



Introduction to Growing Grain

VABF 2022

Speaker Heather Coiner

Funding provided by Southern SARE Grant #LS20-327



A Modular Curriculum for Growing Food Grain for the Local Market

Thank you to our funders and supporters:

- Southern SARE (Grant #LS20-327)
- Virginia Tech and Virginia Cooperative Extension (Dr. Wade Thomason and Eric Bendfeldt)
- NRCS (Chris Lawrence)
- And Many Other Member and Partners!





Grain is a
staple food
of every
culture, yet
how many
Americans
know their
grain farmer?



A close-up, top-down view of a large pile of yellow and white corn kernels. The kernels are densely packed and show some signs of being processed, with some white husk or chaff still attached. A few small pieces of green and brown plant matter are scattered throughout. A semi-transparent grey horizontal bar is centered across the middle of the image, containing the text "We are learning together" in a white, sans-serif font.

We are learning together

What are our objectives today?

1. Who is everybody?
2. General Stuff
3. Specific Stuff

Corn



Types

Agronomy

Planting

Cultivation

Harvest

Wheat



Who are we?



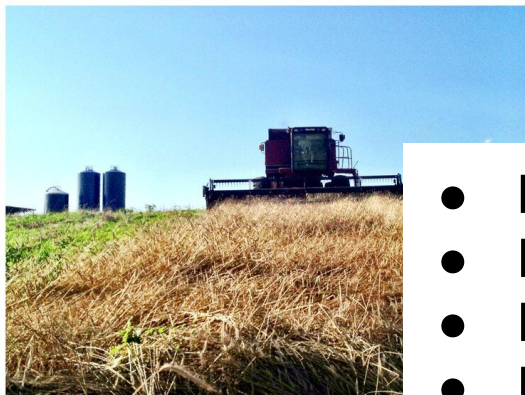
Sources B. Ferguson



Who are you?



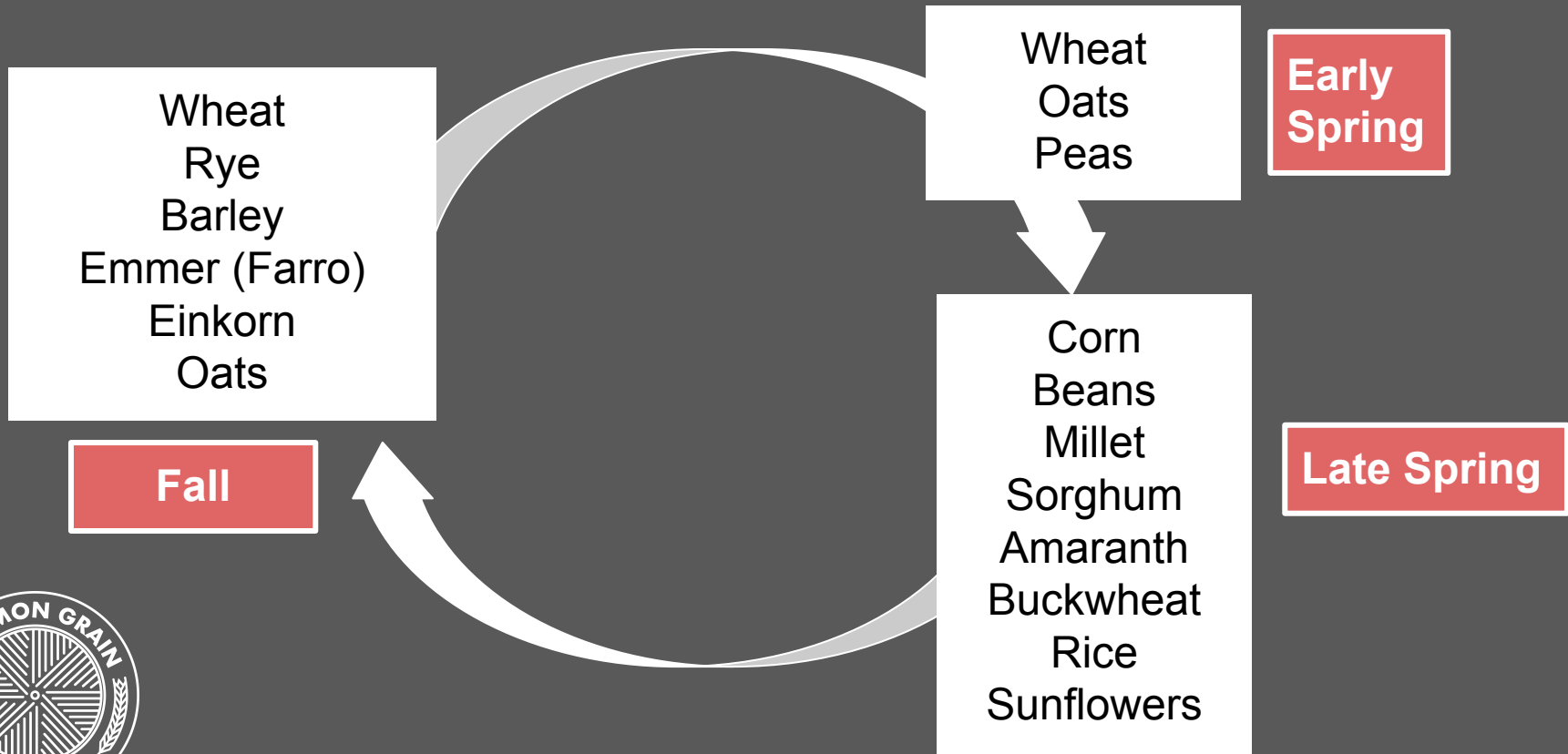
Who are you?



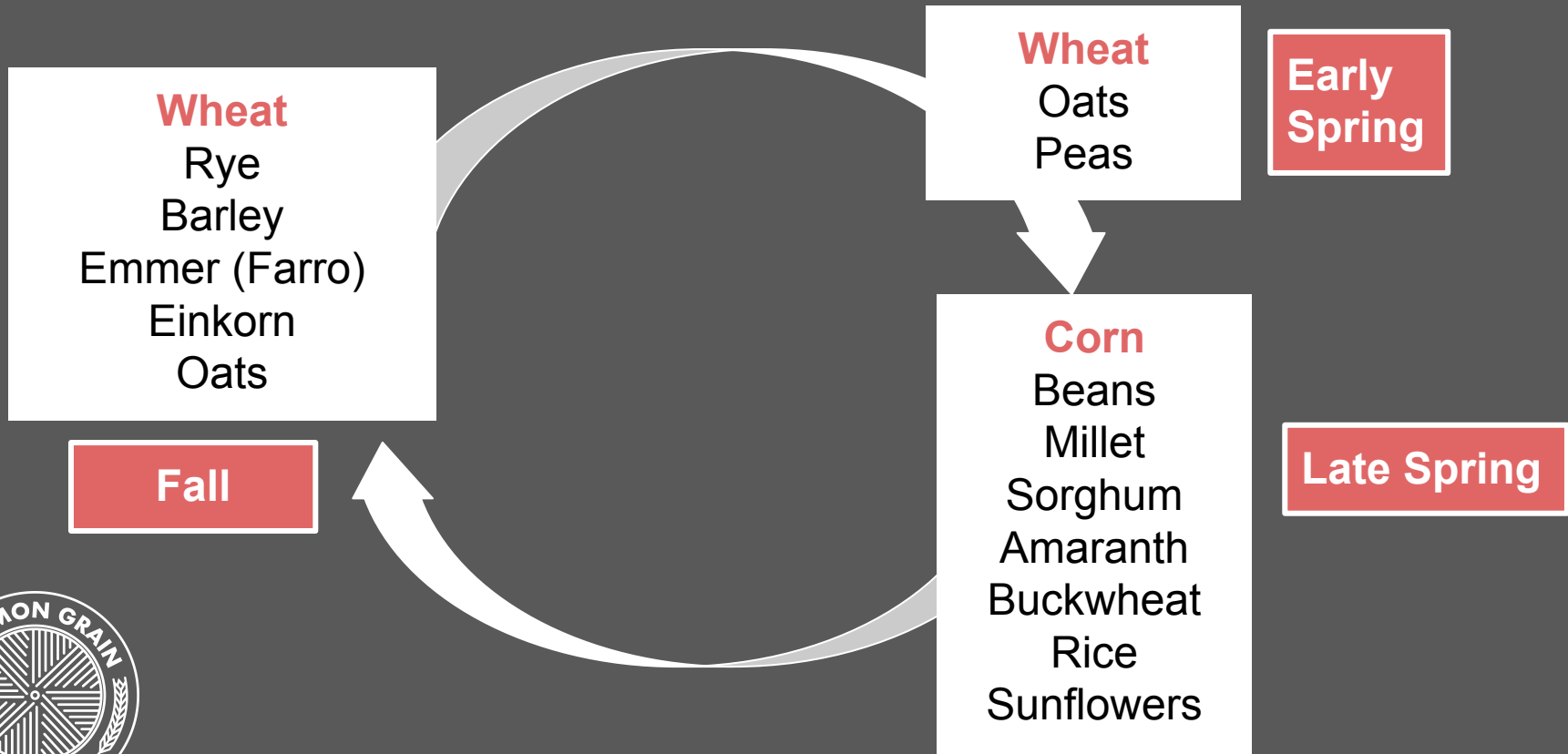
- Beginning farmer
- Experienced Vegetable Farmer
- Experienced Meat / Dairy Farmer
- Experienced Row-crop farmer
- Something else



What crops are we talking about?



What crops are we talking about?





Pete Sisti, Greater
Richmond Grains,
Powhatan, VA



{
Miller
Maltster
}

{
Restaurant
Mill-Bakery
Craft brewery
Oat Milk brewery
Tortilla maker
}

{
Home cook
Home miller / baker
}



Pete Sisti, Greater Richmond Grains, Powhatan, VA

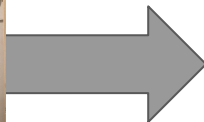
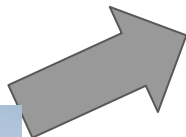


{ Miller Maltster }

{ Restaurant }

Direct market

{ Home cook Home miller / baker }



Crop (lbs/Bu)	Commodity Price *USDA AMS for VA 1/11 ** <u>Bin-run</u>	Organic Commodity Price *USDA AMS for USA 12/15 ** <u>Bin-run</u>	CGA Processor VA Price *Organic and conventional ** <u>Cleaned</u>	CGA Processor MD Price *Organic ** <u>Bin-run</u>	Wholesale Price *DC Metro ** <u>Cleaned</u>	Retail Price *DC Metro Direct ** <u>Cleaned</u>
Wheat (60)	\$8.70	\$14.25	\$36-54 (\$60)	\$22.80	\$58.80-\$92.40	\$108-\$480
Corn (56)	\$6.51	\$9.75	\$28-\$84	\$32.50	\$84-\$100.80	\$100.80-\$280
Buckwheat (50)	n/a	n/a	\$26-\$34.40	\$26.00	\$110-\$180	\$200-\$350
Rye (56)	n/a	n/a	\$33.60-\$56	\$32.50	\$60.48-\$112	\$100.80-\$280

Crop (lbs/Bu)	Commodity Price *USDA AMS for VA 1/11 ** <u>Bin-run</u>	Organic Commodity Price *USDA AMS for USA 12/15 ** <u>Bin-run</u>	CGA Processor VA Price *Organic and conventional ** <u>Cleaned</u>	CGA Processor MD Price *Organic ** <u>Bin-run</u>	Wholesale Price *DC Metro ** <u>Cleaned</u>	Retail Price *DC Metro Direct ** <u>Cleaned</u>
Wheat (60)	\$8.70	\$14.25	\$36-54 (\$60)	\$22.80	\$58.80-\$92.40	\$108-\$480
Corn (56)	\$6.51	\$9.75	\$28-\$84	\$32.50	\$84-\$100.80	\$100.80-\$280
Buckwheat (50)	n/a	n/a	\$26-\$34.40	\$26.00	\$110-\$180	\$200-\$350
Rye (56)	n/a	n/a	\$33.60-\$56	\$32.50	\$60.48-\$112	\$100.80-\$280

Crop (lbs/Bu)	Commodity Price *USDA AMS for VA 1/11 ** <u>Bin-run</u>	Organic Commodity Price *USDA AMS for USA 12/15 ** <u>Bin-run</u>	CGA Processor VA Price *Organic and conventional ** <u>Cleaned</u>	CGA Processor MD Price *Organic ** <u>Bin-run</u>	Wholesale Price *DC Metro ** <u>Cleaned</u>	Retail Price *DC Metro Direct ** <u>Cleaned</u>
Wheat (60)	\$8.70	\$14.25	\$36-54 (\$60)	\$22.80	\$58.80-\$92.40	\$108-\$480
Corn (56)	\$6.51	\$9.75	\$28-\$84	\$32.50	\$84-\$100.80	\$100.80-\$280
Buckwheat (50)	n/a	n/a	\$26-\$34.40	\$26.00	\$110-\$180	\$200-\$350
Rye (56)	n/a	n/a	\$33.60-\$56	\$32.50	\$60.48-\$112	\$100.80-\$280

Crop (lbs/Bu)	Commodity Price *USDA AMS for VA 1/11 ** <u>Bin-run</u>	Organic Commodity Price *USDA AMS for USA 12/15 ** <u>Bin-run</u>	CGA Processor VA Price *Organic and conventional ** <u>Cleaned</u>	CGA Processor MD Price *Organic ** <u>Bin-run</u>	Wholesale Price *DC Metro ** <u>Cleaned</u>	Retail Price *DC Metro Direct ** <u>Cleaned</u>
Wheat (60)	\$8.70	\$14.25	\$36-54 (\$60)	\$22.80	\$58.80-\$92.40	\$108-\$480
Corn (56)	\$6.51	\$9.75	\$28-\$84	\$32.50	\$84-\$100.80	\$100.80-\$280
Buckwheat (50)	n/a	n/a	\$26-\$34.40	\$26.00	\$110-\$180	\$200-\$350
Rye (56)	n/a	n/a	\$33.60-\$56	\$32.50	\$60.48-\$112	\$100.80-\$280

Who are the buyers?



WADE'S MILL

SEYLOU

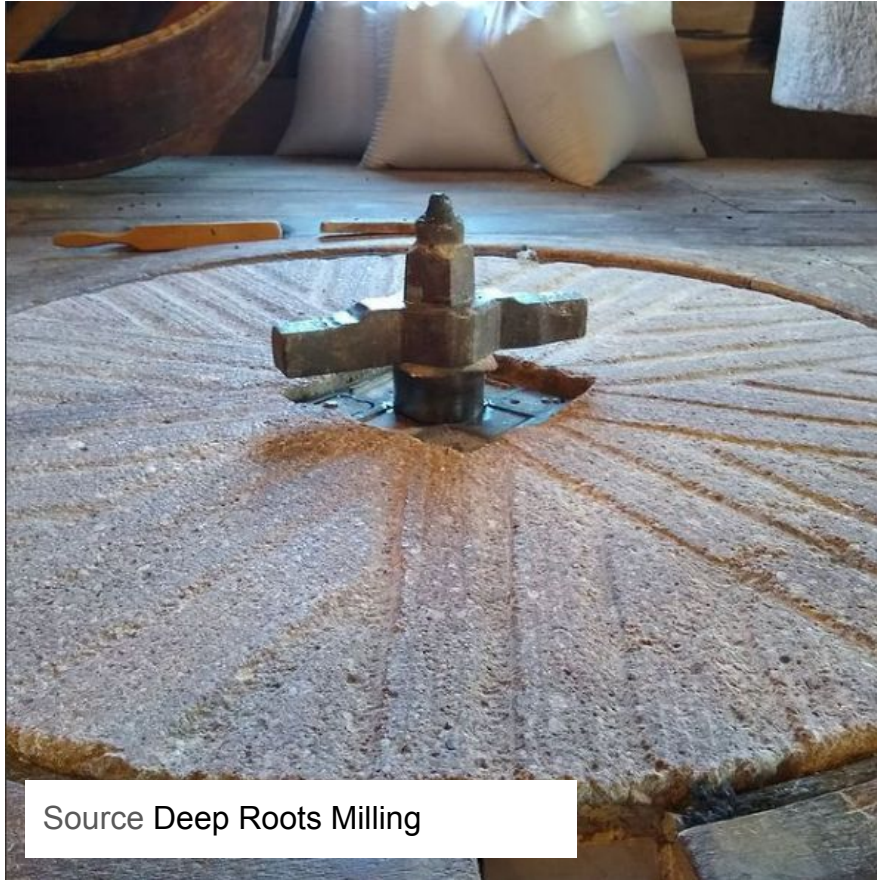
BAKERY & MILL



What do CGA buyers want?

Growing practices

- No glyphosate
- Minimize other sprays
- Minimize soluble Nitrogen
- Strong soil health practices





www.4thesoil.org

Source: A Cooper



Cover crop



Minimize tillage



Cover crop

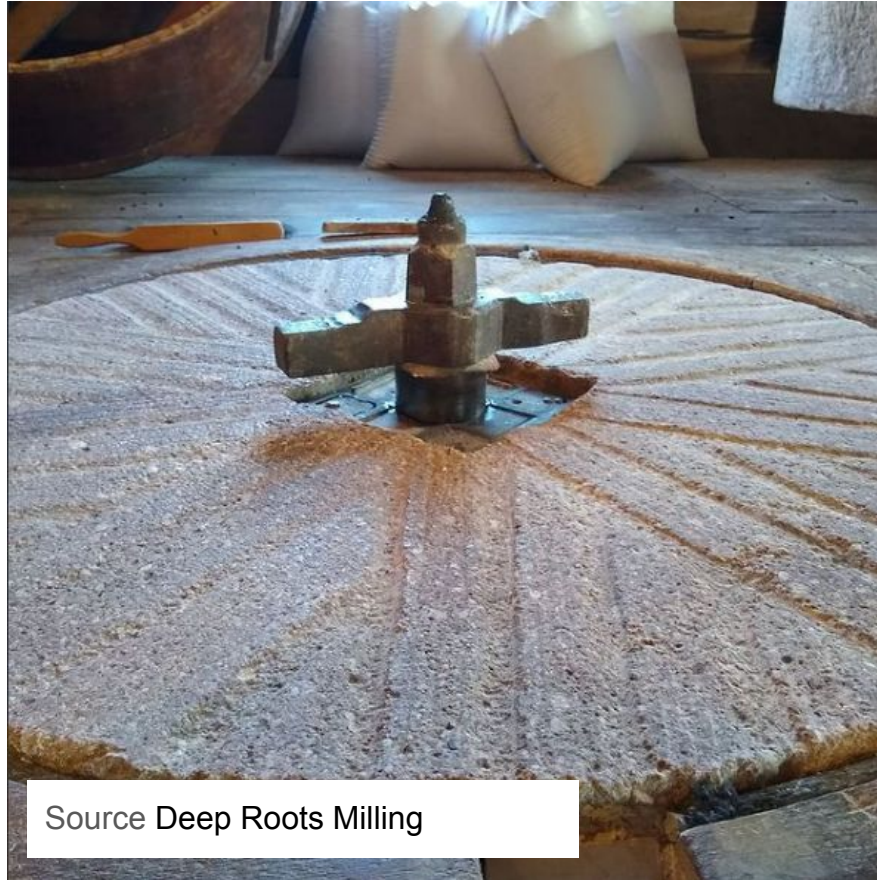


Vary crops & interseed

What do CGA buyers want?

Growing practices

- No glyphosate
- Minimize other sprays
- Minimize soluble Nitrogen
- Strong soil health practices



Grain quality

- No stones, dirt, weed seed
- Good test weight
- No insects
- No off odors
- DON < 1 ppm
- Adequate protein
- Adequate falling number
- Varieties with good flavor, milling qualities



How do I find CGA buyers?

Email: onawa@commongrainalliance.org



**ONAWA
DUFRESNE-
BARGER**



**JILLIAN
O'DONOHUE**



LIBBY LYON



**BENJAMIN
SHOROFSKY**



commongrainalliance.org

Questions?



Source Deep Roots Milling



General Principles



Garden

Small

Mid

Large

	Garden	Small	Mid	Large
Plot size	< 1 acre	1-10 acres	11-100 acres	> 100 acres
Planting & Cultivating	Hand tools	Small tractor	Bigger tractor	Huge tractor
Harvesting	Hand tools, household supplies	Pull-behind implements or custom	Pull-behind or small combine or custom	Combine
Drying & Storage	Household supplies, grain bags	DIY dryers, grain bags	Batch dryer, bins, augers, grain bags	Same
Cleaning	Buckets, a fan, & a tarp	Custom or antique / small tools	On-farm or custom	Same
Marketing	Home use	Retail	Direct market & Processors	Processors

Garden

Small

Mid

Large

	Garden	Small	Mid	Large
Plot size	< 1 acre	1-10 acres	11-100 acres	> 100 acres
Planting & Cultivating	Hand tools	Small tractor	Bigger tractor	Huge tractor
Harvesting	Hand tools, household supplies	Pull-behind implements or custom	Pull-behind or small combine or custom	Combine
Drying & Storage	Household supplies, grain bags	DIY dryers, grain bags	Batch dryer, bins, augers, grain bags	Same
Cleaning	Buckets, a fan, & a tarp	Custom or antique / small tools	On-farm or custom	Same
Marketing	Home use	Retail	Direct market & Processors	Processors

Garden

Small

Mid

Large

	Garden	Small	Mid	Large
Plot size	< 1 acre	1-10 acres	11-100 acres	> 100 acres
Planting & Cultivating	Hand tools	Small tractor	Bigger tractor	Huge tractor
Harvesting	Hand tools, household supplies	Pull-behind implements or custom	Pull-behind or small combine or custom	Combine
Drying & Storage	Household supplies, grain bags	DIY dryers, grain bags	Batch dryer, bins, augers, grain bags	Same
Cleaning	Buckets, a fan, & a tarp	Custom or antique / small tools	On-farm or custom	Same
Marketing	Home use	Retail	Direct market & Processors	Processors

Preparing the soil for planting

Garden



Everyone else

Primary



Secondary



Fitting



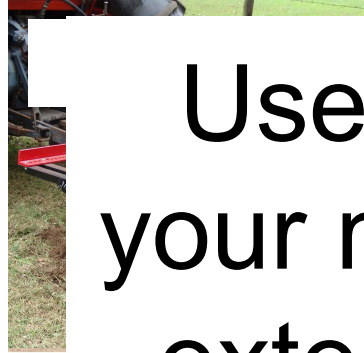
Preparing the soil for planting

Garden



Everyone else

Use what you,
your neighbors, &
extension have
on hand



Seeding your crop

Garden



Everyone else



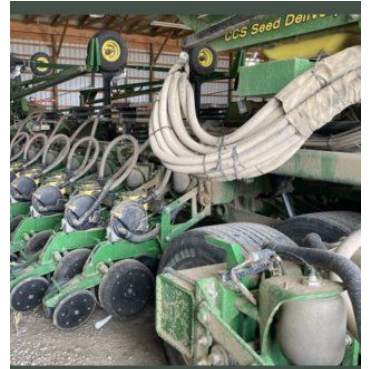
Seeding your crop

Garden



Match your planting gear to your cultivation gear

se



Drying

Aaron Cooper
Cutfresh Organics



Water content for safe storage



\$500-\$700

Grain	Recommended Moisture for Storage
Corn	13-15%
Soybeans	11-13%
Wheat	12.5-13.5%
Barley	11-13%
Oats	11-13%

Tip: warm your grain before measuring



Batch dryer

Air dried grain is generally better quality, but batch (propane) drying makes sense in the face of factors like:

- wet weather
- lack of time

PERC Propane Drying Calculator:
<https://propane.com/propane-products/grain-dryers/>



Source A. Cooper

DIY Mini batch dryer

- Fan taken from a storage bin
- Connected to a perforated drainage pipe
- Run pipe through grain in a bag or bin to air dry
- Easy and cheap for small- and mid-scale



Source A. Cooper

Controlling pests using CO₂



Source A. Cooper, Grainpro.com

Organic post-harvest pest control
No need for cold storage

Transporting finished grain





Weigh costs and benefits before going for a higher price

The economics of 1-100 acres of grain are tricky, so use what you & your community have on hand

Do your best to air dry your grain, but don't be afraid to use propane to save your crop

A close-up, top-down view of a large quantity of corn kernels. The kernels are a mix of yellow and white, with some showing signs of being broken or processed. A semi-transparent grey rectangular box is centered horizontally across the middle of the image, containing the text "Questions so far?".

Questions so far?



Corn



Source Red Tail Grains





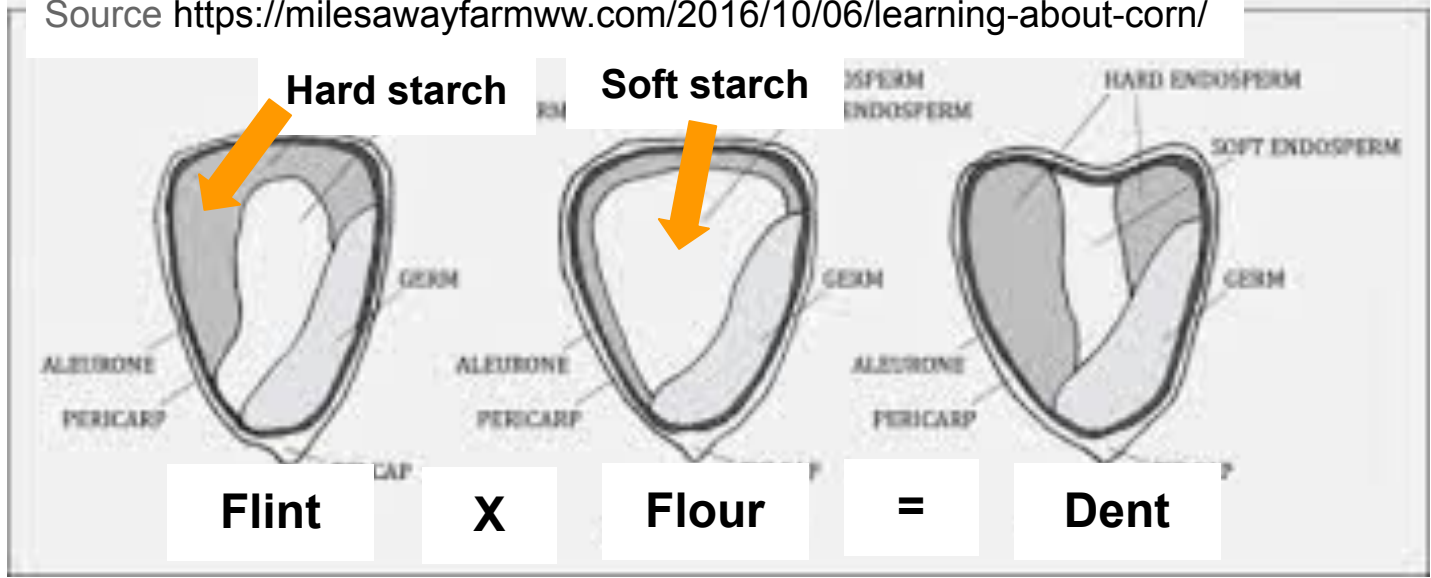
Types

Agronomy

Planting

Cultivation

Harvest





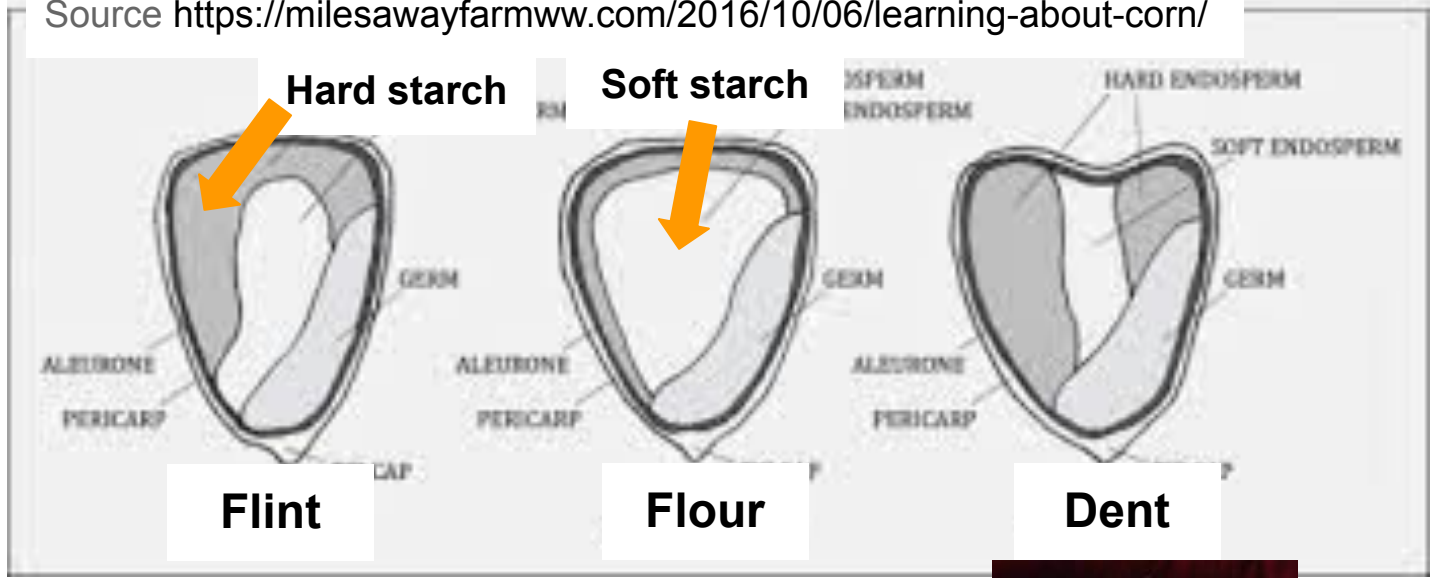
Types

Agronomy

Planting

Cultivation

Harvest



Flint

Flour

Dent





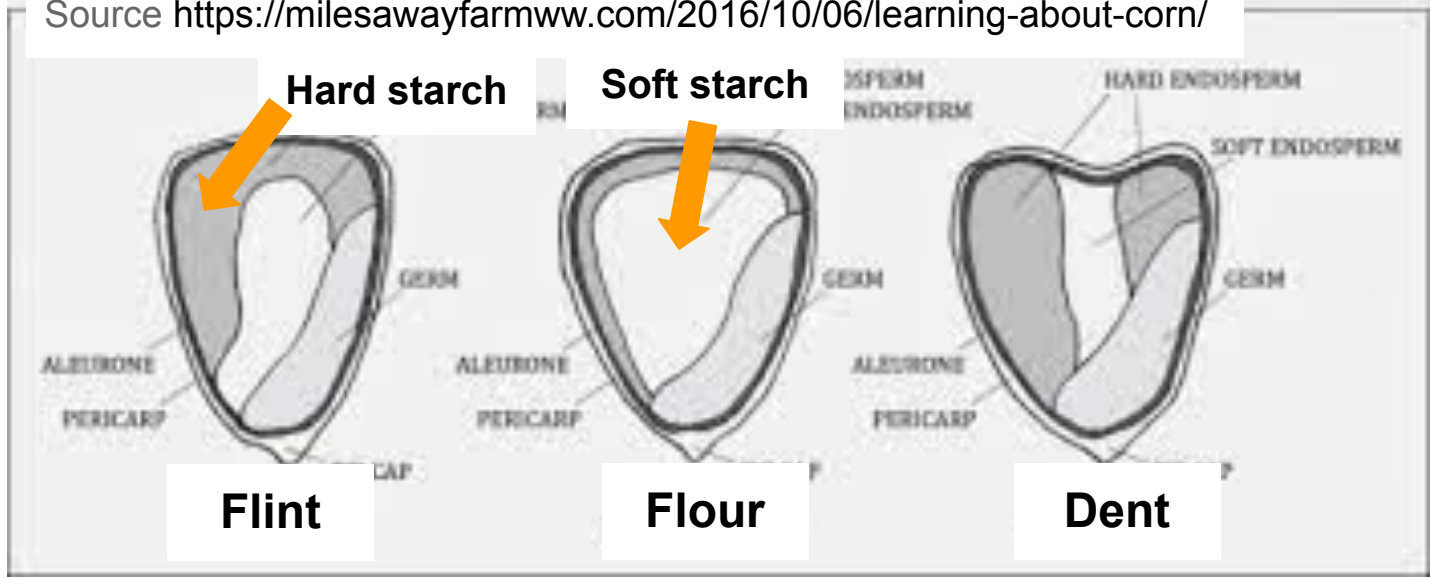
Types

Agronomy

Planting

Cultivation

Harvest





Types

Agronomy

Planting

Cultivation

Harvest



- Indigenous dent corns from Virginia and Appalachia
- Reported yields of 150 bushels / acre before WWII (compared to ~35 bu / ac)
- Superior flour & masa qualities
- BUT flat seeds don't work well with modern planters

Sources Southern Exposure Seed Exchange, Monticello, I. Herzmark



Types

Agronomy

Planting

Cultivation

Harvest

- Corn is a heavy feeder
- Planting into a crimped rye-clover cover crop reduces N fertilizer inputs
- Has to compete with summer annuals...
- ...so needs prompt cultivation through 3-4 weeks post-emergence

Sources Valley Conservation Council

Cover cropping for corn

Winter rye &
crimson clover

Sources A. Cooper

Roller-crimper





www.4thesoil.org

Source: A Cooper



Cover crop



Minimize tillage



Cover crop



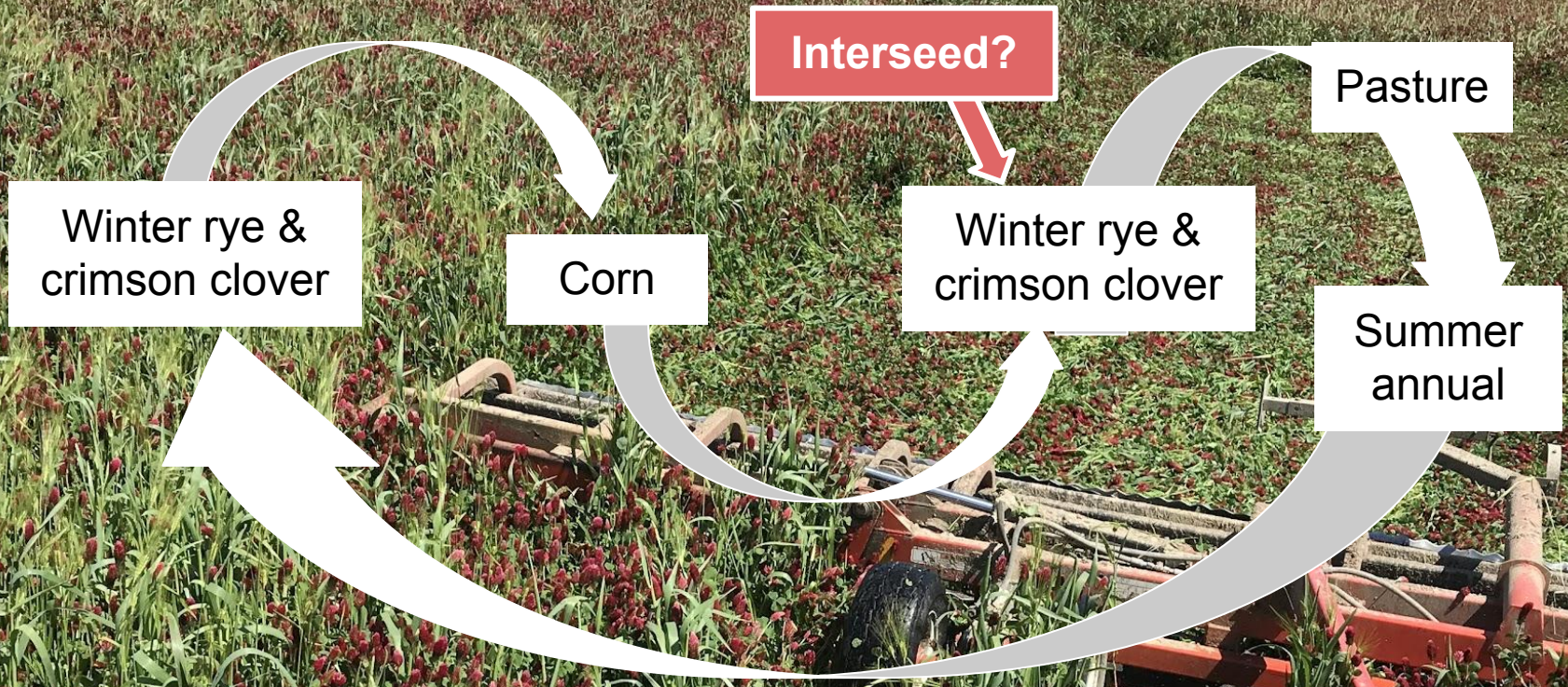
Vary crops & interseed

One-year rotation

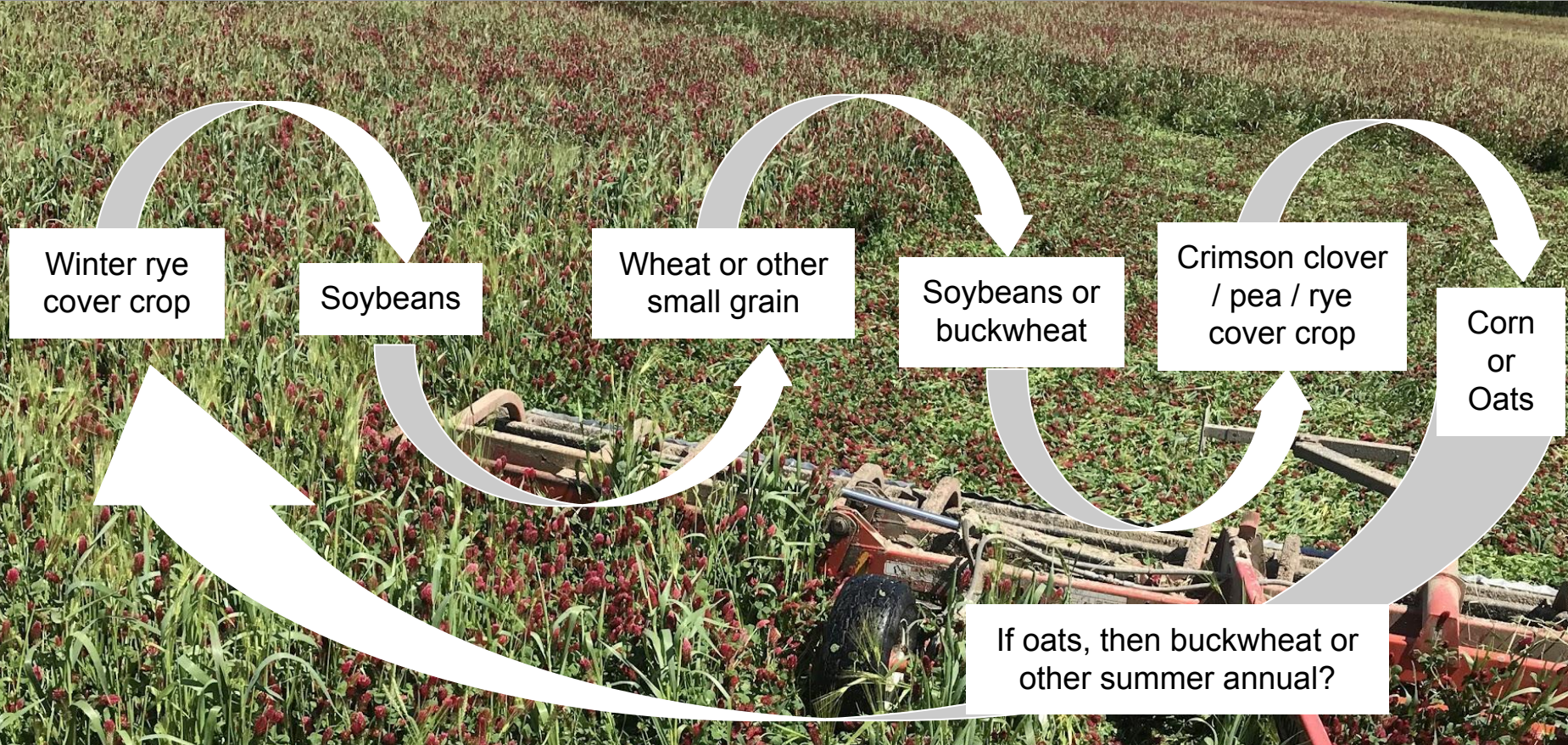


Sources A. Cooper

Two-year rotation



Three-year rotation





Timing

Soils > 50°F
As early as mid-April (BUT...)
Mid-May allows cover crop to mature

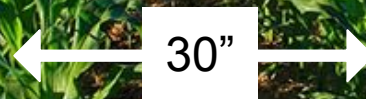
Seeding rate

800 seeds per
per 1000 sq ft
(5-9 oz)



25,000-35,000
seeds per acre
(14-24#)

Spacing



6-8" within rows

Types

Agronomy

Planting

Cultivation

Harvest

Cultivating corn

Aaron Cooper





Cultivate early



Corn competes poorly with weedy summer annuals

- Flame weed, tine weed, or rotary hoe in the first 10 days after emergence

Types

Agronomy

Planting

Cultivation

Harvest



Cultivate often in the first month

Types

Agronomy

Planting

Cultivation

Harvest



- Buffalo hi-residue cultivator
- Can be used in no-till systems



Sources A. Cooper

Harvest





Small scale

- Walk row and husk as you go, or cut while green and shock
- Dry ears in covered greenhouse or shed
- Store as ears or shelled (by hand)



Types

Agronomy

Planting

Cultivation

Harvest



Mid scale

- Harvest as ears (no drying costs!)
- Harvest shelled (good to have some way to dry)
- PTO-driven picker-sheller
- **Antique equipment may be set up for 36-40" rows**



Types

Agronomy

Planting

Cultivation

Harvest



Storage

Types

Agronomy

Planting

Cultivation

Harvest



Corn ears only

Dried grain



Sources A. Cooper, Lazor 2013, "[Sunshower \(Corn Crib\)](#)" by [David Hoffman '41](#) is licensed under [CC BY-NC-SA 2.0](#)



Plant corn after an N-fixing cover crop

Cultivate early & often

Ask your neighbors & extension for help

Source C Wade



Corn Questions?



Source Red Tail Grains





Wheat

Source Keenbell Farm



Types

Agronomy

Planting

Cultivation

Harvest

CLASSES OF WHEAT

Classified by color and kernel hardness, wheat is divided into six classes.



**Hard
red
winter**



**Soft
red
winter**



**Hard
red
spring**



Durum



**Hard
white**



**Soft
white**



Types

Agronomy

Planting

Cultivation

Harvest

CLASSES OF WHEAT

Classified by color and kernel hardness, wheat is divided into six classes



Hard red winter

Soft red winter

This block contains two illustrations of wheat stalks. The left one is labeled "Hard red winter" and the right one is labeled "Soft red winter". An orange arrow points from the "Hard red winter" label to the "Soft red winter" label.



- Redeemer, Nueast, Warthog, Red Fife

Hard Red Spring Durum Hard White Soft White

contains perce...
tein...
an excell...
wheat will...
milling a...
charac...

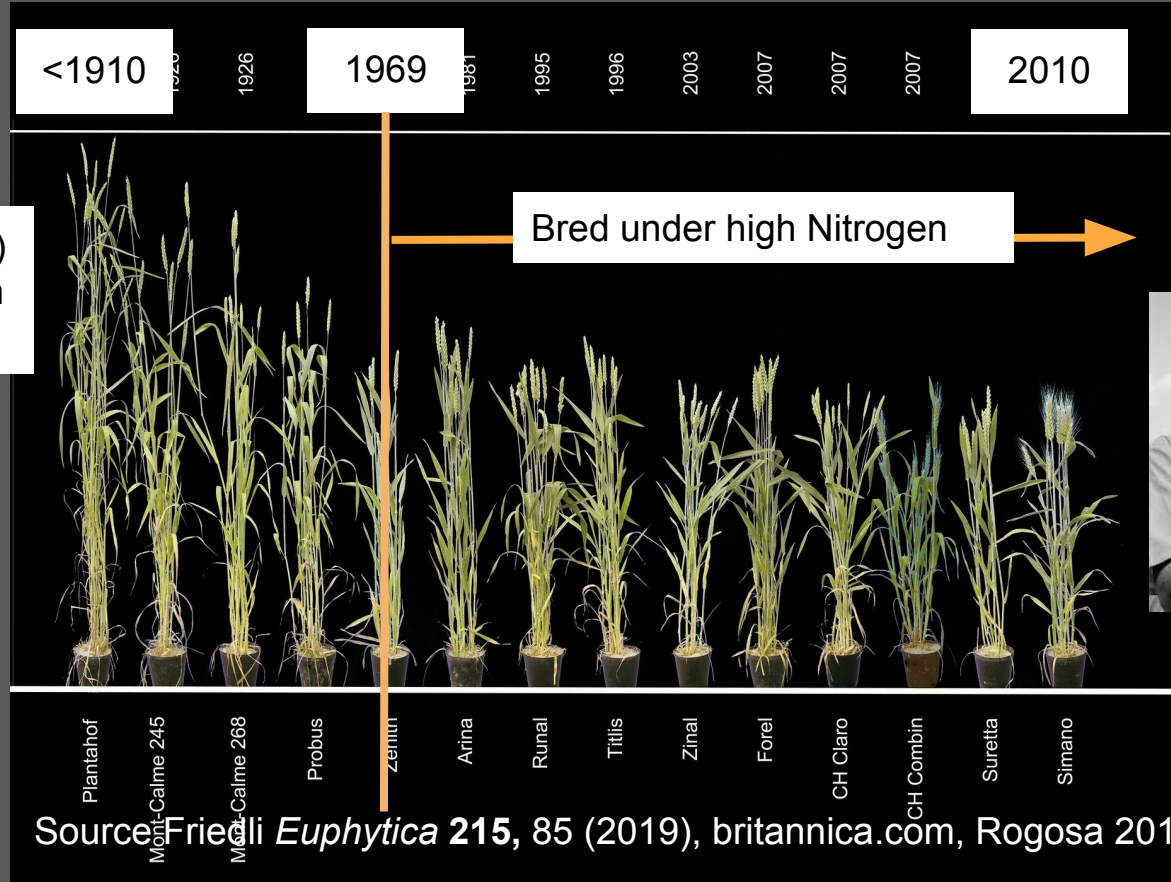
and oriental noodles.

Snack foods.

This block contains a list of wheat varieties: Redeemer, Nueast, Warthog, and Red Fife. It also features four illustrations: a loaf of bread, a biscuit, a basket of bread rolls, and various snack foods. Below the illustrations are labels for "Hard Red Spring", "Durum", "Hard White", and "Soft White". There are also some descriptive text fragments and a note about "Snack foods".

“Modern wheat” = bred since 1968

Tend to lodge (fall over) when grown under high Nitrogen





Types

Agronomy

Planting

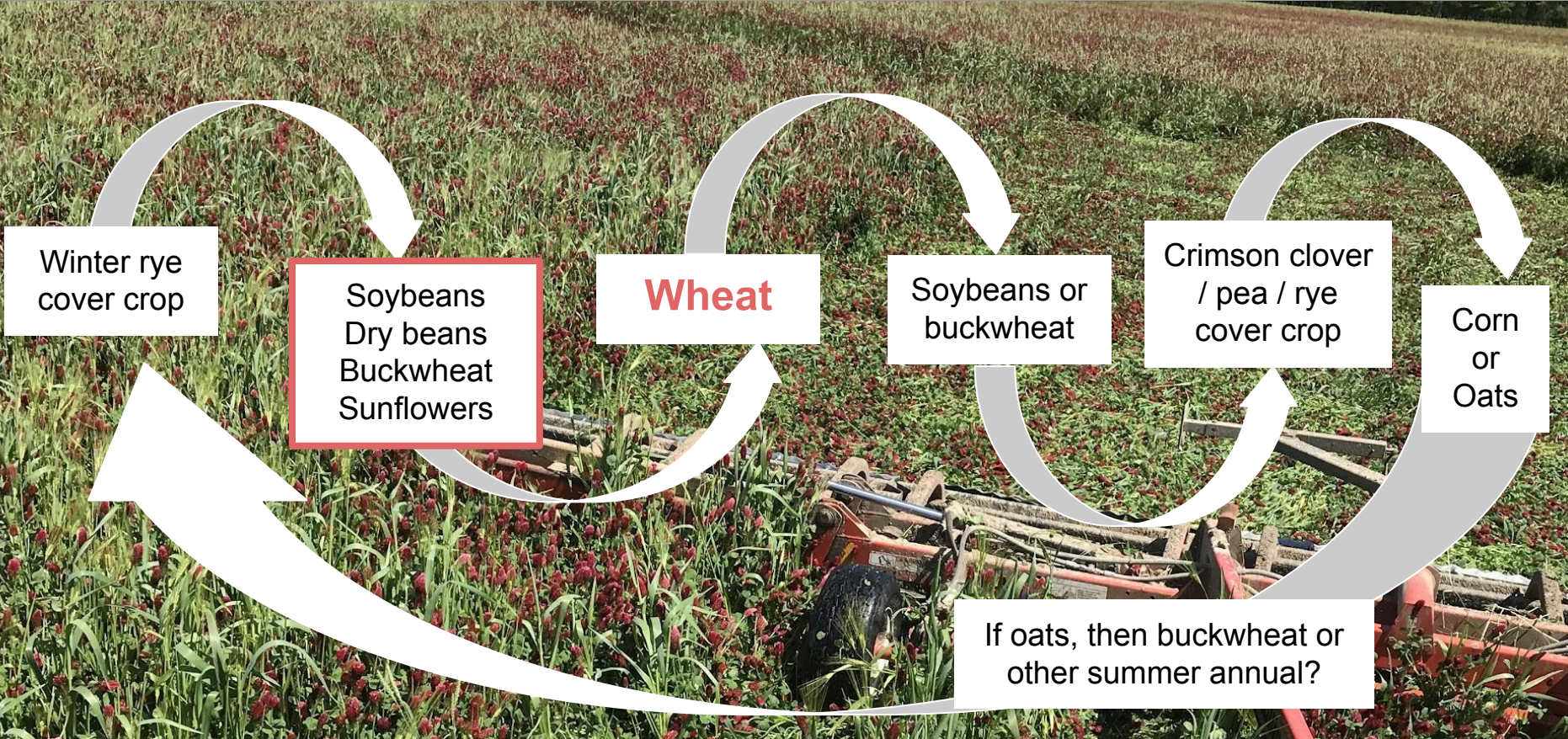
Cultivation

Harvest

- Aim for 22-25 plants / ft on 7" spacing (modern)
- Modern wheats are heavy feeders; older varieties need more space
- Don't plant into corn stover or grain stubble (*Fusarium* risk)
- Seed winter wheat in fall
- Seed spring wheat in early spring
- Good soil contact improves germination

Sources A. Cooper, Lyon (2004)

Three-year rotation



Three-year rotation

Winter
cover

Small grains enhance the whole-farm picture by

- lengthening rotations
- Reducing compaction
- Improving nutrient cycling



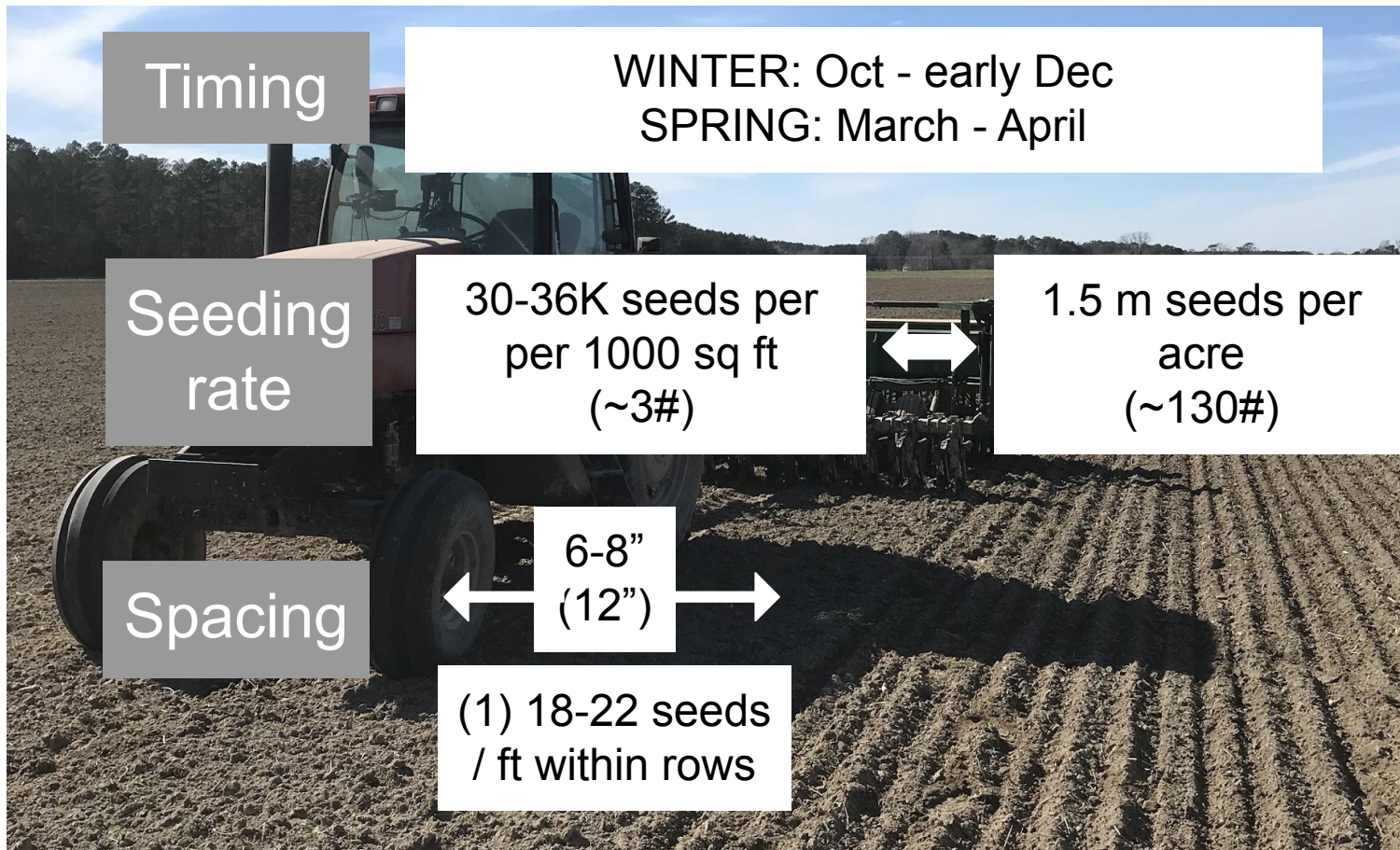
Types

Agronomy

Planting

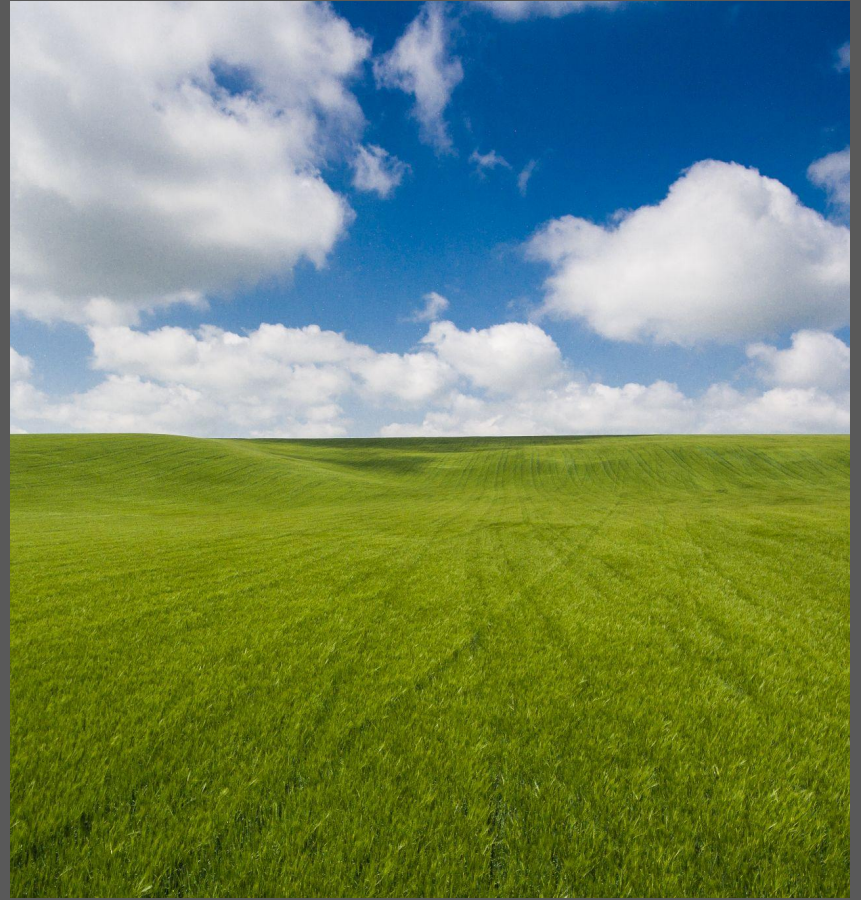
Cultivation

Harvest



Sources A. Cooper, Thomason (2014), Lyon (2007)

Cultivating wheat



Source V Hanacek



Purple Mountain presents...

PurpleTools.net

GARDENER, GROWER AND GREEN LIVING SUPPLIES



6" tine weeder

- Cultivation is not strictly necessary
- Winter wheat is already green in the spring
- Spring wheat also gets a head start





Types

Agronomy

Planting

Cultivation

Harvest



Einbock Tine Weeder



Source F Sachs



Fusarium Head Blight

Types

Agronomy

Planting

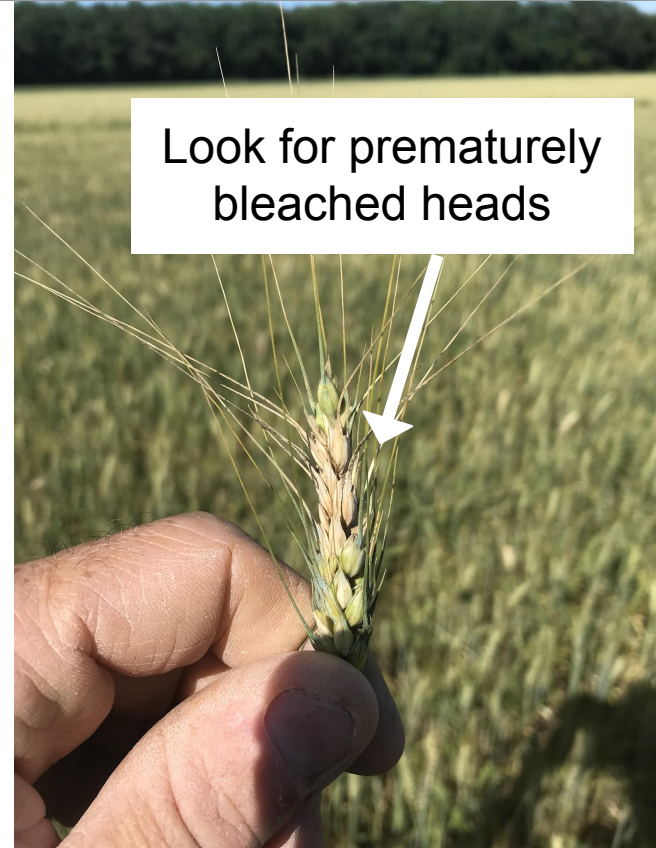
Cultivation

Harvest



- Caused by wet weather when flowering (lasts 7-10 d)
- Leads to DON >1 ppm (vomotoxin)
- Don't plant following corn or other grain
- Some varieties have resistance
- Can be cleaned out but lowers yield

Sources agcrops.osu.edu, A. Cooper, Keller (2011)



Harvesting wheat



Source F Sachs



Harvest timing: sprouting

Types

Agronomy

Planting

Cultivation

Harvest



- Wet conditions lead to sprouting
- Leads to low falling number
- Grow resistant varieties
- Can be cleaned out?
- Sprouted grain can be used as feed
- Watch the weather

Even if you don't see this, your grain may have sprouted



Large scale

Agronomy

Planting

Cultivation

Harvest



Sources A Cooper, CJ Isbell



Large scale

Agronomy

Planting

Cultivation

Harvest



Sources A Cooper, CJ Isbell, Ferrari



Garden scale

Reap & Bind



Shock



Thresh



Winnow



Sources fromscratchhub, groworganic, dreamstime, ecosnippets

Types

Agronomy

Planting

Cultivation

Harvest



Small- mid-scale equipment

Reap & Bind



Shock



Thresh



Winnow



Sources Adaptive Ag, Agriexpo.online, alibaba

Types

Agronomy

Planting

Cultivation

Harvest



Wheat enhances the whole farm

Plant following beans or other non-grain


Ask your neighbors & extension for help

Source F Sachs

A wide-angle photograph of a golden wheat field. The sun is low on the horizon, creating a bright sunburst effect with rays of light. The sky is blue with scattered white clouds. A dense line of green trees forms the background. The foreground is filled with the texture of the wheat stalks.

Thank you!

Source F Sachs

A wide-angle photograph of a golden wheat field stretching to the horizon. The sun is low in the sky, creating a bright lens flare and illuminating the scene. A dense line of green trees is visible in the background under a blue sky with scattered clouds.

Are you more likely to try
growing grain after this
session?

Source F Sachs

Equipment & Supplies

Grain pro (DC) – storage bags, solar dryers (202) 921-6700

<https://www.grainpro.com/en>

Purple Tools (MD) – hand tools, small grain processing equipment (301) 891-2488

<https://www.purpletools.net>

Adaptive Ag (ME) – equipment for small- and mid-size plots (207) 214-0620

<https://www.adaptive.ag/>

Your neighbors, the local farm auction, extension office

Testing

The UVM Cereal Quality Testing Lab (VT) (802) 656-5392

www.uvm.edu/extension/nwcrops/cereal-grain-testing-lab

Hartwick College Center for Craft Food and Beverage (NY) (607) 431-4232

<https://www.hartwick.edu/about-us/center-for-craft-food-and-beverage/>

JLA Labs (for corn–GA) (229) 405-6744 <https://www.jlaglobal.com/>

Seed

Albert Lea Seed (MN) (800) 352-5247 <https://alseed.com/>

Lakeview Organic (NY) (315) 531-1038 <https://lakevieworganicgrain.com/>

Fedco (ME) (207) 426-9900 <https://www.fedcoseeds.com>

NC Foundation Seed Farm (919) 269-5592 <http://www.ncfoundationseeds.org/>

**Keep
learning**

Follow our new “Growing Grain” blog at
<https://www.commongrainalliance.org/growing-grain>



Maintain air flow during storage

Fan purpose	Airflow recommendations
-------------	-------------------------

Natural-air drying of grains and oilseeds	0.75 to 1.5 cfm/bu
---	--------------------

Aeration of stored grains and oilseeds	0.05 to 0.5 cfm/bu
--	--------------------

