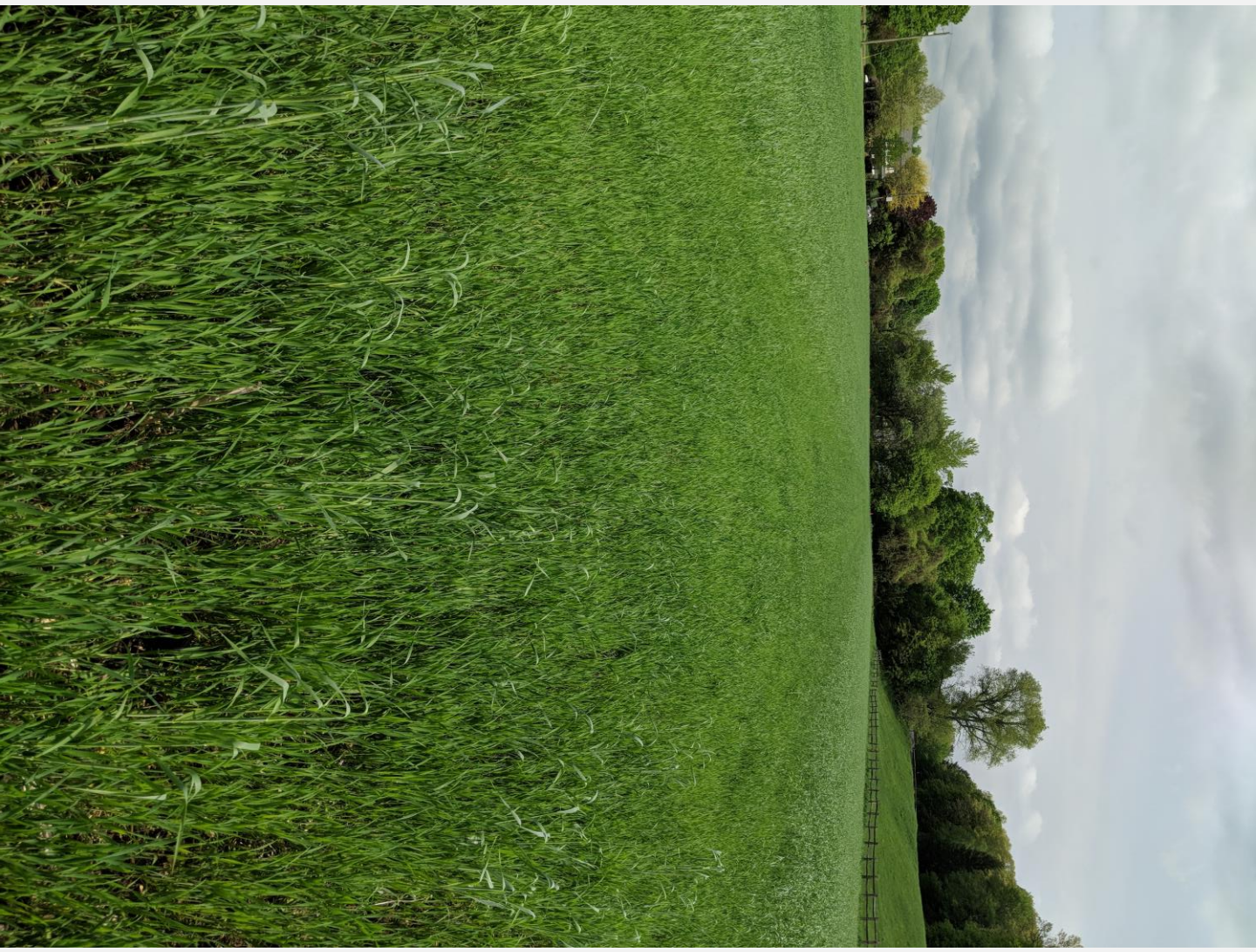
# WORKING TWO JOBS

## COVER CROPS FOR ANIMAL FEED

Sam Corcoran

NOFA Annual Summer Conference

August 11, 2018



# OUTLINE

- Traditional cover cropping versus dual-purpose cover crops
- Where and when to integrate
- Crops and forage quality
- Management and yield
- Resources

# LEARNING OUTCOMES

1. Gain understanding about on-farm nutrient cycling and nutrient balance.
2. Be prepared to plant and harvest or graze cover crops as a source of forage.
3. Develop your own ideas and know the key factors to consider to make dual-purpose cover crops work on your farm, homestead, or backyard garden.

# OUTLINE

- Traditional cover cropping versus dual-purpose cover crops
- Where and when to integrate
- Crops and forage quality
- Management and yield
- Resources

## TRADITIONAL COVER CROPS

+ Prevent soil erosion
+ Weed suppression
+ Capture & recycle nutrients
+ Alleviate soil compaction
+ Build soil organic matter & sequester carbon
+ Food for microbes
- Expensive
- Not harvested/not prioritized

## DUAL-PURPOSE COVER CROPS

+ Prevent soil erosion
+ Weed suppression
+ Capture & recycle nutrients
+ Alleviate soil compaction
+ Build soil organic matter & sequester carbon
+ Food for microbes
+ Pay for themselves
+ Harvested/prioritized

## TRADITIONAL COVER CROPS

+ Prevent soil erosion
+ Weed suppression
+ Capture & recycle nutrients
+ Alleviate soil compaction
+ Build soil organic matter & sequester carbon
+ Food for microbes
- Expensive
- Not harvested/not prioritized

## DUAL-PURPOSE COVER CROPS

+ Prevent soil erosion
+ Weed suppression
+ Capture & recycle nutrients
+ Alleviate soil compaction
+ Build soil organic matter & sequester carbon
+ Food for microbes
+ Pay for themselves
+ Harvested/prioritized

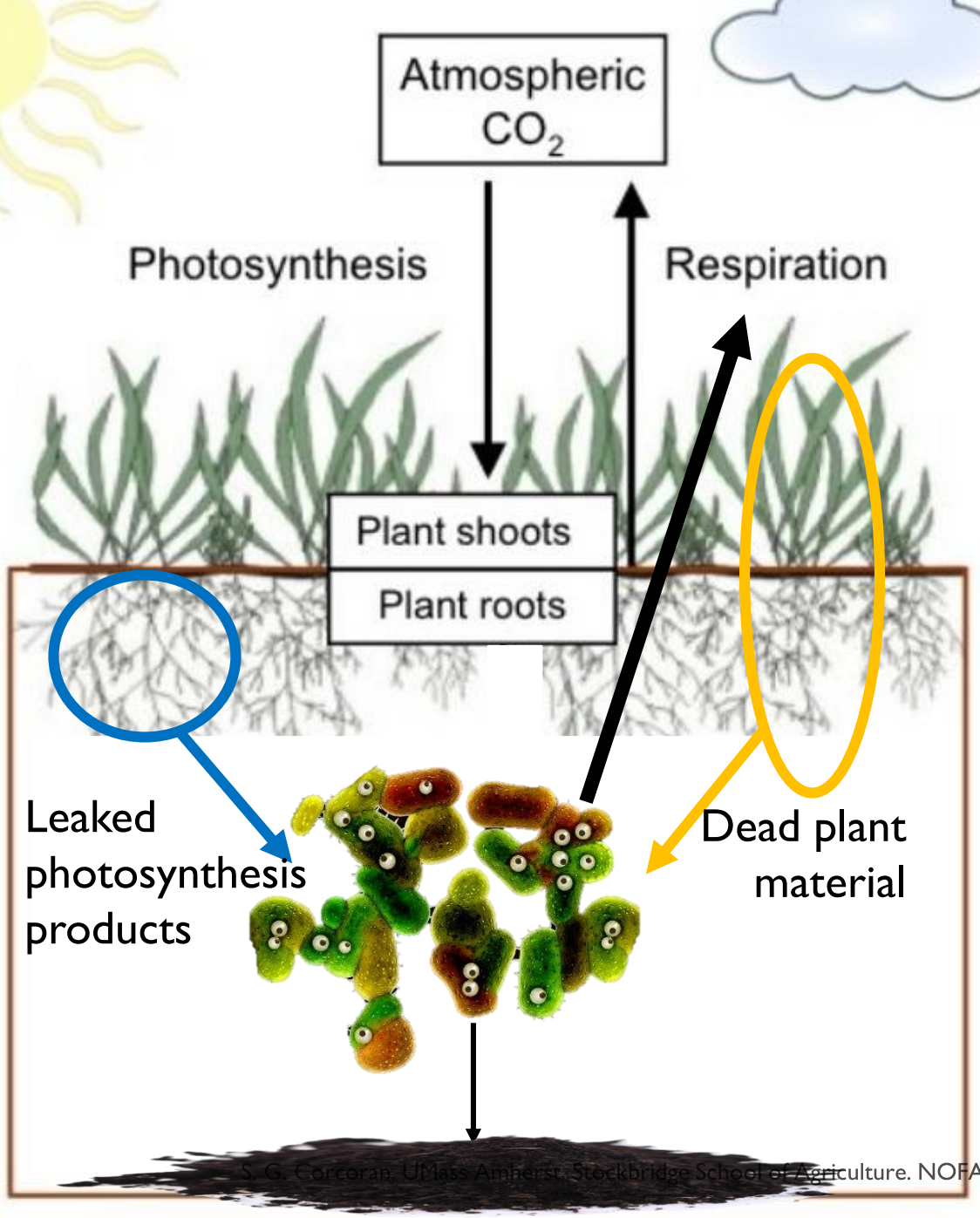
# SOIL: ORGANIC MATTER, CARBON, & MICROBES

Concern: *"I don't want to harvest my cover crop because I won't build as much soil organic matter."*

Soil organic matter (SOM): Living microbes and once living things in various stages of decomposition; carbon based. Ex: plant tissue, manure, microbe secretions, microbes themselves (dead or alive).

Soil microbes: bacteria and fungi in the soil; necessary for decomposition and nutrient release from SOM. SOM is food for microbes. Most C from SOM ends back up in atmosphere due do microbial respiration.

Microbes are the processing center for soil building and deep storage of carbon.




S. G. Corcoran, UMass Amherst, Stockbridge School of Agriculture. NOFA 2018

Figure adapted from: https://www.nature.com/scitable/knowledge/library/soil-carbon-storage-84223790

# BUILDING SOIL-C & SOM WITH MICROBES

Concern: *"I don't want to harvest my cover crop because I won't build as much soil organic matter."*

Considerations:

1. There is still lots of biomass is below ground.

   Up to 35% of a plant's total dry matter is below ground as roots

2. Grazing/harvesting leads to some root death followed by new root growth.

   Makes more food, and sustained food.

3. Plants "leak" up to 30% of photosynthesis products (i.e. carbon-containing) into the soil.

   This is more food and storage potential!

# SOIL: ORGANIC MATTER, CARBON, & MICROBES

Concern: *"I don't want to harvest my cover crop because then I won't build soil organic matter."*

Considerations:

4. You are not removing all above ground biomass.

    Grazing leaves 3-4" stubble plus trample residue

5. Mechanical harvest leaves stubble & you control how much

    Dual purpose rye, wheat & triticale leaves around 900 lbs/A dry matter; most CC produce at least 2000

# BE A SOIL SHEPHERD: DUAL PURPOSE COVER CROPS ARE FEED FOR THE ANIMAL HERD ABOVE GROUND & THE MICROBE HERD BELOW GROUND

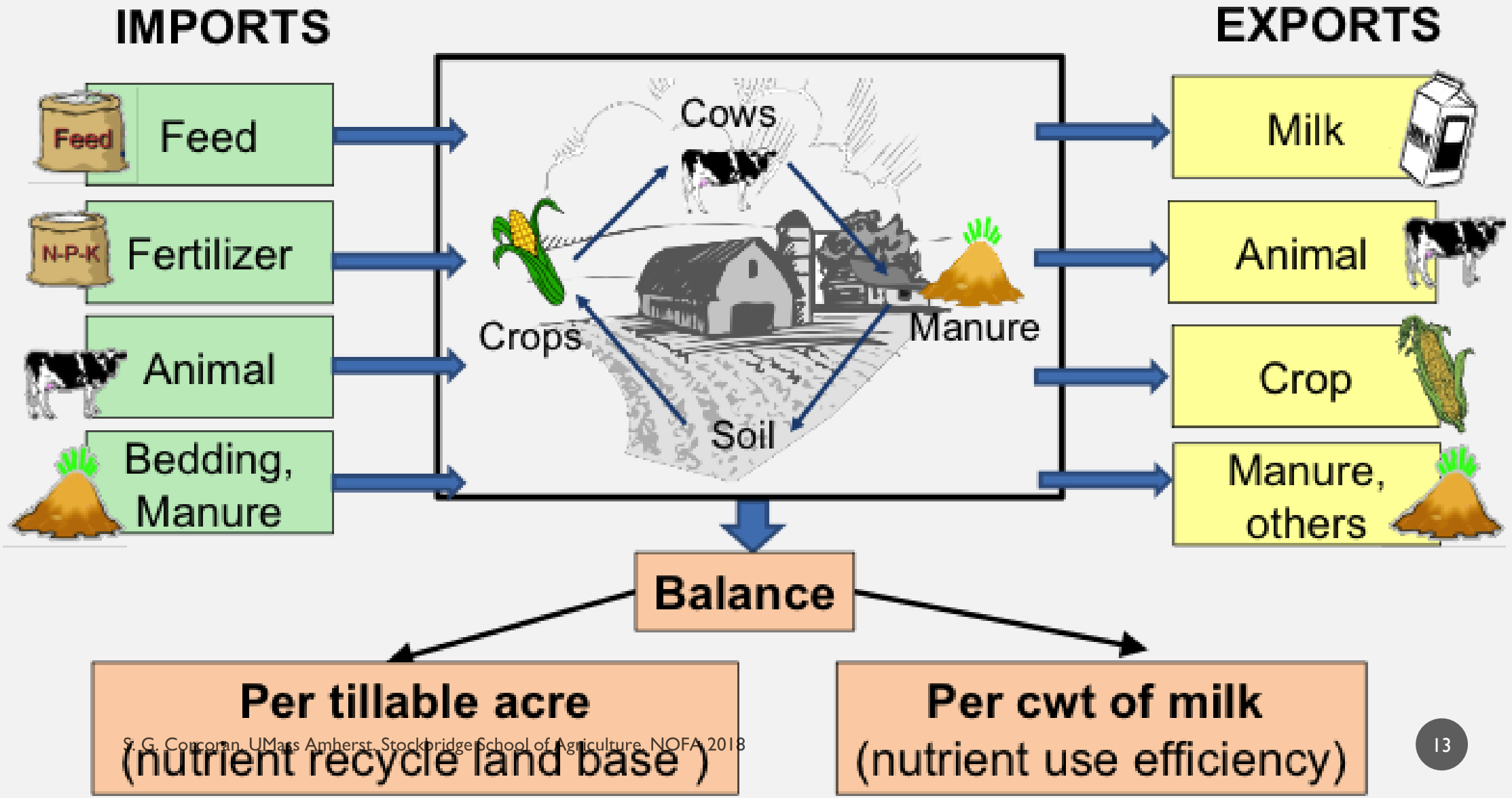
# TRADITIONAL COVER CROPS

+ Prevent soil erosion
+ Weed suppression
+ Capture & recycle nutrients
+ Alleviate soil compaction
+ Build soil organic matter & sequester carbon
+ Food for microbes
- Expensive
- Not harvested/not prioritized

# DUAL-PURPOSE COVER CROPS

+ Prevent soil erosion
+ Weed suppression
+ Capture & recycle nutrients
+ Alleviate soil compaction
+ Build soil organic matter & sequester carbon
+ Food for microbes
+ Pay for themselves
+ Harvested/prioritized

# Whole Farm Nutrient Mass Balance




http://blogs.cornell.edu/whatscroppingup/2015/03/25/whole-farm-nutrient-mass-balance-calculator-for-new-york-dairy-farms/

# NUTRIENT CYCLE WITH TRADITIONAL COVER CROPS IN VEGETABLE PRODUCTION

Nutrient Input (Fertilizer or Manure)

Synchrony (nitrogen) between cover crop nutrient release and cash crop uptake?

Little control over where nutrients "go"

# NUTRIENT CYCLE WITH DUAL PURPOSE COVER CROPS IN INTEGRATED LIVESTOCK PRODUCTION

Nutrient Input (Fertilizer or Manure)

1. Store nutrients in animal manure
2. Keep nutrients moving (important for P)
3. Manage nutrient levels

# OUTLINE

- Traditional cover cropping versus dual-purpose cover crops
- Where and when to integrate
- Crops and forage quality
- Management and yield
- Resources

# WHERE AND WHEN TO INTEGRATE

- Any time and place that you would cover crop.
  - If grazing, what is the plan for fencing?
    - Moveable fencing
  - If mechanical harvest, can bring feed to the animals.
  - Just need to know when is the "right time" to harvest or graze
  - Lowest stakes/worst case scenario: you cover crop something you would have anyways and don't end up feeding it.
    - It happens! Keep it cheap the first time. Just do what you would do anyways and try out the feeding part as an added bonus.

# WHERE AND WHEN TO INTEGRATE

- Compensate for summer slump
  - Pastures with cool season grasses(like KBG, orchard grass, fescue) significantly drop in production in the summer
  - Dual-purpose cover crops in other fields compensate for that drop
  - Cover crops versus “summer annuals”

# WHERE AND WHEN TO INTEGRATE

- Spring/summer to prepare a field before (re)seeding pasture in the fall
  - Weed suppression
  - Erosion control
  - Seedbed prep/compaction alleviation
  - Add fertility and kickstart microbial activity

# WHERE AND WHEN TO INTEGRATE

- Stored feed without committing to hayfields
  - Rye, wheat, triticale can be made into hayledge or baledge
  - Benefits of hay without the commitment to a hayfield
  - Works great under a tarp with tires

# WHERE AND WHEN TO INTEGRATE

- Fallow/resting field, disease or insect pressure, got to it too late
  - Provides all the cover crop benefits
  - Allows for a break is disease and pest cycles
  - Keeps resting land in production
  - Keeps land you got to "too late" in production

# WHERE AND WHEN TO INTEGRATE

- Grazing season extension
  - Planted after summer harvest allows for mid to late fall grazing
  - Overwintering crops (rye, wheat, triticale) create forage early in the spring
    - You might even get **two** harvests out of them (fall & spring)

# WHERE AND WHEN TO INTEGRATE

- Conversion of a field to organic
  - Depends on if you have certified organic animals
  - Could make arrangements with a neighbor
    - To graze or harvest
    - Harvest and sell/trade
    - The neighborhood farmers are watching – true story!
  - Marketing? Ex: Kashi "certified transitional organic program"
  - Keeps the field in production

# WHERE AND WHEN TO INTEGRATE

- Pop up where it's torn up.
  - Areas near barns or pens that have become too muddy
  - Very fast forage production, repair/minimize the damage
  - Can plant harder to establish perennials when the time is right
  - Or, if it gets torn up again there's no love lost

# WHERE AND WHEN TO INTEGRATE

- Kill your overwintering cover crop
  - Graze the hell out of it.

# WHERE AND WHEN TO INTEGRATE

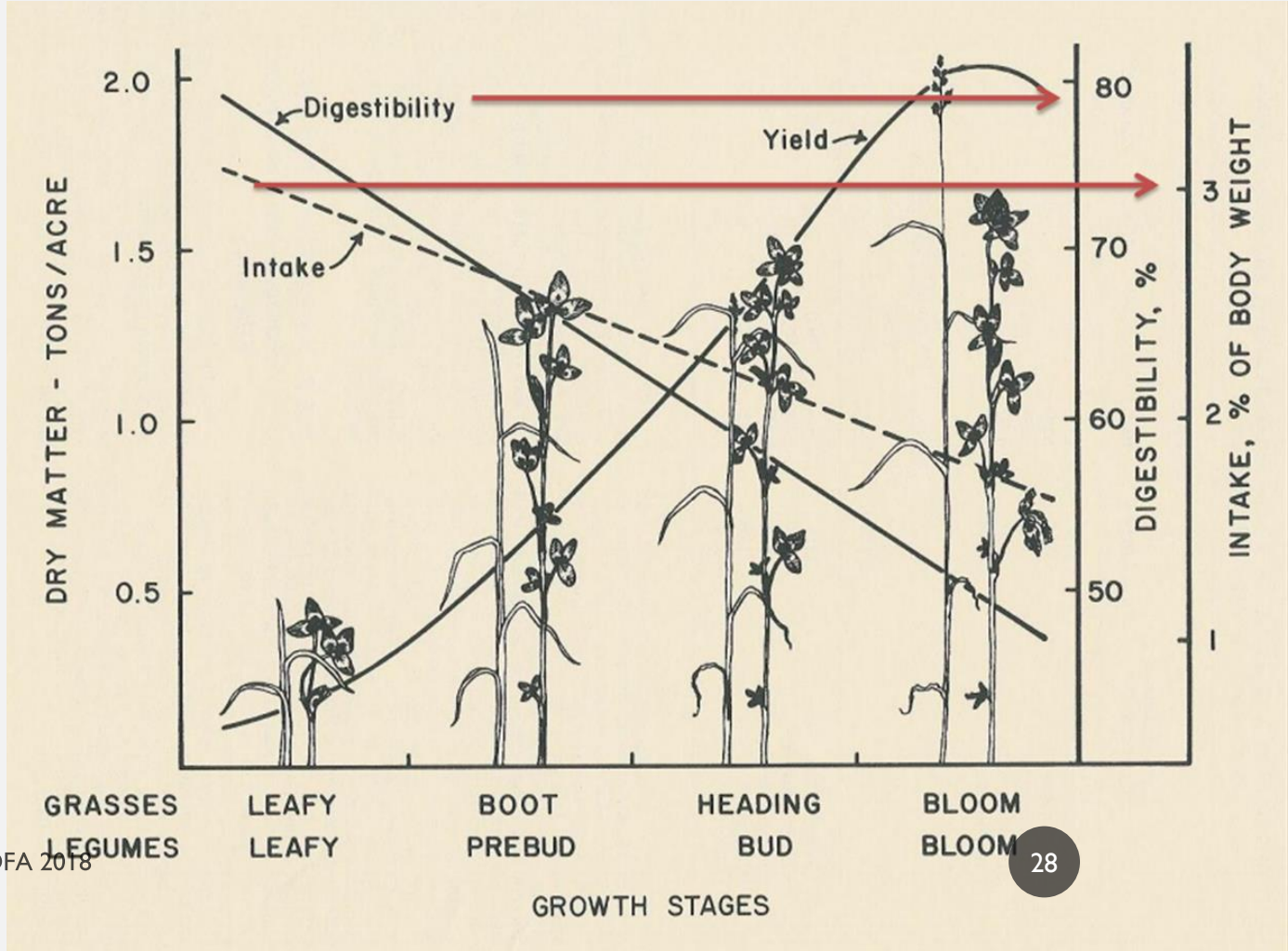
- Thinking smaller?
  - Any part of the garden or raised bed
  - Cut and feed as needed
    - Chickens
    - Rabbits
  - Fenced in garden with a small winter grain
    - Goats and sheep can mow down in the spring
    - Chickens will beat it up, too!

# OUTLINE

- Traditional cover cropping versus dual-purpose cover crops
- Where and when to integrate
- Crops and forage quality
- Management and yield
- Resources

# CROPS AND FORAGE QUALITY

- Forage quality is primarily influenced by:
  - species (grasses vs legumes)
  - Growth stage of the plants
- Quality isn't just about protein:
  - Palatability
    - Texture, leafiness, flavor (brassicas)
  - Intake – affected by palatability
  - Digestibility – factor of age
  - Nutrient content



# CROPS AND FORAGE QUALITY

- Grasses
  - Provide roughage
  - High biomass yield
    - Rye, wheat, triticale (overwinter)
    - Oats
    - Millets (i.e. pearl or fox-tail)
    - Sorghum-sudangrass
    - Italian ryegrass

# CROPS AND FORAGE QUALITY

- Balance legumes and non-legumes
  - Legumes have twice as much protein as grasses
    - Excess legumes can cause bloat
  - Improve palatability and digestibility
  - Fix atmospheric N
  - 30-40% in the mix helps with weight gain and milk production
    - Field peas
    - Cow peas
    - Sunn hemp
    - Clovers

# CROPS AND FORAGE QUALITY

- Brassicas
  - Fast growing
  - Usually high in protein
  - Capture nutrients
  - Tillage/forage radish is ideal
    - Radishes are prone to overwinter/hard to kill
    - Mustards are too high in glucosinolates/ITCs
  - Break-up the pest cycle
  - Excess can cause decreased palatability or illness; avoid using with pregnant animals

# CROPS AND FORAGE QUALITY

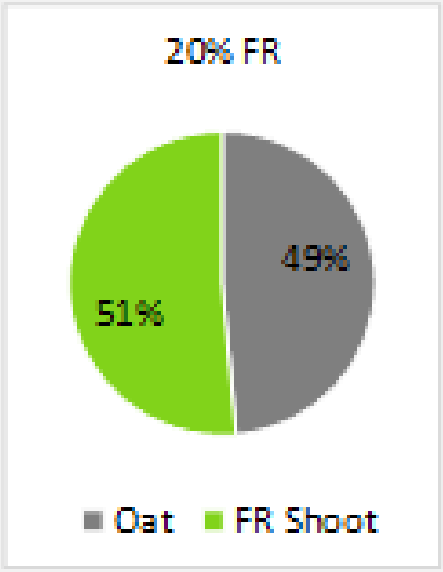
- Other broadleaf crops
  - Buckwheat – don't let it go to seed!
  - Sunflowers

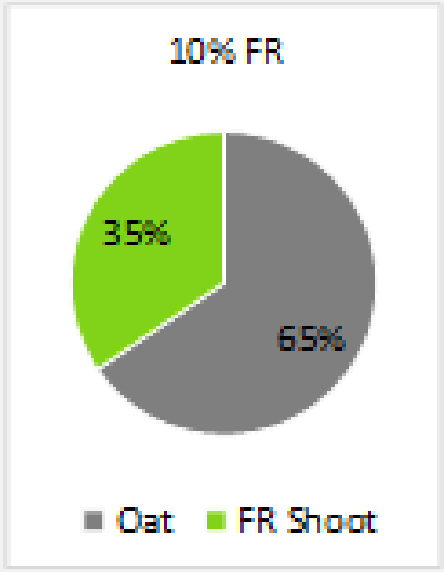
# OUTLINE

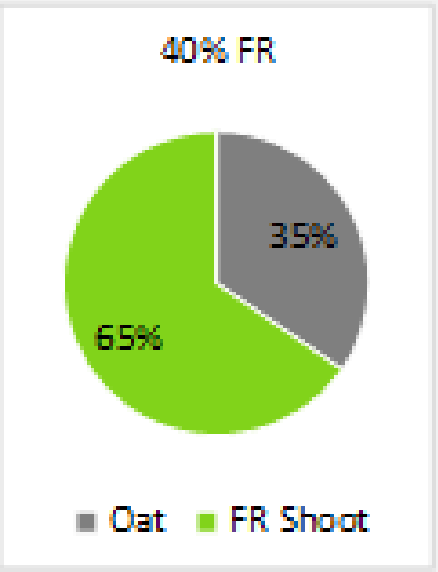
- Traditional cover cropping versus dual-purpose cover crops
- Where and when to integrate
- Crops and forage quality
- Management and yield
- Resources

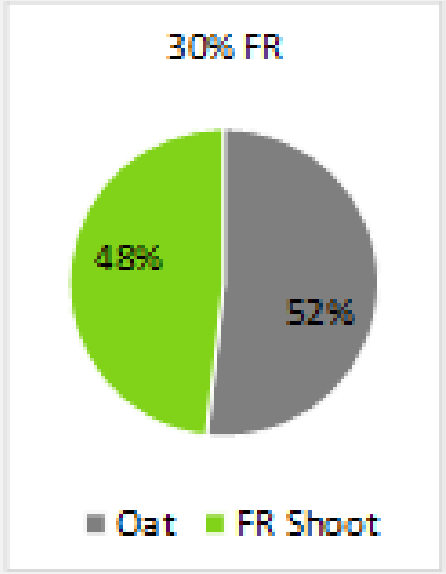
# MANAGEMENT AND YIELD - PLANTING

- Plant the same way as you always plant your cover crops
  - Drill
  - Brillion
  - Fertilizer spreader
  - All about seed to soil contact
- Seeding ratios don't behave the way you think they will




# MANAGEMENT AND YIELD - PLANTING

- Final crop composition (by dry weight)
- 100% FR rate = 8 lbs/A
- 100% oat rate = 110 lbs/A
- For use as a cover crop and forage
  - Seed 100 lbs. oat/A and 1-1.5 lbs. FR/A
  - Yields 1.4 tons DM/A
  - Final crop that is 35% FR and 65% oat by dry weight
  - Contains 17% crude protein
  - Captures 92 lbs. N/A at 20 lbs. P/A
  - Mild in palatability
  - On average, seeds cost $85/A and produce 1.4 tons (dry weight); i.e. it costs $30 per 1000 lbs. of forage.

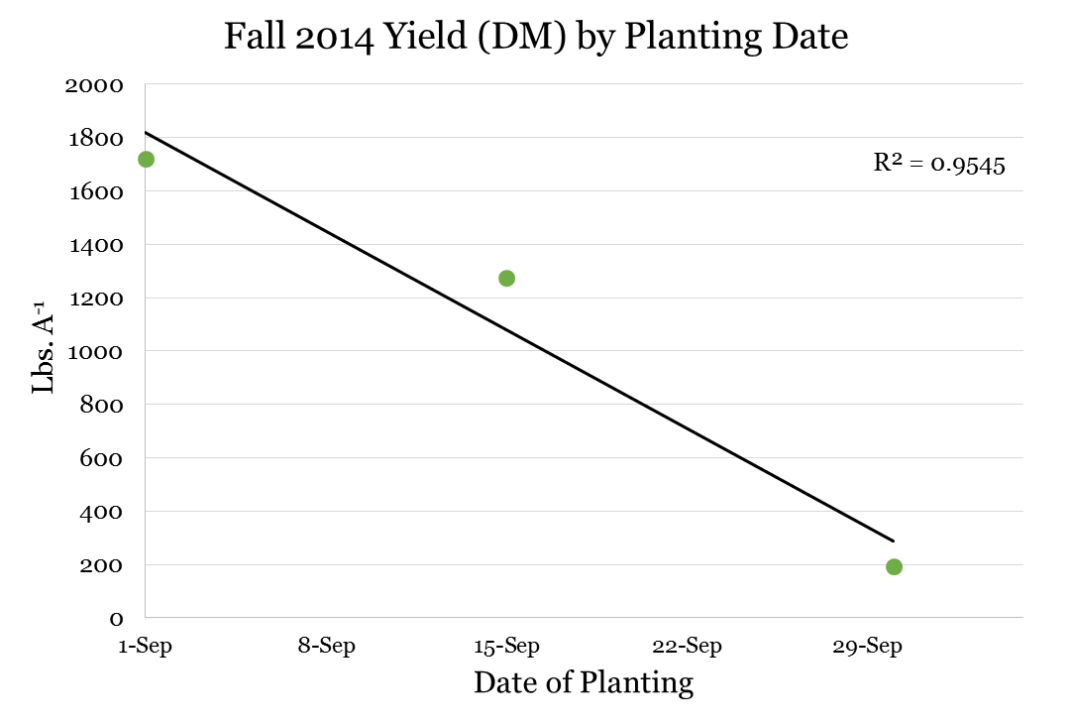
# MANAGEMENT AND YIELD

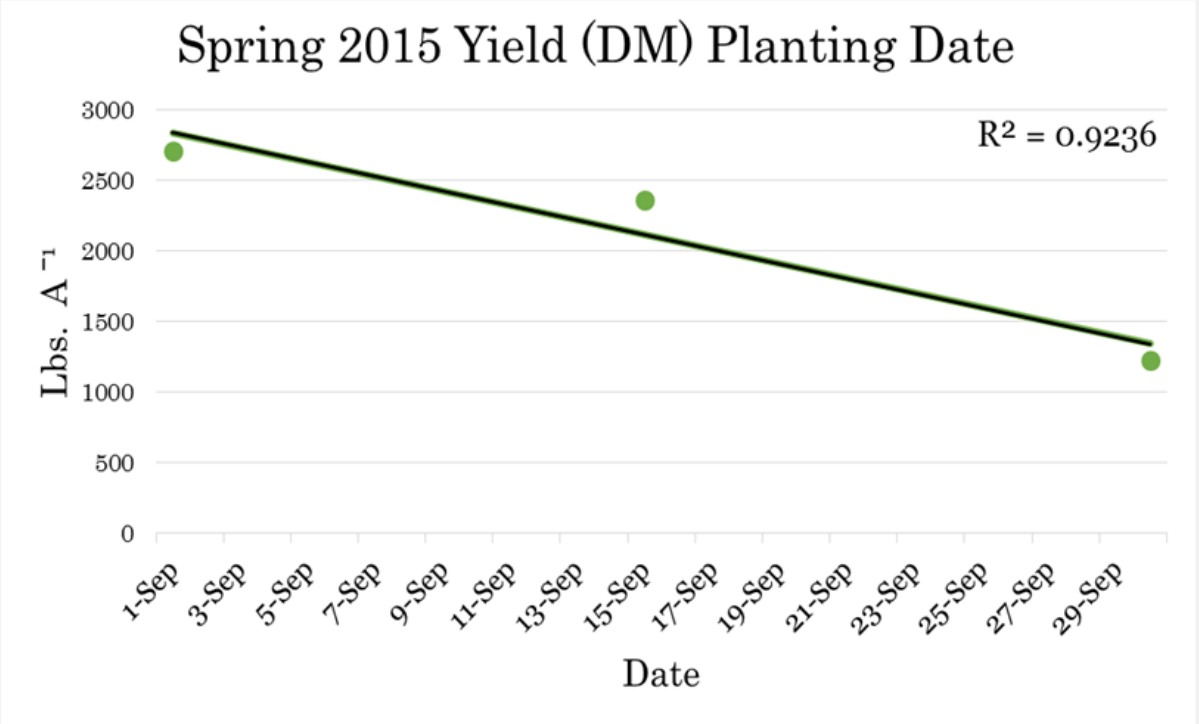
- For fall annuals the winterkill
  - Plant in the first week of September to graze in mid-late October
  - Graze or harvest to leave 3-4” stubble to protect the soil
  - FR and oat will tolerate a few mild frosts
  - Have a plan ready
  - No spring clean up

# MANAGEMENT AND YIELD

- For fall annuals that overwinter
  - Rye, wheat, and triticale should be planted 9/1 to graze in fall
  - Planting by 9/15 might allow for fall grazing (late October/early November), still good for spring
  - Plant **NO LATER** than 9/30 to graze in spring
  - Do not graze lower than 5" (for winter survival and spring regrowth)
  - Will need a termination plan in spring

# MANAGEMENT AND YIELD




| Fall 2014: Feed Quality | | | | | |
|---|---|---|---|---|---|
| Planting Date | ADF | NDF | DDM | DMI | RFV |
| 1-Sep | 18 | 40 | 75 | 3 | 178 |
| 15-Sep | 19 | 40 | 74 | 3 | 174 |
| 30-Sep | 19 | 41 | 74 | 3 | 171 |

# MANAGEMENT AND YIELD

| Crop | Spring RFV 2015 | Spring RFV 2016 |
|---|---|---|
| Rye | 91 | 124 |
| Triticale | 101 | 129 |
| Wheat | 110 | **137** |

- Estimated value: $230-350/acre
- Critical to harvest on time in the spring
- Rye matures fast, wheat is much slower and forgiving, although it yields less
- Removes 50-100 lbs. N, 10-30 lbs. P
    - Decomp of these crops is **slow** in the field. Better to feed and then apply as manure to speed up availability.

# MANAGEMENT AND YIELD

- Sunn hemp
  - Best results when planted in the second week of July
  - Take first cutting/first grazing when plants are 30-40 days old
    - ¾ ton DM/A @ 30 days + ¾ ton regrowth
    - 2 tons DM/A @ 40 days + ½ ton regrowth
  - Legume! Can use to supplement/boost the protein of feed.
    - Requires inoculation
  - Leave 6-10” for regrowth
  - Regrowth can be used for a source of N fertilizer

# MANAGEMENT AND YIELD

- Regrowth can be used for a source of N fertilizer
  - Ex: garlic
  - 20-50 lbs. N in regrowth depending on when it was first harvested and weather

S. G. Corcoran. UMass Amherst. Stockbridge School of Agriculture. NOFA 2018

# MANAGEMENT AND YIELD

- Summer annuals
  - Require warm soil, plant in last week of may/first week of June
  - Our summer mix: buckwheat, foxtail millet, mammoth red clover, Italian rye grass, sunflower
    - Being studied as a corn silage alternative
  - Harvest for stored feed twice or graze twice – once in mid/late July and again in early September
  - Play with your seeding rates!
    - You can take dry matter of each species from subsections to determine the composition

# OUTLINE

- Traditional cover cropping versus dual-purpose cover crops
- Where and when to integrate
- Crops and forage quality
- Management and yield
- Resources

# RESOURCES

- SARE! Google the name of any cover crop and then "SARE"
  - Example: rye sare
- The Art and Science of Grazing by Sarah Flack
- UMass fact sheets
  - Google "umass CDLE fact sheets"
- To estimate yield in your fields:
  - "Determining dry matter with a microwave oven" resource from Dairy One
- For forage sampling
  - Dairy One
  - Cumberland Valley Analytical Service
- For seed
  - Johnny's
  - Albert Lea
    - Forage varieties of winter grain cover crops, organic
  - Integrity Seed Co
    - Sunn Hemp, not certified organic