

# Urban Small Farms Conference 2019

Wednesday, February 20<sup>th</sup>, 2019

| <b>Time</b>                | <b>Beginner Micro Farm</b>   |
|----------------------------|--|
| 8:30                       | Marketing Small Farm Products in the New Age of Food -<br>Ariel Agenbroad, U of Idaho<br><b>pg. 24</b> |
| 9:00                       | Building a CSA - Sheriden Hansen, USU<br><b>pg. 30</b>   |
| 9:30                       | Financial Strategies for Success -<br>Ruby Ward, USU<br><b>pg. 36</b>                                  |
| <b>10:00 - 10:30 Break</b> |  |
| 10:30                      | Sustainable Soil and Nutrient Management -<br>Melanie Stock, USU<br><b>pg. 40</b>                      |
| 11:00                      | Small Acreage Weed Control -<br>Andy West, U of Idaho<br><b>pg. 45</b>                                 |
| 11:30                      | Introduction to Hydroponics -<br>Taylor Wayman, USU<br><b>pg. 47</b>                                   |

Click on the session you would like to view and it will take you there!

## **Marketing Small Farm Product in the New Age of Food**

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How do people eat now? What trends influence their choices, what habits are prevalent among the general consumer population? And what does this have to do with small farmers and food processors? Turns, out, quite a bit! Fresh, local, organic and sustainable food top the list of what consumers are seeking. Understanding what influences the choices consumers make, and the marketing and messaging they respond to, and then reaching those consumers and communicating with them, can lead more of them to becoming YOUR customers!

### **Ariel Agenbroad**

Area Extension Educator, Community Food systems and Small Farms  
University of Idaho Extension  
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Ariel serves southwest Idaho as a University of Idaho Area Extension Educator in community food systems, urban agriculture and small farms. Her areas of specialization include home and market vegetable production, direct marketing of small farm products, on-farm food safety, organic production and farm to school. She holds a BS from UI in Agriculture and Extension Education and a MS in Plant Science, also from UI. Her educational and outreach focuses on how food is grown, handled, processed, transported and consumed in the greater Boise metropolitan area.



# Marketing in the New Food Reality: how understanding the way we eat now creates smarter consumers and opportunities for local food entrepreneurship.

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Presented by Ariel Agenbroad, Area Educator,  
Community Food Systems and Small Farms

UNIVERSITY OF IDAHO EXTENSION



University of Idaho  
Extension

EXTENSION   
UtahStateUniversity

“Most people do not really know why they buy what they buy, eat what they eat, or do what they do.”

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*- Cornell University Research Brief*

# What do YOU think about that?

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Let's find out.

**Are you eating at home more often or less often than you did before?**

**“Regardless of where we source our meals, we increasingly consume them at home.”**

**-David Portalatin, NPD Group, 2018**

**How many snacks, on average,  
do you consume daily?**

**Half of adults eat three or more  
snacks per day**



**Do you feel that fresh foods are healthier?**

**Nearly nine in 10 adults (87%)  
feel that fresh foods are healthier**

-Technomic 2014a; MSI 2014a

# Are you making an effort to choose more fresh foods?

**78% of consumers are making a strong effort to eat more fresh  
versus processed foods**

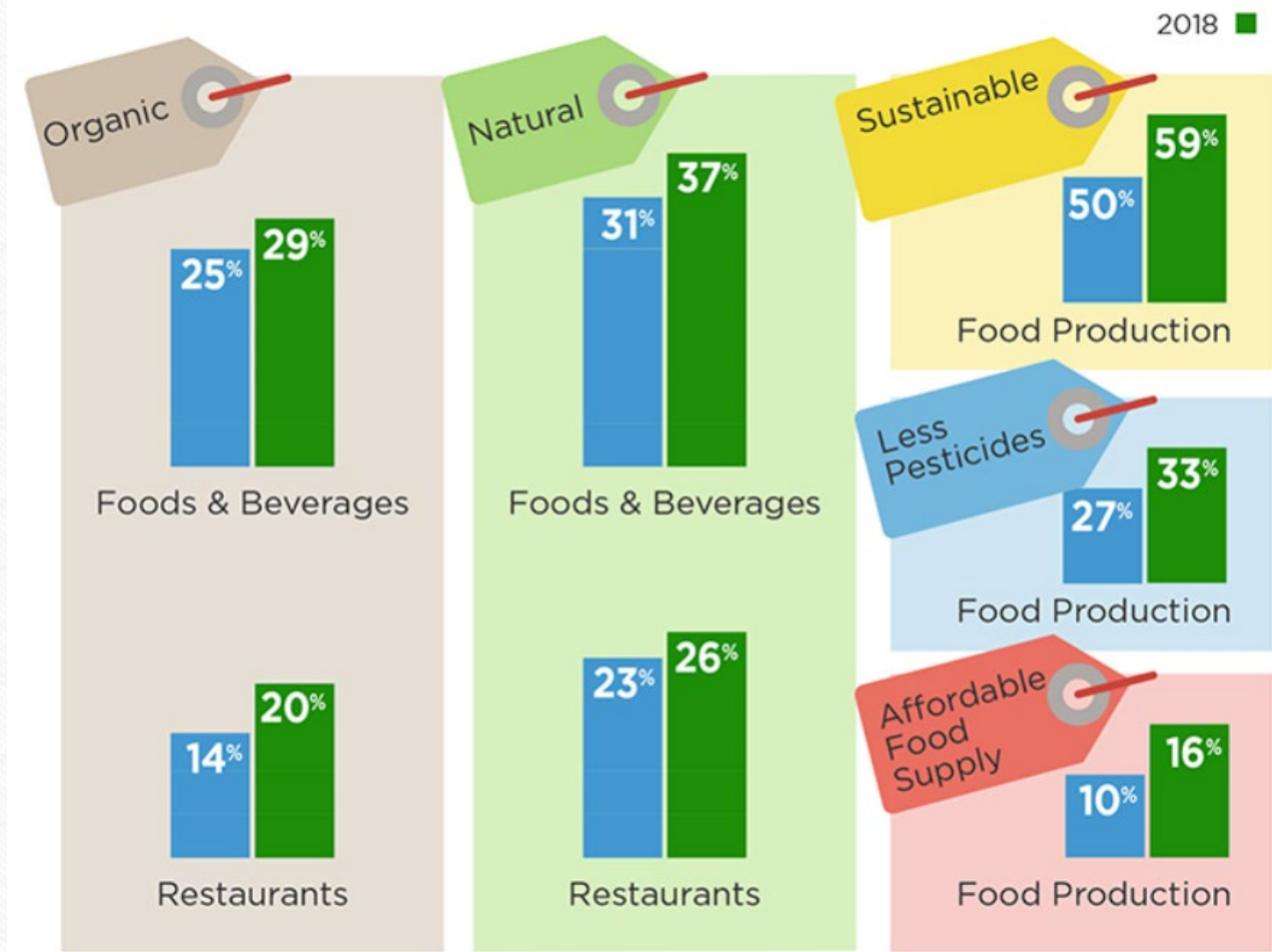
**-Technomic 2014a; MSI 2014a**

# What is important to you?

- Organic food
- Local food
- Sustainable Food
- Natural Food
- Convenience
- Affordability
- Authentic Food
- Clean Food
- Humanely raised meat, eggs and dairy
- Grass fed beef



59% of consumers say it is important that the foods they purchase and consume be produced in a sustainable way.



**Do you consciously avoid specific food items in your diet, for example, carbohydrates, meat, dairy, eggs, gluten, artificial colors, flavors or sweeteners?**

36 % reported following a specific eating pattern or diet in 2018.

- New Hope Network, 2018



**10%**  
Intermittent  
Fasting



**7%**  
Paleo



**5%**  
Low-carb



**5%**  
Whole30



**4%**  
High-Protein



**3%**  
Ketogenic/High-Fat



In 2014, one-third of adults tried a specialty regimen; 8% tried gluten-free; 7%, lactose-free, 6%, raw/living foods; 5%, dairy-free.

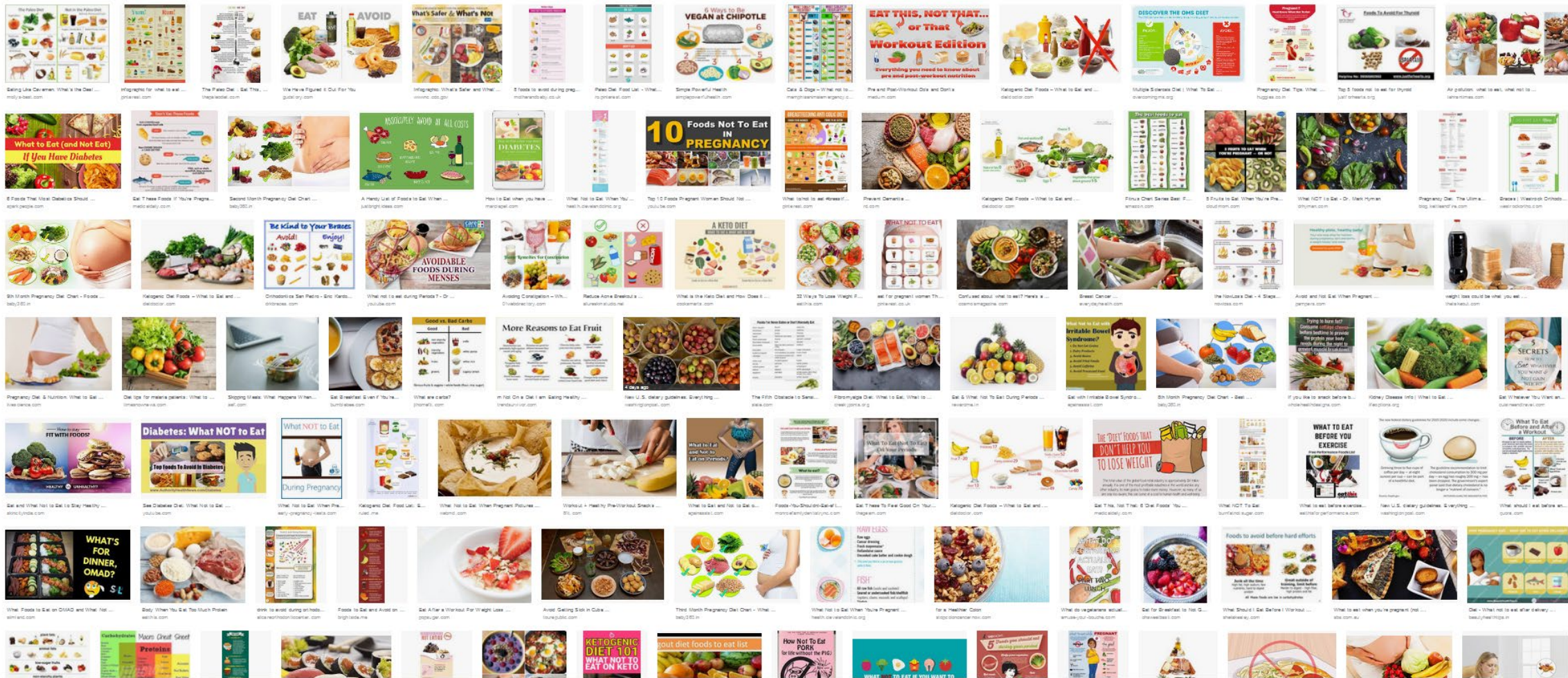
- MSI 2014a

**Are you confused by information related  
to dietary choices and health?**



**Eight in 10 (80 percent) consumers say there is “a lot of conflicting information” about what foods to eat or avoid.**

**- New Hope Network, 2018**



“

A new megatrend focused on gourmet convenience, interest in more plant-based fare, and a need for more complete grab and go meal solutions are among the factors creating fundamental shifts in Americans' eating habits.”

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- A. Elizabeth Sloan, *What America Eats, Food Technology 2016*

# Let's “unpack” these trends

- Fresh, clean eating = healthy eating
- The convenience revolution and reinvention
- Home sweet home, home alone
- Food goes digital, delivery gets creative
- Snacks and RTE re-defining mealtime



[On The Menu](#)

[Pricing](#)

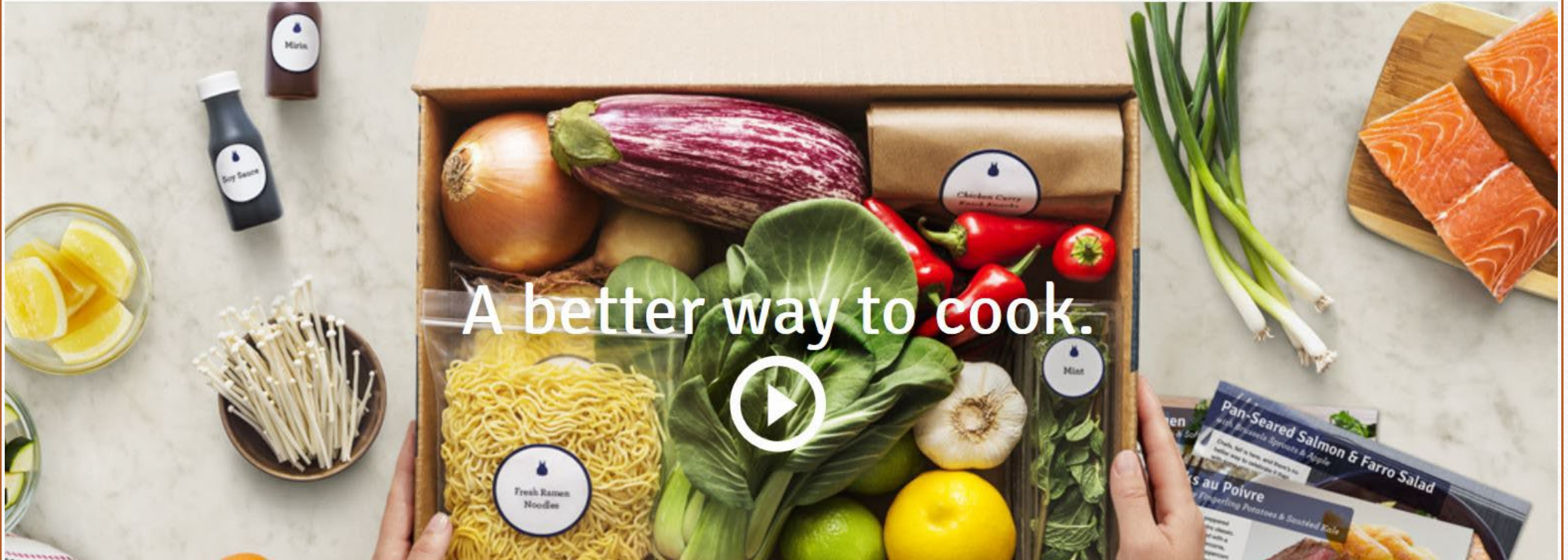
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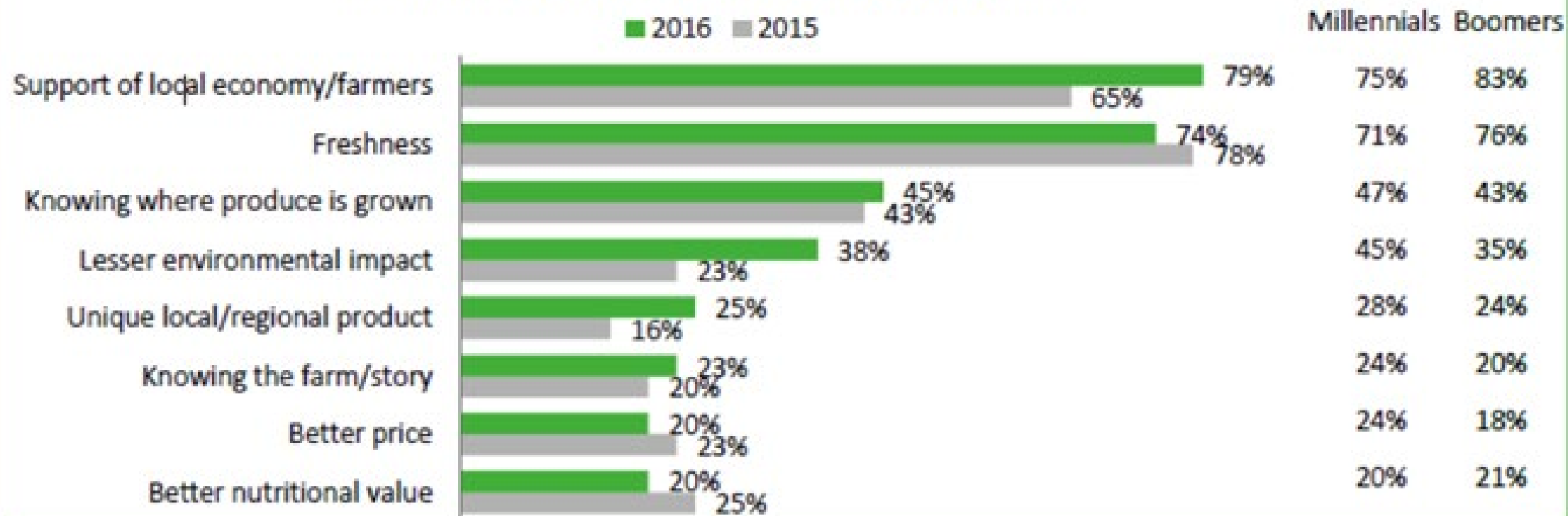
# Former trends here to stay?

- Focus on animal and human welfare/safety/quality of life
- Organic, local, “really, really, real food”
- Functional foods
- Chocolate

“Is the  
chicken  
local?”



### Reasons for purchasing locally-sourced produce



- FMI's 2016 Power of Produce



**How can we use this  
information as  
consumers?**

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**How can we use this information  
as farmers, ranchers and  
specialty food producers?**

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# Research *YOUR* Market

- Reconnaissance is required
  - look, listen, learn, ask questions
- Test the waters before getting in
  - customer surveys
  - product testing
  - focus groups
- Honestly analyze your findings



# Where do you stand?

- Know your:
  - Customer
    - What they buy, how often, at what price
  - Community
    - Can it support your farm & product mix?
- Competition
  - Who else is meeting the demand?
- What makes **you** special?
- What could get in your way?
  - Regulations, access, infrastructure



# Peaceful Bell

Organic \$3  
Carrots  
bunch \$3.00

Organic  
Beets  
bunch \$3.00



Questions?

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University of Idaho  
Extension

## Building a CSA

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I will be discussing the basics of building a Community Supported Agriculture (CSA) program for microscale farms.

### **Sheriden Hansen**

Assistant Professor  
Utah State University  
sheriden.hansen@usu.edu

Sheriden Hansen is an Assistant Professor of Horticulture with USU Extension in Davis County, Utah. Sheriden started as a nurse, receiving a BS in nursing from the University of Utah in 2002. After many years working as an operating room RN, she decided to pursue her passion in horticulture. Sheriden graduated from Utah State University with a BS in Plant Science (Summa Cum Laude) in 2015 and a MS in Plant Science with an emphasis in fruit production in 2017.



# Building a CSA program from the ground up

Sheriden Hansen  
Assistant Professor, Horticulture  
Utah State University Extension



# Building a CSA program

What is a CSA program?

Legal considerations & membership agreements

Types of CSA programs

What to include in shares

How many shares should I sell?

Setting the share price

Recruiting customers & maintaining momentum

Common problems



# What is a CSA program?

- CSA stands for Community Supported Agriculture
- The CSA model was developed in Japan in the 1960's
- First CSA in the USA started in Massachusetts in the mid 1980's
  - CSA Garden at Great Barrington



# What is a CSA program?

- People “buy in” to your farm by buying shares
- Customers also share in the risk
- Provides income during lay months
- Potential to boost income and diversify



# Legal considerations

- Proper business set up
  - LLC vs S-Corp vs Sole Proprietorship
- Before you start make sure that you are properly zoned
  - Farming
  - Share pickups



# Legal considerations

- Some CSA programs offer a written membership agreement for consumers
  - Spells out risks
  - Sets guidelines for the CSA
  - Establishes customer expectations



# Membership agreements should include:

- Farmer contact information
- Definition of your CSA program
  - Nuts and bolts of your program
  - Length of season
  - Pickup or delivery?
  - Work share options?
- Explanation of growing practices and sources



# Membership agreements should include:

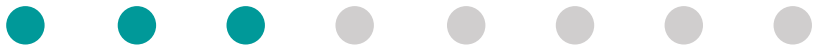
- Rules and Procedures
  - Members fail to pick up shares?
  - Refunds?
- Cancellation policy
- Explanation of risks and rewards
  - Crop failure?
  - Bumper crop?
- Customer signature





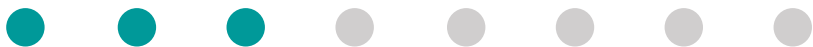
# Types of CSA programs

- Season length
  - Full share ~ 20 weeks
  - Half share ~ 10 or 12 weeks
  - Quarter share ~ 5 or 6 weeks
- Full year
  - Usually includes items other than produce
  - Meat, honey, eggs, textiles like yarn
  - Includes other growers and producers to fill in the gaps



# Types of CSA programs

- Theme - can sometimes help you stand out from the crowd
- Catch phrases
  - Organic
  - Sustainable
  - Pesticide free
  - Heirloom varieties
  - Unusual varieties
  - Historically significant varieties
  - New hybrid varieties
  - Eggs or meat included
  - Etc...



# What should shares contain?

- Between 10-20 lbs of produce
  - Fruit and vegetables
  - Foods that people know how to cook with
  - Maybe one unusual item each week
- Want some diversity to your shares
  - Lettuce, kale, spinach, radish, cabbage
  - vs.
  - Tomato, beans, kohlrabi, greens, zucchini



# What should shares contain?

- Aim for 5-10 different fruits/vegetables to harvest each week
- Plant several types of a vegetable in succession
  - Green, purple, roma, & wax beans
  - Slicing, paste, grape, & canning tomatoes
  - If share has beans/tomatoes for 3 weeks in a row, should be different types = variety
- Variety helps people try new things = happy!



# What should shares contain?

- Help your clients understand that greatest diversity comes in the summer months
- Spring and fall may have limited variety but may include some interesting crops
  - Garlic – scapes vs bulb
  - Peas
  - Potatoes



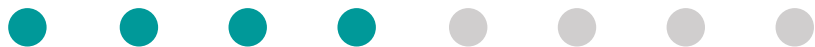
# What should shares contain?

- Adding herbs to shares
  - Great way to add diversity to shares, especially when crops are limited – spring and fall
- Herbs to consider:
  - Basil, sage, rosemary, thyme, parsley, and unusual varieties
  - Try adding a potted herb to the share



# What should shares contain?

- Contents of shares factor into your planting scheme
- Important to plan what is in your shares **BEFORE** you plan the layout of your farm
  - How much space do you need for each crop?
  - How many types of beans/peppers/tomatoes do you need to grow?



# Adding something extra

- Newsletter – printed or digital
- Blog
- Facebook, Instagram, Twitter
  
- Information to include:
  - What is happening on the farm
  - What are you planting
  - Crop updates
  - Photos of the farm
  - History of heirloom plants
  - Introductions to animals and people that work on the farm
  - Recipes to try, especially if you are offering something unusual that week



## **Peachy Cheesecake Tart...**

August 17, 2014



Peach season is upon us! Praise the heavens for peaches, they are here! I have been to get to harvest them day after day, and believe me, I love it. The perk of the job is that I get to enjoy those juicy, peachy orbs of flavor every day, and it's glorious! Juice dripping down your arm and cheeks is perfect.



# How many shares should I sell?

- Start small and build each year
  - There is a learning curve with timing
  - You have people expecting produce each week
  - Start with 10-20 shares and build until you reach maximum capacity
    - Either with labor or land



# Setting the share price

- Cost should be fair for the subscribers, but should cover the value of your produce
  - Don't sell yourself short!
- Estimate the market price per share
  - How much would you pay for the share at a market?
  - Take that number and multiply it by the number of weeks in the share
    - $\$20 \times 10 \text{ weeks} = \$200$
    - $\$35 \times 10 \text{ weeks} = \$350$
    - $\$35 \times 20 \text{ weeks} = \$700$



# Setting the share price

- Average price in Utah is \$32.40 per week
  - $\$32.40 \times 10 \text{ weeks} = \$324.00$
  - $\$32.40 \times 20 \text{ weeks} = \$648.00$
- If you sell 20 shares for a 20 week season  
20 week share  $\$648.00 \times 20 \text{ shares} =$   
**\$12,960**
- Sell remaining produce at a market or increase number of shares...
  - End of summer half share



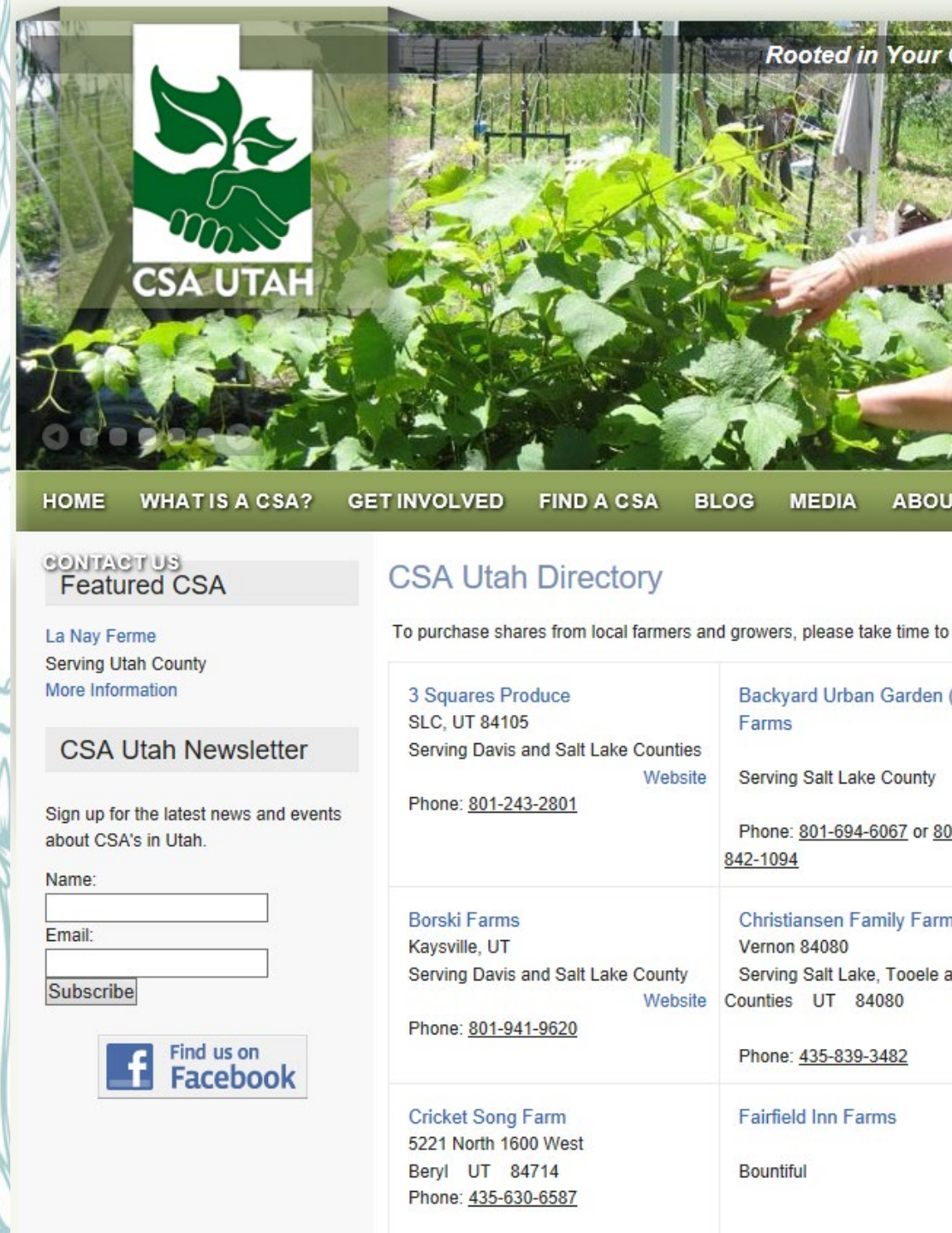
# Setting the share price

- Make sure the price covers the cost of seed, soil, supplies, packaging, worker wages, etc.
- If you are just starting...
  - Sometimes it helps to build clientele by keeping the price slightly lower
  - It can be difficult to bump the price up



# Recruiting subscribers

- Work on building your CSA program each year
  - Start small and build
- Advertise
  - Word of mouth
  - Facebook - ads, Instagram, Twitter, social media
  - YouTube videos
  - CSA directories – CSA Utah
  - Open Houses – CSA Utah
  - Blogs
  - Flyers – great if you sell @ farmers' markets



# Recruiting subscribers

- Include in your advertising:
  - What makes your shares unique
  - Information on how you grow – organic, pesticide free, sustainable, etc.
  - Season length – options for half shares, etc.
  - How do people sign up?



## DublinCSA

COMMUNITY-SUPPORTED AGRICULTURE

### HOW IT WORKS

30 VEG-LOVERS COMMIT TO BUY FRESH ECOLOGICALLY PRODUCED VEG FOR ONE SEASON (9 MONTHS) DIRECTLY FROM OUR FARMER SEAMUS.

MEMBERS PAY UP FRONT (€517.5 FULL SHARE/€258.75 HALF SHARE\*), OR IN 9 MONTHLY INSTALLMENTS (€57.5 FULL/€28.75 HALF SHARE).

\*A HALF SHARE IS EVERY SECOND WEEK.

EACH THURSDAY, MEMBERS MEET UP TO PICK-UP THEIR FRESH VEG IN FRONT OF THIRD SPACE SMITHFIELD, D7 FROM 6.30-7.00PM

### WHAT YOU GET

EACH BAG CONTAINS 5 VARIETIES IN AVERAGE AND IS SUFFICIENT FOR ONE PERSON FOR APPROX. 1.5 WEEKS.

DEPENDING ON THE SEASON: STRAWBERRIES, CHERRY TOMATOES, CUCUMBERS, ONIONS, GARLIC, SALAD, CABBAGE, TURNIPS, CARROTS, PARSNIPS, BEETROOTS, POTATOES, KALE, CHARDS, SQUASH, HERBS ETC

### WHY CSA?

- YOU KNOW HOW YOUR FOOD WAS GROWN AND BY WHOM
- SEAMUS GETS PAID DIRECTLY A FAIR PRICE
- THE GROUP SHARES THE RISK AND THE BENEFIT OF FARMING (IF THE CROP SHOULD FAIL HE STILL GETS PAID AND IF THERE IS SURPLUS IT IS SHARED AMONG THE MEMBERS)
- WE BUILD A STRONG COMMUNITY AROUND THE FARMER, HELP OUT ON FARM DAYS AND SOCIALIZE AT OTHER OCCASIONS

### SIGN UP OPEN UNTIL 01/06/2018

EMAIL: CSADUBLIN@GMAIL.COM OR FB: DUBLINCSA VISIT: CSADUBLIN.WORDPRESS.COM

# Maintaining momentum

- How do you keep customers coming back?
- Offer a varied selection each year
- Co-op with other farmers and vendors
  - Gives you the opportunity to offer unique and different products every year
  - Keeps interest and variety
    - Example with Beehive Cheese
    - Fruit growers
    - Cut flower growers
    - Many potential partners you meet at markets



# Repeat Customer



# Maintaining momentum

- Adding high-value products that you produce – that little extra something...
  - Eggs
  - Cheese
  - Meat
  - Honey
  - Cut flowers
  - Goat milk soap
  - Yarn from sheep
- The price of the share should reflect the added cost of the high-value products...





# Maintaining momentum

- Give people an opportunity to experience the farm
  - Offer an experience, not just food
  - Opportunity to invest in their food
  - Participation days
  - Planting days
  - Learning opportunities



# Maintaining momentum

- How do you keep customers coming back?
- Fantastic customer service
  - Make your customers feel valued
- Give customers the opportunity to give you feedback
  - What did they love?
  - What could make the program better?
  - Are they willing to help more on the farm for reduced prices?
  - Do they want to learn more – could you include a class or event?



# Common problems

- CSA programs aren't perfect
  - Weather
  - Crop failure
  - Stress of producing
  - Can I make more \$ at a high-end market?
  - People can be hard to work with
    - Produce pickup
    - Unrealistic expectations
  - Growing too quickly
  - Takes time to build relationships with customers



# Questions?

## Resources:

- Member agreement example - University of Illinois:  
<https://polk.uwex.edu/files/2014/02/CSA-Model-Member-Agreement-v.1-Univ-IL.pdf>
- CSA Resource Guide for Farmers - NC State University:  
<https://growingsmallfarms.ces.ncsu.edu/growing-smallfarms-csaguide/>
- CSA Utah:  
<http://www.csautah.org/>



## Financial Strategies for Success

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Whether you are thinking of starting a farm business or have a farm business, an important part of managing your business is understanding and analyzing the financial side of your business. This session will provide basics which will show you not only how to think about your business and financial strategies to improve profit, but also provide some simple Excel tools to analyze your own situation. The session will start with how to look at profit and the various types of costs. It will then use an example of a half-acre vegetable farm to show how to conduct financial analysis. Financial management and analysis systems are often too complex and require too much information, knowledge or time. The approach here is to put you in control of your business and give you practical, simple methods of analyzing your ideas to formulate financial strategies that will lead to profitable, viable farm businesses.

### **Ruby Ward**

Professor, Economic Extension Specialist  
Utah State University  
[Ruby.ward@usu.edu](mailto:Ruby.ward@usu.edu)

Dr. Ruby Ward was raised on a farm and ranch in South-eastern Idaho. 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. She teaches agricultural finance and community planning. Dr. Ward has delivered educational programs in Utah and the surrounding region for the last 18 years. Ward currently co-chairs the Urban and Small Farms Conference in Utah. Ward is the project leader for the Rural Tax Education website ([RuralTax.org](http://RuralTax.org)) and Co-chair of the National Farm Income Tax Extension Committee.



# Financial Strategies For Success

Ruby Ward, PhD  
USU Extension

# Hobby vs. Business

You **WANT** to run a  
CSA for **FUN**

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Profit is not main  
concern

Other reasons:

- Teach skills to children or community members
- Produce food in a certain way
- Fun

You **WANT** to make a  
**PROFIT**

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Profit is the main  
concern

How can I effectively run  
a CSA to provide  
income?



# Business Management Curriculum

## Module 4: Financial Analysis



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



*This material is based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award number 2013-38640-22175 through the Western Sustainable Agriculture Research and Education program under sub-award number EW14-017. USDA is an equal opportunity employer and service provider. 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.*

*Each university is an affirmative action/equal opportunity institution*

# Objectives

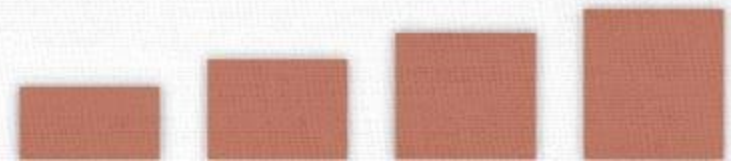
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What is Profit?

- Increasing Profit

Analyze Business Using:

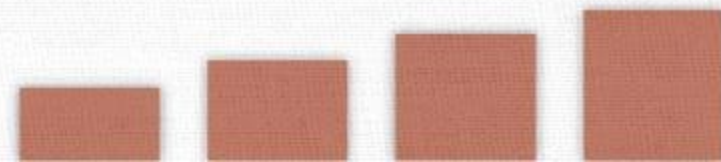
- Sensitivity Analysis
- Break Even Analysis
- Partial Budgeting



# What Does It Cost?

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- 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



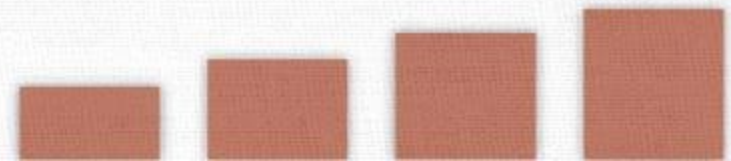
# What is profit?

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Profit = (price – Variable Cost) quantity – fixed cost

Margin Per Unit

Funds left to cover  
fixed cost & profit

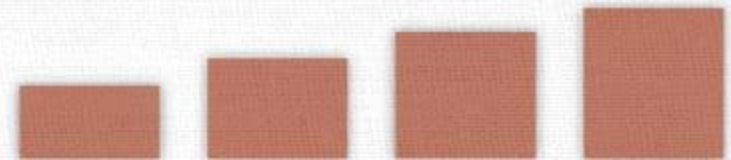


# Analyze Margins

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Margin = (Price – Variable Cost) \* Quantity

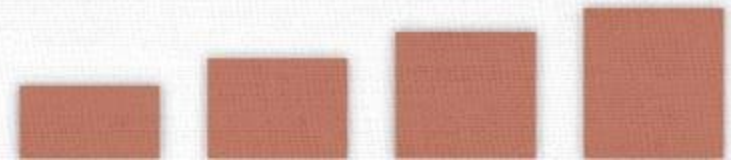
- Do you have a low margin?
- Is price greater than variable costs?
- What happens if cost increases by 10%?  
20%?
- What happens if price drops by 10%?  
20%?



# Analyze Fixed Cost



Profit = (price – Variable Cost) quantity – fixed cost

- Are fixed costs too high?
  - How many units to cover fixed costs (fixed cost / margin)?
  - Do you have equipment that sits idle for long periods of time?
  - How many bulls per cow do you have?
  - Is your horse trailer or truck the envy of your neighbors?
- 

# Analyze Profit – CSA

## Budget for .5 ac Small Farm Full Cost

| <u>Revenue</u>  | <u>Unit</u>         | <u>Price</u>   | <u>Quantity</u>    | <u>Total</u>         | <u>% of</u>    |
|---|---------------------|----------------|--------------------|----------------------|----------------|
| <u>Product</u>  |                     |                |                    |                      | <u>Revenue</u> |
| <i>Individual product</i>                               | <i>size of unit</i> | <i>\$/unit</i> | <i>number sold</i> | <i>Total revenue</i> |                |
| CSA 18 week shares                                      | share               | 583.2          | 10                 | 5832                 | 100%           |
|   |                     |                |                    | 0                    | 0%             |
| <b>Total Revenue</b>                                    |                     |                |                    | <b>5832</b>          | 100%           |
| <u>Expenses</u>   | <u>Unit</u>         | <u>Price</u>   | <u>Quantity</u>    | <u>Total</u>         |                |
| <b>Total Inputs</b>                                     |                     |                |                    | <b>1145</b>          | 20%            |
| <b>Total Labor Costs</b>                                |                     |                |                    | <b>4460</b>          | 76%            |
| <b>Total Fixed costs</b>                                |                     |                |                    | <b>550</b>           | 9%             |
| <b>Total Expenses</b>                                   |                     |                |                    | <b>6155</b>          | 106%           |
| <b>Net income before taxes (revenue minus expenses)</b> |                     |                |                    | <b>-323</b>          | -6%            |
| Income and self employment taxes                        |                     |                | 30%                | -96.9                | -2%            |
| <b>Net profit</b>                                       |                     |                |                    | <b>-226.1</b>        | -4%            |

Price per Unit = \$583.20  
 Total Variable Cost = \$5,605  
 Variable Cost per Unit = \$560.50  
 Margin per unit = \$22.70

Will increasing quantity increase profit?

What could be done to increase margin?

What about fixed cost?

But adjustment can be made on paper!!

*Note: Net profit must be used to pay principal part of loans, purchase new equipment, add to working capital, and withdrawals for owners.*

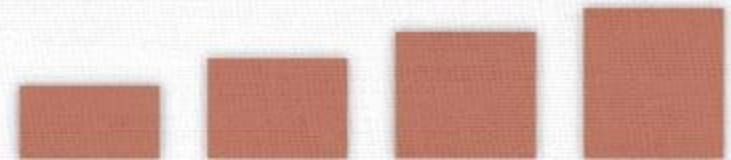
| Situation           | Strategy  | Examples   |
|---------------------|---|--|
| Negative Margin     | Quit and do something else  | Other crops or livestock, other markets  |
| Low Margin          | Increase Price<br>Decrease Variable Costs                           | Pool livestock, Charge more<br>Use pasture longer, less labor, EQIP for better range |
| Sufficient Margin   | Look at Fixed Costs   |  |
| High Fixed Costs    | Decrease Fixed Costs<br>Increase Revenue from FC<br>Increase Volume | Sell equipment<br>Do custom work<br>Plant more acres, increase herd size             |
| Average Fixed Costs | Increase Volume   | Plant more acres, increase herd size   |
| Low Fixed Costs     | Good Job!   |  |



# MyFi – Financial Assistant

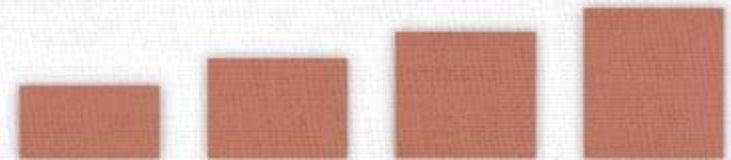
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- MyFi Assist –an app for “My Financial Assistant”
  - Free
  - Available in iOS and Android
  - Can be personalized to your situation



# 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

Choose or change your item and its value below:

Turn Preferences on/off

On

Off

1. What is your item?

calves

Examples: hours worked, head of calves, bales of hay, etc.

2. What is the value of this item?

500

Example: the value of each **hour worked** is **\$10**

Menu

# 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.

## Paying for a Loan

When you use a loan or a credit card to buy something, you will pay back the amount of the loan plus interest and any fees. Fill in the information in the grey boxes below to find out the total cost of buying using credit.

What is the annual interest rate?

6

How many years will you take to pay the loan back?

4

How much do you owe or does the item cost?

30000

What is the amount of your down payment if any?

0

Calculate

Your monthly payment will be **\$704.55**

The total amount you will pay in interest is 3,818.44

After making all your payments you will pay 33,818.44

Your interest cost is equivalent to 13% of the original cost

You will need 1.4 calves each month

16.9 calves each year

The total amount is equivalent to 67.6 calves

The total interest is equivalent to 7.6 calves

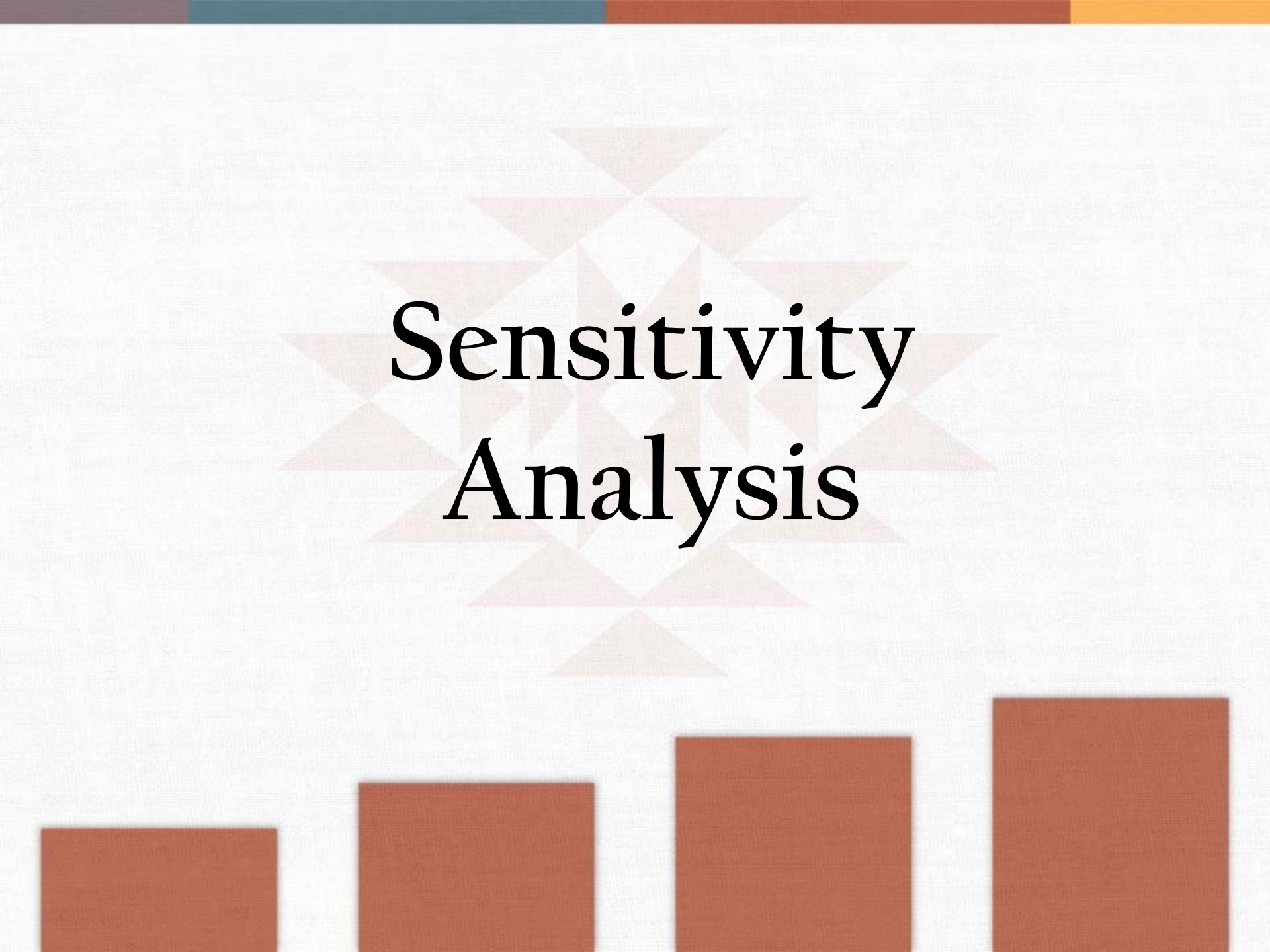
Menu

## 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?

|  |  |
|--|--|
| Your monthly payment will be                                 | \$704.55                                       |
| <hr/>  |  |
| The total amount you will pay in interest is                 | 3,818.44                                       |
| After making all your payments you will pay                  | 33,818.44                                      |
| Your interest cost is equivalent to 13% of the original cost |  |
| <hr/>  |  |
| You will need  | 1.4 calves each month                          |
|  | 16.9 calves each year                          |
|  | The total amount is equivalent to 67.6 calves  |
|  | The total interest is equivalent to 7.6 calves |
| <a href="#">Menu</a>   |  |

- 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.



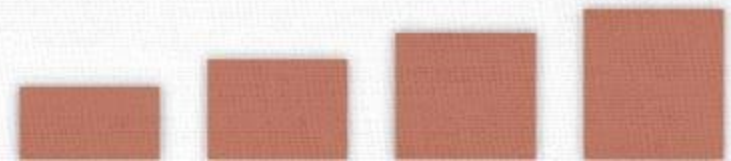
# Sensitivity Analysis



# How Sensitive Are You?

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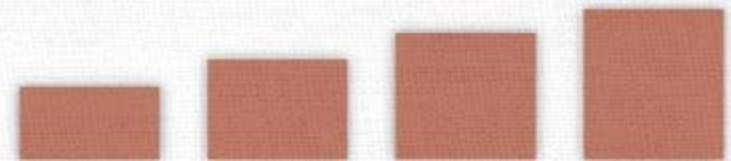
- You made your best guess
- Determine what will happen if you are wrong
- Look at the good, the bad, and the ugly
- Changing one assumption may cause bigger changes in results



# What happens if ...

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- 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

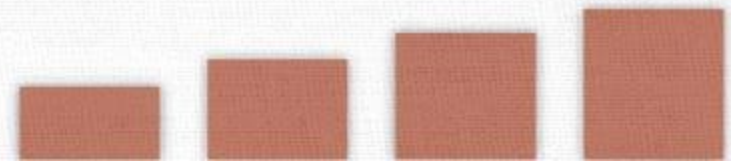




# Doing it

---

- 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





# 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

$$\textit{Profit} = (\textit{Price} * \textit{Quantity}) - (\textit{Unit Operating Cost} * \textit{Quantity}) - \textit{Total Fixed Cost}$$

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

$$\textit{Quantity} = \frac{\textit{Total Fixed Cost}}{\textit{Price} - \textit{Variable Cost}}$$

- Given Quantity: Price needed to break-even

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

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

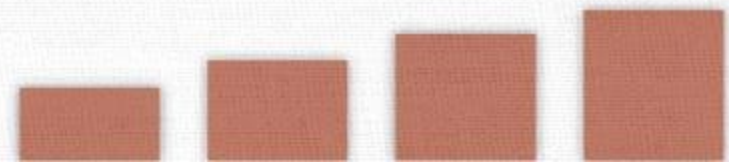
# Tomato Budget – Break-Even Price Analysis

## Enterprise Budget for 14' x 100' Tomato Bed

Different break-even points:

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

- 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.



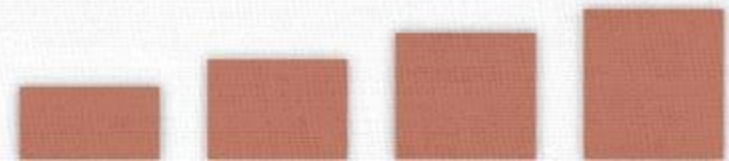
# Tomato Budget – Break-Even Quantity Analysis

## Enterprise Budget for 14' x 100' Tomato Bed

Different break-even points:

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

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



# Break-Even Acres for Equipment

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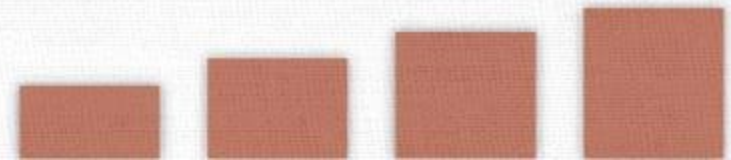
*Break – even acreage*

$$= \frac{\text{Annual Ownership Costs}}{\text{Custom Rates} - \text{Operating Costs Per Acre}}$$

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





Questions?





**Thank You!**

## **Sustainable Soil and Nutrient Management**

---

This presentation will introduce topics in precision agriculture for microfarming. The goal is to inform decision-making on soil fertility for both economic viability and environmental sustainability. We will broadly cover soil sampling; nutrient management; and determining compost and manure applications, as well as using cover crops.

### **Melanie N Stock**

Assistant Professor  
Utah State University  
[melanie.stock@usu.edu](mailto:melanie.stock@usu.edu)

I am a new assistant professor in the USU Plants, Soils, and Climate Department. I moved to Utah from Wisconsin in 2018. My background is in using soil science for manure and land management in the wintertime, and running community gardens. At USU, I am excited to work on resource use efficiency and high value crops with small scale producers. I am particularly excited to begin cut flower research and Extension programming.

# Sustainable Soil and Nutrient Management

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*Beginner Micro Farms Track*

## **Dr. Melanie Stock**

Assistant Professor / Extension Urban & Small Farms Specialist

Department of Plants, Soils, and Climate, Utah State University

Certified Soil Scientist, SSSA



**7<sup>th</sup> Annual Urban & Small Farms Conference**  
**Utah Cultural Celebration Center – West Valley City, UT**  
**February 20, 2019**



# Today's Topics



## I. Sustainable Management: Begins with a Soil Test

- Considerations for Utah
- How to test and what to expect

## II. Meeting your soils' needs

- Addressing test results
- Setting goals for fertilizer, manure, and compost
- Management tips

# Regular soil testing is critical for determining your nutrient needs

---

- Opportunity to know exact crop needs
  - There are 14 nutrients *all* plants need. If one is deficient, yield drops
  - Using visual symptoms alone = often too late & misdiagnosis is common
- Avoid applying too much
  - Reduce fertilizer/amendment cost
  - Avoids salinity problems, environmental hazards



# Soil Test Lab at USUAL

- Helpful documents for soil test interpretation
- Soil samples cost \$14+ to test

[usual.usu.edu](http://usual.usu.edu)

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## Analytical Laboratories (USUAL)

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**About Us**  
FAQ  
After results, what next?  
Equipment  
Quality Control  
What we don't do

## Sample Submission Forms

[Feed \(PDF\)](#)  
[Manure \(PDF\)](#)  
[Plant \(PDF\)](#)  
[Soil \(PDF\)](#)  
[Water \(PDF\)](#)

# Choosing soil tests – know our soils

Utah soils are diverse, but common properties make us unique and lead to special management:

- Low organic matter (average = 0.5-2.0%)
- Average pH = 8.0
- Salinity, the build up of salts (best to be <2)
- Excessive calcium
- Range in textures (loams are common)



***These are also reasons to be weary of out-of-state recommendations!***

# Starting point for soil tests in Utah

## 1. First tier – always consider these important tests

- Phosphorus & Potassium (P & K) – soils can have high levels
- Salinity (EC) and pH – knowing your baseline tells you how close you might already be to threshold values. It's easier to avoid salinity, pH problems than to try to fix later

## 2. Second Tier – one time only

- Texture – this takes 100s to 1000s of years to change. Just test it once

## 3. Optional and follow-up tests

- Nitrogen – not necessary, but can be helpful
- Iron – if see iron deficiency in plants or if have a high pH
- SAR – if salinity is very high
- Total Elemental – micronutrients and metals



# Step 1: Soil test form to begin with the Routine Test



**SOIL ANALYSIS INFORMATION SHEET**  
 USU ANALYTICAL LABORATORIES  
 USU Analytical Labs  
 1541 N 800 E / 9400 Old Main Hill  
 Logan UT 84322-9400  
 (435) 797-2217 or Fax (435) 797-2117  
 www.usual.usu.edu



Date: \_\_\_\_\_  
 Name: \_\_\_\_\_  
 Mailing Address: \_\_\_\_\_  
 City, State, Zip: \_\_\_\_\_  
 County: \_\_\_\_\_  
 Phone: \_\_\_\_\_  
 Email: \_\_\_\_\_

| Sample I.D.    | Sample Numbers |   |   |   |
|----------------|----------------|---|---|---|
|                | 1              | 2 | 3 | 4 |
| Sample Depth   |                |   |   |   |
| Tests Desired* |                |   |   |   |

**\*TESTS OFFERED**  
 Price is per sample

|   |       |
|---|-------|
| 1. Basic (Phosphorus (P) + Potassium (K) only)  | 14.00 |
| 2. Routine (pH, salinity, texture, Phosphorus (P), Potassium (K), recommendations-indicate crop!) | 25.00 |
| 3. Manure application - (Routine + Nitrate-N**)   | 35.00 |
| 4. Micro Plus (Routine + micronutrients (Zn, Fe, Cu, Mn))   | 35.00 |
| 5. Complete (pH, salinity, texture, P, K, Nitrate-N**, micronutrients, sulfate, organic matter)   | 67.00 |
| 6. UDOT Required (pH, salinity, SAR, organic matter, particle size, >2mm)                         | 61.00 |
| 7. Landscaper (UDOT plus P, K, NO3-N**, micronutrients)   | 90.00 |

Please contact the lab for individual analyses/additional analyses  
 \*\*Nitrate-N analysis requires special sampling/handling. See procedures on reverse side.

**TESTS REQUIRE 2 CUPS OF SOIL PER SAMPLE**  
 Providing too much soil may cause delays, while too little soil may not be enough for all tests requested.

COMMENTS or special problems: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Total cost of analysis: \$ \_\_\_\_\_

Check # \_\_\_\_\_  Cash  
 # \_\_\_\_\_ **CALL FOR CC#**  
 Visa  Master card  Discover  AmEx

PLEASE INCLUDE PAYMENT WITH SAMPLE TO PREVENT DELAY ON SAMPLE PROCESSING.

**\*TESTS OFFERED**  
 Price is per sample

|   |       |
|---|-------|
| 1. Basic (Phosphorus (P) + Potassium (K) only)  | 14.00 |
| 2. Routine (pH, salinity, texture, Phosphorus (P), Potassium (K), recommendations-indicate crop!) | 25.00 |
| 3. Manure application - (Routine + Nitrate-N**)   | 35.00 |
| 4. Micro Plus (Routine + micronutrients (Zn, Fe, Cu, Mn))   | 35.00 |
| 5. Complete (pH, salinity, texture, P, K, Nitrate-N**, micronutrients, sulfate, organic matter)   | 67.00 |
| 6. UDOT Required (pH, salinity, SAR, organic matter, particle size, >2mm)                         | 61.00 |
| 7. Landscaper (UDOT plus P, K, NO3-N**, micronutrients)   | 90.00 |

Please contact the lab for individual analyses/additional analyses  
 \*\*Nitrate-N analysis requires special sampling/handling. See procedures on reverse side.

# Nitrogen is NOT included in Routine tests because we can assume it is required each year

**Table 1.** Annual nitrogen recommendations for landscape and garden plants.

| Plants       | General requirements  | Recommendation   |
|--------------|---|--|
| Vegetables** | Low: peas, beans  | 1 to 2 pounds of nitrogen/1000 sq ft                             |
|              | Intermediate: asparagus, beet, carrot, melon, cauliflower, broccoli, brussels sprouts, celery, pepper, tomato, lettuce, radish, spinach, turnip, squash, pumpkins | 2 to 3 pounds of nitrogen/1000 sq ft<br>(= 90-130 pounds N/acre) |
|              | High: onion, sweet corn, potato   | 4 to 6 pounds of nitrogen/1000 sq ft                             |

UTAH VEGETABLE PRODUCTION  
& PEST MANAGEMENT GUIDE  
2016



# SOIL ANALYSIS

| TEST                       | TEST DESCRIPTION   | PRICE PER SAMPLE | SAMPLE SIZE** | NOTES *** |
|----------------------------|--|------------------|---------------|-----------|
| S1                         | Sample Preparation / Drying and Grinding (REQUIRED FOR MOST SAMPLES)         | \$ 4.00          |               |           |
| <b>CHEMICAL PARAMETERS</b> |  |                  |               |           |
| S2                         | pH (saturated paste)   | \$ 4.00          | 100g          |           |
| S3                         | Electrical Conductivity (Ece) (saturated paste)                              | \$ 6.00          | 100g          |           |
| S4                         | pH + Ece   | \$ 7.00          | 100g          |           |
| S5                         | SAR - Sodium Adsorption Ratio  | \$ 14.00         | 150g          |           |
| S6                         | pH + Ece + SAR   | \$ 17.00         | 150g          |           |
| S7a                        | Phosphorus - Olsen NaHCO3 Method (Available P)                               | \$ 7.00          | 2.5g          |           |
| S7b                        | Potassium - Olsen NaHCO3 Method (Available K)                                | \$ 7.00          | 2.5g          |           |
| S7c                        | Olsen P + K  | \$ 11.00         | 2.5g          |           |
| S8a                        | Nitrate-N (Available N) Ca(OH) <sub>2</sub> extract                          | \$ 9.00          | 5g            | a         |
| S8b                        | Nitrate-N (Available N) 2N KCl extract                                       | \$ 10.00         | 20g           | a         |
| S8c                        | Ammonia-N (2N KCl extract)   | \$ 14.00         | 20g           | a         |
| S8d                        | Nitrate-N + Ammonia-N (2N KCl extract)                                       | \$ 19.00         | 20g           | a         |
| S9a                        | DTPA-extractable Elements Micronutrients (Fe, Zn, Cu, Mn)                    | \$ 10.00         | 10g           |           |
| S9b                        | DTPA-extractable Elements Metals (Fe, Zn, Cu, Mn, Cd, Cr, Ni, Pb)            | \$ 11.00         | 10g           |           |
| S10                        | Sulfate-S (Available Sulfur)   | \$ 10.00         | 10g           |           |
| S11                        | Boron - Hot-water extractable  | \$ 17.00         | 15g           |           |
| S12a                       | Organic carbon/Organic Matter Walkley-Black                                  | \$ 13.00         | 0.5g          |           |
| S12b                       | Organic carbon/Organic Matter Loss on Ignition / Ash                         | \$ 14.00         | 20g           |           |
| S12c                       | Combustion (Total Carbon)  | \$ 20.00         | 5g            |           |
| S13                        | Combustion (Total Nitrogen)  | \$ 20.00         | 5g            | a         |
| S14                        | Combustion (Total Carbon + Nitrogen)   | \$ 20.00         | 5g            | a         |
| S15a                       | Water-Soluble Elements (Saturation paste) Ca, Mg, Na, K, B, S                | \$ 17.00         | 250+g         |           |
| S15b                       | Water-Soluble Elements (Saturation paste) Chloride (Cl)                      | \$ 15.00         |               |           |
| S15c                       | Water-Soluble Elements (Saturation paste) CO <sub>3</sub> + HCO <sub>3</sub> | \$ 18.00         |               |           |
| S15d                       | Water-Soluble Elements (Saturation paste) Nitrate-N (NO <sub>3</sub> -N)     | \$ 16.00         |               |           |
| S15e                       | Water-Soluble Elements (Saturation paste) All                                | \$ 34.00         |               |           |
| S16                        | Ammonium Acetate Extractable Cation  |                  |               |           |
| S17                        | Cation Exchange Capacity - NaOAc / N Exchangeable Cation Percentage (Incl    |                  |               |           |
| S19                        | Total Element Composition EPA 3050   |                  |               |           |
| <b>PHYSICAL PARAMETERS</b> |  |                  |               |           |
| S21                        | Coarse Fragment Analysis (>2mm frac  |                  |               |           |
| S22                        | Particle Size by Hydrometer  |                  |               |           |
| S23                        | Sand Sieving (VF, F, M, C, VC)   |                  |               |           |
| S24                        | Particle Size by Hydrometer + Sand   |                  |               |           |
| S25                        | Texture by Feel  |                  |               |           |
| S26                        | Moisture Content   |                  |               |           |

## Considering Elemental Tests

- Micronutrients
- Metals
  - Interest in growing edibles AND
  - Property by major highways, former mines, former orchards, next to houses older than 1980

# SOIL ANALYSIS

| TEST | TEST DESCRIPTION  | PRICE PER SAMPLE | SAMPLE SIZE** |
|------|---|------------------|---------------|
| S19  | Total Element Composition EPA 3050 Digestion + ICP analysis | \$ 33.00         | 4g            |

# Step 2: Soil sample planning

- How often should I soil sample?
  - Perennials = every 3 years,
  - Annuals = every 1-2 years
- Goal: Collect samples that represent your yard/farm
  - Try to group different areas into management “zones”
- Note: Home soil test kits are NOT recommended
  - Most were developed for eastern soils
  - Our soils are special!



# Step 2 cont'd: Determining “zones”

- 3 management zones are common, depending on budget, crops, goals, and property information
- Considerations:
  - Size of your field or property. <30 ac/sample
  - Crop or plant type
  - Natural features – slope, soil texture, drainage
  - History – fertilizer, manure/livestock, compost, irrigation, past use, possible contamination areas
  - Intuition – isolate an area if it is underperforming or just seems different!
- Example on this tomorrow at the Soils Track





Step 3: Now that zones are identified,  
collect samples

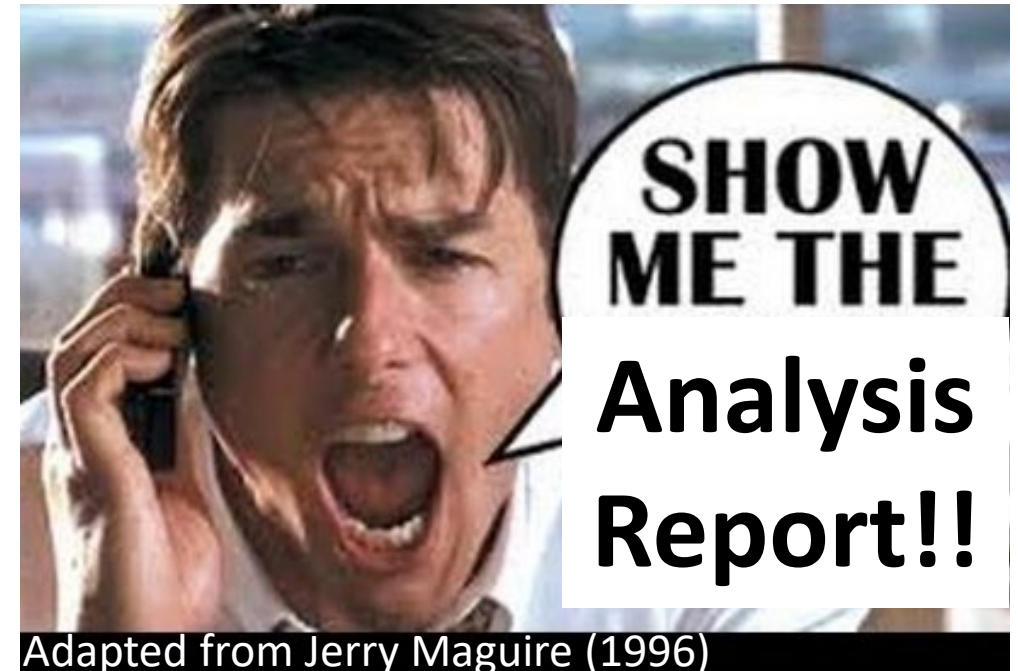
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Come to the **Soils Track tomorrow** afternoon  
to learn how to do this!

# Step 4: Following soil test recommendations

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- Different crops require different nutrient rates
- Credit ALL nutrient sources when following recommendations  
(Chemical fertilizers + manure + cover crops + irrigation water content + ...)
- Considerations for nutrient sources:
  - High Nitrogen
  - Phosphorus – often limiting factor
  - Salt content
  - Weed seeds (un-composted manures)
  - Woody/fibrous material (ties up N)



Adapted from Jerry Maguire (1996)

# Fertilizer Calculations

## UTAH VEGETABLE PRODUCTION & PEST MANAGEMENT GUIDE 2016



- USU Fact Sheets and Guides give step-by-step instructions
- Come to the **Soils Track tomorrow** to learn about this...and have Specialists do it for you!



August 2016

Horticulture/Fertilizers/2016-01


## Calculating Fertilizer for Small Areas

*Tiffany Maughan, Grant Cardon, and Dan Drost*



# Soil Amendments: Compost and Manure

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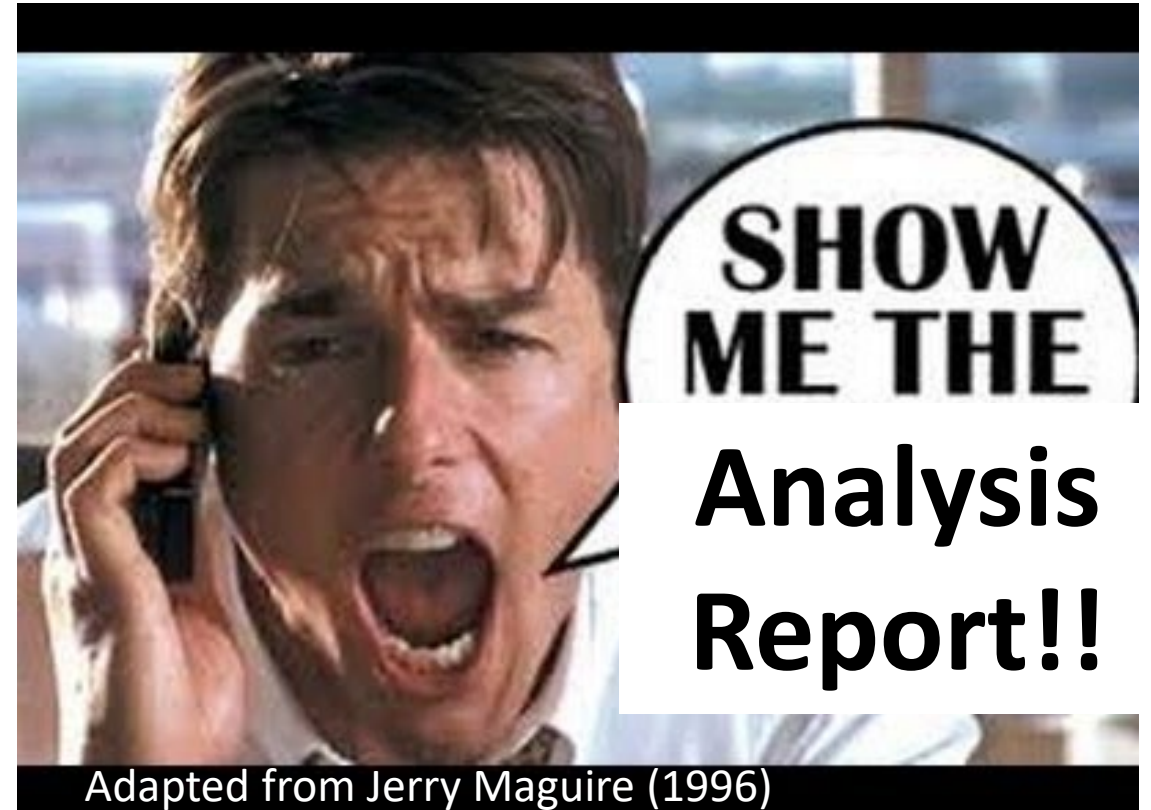
- Compost and Manure add nutrients and organic matter (OM)
  - OM improves soil quality (productivity, structure, water and nutrient retention, erosion resistance...)
- 
- Most arid soils have 0.5-2% OM and rarely get enough. >5% is “ideal”
  - Intensive cropping reduces OM. At the very least, we need to replace what we take
  - One cannot overcome an OM deficiency with mineral fertilizers alone

# Compost and Manures as nutrient sources

- Generally more “dilute”
- Different composts and manures have different nutrient contents
  - Example: Dairy manure ranged 6-28 lb N /T
- Some have high salt,  $\text{pH} > 7$ , high Phosphorus (P), high Potassium (K), but low Nitrogen (N)



We must know how much is in it to calculate application rates.



# Manure/Compost Tests at USUAL



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[Equipment](#)

[Quality Control](#)

[What we don't do](#)

## Sample Submission Forms

[Feed \(PDF\)](#)

[Manure \(PDF\)](#)

[Plant \(PDF\)](#)

[Soil \(PDF\)](#)

[Water \(PDF\)](#)

### TEST

Total elemental composition:

N, P, K, Ca, Mg, Na, S, B, Zn, Cu, Fe, Mn, C;

moisture, pH and salinity (EC)

Price per sample

\$58.00

# Nutrient Contents of Manures and Compost

- See Utah Vegetable Production & Pest Management Guide for general information
- USU Fact Sheet on small-scale manure application coming late 2019!
- General rules of thumb
  1. Watch out for salt (salinity) and pH
    - Chicken manure has the most nutrients, but also the most salt
  2. If given the choice, pick options with more N, less P and K
    - Many manures have more P and K than we need
    - Most compost has equal parts N and P
  3. Consider how much can be over- or under-applied

# Setting nutrient management goals: How much manure do we add? What IS our goal?

---

1. From our soil test, we need:

- Nitrogen = 3 lbs N/1000 sq. ft (aka 130 lbs/acre)
- Phosphorus ( $P_2O_5$ ) = 1 lb /1000 sq. ft (aka 44 lbs/acre)
- Potassium ( $K_2O$ ) = 1 lb /1000 sq ft. (aka 44 lbs/acre)

2. We have back:

- **Use manure to meet your P goal,  
not your N goal**
- 0.5 oz/lb manure or 33 lbs/ton
- or 44 lbs/ton

To hit our N goal, we'd add 100 lbs of manure. To hit our P goal, we'd add 33 lbs manure

If we used enough manure to reach our Nitrogen needs, we would have 3x as much Phosphorus...

...we should not rely on manure (or compost) alone for soil fertility!

# Guidelines for applying manure

- Rate – Apply based on phosphorus needs, NOT nitrogen. In our example, we still need about 2 lbs of N/1000 sq ft (90 lbs/acre)
- Handling – Incorporate manure <72 hours after application. Utah soils!
- Timing –
  - Plant health: Apply > 3-4 weeks prior to planting to avoid burning
  - Human health: Apply  $\geq$  90 days prior to harvesting edibles NOT in soil,  $\geq$  120 days for edibles in contact with soil
  - Environmental health:  
*Avoid* applying before rain, snowmelt, on frozen soils, or on snow. Consider composting during these times.



# Benefits of cover crops

- **Nitrogen source (legumes only)**
- Build organic matter
- Bind and stabilize soil particles
  - Reduces compaction
  - Reduces erosion
  - Improves infiltration
  - Increases water & snow storage
- Scavenge nutrients
- Suppress weeds



Horticulture



EXTENSION  
UtahStateUniversity

extension.usu.edu

October 2016

Horticulture/CoverCrops/2016-01

## Introduction to Cover Crops for Vegetable Production in Utah

*Tiffany Maughan*, Research Associate, and *Dan Drost*, Extension Vegetable Specialist



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September 2016

Horticulture/Fruit/2016-04

## Improving Organic Peach Orchard Fertility with Nitrogen-Fixing Ground Covers in Capitol Reef National Park: A Case Study

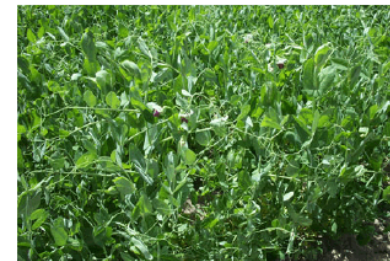
*Esther Thomsen*, Research Assistant  
*Diane Alston*, Entomologist

*Jennifer Reeve*, Soil Scientist  
*Grant Cardon*, Soil Scientist

*Brent Black*, Horticulturist



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## COVER CROPS FOR UTAH GARDENS

*Michael Johnson*, Grand County Extension Agent  
*Maggie Wolf*, Salt Lake County Extension Agent  
*Rich Koenig*, Extension Soil Specialist



# Common Cover Crop Selections

- **Legumes: Hairy Vetch, Clovers, Alfalfa, peas...**

Nitrogen source – you can meet most to all remaining Nitrogen needs

Also keeps the soil covered for weed and erosion control

- **Grains/Grasses: Wheat, Cereal Rye, Oats, Ryegrass**

Lots of biomass: add organic matter, scavenge nutrients, control weeds & erosion, snow

- **Broadleaf: Radish, Mustards/kales, Buckwheat**

Scavenge nutrients, loosen soil, weed and erosion control



# Summary

- Precision farming is not just for Big Ag. We can (and should) do it, too, with proper nutrient planning
- We need to know what our soil needs and what we are adding to it
  - By soil testing!!! Every 2-3 years is ideal
  - Calculate rates for fertilizer, manure/compost, and consider cover crops
  - Analysis of manure and compost – ask for it if you're buying it, test for it if you're producing it. Applying more is not always better.



# Thank you for attending!

Dr. Melanie Stock

Assistant Professor / Urban & Small Farms Extension Specialist

Email: [melanie.stock@usu.edu](mailto:melanie.stock@usu.edu)

Phone: 435-797-0248



## Small Acreage Weed Control

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How do you control weeds when you are dealing with 2 acres or less? Come learn the organic and nonorganic options available.

### **Andy West**

Extension Educator

University of Idaho Extension -

Twin Falls

[andywest@uidaho.edu](mailto:andywest@uidaho.edu)

I am a Horticulture Extension Educator with the University of Idaho Extension based in Twin Falls County. I provide education and answer question related to horticulture for the green industry, general public, Master Gardeners, and small farm operations.



**University of Idaho**  
Extension

# **SMALL ACREAGE WEED CONTROL**

**ANDY WEST**  
**HORTICULTURE EXTENSION**  
**EDUCATOR – TWIN FALLS COUNTY**

# **OVERVIEW**

## **TOPICS:**

- **DEVELOPING A WEED MANAGEMENT PLAN**
- **GUIDELINES FOR CHOOSING TREATMENT METHODS**
- **TOOL BOX**

# DEVELOP A WEED MANAGEMENT PLAN

## STEPS

1. Define your goals
2. Survey your property
3. Develop your plan
4. Implement your plan
5. Monitor your results

# VARIABLES

- Resources available
- Future plans
- Location



# GUIDELINES FOR CHOOSING TREATMENT METHODS

1. Group weeds
2. Identify weeds
3. Understand life cycles
4. Consider timing
5. Evaluate
6. Ask for help
7. Enjoy

# THE WEED MANAGEMENT TOOL BOX

- Preventative
- Cultural
- Mechanical
- Biological
- Chemical

# INFORMATION



Weeds, ways to whip 'em

[http://www.uwyo.edu/barnbackyard/\\_files/documents/magazine/2012guide/0712guideweeds.pdf](http://www.uwyo.edu/barnbackyard/_files/documents/magazine/2012guide/0712guideweeds.pdf)

Creating a weed management plan for your organic farm <https://extension.psu.edu/creating-a-weed-management-plan-for-your-organic-farm>

Weed management for organic farms

[https://lib.dr.iastate.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1050&context=extension\\_pubs](https://lib.dr.iastate.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1050&context=extension_pubs)

Principles of sustainable weed management in organic cropping systems

<https://www.clemson.edu/cafls/research/sustainableag/pdfs/weedmanagement.pdf>

Living on a few acres [https://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/nrcs144p2\\_044808.pdf](https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_044808.pdf)

Take me out to a tarp field <https://smallfarms.cornell.edu/2018/04/06/take-me-out-to-a-tarped-field-needs-sidebar/>



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## **Intro to Hydroponics**

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Basic concepts along with pros and cons of growing hydroponically. See what the fuss is all about.

### **Taylor Wayman**

Hydroculture Technician  
USU Botanical Center Kaysville  
[Taylor.Wayman@usu.edu](mailto:Taylor.Wayman@usu.edu)

Hydroculture Technician at USU Botanical Center in Kaysville. Currently implementing USDA grant to create four Hydroculture demonstration systems in Kaysville (two Hydroponic, two Aquaponic). MBA from University of Colorado. BS in Computer Science from BYU.

# The Basics Of Hydroponics

Taylor Wayman    USU Botanical Center



# Hydroculture

The growing of plants in a soilless medium.

Nutrients dissolved in and delivered by water.

- **Aquaponics**
- **Aeroponics**
- **Hydroponics**

# Aquaponics





# Aquaponics

- Fish Waste In Water (Ammonia)
- Ammonia Converted to Nitrates By Bacteria
- Nitrates (Nitrogen) Feed Plants
- Additional Nutrients Sometimes Added

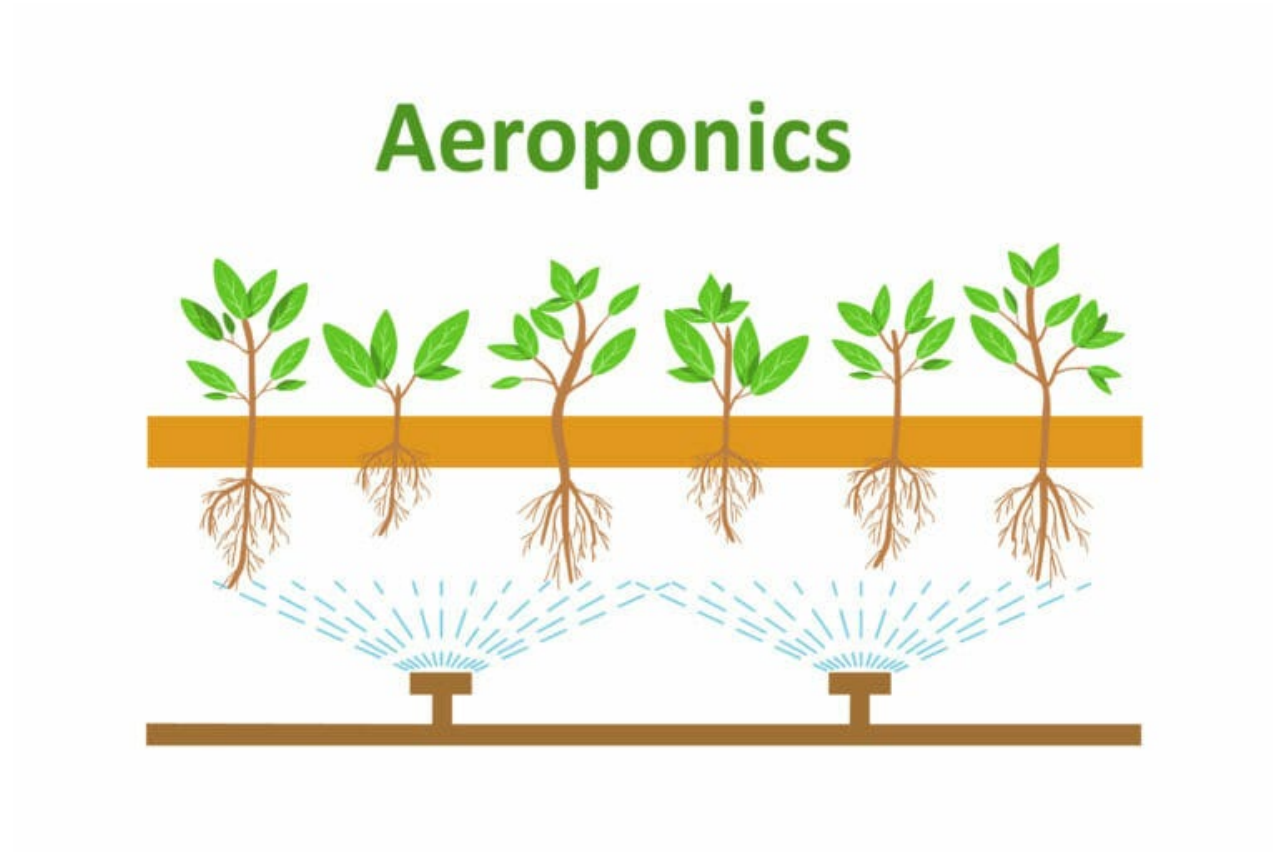


# Aeroponics

The process of growing plants with roots exposed to the air

Like Hydroponics but nutrient rich water solution is delivered in mist form with high frequency

# Aeroponics



A simplified diagram of an aeroponic system. By Lilkin / shutterstock.com.

# Hydroponics

Nutrients (fertilizers) are dissolved in water then delivered to plants



# Why Hydroponics?

- Conserves Water
  - 90%-98% Less Water
  - Lost Only Through Transpiration and Evaporation
- Faster Growth?
- Greater Yield?
- Less Space Needed
- More Predictable/Consistent Yields



# Why Hydroponics?

- Complete Nutrient Control
- No Weeds!
- No Herbicide!
- Less Labor Needed
- Fewer Bugs?
- Fewer Insecticides, If Any

# Why Hydroponics?

- Poor Soil?
- Fewer Diseases?
- Doesn't Deplete Soil
- No Fertilizer Leaching Into Runoff (If you do it right)
- Works Well In Controlled Environments
  - High Tunnels, Greenhouses, Indoors

# Why Not Hydroponics?

- More Technical Knowledge Needed
- Complete Nutrient Control
- Soil Can Be More Forgiving
- pH Fluctuates - Soil Is a pH Buffer
- Usually More Time & \$\$ To Setup





# Why Not Hydrponics?

- Electricity Needed (Usually)
- Failures More Catastrophic
  - If Irrigation System Fails / Power Outage
  - Roots Dry Out Quickly
- Organic Debate
- Disease & Pests May Spread More Quickly

# Which Crops?

- Greens, Strawberries, Tomatoes, Herbs
- Really Though, Almost Anything, But...
- It Will Take Some Tweaking
- Choose / Design Your System Based On Your Desired Crop
- What's Your Motivation? Profit? Food Security? Curiosity?



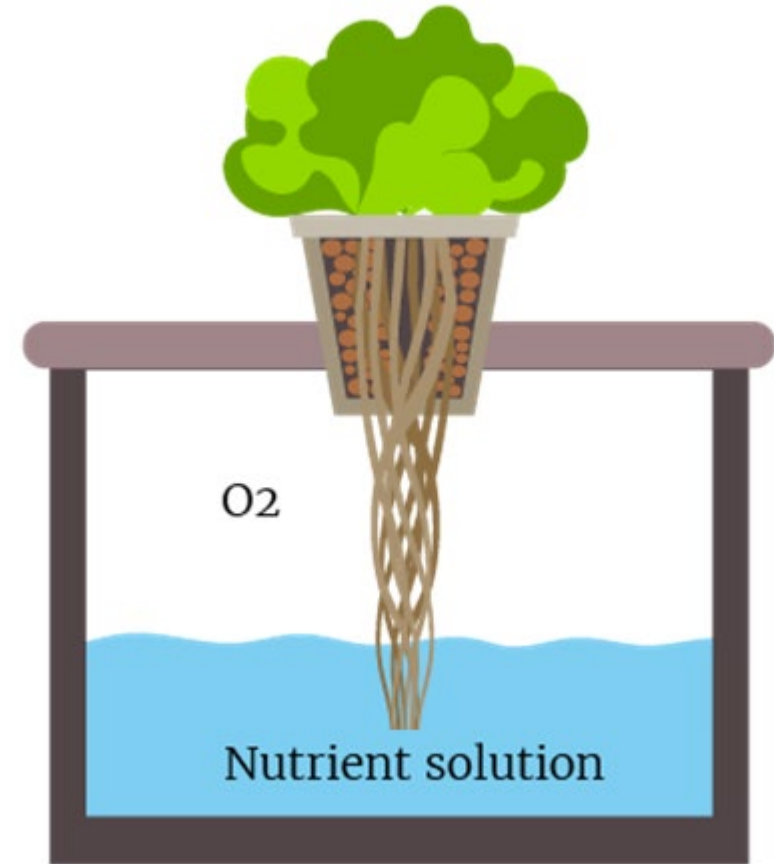
# Hydroponic System Components

- The Grow Media (Rock wool, peat, perlite, wood chips,?)
  - Should be inert
- The Grow Bed, Bucket, Gutter, PVC ?
- The Nutrient Solution
  - Water & Nutrients
- Plumbing, Pump, Aeration, Light ?
- The Plants



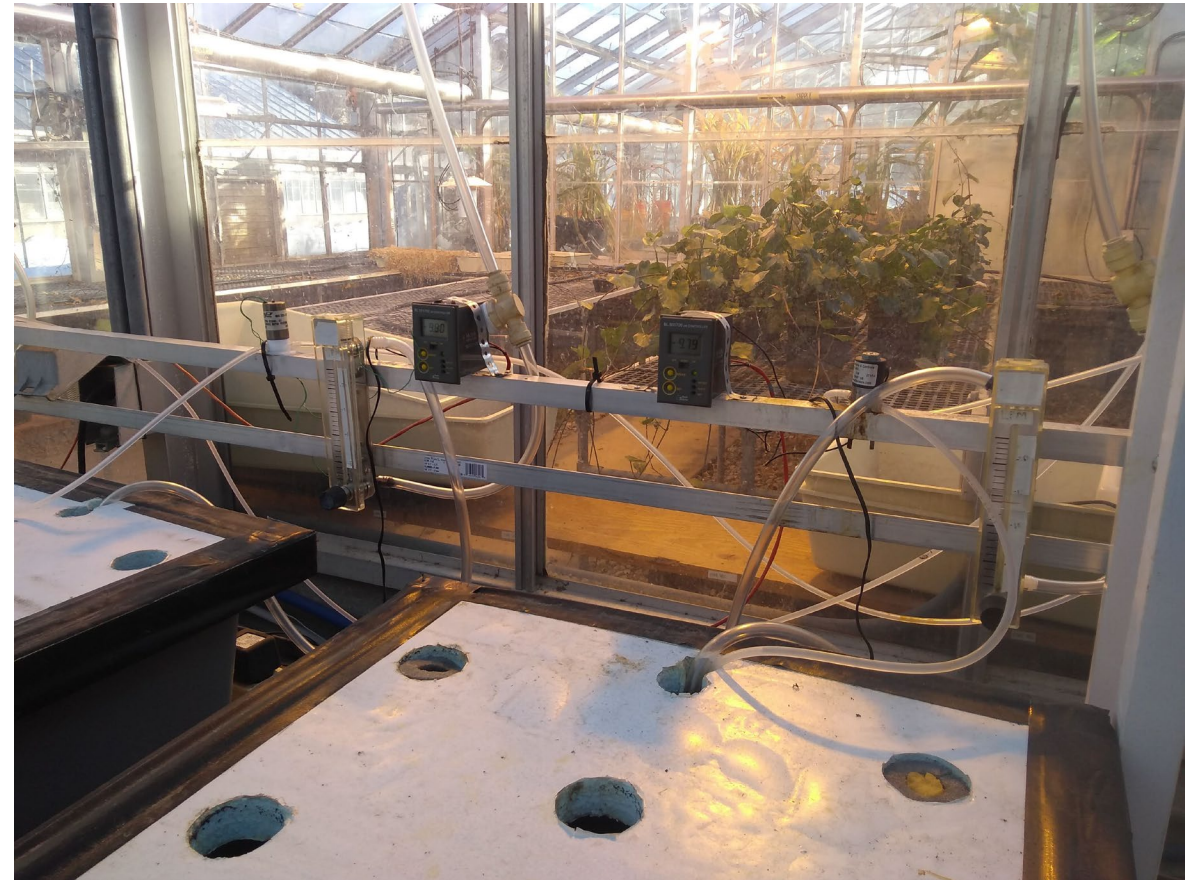
# Hydroponic System Components

- The Grow Media (Rock wool, peat, perlite, wood chips,?)
  - Should be inert
- The Grow Bed, Bucket, Gutter, PVC ?
- The Nutrient Solution
  - Water & Nutrients
- Plumbing, Pump, Aeration, Light ?
- The Plants



# pH Is Finicky In Hydroponics

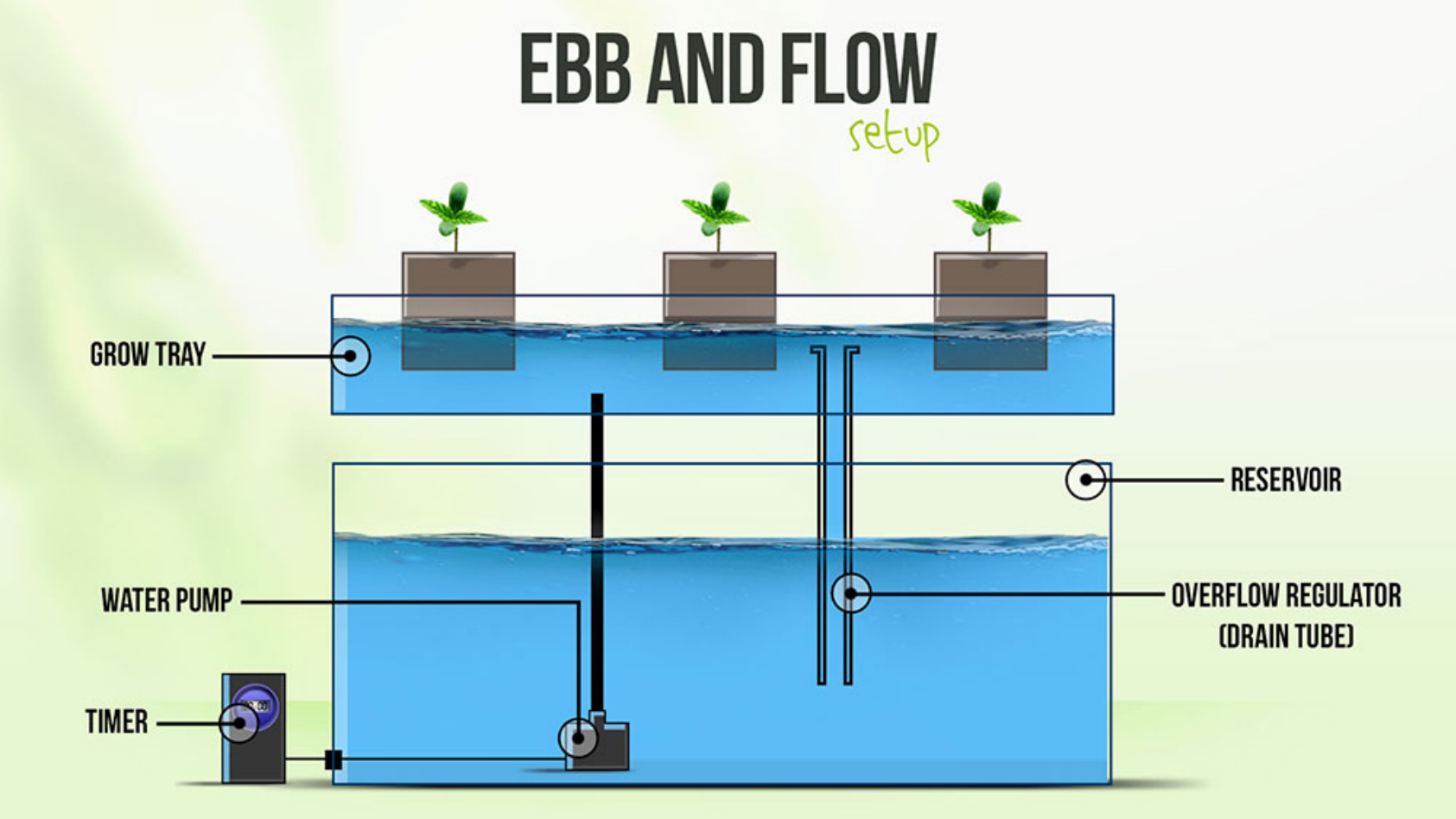
- You'll Need to Pay Attention To It
  - pH Monitoring Equipment
- You'll Probably Need To Control It
  - Adding Acid or Base



# Popular Types of Hydroponic Systems

- Ebb and Flow (Flood and Drain)
- Nutrient Film Technique (NFT)
- Dutch Bucket
- Deep Water Culture (DWC)
  - Kratky

# Ebb and Flow (Flood and Drain)

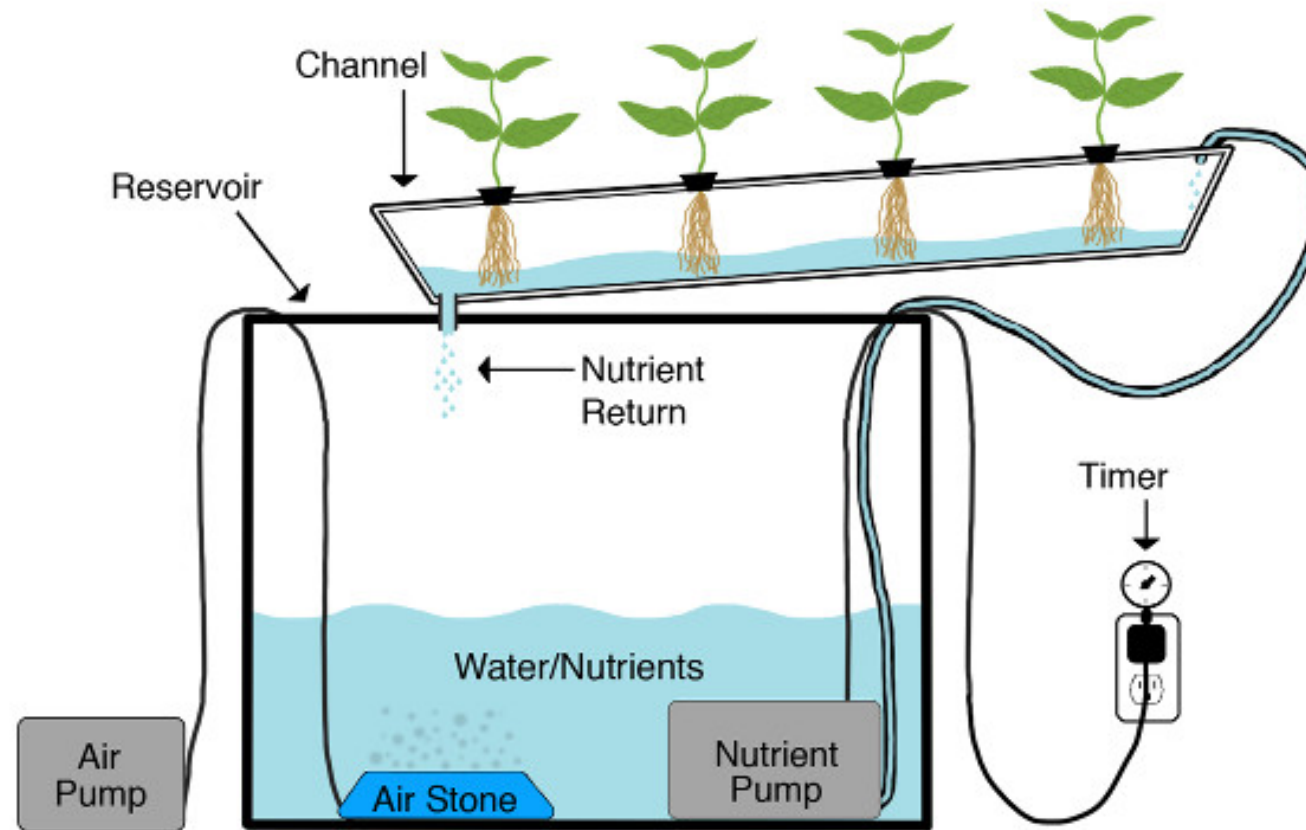


# Ebb and Flow (Flood and Drain)





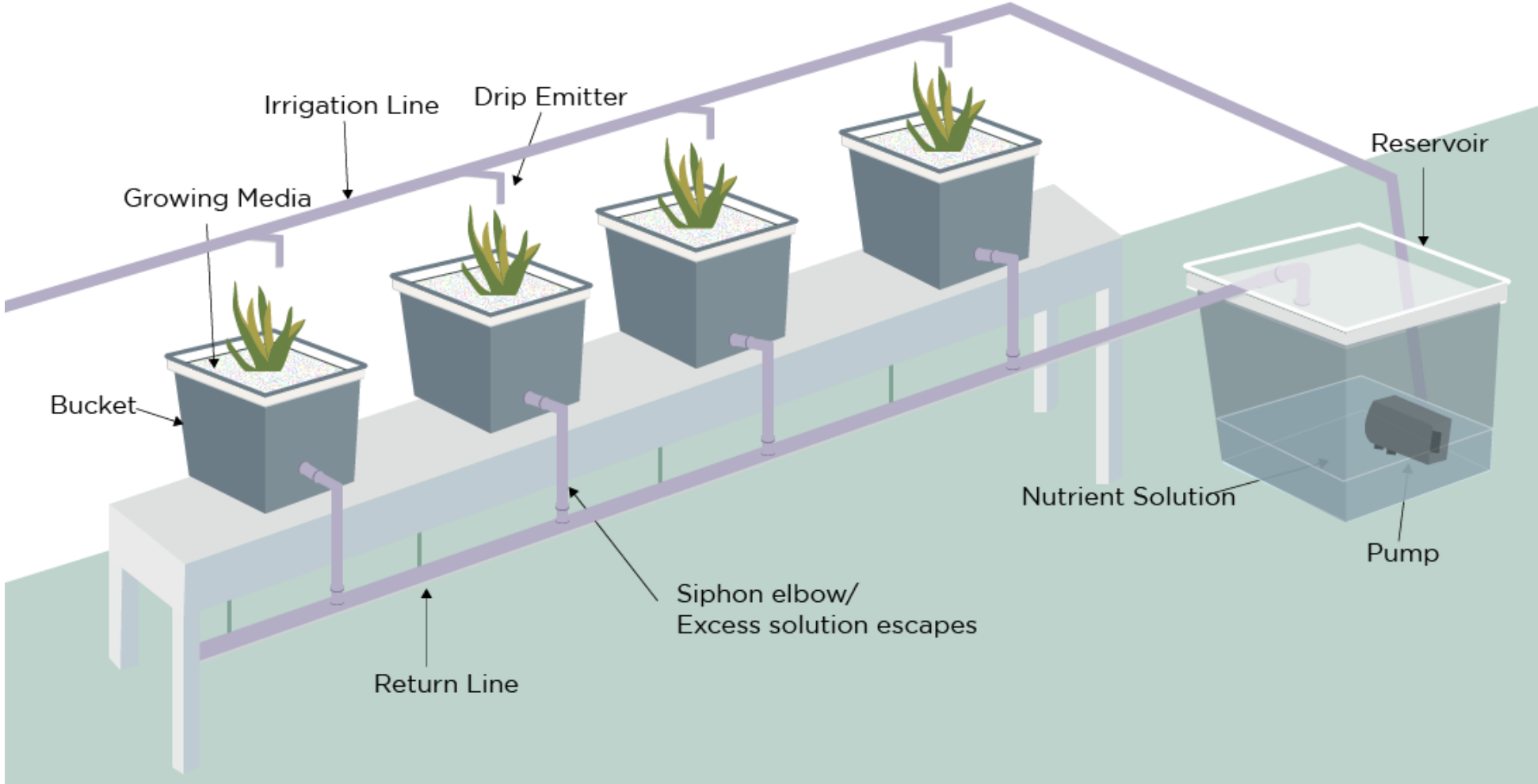
# NFT (Nutrient Film Technique)



# NFT



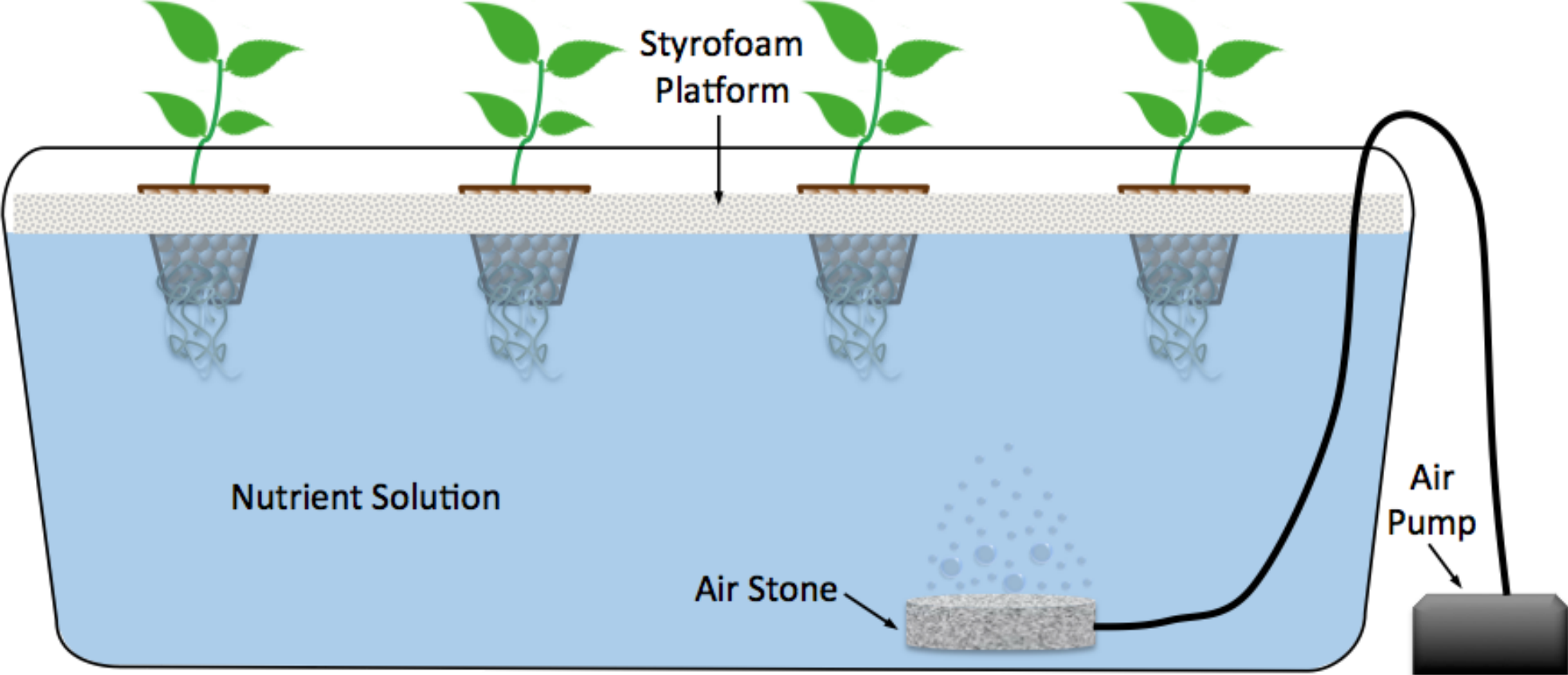
# Dutch Bucket



# Dutch Bucket



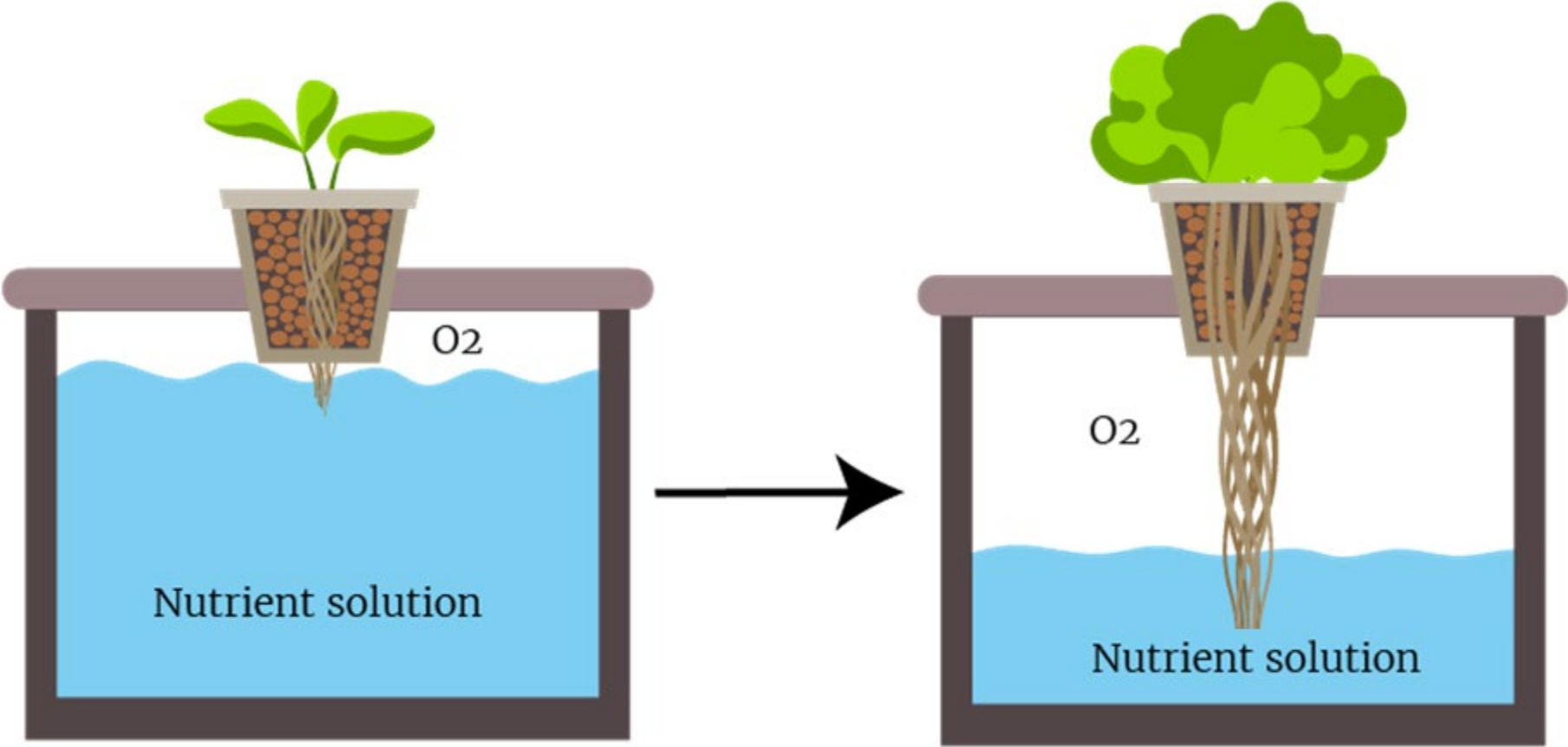
# Deep Water Culture (DWC)



# Deep Water Culture (DWC)



# DWC (Kratky Method)



# Deep Water Culture

## (DWC)

# Kratky Method





# DWC (Kratky Method)



# DWC (Kratky Method)



# DWC (Kratky Method)



# So You're Interested? What now?

- What are your goals?
  - Profit? Food Security? Self Reliance?
  - What do you want to grow?
- Choose your system
- Start Small
- Work out the bugs
- Innovate!

# Can Hydroponics Be Organic?

- Currently, Hydroponics & Aquaponics Can Be
  - Aeroponics Can't
- Controversial
  - Some Traditional Organic Growers Are Very Opposed
- Organic Hydroponic Growing Has It's Challenges
- Maybe "Locally Grown" or "Pesticide Free" Instead of Organic
- What Is Your Value Proposition?

# What We Are Doing In Kaysville

- USDA Specialty Crop Block Grant
  - Hydroponic / Aquaponic Demonstration
    - 2 Hydroponic Demonstrations
      - Kratky & Nutrient Film Technique (NFT)
    - 2 Aquaponic Demonstration
      - Deep Water Culture (DWC) & Dutch Bucket
  - Greens, Strawberries, Sweet Potatoes, Blueberries, and more...

# 1 Hydroponic System Built



# 1 Aquaponic System Built





# Questions?