CONSIDERATIONS FOR GETTING INTO VALUE-ADDED SMALL GRAINS PRODUCTION FOR LOCAL MARKETS

Cornell University
Cooperative Extension
Ulster County

Justin O'Dea, Vegetable & Field Crop Educator

Artisanal Wheat On the Rise

Giving factory flour the heave-ho, small farmers from New England to the Northwest are growing long-forgotten varieties of wheat

Small-scale grains: Another piece of the locavore puzzle

By Rhea Kennedy

Bring Back Local Grains! One Man's Quest in Upstate NY

By Amy Halloran on September 27, 2012

Brooklyn Brewery gives local beer new meaning

The brewer's latest draft, Greenmarket Wheat, is a partnership with GrowNYC, and uses grains exclusively grown by farmers within 200 miles of the city.

Adding Value to Grain Proves a Successful Move for NY Operation

7/21/2010 11:34 AM
By Maegan Crandall Central N.Y. Correspondent

Still Life

New York's distillery boom revives a spirited tradition.

Cornell University
Cooperative Extension, Ulster County

It’s easy, right?

The breadbasket revival

"(A) very beautiful and fertile wheatland which here grows so abundantly that this Esopus is the granary of the whole New Netherlands…"

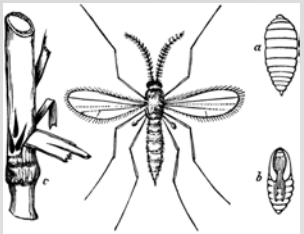
- *Visitor to the Esopus Flats, Kingston NY, 1679*

"This is the granary of North America… From the state of New York, many parts of the continent are supplied with grain; and from the city of New York, and the ports on the river Hudson, more grain and flour are exported, than from any other port in the Union…"

- *Sir William Strickland, on Wheat Production in New York's Hudson Valley, 1795*

The breadbasket revival?

- Hessian Fly invades… --> Yield Declines!
- Soil fertility declines… --> Resources depleted!
- Settling of Western NY, Erie Canal opens… --> Economically inefficient!



Contemporary Hudson Valley:

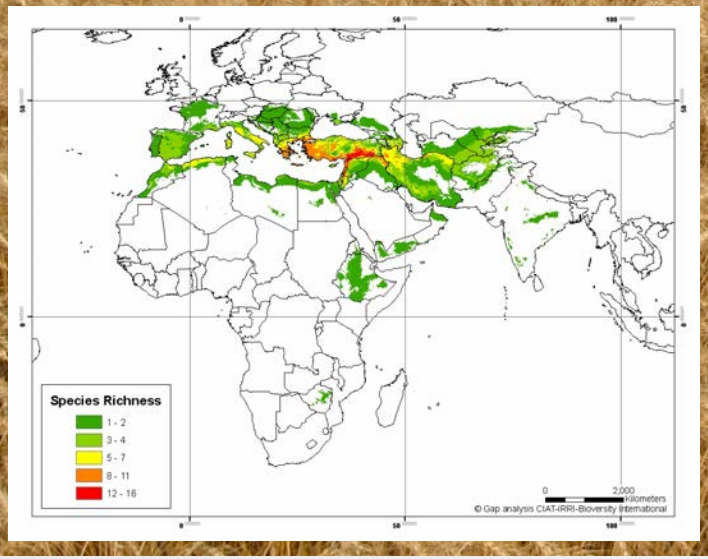
Fresh-market fruit & veg., dairy

Greenmarkets NYC, artisan bakers, NYS Farm brewery, distillery license demanding HV grown wheat!? barley!? rye!?

- 2012 Small grain variety trials begin!

Why the west dominates

- Environment
  - Semi-arid origins, evolution
  - Dry summers, Mediterranean
  - Low disease pressure
  - Unhindered grain maturity
    - Consistent high quality grains



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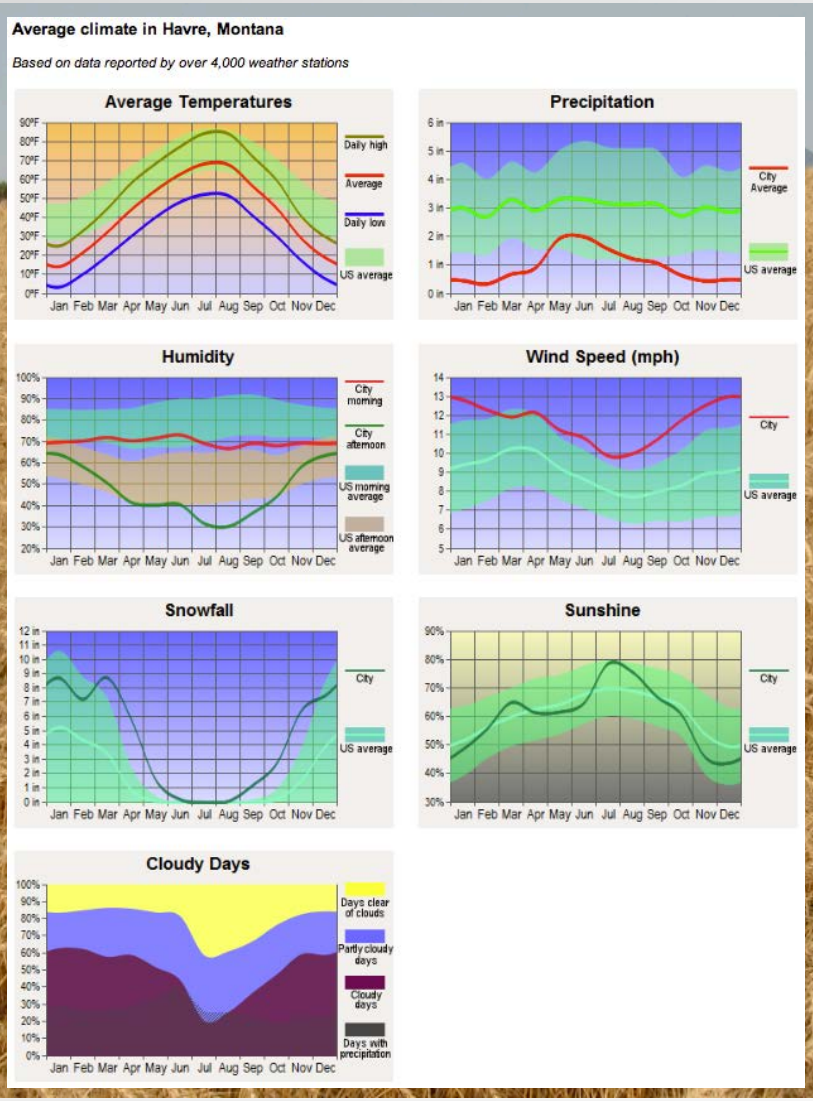

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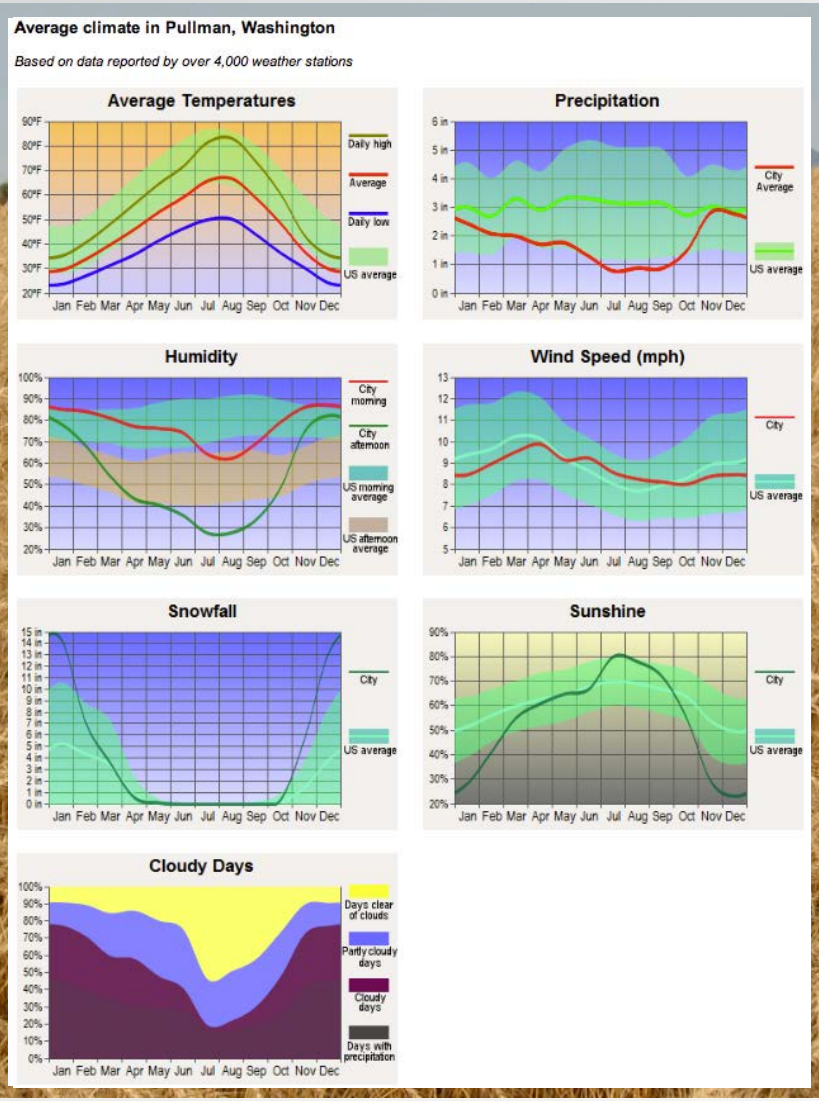

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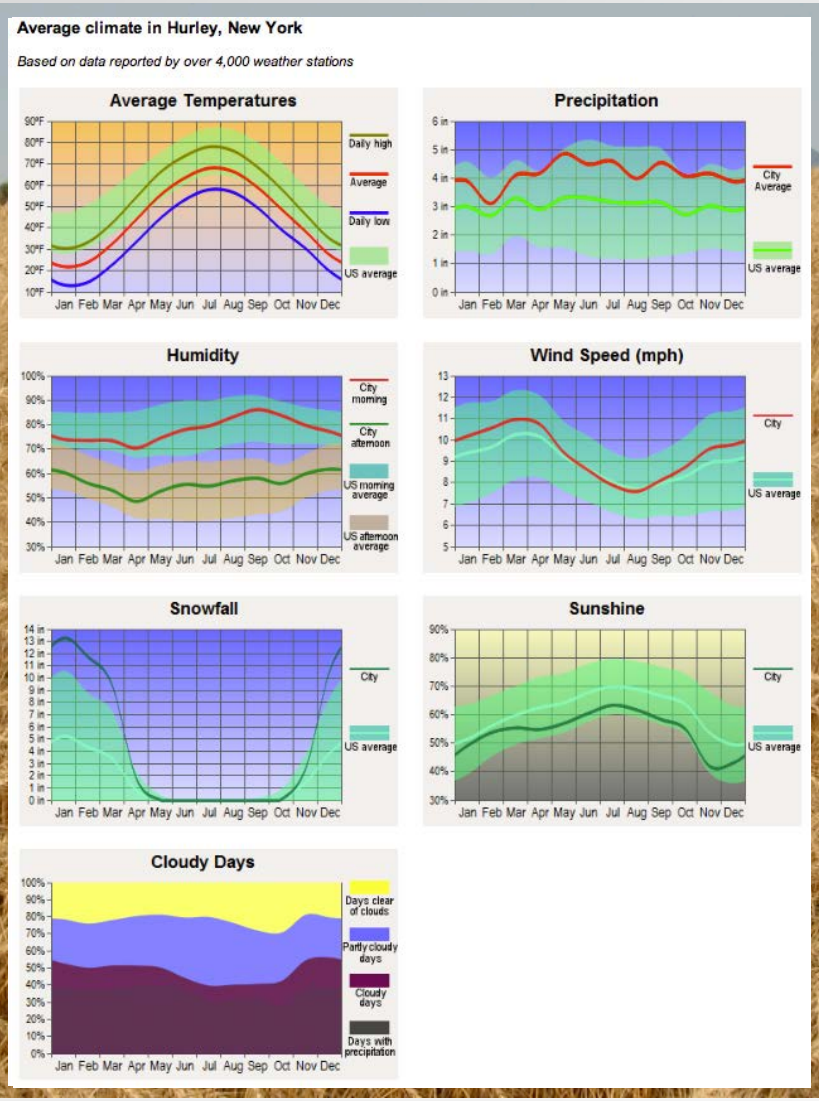

Why the west dominates

- Environment
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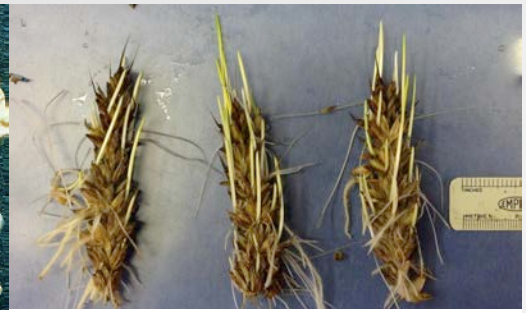
  - Dry summers, Mediterranean
  - Low disease pressure
  - Unhindered grain maturity
    - Consistent high quality grains

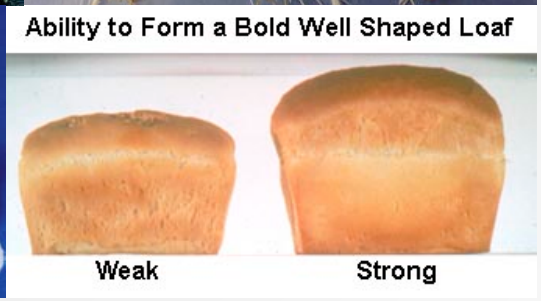
- Land base scale
- Low population & associated pressures
- Knowledge
- Equipment
- Infrastructure

Reinventing the NE breadbasket

Challenges:

- Meeting modern human consumption and/or quality market standards.
  - Fusarium mycotoxins (Deoxynivolenol “DON”, aka “vomitoxin”)
  - Pre-harvest sprouting (bread, malting quality weak)
  - Low crude protein levels % breads (low gluten strength)





Reinventing the NE breadbasket

Challenges:

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  - Fusarium mycotoxins (Deoxynivolenol “DON”, aka “vomitoxin”)
  - Pre-harvest sprouting (bread, malting quality weak)
  - Low crude protein levels % breads (low gluten strength)
- Capital for equipment

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- Capital for equipment
- Land base

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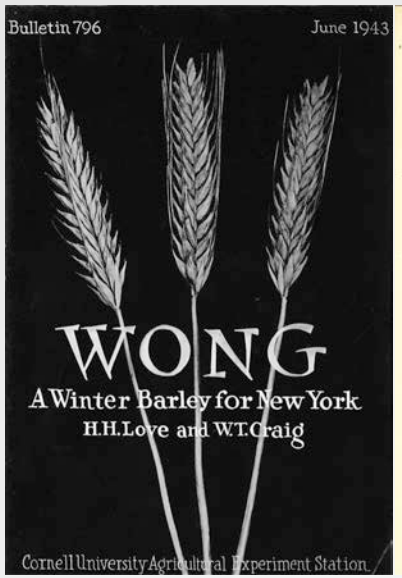
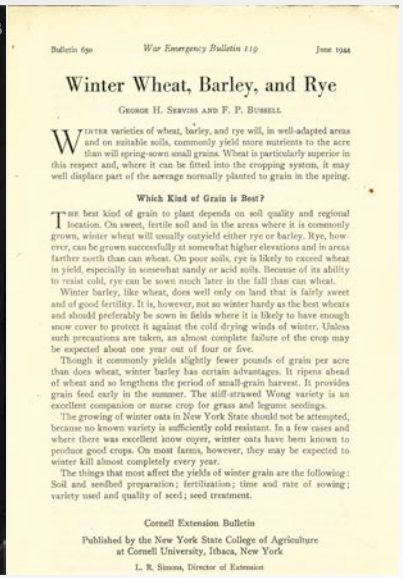
- Capital for equipment
- Land base
- Knowledge, genetics




Bulletin 650 War Emergency Bulletin 119 June 1944

Winter Wheat, Barley, and Rye

George H. Serviss and F. P. Bussell

Winter varieties of wheat, barley, and rye will, in well-adapted areas and on suitable soils, commonly yield more nutrients to the acre than will spring-sown small grains. Wheat is particularly superior in this respect and, where it can be fitted into the cropping system, it may well displace part of the acreage normally planted to grain in the spring.

Which Kind of Grain is Best?

The best kind of grain to plant depends on soil quality and regional location. On sweet, fertile soil and in the areas where it is commonly grown, winter wheat will usually outyield either rye or barley. Rye, however, can be grown successfully at somewhat higher elevations and in areas farther north than can wheat. On poor soils, rye is likely to exceed wheat in yield, especially in somewhat sandy or acid soils. Because of its ability to resist cold, rye can be sown much later in the fall than can wheat.

Winter barley, like wheat, does well only on land that is fairly sweet and of good fertility. It is, however, not so winter hardy as the best wheats and should preferably be sown in fields where it is likely to have enough snow cover to protect it against the cold drying winds of winter. Unless such precautions are taken, an almost complete failure of the crop may be expected about one year out of four or five.

Though it commonly yields slightly fewer pounds of grain per acre than does wheat, winter barley has certain advantages. It ripens ahead of wheat and so lengthens the period of small-grain harvest. It provides grain feed early in the summer. The stiff-strawed Wong variety is an excellent companion or nurse crop for grass and legume seedings.

The growing of winter oats in New York State should not be attempted, because no known variety is sufficiently cold resistant. In a few cases and where there was excellent snow cover, winter oats have been known to produce good crops. On most farms, however, they may be expected to winter kill almost completely every year.

The things that most affect the yields of winter grain are the following: Soil and seedbed preparation; fertilization; time and rate of sowing; variety used and quality of seed; seed treatment.

Cornell Extension Bulletin

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L. R. Simons, Director of Extension

Reinventing the NE breadbasket

Challenges:

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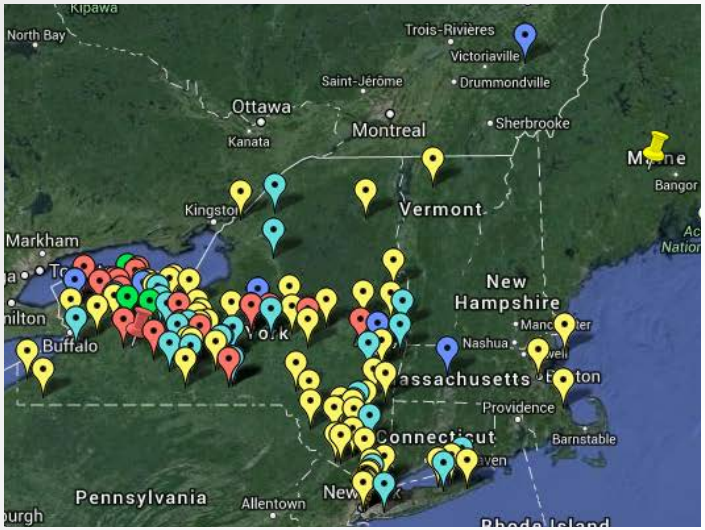
  - Pre-harvest sprouting (bread, malting quality weak)
  - Low crude protein levels % breads (low gluten strength)
- Capital for equipment
- Land base
- Knowledge
- Economic immaturity
  - Price??
  - Fledgling markets, evolution of economic infrastructure

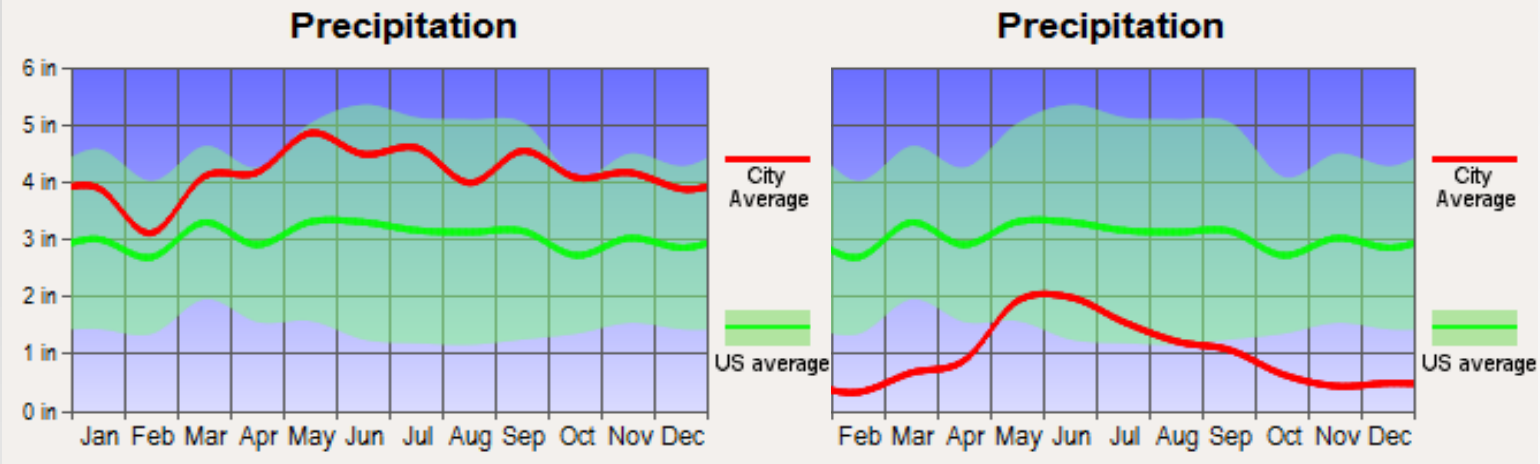


Opportunities

- Reliable rainfall!

"Dryland agroecosystem yields in the northern Great Plains (NGP) of North America are primarily limited by low and erratic water availability."

- Diverse options for rotations!



Hurley, NY

Havre, MT

Opportunities

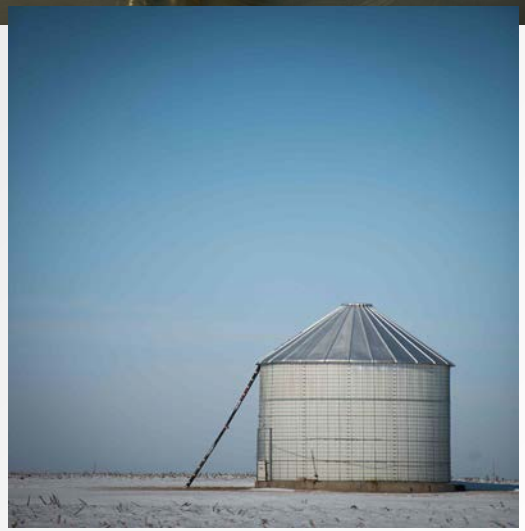
- Reliable rainfall!

"Dryland agroecosystem yields in the northern Great Plains (NGP) of North America are primarily limited by low and erratic water availability."

  - Diverse options for rotations!

- Production Economy
  - Economy of scale
  - Relatively low-input
  - Rotational benefit
    - Weed control
    - Disease control

- Proximity to premium, direct markets
- Expanded market opportunity
  - Product diversity = stability, resilience
  - Non-perishable, dry commodity
    - Expanded window to move product



Assessing your assets

Start small & manageable, work up as you learn.

- Appropriate acreage, economy of scale
- Appropriate soils, site (loams, good drainage, 3'+ depth, flat to gentle slopes)
- Access to capital or equipment (reliable?)
- Learn your market, choose wisely.
  - Establish secondary livestock feed market, even if using grain on site for value-added product/s

Assembling your toolbox

- Reliable access to equipment for:
  - Primary & secondary tillage (plow, disk, harrow etc.)
  - Seeding (grain drill)
  - Weed, disease, pest management (tine weeder, boom sprayer)
  - Harvesting (combine)



Assembling your toolbox

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  - Disease & weed management (tine weeder, boom sprayer)
  - Harvesting (combine)
  - Cleaning (barrel, screen cleaners), moving (augers, gravity wagon, truck)

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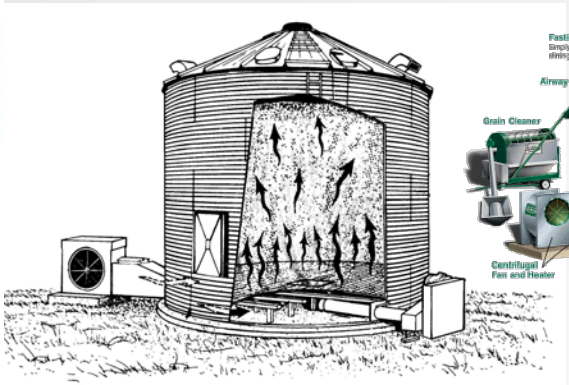
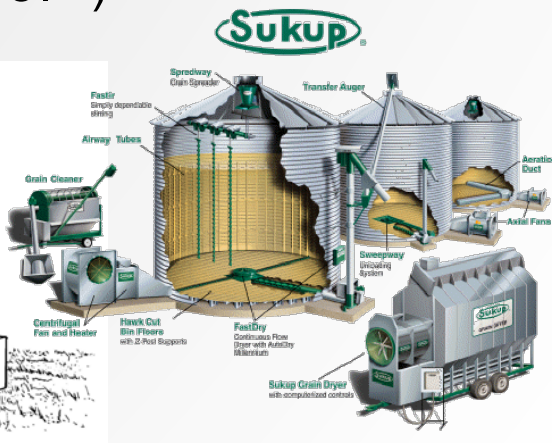
  - Cleaning (barrel, screen cleaners)
  - Drying and storing (aerator/drier, covered space & bags, or bins; rodent proofing measures, insect control*)





Getting started

- Set yourself up for success.
  - Sod ground needs time and work to bring into production.
  - Follow a broadleaf crop, but avoid vetch. Grassy crops host small grain diseases; Long, “stacked” rotations may be an exception.
  - Choose a species and variety that is suits your needs. This is foundational.
    - Winter, spring; red, white; hard, soft; feed, malting, 2 vs. 6 row….
    - Disease, sprouting resistance (soft white wheat, malting barley= higher sprouting susceptibility)
  - Weed control is especially important for spring grains.
  - Seed timely, at appropriate rates. Use a grain drill. Observe hessian fly free dates.
  - Don’t neglect fertility. Legumes are a great rotational crop, but avoid over-fertilizing.

Getting there…

- Avoid a colossal fail.
  - Tine weed 2-3x for spring grains, herbicide, undersow with red clover
  - Fungicide for fusarium head blight, aggressive foliar diseases
    - Resistant varieties, fertility helps
    - Fusarium head blight risk assessment tool (PSU)

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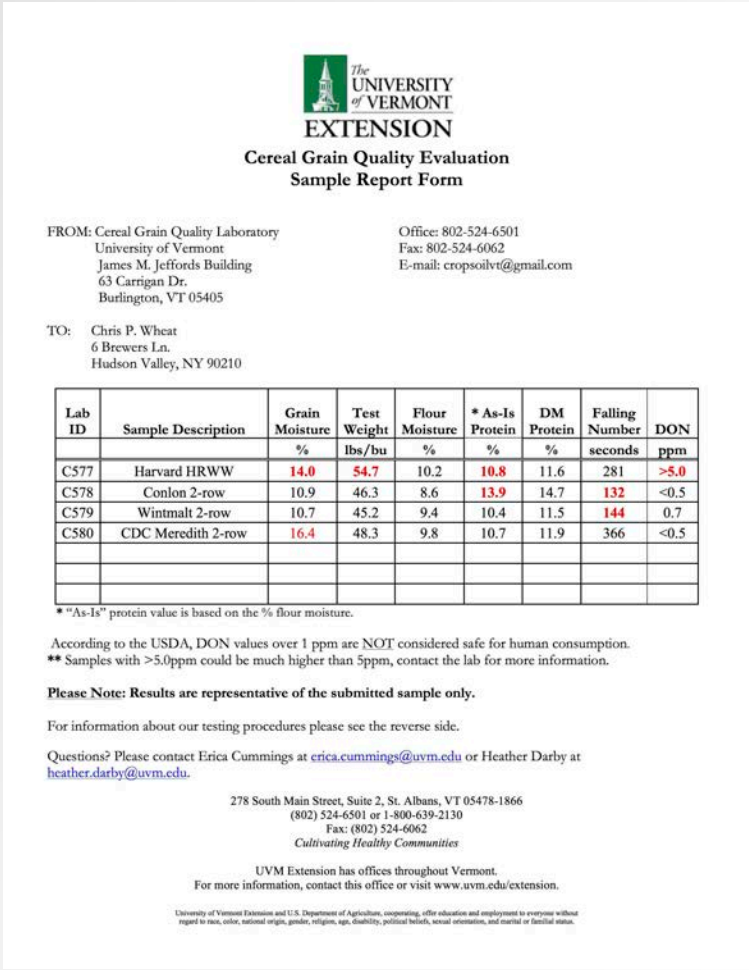
  - Fungicide for fusarium head blight, aggressive foliar diseases
    - Resistant varieties, fertility helps
    - Fusarium head blight risk assessment tool (PSU)
  - Scout field for evidence of scab (Fusarium).
  - Have your harvest, drying, cleaning, and storage equipment & plan in order
  - Monitor grain moisture as harvest approaches.
    - Harvesting before 12-13% and drying down mitigates risk of pre-harvest sprouting.

Finishing up

- Keep your powder and your pants dry.
  - Harvest dry, turn up the air on the combine if fusarium infection is prevalent.
  - Clean immediately, ASAP
    - Chaff, weed seeds, fusarium shrunken kernels
    - Green matter can ruin grain (esp. ragweed)
  - Measure harvest grain moisture, dry as needed, low heat drying if needed (<110°F to keep germination viable)
    - 16-18% Moisture- consider heated aeration
    - 14-15% Moisture- needs aeration
    - 12-13% Moisture- is stable
  - Moisture can vary with humidity & temperature, monitor throughout storage.

Report card from UVM

- You passed the course, now for the final exam.



The UNIVERSITY of VERMONT
EXTENSION

Cereal Grain Quality Evaluation
Sample Report Form

FROM: Cereal Grain Quality Laboratory
University of Vermont
James M. Jeffords Building
63 Carrigan Dr.
Burlington, VT 05405

Office: 802-524-6501
Fax: 802-524-6062
E-mail: cropsoilvt@gmail.com

TO: Chris P. Wheat
6 Brewers Ln.
Hudson Valley, NY 90210

Lab ID	Sample Description	Grain Moisture	Test Weight	Flour Moisture	* As-Is Protein	DM Protein	Falling Number	DON
		%	lbs/bu	%	%	%	seconds	ppm
C577	Harvard HRWW	14.0	54.7	10.2	10.8	11.6	281	>5.0
C578	Conlon 2-row	10.9	46.3	8.6	13.9	14.7	132	<0.5
C579	Wintmalt 2-row	10.7	45.2	9.4	10.4	11.5	144	0.7
C580	CDC Meredith 2-row	16.4	48.3	9.8	10.7	11.9	366	<0.5

* "As-Is" protein value is based on the % flour moisture.

According to the USDA, DON values over 1 ppm are NOT considered safe for human consumption.
** Samples with >5.0ppm could be much higher than 5ppm, contact the lab for more information.

Please Note: Results are representative of the submitted sample only.

For information about our testing procedures please see the reverse side.

Questions? Please contact Erica Cummings at erica.cummings@uvm.edu or Heather Darby at heather.darby@uvm.edu.

278 South Main Street, Suite 2, St. Albans, VT 05478-1866
(802) 524-6501 or 1-800-639-2130
Fax: (802) 524-6062
Cultivating Healthy Communities

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For more information, contact this office or visit www.uvm.edu/extension.

Report card from UVM

- You passed the course, now for the final exam.
  - Grain moisture
    - <13%
  - Test weight (density)
    - Varies by grain
  - Grain Protein
    - >12% for bread wheat
    - <12% for malting
  - Falling number
    - >200 seconds (low sprouting)
  - DON (mycotoxin)
    - <1 ppm

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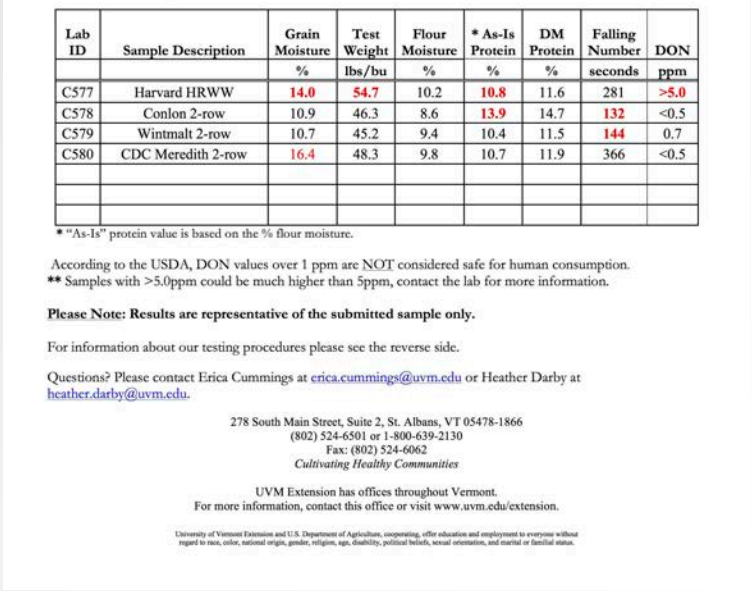

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Grain Quality: *Wheat*

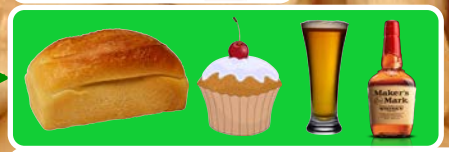
Your wheat

- Vomitoxin/DON (ppm)
  - ≤1 ppm)
  - 1-2 ppm
  - >2-10 ppm
- Grain protein (%)
  - ≥12%
  - 10-12%
  - <10%
- Pre-harvest sprouting (seconds)
  - >350 sec
  - 200-350 sec
  - <200 sec

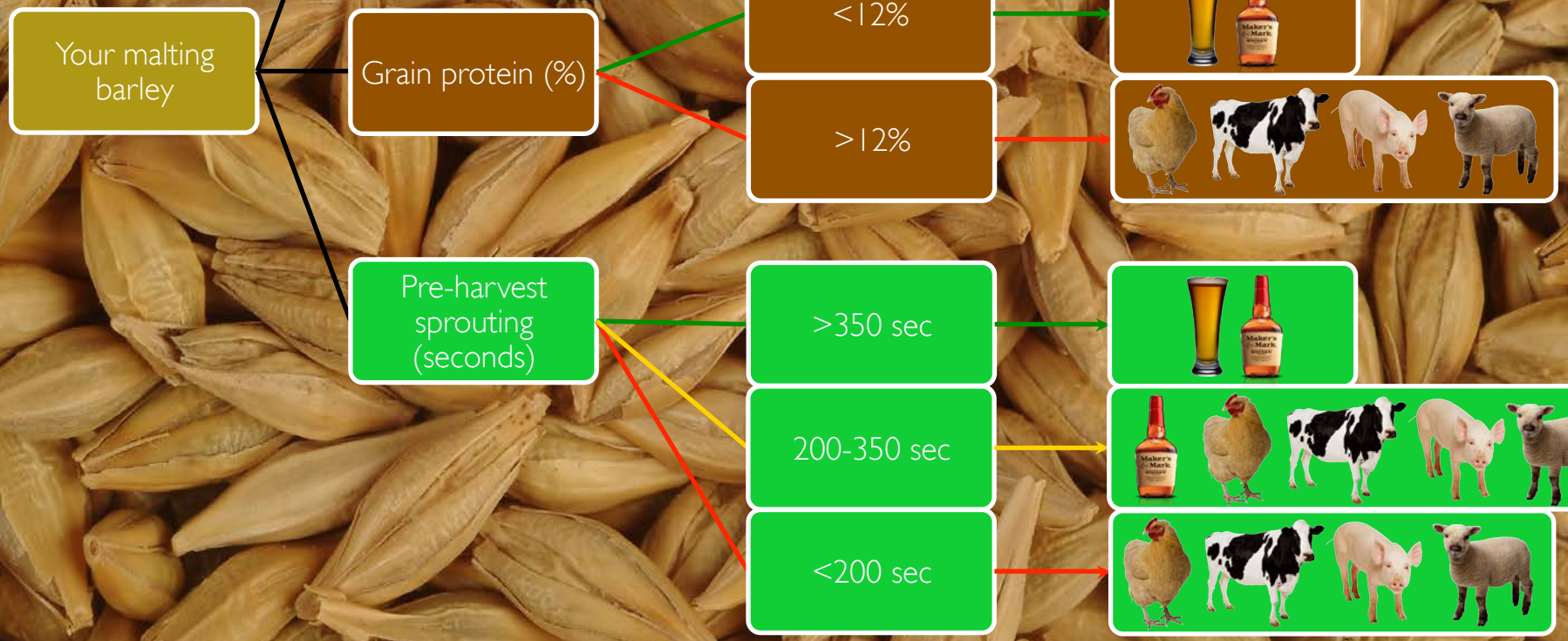






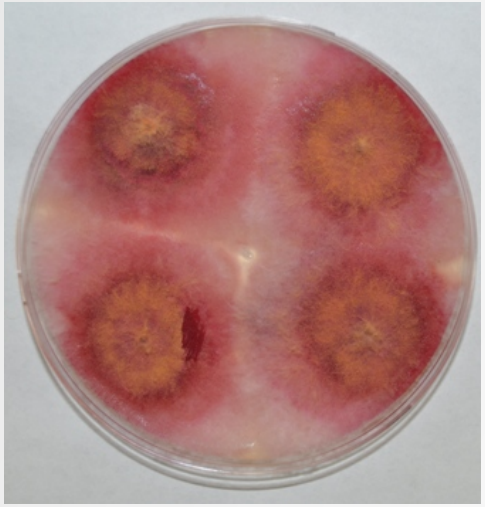


Grain Quality: *Barley*



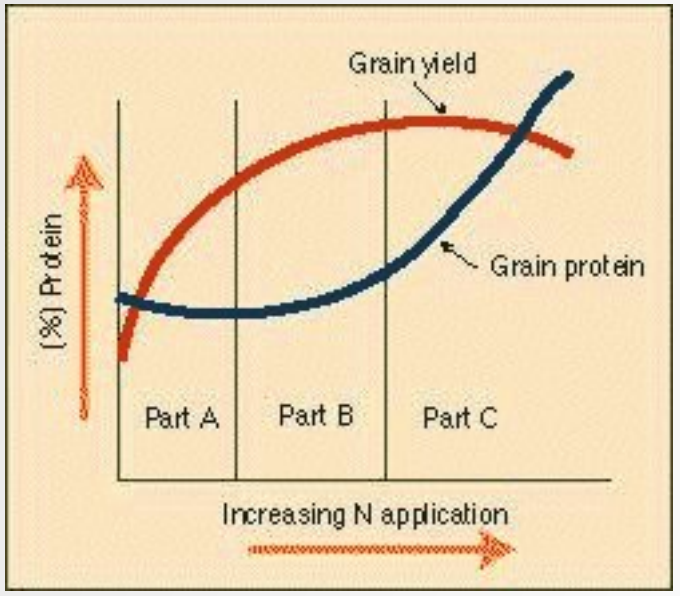
Troubleshooting 1

- High DON levels: Prevent fusarium infection.
  - Use moderately resistant varieties
  - Rotate with non-hosts of *Fusarium graminearum*
    - Minimize corn, wheat, rye, barley, oats, forage grasses residue contact, grassy weeds
    - Follow broadleaf crops
  - Have adequate fertility & correct pH = heightened potential to resist disease
  - Apply triazole (Caramba, Prosaro) fungicide within 3-5 days of flowering (anthesis)
  - Rigorous cleaning to remove infected, shrunken kernels



Troubleshooting 2

- Manage Protein Levels
  - Protein is dependent on available N (assuming other nutrients are adequate), diluted by available water
  - Adequate N fertility for desired quality
    - Bread wheats need N for glutens
    - Malting barleys need N to support yields, but not for protein boost
  - Variety plays a role
  - Legumes can help– biologically mediated N release, but need to be given credit in fertility strategy.
  - Over fertilizing with N = lodging
    - Lodging resistant varieties help



Troubleshooting 3

- Low falling number, high grain moisture
  - Pre-harvest sprouting resistant varieties
  - Highly targeted harvest timing for each variety's need
  - Ability to dry (and even better, to be able to add low heat)

Other considerations

- Weed tainted grain (imparts off flavors, moisture, contaminates)
  - Good cleaning practices
- Foliar disease
  - Follow good rotation practices
  - Scout for vigorous diseases
  - Adequate fertility for plant health
- Ergot (*especially* in Rye)
  - Follow good rotational practices

In the pipeline… stay tuned

- Statewide variety trials, Ulster County, 2014-2018
  - Wheats for artisan baking markets
  - Malting barleys
  - Hybrid ryes (stellar yields, from Germany)
  - Some wheats for malting (‘Medina’)
  - Applied trials with area bakers, malters, brewers, distillers
- Ongoing fusarium management research
- Annual field days, winter workshops
- Production guides (paper and video)

Preliminary Results

2014 Hudson Valley Spring Malting Barley and Spring Wheat Summary - Cornell

Spring Malting Barley

		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging			Heading Date		
	Entry	Conv	Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Mean
1	Herta	1712	5	2161	5	1936	5	51.2	53.9	52.6	7.3	7.7	7.5	6/25	6/24	6/24
2	Conlon	1501	8	2030	7	1765	7	53.7	53.7	53.7	8.0	7.7	7.8	6/24	6/24	6/24
3	Genie	243	10	589	9	416	10	-	47.6	47.6	7.7	5.7	6.7	7/2	6/28	6/30
4	M152	2959	1	2886	2	2923	2	56.2	57.7	56.9	3.3	3.3	3.3	6/23	6/22	6/23
5	Lacey	2871	2	3128	1	2999	1	56.1	59.6	57.9	2.0	3.0	2.5	6/23	6/22	6/23
6	Quest	2516	3	2771	3	2643	3	56.3	58.3	57.3	7.3	5.7	6.5	6/22	6/22	6/22
7	KWS Thessa	383	9	504	10	443.7	9	-	-	-	8.7	7.3	8.0	6/27	6/26	6/26
8	Cerveza	1642	6	2048	6	1845	6	48.1	51.0	49.5	6.0	3.7	4.8	6/29	6/25	6/27
9	Newdale	1502	7	1639	8	1571	8	48.7	50.6	49.7	5.3	5.0	5.2	6/28	6/25	6/26
10	AAC Synergy	1898	4	2245	4	2071	4	46.6	49.4	48.0	5.3	4.3	4.8	6/26	6/25	6/25
	Mean	1723		2000		1861		52.1	53.5	52.6	6.1	5.3	5.7	6/26	6/24	6/25
	CV	11.2		13.7												

Spring Wheat

		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging			Heading Date		
	Entry	Conv	Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Mean
1	Stoa	1908	5	2019	8	1964	8	69.9	70.8	70.4	1.3	1.3	1.3	6/21	6/19	6/20
2	Red Fife	1905	6	2054	6	1979	6	71.2	70.0	70.6	4.7	5.7	5.2	6/21	6/20	6/21
3	RB07	2101	2	2218	3	2159	3	71.6	72.0	71.8	1.0	1.3	1.2	6/20	6/19	6/19
4	Tom	1962	3	2040	7	2001	5	72.5	71.6	72.1	1.7	1.0	1.3	6/21	6/18	6/20
5	MN06078W	1747	8	2182	4	1965	7	69.6	71.3	70.4	1.3	1.7	1.5	6/19	6/19	6/19
6	Rollag	1741	9	1860	9	1801	9	73.8	73.8	73.8	1.0	1.0	1.0	6/20	6/19	6/19
7	Sabin	1874	7	2532	2	2203	2	70.5	72.5	71.5	1.3	1.3	1.3	6/22	6/20	6/21
8	Glenn	1941	4	2073	5	2007	4	75.2	74.5	74.9	1.0	1.0	1.0	6/19	6/18	6/18
9	Lucille (Emmer)	1267	10	1723	10	1495	10	38.0	38.9	38.4	6.3	7.0	6.7	6/27	6/24	6/25
10	CDC Zorba (Spelt)	3035	1	2789	1	2912	1	34.2	36.2	35.2	2.7	3.3	3.0	6/28	6/28	6/28
	Mean	1948		2149		2049		64.7	65.1	64.9	2.2	2.5	2.4	6/22	6/20	6/22
	CV	8.5		4.5												

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2014 Hybrid Winter Rye Regional Trial – Cornell University

Cumulative Summary		Grain Yield 2 Year	
	Entry	kg/h	b/a
1	Palazzo	6600	105
2	KWS Magnifico	6613	105
3	Brasetto (180 k/m2)	6556	104
4	Brasetto (200 k/m2)	6639	106
5	Brasetto (250 k/m2)	6903	110
6	KWS Bono (H 119)	6508	104
7	KWS Rhavo (H 120)	6539	104
8	Medina (wheat ck)	3857	61