming directly out of the mountains meets the E. coli standards.
- The water coming out of some reservoirs has high E. coli at times.
- The further the water travels from the primary diversion the higher the opportunities for contamination and for warmer water temperatures.

Questions

References

- (E.R. Atwill, Melissa L. Partyka and Ronald F. Bond, 2015) Challenges and Opportunities for Implementing FSMA's Irrigation Water Quality Regulations Washington State Water Resources Association, 2015 Annual Conference and Membership Meeting, Spokane, Washington. December 4, 2015.

Aligning GAP and FSMA

Background Information:

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Shawn Olsen works for Utah State University Extension in programs related to fruit and vegetable production.

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Karin Allen is an Associate Professor in the Department of Nutrition, Dietetics and Food Sciences at Utah State University and serves as the Food Quality and Entrepreneurship Specialist for Cooperative Extension. Dr. Allen works with small food producers (both on and off the farm) to address food processing issues including labeling, safety, and regulatory compliance, as well as issues specific to agritourism and community supported agriculture operations.

Session Description:

How to meet GAP and FSMA standards

Aligning GAP and FSMA

Shawn Olsen
Karin Allen

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GAPs – Good Agricultural Practices

- USDA program based on FDA's Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables
- Implemented in 2002
- Voluntary audits performed by USDA, State Departments of Agriculture, or other private companies
  - Many buyers may require GAP audits
- Overall food and worker safety requirements

GAP audits do not guarantee you are in compliance with FSMA!

FSMA – Food Safety Modernization Act

- FDA regulations that must be followed by produce growers
  - Some exemptions based on crops grown, farm size, and customer types
- "Produce Safety Rule" published in 2015
  - Standards for the Growing, Harvesting, Packing, and Holding of Produce for Human Consumption
- Mandatory inspections conducted by FDA or State Departments of Agriculture
- Specific regulations focused on microbial safety of food
  - Five major routes of contamination addressed
- Major emphasis is on evaluating/preventing risks and recordkeeping

Produce Safety Rule Focus Areas

- Worker Training and Health and Hygiene
- Agriculture Water (includes irrigation and postharvest water sources)
- Biological Soil Amendments
- Domesticated and Wild Animals
- Equipment, Tools, and Buildings

FSMA compliance does not guarantee you will pass a GAP audit!

Worker Training and Health and Hygiene

FSMA

- FDA-accepted training for at least one food safety manager
  - One-time only
- Annual training for employees who contact produce
  - Must record name and date of attendees
- Appropriate training for all visitors and guests
  - Includes contractors, deliveries

GAP/GHP

- Designated food safety program manager
- Regular training for employees who handle produce, esp. before harvest time
- All employees and all visitors follow proper sanitation and hygiene practices

Agricultural Water – Irrigation Sources

FSMA

- Development and Monitoring of MWQP
  - 20 samples within first 2-4 years to develop
  - 5 samples annually thereafter
- Maximum allowable levels of total *E. coli*
- Must monitor all sources of irrigation water

GAP/GHP

- Test at accredited lab for generic E. coli
- Test surface water at planting, peak use, and before harvest
- Test well water every 3 months
- Max levels similar to FSMA

Agricultural Water – Postharvest Sources

FSMA

- Much stricter requirements than for irrigation water
- Any water sources during harvest or postharvest activities
  - Rinsing/washing
  - Cooling
  - Ice making
  - Postharvest fungicide or wax

GAP/GHP

- Potable (culinary) water must be used for rinsing, washing, cooling, ice making
- Water contact surfaces such as wash tanks are cleaned and sanitized
- Any water treatment (disinfectant) use is monitored

Biological Soil Amendments

FSMA

- Any fertilizers, etc. of animal origin
  - No human waste materials
- Must document that treatment is adequate
  - Testing not required if using an FDA validated method, must keep records of process
- Does not cover chemical soil amendments
- Raw manure requirements under review with USDA NOP

GAP/GHP

- Raw manure incorporated 120+ days before harvest
- Records of manure composting process, 131 F for 15 days, turned 5 times
- Record of manure testing
- Record of synthetic fertilizer usage

Domesticated and Wild Animals

FSMA

- Must monitor for evidence of wild life incursions
- Affected produce cannot be harvested and sold raw
  - Can be diverted to some other uses
- Monitoring and corrective action plan recommended
- Will domesticated animals come in contact with produce?

GAP/GHP

- Fields are monitored for signs of animals
- Measures taken to reduce opportunity for animals to enter fields
- Contaminated produce flagged for non-harvest
- Pest control, esp. rodents, in packing house very imp.

Equipment, Tools, and Buildings

FSMA

- Equipment and tools should be cleaned, and if possible, sanitized
- Buildings should prevent or minimize contact with pests or contamination
- Direct food-contact surfaces must be cleaned and sanitized
- Records must be kept

GAP/GHP

- Harvest containers and harvest tools should be kept clean and disinfected
- Light bulbs, glass should be protected from breakage
- Produce is covered during transportation
- Food contact surfaces are cleaned or sanitized

GAP requirements not included in FSMA

- Documented Farm Food Safety Plan
  - FSMA *recommends*, but does not require
- Designated food safety officer
  - But this person would ideally be the one attending the FDA-approved course
- Traceability records
  - Some on-farm food processing activities require traceability
- Pesticide residue testing
- Mock recall plan
- Farm Sewage treatment is done properly

Recommended additions to a GAP plan

The following activities can be added to an existing GAP plan over the next few years to move towards FSMA compliance

- Test 5 surface water samples per year, for total *E. coli* by EPA 1603
  - All water sources must be sampled individually, at the point most representative of their use
- Have one or more employees responsible for farm food safety attend Produce Safety Alliance training
- Develop a farm-specific food safety training program for employees
  - Generic plans can be used as a starting point
- Evaluate and document your current composting techniques against FDA requirements

Tunnel Types and How They Are Used

Background Information:

Brent Black
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Logan, UT 84322
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Extension Fruit Specialist at Utah State University since 2005. Focus on commercial tree fruit crops and small acreage berry production.

Session Description:

An overview of high tunnels, low tunnels and other protected cultivation options, and how to determine which are best for specific applications.

High Tunnels: Types and Uses

Dr. Brent Black
USU Extension Fruit Specialist

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Low tunnels

- Small
- Single row coverage
- Less temperature lift
- Diffuse light

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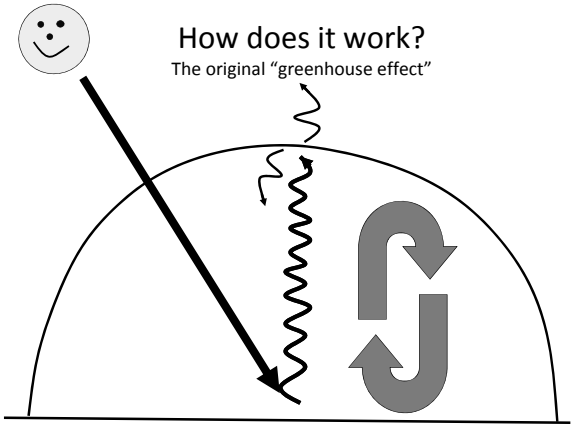
How does it work?

The original "greenhouse effect"



Extreme case study

Panguitch
6600 feet elevation
75 ffd

- March 11, 2009
  - Outside temp -10.4 F
  - Tunnel temp 13.0 F
  - Under row cover 32.0 F

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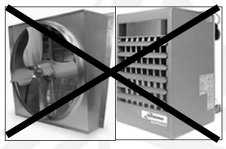
High Tunnels

- Large structure
  - Walk-in size
  - Allows equipment
- Not a greenhouse
  - Passive heating and cooling
  - a.k.a. "cold frame"



Extreme case study
2006 Feb-Mar, Panguitch

- Highest Maximum Inside 120°F

- How cold can plants tolerate?
- How hot do they prefer?

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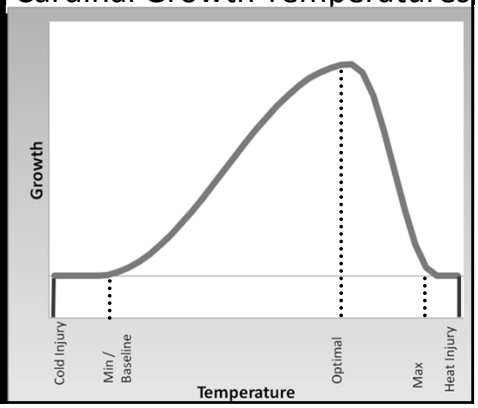
Cardinal Growth Temperatures



What are these cardinal temps?

Cool Season

- Hardy & Half-Hardy
  - Able to withstand frost
  - Germinate at cooler temperatures (35-40F)
  - Biennials may flower
  - No chilling injury but can be frost damaged
  - Base temp ~ 35-40F
  - Upper limit ~ 70-80F

Warm Season

- Tender & Very-tender
  - Frost damaged
  - Chilling sensitive
  - Germinate at warm temps (55-60F)
  - Chilling injury < 50F
  - Base temp ~ 50+F
  - Upper limit ~ 80-95F

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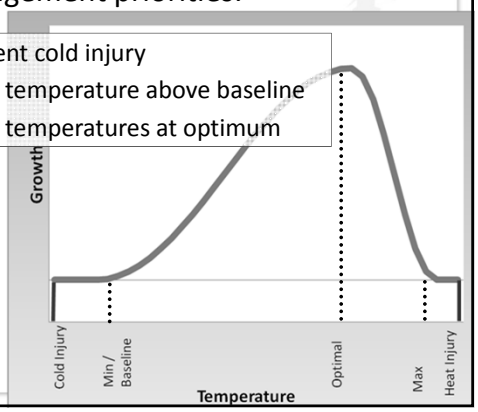
Management priorities:

#1 Prevent cold injury
#2 Keep temperature above baseline
#3 Keep temperatures at optimum



Where do you find cardinal temps?

April 2010 Horticulture/HighTunnels/2010-04

Temperature Management in High Tunnels

Brent Black, Extension Fruit Specialist, and *Dan Drost*, Extension Vegetable Specialist

Table 1. Cardinal temperature for fruit crop growth.

Crop	Minimum (°F)	Optimum (°F)	Maximum (°F)
Strawberry	40	65-75	85
Raspberry	40	65-75	90
Blackberry	40	75-85	95

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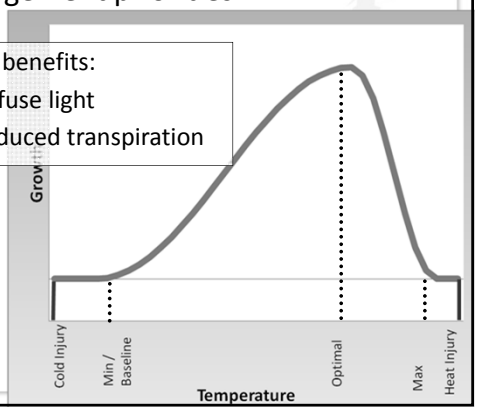
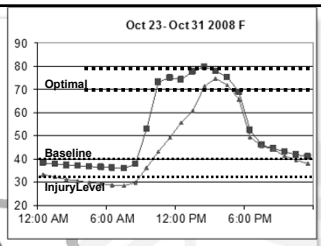
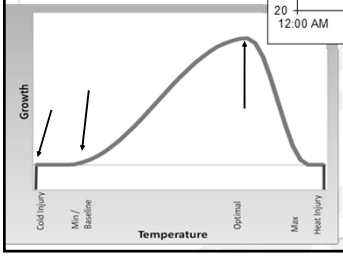
Management priorities:

#4 Side benefits:
a) Diffuse light
b) Reduced transpiration



- Strawberry example
  - Blossom injury = 30 - 32
  - Baseline = 40
  - Optimum = 70s
  - Heat injury > 85 to 90





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Where do you find cardinal temps

Horticulture

UtahStateUniversity COOPERATIVE EXTENSION

April 2010

Temperature M

Brent Black, Extension Fruit !

Table 3. Cardinal temperature for growth of selected vegetables.

Crop	Min. (°F)	Opt. (°F)	Max. (°F)
Chive, Garlic, Leek, Onion	45	55-75	85
Beet, Broad Bean, Broccoli, Cabbage Chard, Collards, Kale, Parsnips Radish, Spinach, Turnip	40	60-65	75
Artichoke, Carrot, Cauliflower, Celery Endive, Lettuce, Mustard, Parsley, Pea, Potato	45	60-65	75
Lima Bean, Snap Bean	50	60-70	80
Sweet corn	50	60-75	95
Pumpkin, Squash	50	65-75	90
Cucumber, Muskmelon	60	65-75	90
Sweet Pepper, Tomato	65	70-75	80
Eggplant, Hot Pepper, Okra, Sweet Potato, Watermelon	65	70-85	95

From Knott's Handbook for Vegetable Growers (4th Edition).

Design

Single bay
- Greater temperature lift
- Maximize cold-weather protection

Multi-bay
- Less temperature lift
- Diffuse light
- Rain shelter

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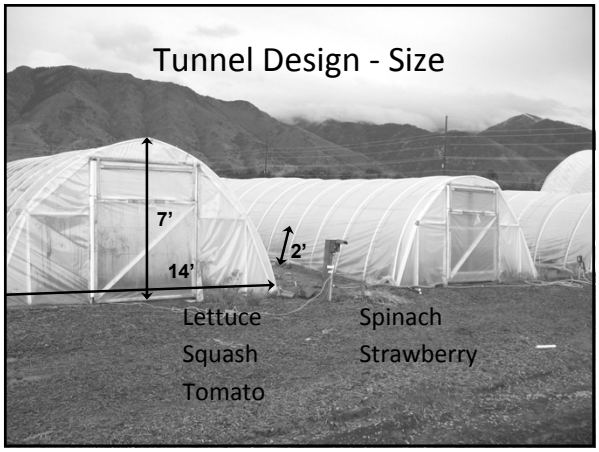
Tunnel Design - Size



Materials

PVC

Steel

Low cost
Flexible

Expensive
Strong
Rigid

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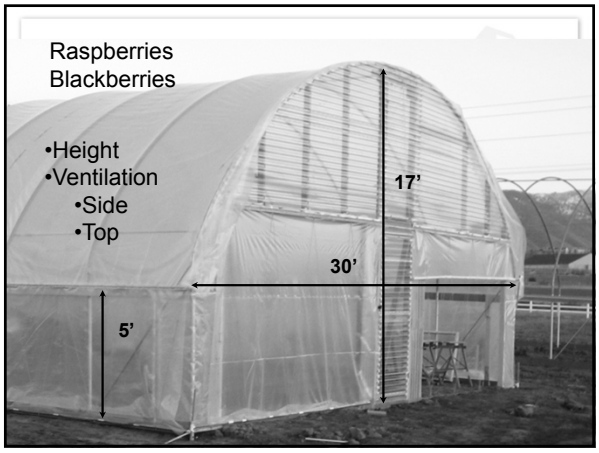
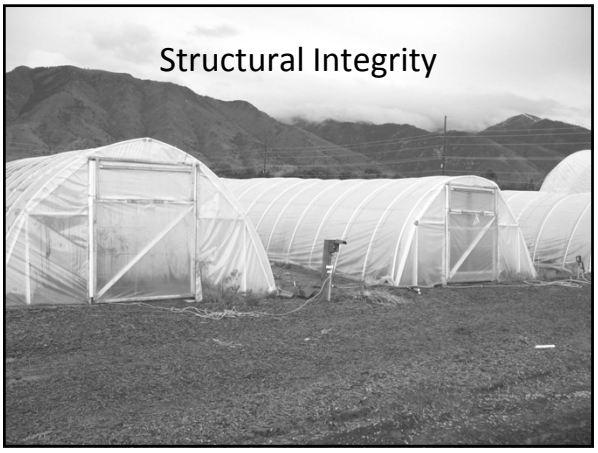
Raspberries Blackberries

- Height
- Ventilation
  - Side
  - Top



Structural Integrity



Arch design

- Gothic (sheds snow)
- Rounded (Plastic longevity?)
- Vertical side walls
  - Ventilation and snow



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Cost/Economics


- 14’ x 90’
- $600 to $700 (materials)
- $0.48 to $0.56 per sq.ft.

- 20’ x 96’
- $3,000 to $8,500
- $1.50 to $4.75 per sq.ft.

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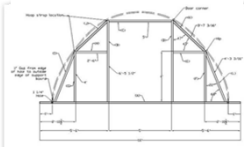
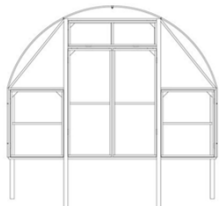
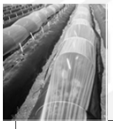
SNOW LOAD


Low-cost (14’ x 7’)


Tall crop (14.5’ x 10’)


Strong wind (17.5’ x 8’)


Low tunnels

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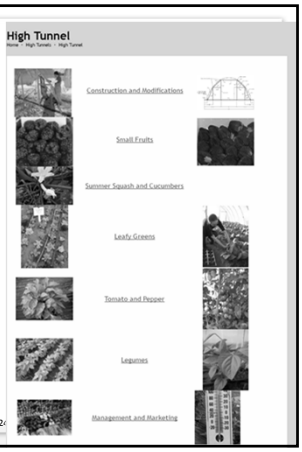
Endwall design
Withstand wind
Tractor access


5 - 6’

Other Resources

- USU Website (tunnel.usu.edu)
- Cornell University – (www.cornell.edu)
- Penn State University (plasticulture.cas.psu.edu)
- ATTRA National Sustainable Agriculture Information Service (www.attra.ncat.org)
- www.hightunnels.org – hosted by Kansas State University



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High Tunnel Site Selection Considerations

Background Information:

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Tiffany has worked as a research associate working on fruit and vegetable fact sheets and research projects since 2013. She completed her M.S. in Plant Science at USU in 2013 and her B.S. in Horticulture in 2012.

Session Description:

We will go over different factors impacting a high tunnel and that should be considered before construction.

High Tunnel Site Selection Considerations

Tiffany Maughan, USU Extension

Location, Location, Location

- Determine the best location on your property for a high tunnel
  - Many factors to consider
- Identify deficiencies in specific sites and how they can be corrected

Factors to consider

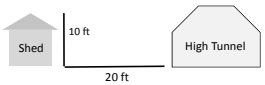
- Size
- Sunlight
- Accessibility
- Soil
- Wind
- City Ordinances

Size

- High tunnels come in MANY shapes and sizes
- Size depends on
  - Crop
  - Equipment
  - Management
  - **Available Space**

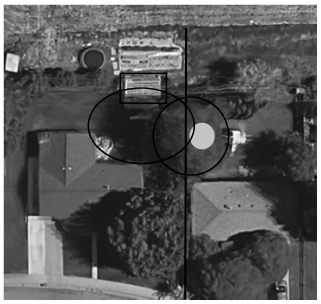
Sunlight: Shade

- Sunlight one of the most important factors
- Other structures
  - Buildings
    - Set HT back 2 to 2.5 times the height of building
  - Trees
- Proximity to other HT
  - N/S High tunnels can be placed closer together than E/W



Shading Example

- Built High Tunnel 6 years ago
- Small Tree
- Now… Big Tree



Sunlight: Orientation

- Well **above** 40° lat orient tunnels E/W
- Well **below** 40° lat orient tunnels N/S
- East/West
  - Maximizes sunlight exposure during the low-light period of winter
  - Winter/Early Spring/Late Fall Production
- North/South
  - Warms up more quickly in the morning (vent earlier)
  - Less crop shading (particularly with tall crops)

Access

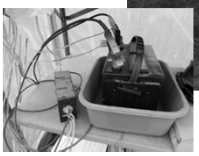
- High tunnels require daily monitoring
- Proximity to house/main building
- Year-round access
- Equipment access

Access: Electricity

- Depends on goals for high tunnel
- Situations that use electricity
  - Heating: cables, electric heaters, light bulbs
  - Powered automatic ventilation
  - Construction/Maintenance

Electricity Alternative

- Power source (solar)
- Deep-cycle battery
- Voltage regulator
- 12-volt electric motor
- In this case used to roll up sides



Access: Water

- 3 or 4 season growing
- Culinary
- Filtered Secondary
  - Drip Irrigation

Soil: Health

- Very intensive production
- Soil should be as healthy as possible
  - No compaction (good drainage)
  - Good pH and organic matter
  - No soil-borne diseases
    - Think of past crops in area
- It's a good idea to get a soil test
  - Visit usual.usu.edu

USUAL
Soil·Manure·Plant·Feed·Water

Soil: Drainage

- Do not build in low spots or at the bottom of a hill
- High tunnels displace rainfall
  - a 30' x 96' structure sheds 1,728 gallons of water for every inch of rain
- Elevated Pad
- Drainage ditch

Wind

- Face endwalls toward the prevailing wind
  - Smaller surface area exposed to winds

Wind

- Windbreaks for strong wind areas
  - Too close: shade
  - Too far: ineffective

Utah Building Code

- Effective since 2015
- High tunnels exempt from municipal regulation
  - Not permanent structure
  - Use dependent
  - Metal, wood, or plastic frame
  - Plastic, woven textile, or other flexible covering
  - Flooring
- No building permit required

Home ▸ Utah Code ▸ Title 10 ▸ Chapter 9a ▸ Part 5 ▸ **Section 525**

Title 10 Chapter 9a Part 5 Section 525

<< Previous Section (10-9a-524) Download Options Pl

Index **Utah Code**
Title 10 **Utah Municipal Code**
Chapter 9a **Municipal Land Use, Development, and Management Act**
Part 5 **Land Use Ordinances**
Section 525 **High tunnels -- Exemption from municipal regulation.** ***(Effective 5/12/2015)***

Effective 5/12/2015
10-9a-525. High tunnels -- Exemption from municipal regulation.
(1) As used in this section, "high tunnel" means a structure that:
(a) is not a permanent structure;
(b) is used for the keeping, storing, sale, or shelter of an agricultural commodity; and
(c) has a:
(i) metal, wood, or plastic frame;
(ii) plastic, woven textile, or other flexible covering; and
(iii) floor made of soil, crushed stone, matting, pavers, or a floating concrete slab.
(2) A municipal building code does not apply to a high tunnel.
(3) No building permit shall be required for the construction of a high tunnel.

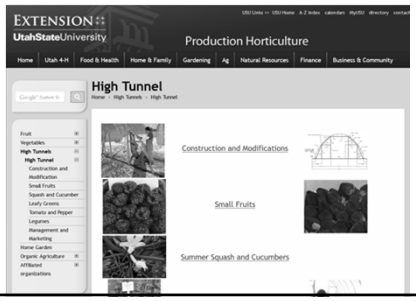
Building Code: Considerations

- Pays to be safe
  - Check with city/county codes
  - Edge of property
  - Height regulations

Aesthetics

- Think of your (and your neighbor's) views

Tunnel.usu.edu
(extension.usu.edu/productionhort)



Thank you

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Unique Management Considerations

Background Information:
Britney Hunter
USU Extension Davis County
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Britney is a Horticulture Extension Assistant Professor (aka County Agent) for USU in Davis County. Britney organizes educational programs at the USU Botanical Center in Kaysville and provides expertise related to horticultural science to the community. Britney also has expertise is in out-of-season vegetable production using high tunnel greenhouses.

Session Description:

High tunnels are a methods of growing crops over an extended season. However, they require more intensive management than traditional methods. They also create unique management considerations. They are a tool to control the climate/temperature extremes. The management considerations include selecting crops with similar temperature requirements. Some of the issues that require different management include: cooling and shading, water management, fertilization, winter weather, etc. Also the humid environment promotes disease and requires more intensive pest management. This session will go over these considerations and provide information on what you need to consider in managing production in a high tunnel.

Unique Management Considerations for High Tunnels

Britney Hunter
Extension Assistant Professor
Davis County Horticulture

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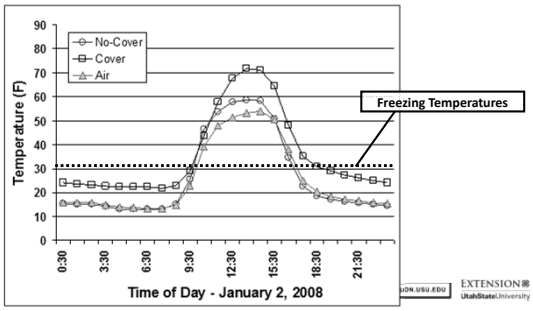
Climate Control / Temperature Extremes



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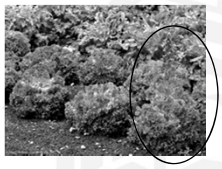
Cool Season Vegetables

Freeze damage 22°F

Bolting > 80°F



Target heat resistant varieties

http://www2.highlandstoday.com/content/2010/jan/18/la-freeze-wiped-out-venus-farms/
http://ecolibrary.org/page/DP270

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Warm Season Vegetables

Freeze damage < 32°F

Heat stress > 90°F

http://troutclancampfire.blogspot.com/2009/08/overview.html
http://applegreengarden.blogspot.com/

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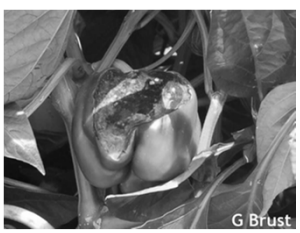
Sunscald / Zippering



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https://extension.umd.edu/growit/sunscald-vegetables
https://agdev.anr.udel.edu/weeklycropupdate/?tag=pepper

Cooling/shading

http://hightunnels.org/managing-stress-high-tunnels-shade-cloth/

Potassium deficiency

Hornworm

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Fertilization

- Increased growth = increased demand
- Constant cropping = increased demand
- Cover crops can be used

Water

- Does not dry down as fast
- No rainfall
- Disease potential
  - worse in fall

Drip Irrigation

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Access to water

- Frost free source
- Secondary water shut off

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Winter Considerations

- Snow removal

Winter considerations

- Cold water seepage
- Soil conditions / mud
- Better to construct in fall

Access

- Equipment
- Outside rows

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Humidity Promotes Disease

Sclerotinia

- Affects tomato, pepper, lettuce
- Primarily on flowering tissue
- Also affects stems

http://u.osu.edu/hightunneldiseasefacts/tomato-diseases/sclerotinia-white-mold/

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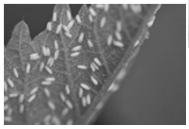
Pest Management

- Pests can build up faster
  - Less diverse predators
  - Ideal conditions
- Aphid
- Whitefly



http://pohnpei-garden.blogspot.com/2013/09/aphids.html

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Pest Management

- Pests can build up faster
  - Grasshoppers
  - Mice
  - Slugs

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Vertical High Tunnel Lettuce

- Increase plants per square meter
- Avoid pests

Pests such as voles, mice, slugs, grasshoppers, and aphid are less problematic in the raised gutters

Thank you

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High Tunnel Crops: Utah examples

Biographical Information:
Daniel Drost
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Dr. Drost is a Professor of Horticulture and Extension Vegetable Specialist in the Department of Plants, Soils and Climate at Utah State University. Dan has extension, research and teaching responsibilities that focus on small farms issues and addresses plant growth and crop production that impact Utah's commercial vegetable farms. Dr. Drost grew up on a diverse crop-livestock farm in Michigan and has a master's degree in horticulture from Michigan State University and a PhD in vegetable crops from Cornell University.

Session Description:

Address crop production strategies for successfully growing fruits, vegetables and flowers in high tunnels.

Growing Strawberries, Early Red Peppers, and Peony Using High Tunnels

by

Dan Drost, Tiffany Maughan, Brent Black,
Larry Rupp, and Ruby Ward



Overview

- Goals: Early Production
- Environmental Requirements
- Optimizing Planting Dates
- Understand Heating Needs
- Productivity Potential
- Summary




Identifying Appropriate Planting Dates

Table 2. Climate information for cities throughout Utah.

	Last Spring Freeze			First Fall Freeze			Freeze-Free		
LOCATION	Early	Avg	Late	Early	Avg	Late	Early	Avg	Late
BEAR LAKE	10-May	29-May	21-Jun	24-Aug	20-Sep	18-Oct	82	114	160
BRIGHAM CITY	9-Apr	4-May	2-Jun	4-Sep	11-Oct	13-Nov	111	159	206
CEDAR CITY	29-Apr	14-May	5-Jun	24-Sep	9-Oct	26-Oct	128	147	158
DELTA	15-Apr	17-May	19-Jun	2-Sep	28-Sep	28-Oct	75	133	183
LOGAN	25-Apr	14-May	21-Jun	30-Aug	26-Sep	24-Oct	94	135	182
MOAB	8-Mar	17-Apr	18-May	16-Sep	17-Oct	9-Nov	136	184	239
OGDEN	18-Apr	13-May	16-Jun	10-Sep	7-Oct	26-Oct	92	147	182
PARK CITY	8-Jun	14-Jun	21-Jun	27-Aug	6-Sep	14-Sep	78	83	98
RICHFIELD	18-Apr	27-May	20-Jul	23-Aug	20-Sep	16-Oct	49	116	164
SALT LAKE CITY	19-Mar	12-Apr	30-Apr	11-Oct	31-Oct	21-Nov	175	203	233
ST. GEORGE	12-Feb	6-Apr	20-May	21-Sep	28-Oct	24-Nov	135	205	268
VERNAL	21-Apr	27-May	4-Jul	27-Aug	22-Sep	23-Oct	62	118	158

http://climate.usu.edu/

HT Strawberries

- Extending the season
  - Avoid wholesale mkt
  - Capture local market
  - Supply premium fruit
  - Before field production
- Frost protection
  - Fall crown growth
  - Flower protection

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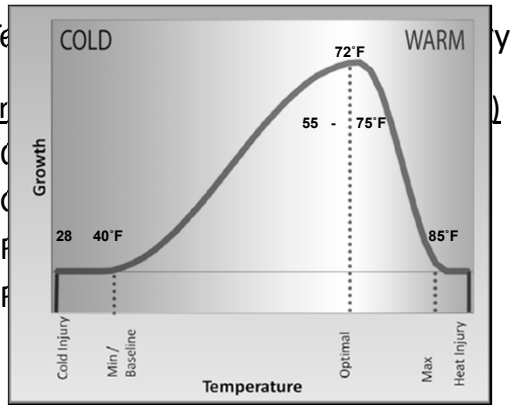
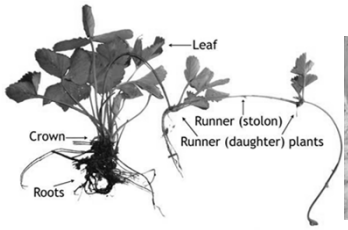


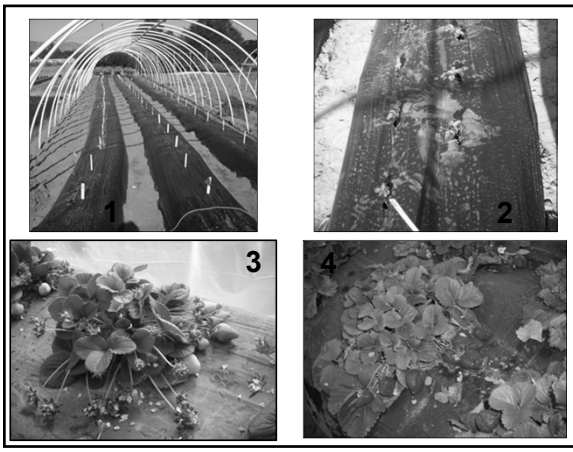
Strawberry Growth

- Fall Planted to maximize crown development
- Winter Protection to maintain king bloom
- Spring Management to optimize fruit size



Optimize High Tunnel Production

- Cultivars
  - June bearing or day-neutrals
- Plug plants or dormant plants
  - cost? ($0.25 vs. $0.10)
- Planting Dates
  - Late Aug to late Sept
- Tunnel Set-up
  - Mulch, drip, water & feed
- Fall & Winter Management
  - Temperature regulation
  - Runner & flower removal



High Tunnel Junebearing Strawberries : Cost & Returns; 14' x 96' Tunnel

		Units	Quantity	Price ($)	Total
Revenue	Early	1 lb Clams	375	$6.00	$ 2,250.00
	In-season	1 lb Clams	475	$4.50	$ 2,137.50
Total					**$ 4,387.50**
Operating Expenses					
	Supplies (Prep, Plants etc., Harvest)				$ 565.00
	Labor (Prep, Plant/Care, Harvest)		155	$10.00	$ 1,550.00
Total Operating Expense					**$ 2,115.00**
Fixed Expenses (Depreciation - Tunnel & Irrigation)					**$ 310.00**
Total Expenses					**$ 2,425.00**
Net Income					**$ 2,272.50**

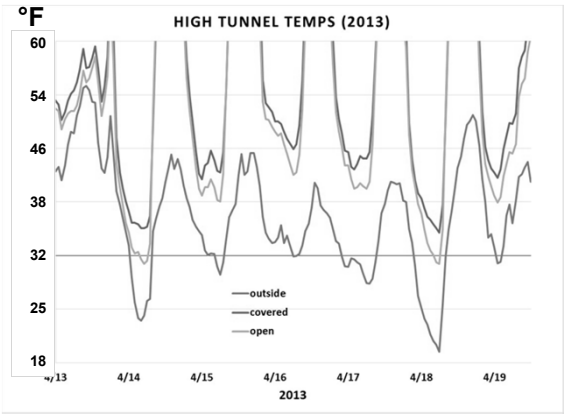
~ $35,000/A

Northern Utah High Tunnel Strawberry Production
Costs and Returns, 2014

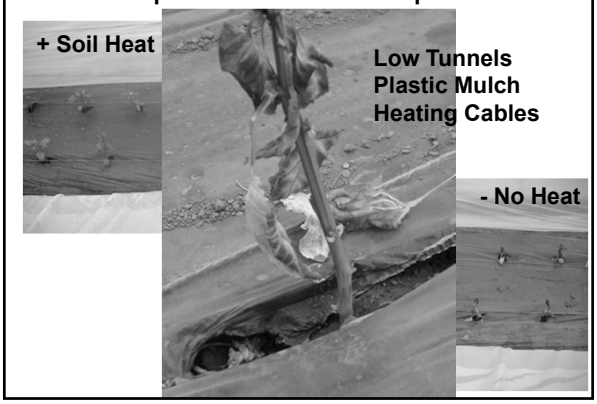
Red Pepper: Early Season Production

- Capture market when there is little supply
- **GREEN** Peppers - Low prices
- High Demand for **RED** Fruit (just takes more time)
- Direct Markets
- Price premiums large
- Field **REDS** ~ mid-August

Tunnel – Peppers



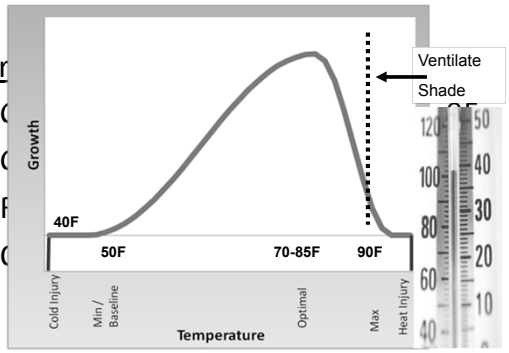
Crop Protection Required



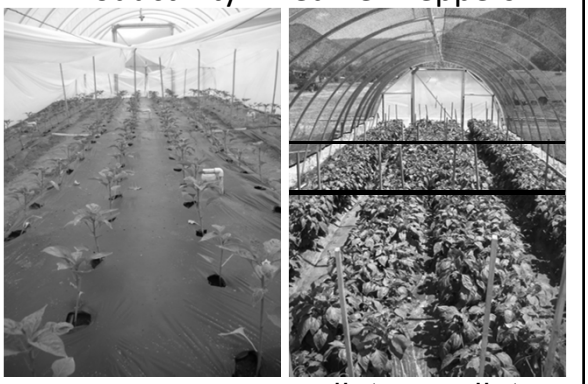
Pepper Temperature Response

Gr

- C
- C
- F
- C

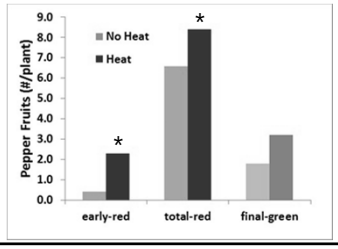


Productivity – Red Bell Peppers



Productivity – Red Bell Peppers

- Supplemental heat increased earliness
- Harvest started: **21 Jun 2012; 19 June 2013**
- 1st **5** harvests (early); 10-15 total harvests
- Field peppers - **no color** until mid-August



Financial Sustainability?

14' by 96' High Tunnel

Units	Quantity	Price	Total
lbs	3450	$1.00	$3,450.00

Total Labor	$555.00
Total Supplies	$572.00
Annual Operating	$1,127.00
Annual Deprec (Hi/lo tunnels)	$250.00
Annual Deprec (irrigation)	$60.00
Total Expenses	$1,437.00
Net Income	$2,013.00

575 plants/house = 6 fruit/plant

LABOR	HOURS	Cost ($)	
Soil test + Applicatio	1.5	10	$15.00
Tillage	1	10	$10.00
Plastic-Drip-Heat	3	10	$30.00
Planting	2	10	$20.00
Lo Tunnels	1	10	$10.00
Maintenance	20	10	$200.00
Irrigation etc.	4	10	$40.00
Harvest	20	10	$200.00
Cleanout	3	10	$30.00
			$555.00

SUPPLIES	units	No.Units	Price ($)	
Soil Test	each	1	14	$14.00
Fuel	gal	1	3	$3.00
Fertilizer	lbs	30	1	$30.00
Plastic (soil/LoT)	ft	600	0.1	$60.00
Drip Tape	ft	200	0.05	$10.00
Heat Cables	each	3	120	$360.00
Seed	1000	0.5	0.12	$60.00
Urea	lbs	10	1	$10.00
Harvest Containers	bags	1000	0.025	$25.00
				$572.00

Conclusions Red Peppers

- Early cold very harmful to peppers and will delay maturity.
- RED fruits consistently produced by mid-June.
- Productivity levels of 7-10 fruits per plant expected.
- Very good return on investment ($$$).

HT Flower Production

- Capture market when there is little supply
- Diversifies opportunity but…
- Product mix considerations (bouquets?)
- Local markets saturation
- Pricing and competitiveness
- Local availability

High Tunnel Flowers

- Types
  - Delphinium, Echinacea, Peony, bulb crops
  - Sunflower, Lisianthus, Status, Snapdragon, etc
- Planting Dates
  - Temperature determines
- Tunnel Set-up
  - Plastic mulch, drip, water & feed
- Crop Management
  - Temperature regulation
  - Flower Harvest

High Tunnel Peonies - USU

Time line: Planted Oct 2011

1st harvest 2014

Emergence HT vs. Field

2014

– Tunnel, March 2

– Field, March 14

2015

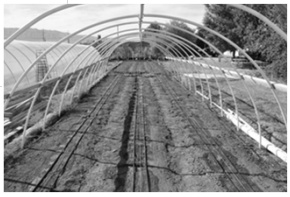
– Tunnel, Feb 20

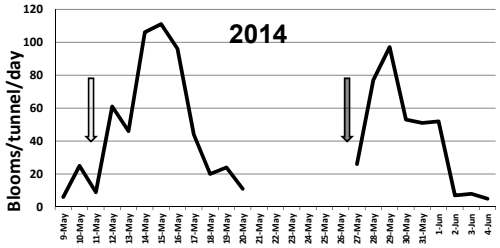
– Field, March 4

2016

– Tunnel, Feb 27

– Field, March 22





Conclusions

- In 2014 (yr1), flowering 2 weeks earlier compared to field production (May 11).
- Flowering ~3-4 weeks earlier in 2015/2016 (50% before May 10).
- Tunnel closure date needed to schedule flowering dates.
- Crops for Mother's Day (other?) with high tunnels.
- Further research is needed on other flowers.

Questions!

WESTERN SARE Sustainable Agriculture Research & Education

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Tunnel Designs and Northeastern Experiences

Biographical Information:
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University Park, PA 16802
efz@psu.edu

Kathy Demchak has been a Sr. Extension Associate in the Dept. of Plant Science at Penn State University since 1999. She has worked with berry crops since 1992, and has conducted research and demonstration work on high tunnel berry production since the year 2000. She is part of a Specialty Crops Research Initiative project entitled “Optimizing Protected Culture Environments for Berry Crops”, headed by Eric Hanson at Michigan State University.

Session Description:

Multi-bay or single-bay, 3-season or 4-season, and moveable or not are some of the choices growers need to make when choosing a high tunnel. Add to these different choices in roof and end wall designs, materials, tunnel sizes, and track options - all of which affect cost - and the decision can seem overwhelming! This talk will share some Northeastern experiences regarding what has worked well, and what hasn’t.

TUNNEL DESIGNS AND NORTHEASTERN EXPERIENCES

Kathy Demchak and Matt Cooper
Dept. of Plant Science

www.tunnelberries.org

Growing Berries in Protective Structures

The TunnelBerries Research & Extension Website is a berry grower information source for:

- Selecting tunnel structures & plastics
- Optimizing productivity & pest management
- Increasing profits
- Minimizing plastic waste generation

Funded by the National Institute of Food and Agriculture, U.S. Department of Agriculture, Specialty Crops Research Initiative under Award Number 2014-51181-22380.

Utah State Info

- See info on High Tunnels at http://tunnel.usu.edu

High Tunnels

- Multi-bay or single-bay
- Multi-bay only covered for three seasons (spring, summer, fall)
  - Sometimes called "three-season tunnels"
- Single bay may be covered year-round or three seasons
  - Sometimes called "four-season tunnels"

High Tunnels

- Rapid recent expansion in numbers
  - NRCS EQIP (Env. Qual. Incentives Program) High Tunnel System initiative
    - Purpose: "to assist producers to extend the growing season for high-value crops in an environmentally safe manner."

High Tunnels

- Where are they are used?
  - Widely used in Europe for berry crops
  - N. America, widely used in California, Mexico for berry production, vegetables
  - Used on small scale in Eastern U.S.
    - Many direct-marketers here
    - Diversified production with many crops
  - One 17' x 96' single bay tunnel covers 0.04 acres

High Tunnels

- What crops are they being used for?
  - High value and highly productive food crops or those that can reach maturity quickly and/or have a long harvest season
    - Tomatoes, cucumbers, peppers (warm season)
    - Salad greens (cool season)
    - Berries
  - Not a lot of info available on how many tunnels, what for

High Tunnels

- Multi-bay or single-bay
- Multi-bay only covered for three seasons (spring, summer, fall)
  - Sometimes called “three-season tunnels”
- Single bay may be covered year-round or three seasons
  - Sometimes called “four-season tunnels”

Multi-bay Tunnels

- Haygrove, TunnelTech
- In warmer countries, “Spanish” tunnels
- Where protection from elements is a main objective and winter protection isn’t needed
  - No tolerance of snow load
  - Usually for protection from rain or sun
  - Widely used on West Coast
  - Used here and there in other parts of the country

Multi-Bay Tunnels

- Plastic gathered for winter
- Plastic gathered at top during high winds (>20mph), hot days
- Multi-bay size: depends on no. of bays (std 24' wide/bay), 100-1400 ft long

Environmental Changes Relative to Field – Multibay

- No moisture on foliage from rain or irrigation
- Placement and amount of water is controlled
- But no winter protection (can be an advantage with insects and leaching of salts)
- Can fully vent on hot summer days

Single Bay Tunnels

- Where season extension and/or winter protection is needed
  - Can be kept closed for winter (usually)
  - Used mainly in colder areas with short growing season
  - Used where growers are smaller-scale and/or have diversified operations
  - Quonset-style roof or Gothic (peaked) roof

Single-bay Tunnels

- Single bay size: 14 to 30 ft wide
  36 to 150 ft long
- Can be kept covered for winter
- Moderate snow OK if peaked design
- Closed when windy

Environmental Changes Relative to Field – Single Bay

- No moisture on foliage from rain or irrigation
- Placement and amount of water is controlled
- Higher humidity
- Warmer air temperatures
  - Mild in winter
  - Can be hot in summer
- Warmer soil temperatures
  - Lack of soil freezing during winter

Tunnel Use Results

- Longer growing season – earlier and later yields
- Plants generally grow much larger than in field
  - Higher yields
- Can grow some crops that we couldn't otherwise due to short growing season or cool temps
- Changes in pest complexes

Which tunnel type? Consider…

- Crops – do you WANT to "grow" all year?
- Do you want to worry about snow and wind?
- Salt build-up vs. leaching
- How much cover do you want to afford pests/rodents/carryover of insects and mites?
- Do you have a crop that needs to be winter-protected (e.g., blackberries)

How Do You Pick a Size?

- Lots of different manufacturers
- Many sizes
- Besides the obvious factors of space and how much you want to grow…
- Temperature management is often #1 concern

Width

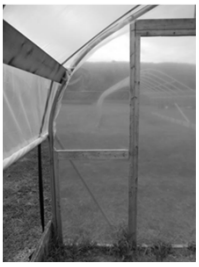
- Related to height (more on height later)
  - Wider = taller
- Wind flow through is big factor
  - Crops you want to grow – powdery mildew susceptibility? Other diseases?
  - Generally have wind flow through narrower dimension of tunnel
  - May need other venting options

Length

- Some growers report a psychological barrier to longer tunnels
- 30' x 72' most common size purchased now – most square footage for the cost

Height

- Important for temperature management
- Taller tunnels = heat can rise
  - Get wider tunnels or legs
  - Better for crops that prefer cool temps.
- Affects height of "hipboard"
  - Can roll up sides to that point
  - Too low in older tunnels (heat trapped in higher areas of tunnel)

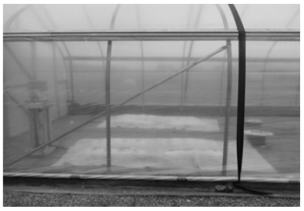


Roof Shape

- Huge factor in areas with snow – Gothic better over quonset
- Interacts with thickness of steel, trusses
  - 1.66" O.D. on ours
  - Trusses needed for wider (>17' wide) tunnels
- Failures under snow with less substantial steel on quonset style rooflines, esp. where holes are drilled in bows

Track options

- Track with cap – hipboard needs to be absolutely flat
  - Can cut plastic otherwise
- Wiggle wire cheaper (not all the same though), easier to work with



End Walls

- Solid vs. clear
- See info on High Tunnels at http://tunnel.usu.edu

Venting options

- Roll-up sides
- Drop-down curtains
- Air flow at ground level on cold nights?
- Gable end or roof vents

Plastics

- Some differences between tunnel plastics and typical plastic sheeting
  - Additives to prevent the plastic from breaking down in sunlight (caused by UV light, heat)
  - Additives to affect heat buildup and/or retention
  - May diffuse light to various extents
  - May affect condensation, etc.
- 6-mil, 4-yr greenhouse grade is standard in PA

UV Characteristics - How Do You Know What You Are Buying?

- All will have something to prevent breakdown from UV light
  - See words “UV protected”, “UV stabilized”
- May see effects advertised
- You can ask or check out company literature on web sites, sometimes with a little digging

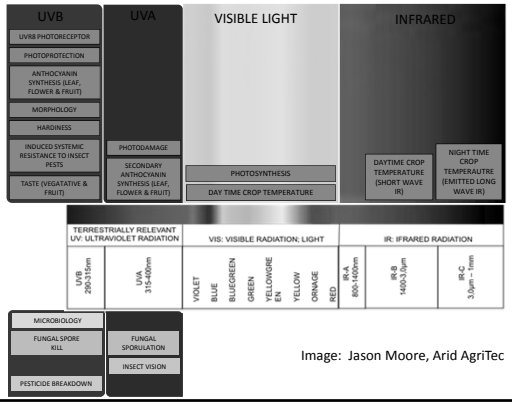
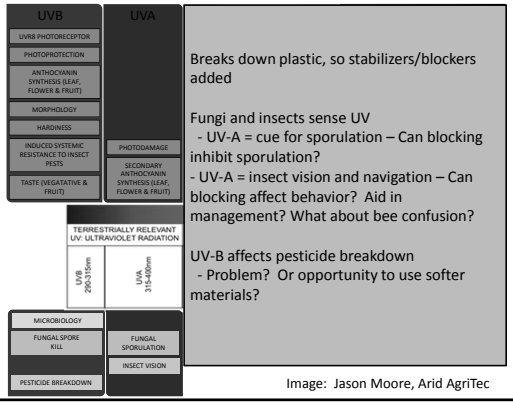


Image: Jason Moore, Arid AgriTec



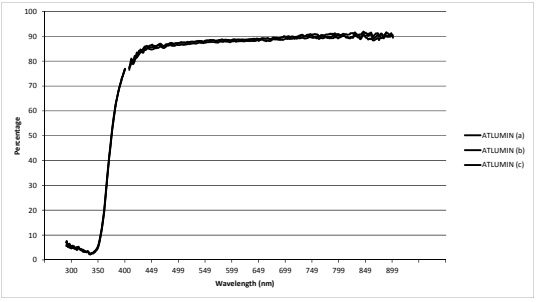
Breaks down plastic, so stabilizers/blockers added

Fungi and insects sense UV
- UV-A = cue for sporulation – Can blocking inhibit sporulation?
- UV-A = insect vision and navigation – Can blocking affect behavior? Aid in management? What about bee confusion?

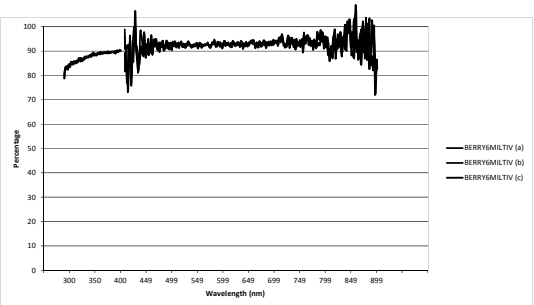
UV-B affects pesticide breakdown
- Problem? Or opportunity to use softer materials?

Image: Jason Moore, Arid AgriTec

One common pattern for tunnel plastics:
Blocks portion of UV-A, UV-B



Film that blocks very little UV

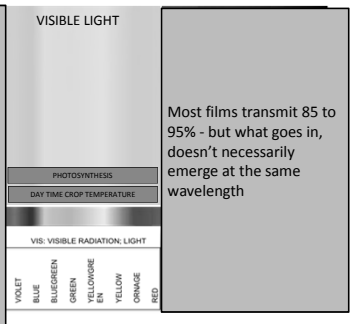


Visible light – what we see and what plants use for photosynthesis

Best wavelengths for photosynthesis are in ranges we see as blue and red

Some plastics diffuse light more than others – so light is more evenly spread throughout tunnel and plant canopy

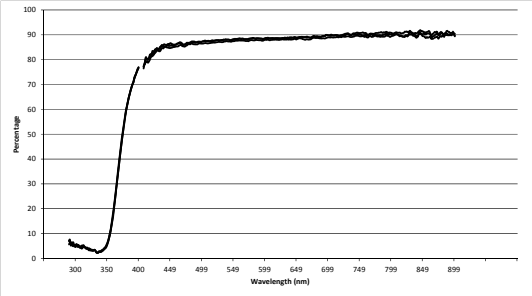
Lower leaves on tall plants receive light rather than being shaded.

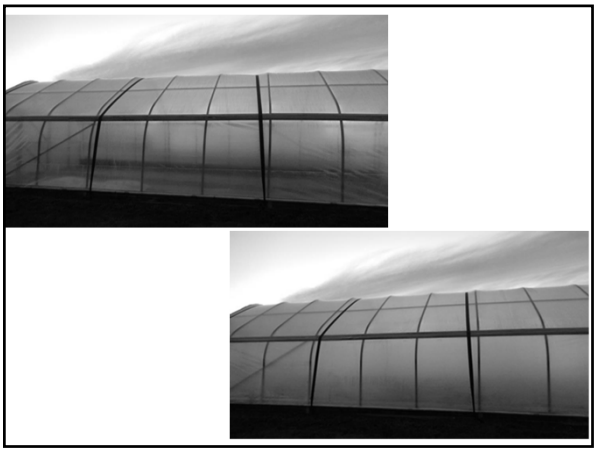


Most films transmit 85 to 95% - but what goes in, doesn’t necessarily emerge at the same wavelength

Image: Jason Moore, Arid AgriTec

~ 90% of visible (= photosynthesis)





Practical Significance? - Visible Light

- "Clear" vs. "Diffused" formats
  - Clear usually equals more shadows, more heat buildup – all other factors being equal
  - More diffuse = light reaching plant from different angles, less shading, less heat buildup
- More important for taller crops, esp. ones that prefer cool temps (raspberries)?
  - But need more work on this
  - At what point is crop light saturated?
  - Cloudy vs. clear location?
- Move is towards more options in plastics that diffuse light

How Do You Know What You Are Buying?

- Generally specified in literature/selling points
  - High light transmission
  - Less scorching or sunscald
  - Less heat build-up
  - You can see the differences in samples

Infra-red = heat

Longer wavelengths of visible light and short-wave IR heat up tunnel during day, and are stored as heat

Emitted back towards plastic as long-wave IR at night

"IR" plastics contain additive to block IR. May be inside layer if two layers of covers are applied

Plastics that block short-wave IR - intent is to to reduce heat build-up during day (will market as reducing temps)
- Likely to also contain additive to diffuse light

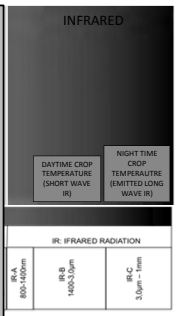
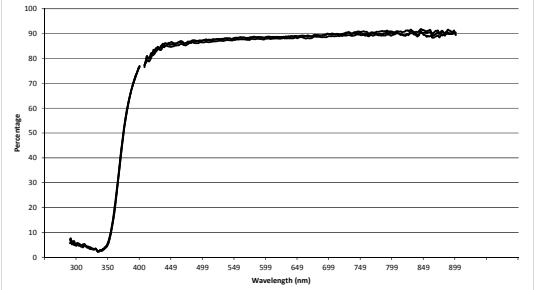
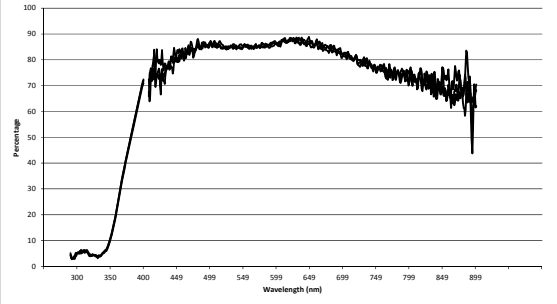


Image: Jason Moore, Arid AgriTec

Film that doesn't block IR



Plastic that blocks short-wave IR



How Do You Know What You Are Buying?

- Generally specified in literature
  - Cooler plastics
  - May see the letters IR or TES (thermal energy saving) in the film name, depending on effects

Other Characteristics

Anti-condensate ("AC")

- Keeps water from dripping onto your plants
  - Either water remains as small droplets, or clings and runs down side of plastic
  - May be a coating – one side may need to face inward
    - Marked on plastic – unless cut into small pieces (less shiny surface)
  - May be incorporated into plastic – which side is up doesn't matter. Additive migrates to surface as it's washed off.

Anti-Dust ("AD")

- Has additive that repels

Most are combinations, name will be a clue

- Features often specified in the product literature
- Features are often specified in the name of the plastic
  - "Clear", "UVClear", "IR", "IR/AC"
- Talk to manufacturer about your primary uses for the tunnel, what their plastics should do

Cost of Plastic Covering

- Wide range of prices for same plastic
  - 8 to 13.1 cents/sq ft for Tufflite IV
- Generally 9 to 11 cents/sq ft
- Plastic is heavy – 130 lbs for one 17' x 96' tunnel
  - Shipping could be an additional 10 – 40%.

Finding Info

- TunnelBerries web site
- Manufacturer's and distributor's websites
- A "moving target"

Plastic films	Manufacturer/Re-roller	Sources
Dura-Film Super 4	AT Films Inc. (Alberta)	BFG Supply, PlastiTech, AT Films
Dura-Film Thermax	AT Films Inc. (Alberta)	BFG Supply, PlastiTech, AT Films
Dura-Film Luminance/Luminance	AT Films Inc. (Alberta), BPI Visqueen (U.K.)	AT Films, BFG Supply / Haygrove High Tunnels
Flex-O-Glass 4 yr IR Clear	Warp Bros. (Chicago, IL)	BFG Supply, Hummert
Flex-O-Glass 4 yr UV Clear	Warp Bros. (Chicago, IL)	BFG Supply, Hummert
GT IR/AC	Green-Tek (Janesville, WI)	Poly-Tex, Inc., Green-Tek, Stuppy Greenhouse Manufacturers
GT 4 Clear	Green-Tek (Janesville, WI)	Poly-Tex, Inc., Green-Tek, Stuppy Greenhouse Manufacturers
K50 Clear	Klerks-Hyplast (Chester, SC)	BFG Supply, Stuppy Greenhouse Manufacturers, XS Smith/Rough Bros.
K50 IRAC	Klerks-Hyplast (Chester, SC)	BFG Supply, Stuppy Greenhouse Manufacturers, XS Smith/Rough Bros.
KoolLite Plus	Klerks-Hyplast (Chester, SC)	BFG Supply, XS Smith/Rough Bros.
Sun-Selector Suncover Clear	Ginegar (Israel)	Ledgewood Farms, A.M. Leonard
Sun-Selector Sunsaver Clear	Ginegar (Israel)	Ledgewood Farms, A.M. Leonard
Sun-Selector Sunsaver Diffused	Ginegar (Israel)	Ledgewood Farms, A.M. Leonard
Sun-Selector Suncover Diffused	Ginegar (Israel)	Ledgewood Farms, A.M. Leonard
Super Long Life AD USA	Eiffel Plastics (Italy)	Excalibur Plastics (Ontario)
Tufflite TES	Berry Plastics Corp. (Monroe, LA)	PlastiTech, Nolt's Produce Supplies, RainFlo Irrigation
Tufflite IV	Berry Plastics Corp. (Monroe, LA)	PlastiTech, Rimol Greenhouse Systems, Nolt's Produce Supplies, Zimmerman's High Tunnels and Greenhouses, Rainflo Irrigation
Sunmaster Clear	Lumite (Georgia, USA)	FarmTek (Grower's Supply)
Sunmaster IRAC	Lumite (Georgia, USA)	FarmTek (Grower's Supply)
Other covers		
Solarig 140 and 172 (woven material)	Solarig, P.I.C. Plast Ltd (Israel)	Robert Marvel Plastics
Solawrap Polydress ("bubble wrap")	Global Plastic Sheeting,	Solawrap
Solexx (5 mm corrugated plastic)	Adaptive Plastics (Oregon)	Adaptive Plastics

Northeastern Experiences

Grower Survey - Major Problems (if >30% of respondents)

	Current	Former
Cost, construction/maintenance	58.8	36.4
Temperature management	48.5	36.4
Finding market for off-season berries	8.8	45.5
Controlling spider mites	45.6	27.3
Controlling other mites/insects**	30.9	9.1
Environmental catastrophe	30.9	18.2

**SWD wasn't present yet!!

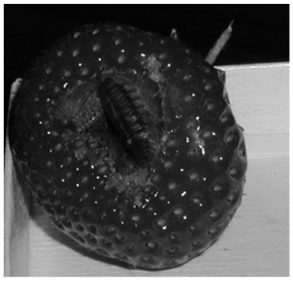
Temperature/Humidity Management

- Can make insect problems worse
- Also may be powdery mildew problems worse

Venting

- Raspberries grow well in cool temps.
  - Goal is to keep temperature around 70-80 degrees

What's Different in Tunnels?



- Never saw this in the field:
  - Sowbugs and earwigs consuming strawberry fruit

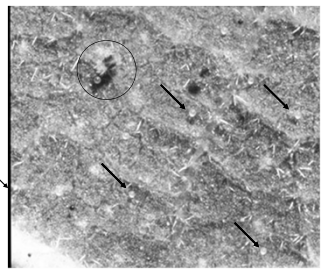
Photo: Catie Rasmussen

Crown borer

Powdery Mildew

Two-Spotted Spider Mite and Eggs (Leaf Underside)

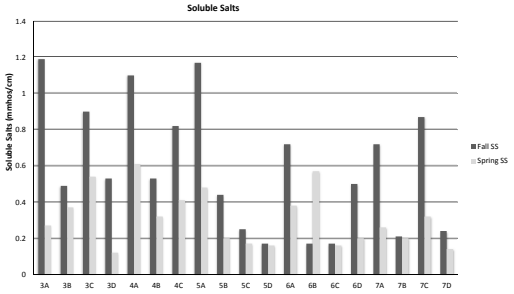
- Scout
- Release predatory mites when first seen



Salinity Issues

- Using composts and soluble fertilizers for nutrients
- In single bay tunnels, evaporation without leaching

Soluble Salts after 1 winter uncovered



Soil Compaction

- A lot of foot traffic in a tunnel
- Identified by some long-term growers as an issue

Trickle Irrigation

- 1x/week during early spring and late fall, increasing to 3x/week during summer
- About 2 hours each time if 0.45gal/100'/min trickle tape - unless uncovered (may get rain)
- Water quality an issue at Rock Springs
  - pH 8.6
  - High in calcium and magnesium

Potassium Issues

At Rock Springs and in grower planting

0.85% here

1.0 to 1.45% is considered deficient

Soil and Water Tests

- Soil was high in potassium
- Real issue was water source – not something we normally worry in the field
  - Source was well water
  - No rainfall - Bigger impact of water source in tunnel

SWD Observations – 2012

- Relatively low SWD populations in tunnels
  - But plenty of larvae in fruit – turned out to be mainly other species
- H. T. raspberry grower reported no SWD issues with daily picking

Where to From Here?

- See info on High Tunnels at http://tunnel.usu.edu
- Will be updating information on www.tunnelberries.org

This work is based upon research supported by the USDA National Institute of Food and Agriculture, Section 7311 of the Food, Conservation and Energy Act of 2008 (AREERA), Specialty Crops Research Initiative under Agreement 2014-51181-22380.

Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.

United States Department of Agriculture
National Institute of Food and Agriculture

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High Tunnel Information and Resources

Background Information:

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Britney is a Horticulture Extension Assistant Professor (aka County Agent) for USU in Davis County. Britney organizes educational programs at the USU Botanical Center in Kaysville and provides expertise related to horticultural science to the community. Britney also has expertise is in out-of-season vegetable production using high tunnel greenhouses.

Session Description:

High tunnel resources available to growers

High Tunnel Information and Resources

Britney Hunter
Extension Assistant Professor
Davis County Horticulture

EXTENSION
UtahStateUniversity

EXTENSION.USU.EDU

Websites
(Production Factsheets, budgets, construction)

- USU Website (tunnel.usu.edu)
- Cornell University – (http://hightunnels.cals.cornell.edu)
- Penn State University (plasticulture.cas.psu.edu)
- ATTRA National Sustainable Agriculture Information Service (www.attra.ncat.org)
- www.hightunnels.org – hosted by Kansas State University

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Printed and Online Manuals

- Penn State: $25
- Missouri: $30
- Minnesota
- Iowa
- Vermont

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Tunnel.usu.edu

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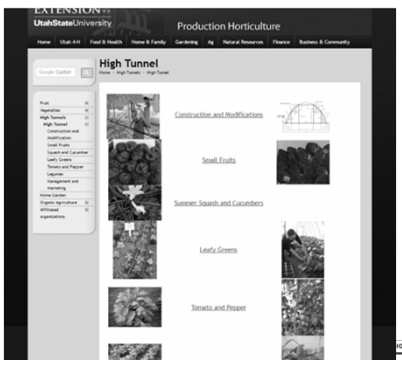

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USU Tunnel-specific Factsheets and Budgets

Factsheets
Strawberry
Raspberry
Blackberry
Squash
Lettuce
Spinach
Tomato
Pepper
Green bean

Budgets
Strawberry
Raspberry
Squash
Tomato

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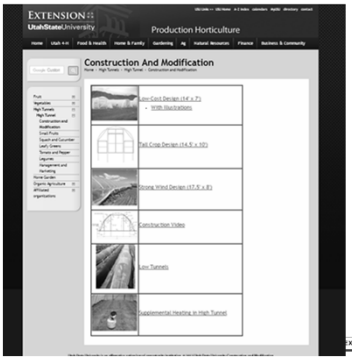

USU Extension Resources

- Demonstration site in North Logan
  - 9 small tunnels (14’ x 42’)
  - 3 large tunnels (30’ x 30’)
  - 10-year history with vegetables
  - 7-year history with berries

USU Extension Resources

- Demonstration site in North Logan
- Workshops
  - Management
  - Construction (Also on YouTube)

Financial Assistance

- NRCS – “EQUIP” program
  - Environmental Quality Incentives Program (EQUIP)
  - Will help pay for the cost of a high tunnel “kit”
  - Contact local field office for help
  - Some information online
- https://www.nrcs.usda.gov
  - Programs – Financial Assistance

https://offices.sc.egov.usda.gov

Thank you

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Small Changes for Big Profits: Understanding financial tools

Biographical Information:
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Logan, UT 84322-4835

Dr. Ruby Ward was raised on a farm and ranch in South-eastern Idaho. After graduating from Ricks College, she received a BS in Agricultural Economics and Accounting from Utah State University. From Texas A&M University she received an MBA and a PhD in Agricultural Economics. Dr. Ward is a professor in the Department of Applied Economics at Utah State University. Her current assignment involves all three areas emphasized at a land grant University—teaching, research and extension. She teaches agricultural finance and community planning. Dr. Ward has delivered educational programs in Utah and the surrounding region for the last 15 years. Ward was the committee chair for the Diversified Agricultural Conference for 10 years and currently co-chairs the Urban and Small Farms Conference in Utah. Ward is the project leader for the Rural Tax Education website (RuralTax.org) and Co-chair of the National Farm Income Tax Extension Committee. She has given many presentations on Tribal tax and financial issues. Ward works primarily in the area agriculture entrepreneurship.

Session Description:

This session will go over some basics for financial tools and analysis. This all will be done in the context of understanding what affects profit. It will examine methods and tools for both measuring profit, and understanding how combinations of changes can be used to reach a profit

goal. Included tools are: break-even analysis, loan calculations, sensitivity analysis, and cash flow analysis.

Business Management Curriculum

Module 4: Financial Analysis

WESTERN SARE Sustainable Agriculture Research & Education

USDA United States Department of Agriculture

National Institute of Food and Agriculture

Project Team:

- Ruby Ward, Professor, Utah State University
- Trent Teegerstrom, Associate Director of Tribal Extension, University of Arizona
- Karli Salisbury, Research Associate, Utah State University
- Kynda Curtis, Professor, Utah State University
- Staci Emm, Extension Educator and Professor, University of Nevada Reno
- Carol Bishop, Extension Educator and Associate Professor, University of Nevada Reno

EXTENSION UtahStateUniversity

THE UNIVERSITY OF ARIZONA COLLEGE OF AGRICULTURE & LIFE SCIENCES Cooperative Extension Tribal Extension Programs

University of Nevada Cooperative Extension

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Objectives

- What is Profit?
  - Increasing Profit
  - Profit vs. Wealth
- Analyze Business Using:
  - Sensitivity Analysis
  - Break Even Analysis
  - Partial Budgeting

What Does It Cost?

- Variable - When I plant another acre my total cost will increase
  - Seed, chemicals, labor, etc.
- Fixed – Stays the same whether I plant another acre or not
  - Depreciation, interest, long-term loans
  - Insurance and property tax

The Math Lesson

Profit = volume (price – cost per unit) – fixed cost

- How do we make more profit?
  - Increase volume
  - Increase efficiency
  - Change to something else

Increase Volume

- Sell more to same customers
- Sell to more customers
- Plant more acres
- Have more head of cattle
- Lease more ground

Become More Efficient

- Decrease the cost per unit
  - Spread same fixed costs over more units using same qualities
  - Lower variable costs by using resources more efficiently
- Increase yield
  - Higher quality produce
  - Harvested more efficiently

Change Your Product Mix

- Some products (enterprises) may be more profitable
- Focus more effort and resources on more profitable enterprises
- North Carolina
  - Sold petunias and geraniums because Walmart did. Cost more than she sold them for.
  - People traveled hours to buy specialty plants, which she made money on.

Break-Even Analysis

Break-Even Analysis

- Utilize cash expenses to determine cash break-even costs
- Can calculate yields required to cover cost
- Helps determine your price floor
  - Cash cost
  - Total cost (economic cost)
- Custom operations or own equipment?

Break-Even Analysis

- Profit Equation

$$Profit = (Price * Quantity) - (Unit\ Operating\ Cost * Quantity) - Total\ Ownership\ Cost$$

- Given Price: Quantity to break-even ($0 profit)

$$Quantity = \frac{Total\ Ownership\ Cost}{Price\ -Unit\ Operating\ Cost}$$

- Given Quantity: Price needed to break-even

$$Price = \frac{(Unit\ Operating\ Cost * Quantity) + Total\ Ownership\ Cost}{Quantity}$$

$$Price = Unit\ Operating\ Cost + \frac{Total\ Ownership\ Cost}{Quantity}$$

- Price after taxes – solve for Quantity or Price with profit = $0.

Tomato Budget – Break-Even Price Analysis

Enterprise Budget for 14' x 100' Tomato Bed

Revenue Product	Quantity	Unit	Price	Total	% of Revenue
individual product	*number sold*	*size of unit*	*price per unit*	*total revenue*	
Tomatoes Average Price	450	lbs	$ 1.50	$ 675.00	100%
Total Revenue				$ 675.00	100%
Expenses					
Materials				$ 129.00	
Labor				$ 530.00	
Marketing				$ 20.00	
Ownership Expenses (Fixed Costs)				$ 125.00	
Total Expenses				$ 804.00	119%
Net income before taxes (revenue minus expenses)				$ (129.00)	-19%
Income and self employment taxes				$ (19.35)	-3%
Net profit				$ (109.65)	-16%

Different break-even points:

- Cover variable costs
  - Variable Expenses / Quantity = Break-even price point
  - $679/450 = **$1.50 per lb.**
- Cover variable and fixed costs
  - (Variable + Fixed) / Quantity = Break-even price point
  - ($679+$125) / 450 = **$1.78 per lb.**

Tomato Budget – Break-Even Quantity Analysis

Enterprise Budget for 14' x 100' Tomato Bed

Revenue	Quantity	Unit	Price	Total	% of Revenue
Product					
Individual product	*number sold*	*size of unit*	*price per unit*	*Total revenue*	
Tomatoes Average Price	450	lbs	$ 1.50	$ 675.00	100%
Total Revenue				**$ 675.00**	100%
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Income and self employment taxes				$ (19.35)	-3%
Net profit				**$ (109.65)**	-16%

Different break-even points:

- Cover variable costs
  - Variable Expenses / Price = Break-even quantity point
  - $679/$1.50 = **452 lbs.**
- Cover variable and fixed costs
  - (Variable + Fixed) / Price = Break-even quantity point
  - ($679+$125) / $1.50 = **536 lbs.**

Break-Even Acres for Equipment

$$Break-even\ acreage = \frac{Annual\ Ownership\ Costs}{Custom\ Rates\ -\ Operating\ Costs\ Per\ Acre}$$

Annual Ownership Costs: Annual; depreciation, interest, taxes, insurance, and housing

Custom Rate per Acre: Rate charged per acre

Operating Costs per Acre: Fuel, maintenance, labor, and other inputs

Financing Equipment and Improvements

• Utah Used Auto Loans for 48 months (4 years).

Credit Score	Interest Rate
720-850	3.49%
690-719	4.92%
660-689	7.44%
620-659	10.07%
590-619	16.36%
500-589	18.35%

From MyFico.com

What does that mean for how much you pay?

Borrow $10,000 for a tractor

Credit Score	Interest Rate	Monthly Payment
720-850	3.49%	$224
690-719	4.92%	$230
660-689	7.44%	$242
620-659	10.07%	$254
590-619	16.36%	$285
500-589	18.35%	$296

What does that mean for how much you pay?

Credit Score	Interest Rate *	Monthly Payment	Paid Each Year
720-850	3.49%	$224	$2,682
690-719	4.92%	$230	$2,759
660-689	7.44%	$242	$2,898
620-659	10.07%	$254	$3,048
590-619	16.36%	$285	$3,423
500-589	18.35%	$296	$3,547

How many cartons of peppers do you have to sell? ($14/carton)

Credit Score	Interest Rate *	Monthly Payment	Paid Each Year	Car. Of Peppers
720-850	3.49%	$224	$2,682	192
690-719	4.92%	$230	$2,759	197
660-689	7.44%	$242	$2,898	207
620-659	10.07%	$254	$3,048	218
590-619	16.36%	$285	$3,423	244
500-589	18.35%	$296	$3,547	253

Sell 32% more peppers with bad credit.

What about the whole loan? ($14/carton)

Credit Score	Interest Rate	Total Paid	Interest Paid	Cartons for interest
720-850	3.49%	$10,729	$729	52.1
690-719	4.92%	$11,037	$1,037	74.0
660-689	7.44%	$11,592	$1,592	113.7
620-659	10.07%	$12,190	$2,190	156.4
590-619	16.36%	$13,692	$3,692	263.7
500-589	18.35%	$14,188	$4,188	299.1

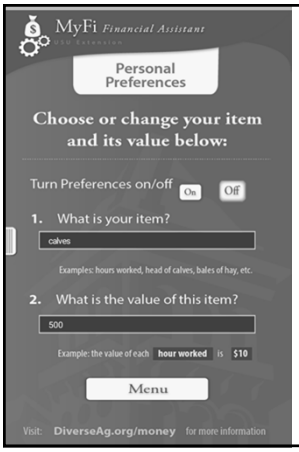
MyFi – Financial Assistant

- MyFi Assist –an app for "My Financial Assistant"
  - Free
  - Available in iOS and Android
  - Can be personalized to your situation

MyFi Assist was first introduced in the Money Management modules: a guide to personal finances. MyFi Assist will be used in examples of partial budgets.

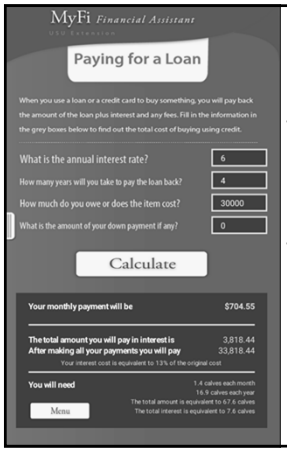
What Can My Business Afford?

- Investing in capital is a way to further a business's objectives and reach its goals. But is it affordable?
- Example: Buying a new truck
  - Increase fuel efficiency, decrease truck maintenance, increase towing capacity
  - Helpful when managing a ranch
- Will the efficiency of having a truck offset the payment?
- Use MyFi Assist to figure your monthly payment and how much of product you would have to sell to make the payment.



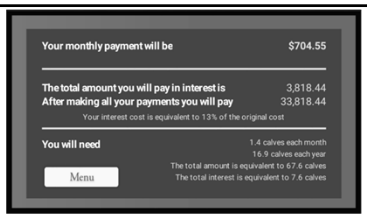
Personal Preferences – Ranch Example

- Input calves as the item of interest.
- In this example, each calf is valued at $500.
- What is the monthly payment of a truck bought for $30,000?
- The interest on the loan is 6%, and there is no down payment.
- Plan to pay the loan off in 4 years.



Personal Preferences – Ranch Example

- You would like to purchase a pickup and need to borrow $30,000 now. You will pay it off with monthly payments over 4 years. The interest rate is 6% annually.
- Use MyFi Assist, "Paying for a Loan"
  - Calculate the monthly payment
  - Calculate how many calves you would have to sell to make the truck payment.
  - What is the total you will pay for the pickup?



- The monthly payment for the truck is $705.
- 17 calves per year must be sold in order to make the truck payment.
- Can the business justify buying this truck?
- We will look at the effects of buying this truck using a sensitivity analysis, break-even analysis, and a partial budget.

How Do You Become Wealthy?

$$Growth = Profit - Taxes - Consumption$$

Deferring taxes does not generate wealth

- Either increase profit or lower consumption

How Do You Become Wealthy?

- You do not need to be a financial expert
- Understand how changes affect bottom line so you know what to work on
- Use the tool to find out how much you need to change to make it profitable
  - Then think of what you can do physically on the farm or ranch

Sensitivity Analysis

How Sensitive Are You?

- You made your best guess
- Determine what will happen if you are wrong
- Look at the good, the bad, and the ugly
- Changing one assumption may cause bigger changes in results

What happens if …

- Things happen that can affect your net profit
- Knowing the relationship of revenue, costs, and profit allows you to predict net income
- Help make adjustments and prepare for the year

Doing it

- Need to know revenue (value of sales) for a typical year
- How much you paid for
  - Expenses
  - Labor
  - Overhead (electricity, phone, insurance, etc.)
- Convert to percentages of revenue

Sensitivity Analysis – Ranch Operation

What if we increased production by 10%?...

Revenue would increase by 10%
Variable expenses would increase by 10%
Your bottom line would increase by 29%

Sensitivity Analysis: A Place To Start
change these cells to reflect the operation
Use these cells to examine the effect of percentage changes.

			% change	New Result	
Revenue		**$ 306.00**	10%	**$ 336.60**	
Expenses					
Inputs		$ 97.00	10%	$ 106.70	
Feed		$ 53.00	10%	$ 58.30	
Labor		$ 33.00	10%	$ 36.30	
Overhead		$ 80.00		$ 80.00	
Total Expenses		**$ 263.00**		**$ 281.30**	
Net Income before taxes		**$ 43.00**		**$ 55.30**	
					Percent change in net income
Income taxes	15.0%	$ 6.45		$ 8.30	
Net Income		**$ 36.55**		**$ 47.01**	**29%**

Sensitivity Analysis – Ranch Operation

What if we bought the $30,000 truck?

Revenue would stay the same

Inputs:
Fuel and Vehicle Maintenance would decrease by ~5%
Labor for Maintenance would decrease by ~5%
The bottom line would decrease by 31%

Because no additional revenue is being generated, the bottom line is affected a lot. This does not take into account the time it takes to pay off the truck; it is the reflection of one year's worth of truck payments.

Sensitivity Analysis: A Place To Start
change these cells to reflect the operation
Use these cells to examine the effect of percentage changes.

			% change	New Result	
Revenue		**$ 306.00**		**$ 306.00**	
Expenses					
Inputs		$ 97.00	-5%	$ 92.15	
Feed		$ 53.00		$ 53.00	
Labor		$ 33.00	-5%	$ 31.35	
Overhead		$ 80.00	25%	$ 100.00	
Total Expenses		**$ 263.00**		**$ 276.50**	
Net Income before taxes		**$ 43.00**		**$ 29.50**	
					Percent change in net income
Income taxes	15.0%	$ 6.45		$ 4.43	
Net Income		**$ 36.55**		**$ 25.08**	**-31%**

Break-Even Analysis

Break-Even Analysis

- Utilize cash expenses to determine cash break-even costs
- Can calculate yields required to cover cost
- Helps determine your price floor
  - Cash cost
  - Total cost (economic cost)
- Custom operations or own equipment?

Break-Even Analysis

- Profit Equation

$$Profit = (Price * Quantity) - (Unit\ Operating\ Cost * Quantity) - Total\ Ownership\ Cost$$

- Given Price: Quantity to break-even ($0 profit)

$$Quantity = \frac{Total\ Ownership\ Cost}{Price\ -Unit\ Operating\ Cost}$$

- Given Quantity: Price needed to break-even

$$Price = \frac{(Unit\ Operating\ Cost * Quantity) + Total\ Ownership\ Cost}{Quantity}$$

$$Price = Unit\ Operating\ Cost + \frac{Total\ Ownership\ Cost}{Quantity}$$

- Price after taxes – solve for Quantity or Price with profit = $0.

Tomato Budget – Break-Even Price Analysis

Enterprise Budget for 14' x 100' Tomato Bed

Revenue Product	Quantity	Unit	Price	Total	% of Revenue
individual product	*number sold*	*size of unit*	*price per unit*	*total revenue*	
tomatoes Average Price	450	lbs	$ 1.50	$ 675.00	100%
Total Revenue				**$ 675.00**	100%
Expenses					
Materials				$ 129.00	
Labor				$ 530.00	
Marketing				$ 20.00	
Ownership Expenses (Fixed Costs)				$ 125.00	
Total Expenses				**$ 804.00**	119%
Net income before taxes (revenue minus expenses)				**$ (129.00)**	-19%
Income and self employment taxes				$ (19.35)	-3%
Net profit				**$ (109.65)**	-16%

Different break-even points:

- Cover variable costs
  - Variable Expenses / Quantity = Break-even price point
  - $679/450 = **$1.50 per lb.**
- Cover variable and fixed costs
  - (Variable + Fixed) / Quantity = Break-even price point
  - ($679+$125) / 450 = **$1.78 per lb.**

Tomato Budget – Break-Even Quantity Analysis

Enterprise Budget for 14' x 100' Tomato Bed

Revenue	Quantity	Unit	Price	Total	% of Revenue
Product					
Individual product	*number sold*	*size of unit*	*price per unit*	*Total revenue*	
Tomatoes Average Price	450	lbs	$ 1.50	$ 675.00	100%
Total Revenue				**$ 675.00**	100%
Expenses					
Materials				$ 129.00	
Labor				$ 530.00	
Marketing				$ 20.00	
Ownership Expenses (Fixed Costs)				$ 125.00	
Total Expenses				**$ 804.00**	119%
Net income before taxes (revenue minus expenses)				**$ (129.00)**	-19%
Income and self employment taxes				$ (19.35)	-3%
Net profit				**$ (109.65)**	-16%

Different break-even points:

- Cover variable costs
  - Variable Expenses / Price = Break-even quantity point
  - $679/$1.50 = **452 lbs.**
- Cover variable and fixed costs
  - (Variable + Fixed) / Price = Break-even quantity point
  - ($679+$125) / $1.50 = **536 lbs.**

Break-Even Acres for Equipment

$$Break-even\ acreage = \frac{Annual\ Ownership\ Costs}{Custom\ Rates\ -\ Operating\ Costs\ Per\ Acre}$$

Annual Ownership Costs: Annual; depreciation, interest, taxes, insurance, and housing

Custom Rate per Acre: Rate charged per acre

Operating Costs per Acre: Fuel, maintenance, labor, and other inputs

Cash Flow

Why is Cash Flow Important?

- Use cash to:
  - Pay bills
  - Pay employees
  - Down payments for improvements
  - Buy new equipment
  - Take withdrawals from business
  - Unexpected expenses
- Cash flow is another word for **Liquidity**
- Constant need for cash

Cash Flow Statement

- The cash flow traces the flow of cash into and out of the business over a period of time, usually one year
- Deals only with cash transfers and breaks the year down by month.
- Allows the planner to anticipate credit needs and repayment schedules

Cash Flow Statements

Cash Flow: Running cash balance of the cash inflow and outflow for a period. This is usually prepared annually, showing income, outflow, and cash available or needed for each month.

Projected Cash Flow: Same as above, but completed at the start of the year to estimate the cash flow needs of the operation.

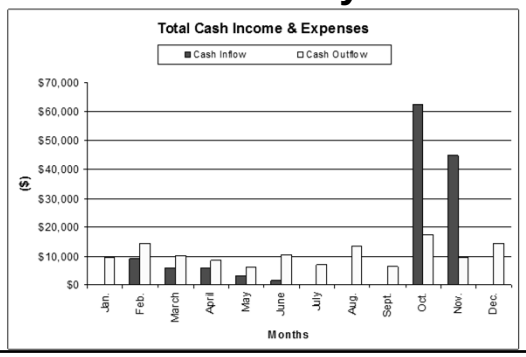
Projected Cash Flow

Monthly Income and Expenses

year: 2009

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL	Projected
Tomatoes				$500.00	$600.00	$700.00	$700.00	$600.00	$500.00				$3,600.00	
Asparagus					$300.00	$500.00	$500.00	$400.00	$300.00				$1,900.00	
Corn					$375.00	$300.00	$300.00						$975.00	
Other													$0.00	
Gross sales	$0.00	$0.00	$0.00	$500.00	$1,175.00	$1,500.00	$1,500.00	$1,000.00	$700.00	$0.00	$0.00	$0.00	$6,375.00	$0.00
Car & Truck (line 12)	$75	$65	$60	$80	$70	$65	$75	$70	$85	$65	$70	$75	$855.00	
Chemicals (line 13)													$0.00	
Conservation expenses (line 14)				$75	$80	$80							$235.00	
Custom Hire, machine work (line 15)			$120			$120			$120			$120	$480.00	
Depreciation (line 16)													$0.00	
Employee Benefit plan (line 17)													$0.00	

Monthly Cash Flow Summary



Partial Budgeting

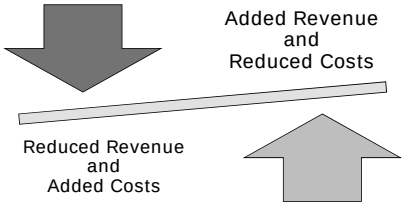
Techniques to Evaluate Changes

- Partial Budgeting
  - A financial decision-making tool that will help you look and the advantages and disadvantages of changing a specific operation
  - Used to analyze important decisions like
    - Adopting a new technology
    - Leasing instead of buying new machinery
    - Hiring custom work
    - Changing enterprises

Partial Budgeting

- State the change you would like to analyze
- List added returns
  - Any additional revenue that is generated from the proposed change
- List reduced costs
  - Areas where the proposed change would reduce costs
- List reduced returns
  - The proposed change may reduce the revenue of other areas of your business
- List added costs
  - Any additional costs that are generated from the proposed change

How Do We Evaluate Change in the Business?



If (Added Revenue + Reduced Costs) – (Reduced Revenue + Added Costs) is positive, then the stated change could be feasible

Partial Budgeting Worksheet

Partial Budget

Additional revenue			
What	number	$ /unit	Total

Reduced revenue			
What	number	$ /unit	Total

Reduced Cost			
What	number	$ /unit	Total
		Total	0

Additional cost			
What	number	$ /unit	Total
		Total	0

Net Difference 0

A partial budget is only as good as the information you include. Try to be as accurate as possible.

+ Additional Revenue
+ Reduced Cost
- Reduced Revenue
- Additional Cost
= Net Difference

If the Net Difference is positive then the proposed change has a net positive benefit and could be a viable alternative.

Partial Budget - Tomato Bed

Stated Change: Buy a tractor and a rototiller for our 14' x 100' tomato bed.

Partial Budget for a 14' x 100' Tomato Bed

Additional revenue			
What	Quantity	$ /unit	Total

Reduced revenue			
What	Quantity	$ /unit	Total

Reduced Cost			
What	Quantity	$ /unit	Total
Labor Land Prep	3 hrs.	$10	$30.00
	Total		30

Additional cost			
What	Quantity	$ /unit	Total
35 HP Tractor Payment	1	2,000	2,000
Roto Tiller	1	300.00	300
Fuel	3	2.5	8
	Total		2308

Net Difference -2277.50

- The partial budget shows that it is not cost effective to buy a tractor and a rototiller for a small 14' x 100' tomato bed.
- But the added technology creates the potential for expansion.

Partial Budget - Tomato Bed

Stated Change: Buy a tractor and a rototiller for our 20 - 14' x 100' tomato bed.
Buy the tractor and rototiller assuming a 10 year usage.

Partial Budget for a 14' x 96' Tomato Bed

Additional revenue			
What	Quantity	$ /unit	Total

Reduced revenue			
What	Quantity	$ /unit	Total

Reduced Cost			
What	Quantity	$ /unit	Total
Labor Land Prep	120 hrs.	$10	$2,400.00
	Total		2400

Additional cost			
What	Quantity	$ /unit	Total
35 HP Tractor Payment	1	1,000	1,000
Rototiller	1	150.00	150.00
Fuel	75	2.5	187.50
	Total		1338

Net Difference 1062.50

Questions?

Thank You!

How to Use Tools to Make Decisions in Real Situations

Biographical Information:

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Dr. Ruby Ward was raised on a farm and ranch in South-eastern Idaho. After graduating from Ricks College, she received a BS in Agricultural Economics and Accounting from Utah State University. From Texas A&M University she received an MBA and a PhD in Agricultural Economics. Dr. Ward is a professor in the Department of Applied Economics at Utah State University. Her current assignment involves all three areas emphasized at a land grant University—teaching, research and extension. She teaches agricultural finance and community planning. Dr. Ward has delivered educational programs in Utah and the surrounding region for the last 15 years. Ward was the committee chair for the Diversified Agricultural Conference for 10 years and currently co-chairs the Urban and Small Farms Conference in Utah. Ward is the project leader for the Rural Tax Education website (RuralTax.org) and Co-chair of the National Farm Income Tax Extension Committee. She has given many presentations on Tribal tax and financial issues. Ward works primarily in the area agriculture entrepreneurship.

Session Description:

The first hour covered the financial tools and basics. This half hour will be more discussion oriented to look at how to use the financial tools in real situations. A list of potential situations is

included here, but additional questions and/or situations brought up by the audience will also be discussed.

How to use Financial Tools to Make Decisions in Real Situations:

Example Situations

1. I am at the market. If I don't sell my product, it goes to waist. Should I keep my prices, and then donate or do something with the rest? Should I lower my price, to gain customers? Should I give it away to anyone that is there? What does each choice do to my profit?

2. My goal is to increase sales. What are strategies to do that? How can I track it? How can I get my employees involved in this? How can I track my employees' performance?

3. I am thinking of hiring more employees this season. How much extra do I need to sell to cover the cost of the labor?

4. I just cannot produce enough of a particular item. Everyone keeps asking for it and I sell out, but it is a pain to grow. I don't know if its even worth it.

Insights on Marketing Strategies in the Northeast

Biographical Information:
Kathy Demchak
Penn State University
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University Park, PA 16802
efz@psu.edu

Kathy Demchak has been a Sr. Extension Associate in the Dept. of Plant Science at Penn State University since 1999. She has worked with berry crops since 1992, and has conducted research and demonstration work on high tunnel berry production since the year 2000. She is part of a Specialty Crops Research Initiative project entitled "Optimizing Protected Culture Environments for Berry Crops", headed by Eric Hanson at Michigan State University.

Session Description:

Many successful Northeastern farmers have placed a focus on providing customers with a memorable experience that makes their operation a destination rather than a stop along the way. Farmer's markets have been increasing in numbers over the past few years, CSAs are still popular, and even producers who sell wholesale are benefiting from the "Know Your Farmer, Know Your Food" movement. This talk will provide an overview of the many different marketing strategies used by Northeastern growers to increase their bottom line.

Insights on Marketing Strategies in the Northeast

K. Demchak, Dept. of Plant Science, Penn State University

Results from the 2015 USDA-NASS Local Food Marketing Practices Survey (https://www.agcensus.usda.gov/Publications/Local_Food/index.php) showed that while California was first in direct-to-consumer sales, New York and Pennsylvania ranked second and third in sales, with a combined value nearly equal to that of California's. Pennsylvania ranked first in the number of farms selling directly to consumers with over 6000 farms doing so. Not surprisingly, many of these farms are located near large metropolitan areas.

Farms in the Northeast are highly diversified operations – it is not uncommon for farms to grow 30 or more different crops on-site, but in addition, growers in the region use many different marketing strategies to increase their bottom line. Many successful Northeastern farmers have placed a focus on providing customers with a memorable experience that makes their operation a destination rather than a stop along the way.

Pick-your-own (aka U-pick or PYO) crops. With today's consumer becoming ever-less-familiar with growing crops, pick-your-own operations offer consumers opportunities for enjoyable family outings where they can pick a few quarts of strawberries or blueberries, or wander around the field looking for the perfect pumpkin or interesting gourds. Crops such as berries, where labor for harvest may be expensive, scarce, or both, are popular for pick-your-own operations. Pennsylvania also ranks first in the nation in the number of strawberry growers, which is often referred to as the crop that kicks off the marketing season. Many growers report that the biggest value in the strawberry crop is that it draws consumers in to their farms early in the season, and while consumers may pick only a few dollars' worth of strawberries (and possibly eat more in the field than they pay for), the sales of other items multiply. With an enjoyable first experience, the hope is that customers will continue to come to the farm throughout the summer and fall.

Parking within walking distance of the pick-your-own field is a consideration, and sometimes results in limitations being placed on cultural practices such as crop rotation; as growers often want to keep U-pick fields within walking distances of the parking lots. Alternatively, growers can provide hayrides or wagon rides to get their customers to the fields if they are located further than an easy walking distance away.

Prices charged for PYO crops vary tremendously depending on location. For example, in PA PYO strawberries still are sold for under $2.00 per pound in the northern rural areas of the state but $5.99 per pound near the Philadelphia area. Whether this is purely a reflection of what the consumer will pay is unclear. As one grower put it, prices may be a reflection of what the farmer would be willing to pay, rather than purely a reflection of what the consumer would pay. Another commented that basing prices on what appeals to the cheapest customer might not be the best strategy for profitability.

On-farm markets. Farm markets are of course, a way to sell produce grown on the farm, but also can be used to market additional products. Many markets offer common value-added products such as jellies, fruit butters, or salsas, but alongside these in the same display, may have signage describing suggested uses for products, or offer crackers or biscuits for additional jelly appeal, or chips to go with the salsa. They may provide in one theme-focused location all of the items needed for food preservation, such as canning jars and lids, canners, and utensils. They may also

offer packaged pickling mixes, fruit pectin, or books with recipes and directions for preserving food as well. Gift baskets are a valuable item to have, especially around the holidays, but do require having someone available to make them who has a creative touch. Often there will be educational information presented with the products – for example, season, descriptions and best uses for the 20 or so varieties of apples that a larger farm market may sell.

Placement and arrangement of the displays is often creative and intended to provide a homey feel, with antique cupboards, shelving, or apple crates used to display products.

Many on-farm markets offer bakery products, with pies often being reported as an item that increases sales greatly. These may or may not use fruit grown on the farm. Others markets have small cafes or coffee shops where consumers can have breakfast, a snack, or a unique sandwich, encouraging them to stay longer. For a less involved option, the farm may offer a shady spot or picnic tables under a pavilion where customers can enjoy a packed lunch or snacks if they wish. Placement, of course, should be such to ensure that only the customers visiting the farm are likely to use the area, but also should be where farm personnel can keep an eye on the area.

Increasingly farmers are partnering with other local farmers or agricultural businesses to capitalize on the local foods movements while offering a wider range of products in their markets such as specialty flours, cheeses, grass-fed beef, or eggs from free-range chickens. Meat products are often kept frozen to minimize concerns with spoilage.

Most operations have a web site that provides information on the farm, but some also make it easier for customers to place and pay for an order for baked goods or other products that they can pick up later.

Agritainment. A plethora of activities to entertain customers are frequently offered, including corn or sunflower mazes which kids can navigate - occupying as much as 10 acres - petting zoos, and hay wagon rides. Some farms (with appropriate safety measures in place of course) may have potato gun contests, competitions where participants see how far they can launch a pumpkin with a catapult, or feature pumpkin bowling with prizes. Some farms offer birthday party packages that include activities on the farm, a snack, gift bags, and a coupon that provides a discount for a future visit to the farm. For older kids the party might include a campfire.

Generally there will be a series of special events taking place during the year, such as an Easter egg hunts, strawberry festivals, fall harvest festivals, haunted hay rides, or concerts. More recently, the concept of charging a single admission price to the farm for these events has been adopted by a number of growers, whereas previously, they may have charged for individual activities.

Of course, with additional people attending events on farms, the probability of a customer being injured on the farm increases, so every effort to provide a safe experience should be provided, and liability and insurance concerns address with the farm's insurer. It is also critical to make sure that activities are sufficiently staffed with people-friendly and well-trained employees.

Educational opportunities. Many farms offer school tours that consist of activities such as a wagon ride around the farm with an explanation of which crops are grown and how, and other activities such as picking out a pumpkin in the fall or planting a plant in the spring. One farm even offers a rent-a-baby-chick program, where children first take a class on proper chick care, are provided with all the materials needed for correctly caring for a chick, and then can raise the

chick either at home or in a school setting, and return it after 2 weeks if they don't wish to keep it. This greatly relieves the stress for both the adult involved and the chicken.

Farmers markets. An increasing number of farmer's markets are in existence, where growers with a wide array of products have a booth or space at a given location. The markets may be indoors if a large enough building is available, and this also allows the market to be open year-round. More frequently, markets are at an outdoor location. Some of the service plazas along the Pennsylvania Turnpike have days where farmer's markets are held, or they may be held along streets in downtown areas or even in parking lots of shopping plazas or home improvement stores.

Community Supported Agriculture (CSAs). With CSAs, customers purchase shares, which provide the farmer with up-front cash flow before the beginning of the growing season, and in return are provided with an assortment of fresh produce as it becomes available, generally enough to last through a week. Usually the produce consists of vegetables, but also may include value-added products when fresh items are low in supply. Sometimes growers will partner with other operations to add appealing items which they don't grow such as berries. Generally produce is taken to a convenient pick-up location where CSA subscribers can stop by on a given day of the week.

Restaurants. Some growers have cultivated relationships with chefs at local restaurants who either prefer to buy local produce, or who are looking for specific varieties or qualities in a commodity that the grower can produce. Often the highest quality if necessary, but often this is reflected in the price received.

Wholesale. A number of avenues for large quantity sales exist, though a relatively lower number of growers use them. Currently, about a dozen auctions exist in the state where smaller growers, primarily those belonging to Plain Sect communities, may bring their produce and to which wholesale buyers come. Other growers selling wholesale quantities belong to well-organized large-scale industries such as the tree fruit industry where a processor may be located nearby.

Recently, regional grocery chains such as Wegmans have become more active in working with local growers, primarily seeking out those employing certified organic or sustainable practices. Other regional chains are interested in the marketing appeal of simply having some local growers provide some of their product. Finally, a few of the largest growers are able to grow produce in sufficient quantities to work with larger distributors such as national or nearly-national retailers.

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Insights on Marketing Strategies in the Midwest

Background Information:

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Liz Maynard serves as a Purdue Extension specialist for vegetable crops in Indiana. Her research and extension focus on cultural practices for sustainable vegetable production. Recent projects include extending production of vegetables in fall, winter, and spring using protective structures including high tunnels, managing soil fertility on organic vegetable farms, and sweet corn variety evaluation.

Session Description:

We will take a look at marketing tools and strategies used by produce growers in the Midwest, including FOODLink, an information source for consumers about seasonal produce.

Marketing Strategies in the Midwest

Liz Maynard, Purdue University

FOODLink is an information source for consumers about seasonal produce in Indiana. It was developed to help consumers know when local produce is available, become familiar with kinds and types sold by local farmers, learn basic preparation practices, and get ideas for how to pair with other foods and use in recipes. The information is online in a smart-phone friendly format. < https://extension.purdue.edu/foodlink/>

Producers can download point-of-sale information about FOODLink to use at farmers' markets, roadside stands, and farm markets. Each fruit or vegetable has its own sign with a QR code that links directly to information about that product. This makes it simple for smart-phone users to learn about the produce as they browse market displays.

FOODLink was developed by Purdue Extension under the leadership of Roy Ballard, Extension Educator in Hancock County, with funding from the Indiana State Dept. of Agriculture through the USDA Specialty Crop Block Grant Program.

Another approach to increase the sales of local produce, as well as other local foods, has been the development of new food hubs. One of these is the Hoosier Harvest Market <http://hoosierharvestmarket.com/>. This is an online marketplace where consumers can order from member producers and pick up all the items at one time at one of several locations. The Hoosier Harvest Market opened for business in 2013. It delivers to 15 locations in 5 counties in central Indiana. This project was also led by Roy Ballard and funded by a Specialty Crop Block Grant.

How to Reach Potentials Markets: Panel of professional customers

Session Description:

In general, the data shows that sales at farmers markets and other outlets have leveled off. At the same time the number of markets and vendors is increasing. This means that farmers now may have to go to multiple markets to reach the same sales they used to get at only one market. In order to increase sales at farmers markets and other direct marketing outlets, it is useful to understand what potential customers value and how to reach them. This panel is made up of the following individuals:

1. Kalissa is a working mom. She has worked in department stores and as a personal stylist. She lives in Daybreak.
2. Sarah is a mother of 4 boys. She lives in West Jordan.
3. Jaqueline lives in Davis County and is a Foodie. She works providing educational programs on nutrition and food preservation.

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Whole Farm Revenue Protection

Background Information:

Catharine Anderson
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Catharine Anderson is a Risk Management Specialist for the USDA-Risk Management Agency-Davis Regional Office. She has worked for the Risk Management Agency (RMA) since 2005, after graduating from the University of California-Davis with a B.S. in Biotechnology and a M.A. in Geography/GIS. The regional programs that she maintains are Whole Farms Protection Revenue, Mint, Forage Production, Small Grains, Pecans and Forage Seeding.

Session Description:

Basics of Whole Farm Revenue Protection

Whole Farm Revenue Protection

Presented by
Catharine Anderson
Risk Management Specialist
USDA - Risk Management Agency
Davis Regional Office

USDA

This presentation highlights features of the WFRP and is not intended to be comprehensive. The information presented neither modifies or replaces terms and conditions of the WFRP policy and the county actuarial documents.

USDA - Risk Management Agency

- Davis Regional Office (serving Arizona, California, Hawaii, Nevada and Utah)
- Provide:
  - Agricultural producers with the opportunity to achieve financial stability through effective risk management tools;
  - Educational opportunities to help producers choose appropriate risk management tools.

What kind of farms benefit from Whole Farm?

- Highly diverse farms
- Farms with specialty commodities
- Farms selling to:
  - Direct markets
  - Specialty markets
  - Regional or local markets
  - Farm-identity preserved markets

What does Whole Farm cover?

- Organic growers can insure their organically grown (insurable) crops.
- Revenue from all commodities produced on the farm:
  - Including animals and animal products
  - Commodities purchased for resale (up to 50% of total)
  - Excludes timber, forest, forest products and animals for sport, show or pets.

What does Whole Farm cover?

- Covers revenue 'produced' in the insurance year.
  - A commodity not harvested or sold will count as revenue.
  - A commodity grown last year and sold this year will not be covered.
  - Prices used to value commodities to be grown must meet the expected value guidelines in the policy.

What does Whole Farm cover?

- For commodities that grow each year, like cattle, only the growth for the insurance year counts.
  - Example: Calves worth $800 at beginning of the year and to be sold at $2,000, the value insured will be $1,200.

What does Whole Farm cover?

- Replant costs (with approval).
- Loss of revenue during the insurance year due to:
  - Natural causes of loss and decline in the market price during the insurance period.
  - When revenue-to-count for the insurance year is lower than insured revenue, a loss payment will be made.
  - Taxes must be filed for the insurance year before any claim can be made (2017 insurance years requires 2017 year farm taxes to be filed).

What are the features of WFRP?

- All farm revenue is insured together under one policy.
  - Individual commodity losses are not considered, it is the overall farm revenue that determines losses.
- Premium subsidy is available and depends on farm diversification

What are the features of WFRP?

- Coverage levels 50-85%
  - 5% increments
  - Eligibility for the 80% and 85% coverage level requires 3 commodities (commodity count)
  - Potato farms must have 2 commodities
  - Commodities insurable with other revenue coverage must have 2 commodities

Important Dates

- Must purchase by Sales Closing Date of:
  - AZ and CA: February 28
  - NV and UT: March 15
- And, at the same time, provide your completed Intended Farm Operation Report for your farming entity.

Qualifying Person Criteria

- Be a U.S. citizen or resident;
- Be eligible to receive federal benefits;
- File a Schedule F or Substitute Schedule F tax form covering 100 percent of the farm operation;
- The entity must have tax returns for each year (5 consecutive years) of the revenue and expense history and farm operation as the insured person for the insurance year (check policy for exceptions);

Program Enhancements

- USDA-qualified *Beginning Farmers and Ranchers (BFR)* may qualify with 3 historic years of taxes if they have been farming also the previous year.
  - For 2017 – requires taxes to have been file in 2013, 2014, 2015 and for the producer to have been farming in 2016.
  - Qualifying BFR's receive an extra 10% premium subsidy

Program Enhancements (continued)

- Coverage is available up to $8.5 million for all commodities produced on the farm all under one policy
- Producers with up to $1 million expected revenue from *animals and animal products* may qualify (removed 35% limit)
- Producers with up to $1 million expected revenue from *nursery and greenhouse* may qualify (removed 35% limit)

Program Enhancements (continued)

- Record requirements for direct-marketed commodity sales were modified:
  - Acceptable sales records for direct marketed commodities are now records kept by the producer during the year
- Recordkeeping aids (examples) for direct marketers are available on the WFRP web page (www.rma.usda.gov)

How Whole Farm Revenue Protection Works

- Determine Whole Farm Historic Average Revenue
- Determine 2016 Expected Crop Revenue
- Determine Approved Revenue
- Decide what percentage of Approved Revenue to guarantee
- Actual 2016 Insured Revenue Determined
- Taxes Filed / Possible Claim
- Loss Paid

At 75% Coverage Level:

$ 101,225	Approved Revenue
x 75%	Coverage level (deductible)
75,919	Insured Revenue (Asset protection)
- 48,040	2016 Revenue to Count for insurance year
$ 27,879	Revenue Loss (Indemnity payment)

Total Premium Cost: $6,529
USDA Pays 80% Subsidy: $5,223
Producer Final Premium Cost: $1,306

What Does it Cost? – Depends on…

- County
- Number and diversity of crops
- Types of crops insured

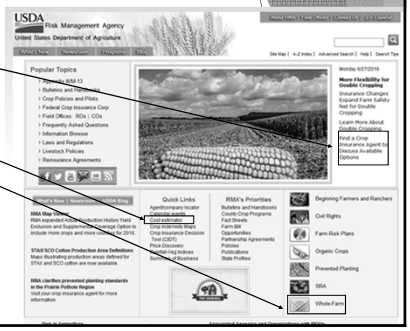
Subsidy Portion of Total Premium Paid by USDA

Coverage Level Premium Subsidy

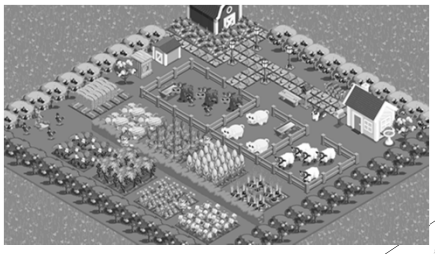
Coverage Level	50	55	60	65	70	75	80	85
Basic 1 Commodity	.67	.64	.64	.59	.59	.55		
2 Commodity Count	.80	.80	.80	.80	.80	.80		
3 Plus Commodity Count	.80	.80	.80	.80	.80	.80	.71	.56

Local Crop & Livestock Insurance Agents

- For more information on:
  - Find a crop/livestock agent
  - Cost Estimator – Premium Calculations
  - Program – Policies
- Log on to: www.rma.usda.gov



Questions???



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Available Financial Resources for Small Farms

Biographical Information:

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Federal/Private Loan & Grant Programs

Resources Available

- Western Ag Credit
- Utah Department of Agriculture and Food
- Agriculture Marketing Service (AMS)
- Rural Development (RD)
- Farm Service Agency (FSA)
- Natural Resources Conservation Service (NRCS)

Western Ag Credit

- As an agricultural lender, Western AgCredit can lend money for any ag-related purchase
- Common loan programs
  - Operating Loans
  - Equipment Loans
  - Livestock Loans
  - Agriculture Real Estate Loans
- Special programs
  - Ag Start Program
  - Farm Fresh Marketing Grant
  - Young, Beginning and Small Program

Western Ag Credit

- Ag Start Program https://www.westernagcredit.com/products_and_services/agstart
- The purpose of AgStart is to assist small farming and ranching operations in the early stages of development who market, or plan to market, their agricultural products directly to consumers or through local/regional food systems through low interest loans. This includes but is not limited to organic farming, local food farming and small farming operations.
- Up to $25,000 per applicant

Western Ag Credit

- Farm Fresh Marketing Grant https://www.westernagcredit.com/products_and_services/farm_fresh_advertising_grants
- Helps farmer's markets publicize their markets and donates reusable shopping bags

Western Ag Credit

- Young, Beginning and Small Program
  - https://www.westernagcredit.com/products_and_services/young_beginning_small
- The special financing programs we offer help young (under 35), beginning (less than 10 years of experience) and small (operators that generate less than $250,000 in annual gross sales of agriculture products) borrowers obtain the agricultural financing necessary for success in their operations.

Utah Department of Agriculture & Food

- Agricultural Resource Development Loans (ARDL)
- Specialty Crop Block Grant Program
- Utah's Own Program
- Ag Land Preservation
- Agriculture Certificate of Environmental Stewardship (ACES)
- Utah Grazing Improvement Program (UGIP)
- http://ag.utah.gov/

Agricultural Marketing Service

- Farmers' Market Promotion Program (FMPP)
- Local Food Promotion Program (LFPP)
- Federal State Marketing Improvement Program (FSMIP)
- http://www.ams.usda.gov/

Agricultural Marketing Service

- Farmers' Market Promotion Program
  - Projects that develop new market opportunities for farm and ranch operations serving local markets by developing, improving, expanding, and providing outreach, training, and technical assistance.
- Projects that assist in the development, improvement, and expansion of…
  - Farmers markets, roadside stands, community-supported agriculture programs, agritourism and food activities
  - Other direct producer-to-consumer market opportunities
- Per grant awards
  - $15,000 - $100,000
  - 24 month grant period

Agricultural Marketing Service

- Local Food Promotion Program
  - Projects supporting the development and expansion of local and regional food business enterprises. Projects for entities that process, distribute, aggregate, or store locally or regionally produced food products.
- Planning grants
  - Activities can include, but are not limited to:
    - Market research, feasibility studies, business planning
  - Per grant awards
    - $5,000 - $25,000, 25% match required
    - 12 month grant period
- Implementation grants
  - Activities can include, but are not limited to:
    - Training & technical assistance, outreach & marketing, non-construction infrastructure improvements, working capital
  - Per grant awards
    - $25,000 - $100,000
    - 24 month grant period

Rural Development

- Value Added Producer Grants
- Rural Business Development Grants
- Rural Microentrepreneur Assistance Program
- Rural Energy for America Program Renewable Energy Systems & Energy Efficiency Improvement Loans & Grants
- Many others at http://www.rd.usda.gov/

Rural Development

- Value Added Producer Grants
  - http://www.rd.usda.gov/programs-services/value-added-producer-grants
- The VAPG program helps agricultural producers enter into value-added activities related to the processing and/or marketing of bio-based, value-added products. Generating new products, creating and expanding marketing opportunities, and increasing producer income are the goals of this program. You may receive priority if you are a beginning farmer or rancher, a socially-disadvantaged farmer or rancher, a small or medium-sized farm or ranch structured as a family farm, a farmer or rancher cooperative, or are proposing a mid-tier value chain. Grants are awarded through a national competition.
- Maximum grant amounts
  - $75,000 for planning grants; $250,000 for working capital grants
- Matching funds requirements
  - 50% of total project costs, in-kind or cash

Rural Development

- Rural Business Development Grants http://www.rd.usda.gov/programs-services/rural-business-development-grants
- RBDG is a competitive grant designed to support targeted technical assistance, training and other activities leading to the development or expansion of small and emerging private businesses in rural areas that have fewer than 50 employees and less than $1 million in gross revenues. Programmatic activities are separated into enterprise or opportunity type grant activities.
- Generally, grants range from $10,000 up to $500,000. There is no cost sharing requirement.

Farm Service Agency

- http://www.fsa.usda.gov/
- Microloan Program
  - Minority and Women Farmers and Ranchers Loans
  - Beginning Farmer and Rancher Loans
- Conservation Loan Program
- Direct Farm Ownership Loans
- Direct Operating Loan Program

Farm Service Agency

- Microloan Program
  - http://www.fsa.usda.gov/programs-and-services/farm-loan-programs/microloans/index
- The focus of Microloans is on the financing needs of small, beginning farmer, niche and non-traditional farm operations, such as truck farms, farms participating in direct marketing and sales such as farmers' markets, CSA's (Community Supported Agriculture), restaurants and grocery stores, or those using hydroponic, aquaponic, organic and vertical growing methods.
- Portion of funds targeted to small and beginning farmers/ranchers, and minority and women farmers/ranchers.

Natural Resources Conservation Service

- NRCS provides technical and financial assistance to private landowners/ag producers.
- NRCS's natural resources conservation programs help people reduce soil erosion, enhance water supplies, improve water quality, increase wildlife habitat, and reduce damages caused by floods and other natural disasters. Public benefits include enhanced natural resources that help sustain agricultural productivity and environmental quality while supporting continued economic development, recreation, and scenic beauty.
- http://www.nrcs.usda.gov

Natural Resources Conservation Service

- Conservation Plan Development
- Environmental Quality Incentives Program (EQIP)
  - General (Irr. Cropland, Dry Cropland, Range, Pasture, Forestry, Riparian, AFO/CAFO)
  - Initiatives (High Tunnels, Sage Grouse, Salinity, Wildlife, Drought, Energy, Organics)
- Agricultural Management Assistance Program (AMA)
- Conservation Stewardship Program (CSP)
- Agricultural Conservation Easement Program (ACEP)
  - Agricultural Land Easement (ALE)
  - Agricultural Land Easement Grasslands (ALE-GSS)
  - Wetland Reserve Easement (WRE)

Natural Resources Conservation Service Conservation Plan Components

- Sustainable and Productive Soils
  - Quality: Erosion, Nutrients, Contaminants
- Clean and Abundant Water
  - Quality: Nutrients, Pathogens, Petroleums, Salinity
  - Quantity: Irrigation, Drought, Water Flow
- Air
  - Quality: Odor, Particulate Matter, Reduced Visibility
- Plants
  - Condition: Invasive Weeds, Wildfire, T&E Species
- Animals
  - Wildlife: Habitat, Food, Cover, Shelter
    Domestic: Water, Forage Quality, Grazing, Manure Management
- Adequate Energy Supply
  - Fuel, Alternative, Power
- Human Interaction
  - Economics, Sustainability, Cultural Resources, Traditions

Natural Resources Conservation Service

- Environmental Quality Incentives Program
- Project examples
  - Composting facility
  - Cover crops
  - Fencing
  - Irrigation systems, pipeline, pumping, sprinklers
  - Pasture and hay planting
  - Residue management
  - Season high tunnel systems
  - Watering facilities
  - Crop rotation
  - Nutrient management
  - Prescribed grazing

Natural Resources Conservation Service

- High Tunnel Initiative
- NRCS provides financial assistance for high tunnels up to a maximum of five percent of one acre, or a total of 2,178 square feet. Landowners can purchase and install larger high tunnels, but NRCS will only pay for the first 2,178 square feet. Plants must be planted in the ground or in permanent raised beds, not containerized.
  - Since water runoff from high tunnels can cause erosion, pooling and other environmental concerns, additional conservation practices may be installed as a condition for the installation of a high tunnel.
  - These might include runoff management, filter strips, drain structures for water control, critical area planting

USDA United States Department of Agriculture National Institute of Food and Agriculture

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Thank you!

Urban Food Connections of Utah

Local Food Microgrant Program: Accepting Applications

Urban Food Connections of Utah is pleased to offer a limited number of microgrant opportunities for commercial farming establishments dedicated primarily to the production of fruits and vegetables using ecologically sustainable agricultural methods. The intent of the Local Food Microgrant Program is to increase the amount and diversity of ecologically sustainable agriculture produced for the Salt Lake City market by assisting local small farmers to access technology, education, tools and equipment to grow more organic local produce.

Maximum grant request is $5,000. Deadline for grant applications is March 15, 2017.

Who may apply for the grant?

UFCU is accepting applications from commercial farmers that sell or distribute organic produce through Salt Lake City farmers markets, restaurants, institutions, grocery stores, and community supported agriculture operations that have drop-off sites within Salt Lake City limits. Microgrant funding is available to farms that are based in the following counties: Salt Lake, Davis, Weber, Morgan, Wasatch, Utah, Summit, Box Elder and Cache.

Projects that qualify for funding:

Potential projects may include:

- Installation of sustainable farming techniques such as waterwise irrigation systems, increased produce storage capabilities, solar panels, etc…
- Building hoop houses or greenhouses to extend the growing season
- Purchase of organic seed
- Continuing education for farmers
- Sponsorship for labor costs in the form of a summer farm apprenticeship

How to apply:

Applicants may find the application on our website: www.slcfarmersmarket.org. For questions regarding the grant and grant application, please contact our Grant Manager, Summer Martin, by email (summer@downtownslc.org) or by phone (801.333.1102).

The Local Food Microgrant Program is made available through
SLC Green: Salt Lake City's Sustainability Department.

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UDAF: Utah’s Own and Marketing

Biographical Information:
Ryan Parkinson
Utah's Own Marketing Specialist
rjparkinson@utah.gov

350 North Redwood Road
P.O. Box 146500
Salt Lake City, Utah 84114

Session Description:

The Division of Marketing and Economic Development plays a vital role in the Department’s mission to “Promote the healthy growth of Utah agriculture, conserve our natural resources and protect our food supply.” The division promotes in various local, domestic and international markets. The signature program and cornerstone of local marketing efforts is the Utah’s Own Program.

Utah’s Own connects local farms, ranches and food companies with Utah consumers through many venues including advertising, social media, branding in retail outlets and through the Utah’s Own Website. www.utahsown.org.

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USDA: Natural Resource Conservation Service

Biographical Information:

Travis Mote
Ogden Area & Field Office
2871 South Commerce Way
Ogden, UT 84401

Session Description:

The presentation will explain all of the benefits and opportunities that NRCS has to offer for landowners. These include technical assistance in developing a conservation plan on their property and helping them make sound management decisions. In addition, programs that provide financial assistance to help implement projects on their property will also be covered.

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USDA-FSA: Loan programs for urban and small farms

Background Information:

Steven Bartholomew
Farm Service Agency
302 East 1860 South, Provo, Utah 84606
steven.bartholomew@ut.usda.gov
801-377-5296 X104

I am a Farm Loan Specialist/Manager for Farm Service Agency. I supervise the Farm Service Agency loan program in Tooele, Salt Lake, Utah, Wasatch and Juab Counties.

Session Description:

I will talk about the Farm Service Agency Microloan Program. I will also discuss our real estate and operating loan programs.

Rural Energy for America & Value Added Producer Grants

Biographical Information:
Barry Christensen
USDA Rural Development
5 South Main Ephraim, UT 84627
barry.christensen@ut.usda.gov
435-283-8004

I have worked for Rural Development for about 10 1/2 years. Of that time I have spent approximately 2 years working in the Value Added Producer Grant program.

Session Description:

What USDA Programs can do for you.

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Introduction to Stone Fruit Production

Biographical Information:
Teryl R. Roper
Utah State University
Department of Plants, Soils, And Climate

Dr. Roper teaches the fruit production course at USU. He was Extension Fruit Crops Specialist at the University of Wisconsin-Madison for 20 years. He earned BS and MS degrees in Botany from Brigham Young University and a PhD in Horticulture from Washington State University. Teryl's academic career focused on the production of fruits in the upper Midwest, including cranberries, apples, and tart cherries. Much of his research included mineral nutrition of perennial fruit crops.

Session Description:
This session is for producers who are new to growing stone fruit (peaches, plums, apricots) or who are considering growing them. This session will provide the basic information producers need to be successful growing these luscious fruits in Utah.

Introduction to Stone Fruit Production

Teryl R. Roper
Dept. of Plants, Soils, & Climate
Utah State University

UtahState University
DEPARTMENT OF PLANTS, SOILS, & CLIMATE

Agenda

- Introduction of speakers
- Site Selection
- Hardiness
- Chill hours
- Site preparation
- Pollination requirements
- Thinning
- Why plantings fail

Speakers & topics

• Teryl Roper	Introduction
• Mike Pace	Northern Utah
• Rick Heflebower	Southern Utah
• Sheriden Hansen	Training/pruning
• Brent Black	
• Marion Murray	Pest Management/IPM

What are Stone Fruits?

- **Apricot**
- Almond
- Cherry
- **Peach/nectarine**
- **Plum**

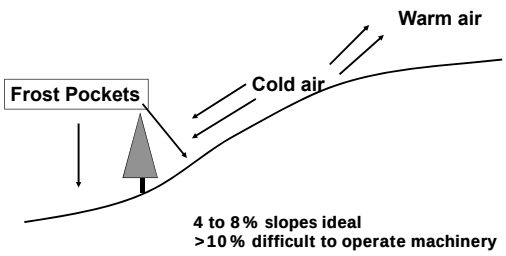
- Genus = *Prunus*

- Fleshy mesocarp surrounding
- Stony endocarp (pit)

Site Selection

- Climate
  - Frost free days
  - Chilling hours
- Elevation
- Slope
- Aspect
- Soil type
- Salinity
- Water
- Prior crops — stone fruits?

Elevation & Air drainage



Climate

- Long term conditions
- Coldest winter temperatures
- Hottest summer temperatures
- Last spring frost
- First fall freeze
- Frost free days

Spring Freeze Dates

Location	Early	Median	Late
Brigham City	9 April	2 May	2 June
Farmington	22 March	5 May	16 June
Santaquin	6 April	14 May	17 June
St. George	9 February	30 March	20 May

Fall Freeze Dates

Location	Early	Median	Late
Brigham City	9 September	12 October	13 Nov
Farmington	8 Sept	12 October	8 Nov
Santaquin	9 Sept	5 October	5 Nov
St. George	21 Sept	31 October	25 Nov

Frost Free Days

Location	Short	Median	Long
Brigham City	111	161	206
Farmington	96	161	201
Santaquin	96	142	184
St. George	135	211	268

Chilling

- Perennial plants require a period of chilling for normal flowering
- Hours below 45°F
- Wide range in Prunus:
  - Apricot 500-600
  - Cherry 700-800
  - Peach 50-1200
  - Plum 600-800 (European & American types)
- Therefore, choose crop & cultivar carefully

Hardiness

- Fall
  - Early frosts before full acclimation
  - Damage to branches and buds
- Midwinter
  - Fluctuating temperatures
  - Absolute cold
- Spring
  - Late Spring frosts

Managing Hardiness

- Genetics—choose the right crop/cultivar
- Don't fall prune
- Don't fall fertilize
- Fall irrigate as possible
- Control pests after harvest
- Paint trunks white to prevent SW injury
- Choose a good site

Rootstocks

- Graft compatability
- Most compatible with peach

- Lovell, Halford
- Nemaguard
- Guardian
- Bailey
- Siberian C

Site preparation

- Begin the year before planting
- Control perennial weeds
- Deep rip if hardpan
- Install irrigation mainlines (if buried)
- Plant grass over the entire field around Labor Day
  - Perennial ryegrass
  - Creeping red fescue
  - (Orchard mix)
- After grass established, mark & layout rows
- Spray planting rows & leave killed sod

Pollination

- **Self-pollinating**
  - Peach
  - Apricot
  - Tart cherry
- **Cross-pollinating**
  - Sweet Cherry
  - Most plums

Pollination

- Honeybees
- Native insects
  - Flies
  - Beetles

- Contract with beekeepers
- 1-2 hives/acre

Fruit set

- Flowering → Pollination → Fertilization of ovary
- Fruit set

- Often fruit set exceeds carrying capacity
- Return bloom

Thinning

- No chemical thinning for stone fruits
- Cherries & apricots typically not thinned
- Peaches usually require hand thinning
  - Fruit size
  - Return bloom
  - Protect tree from breakage
  - Hardiness

Thinning peaches

- Begin 3-4 weeks after bloom
- Shake limbs to remove unfertilized fruit
- Remove small/weak fruit by hand
- Space remaining fruit 3-5 inches apart
- About 100 to 150 fruit per tree—mature
  - Less on immature

Why Plantings Fail

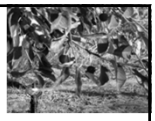
- **Physical / biological**
- Winter injury
- Recurring spring frosts
- Gummosis/canker
- Uncontrolled pests
- Drought/irrigation
- Soils
- Iron Chlorosis

- **Financial**
- Who is going to buy the fruit?
- Cultivars mismatch market
  - Too late
  - Too soft
  - Poor color
  - Poor flavor
- Insufficient management

Hardiness

- Site
- Cultivar
- Rootstock
- Management
  - Don't overcrop
  - Don't fall prune
  - Don't apply N in fall

Soil issues



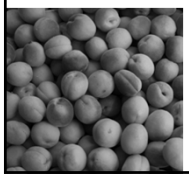
- Peach rootstocks not adapted to alkaline soils
  - Salt
  - pH
- Deep, wide irrigation
  - Develop a wide, deep root system
  - Allow to dry between irrigations
- Water quality
  - <2 dS/m electrical conductivity
- Apply chelated iron product
  - Foliar spray in early spring/fall after harvest

Pests

- Greater peach tree borer
- Peach twig borer
- Canker diseases

Financial

- Who is going to buy the fruit?
- How will you harvest, pack, market?
- How will you set your price?
  - Do you know the actual costs?
- Local fresh markets = quality, not cheap



Conclusion

- Plan ahead
- Prepare well in advance
- Select appropriate plant materials
- Know your costs
- Know your market
- Produce high quality fruit → premium price

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Stone Fruit Production in Northern Utah

Biographical Information:
Mike Pace
USU Extension - Box Elder County
01 South Main Street, Room #30
Brigham City, UT 84302
mike.pace@usu.edu

Mike currently works in Box Elder County as the Agriculture and Horticulture Agent and has been with USU Extension for 18 years. His primary assignment includes working with commercial fruit and vegetable growers, home horticulture and agronomy crops. He manages a 1.5 acre demonstration orchard at the USU Botanical Center in Kaysville, UT that has heirloom and modern apple varieties, peaches, rootstock demonstrations, grapes and misc. fruits. In his spare time he loves to teach fruit tree grafting classes.

Session Description:

We will be discussing stone fruit varieties, common cultural practices, planting density and rootstocks used along the Wasatch Front for stone fruit production.

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Stone Fruit Production along the Wasatch Front

Mike Pace
USU Extension Office
Box Elder County

Challanges growing tree fruit

- Length of growing season
- Winter temperatures
- Summer heat
- Wind
- Late spring frosts
- Soils
- Insects
- Birds

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Fruit Tree Zones

Apples	Zone 3 to 9
Apricots	Zone 4 to 9
Pears	Zone 4 to 9
Plums	Zone 4 to 9
Peaches	Zone 5 to 9
Asian Pears	some down to Zone 5
Pluots, Apriums	Zone 5 to 9
Cherries	Zone 5 to 9

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Usual Order of Bloom

- Apricots
- Japanese Plums
- Peaches
- Asian Pears
- European Plums
- Cherries
- Pears
- Apples

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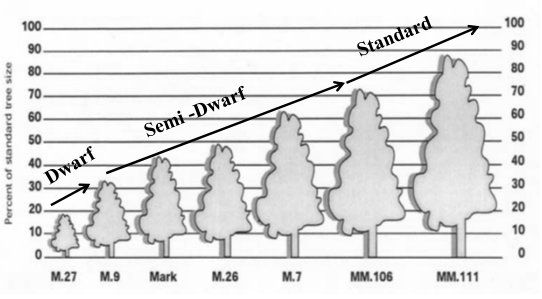
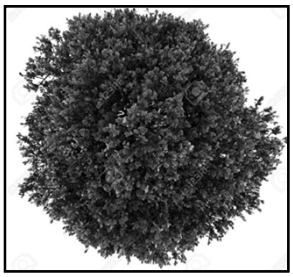
Pollination Requirements

Variety	Cross Pollination	Self Fruitful
Apples	Yes	
Peaches		Yes
Nectarines		Yes
European Pears	Yes	
Asian Pears	Yes	
European Plums	Mostly	Some
Japanese Plums	Yes	
Sweet Cherries	Yes	Some
Tart Cherries		Yes
Apricots	Some	Mostly

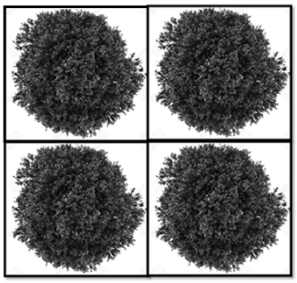
Rootstock Size



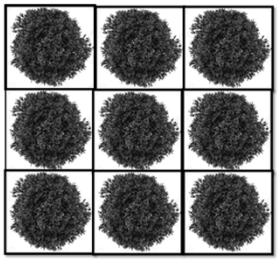
30’ by 30’ = 1 Standard Cherry Tree



30’ by 30’ = 4 Semi-Dwarf Cherry Tree



30’ by 30’ = 9 Dwarf Cherry Tree



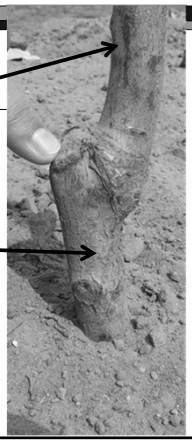
Fruit Tree

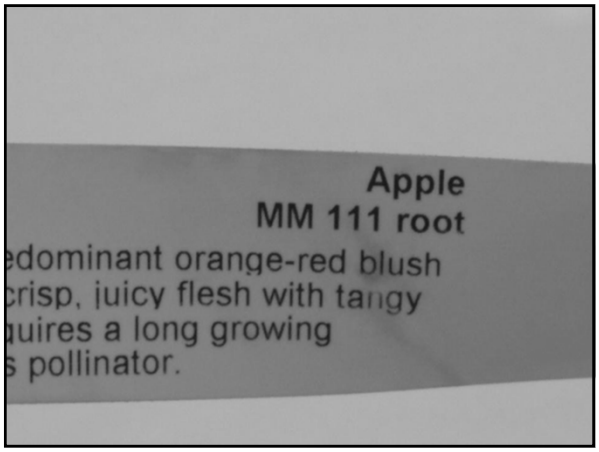
Scion wood

- Fruiting cultivar
  - Early Elberta, Redhaven

Rootstock

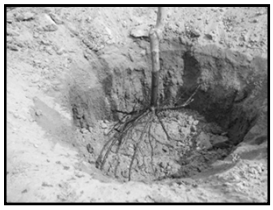
- Size of tree
- Disease resistance





Planting

- Hole should be 2 to 3 times the diameter of the root ball
- Planting depth
- Water them in
- Southwest winter injury



EXTENSION
UtahStateUniversity

Fruit Tree Space Requirements

Dwarf Apple	6 - 10’
Semi-Dwarf Apple	12 - 15’
Standard Apple	30 - 40’
Pear	12 – 18’
Apricot	25 - 30’
Peach	12 – 16’
Plum	12 - 18’

EXTENSION
UtahStateUniversity

Fertilizing Fruit Trees

- Apply in the late winter/early spring
- Apply a granular product around dripline of the tree
- Apply 1 ounce of actual N per year of tree age
- Do not exceed 8 ounces of actual N per year per tree

6 year old tree

Actual Nitrogen	34-0-0	21-0-0
6 ounces	18 ounces	30 ounces

EXTENSION
UtahStateUniversity

Irrigation

- Twice a month deep irrigation or based on soil type (established trees)
- Maybe 7 to 10 days on young trees
- Apply the water in the dripline of the tree
- Deep irrigation 18” to 24”
- Watering near the trunk of the tree creates crown rot

EXTENSION
UtahStateUniversity

Peach Variety Recommendations

Flaming Fury PF-1, Early Redhaven, Risingstar, **Redstar, Redhaven,** Saturn, **Blazingstar, Reliance, Flaming Fury PF Lucky 13, Glohaven, Coralstar,** Artic Gem, Regina, **Roza, Canadian Harmony, Red Globe, Loring, Suncrest, Veteran, Blushingstar, Flamin’ Fury PF-24C, Contender, Cresthaven, Early Elberta, Elberta, Angelus, J.H. Hale, O’Henry, Polly, Intrepid,**

EXTENSION
UtahStateUniversity

Sweet Cherry Variety Recommendations

Chelan, Black Tartarian, Royal Ann, Bing, Stella, Rainier, Van, Lapins, Sweetheart

Tart Cherry
Montmorency

EXTENSION
UtahStateUniversity

European Plum Varieties

Green Gage, Early Italian, Italian, Stanley, Damson, Seneca

EXTENSION
UtahStateUniversity

Japanese Plum Varieties

Shiro, Santa Rosa, Satsuma, Duarte, Elephant Heart,

EXTENSION
UtahStateUniversity

Plumcot Varieties

Flavor Queen, Dapple Dandy, Flavor King,

Flavor Supreme, Flavor Grenade,

EXTENSION
UtahStateUniversity

Apricot Variety Recommendations

Tomcot, Goldrich, Goldcot, Rival, Harglow, Perfection, Chinese (Mormon), Moorpark, Tilton

EXTENSION
UtahStateUniversity

Utah State University Botanical Center – USU BC

EXTENSION
UtahStateUniversity

Heirloom Apple Varieties

Arkansas Black	Jonathon
Ashmead Kernel	McIntosh
Baldwin	Melrose
Calvelle Blanc D Hiver	Mutsu/Crispen
Cortland	Northern Spy
Cox Orange Pippen	NW Greening
Golden Russett	Pink Pearl
Granny Smith	Smoke House
Gravenstein	Spitzenburg
Grimes Golden	Wealthy
Idared	Wolf River

EXTENSION
UtahStateUniversity

Modern Apple Varieties

Akane	Gibson Golden	Northpole
Blondee	Ginger Gold	Pink Lady
Braeburn	Golden Sentinel	Red Jonaprince
Cameo	Honeycrisp	Ruby Jon
Crimson Crisp	Jonagold	Sansa
Empire Royal	KinderKrisp	Scarlet Sentinel
Fuji, September Wonder	Macoun	Sweet 16
Gala - Gale,		Zestar

EXTENSION
UtahStateUniversity

Peach Varieties

Angelus	O'Henry
Artic Gem	PF 1 Flaming Fury
Blushingstar	PF 24-007
Canadian Harmony	PF Lucky 13
Contender	Redstar
Cresthaven	Regina
Early Elberta	Risingstar
Early Redhaven	Saturn
Loring	Suncrest

EXTENSION
UtahStateUniversity

Aprium, Plumcot & Plum Varieties

20th Century	Flavor Queen	Duarte
Bartlett	Flavor Supreme	Elephant Heart
Moorpark	Dapple Dandy	Santa Rosa
Flavor Delight	Flavor King	Satsuma
		Stanley

EXTENSION
UtahStateUniversity

No fruit, very little fruit, fruit every other year problem

- Trees too young
- Pollination problem
- Pollen sterile tree
- No bees
- Cold weather
- Frost
- Poor thinning or no thinning the previous year
- Applied insecticide too early & too heavy

Fruit tree bearing age

- Standard tree 5-7 years
- Semi dwarf 3-5 years
- Dwarf 2-3 years

EXTENSION
UtahStateUniversity

EXTENSION

UtahStateUniversity

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http://extension.usu.edu/boxelder/

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Stone Fruit Production in Southern Utah

Background Information:

Rick Heflebower
Utah State University
475 S.Donlee Drive
St. George, Utah
rick.h@usu.edu

Horticulture Extension Agent for Utah State University in Washington County

Session Description:

Varieties and Cultural Practices used in Southern Utah

Peaches and other related crops in southern Utah

Rick Heflebower

Horticulture Extension Agent

UtahStateUniversity
COOPERATIVE EXTENSION

Other crops include apricots, sweet cherries, pistachios and pecans

Peaches in Washington County

- Local history records peaches being grown in Hurricane and Leeds in early 1900s
- Before modern refrigeration peaches were picked and shipped to SLC by rail
- In 2000 acreage was around 100 acres
- Since the loss of the LDS Church farm it is more like 70 acres today

Why do we grow peaches here?

- Hurricane 3241
- Leeds 3481

- Hi 98 (114) Low 25 (-2)
- Rainfall is 14 inches

- FF Season is April 12
- to October 25

Varieties

- Redhaven (July 15)
- Canadian Harmony
- Red Globe
- Lemon Elberta
- Elberta
- Redskin (Redhaven x Elberta)
- Fairtime (early September)

What is pruning?

…removing certain parts of a tree to regulate the bearing habits of the tree and quality of fruit…

Some fruit varieties lend themselves to one system more than another

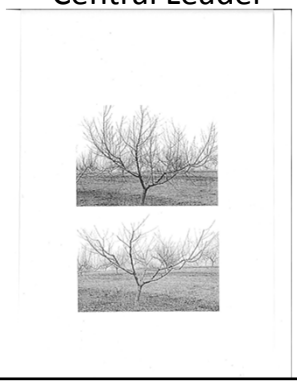
Why do we prune fruit plants?

- Correct problems (broken, crossing, diseased)
- Encourage bearing
- To strengthen the branches
- Reduce unwanted growth
- Improve fruit size
- To give shape and structure

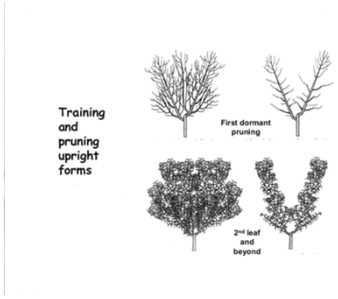
UtahState University
COOPERATIVE EXTENSION

What is the difference?

Central Leader



Quad and Perpendicular "V"



Pruning

is both art and science

Where are we going?

- Moving to the Quad or Two limb “V”
- Requires a lot of pruning, but “pays off”
- “Saleable” fruit depends on pruning and thinning (small peaches do not sell)
- Yields depend on age of tree
- Sold at roughly $1.00 per pound
- A 24 pound box is $25+

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Training and Pruning Stone Fruit Systems and Practices

Biographical Information:

Sheriden Hansen
Utah State University
4820 Old Main Hill
Logan, UT 84322
sheridenmoon@gmail.com

Graduate student at USU studying plant science with an emphasis on fruit production.

Session Description:

Modern and historic training and pruning practices for peaches, apricots and cherries.

STONE FRUIT SYSTEMS

TRAINING & PRUNING PRACTICES

STONE FRUIT SYSTEMS

TRAINING & PRUNING PRACTICES

Sheriden M. Hansen, USU

Introduction

How's, when's, and why's of pruning.
Basic pruning cuts and general terms.

Peaches and Nectarines

Anatomy
Establishment
Open Center vs. Quad V

Cherries

Anatomy
Spanish Bush vs. Modified Central Leader

WHY PRUNE?

Tree Health
- Improve air circulation
- Decrease disease risk

Direct Growth
- Renew fruiting wood

Produce Quality Fruit
- Crop load management
- Increase light penetration

WHY PRUNE?

What is fruit quality?

- Color
- Sugar
- Size
- Dry Matter

WHEN TO PRUNE?

Late winter to early spring
- Dormant trees
- Visualization easier
- Assess presence and density of flower buds
- Temperatures should be above 50ºF, no sub-zero temperatures
- Reduced disease risk

WHEN TO PRUNE?

Summer Pruning
- Reduce vigor
- Open center of tree
- Improve air circulation
- Increase light for fruit coloration
- Higher risk of disease

Timing of pruning can affect fruit size
- Late pruning can reduce fruit size

TYPES OF CUTS

Heading cut
- Remove the tip of the branch
- Shorten and stiffen branches
- Encourage fuller growth

Thinning cut
- Removes a branch
- Should be cut at branch collar

Bench cut or Stub cut
- Redirect growth
- Replace a branch
- Need at least 1 viable bud remaining

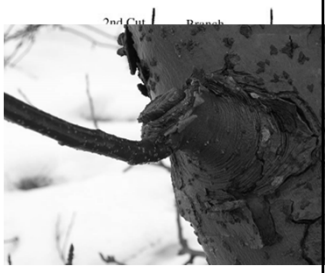
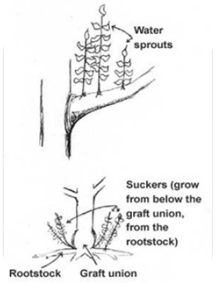


Photo courtesy of Richard Layne, Appleton, Virginia Tech

TERMS TO KNOW



- LEADER
- SCAFFOLD
- LATERALS
- SPURS
- VEGETATIVE BUDS
- MIXED BUDS
- PURE BUDS
- WATERSPROUTS

STONE FRUIT SYSTEMS
TRAINING & PRUNING PRACTICES

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How's, when's, and why's of pruning.
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Anatomy
Establishment
Open Center vs. Quad V

ANATOMY

Peaches and Nectarines

- Peaches fruit on 1-year-old wood
- Pure buds
- Fruiting wood should be pencil-sized in diameter
- Not more than about 8-12 inches long
- Each fruiting branch should only hold 1-2 fruit. Fruit MUST be thinned.

THE OPEN CENTER

Peaches and Nectarines

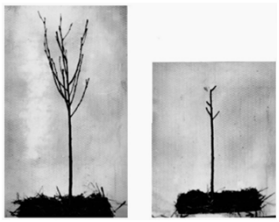


Figure from USU publication: Pruning the orchard, 1994.

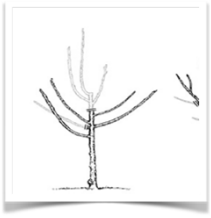
Most common method of training
Allows for good light penetration

- Trees are planted in spring and pruned shortly after planting
- Scaffold limbs start 20-24 inches off the ground
- Head the leader 4-6 inches above the height of the scaffolds
- Strong lateral branches should be headed with 2-3 buds remaining, weak laterals, leave 6-7 buds

FIRST SUMMER

Peaches and Nectarines

- Low shoots on the trunk should be removed
- All shoots that form angles less than 15-45 degrees should be removed (depends on system)
- Scaffolds that are too upright become too vegetatively vigorous



FIRST WINTER

Peaches and Nectarines

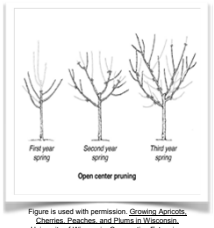


Figure is used with permission. Growing Apricots, Cherries, Peaches, and Plums in Wisconsin, University of Wisconsin, Cooperative Extension.

- Most critical time to select branches that form main scaffold
- Bushy center removed
- 3-4 main scaffolds selected, all others removed
- Branch angle critical
- Remove low branches or any watersprouts

OPEN STEEP LEADER

Peaches and Nectarines

TRADITIONAL PRUNING METHOD

- Once scaffolds are established, heading and bench cuts used to direct growth and fill space
- Scaffolds encouraged to branch: "bifurcated system"
- 4 primary, 8 secondary, 16 tertiary scaffolds

OPEN STEEP LEADER

Peaches and Nectarines

TRADITIONAL METHOD
BIFURCATING SCAFFOLDS

ADVANTAGES:
- Increased canopy volume improves early and mature yields

DISADVANTAGES:
- Time consuming
- Complicated
- More intense labor
- Difficult to keep sunlight in lower portion of the tree

QUAD V SYSTEM

Peaches and Nectarines

MODERN SYSTEM
4-5 PERMANENT COLUMNS

- Scaffolds do not branch
- 4-5 permanent columns around the trunk
- Weak bench cuts used to direct growth upward and outward
- Column angle 15-45 degrees from vertical
- Fruiting wood comes directly off scaffolds – renewal pruning

PRUNING QUAD V

Two-year-old Peach or Nectarine

2-YEAR-OLD TREE	STEP ONE	STEP TWO	FINISHED
Scaffolds are established	Renew two-year-old wood	Renewal pruning of excess shoots	Fruiting wood left for fruit production
A lot of growth from last season	Continue to establish form	Shorten some of the fruiting wood	Renewal pruning for next year's crop

PRUNING QUAD V

Three-year-old Peach or Nectarine

3-YEAR-OLD TREE	STEP ONE	STEP TWO	FINISHED
Scaffolds are established	Renew two-year-old wood	Renewal pruning of excess shoots	Fruiting wood left for fruit production
A lot of growth from last season	Continue to establish form	Shorten some of the fruiting wood	Renewal pruning for next year's crop

PRUNING QUAD V

Mature Peach or Nectarine

MATURE TREE

Scaffolds are established

A lot of growth from last season

STEP ONE

Renew two-year-old wood

Renewal pruning of excess shoots

STEP TWO

Renewal pruning of excess shoots

Shorten some of the fruiting wood

FINISHED

Fruiting wood left for fruit production

Renewal pruning for next year's crop

STONE FRUIT STEMS

TRAINING & PRUNING PRACTICES

Sheriden M. Hansen, USU

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Anatomy
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ANATOMY

Cherries and Plums

- Cherries fruit on 2-year-old and older spurs
- Sometimes fruit at the base of 1-year-old wood
- Buds are mixed

SPANISH BUSH INITIAL PRUNING

Cherries

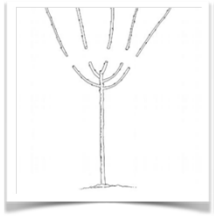


Figure from PNW-667 Cherry Training Guide, used with permission

Form initial tree structure

- Multileader system
- After initial planting, head leader back to 12-14 inches above the graft union (about 18 inches above the ground)
- Make sure 3-4 buds remain below the cut
- Head all leaders to 2-5 inches in length
- Weak leaders should be left longer, strong leaders should be shorter.

SPANISH BUSH YEAR TWO

Cherries

Figure from PNW-667 Cherry Training Guide, used with permission

Continue forming tree structure

- Dormant pruning to remove any upright or unwanted branches
- Prior to summer solstice, head back all leaders to 2-5 inches in length
- Number of leaders should be 20-25 for semi-vigorous rootstocks and 25-30 for vigorous rootstocks
- Allow leaders to grow over season
- Goal is 24-36 inches of growth per season

SPANISH BUSH YEAR 3 & BEYOND

Cherries

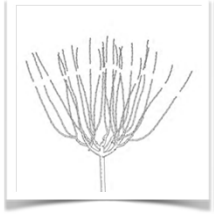


Figure from PNW-667 Cherry Training Guide, used with permission

Continue forming tree structure, light penetration, balance in the tree

- Dormant pruning to remove any upright or unwanted branches, thinning cuts for light penetration
- 2-4 strategically placed leaders should be removed to open center of the tree and improve light penetration
- While dormant, remove a quarter of the new growth from last season to balance leaf-area-to-fruit ratio (tipping)

SPANISH BUSH MATURE PRUNING

Cherries

Figure from PNW-667 Cherry Training Guide, used with permission

Continue forming tree structure, light penetration, balance in the tree

- If leader growth is weak (less than 24-inches per year), remove additional leaders
- Cut back 20% of the strongest laterals each year so that spurs are not older than 5-years
- Renew or remove branches larger than ½ the diameter of the main scaffold

SPANISH BUSH MATURE PRUNING

Cherries

Figure from PNW-667 Cherry Training Guide, used with permission

Light penetration in canopy and renewal pruning

- Tree shape and size should be maintained with dormant pruning and topping
- Trees should be topped to 8-feet in late summer and early fall
- Sides of trees should be hedged (mechanically or by hand)

SPANISH BUSH MATURE PRUNING

Cherries

Photo from PNW-667 Cherry Training Guide, used with permission

ADVANTAGES:

- Most of fruit can be harvested from the ground
- Well branched tree that requires minimal pruning
- Trees are a manageable size

DISADVANTAGES:

- Yields can be delayed

CENTRAL LEADER

Cherries

INITIAL PRUNING:

- Remove all the lateral limbs at time of planting (whip)
- First summer, when new laterals are 3-4 inches in length, clothespins or toothpicks used to get 90º angles

CENTRAL LEADER

Cherries

SECOND YEAR:

- Choose 3-4 well spaced scaffold limbs with: 1. wide crotch angles, 2. in different compass directions
- Remove any unwanted laterals, lateral limbs above the chosen scaffolds should be stubbed to 4-6-inches in length (remove following year)
- Remove all upper limbs that compete with the leader
- If you do not have 4 well-spaced scaffolds, stub all laterals and wait until the following year to choose scaffolds

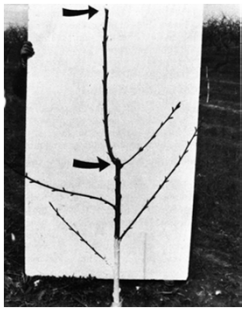


Image from C. Kesner and J. Nugent, MSU co-operative extension, Training and Pruning Young Cherry Trees

CENTRAL LEADER

Cherries

THIRD YEAR:

- Choose 2 to 4 additional scaffold limbs for a total of 6-8 scaffolds.
- Stub limbs directly above chosen scaffolds (remove following year)
- Remove any unwanted laterals including uppermost limbs that compete with laterals
- Thin out branches from last year's scaffolds, keep branches that are parallel with the ground

Image from C. Kesner and J. Nugent, MSU co-operative extension, Training and Pruning Young Cherry Trees

CENTRAL LEADER

Cherries

MATURE PRUNING:

- Head leader once it reaches desired height
- Thin out main scaffolds
- Remove upper limbs that block light penetration into the tree
- Cherries remain productive in the inner areas of the tree with good light penetration
- Renewal pruning of a few of the strongest laterals each year to encourage new fruiting wood growth.

CENTRAL LEADER

Cherries

ADVANTAGES:

- Fairly easy system to establish and maintain
- Minimal annual pruning

DISADVANTAGES:

- Trees can get fairly large depending on rootstock

QUESTIONS?

Back to Top

Stone Fruit Pests and IPM Practices

Biographical Information:

Marion Murray
Utah State University
5305 Old Main Hill
Logan, UT 84322
marion.murray@usu.edu

Marion has been the IPM Project Leader at Utah State University Extension since 2006. She conducts Extension outreach and research in integrated pest management and distributes weekly pest advisories for tree fruits and landscape ornamentals. Prior to coming to USU, she spent 10 years in public horticulture education and landscape management. She received her Master's degree in plant pathology from Oregon State University and undergraduate degree at Penn State University. She is originally from North Carolina.

Session Description:

This presentation will cover the primary insects and diseases of stone fruits and how to use integrated pest management to combat them.

Lifestyle Branding: What can it do for you?

Background Information:

Jen Wakeland
The Kinship Creative
8038 Farm to Market Road, Bow, WA 98232
jen@thekinshipcreative.com

I am a creative consultant with several hours of consulting time in business development, marketing, and visionary leadership; my team and I create brands through visual storytelling for small to mid-level companies and consult with them through growth spurts, launching of new products, and times of concern over company direction. As a way to keep in tune with our clients, we created and managed a "proof of concept" retail company, Salt City Emporium for five years, to understand this new digital marketing era, practice what we preach, and implement it as we would ask our clients to do. Our team makes up 38 years of small business history, 18 years of marketing, 6 years of franchising, 128 seasonal markets, 12 years of design, and dozens and dozens of entrepreneurs who allowed us the opportunity to tell their story.

Session Description:

The presentation will be focused on visual storytelling and your messaging for financial growth and scalability in the digital marketing age.

What can lifestyle branding do for me?

Jen Wakeland

THE KINSHIP CREATIVE

What is lifestyle branding?

-Marketing products or services to embody the interests, attitudes, and opinions of an audience or culture.

-Seeks to inspire, guide, and motivate people, with the goal of their products contributing to the definition of the consumer's way of life.

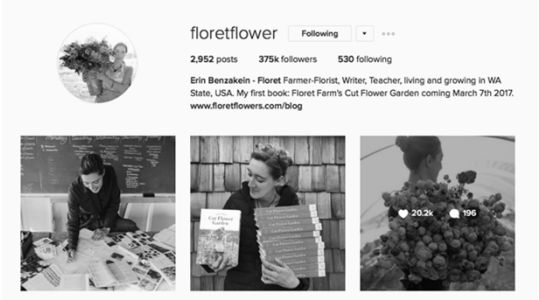
floret
EST.2008

Floret accomplishments

Floret Sales

Most importantly:

Customers who believe in her, and her story.



So how did it happen?

It all starts with why.

Erin started with a feeling…

Why is the story important?

It gives her brand purpose.

How did she accomplish it?

Simple Principles
-Vision/Purpose
-Customer
-Voice

Diagnostic checks

Vision:

An educational and research based farm, that shares ideas,techniques and a whole lot of heart with fellow flower enthusiasts.

Customer:

Jane

Voice:

Nostalgic, expert, humble, relatable

Diagnostics:

Does it support our vision?
Are we diluting the brand?
Are we keeping our ideal customer in mind?

Applying the Principles

With the principles in place…where does it all go?

WORTHY CONTENT

High quality images with captions that create a dialogue, promotes connections and engages feedback.

Additional content

-Videos
-Stories
-Music
-Blog posts
-Endorsements
-Testimonials

Content can be:

RELATABLE - Your story
EMOTIONAL - Strikes emotion to take action
POLARIZING - A topic that evokes a lot of opinions
LIFESTYLE RICH - Creates a lifestyle one wishes to belong to

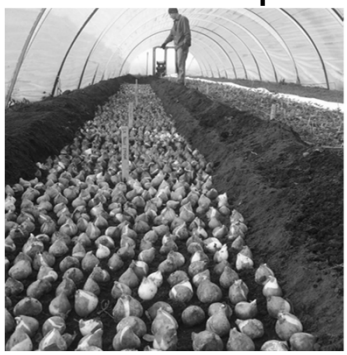
CAPTURING CONTENT:

-Messaging
-Products/Services
-Collaborations
-Endorsements
-Your daily business happenings
-Sharing of other's content (do so sparingly)

Lifestyle images

Show them you

Show them the process



Daily Happenings

Collaborations

Accomplishments

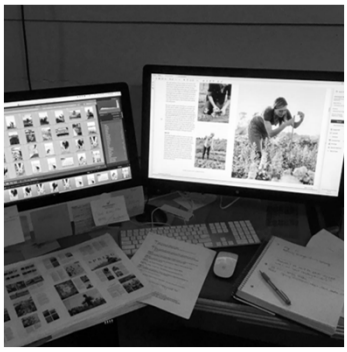
Product Shot

Business Happenings

Behind the scenes

EVEN THE PROS GET
HUNG UP.

BAD LIGHTING



OUT OF FOCUS

COLLAGES

TIPS:

-Snap pictures now for later use
-Be ready to shine at a moments notice
-Captions needs to be personal and concise
-Be sure to give credit and check your links
-Try to find the best light
-Determine your best time of day for posting
-Respond to any and all comments in a short period of time
-Don't use text over images, tell your message in the commentary
-Keep your ideal customer in mind for every.single.action in your plan

PHOTOGRAPHY:

-When taking pictures, don't shoot in Instagram
-Shoot from angles over a wide shot
-Be sure to incorporate scale into your images
-Check your background for anything "off brand"
-Tap for light exposure to find the best light
-Slide for light
-Take an ariel angle for more interesting wide shots

SUGGESTED APPS:

-VSCO Cam
-Facetune
-Dropbox
-Followers +
-Snapseed

before:

after:

Q & A

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Creating a Customer Experience Through Branding

Session Description:

Heber Valley Cheese makes and sells Artisan Cheese. They are a fully integrated from the dairy farm to creamery. Their message is “Experience the Difference of the Farmer’s Touch.” They built their brand on the heritage of 100 years of the Kohley family dairy. They are located in midway and not only sell their cheese but want to provide “others with a memorable experience”. Their website invites customers to “Plan a scenic drive to our farmstead store in Midway, Utah. Enjoy fresh or aged cheeses while watching the cows graze in adjacent pastures.” They will go over how they are creating customer experiences through their branding and selling not only the cheese but the heritage and experience also.

Using Market Research to Enhance Product Success

Biographical Information:

Kynda R. Curtis, Ph.D.
Professor and Extension Agriculture & Food Marketing Specialist
Co-Editor, Choices Magazine (AAEA) - http://www.choicesmagazine.org/
President, Food Distribution Research Society - https://www.fdrsinc.org/
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Dr. Kynda Curtis has been a Professor and Extension Economist in the Department of Applied Economics at Utah State University since 2010. Originally from Anchorage, Alaska, Kynda holds a B.A. in Economics from Whitman College and an M.S. in Financial Services from the American College. After spending several years living in Spain and Germany, Kynda completed a Ph.D. in Economics at Washington State University (2003), where she specialized in agricultural marketing and econometrics. Before coming to Utah she spent seven years at the University of Nevada, Reno as an Assistant Professor and State Specialist. Kynda's research interests include international agriculture/food marketing, consumer economics and industrial organization. In her Extension appointment she works with agricultural producers to assist them in developing new markets for their products and assessing the feasibility of new food and agricultural products and value-added processes. She has received Extension program awards from the Agricultural and Applied Economics Association and the Western Agricultural Economics Association.

Session Description:

This session will discuss methods for conducting simplified market research, as well as approaches to using research results to implement effective and profitable business and product development strategies.

USING MARKET RESEARCH TO ENHANCE PRODUCT SUCCESS

KYNDA CURTIS, EXTENSION SPECIALIST
USU

DEFINE YOUR TARGET MARKET

- Detailed picture of your target market allows you to:
  - Implement effective and targeted promotion
  - Cater to most valuable customers
  - Design of new products which serve customer needs
  - Select appropriate outlets for your products(s)
  - Provide services and support your market needs/demands

HOW IS A TARGET MARKET DEFINED?

- Demographics
  - Age, location (state, county, etc.), gender, education level, income, children, martial status, etc.
- Psychographics
  - Interests, hobbies, or concerns regarding health, food safety, environmental, etc.
- Product/Service needs or preferences
  - Product or product characteristics (options, variety, location, package size, etc.) they require

WHAT CUSTOMER DATA TO COLLECT?

- Name and contact information
- Transaction history
- Record of communication and responses
- Demographic profile (age, gender, profession, etc.)
  - Birthdays and anniversaries
- Psychographic profile (hobbies, interests, etc.)
- Spending habits

NAME & CONTACT INFORMATION

- Market directly to the customer
- Customize/personalize communications
- Communicate about upcoming sales, new products, new flavors/varieties, etc.
- Communicate about late or out of stock items

TRANSACTION HISTORY

- Basic preferences, which products they purchase and when/how
  - What products are most important to them
  - Where do they shop or purchase the product
  - Amount of the product (size, frequency, etc.)
- Amount they spend with your company on an annual, monthly, weekly, basis
  - How valuable are they
  - What specials or customer appreciation items/events you should offer to them

RECORD OF COMMUNICATION & RESPONSES

- Effectiveness of different types of communication
  - One method may encourage sales more than others
- Customer preferred communication style/type
  - Email, phone, etc.
- Track communications so that spaced appropriately
  - Not overwhelming, or too many

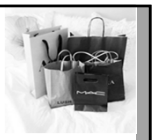
DEMOGRAPHIC PROFILE

- Age, location (state, county, etc.), gender, education level, income, children, martial status, etc.
  - Birthdays and anniversaries
    - Email/send birthday/anniversary card with promotion (% discount, coupon, etc.)
    - Personal touch and customer feels valued, reminds them of your company/products
- Harder to obtain
- Provides an improved description of your target market
  - Type of customer you should cater to, expand market

PSYCHOGRAPHIC PROFILE

- Interests, hobbies, etc.
- Concerns regarding health, food safety, environment, etc.
- Difficult to obtain
- Use to select effective promotional channels
  - Magazines or publications of interest, social media, etc.
- Use to inform special labeling, packaging, certification
  - Organic, recyclable, low whatever….
- Use to inform corporate responsibility initiatives
  - Concerns of interests of customers
    - Sustainability, fair trade, worker health, etc.

SPENDING HABITS



- How do your customers shop?
  - Thoughtful purchasing, impulse buys, or comparison (price) shopping
- Display products and structure pricing around habits
  - Grocery stores place candy and magazines near checkout for impulse buys
- Difficult to assess
  - Structured surveys, try different strategies to see which work, professional assistance from marketing agency

HOW TO COLLECT CUSTOMER DATA?

- Past transactions, orders, and communications
- Online orders
  - Name and contact info is provided, spending habits, user preferences, etc.
- Surveys
  - At purchase, online, at events…
- Customer appreciation events, "disguised focus groups"
  - Conduct surveys, provide samples for feedback, make observations
- Competitions
  - "To win" must provide contact info and a few other details may be demographic or interests…
- Outside data/research

OUTSIDE DATA

- Existing research and statistics
  - Government stats and reports
  - Expenditures, investments, consumption
- Published reports
  - Trade associations, banks, government
- Market research organizations
  - Consumer panels, retail audits

DATA EXAMPLES - GOVERNMENT

- Demographics from the most recent U.S. Census can be searched online by state and by zip code
  http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml
  - Ages, household and family size, income, ethnicity, etc.
  - All of which can provide information as to the characteristics of potential customers in the surrounding area
- Average annual consumption levels for hundreds of foods in the US can be found on USDA's Economic Research Service (USDA-ERS) website
  http://www.ers.usda.gov/data-products/food-availability-(per-capita)-data-system/.aspx
  - ERS data is for standard, conventional products only

CUSTOMER OR MARKET ASSESSMENT SURVEYS

- Surveys are the most popular method for collecting data
- Variety of methods including
  - Telephone survey
  - Face-to-face (in-person) survey
  - Internet survey
  - Dot survey
  - Observation
  - Informal interview

TELEPHONE SURVEYS

- Telephone surveys are conducted by calling individuals and having them answer questions over the phone
- Advantages of telephone surveys
  - Interviewer can encourage respondent to answer all the questions
  - Responses can be analyzed immediately
- Disadvantages of telephone surveys
  - Expensive to pay telephone interviewers
  - As with mail surveys, random sampling is best, but call list can be put together from phone book if necessary
  - Many residents now only have cell numbers, unlisted numbers

IN-PERSON INTERVIEWS

- An in-person interview is a survey administered face-to-face
- Advantages of in-person interviews
  - Interviewer can encourage respondents to fully complete survey
  - Results can be analyzed immediately
  - Specific populations can be targeted
    - Farmers' markets, grocery stores, etc.
- Disadvantages of in-person interviews
  - Costly to pay interviewers
  - Some respondents may not be unwilling to reveal information about themselves to a stranger
  - Must have permission to conduct these interviews in a public place

INTERNET SURVEY

- An web-based survey is conducted via software online
  - A letter, post card, or email is sent out inviting respondents to take the survey
- Advantages of internet surveys
  - May be completed faster than other survey types
  - May be less expensive to conduct than other survey types
  - Some software ensures that respondents have to answer all the questions
  - Results can be analyzed immediately
  - Some online survey providers can supply email listings of target audience

INTERNET SURVEY, CONT.

- Disadvantages of Internet surveys
  - Population of interest must have Internet access
    - Contacting the population of interest may be more difficult than with other methods
  - Some individuals may be uncomfortable providing sensitive information (such as household income) over the Internet

qualtrics
the world's best online survey software.

DOT SURVEY

- Dot surveys or posters are used to focus on just a few important questions
- Technique involves usually no more than four questions displayed on an easel
- Response categories are listed as well
- Respondents place stickers or "dots" in the proper category to indicate their response

DOT SURVEY, CONT.

- Advantages of dot surveys
  - Offer an alternative to written and oral surveys
  - Simple to complete-has been found to increase response rates over other survey types
- Disadvantages of dot surveys
  - Can only ask a few questions
  - Respondents can see responses from other respondents-may be swayed by what they see
    - Argument that this effect is similar to real-world activity, such as fad items and impulse buying

INTERVIEWS & OBSERVATION

- Used to understand behavior, evaluate reactions
  - Focuses on image, product usage, and associations with name
- May be focus groups in which a group of target customers is asked a lengthy set of questions
- Informal interviews consist of asking the same simple, but specific questions of many people
- Observation consists of observing consumers and taking note of their behavior, perhaps reaction to trying a new product or flavor
- Providing samples, comment cards, recording impressions/behaviors at sales venues, customer appreciation events, etc.

EXERCISE #1

- Your business wants to assess the potential demand for a <u>new</u> specialty juice flavor
  - Several potential flavors under consideration, but you are looking to roll out just one
- You have an existing customer base
- What type of new data do you need? What data do you already have?
- How might the needed data be collected?

EXERCISE #2

- You are starting a new company and you are looking to introduce 2-3 flavors of specialty juices initially
- You do not have a current customer base
- What questions do you need to answer?
- What type of data do you need?
- How might the needed data be collected?

POMEGRANATE JUICE PRICING EXAMPLE

- Produce and sell juice at specialty/health stores
- Cost of production is $.80 per 8 oz. juice
  - $.80 cost of production (multiply by 1.20)
  - $.96 cost with profit (multiply by 1.25)
  - $1.20 wholesale price (multiply by 1.40)
  - $1.68 minimum retail price required
- $1.47 per 8 oz. retail price (ERS, 2013)
  - Pricing data is US average, specialty retail price may be much higher
  - Target market may be willing to pay more (health benefits, families with children, seniors, etc.)
  - What packaging, labeling, etc. may differentiate the product?

FOOD PRODUCT PRICING RESOURCES

- Fresh and processed fruits and vegetables
  - http://www.ers.usda.gov/data-products/fruit-and-vegetable-prices.aspx
- Meats and poultry
  - http://www.ers.usda.gov/data-products/meat-price-spreads.aspx
- Organic foods
  - http://www.ers.usda.gov/data-products/organic-prices.aspx
- Drinks and meals away from home
  - http://www.ers.usda.gov/data-products/quarterly-food-away-from-home-prices.aspx

THANK YOU

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Open Discussion About Small Farms Programs and Issues

Session Description:

This is the 5th year of the Urban and Small Farms Conference. The conference has been growing and feedback has been very positive. We would like to have an opportunity to have more in-depth feedback and also for participants to have time to discuss issues important to the Small-Urban Farms Community. They discussion will start with a general group, but there are options to break into smaller groups for discussions around different themes. This will not only help us know what topics you would like to see, but what issues are you facing, are their ways you would like to communicate with each other, what research would you like to see done, etc.