

Winter Malt Barley Production and Market Development in the Mid-Atlantic USA



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Abstract

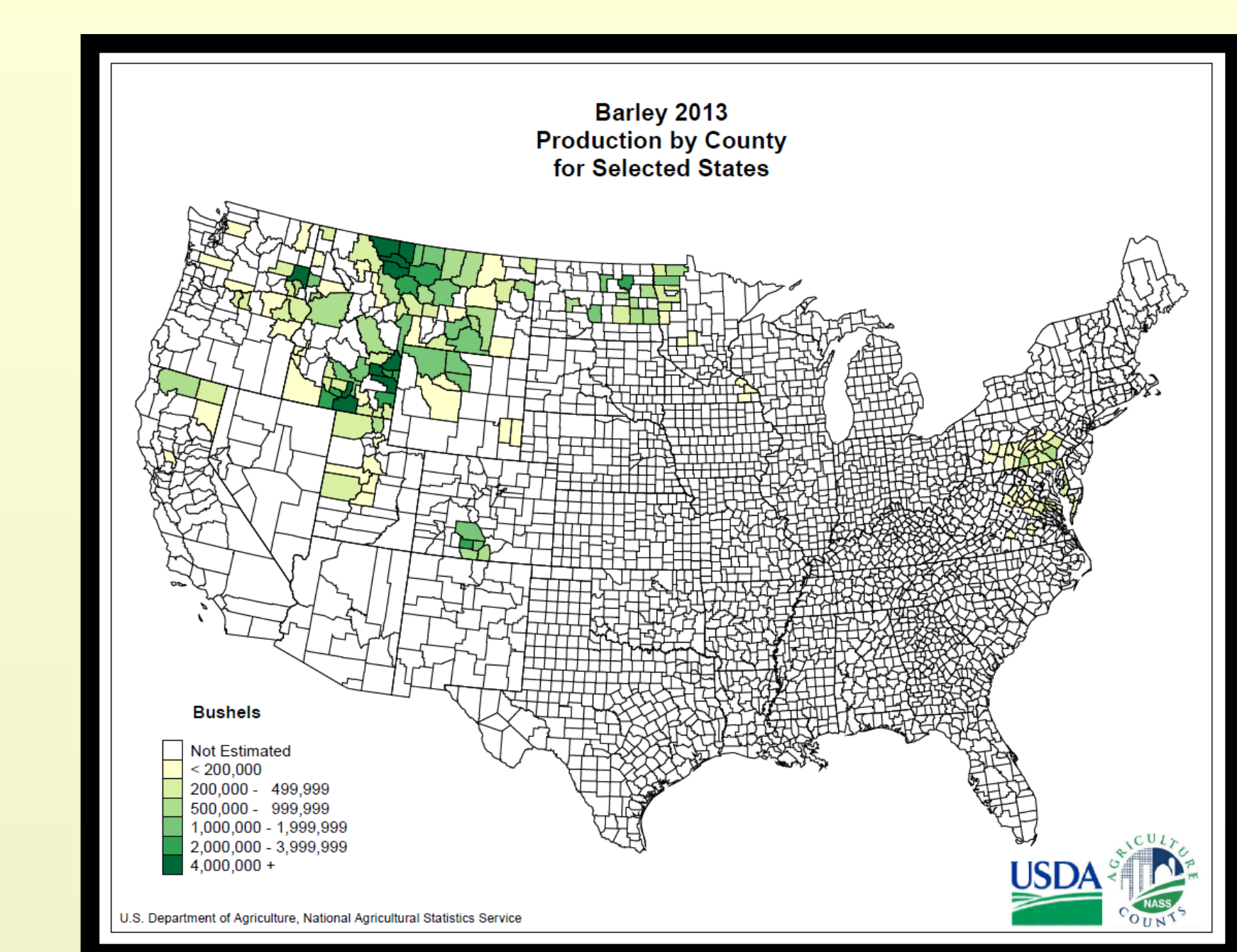
According to the Virginia Craft Brewers Guild, the number of craft breweries is expected to increase by 50% over the next five years. In order to supply this industry with quality raw materials, and to produce as much of this raw material in Virginia as possible, an investment is needed in malt-type barley (*Hordeum vulgare* L.) production research and extension. Cultivar evaluations and studies of cultivar-by-management interactions have been conducted to develop extension recommendations considering both barley yield and end-use quality. Cultivar development through traditional breeding and marker assisted selection is ongoing. Extension programs are focused on understanding the needs of the brewing industry and supplying quality raw materials to that industry.

Current Situation

1. Current and future demand for locally grown malt-type barley exists in Virginia and the mid-Atlantic region
2. Virginia currently produces 2.7 million Mg of feed barley annually but plantings are declining due to poor market opportunities
3. The number of craft breweries in Virginia is expected to increase by 50% by 2015. Most of these are small operations that add significant value to local agricultural products.
4. Due to Virginia's proximity to multiple population centers, value-added commodity production is a viable endeavor for many growers, including barley producers.
5. Farm business and tourism opportunities exist with farm-based craft breweries.

Approach

1. Evaluation of existing malt-type cultivars in the mid-Atlantic with emphasis on agronomic and end-use quality characteristics.
2. Breeding and development of new, locally adapted malt-type cultivars.
3. Research and development of best agronomic practices for malt-type barley for the mid-Atlantic.
4. Demonstration and extension of production techniques and recommended cultivars.
5. End-user outreach and market development.



Activities

- Participation in the Uniform Winter Malt Barley trials led by USDA-ARS

2013-14 Barley grain yield and agronomic characteristics, UWMBT, conducted at Blacksburg and Warsaw, VA

Line	Yield Rank	Yield (kg/ha) (t/ha)	Moisture (%)	Test Weight (kg/m ³)	Heading Date	Height (cm)	Log Lodging (°)	Leaf Rust	Powdery Mildew (SPG)	Net Weight (kg)	Yield (kg/ha)	Water Uptake (kg/ha)
Thoroughbred	1	3902	13.9	584.9	114.0	35.3	5.3	1.8	1.3	0.0	0.0	91.7
VA10B-43	2	3743	13.7	615.3	113.0	35.7	5.8	1.8	1.3	0.0	0.0	85.2
VA10B-29	3	3584	13.5	599.9	116.2	38.8	4.0	2.7	4.3	0.0	0.0	91.7
Endeavor	4	3582	13.4	599.9	116.2	38.8	4.0	2.7	4.3	0.0	0.0	91.7
Novosadski 183	5	3228	13.6	576.5	119.5	35.3	5.3	1.8	1.3	0.0	0.0	80.0
Novosadski 293	6	3192	12.8	581.1	113.7	35.3	5.3	1.8	1.3	0.0	0.0	80.0
Charles	7	3138	14.2	590.0	121.6	35.3	5.3	1.8	1.3	0.0	0.0	80.0
McGregor	8	2796	13.5	480.3	115.5	38.2	7.0	8.0	8.0	0.0	0.0	85.0



- Malt quality testing performed on all entries in UWMB trials by USDA-ARS Cereal Crops Research Unit, Madison, WI

Variety or Selection	Kernel wt. (mg)	Color (L*	Barley Yield (t/ha)	Malt Yield (t/ha)	Water Absorption (ml/100g)	Wort Density (°P)	Wort Volume (ml)	Protein (g/kg)	Protein (%)	Alpha-amylase (IU/kg)	Beta-amylase (IU/kg)	FAN (g/kg)	Quality Score	Overall Rank
Charles	26.4	83.0	38	78.6	4.4	1	34.0	161	12.0	105.6	174	207	29	3
Endeavor	23.5	24.7	39	75.3	3.8	2	34.3	143	10.3	121	74	167	26	12
McGregor	27.4	65.5	28	79.2	4.1	1	33.9	157	12.4	101	148	142	14	18

Activities (cont.)

- Virginia malt-type barley cultivar evaluation studies conducted annually at Warsaw and Blacksburg, VA
- Grain physical and compositional analysis (protein, starch, ash, fat, etc.) conducted on samples from Virginia evaluation studies

Our program is focusing on developing barley having superior malt quality for potential use in the brewing industry. In this regard, the Virginia Tech breeding program has evaluated several winter malting barley lines over the past several years, primarily for use as parents in our breeding program. One of the two parents of our hulled barley variety Thoroughbred is 'Plaisant', a French malting variety, imparting Thoroughbred with fairly good malt extract but lacking desired enzymes for large scale beer production.



- Research and development of best agronomic practices for malt-type barley for the mid-Atlantic.

2012-13, Over Locations, Painter and Orange

Cultivar	%	kg m ⁻³	0-9	Yield
Thoroughbred	13.5	571.6	1.8	5404
VA10B-43	13.6	567.8	1.7	5331
VA09B-29	13.3	554.7	1.2	5205
Endeavor	13.8	549.5	1.9	4708
VA09B-35	13.4	577.4	2.9	4574
VA09B-34	13.3	573.8	2.2	4324
Novosadski 183	13.4	568.7	2.1	4042
Novosadski 293	13.8	553.6	1.9	4043
Charles	13.4	506.0	3.0	3526
LSD (0.05)	0.3	27.0	ns	478

Summary of performance of multi-type entries, Over locations, 2013-14	Yield	Moisture	Test Weight	Height	Log Lodging	Leaf Rust	Powdery Mildew	Net Weight	Barley Yield	
Thoroughbred	3624	13.2	617.5	120.3	62.7	4.1	1.1	5.8	2.3	0.0
VA10B-43	3552	13.3	619.5	117.6	68.8	4.8	0.2	5.3	0.8	0.0
VA12B-7	3377	13.3	623.1	117.7	91.2	3.4	1.6	1.7	2.2	0.0
Satum	3242	13.4	575.5	121.8	79.1	4.4	0.4	1.9	1.9	0.3
McGregor	3048	13.3	575.6	121.0	69.7	4.2	0.0	0.3	1.3	0.0
KWS Iga	2854	13.5	610.0	124.0	62.8	3.4	0.1	1.8	0.9	1.2
VA09B-35	2625	13.2	617.0	116.1	69.2	6.4	0.0	1.2	0.9	0.0
VA09B-34	2451	13.3	626.4	115.5	67.0	4.5	0.2	0.8	1.1	0.0
Viola	2029	13.3	626.1	119.9	70.8	3.9	0.0	0.2	1.2	0.3
Endeavor	1875	13.4	618.6	121.5	88.2	4.5	0.5	1.6	2.2	0.0
Charles	3956	13.4	541.0	119.8	75.2	6.2	1.0	1.4	2.2	0.0
LSD (0.05)	224	0.6	8.1	0.4	1.9	0.9	0.6	0.8	0.5	0.6
CV	19									

Our typical variety tests do not employ fungicides, however in this case we wanted to assess the relative performance of these malt type barley cultivars under a management regime that would be recommended to commercial growers.

Two experiments were conducted in 2012-13 to measure the effect of cultivar disease resistance and fungicide application in current and promising malt-type barley lines and standard cultivar comparisons. Charles and Endeavor are winter malt barley cultivars developed by USDA-ARS in Idaho. Thoroughbred was developed by Virginia Tech and has been widely grown in the mid-Atlantic region. Novosadski 183 and 283 were developed in Yugoslavia (the former Soviet Union) and were originally identified in early screening in the 1990's as being at least partially adapted to Virginia conditions. Lines designated with a VA- are experimental cultivars developed in the Virginia Tech program. Listing and usage of the fungicides in this test does not imply endorsement of these products over others. They were chosen because these products are in common use by producers in the region.

Over locations Thoroughbred, VA10B-43, and VA09B-29 were the highest yielding entries, followed by Endeavor. When Tilt (at GS 48) and Prosoaro (GS 58) fungicides were applied, yields were higher than when no fungicide was applied or when Tilt alone was used. This implies that protection from late season diseases such as leaf rust and head scab was advantageous this season.

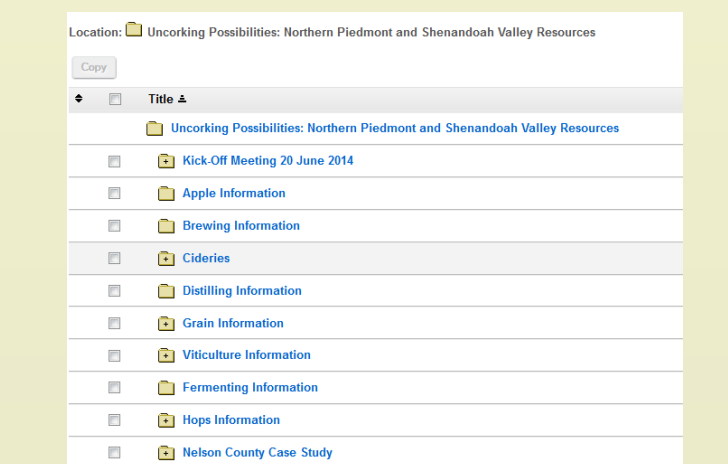
Activities (cont.)

- Field days and demonstrations of malt-type winter barley for Virginia



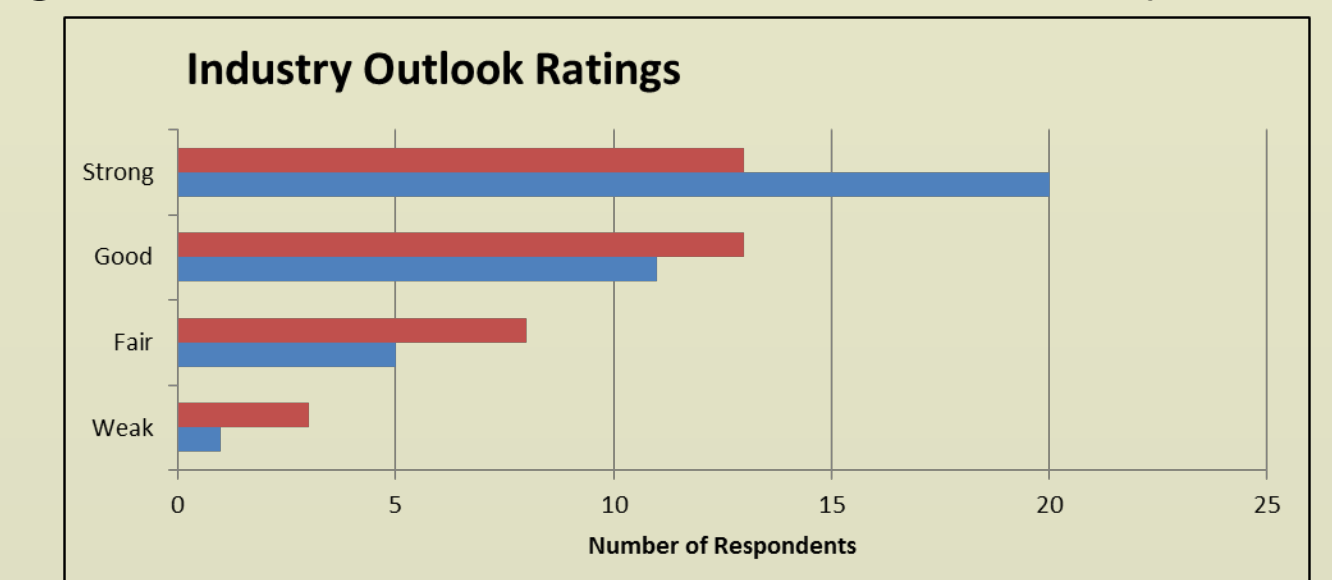
- Uncorking the Possibilities working group and Scholar site for identifying:

- Opportunities
- Stakeholders
- Capabilities
- Information requirements
- Business partners



- Producer and end-user surveys distributed in 2014

- Opportunities:
- Demand-driven and growing market
- "Locally grown" products
- Decreased transportation costs
- Higher value than current feed barley



- Challenges:
- Quality and consistency
- Developing markets means developing relationships
- Lack of well-adapted cultivars
- Lack of grain-handling infrastructure and experience



Future Plans

- Continued malt-type barley cultivar development and evaluation
- Field days and demonstrations both for growers and potential end users
- Industry-wide "summit" to further identify needs and barriers to increased local production and use of malt-type barley
- Expansion of grain quality evaluation and testing capacity at Virginia Tech



Department of Crop & Soil Environmental Sciences