



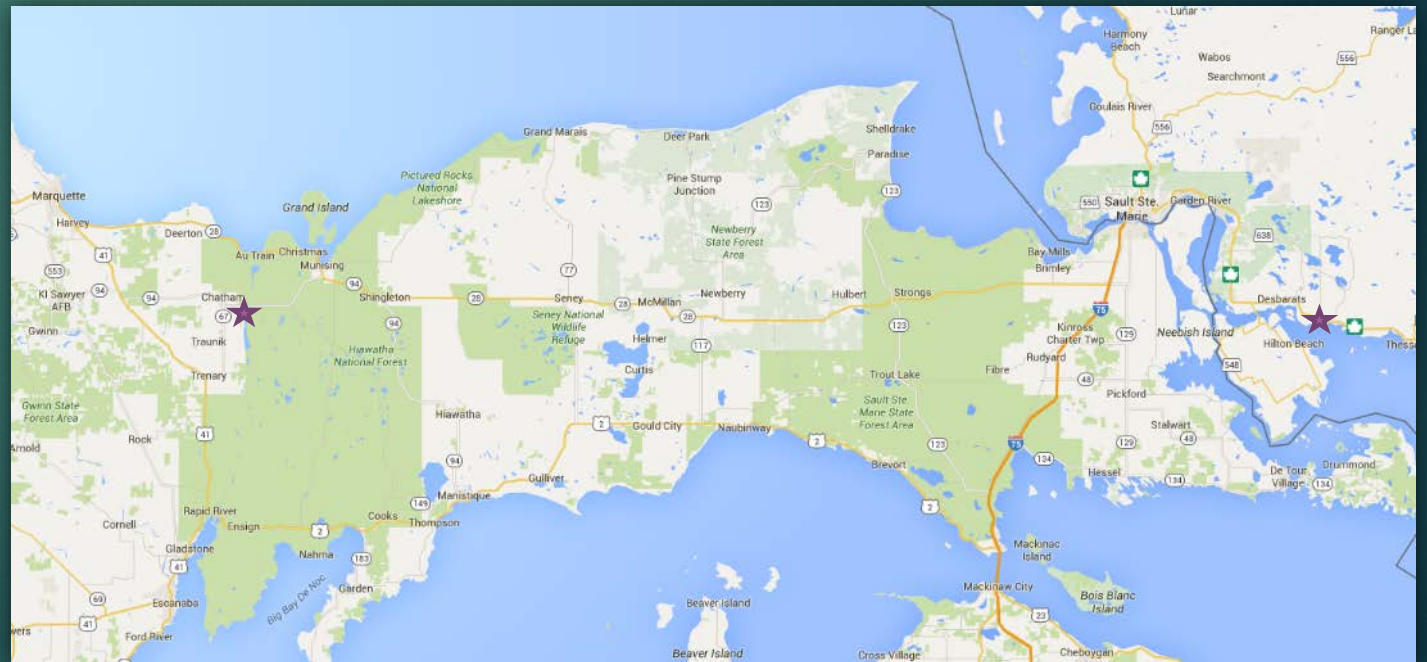
Malting Barley Opportunities

ASHLEY MCFARLAND, DIRECTOR

MICHIGAN STATE UNIVERSITY UPPER PENINSULA RESEARCH AND EXTENSION CENTER

Upper Peninsula Research & Extension Center

- ▶ Established in 1899
- ▶ Historically focused on dairy
- ▶ Current research focus:
 - ▶ Soil health
 - ▶ Integrated cropping and livestock systems
 - ▶ Local food systems



Malting barley research

- ▶ Established research program in 2013
 - ▶ Variety trials
 - ▶ Cultural management
 - ▶ Facilitation of industry growth
- ▶ Developed to respond to demand from craft beverage market

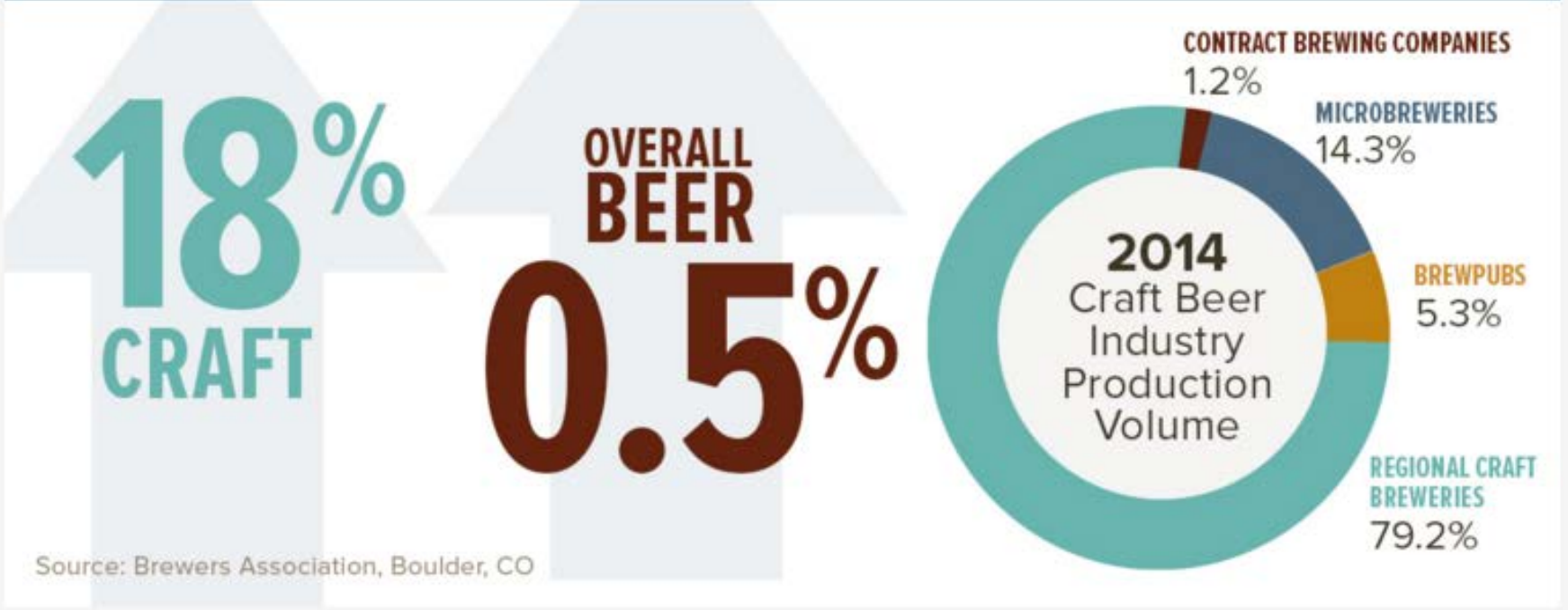




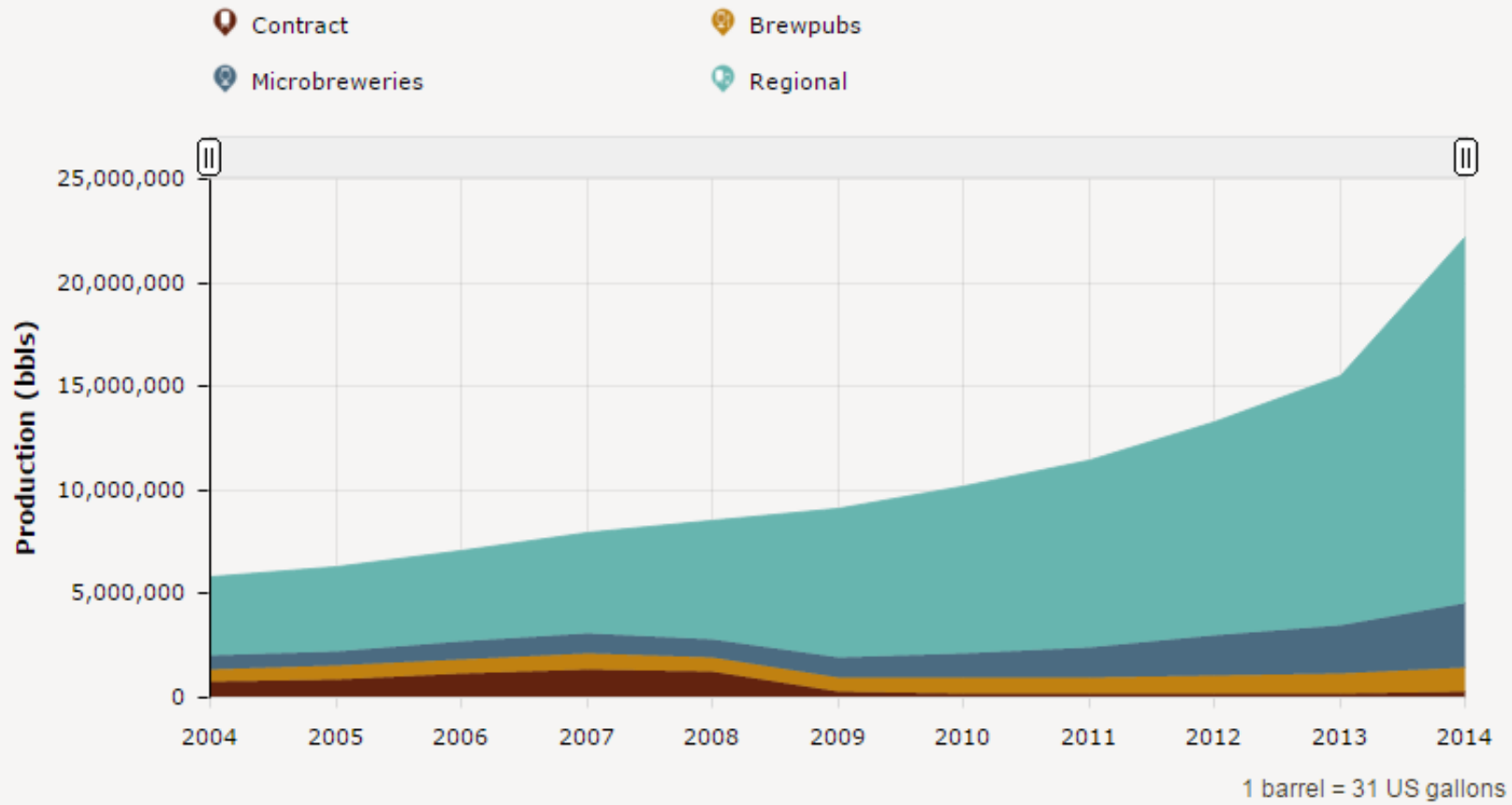
“ An American craft brewer
is small, independent, and
traditional ”

BREWERS ASSOCIATION

U.S. BEER PRODUCTION VOLUME 2014



Historical Craft Brewery Production by Category



U.S. BEER SALES VOLUME GROWTH 2014

OVERALL BEER
0.5%
197,124,407 bbls

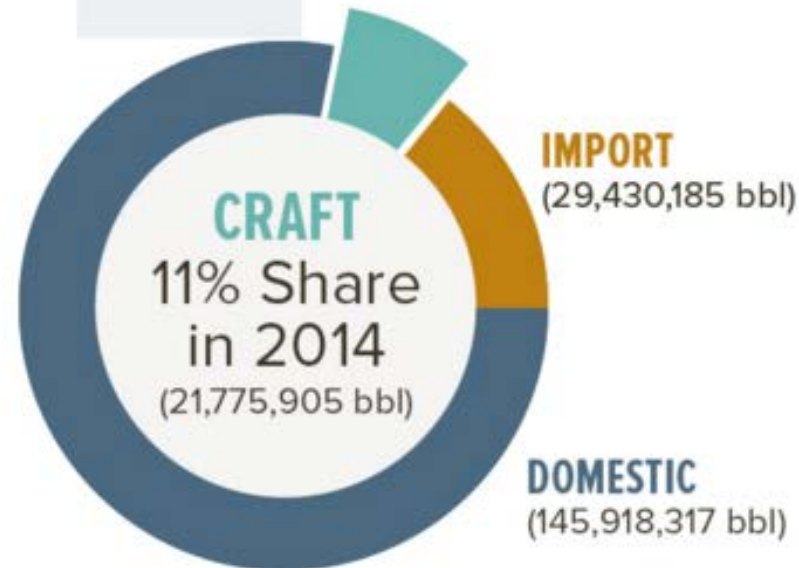
17.6%
CRAFT
21,775,905 bbls

IMPORT BEER
6.9%
29,430,185 bbls

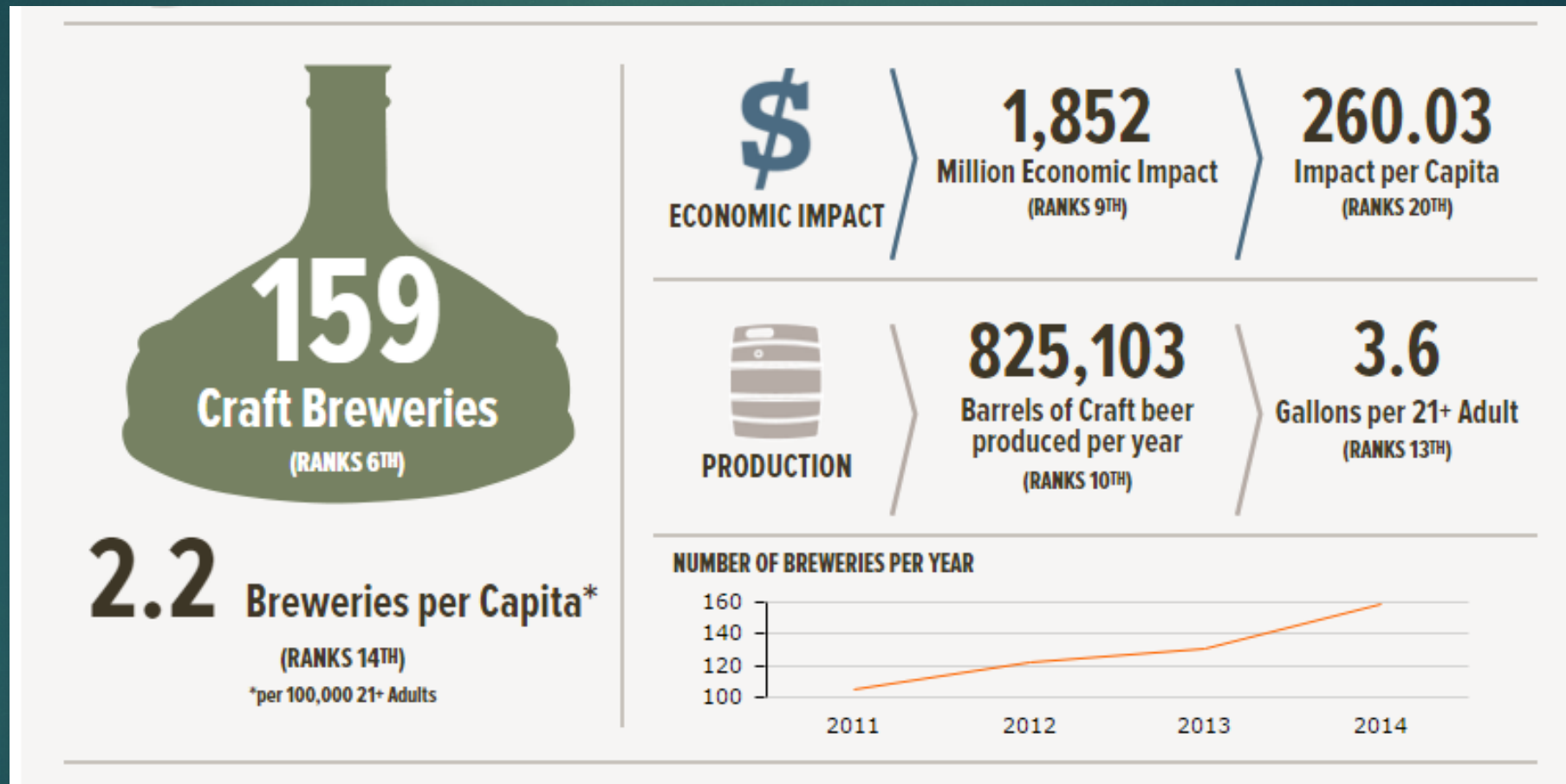
36%
EXPORT CRAFT BEER
383,422 bbls

OVERALL BEER MARKET
\$101.5 BILLION

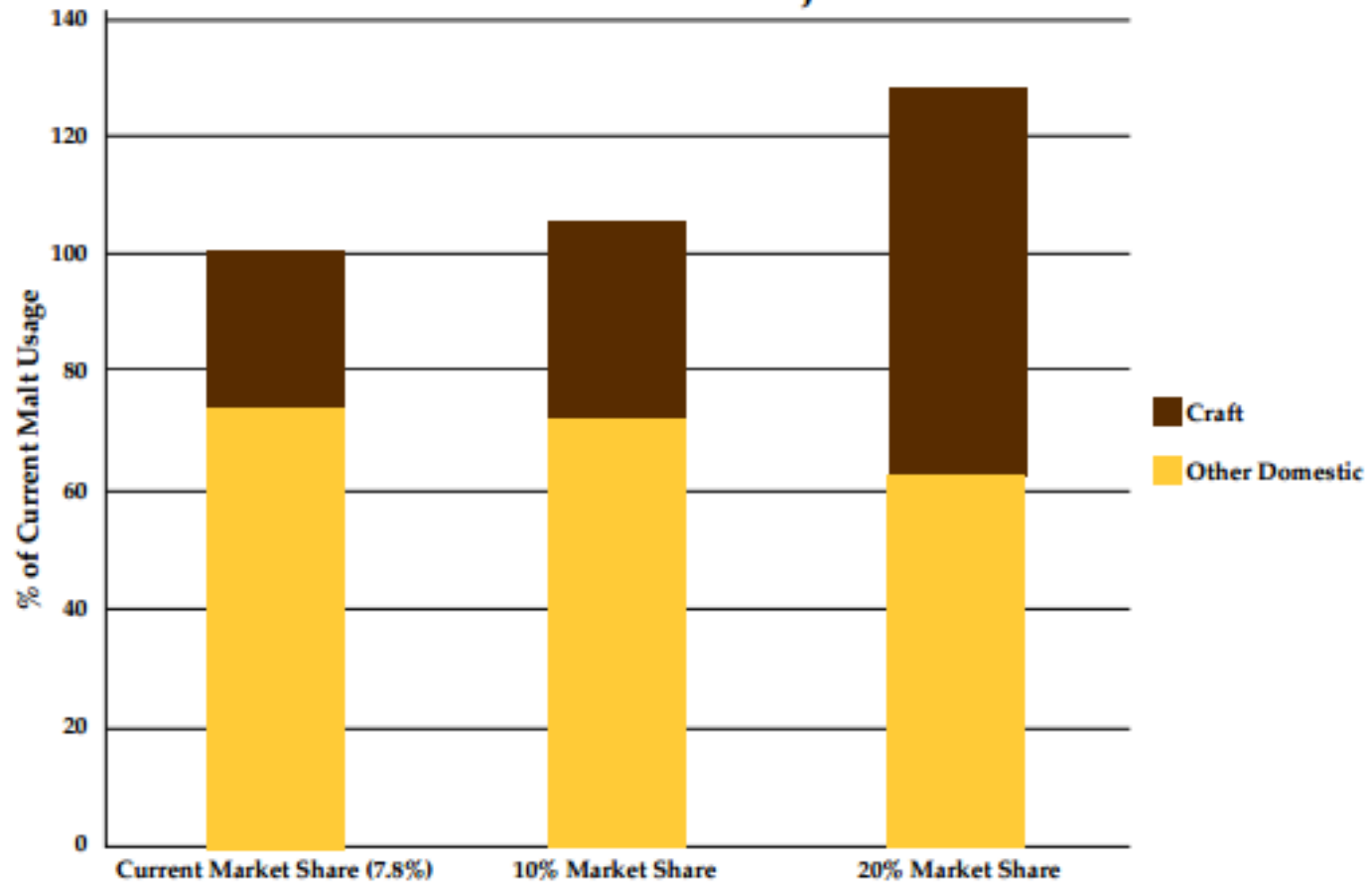
CRAFT BEER MARKET
\$19.6 BILLION
22% DOLLAR SALES GROWTH




Michigan



Share of Domestic Malt Usage Based on Craft Market Share, Current and Projected





““ The number of licensed breweries in Canada has risen almost 70% over the past five years to 520 operating in 2014. Over half of these breweries make their products in Ontario and Québec.””

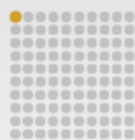
BEER CANADA, 2015 ANNUAL STATISTICAL BULLETIN

BEER AND CANADA'S ECONOMY: FROM GRAIN TO GLASS



beercanada.com
@BeerCanada

1 IN EVERY 100 JOBS is supported, directly & indirectly, by the beer industry



FOR EVERY \$1 spent on beer **>** **\$1.12 GDP** is generated

BEER HAS 3X THE ECONOMIC IMPACT of wine and spirits combined



Local brewers purchase **300,000 TONNES** of Canadian malting barley annually



CANADA HAS ONE OF THE HIGHEST beer taxes in the world

The brewing industry has **REDUCED ITS ENERGY USE BY 58%** since 1990, which benefits the environment and saves costs

Beer sales generate **\$5.8 BILLION ANNUALLY** in government tax revenues

11,685 BREWERY JOBS AND \$975 MILLION IN WAGES

520 FEDERALLY LICENSED domestic brewing operations in Canada, **A 94% INCREASE SINCE 2007**

85% OF BEER CONSUMED in Canada is **MADE IN CANADA**

Sources: Barley Council of Canada, Canada Revenue Agency, Canadian Industrial Energy End-Use Data and Analysis Centre, Conference Board of Canada, Impact Databank, Statistics Canada



Malting barley production

- ▶ Outlined in *Malting Barley Production in Michigan* guide - http://agbioresearch.msu.edu/centers/uprc/malting_barley
- ▶ Keep in mind – *Manage for quality not yield!*

Extension Bulletin GMI-035 • New • July 2014

Malting Barley Production in Michigan


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Scott Graham, Director, Michigan Brewers Guild

Because of the increasing demand for locally sourced ingredients in everything from the salads we eat to the beer we drink, barley, produced for malt, is being revisited as a potential crop for Michigan growers. This publication explores that potential and outlines best production practices for Michigan-grown malting barley.

Introduction

Barley – the most widely adapted cereal grain in the world – is an ancient crop that has been used for thousands of years for feed, food and production of beer. Its ability to thrive in adverse conditions makes it a suitable crop where other high-valued commodities such as corn, rice and wheat fail to yield. Although there is a wide spectrum of barley types, this text will focus on *Hordeum vulgare* L., the commonly cultivated species that dominates global production (Figure 1). The cultivation of barley, the fifth most-produced crop in the world, is widespread throughout North America and occurs on every other continent outside of Antarctica.

Worldwide, 125 million acres of barley were harvested in 2013. Only 3 million of those acres were harvested in the United States, which was nearly half of the 30-year national average (1984-2013, 5.9 million acres). U.S. acreage has steadily declined over this time period as barley competed for agricultural land with other high-value crops. Because of increased yields, however, domestic production of barley (in bushels) is down only 36 percent since 1984. In Michigan, only 10,000 acres of barley were harvested in 2013, with nearly all



production going to feed markets. Nationally, 55 percent to 60 percent of barley goes to feed and is cracked, ground or rolled before being fed to livestock (Figure 2). Protein levels in barley grain range from 10 percent to 15 percent and are heavily affected by crop mismanagement. Aside from feed uses, 30 percent to 40 percent of U.S. barley is malted for brewing, 2 percent to 3 percent is used in other foods, and 5 percent is harvested for seed. Unique varieties of barley have been developed to

Figure 1. Barley is the fifth most produced crop in the world.

MICHIGAN STATE UNIVERSITY | Extension

Types

- ▶ Feed barley vs. malting barley
- ▶ 2 row vs. 6 row



Variety selection very important

- ▶ Procure certified seed to ensure variety purity and to avoid disease
- ▶ American Malting Barley Association approved varieties

2016 Recommended Malting Barley Varieties

Two-Rows

AAC Synergy	(2015)
ABI Voyager	(2014)
AC Metcalfe	(2005)
CDC Copeland	(2007)
CDC Meredith	(2013)
Charles*	(2009)
Conlon	(2000)
Conrad	(2007)
Endeavor*	(2015)
Expedition	(2013)
Harrington	(1989)
Hockett	(2010)
Merit	(2000)
Merit 57	(2010)
Moravian 37	(2010)
Moravian 69	(2010)
ND Genesis	(2016)
Pinnacle	(2011)
Scarlett	(2008)
Wintmalt*	(2013)

Six-Rows

Celebration	(2011)
Innovation	(2014)
Lacey	(2000)
Legacy	(2001)
Quest	(2011)
Stellar-ND	(2006)
Thoroughbred*	(2015)
Tradition	(2004)

Variety name & year first recommended

*Winter

These malting varieties listed in alphabetical order are recommended by AMBA for planting in 2016. When delivered to market in pure carlots of sound, bright, plump, low moisture barley in an acceptable protein range, they may command premium prices over feed barley. Growers are encouraged to contact their local elevator, grain handler or processor to gauge market demand for any variety grown in their region prior to seeding. 2015 crop plantings by variety are included at the end of this publication.

prepared and distributed by

AMERICAN MALTING BARLEY ASSOCIATION, INC.

740 N. Plankinton Avenue, Suite 830, Milwaukee, WI 53203

<http://www.AMBAinc.org>



Expectations

- ▶ Average yield 50 bu./acre
 - ▶ 7 year average in Chatham 62 bu./acre
- ▶ Average test weight 48 lbs./bu.
 - ▶ 2015 average test weight 49 lbs./bu.
- ▶ Price highly variable



Planting

- ▶ Plant as early as possible
- ▶ Seeding rate
 - ▶ 96 lbs. (2 bushels)/acre
 - ▶ 1.25-1.30 million seeds/acre
- ▶ Planting depth – 1-1.5 inches
- ▶ Prefers well-drained, fertile loam or clay loam soils
- ▶ Prefers pH 6.0-8.5



Fertility

- ▶ Soil test!
- ▶ Follow P and K recommendations based on results
- ▶ Do not over-apply nitrogen
 - ▶ Greatly impacts protein content
 - ▶ Following soybeans, recommend 50 lbs. of N



Pest management

- ▶ Weed control
 - ▶ 11 oz./acre Huskie to control annual weeds
- ▶ Fungicide
 - ▶ 8.2 oz./acre Prosaro applied at heading to control fungal disease
 - ▶ *Fusarium* head blight
 - ▶ **Control DON < 0.5 ppm**
 - ▶ Avoid following corn or other grass crop



Harvest

- ▶ Preferred moisture 13.5%
 - ▶ Consider harvesting wet and drying in bin to avoid pre-harvest sprout
 - ▶ Use very low heat to avoid killing germ
- ▶ Set your combine to ensure a clean harvest
- ▶ Handle grain with care – may need to de-beard and/or clean post-harvest



Quality

- ▶ Focus primarily on:
 - ▶ Keeping protein 10-12%
 - ▶ Keeping DON < 1 ppm
 - ▶ Avoiding pre-harvest sprout
- ▶ Testing capabilities at MSU UPREC



American Malting Barley Association, Inc.
MALTING BARLEY BREEDING GUIDELINES
IDEAL COMMERCIAL MALT CRITERIA

	Six-Row	Adjunct Two-Row	All Malt Two-Row
AMBA Member Interest*	20%	55%	25%
Barley Factors			
Plump Kernels (on 6/64)	> 80%	> 90%	> 90%
Thin Kernels (thru 5/64)	< 3%	< 3%	< 3%
Germination (4ml 72 hr. GE)	> 98%	> 98%	> 98%
Protein	≤ 13.0%	≤ 13.0%	≤ 12.0%
Skinned & Broken Kernels	< 5%	< 5%	< 5%
Malt Factors			
Total Protein	≤ 12.8%	≤ 12.8%	≤ 11.8%
on 7/64 screen	> 60%	> 70%	> 75%
Measures of Malt Modification			
Beta-Glucan (ppm)	< 120	< 100	< 100
F/C Difference	< 1.2	< 1.2	< 1.2
Soluble/Total Protein	42-47%	40-47%	38-45%
Turbidity (NTU)	< 10	< 10	< 10
Viscosity (absolute cp)	< 1.50	< 1.50	< 1.50
Congress Wort			
Soluble Protein	5.2-5.7%	4.8-5.6%	< 5.3%
Extract (FG db)	> 79.0%	> 81.0%	> 81.0%
Color (°ASBC)	1.8-2.5	1.6-2.5	1.6-2.8
FAN	> 210	> 210	140-190
Malt Enzymes			
Diastatic Power (°ASBC)	> 150	> 120	110-150
Alpha Amylase (DU)	> 50	> 50	40-70

* Based on a survey of AMBA's regular members.

General Comments

Barley should mature rapidly, break dormancy quickly without pregermination and germinate uniformly.

The hull should be thin, bright and adhere tightly during harvesting, cleaning and malting.

Malted barley should exhibit a well-balanced, modification in a conventional malting schedule with four day germination.

Malted barley must provide desired beer flavor.

June, 2014

Variety performance

Variety	Type	Yield	Protein	DON	RVA
AAC Synergy	2 row	50	11.5	0.0	70
AC Metcalfe	2 row	50	12.6	0.0	99
Conlon	2 row	38	12.5	0.0	154
Lacey	6 row	50	12.4	0.0	113
Odyssey	2 row	60	11.6	0.0	174
Pinnacle	2 row	57	10.7	0.0	143

Challenges

- ▶ Wet weather
- ▶ Lodging
- ▶ DON
- ▶ Harvesting
- ▶ Cleaning and bagging
- ▶ Analysis
- ▶ Long-term storage
- ▶ Communication
- ▶ Marketing
- ▶ Experience

Malting

- ▶ Malthouses are the direct market for your malting barley grain
- ▶ Consider contracting grain
- ▶ Be prepared for price adjustments for quality

MICHIGAN MALTHOUSES

Map updated January 2016



1. U.P. Malt Company
Bill Weisinger
bweising@yahoo.com
(906) 202-2128

2. Superior Malt
Clem Geiger
cgeiger@hotmail.com
(906) 399-9966

3. Artisan Malts
Ruthanne Stark
artisanmalt@gmail.com
(906) 440-5757

4. Empire Malting Co.
Alison Babb
empiremalting@yahoo.com
(352) 226-1644

5. Great Lakes Malting Co.
Jeff Malkiewicz
jeff@greatlakemalting.com
(231) 714-4551

6. Michigan Malt
Wendell Banks
wendell@michiganmalt.com
(989) 954-5962

7. Fedora Malthouse
Julie Baker
fedorabaker1ja@gmail.com
(989) 289-5135

8. Pilot Malt House
Ryan Hamilton
ryan@pilotmalthouse.com
(616) 209-8388

9. Mitten State Malt
Larry Judge
larry.judge1@gmail.com
(517) 490-5245

10. Arrowhead Malt
David Burdick
david@arrowheadmalts.com
(517) 474-0447

11. Motorcity Malt
Tom Laboda
tlaboda@motorcitymalt.com
(248) 425-9402

To be listed on this map,
contact Ashley McFarland
ashleymc@anr.msu.edu or
(906) 439-5176

Malting

- ▶ **Steeping** 2-3 days to sprout grain – creates enzymes to convert starches to sugars
- ▶ **Germination** 4-5 days – grain constantly turned to allow for even germination
- ▶ **Kiln drying** – time dependent on type of malt



Advice to growers

- ▶ Manage for quality not yield
- ▶ Secure your market before planting
- ▶ Have a plan B



Suggestions to grow industry

- ▶ Get certified seed growers on board
- ▶ Variety trials important
- ▶ Consider heritage lines
- ▶ Commission feasibility study
- ▶ Processing must grow with acreage
- ▶ Be represented



GREAT LAKES HOP AND BARLEY CONFERENCE

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Michigan State University
AgBioResearch

March 16-17, 2016
Grand Traverse Resort
Acme, Michigan

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