



PA Malt

Philadelphia Society for Promoting Agriculture
01-Dec-2016 Luncheon

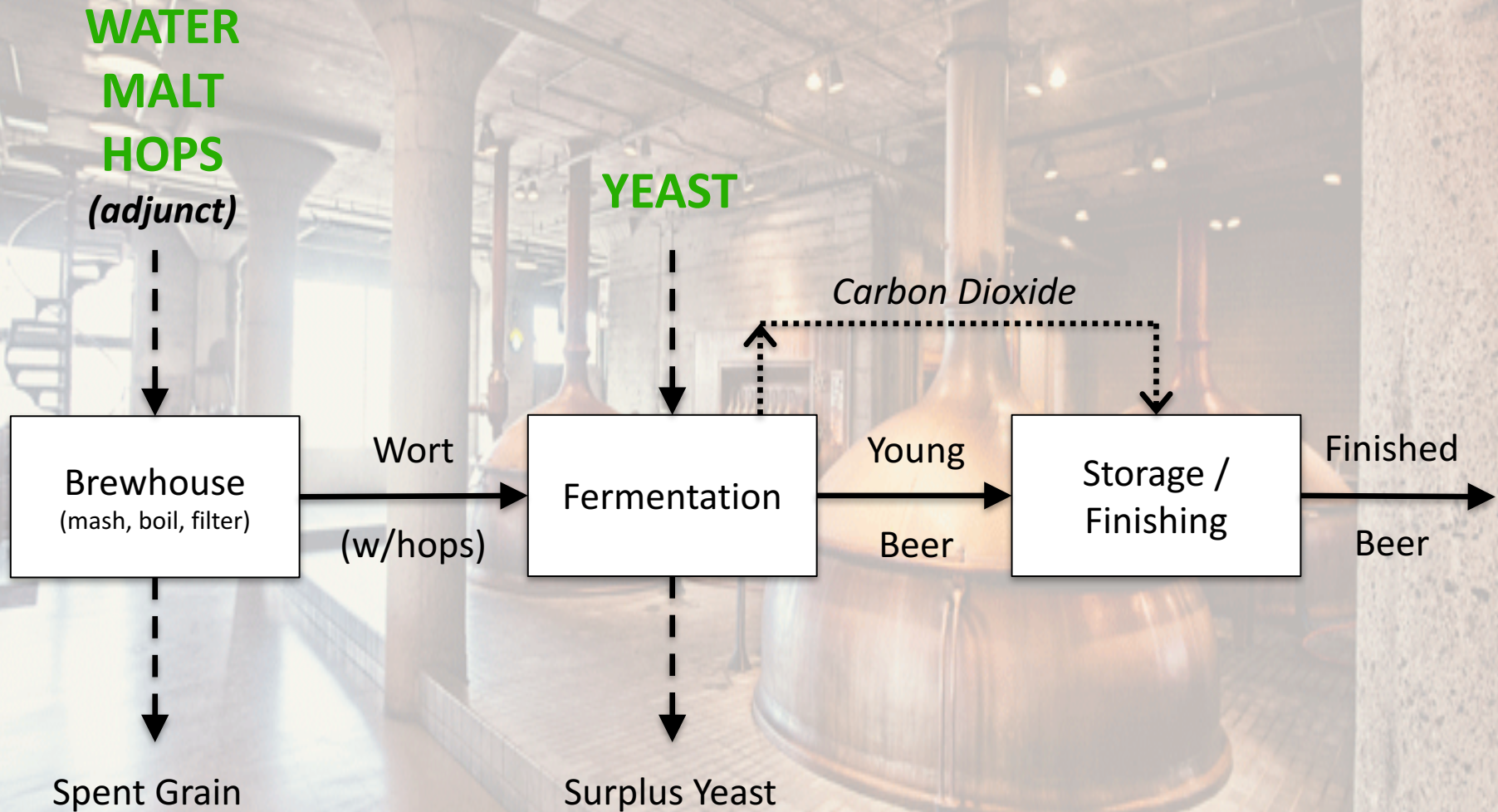
Mark Brault, Co-Founder
Scott Welsh, Co-Founder

Outline

- Malting 101
- Current Malting Barley Economy
- Opportunities for Improvement
- Pennsylvania Craft Malt®
- Key Success Factors



Brewing Process Summary



No Malt means No Beer

Water, hops, and yeast alone cannot make a beer!



Brewing Fundamentals

- Malted Barley Contributions to Brewing:
 - Source of modified carbohydrates
 - Enzymes to reduce modified carbohydrates to fermentable sugar
 - Soluble protein
 - Color and flavor
 - Filter material for wort clarification

***This list of contributions is the very essence of the brewing process!
Unmalted barley cannot provide these attributes!***



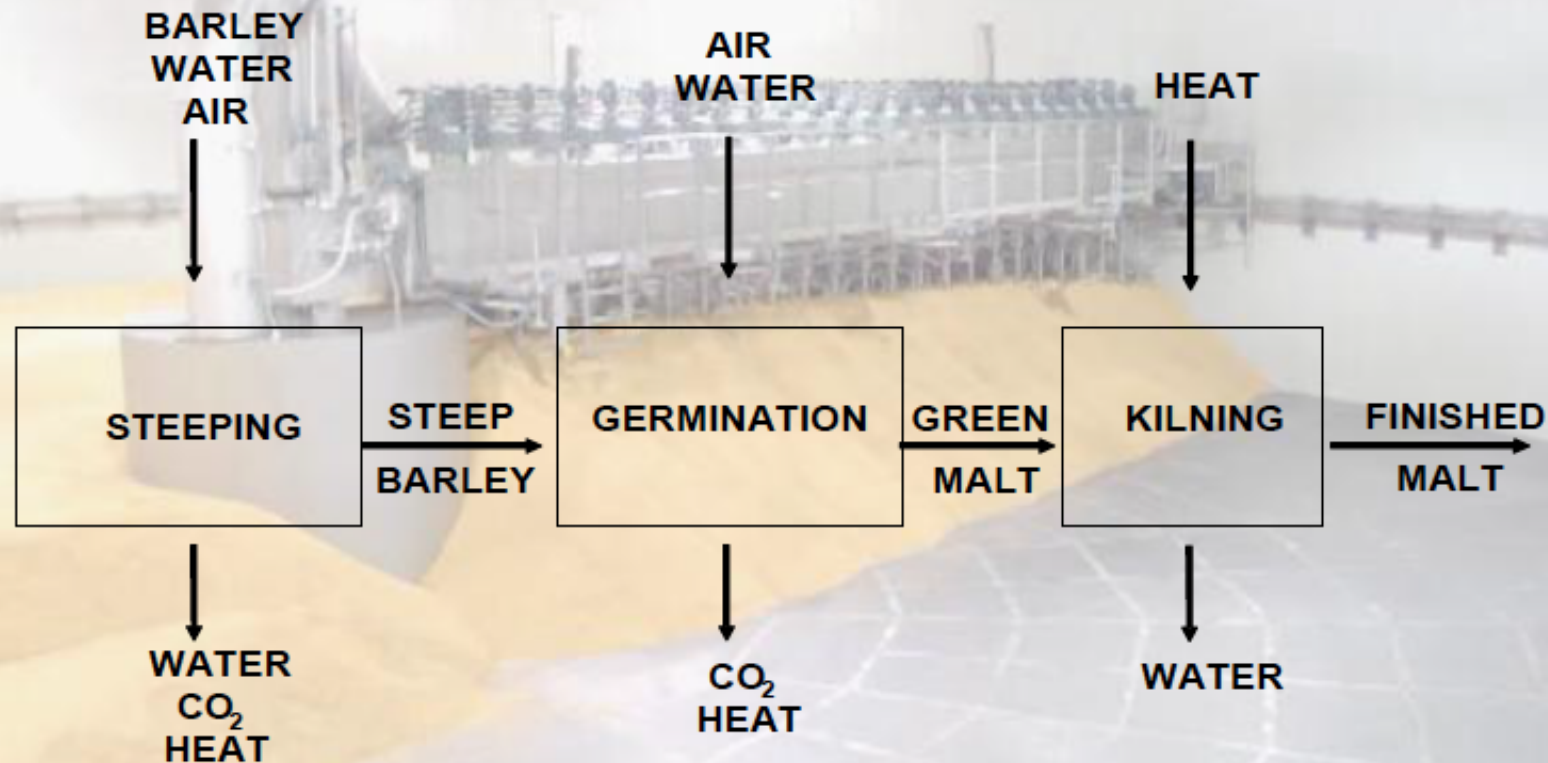
Malting Fundamentals

Plant Germination:

- Uncontrolled and unchecked, the germination process will consume the entire barley kernel and create a barley plant
- **“Modification”** – a comprehensive term that describes all of the physical and chemical changes that occur when barley is converted to malt



Malting Process Summary



***An uncomplicated batch process with only a few inputs!
The only “ingredient” on a malt label is barley!***



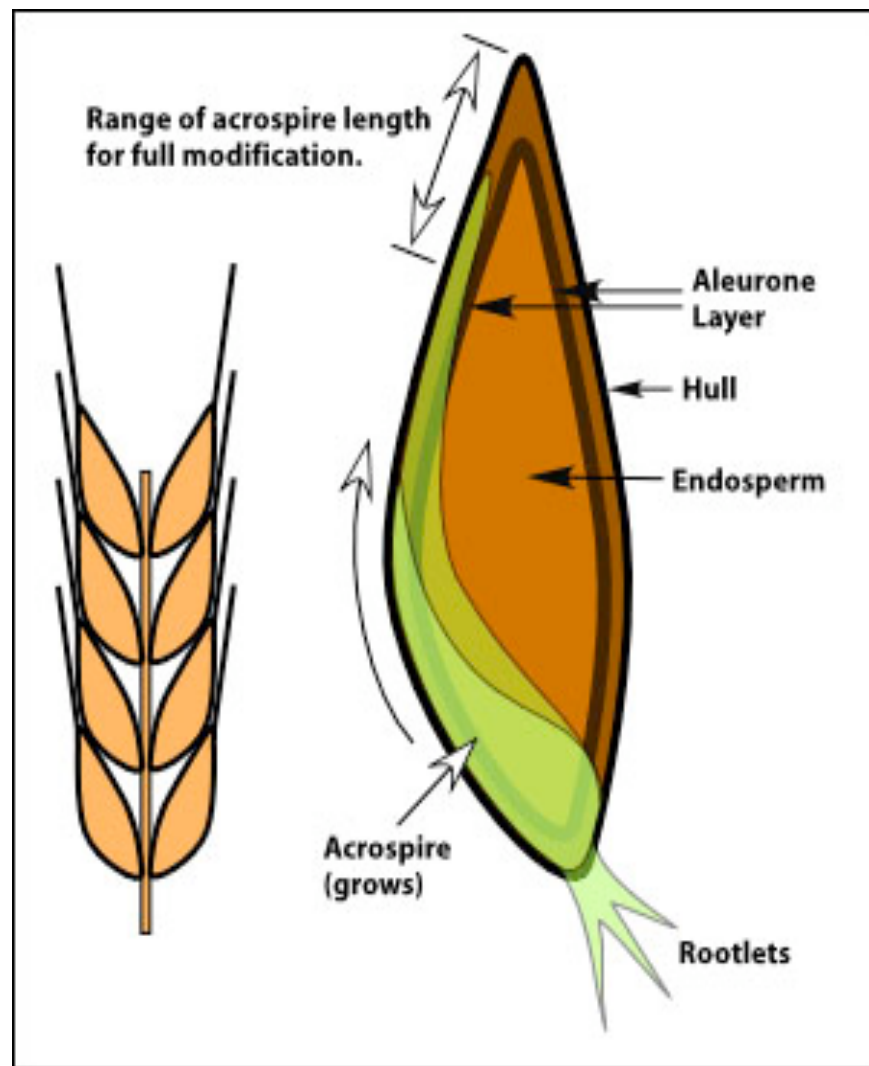
Complements of Joseph Hertrich

Deer Creek Malthouse, LLC
Pennsylvania Craft Malt®

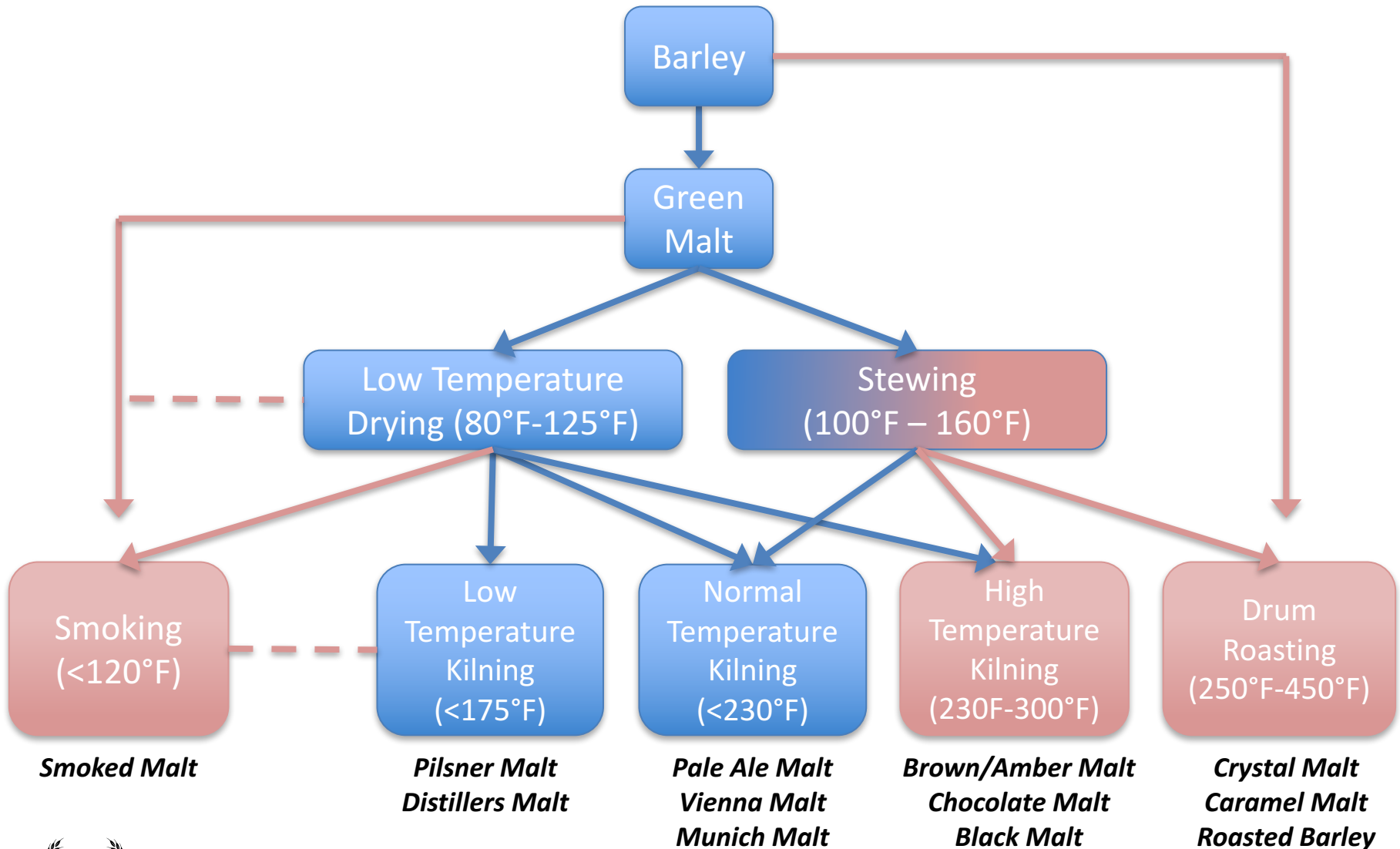
What is the barley kernel doing during Germination?

**“Modification” is directional;
not perfectly sequential:**

- **Kernel Activation** – steeping
 - Embryo rehydration
 - Gibberellin hormone to the aleurone layer
- **Enzyme Creation Phase** – germination
 - Production of amylases, glucanases, proteases, lipases, and lipoxygenases
- **Substrate Digestion Phase** – germination
 - Protein reduction first, carbohydrate reduction second, glucans third

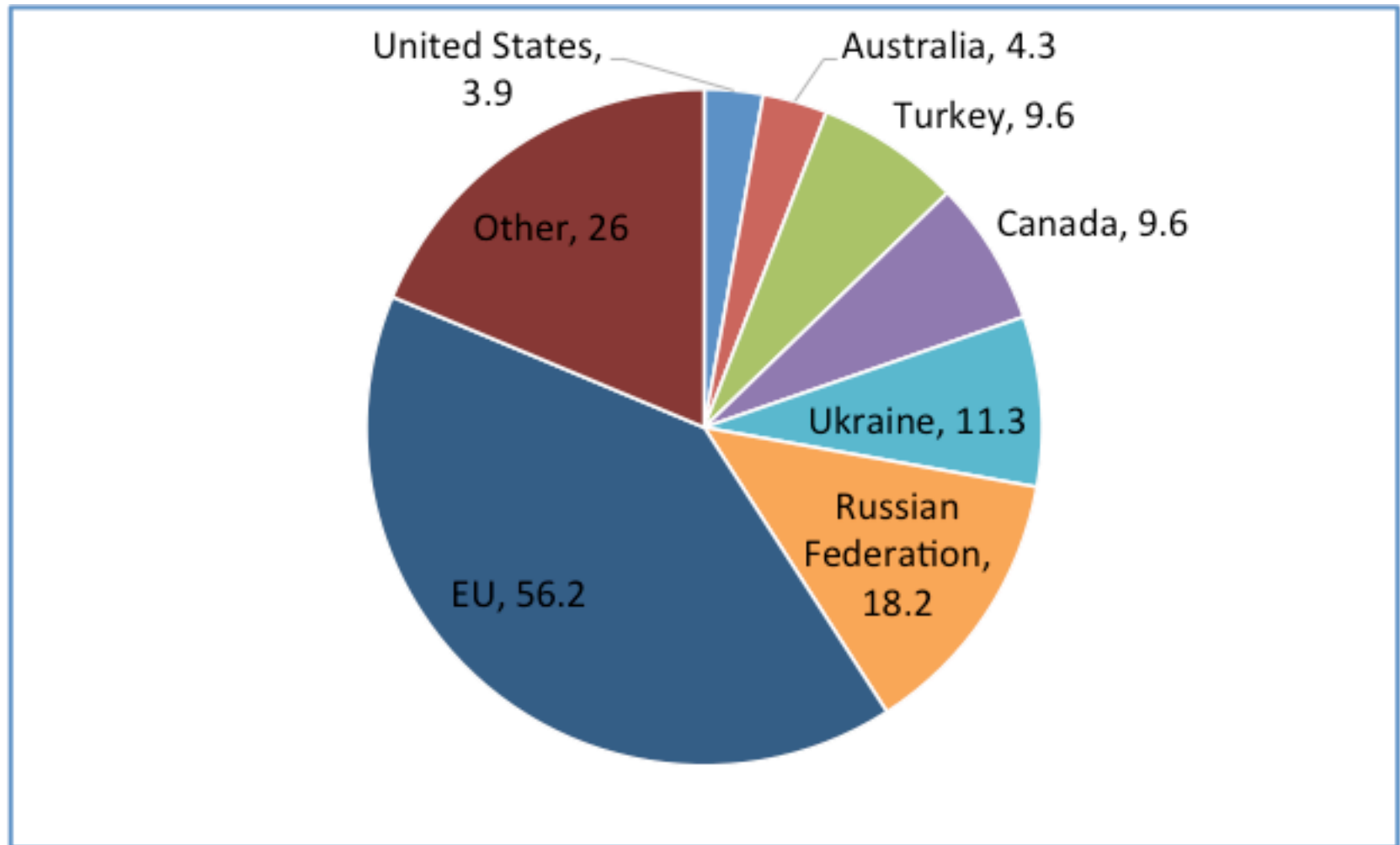


Schematic of Malt Production



Malting Barley Countries

Millions of Tons



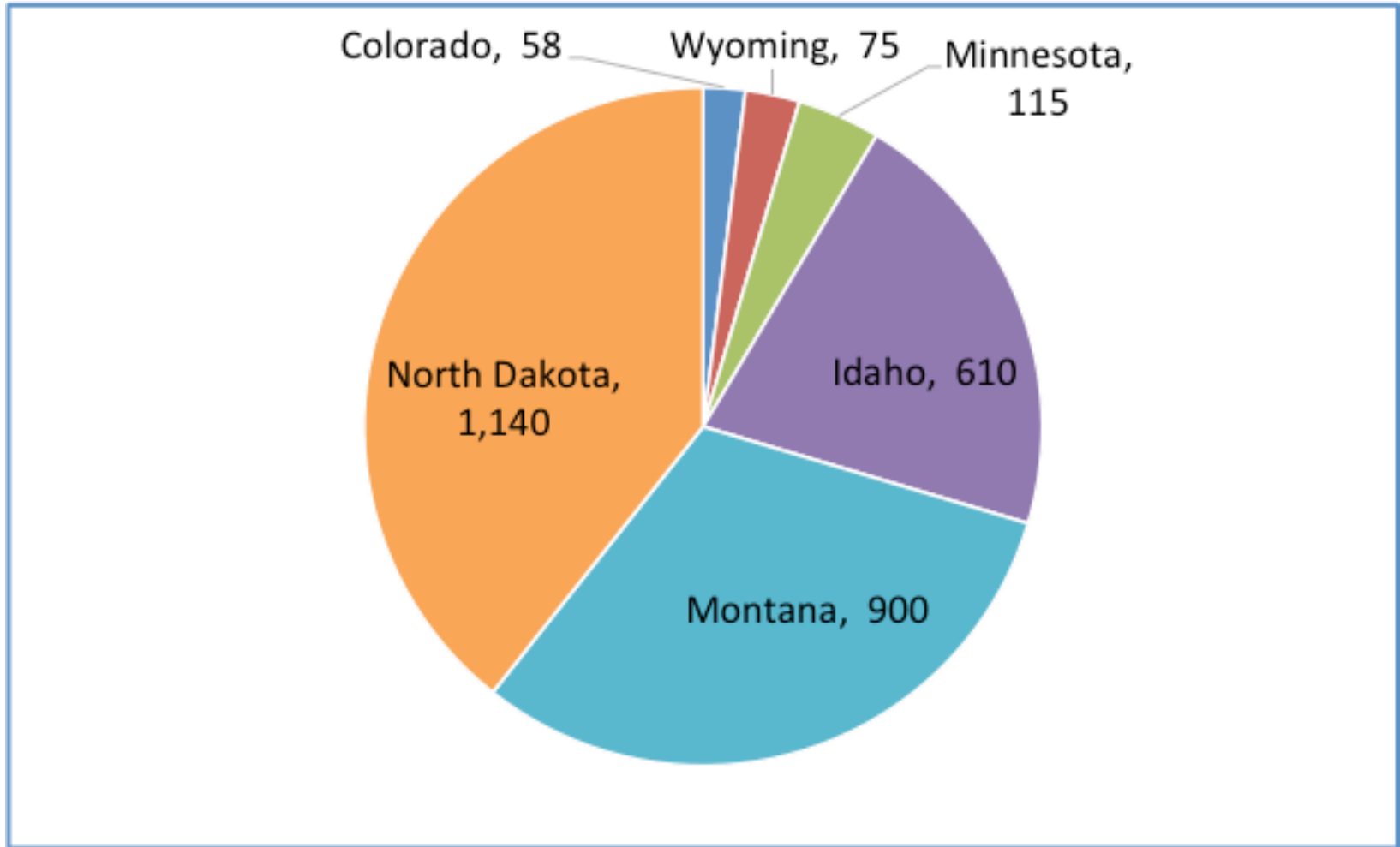
2012 AMBA Data



Deer Creek Malthouse, LLC
Pennsylvania Craft Malt®

Malting Barley States

1000s Acres of Malting Barley



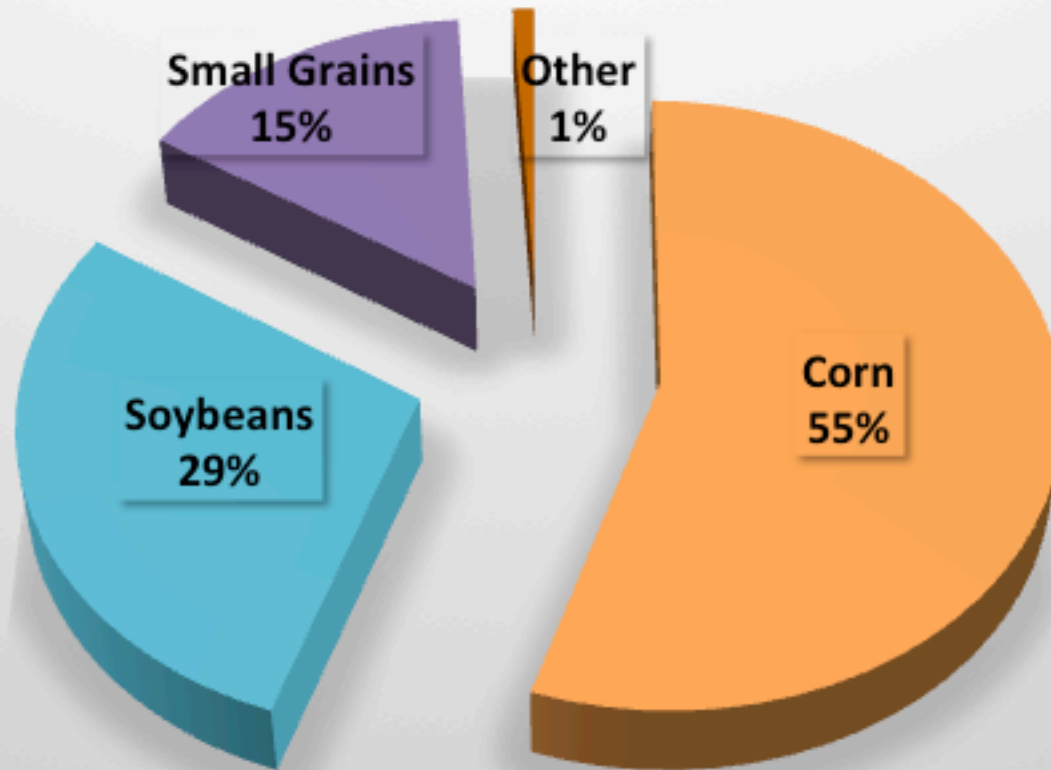
2012 AMBA Data



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Pennsylvania Production Data

Pennsylvania Agronomic Crop Acreage



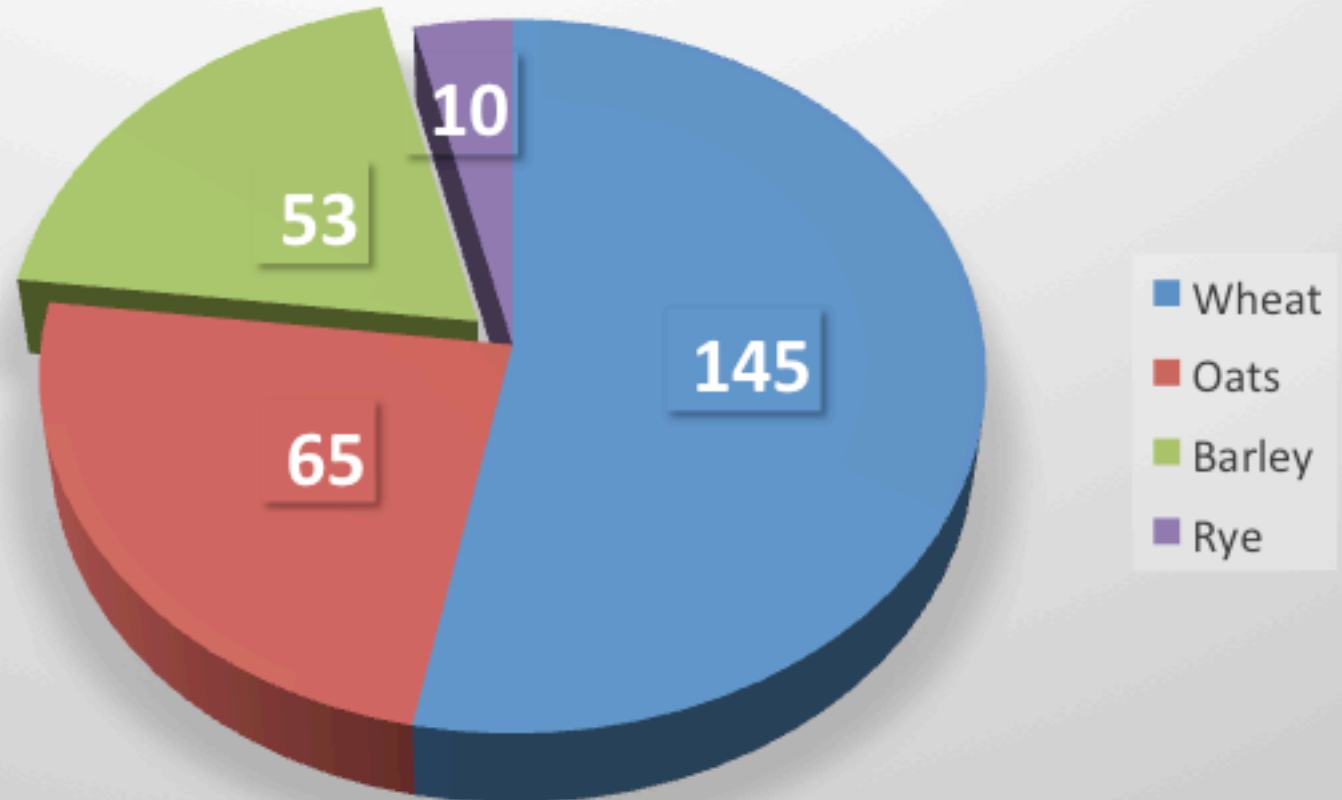
USDA 2012 Census



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Pennsylvania Production Data

Small Grains, PA Acres (1000s)



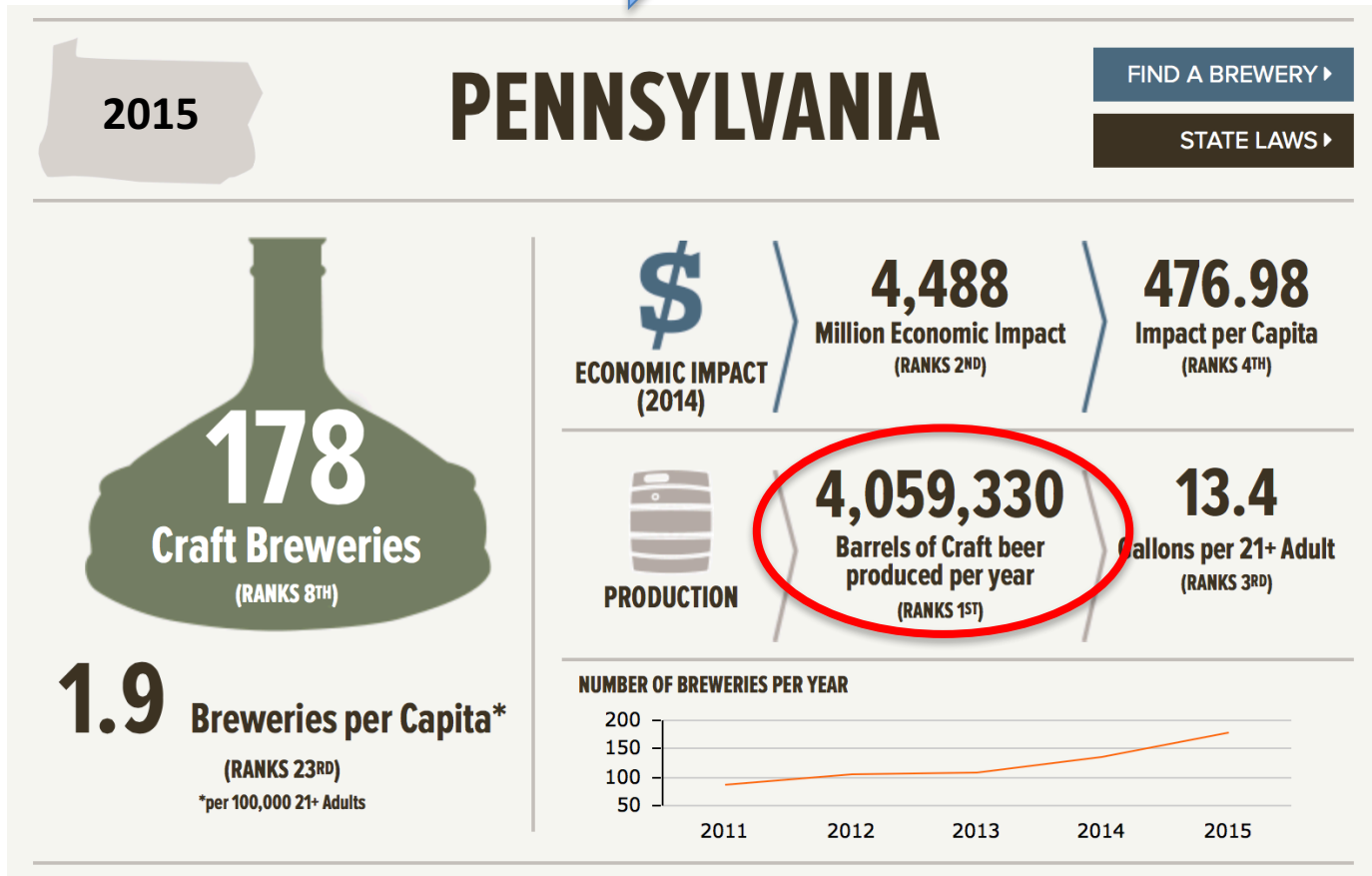
USDA 2012 Census



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Pennsylvania Beer by Acres

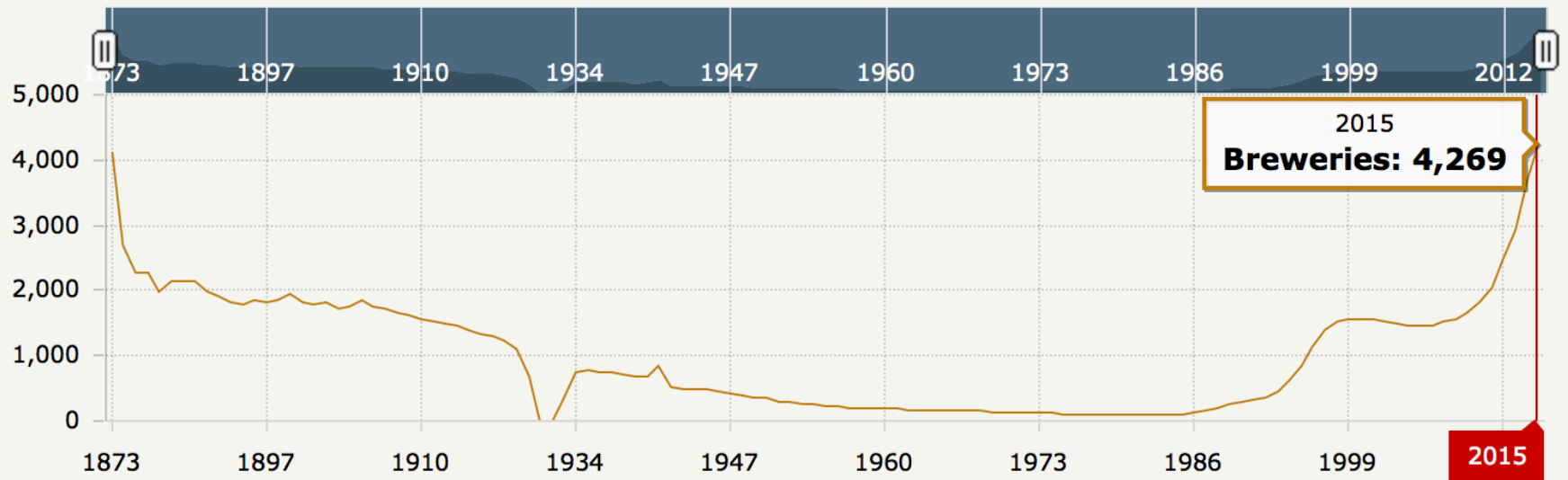
4.07m barrels/yr  ~133,000 acres of barley*



*70 lbs of malt per barrel of craft beer; 60bu/acre yield malting barley; 80% malt yield; 15% dockage



US Breweries



Brewers Association Statistics



Still Growing!

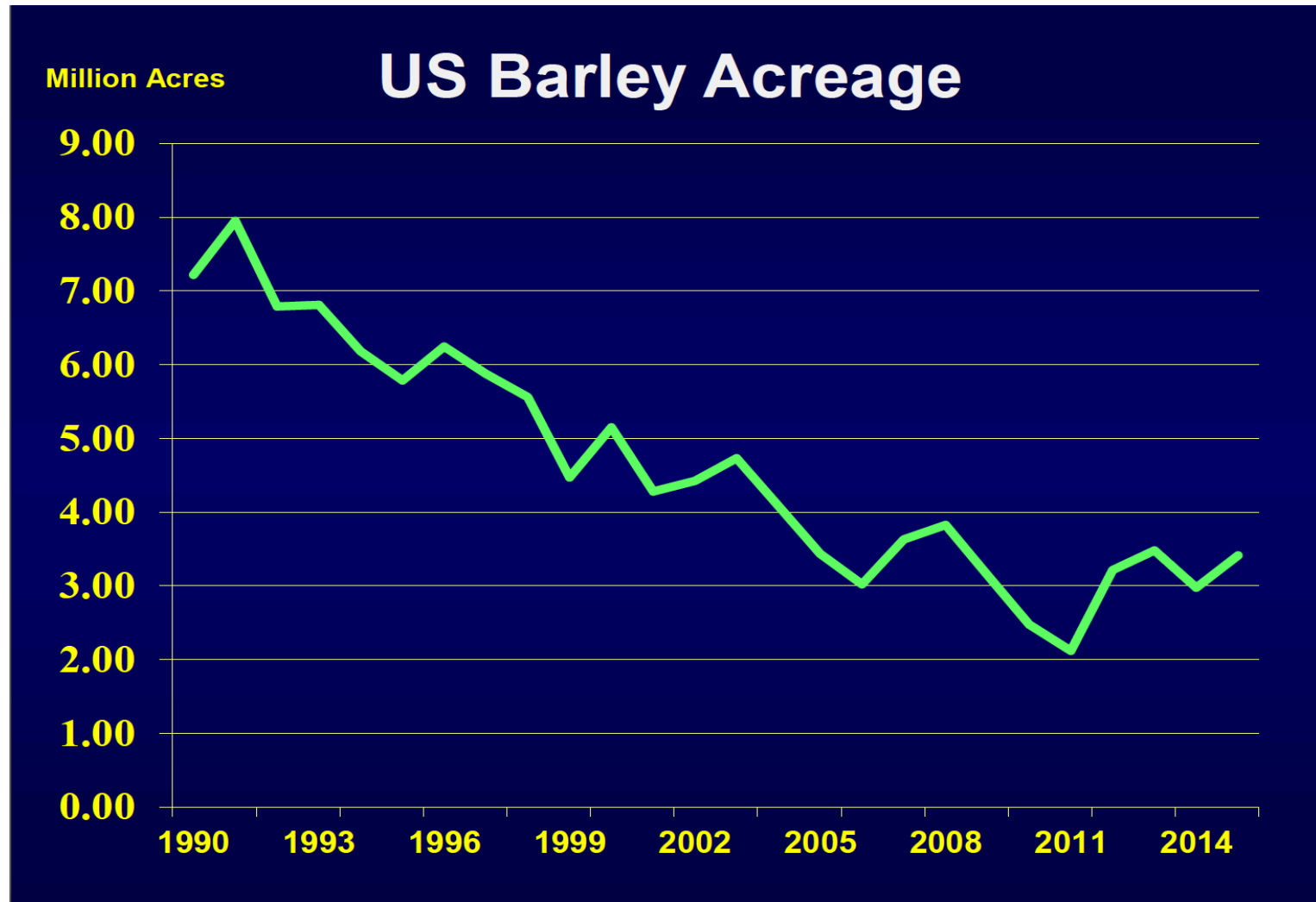
U.S. Brewery Count

	2012	2013	2014	2015	'14 to '15 % Change
CRAFT	2,401	2,863	3,676	4,225	+ 18.1
Regional Craft Breweries	97	119	135	178	+ 31.9
Microbreweries	1,149	1,464	2,041	2,397	+ 21.6
Brewpubs	1,155	1,280	1,500	1,650	+ 12.2
LARGE NON-CRAFT	23	23	26	30	
OTHER NON-CRAFT	32	31	20	14	
Total U.S. Breweries	2,456	2,917	3,722	4,269	+ 17.9

Brewers Association Statistics



Barley Production by Year

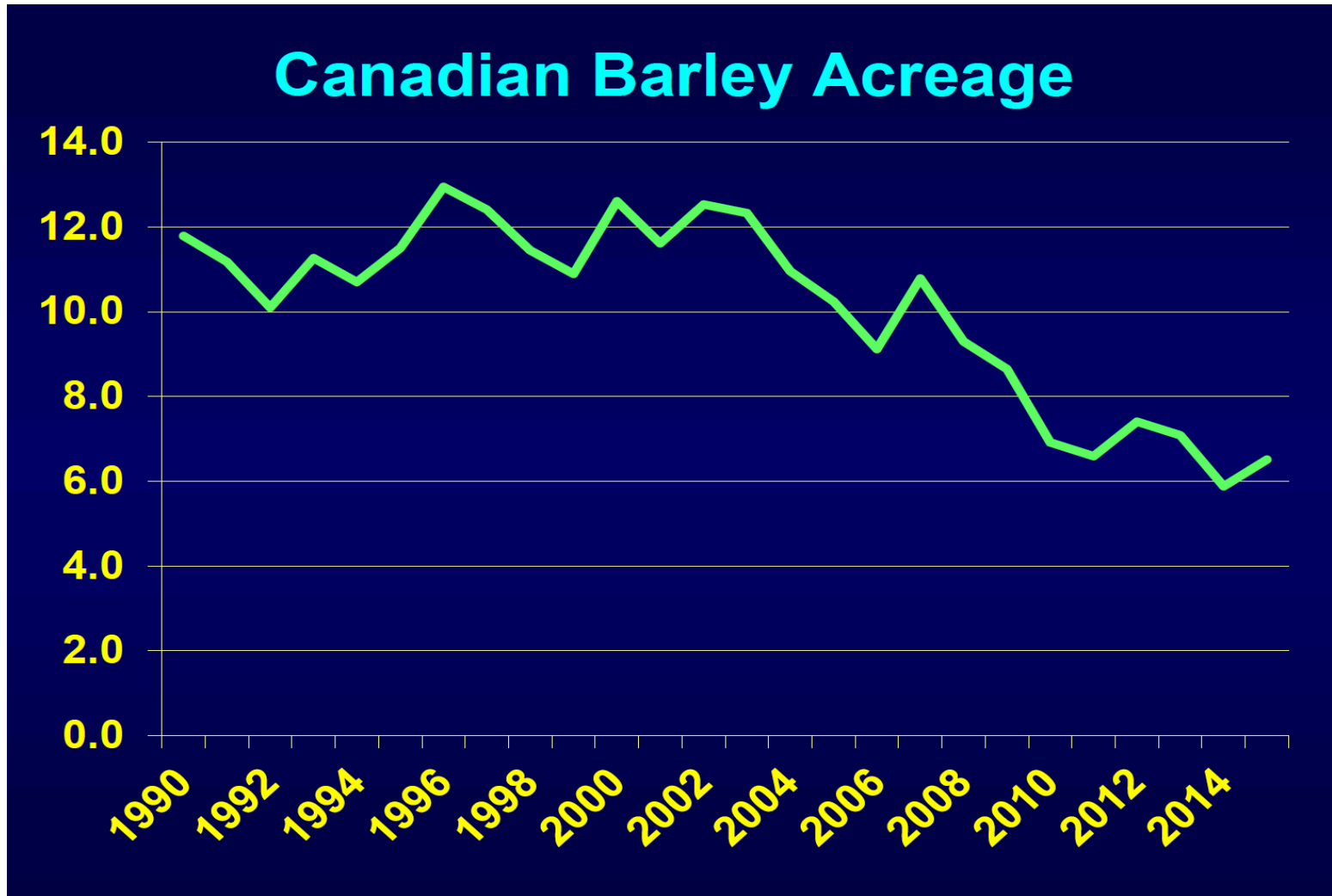


Complements of Mike Davis, AMBA



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Barley Production by Year



Complements of Mike Davis, AMBA



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Malting Barley Supply Chain Opportunities

- Industry demand outpacing supply
- Limited supply of LOCAL malt
- Craft brewers have different needs than large adjunct brewers
 - Specs
 - Storage / Logistics
 - Personalization / Customization
 - Scale
- R&D not focused on flavor origins, winter 2-row breeding, and non-barley malt product development



Pennsylvania Craft Malt®

Quality

- “Craft” specifications
- Small batches, process flexibility
- Analytical testing

Flavor

- Traditional floor malting
- Variety selection
- Pilot brewing



Local

- Responsibly sourced grain
- Malt produced in SE PA
- Consumed in the Mid-Atlantic



Great Barley → Great Malt → Great Beer

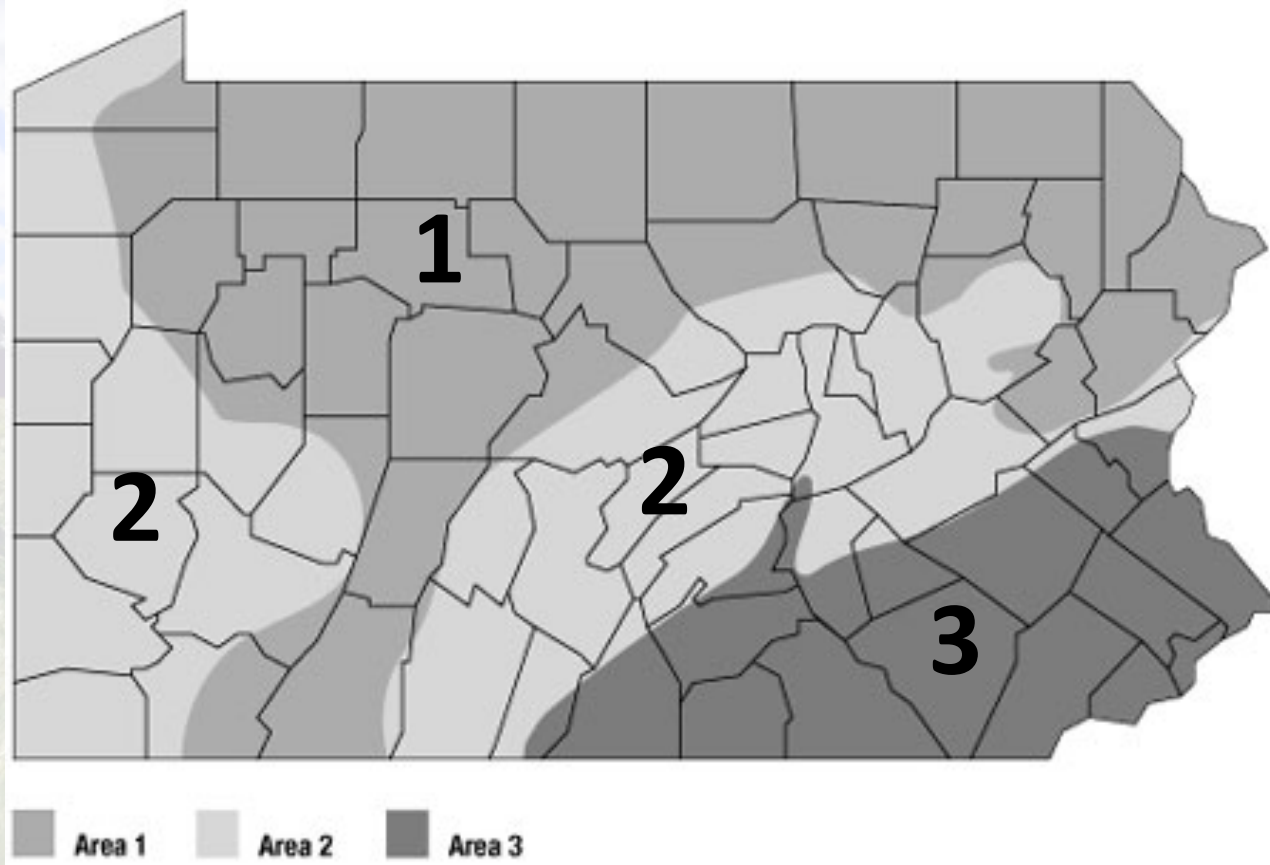


Variety Trials / Selection

- Agronomic factors
 - Winter hardiness
 - Disease resistance
 - Dormancy
(resistance to PHS)
- Malting factors
 - Plumpness
 - Germination
 - Protein
 - DP
 - β -Glucan
- Flavor
 - Micro malting
 - Pilot brewing
 - Sensory analysis



Barley Growing Regions in PA



- Spring barley typically not grown in Area 3
- Winter barley varieties grow well with highest yields in Area 3
- Variable yield from PSU and Deer Creek MH variety trials



PA Malt Key Success Factors

- **Agronomic**
 - Winter hardiness
 - Disease resistance
 - Dormancy (resistance to PHS)
- **Infrastructure**
 - Quality
 - Scale
 - Variety
- **Collaboration**
 - Every node in the value chain
 - Change catalyst



Questions?



What's on Tap?

- Beer releases with our malt
- Events
- Beer and malting news



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Other questions?



info@deercreekmalt.com
717-746-MALT



Craft Brewer Malt Barley Supply Gap Solutions

Gap	R&D	Farm	Malthouse
FAN			
Diastatic Power			
Scale			
Contracting			
Geography			
Flavor			



Malting Barley Economic Shift

Dimensions	Current	New
Customers	Large Adjunct	Small All-Malt
Farming	Centralized	Decentralized
Distribution	Broad, Established	Local, Direct, New
Production	Large Scale	Small, Flexible, Local
Geography	Great Plains	Everywhere!



Malting Barley Characteristics for Craft Brewers

To produce all-malt beer brands, craft brewers seek barley malts with:

Trait / Topic	Consensus Target
FAN	<150 ppm
Diastatic Power	<150 Linter
Protein Content	<10.5%
Protein Modification (S/T)	35% - 45%
Beta Glucan	<140 ppm
Flavor	Distinct!

The demand for such malts will grow as craft production increases





MALT ANALYSIS



Product: Pennsylvania Dutch Malt

Lot: M15G022B

Source: Chester County, PA

Variety: 2-Row Winter Barley

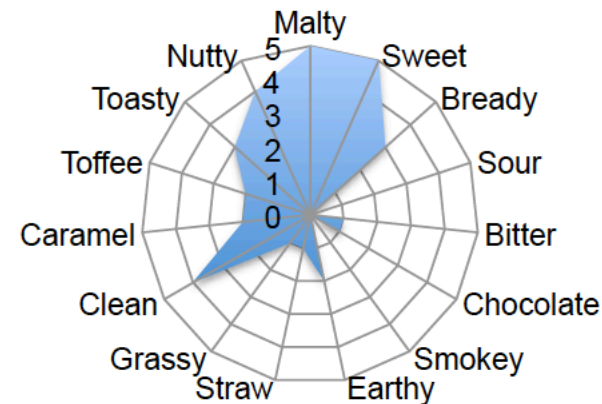
Utilization: Up to 100%

Kilned on: 22-Jul-2015

General Description:

PA Dutch malt is produced from well-modified, two-rowed barley in the spirit of Pennsylvania German heritage and the traditional “Munich” style of malt. Sourced from only the highest quality locally grown barley, and handcrafted using traditional floor germination techniques, this artisanal malt produces a very clean, malty wort with nutty, toffee sweetness, dark amber color, and enough diastatic power to convert itself quickly. Notes of burnt straw, caramelized nuts, and toasted bread. It is perfect for Bock, Märzen, Altbier, or Oktoberfest recipes, or any beer (or spirit) where a malt-forward flavor profile is desired.

Wort Flavor Profile:



Modification Indicators

Malt Quality Analysis:

Size Distribution		Extract Potential		Wort Characterization	
>6/64" (%)	98	FGDB (%)	80 [*]	Color (SRM)	10-11
>5/64" (%)	1	CGDB (%)	77.5	pH	5.4
<5/64" (%)	1	FGDB/CGDB	2.5	Viscosity (cP)	1.37
		D.P. (°L)	115	Clarity <small>[clear, hazy, cloudy]</small>	clear
Nitrogen Analysis		α-amylase (D.U.)	80	S.G.	1.035 [†]
Protein (%)	11.5 [‡]	Conversion Time (min)	<20	°Plato	8.65
Soluble Protein (%)	5.57				
Total Nitrogen (%)	11.3	Other		Fermentability	
S/T (KI) (%)	49.3	Moisture (%)	4-6	ADF (%)	80 [§]
FAN (mg/L)	236	Filtration Time <small>[good, fair, poor]</small>	good	RDF (%)	64.8
		β-glucans (ppm)	50		
		Friability (%)	80		

* Coarse (CG) and fine grind (FG) extract from 1hr single infusion mash at 152°F

† FG result shown for S.G. from 1hr single infusion mash (CG = 1.034, 8.41 °P)

‡ Average result from unmalted barley analysis

§ Typical result from 5 gallon fermentation experiment after 7 days

Questions about quality analysis? Contact Mark at 717.746.MALT or mark@deercreekmalt.com

Deer Creek Malthouse
1646 E. Street Rd.
Glen Mills, PA 19342

