Industry Analysis:

Malting

Photo: Mature Barley – Dupuyer, MT – Photo credit: Chuck Hanley

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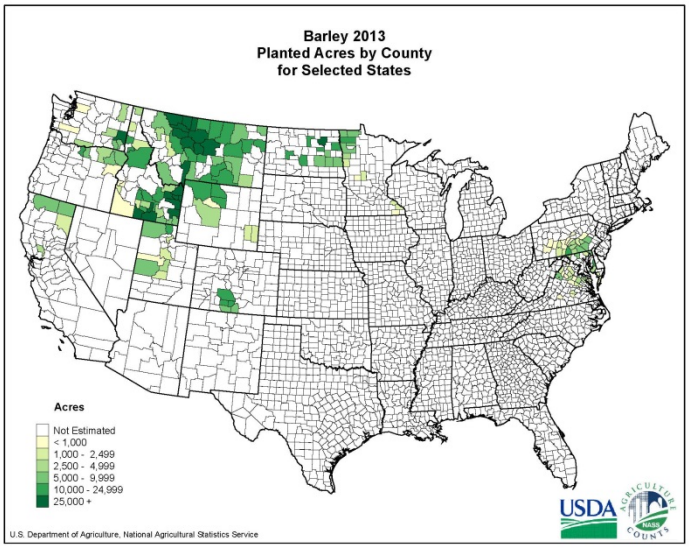
Introduction

Montana's Golden Triangle production of grains is the agricultural envy of the world. This region produces the nation's finest wheat and barley. Montana wheat is of such quality that it is blended with wheat produced throughout the country in order to increase the quality of those grains. Montana barley is equally exceptional. The finest barley on the continent is produced right here in Montana; and the best of those grains is sold as malting barley.

US malting barley production is predominantly consumed by American brewers accounting for 87% of non-feed barley consumption. Large American breweries like Anheuser-Busch InBev (AB InBev), MillerCoors, and Pabst consume the bulk of production; however, in recent years, the rise of craft brewing throughout the nation increased its share of demand for the available supply of malt barley.



Craft breweries now consume nearly 20% of total malting barley production. In 2012, craft beer surpassed 6% of the total U.S. beer production (approximate current share is 8%) with volume and dollar sales reaching record levels. Craft brewers reach consumers by providing unique brews that are packed with flavor and malt.

Montana is second in the nation for craft breweries per capita with over 50 breweries now operating in the state and more under development. This increase in local demand for malt has convinced the state's only maltster, Malteurop in Great Falls, to provide its malted barley in smaller volumes so that craft brewers can make appropriate sized orders. Craft brewers use approximately 80-90% pale malts, or base malts, in their brews; Malteurop provides the majority of this malt used by Montana's breweries. The remaining malt needed by craft brewers is classified as specialty malts and is acquired domestically or from international markets.

Given the increased popularity of the craft brewing industry, the Montana Department of Commerce's Industrial Development Program (IDP) and the Montana Department of Agriculture believe there is an opportunity to add value to Montana's world renowned barley production through further development of malts within the state. This industry analysis report investigates conduciveness of the current market conditions to develop malting facilities in the state.

Understanding the Malt Industry

Malting is one of the oldest agricultural processes of human history. Malted grains were used in traditional meal made entirely from germinated wheat dating back to ancient times. Perhaps discovered accidentally, products made from germinated grains provide additional flavors agreeable to the palate and fermented grains deliver intoxication when consumed. Malting practices more similar to the processes used today can be traced back to around 500 C.E. when malt houses were first constructed. These malt houses used floor malting and natural draft kilning techniques to produce large quantities of malt for brewing and distilling. These practices are still used today, however, the industry has evolved with the development of mechanical equipment which decreases labor inputs and produces a more consistent product.

Today, malting can be defined as a process whereby grains are made to germinate by soaking in water and are then halted from germinating further by drying with hot air. Malting develops the grain's enzymes which are required to modify the starches into sugars. Malting also develops other enzymes which break down the proteins in the grain into forms that can be used by yeast. The term "malt" refers to several products of the process: the grains to which this process has been applied (for example malted barley), the sugar, heavy in maltose, derived from such grains (such as the baker's malt used in various cereals), and a product based on malted milk, similar to a malted milkshake. (Wikipedia[1])

Barley is the primary source grain used in malting for various applications. Brewing is the primary consumer of malted grains throughout the globe followed by distilling. The primary driving factors that determine industry profit and management decisions are therefore the price of coarse grains, demand from beverage manufacturing, the trade weighted index, and per capita alcohol consumption. Demand for malts has remained relatively even, however the source of that demand has shifted as domestic lager consumption has decreased and craft beer consumption has increased.

The manufacturing or processing of malt requires various inputs that can determine the location of a malting facility. The primary input is the grain. Maltsters prefer to ship the grain as little as possible due to the transportation costs associated with the high weight of the grain. Access to water is also important. Malthouses are large water users. A significant volume from a quality water source is imperative in malting and wastewater treatment is required. Energy is the final primary input in a malthouse's operations. Large amounts of energy are needed to complete the three stages of malting; the largest of these is the kilning stage when grains can be exposed to temperatures topping 200 degrees Fahrenheit.

[1] http://en.wikipedia.org/wiki/Malt

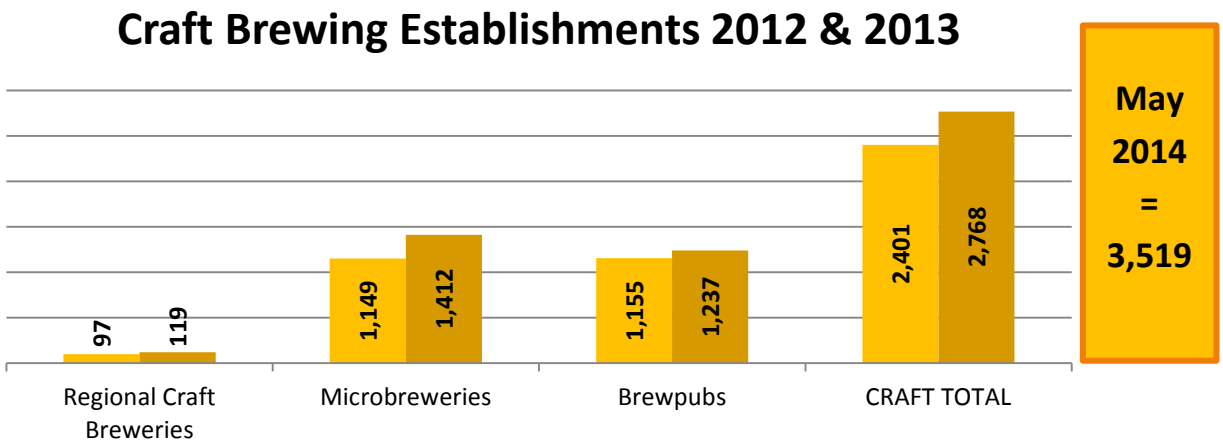
Market Analysis

This report focuses on the prospect of successfully developing a sustainable mid-sized malting facility in Montana. The majority of malted barley in North America is consumed by the brewing industry. Approximately 80% of this market is made up of commercial brewers who have largely made the malting industry vertically integrated from the seed in the field to the beer in the bottle. Given that the industry is dominated by approximately a dozen facilities and only a handful of companies, this report summarizes IDP's research of the current status of the marketplace and the potential for development and addition of a new Montana-based malthouse to the market.

Demand

Growth in Brewing and Distilling

The craft brewing and distilling industry has realized significant growth in Montana and across the nation in recent years. In 2013 alone, 413 new breweries opened in the US. In total, 2,822 breweries operated for part or all of 2013 representing the highest number of operating breweries in America since the 1870's. This upward trend is projected to continue. While this growth has not contributed to an overall increase in demand for malt, it has increased demand for specialty malts which are used in higher volumes by craft brewers.



Increasing Craft Beer Consumption

It seems that craft breweries have sprung up everywhere catering to customers who are seeking distinctive and flavorful beers. Statistics from the Brewers Association (a trade association representing craft breweries nationwide) show 3,519 craft breweries listed as of the end of May 2014; and 123 new breweries added in the month of April 2014 alone. The growth in breweries is having a significant impact on the market place.

The impact is highlighted in a 2012 IBISWorld industry report entitled *Malt Production in the US:*

> The Malt Production industry experienced volatile but positive growth over the past five years. Although barley costs were unstable and high, operators raised prices enough to partially counteract cost increases without significantly hurting demand; thus boosting revenue. Consumers had less disposable income during the recession and purchased less beer, which caused beer production volumes to decline slightly. However, the rise of craft beer maintained brewers' demand for malt. Craft brewers make up a small proportion of beer production, but account for about 18.0% of malt demand. Furthermore, increasing global beer production is driving foreign breweries to source malt from the industry, lifting exports an annualized 10.4% to $262.2 million over the five years (2008 to 2012) and mitigating import competition.

A key statistic is that craft beer production in the US consumes a disproportionately large quantity of malted grain. Constituting just 5.7% of total beer production in 2012, US craft breweries consumed 17.9% of the malt sold. This shows that craft breweries are a significant and growing component of the malt market.

The infographic below shows that while the American beer market has dropped nearly 2% in sales, the craft beer sector has increased over 17% and exports have increased nearly 50%. Domestic brewers easily retain their dominant portion of the market with over 75% of sales. Large brewers of domestic lagers like AB InBev and MillerCoors have taken note of the growth in the craft sector and have added craft brews to their product lines or acquired small craft breweries into their portfolios.

Growth of the Specialty Malt Market

IDP research indicates that craft brewers like variety and they are willing to try new and different types of pale and specialty malts in order to create distinctive beers. Willingness to try new malt varieties sends a positive signal to potential investors in a specialty malting plant that market acceptance of a new product should be high.

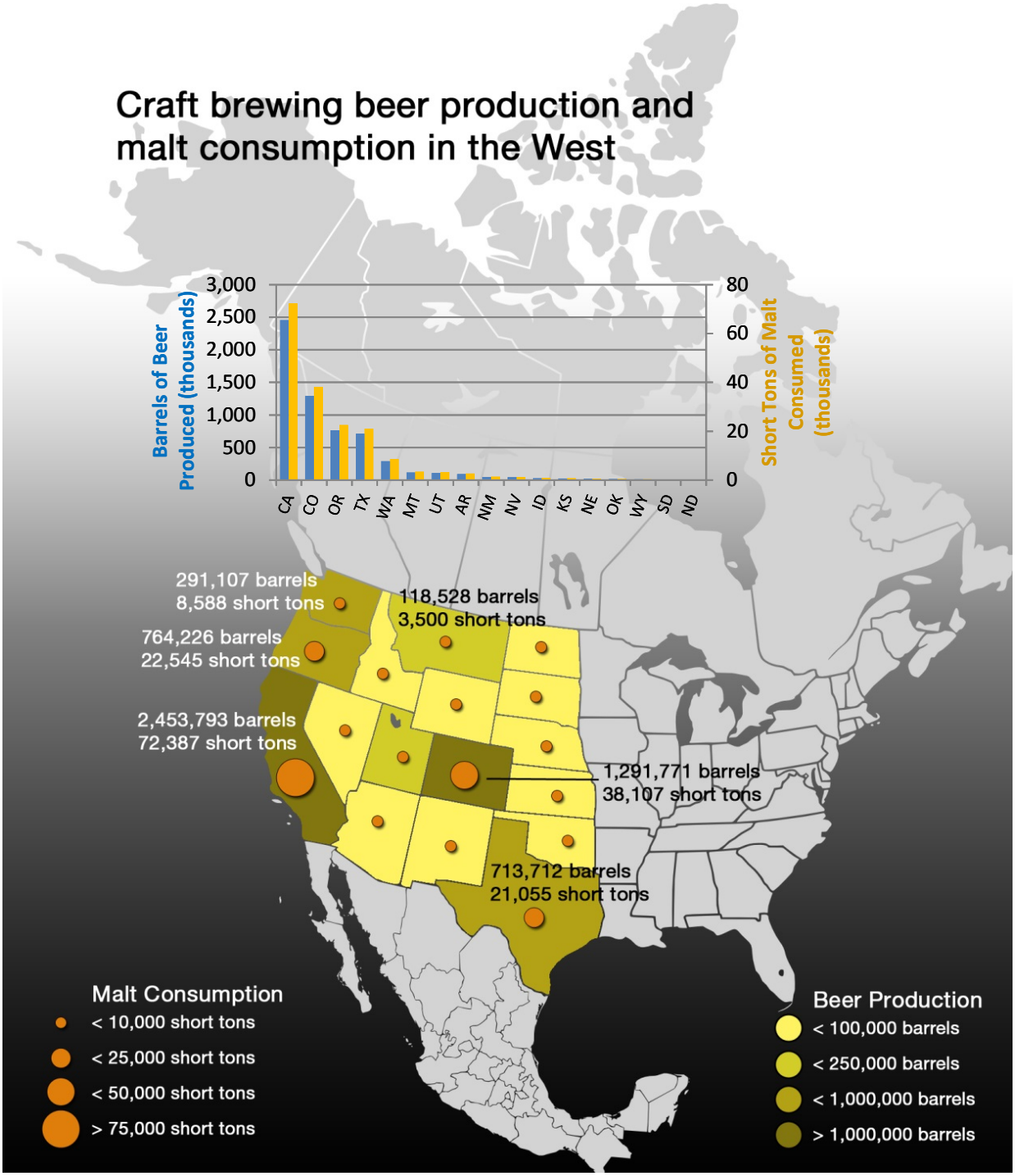
The purpose of this analysis is to consider the feasibility of developing a competitive malting facility in Montana. The Montana Department of Commerce, Industry Development Program (IDP) has researched the demand for malt by US craft brewers as part of this industry analysis. Our estimates are based on extrapolating Montana craft beer production / malt consumption numbers provided by the Montana Brewers Association (MBA). The MBA reports 51 craft breweries operate in Montana producing 118,500 barrels of beer in 2013 and consuming 7 million pounds of malted grain. IDB calculated the volume of base or pale malt consumed versus specialty malts consumed by craft brewers by assuming that 15% of the malt used to make a batch of craft beer is of the specialty variety while about 85% of each batch is comprised of base or pale malt.

Montana craft breweries produce nearly 120,000 barrels of beer and consume approximately 7,000,000 pounds of malt per year.

IDP obtained the 2012 beer production numbers from the National Craft Brewers Association for all 50 states. Using the ratio of 59 lbs. of malt per barrel of craft beer (based on MBA numbers), the following spread sheet estimates craft beer production / malt consumption.

The numbers indicate that US craft brewers produced about 13.75 million barrels of beer in 2012 and consumed about 405,000 tons of malt worth about $340 million. Of that total malt consumption, it is estimated that about 61,000 tons were comprised of specialty malts, valued at approximately $100 million.

US Craft Beer Production and Malt Use		
13.75 million barrels produced in 2012		
	Consumption	**Value**
Pale Malt	344,000 tons	$240 million
Specialty Malt	61,000 tons	$100 million
Total	**405,000 tons**	**$340 million**



Map design by: Dustin de Yong – Montana Dept. of Commerce

Recent demand for malt has been static; however, moderate growth for all malt is expected in the short term. The specialty malt market is the most likely to expand; however, this market lacks production volume compared to the pale or base malt market.

Some of the growth anticipated for the craft brewing and malt industries is due, in part, to increases in malt exports. Currently, many domestic craft brewers import malt from Europe which certainly has an increased transportation cost to reach US markets leaving them vulnerable to domestic competition.

Framing a business decision to build a malting plant in Montana will involve many factors, not the least of which is estimating the portion of the current and future craft brewing malt market that could be captured. The malting industry operates on small margins and high production volume. A developer will need to consider a balance of specialty and base malt production and volumes in order to maximize profit and return on investment.

Supply

In 2012, over 57% of US barley production was used for malt, about 31% was used as feed, and about 5% was exported. According to the American Malting Barley Association (AMBA), US malt production since 1986 had remained fairly static until a few years ago. The 2012 IBISWorld Report states:

> The Malt Production industry has grown over the past five years despite challenges from volatile input prices, changing consumer trends, and import competition. Although the price of barley and other coarse grain inputs rose significantly, producers were able to increase prices enough to increase revenues. Additionally, an increase in global beer production caused many breweries around the world to demand more malt from US producers, lifting exports and mitigating import competition. Revenue rose at an annualized rate of 5.2% to $1.1 billion between 2008 and 2012, including an 11.0% jump in 2012 as a result of rapid export growth.

According to the National Agricultural Statistics Service (NASS), Montana growers planted 990,000 acres of barley in 2013, up 90,000 acres from 2012. Of the total, approximately 66%, or 660,000 acres, were planted as malting barley varieties. For 2014, Montana acreage planted in barley was reported to be 940,000 acres, ranking the state first in the nation. For 2014, the next leading barley acreage states are Idaho and North Dakota which were projected to plant 660,000 and 650,000 acres, respectively.

Key Malt Industry Statistics			
Nation		**Montana**	
Revenue (2012)	$1.1 billion	Malt Barley Planted	660,000 acres
Exports (2012)	$262.2 million	Percent of Malt Barley Planted to make Malt Grade	~ 90%
Annual Growth (2007-2012)	5.20%	Malt Barley Produced	27.6 million bushel
Projected Annual Growth (2012-2017)	2.40%	Malt Barley Exported	15.6 million bushel

Maltsters and brewers purchased 27.6 million bushels of Montana's barley crop between July 1, 2012 and June 30, 2013 to make malt. Malteurop's malting facility in Great Falls has a capacity to process 12 million bushels annually, meaning that facility processes about 43% of Montana's barley crop. Much of the remaining 57% is contracted and exported to large breweries like MillerCoors and AB InBev.

Market Trends

Craft Malting

Increasing development of microbreweries and craft beer production increased demand for specialty malts. Craft malting has made a surge in the marketplace as microbreweries search for unique, consumer-capturing brews that no other brewery can offer. This surge has caught the attention of industry manufacturers and more small-batch malt systems are becoming available for micro and craft malting applications.

Water Conservation

The world's largest retailer, Walmart, has placed pressure on brewers who stock their shelves to decrease the amount of water used to make their brews. In response, MillerCoors and AB InBev have sent a message to their maltsters and contracted growers to make investments in water conservation. These water conservation initiatives provide a competitive advantage to Montana's malt barley production as Montana boasts more acres of malt barley planted in dry-land farming than any other state.

Source Locating

More malting companies are locating near the source of their primary input - barley. As demand for malts has become decentralized from the brewing centers of yesterday, malting companies are keeping transportation costs down by locating near contracted acreage.

AB InBev has launched a water conservation campaign in recent years calling for men to put down their razor and grow a beard in the name of water conservation. Anheuser-Busch claims to have reduced water use by 40% since 2007.

Factors of Development

Logistics

Locating a mid-sized specialty malting plant in Montana has several competitive advantages including proximity to one of the continent's prime malt barley growing regions. Montana's low protein malting barley is of the highest quality for making beer as a result of ideal growing conditions. These conditions include the region's hot days and cool nights during the height of the growing season and dry weather during the harvesting season. Montana barley is already in high demand, increasing the potential that a prospective in-state, specialty malting facility could create a branded malt product that would enjoy a similar branded high demand. The steadily rising prices brought by Montana malting barley has been good for producers and the state's agricultural economy, but has also resulted in higher downstream costs for brewers and consumers alike. Locating a specialty malting facility near the source barley would provide competitive pricing for its finished product.

It would appear that Malteurop located its facility in Great Falls, in part, to be near its barley supply. IDP estimates that making malt reduces the final product weight by about 30%. This reduction in bulk may result in lower shipping costs and logistical efficiencies for some business scenarios.

Malting reduces barley weight by approximately 30%.

Rail transportation has been affected by booming energy development on the Montana / North Dakota border and in Northern Alberta. This massive, recent scale up of rail shipping Bakken crude and oil sands bitumen has created freight congestion that further underscores a potential strategic advantage to locating near the barley source.

Expenditures

Malting facilities can be incredibly simple and labor intensive, or mechanically complex with little labor input. These factors result in varying capital costs to develop and operate a malthouse.

Capital Expenditures

Traditional malthouses in Europe were very simple, yet effective. Techniques, such as floor malting and hand raking, keep capital expenditures down but increase labor inputs over time. Many micro malthouses emerging today are using some of these traditional techniques to keep upfront costs as low as possible.

Other mechanical and automated equipment provides greater malt consistency and fewer labor inputs. The nation's commercial and industrial malthouses are highly automated and engineered in order to secure a consistent quality in product over very large volumes. Some smaller and mid-sized malthouses use a combination of mechanical and traditional malting techniques. Recently, some of the finest manufacturers of brewing and malting equipment have developed scalable, small batch malting systems

in order to meet the growing trend of craft and micro malting occurring around the globe. As the market for these systems increases and manufacturing output meets this growing demand, the capital expenditures for these systems will decrease.

Operating Expenditures

Grains

These commodities fluctuate in price on the open market due to acres planted, crop yields, weather, etc.

Water

Water is also a very important input used in the malting process and can vary greatly depending on location.

Transportation

Logistics play a very big role for companies who do not have a local supply of malt grains and/or are targeting markets outside of their area.

Power

Power prices may also affect a malthouse's bottom line depending on the type of energy used in fueling the malting process.

Wastewater

Wastewater treatment can also be a significant operating expenditure for large malting facilities; smaller facilities may still be able to use municipal facilities.

Labor Compensation

Malthouses are not large employers as most of the processes have been mechanically automated.

Taxes

Multimillion dollar malting facilities can suffer from tax burdens. However, Montana malting facilities are exempt from business equipment tax, can locate in favorable tax increment districts across the state, and enjoy no sales tax statewide.

Revenues

Revenue streams for malting companies are primarily derived from the sale of malted grains. Some malthouses have made use of malting byproducts. Power generation from otherwise wasted biomass can reduce an operators power bill and increase revenue. This same byproduct can be used in livestock feed applications.

Case Studies

Previous Developments

Montana's supreme barley production has attracted investment in malting in recent history. In 1997, investors financed a $200,000 study to examine the development of a commercial malthouse to be located in Choteau. It is IDP's understanding that development of the project dissolved as the location did not have a sufficient water supply.

Malteurop Great Falls

The Malteurop facility in Great Falls was initially developed by International Malting Company (IMC) in 2003-2004 and then bought by Archer Daniels Midland (ADM) Malting, a subsidiary of the agriculture conglomerate ADM. Malteurop then acquired ADM Malting in 2008 and continues to operate the facility as well as two other malthouses previously owned by ADM in the Midwest.

Malteurop Great Falls – 200,000 ton / year malting facility.

Malteurop is Montana's only operating malting company, has an international footprint, and holds one quarter of the US malting market, followed closely by Cargill at 19%. Malteurop sells approximately 80% of its product to commercial breweries like AB InBev, MillerCoors, and Pabst. The Great Falls malting facility is the second largest of the company's three US malt houses producing 200,000 tons per year; the other malt houses are in the Midwest and produce 220,000 ton and 115,000 ton per year. Malteurop does not currently produce specialty malts commercially however, IDP has learned that the company is developing a specialty malt program. At which of the three Malteurop facilities this development will occur has not been made public.

Current Developments

Tom Blake, Montana's former barley breeder at Montana State University, has developed a malting system for craft breweries to operate in-house. The current prototype produces roughly 800 pounds of malt per week and was scaled to meet the malt demands of an average-sized Montana craft brewery. This system would allow brewers to experiment with different malts which they might not otherwise find or be able to acquire on the market. The technology is scalable to meet the needs of breweries both large and small. An investment by a brewing company in this technology would also require additional labor

Tom Blake has also partnered with Andy Stohlmann of Montana Maltings who is currently developing a micro-malthouse in Montana using a system developed by Kaspar-Schulz of Germany. Mr. Stohlman is currently testing batches of malts utilizing Tom Blake's technology and will be providing over 20

different specialty and custom malts to local breweries, distilleries, and homebrew customers. Mr. Stohlmann has acquired barley production agreements and attracted approximately half of the $3 million investment he is seeking. The company is also growing test plots of hops in the Gallatin Valley and is actively recruiting new hop growers to increase their production.

Hypothetical Development

As IDP has prepared this malt industry analysis, a number of plausible development scenarios emerged under which specialty malting facilities could be built in Montana:

In-House Specialty Malting

Less than 50 tons per year

Individual breweries can purchase off the shelf micro-malting systems designed to produce enough malt in small batches to meet the specialty malt needs of a single brewery. The Bayern Brewery in Missoula has considered this approach, looking into a micro malting system that would produce about 220 lbs. per day of specialty malt. The owner is looking to expand his current brewery site to add this micro malting system – the cost of the malting system is about $550,000.

Micro Specialty Malting

Approximately 1,000 tons per year

Another scenario is for an entrepreneur to build a micro scale malting system producing around 1,000 tons annually. Montana Maltings of Bozeman has developed a business plan and is in the early development stages of a facility this size - likely to be located in Gallatin County. The estimated cost to develop this plant is $3 million. Malting equipment from Kaspar-Schulz cost is $1.9 million and the remainder is building and land development expenses. The company indicates it has investors willing to pay for 50% of the development cost. IDP, along with the Montana Manufacturing Extension Center (MMEC), is actively assisting Montana Maltings on the development of a financing plan including potential participation from the Montana Board of Investments. Montana Malting's business plan is to capture as much of the 500 ton annual specialty malt demand of Montana craft brewers; as well as sell malt to out- of-state customers.

Commercial Specialty Malting

Approximately 10,000 tons per year

A third scenario for a group of investors, including existing Montana companies, is to pursue a larger specialty malting plant. This strategy, in addition to capturing as much of the relatively small 500 ton annual Montana specialty malt market as possible, would seek to market products outside of Montana including attempting to land contracts with some of the larger craft brewers in the region like New Belgium, Sierra Nevada and others. IDP estimates that two to four of the larger regional craft breweries, producing around of two to three million barrels of beers annually, create a demand for about 9,000 to 13,500 tons of specialty malts annually.

Industrial Malting

Greater than 50,000 tons per year (pale and specialty malt)

A fourth scenario would be for specialty malting companies to expand their operations in or into Montana. While it has produced primarily base malts in the past, Malteurop is developing a line of specialty malts aimed at meeting the expanding demand from craft breweries. The City of Great Falls' development strategy is to market its attributes to existing specialty malting companies, like Briess or Great Western, in an effort to attract them to build a facility. Industrial development of this size tends to take advantage of economies of scale. Therefore, a profitable malting facility would likely top the 100,000 ton or even 200,000 ton capacity and produce pale malts as well as specialty.

Development Target: Commercial Specialty Malthouse

Justifying Production Level

After careful market analysis, IDP has found sound evidence justifying development of a specialty malting facility on the commercial scale, approximately 10,000 ton per year, in Montana. This includes:

Demand

Capturing two of the four largest craft brewers in the region would consume 10,000 tons of specialty malt annually. The rapidly growing craft beer industry also carries increasing demand for these malts spread over a large geographical area and number of establishments.

Production

In order to achieve a return on investment (ROI) rate attractive to investors, the malting facility must achieve some level of economies of scale. Specialty malt, while primarily sold in 50 pound bags, is a bulk product and carries small margins. Therefore, to be profitable, a company must sell large quantities. A 10,000 ton commercial facility would provide the production necessary to be successful on these small margins and provide the larger quantities needed by the craft industry's largest breweries.

Quality Control

Production consistency and quality are vital to the success of larger craft breweries that depend on delivering a reliable product in a can or bottle to their consumers. Commercial facilities can better manage quality of larger batches of malt compared to smaller facilities.

Logistic Advantage

Transportation costs may decrease by locating near the raw barley source. This saving can be passed on to the consumer or retained as profit.

Available Upstream Barley Supply

The malthouse must consider its supply of raw barley. Current acreage and associated contracts for barley planted for malt are somewhat constrained. While a demand from a new malthouse for 1 million bushels or less of malt barley may be attainable; producers would likely not be able to meet the five or ten million bushel demand of an industrial malthouse, five in the short term.

The IDP is collaborating with the MMEC and CTA Architects and Engineers (CTA) to provide a cost analysis for possible malting facilities in Montana. These facilities would likely be located in close proximity to the state's largest barley growing region from the Great Falls area and to the northwest.

Running the Numbers

IDP has calculated the capital expenditures and possible ROI of the commercial development of a 10,000 ton per year specialty malt facility. IDP assumes that the plant area requirement for a 10,000 ton plant would be directly proportional to the Malteurop 200,000 facility (200,000 vs 10,000 = 5%). The facility would handle 5% of the grain compared to the Malteurop facility, thus the space required is 5%. Space for lab and administrative areas would add an anticipated 2,500 square feet for a 10,000 ton facility.

	Malteurop	Specialty Malthouse
Annual Tonnage	200,000 tons	10,000 tons
Germination	140,000 sq. ft.	7,000 sq. ft.
Kiln	45,000 sq. ft.	2,250 sq. ft.
Silos	42,000 sq. ft.	2,100 sq. ft.
Lab / Admin	50,000 sq. ft.	2,500 sq. ft.
Total sq. ft.	**277,000 sq. ft.**	**13,850 sq. ft.**

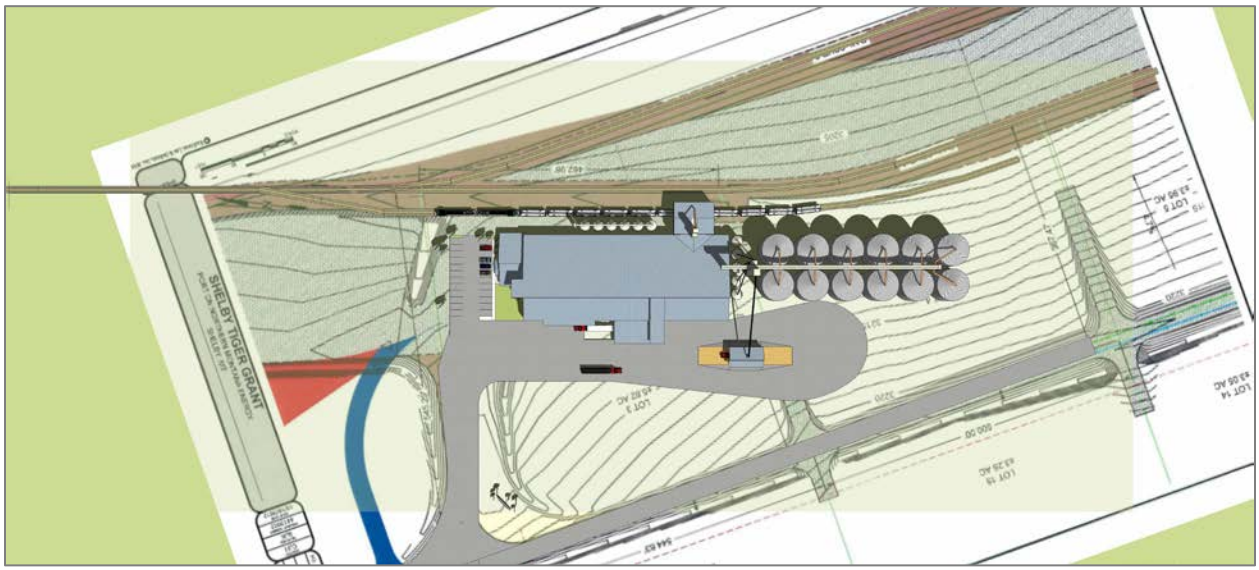
* Note: Information from the Schulz company website indicates that a 25 ton per week micro-malting system measures 11.4 feet by 59.3 feet constituting a total area of 676 square feet. IDP estimates installing 10 of these systems in a modular fashion would require approximately 7,000 square feet.

Land and Building Cost

According to Department of Commerce records, capital expenditures in 2003 dollars for the Malteurop facility in Great Falls was $75 – 80 million excluding processing equipment.

Calculating 5% of the high side of the 2003 Malteurop plant cost of $80 million and adding a 30% inflation factor, IDP estimates land and building costs in 2014 dollars of $5.2 million for a commercial specialty malthouse capable of housing equipment and personnel to produce 10,000 tons per

year. MMEC and CTA have been requested to review this estimate.



Equipment Cost

IDP estimated equipment costs based on the 1,000 ton per year compact Schultz malting machine that costs $1.9 million. IDP, working with MMEC, roughly calculates that scaling that equipment up in a modular fashion to produce 10,000 tons per year would cost about $14 million.

Total Cost

The total cost estimate for a specialty malt plant producing 10,000 tons annually is:

Land and Building	$5.2 million
Equipment	$14 million
Total	**$19.2 million**

A 30% contingency factor in this estimate would create an investment range of $16 to $23 million for land, building and equipment.

Return on Investment

A 10,000 ton plant would produce 20 million pounds of malt per year, valued at $13 million using an average specialty malt price of 65 cents per pound. IDP is uncertain how much investors would want to net out of this plant. Assuming an ROI of 5%, a malthouse would need to have $1 million in net profits annually from a 10,000 ton plant producing $13 million in gross revenue. A 10,000 ton malt plant would process about 600,000 bushels of malt barley with an average cost of $6.50 per bushel resulting in annual input costs of approximately $3.9 million. The plant would require around 10- 15 employees with payroll estimated at $1.1 million annually, which leaves about $7 million to pay debt, operate the plant (pay utility costs, insurance, repair and replace equipment, etc.) and market the product leaving approximately a $1 million dollar profit.

The image above as well as the image on page 15 are conceptualizations created by CTA for the placement of a mid-sized malting facility within the Shelby, Montana Industrial Park. Shelby Mayor Larry Bonderud indicates the town has considered a facility of this nature and that all utilities and services are currently available for a shovel ready development site.

Supportive Ventures

The rise of craft brewing has caught the attention of many of Montana's entrepreneurs from farmers to brewers to seed scientist. Multiple supportive ventures are under development in Montana that can provide quality information and assistance in development of a specialty malt facility.

The facilities listed below can easily integrate research associated with malting. These research assets set Montana apart in the private malting industry by providing quality scientific research and development of malts from the seed in the field to the last drop of the pint glass.

Malting Lab

Former Montana State University barley breeder Tom Blake has received a grant through the Montana Department of Agriculture's Growth-Through-Ag program to build a malting laboratory. This lab will examine the response of various barley strains and varietal grains to malting processes in order to achieve desired malts.

Flavor Profile Lab

The 406 Brewing Company of Bozeman has been awarded a grant through the Growth-Through-Ag program to construct a flavor profiling lab. This laboratory will be able to determine finished malts flavor profiles and further analyze their effect once brewed.

Mini Malting System

Tom Blake also has developed a mini malting system that can produce up to 800 pounds of malt per week at full capacity. This system can be acquired with very little expense and serves as an ideal volume for maltsters to run test batches.

Northern Seed Lab

Butte-based Northern Seed is expanding into the Bozeman area with one of Montana's first private seed research facilities. The lab will screen seed varieties developed in crop breeding programs around the world which Northern Seed will market through Westfeeds and Montana Seed and Grain. In addition to screening, Northern Seed will take on contract research at the facility. Ron Ueland, President of Northern Seed stated, "I'm very confident that out of this will come a value-added variety or seed variety that isn't in existence today."

Montana State University College of Agriculture

The University has long been recognized as a leader in barley breeding and the facilities housed in the Department of Plant Sciences and Plant Pathology continue to contribute the highest level of research, development, and commercialization in many small grain industries.

SWOT Analysis

Sourcing the input material - barley - from your backyard is very cost efficient for malt producers. The nation's largest malthouses have either located near a barley source or near a large customer base - breweries. The nation's largest malthouses supply or are owned by large domestic brewers which consume large volumes of base malts. These large domestic brewers often pay two-way transportation costs both getting the barley from field to the malthouse as well as from the malthouse to the brewery. Breweries in Colorado and California incur the largest transportation expenses.

As craft breweries volume of production is a small fraction of large domestic brewers, a malthouse must serve a larger customer base over a much larger area in order to produce enough volume to achieve a return on their investment. Consequently, a specialty malthouse will obtain the highest logistic efficiency by locating near its source malt. A facility located in Montana would hold an advantage over the larger specialty malt producers currently operating outside of ideal barley growing regions.

Malthouses also require a fair amount of land and water. Obtaining a large amount of land near utility services helps to keep construction costs down as the facility can build horizontal rather than vertical which also avoids costly extensions of needed utilities. Montana communities continue to develop industrial parks and tax increment finance districts creating an ideal location for development. Water may seem abundant in a headwater state like Montana; however, much of that water is already accounted for in historical water rights. This does not equate to inaccessibility since some rights may have water available for distribution under current rights or a user may find that a malthouse application more profitable and apply for a change of use in the water right. Montana's water is available and of excellent quality for malting.

Montana's long history as an agricultural producer means a number of key assets to the malting industry are already in place, most importantly growers and ag workers. Montana growers are known for producing the highest quality grains in the world. This quality comes from a deep understanding of how varieties respond to different environments which is precisely what maltsters spend their lives perfecting. Value-added applications across the state have created a workforce of capable individuals fed by the state's outstanding ag curriculum offered by the Montana University System campuses. The state could greatly benefit from a food lab and food scientist approved by the FDA in order to expedite development of value added applications in the ag industry. The Montana Department of Agriculture has invested in a malting lab and a flavor profile lab to aid the malting and craft brewing industry.

Infrastructure	*Strength*	*Weakness*	*Opportunities*	*Threats*
Water	Sufficient water supply and infrastructure in barley growing regions	Wastewater treatment facilities may not have needed capacity for a large malthouse	Wastewater facilities could serve malthouse and future tenants	Possible increases in capital investment may deter investment
Ag Infrastructure Network	Montana's strong ag economy has established a strong network to move ag products	Lack of rail competition and rail congestion leads to increased costs.	Develop stronger in-state markets for malted barley and increase robustness of in-state infrastructure	Increased price of transportation due to lack of rail capacity and ability to reach a diversity of markets
Power	Competitive power prices and renewable power available	None	On-site power production through CHP, biomass, or wind	Lower power costs in other states (WY)
Land	Abundant and affordable industrial parks; world's best barley region	None	Multiple options allow developer to solicit offers to locate from different communities	None

Workforce	*Strength*	*Weakness*	*Opportunities*	*Threats*
Current Workforce	Trained workforce at Malteurop in Great Falls; Montanans are well versed in manufacturing / ag processing; entry level requires little to no training	Lack of knowledgeable and experienced Maltster	Increase worker training; tailored MUS curriculum; leverage MT lifestyle to attract workforce	None
College Graduates	Montana has 19 agricultural degrees and certificates spread across the state and 10 food related degrees and certificates	Lack of a food scientist	Obtain an accredited food scientist at MSU; develop malting and brewing curriculum	Outside markets provide more employment opportunities and higher wages for graduates

Quality of Life	Strengths	Weaknesses	Opportunities	Threats
Recreation	Abundant outdoor opportunities; 2nd in breweries per capita; outstanding rural living	Cold northern climate doesn't appeal to all audiences; no coastline	Leverage Montana's lifestyle in marketing efforts	Competing states with similar amenities
Community	Excellent school systems; family-centric atmosphere; short commutes; no traffic; low crime	Limited proximity to cultural amenities	Easily become a member of and shape the community in which you live	Larger population centers with greater cultural diversity and amenities

Tax Environment	*Strength*	*Weakness*	*Opportunities*	*Threats*
Real Property Tax	Low cost of land	Tax rate is perceived as high	Education about tax policies and incentives; quantify operating costs in Montana versus other states	Termination of tax incentives; politics of tax policies that pick and choose subsidization
Corporate Income Tax	Montana ranks 7th best in the Tax Foundation's State Business Tax Climate Index	Limited number of corporations that can promote Montana as a place to do businesses	Education about taxes	MT ranks 23rd lowest among states levying a corporate income tax
Business Equipment Tax (Personal Property Tax)	Full exemption for malting facility equipment	None	Education about taxes	None
Sales Tax	There is no sales tax	Drives up property and income taxes	Leverage savings from lack of sales tax against other perceived high tax	Competing states with no sales tax

Financial Incentives	*Strength*	*Weakness*	*Opportunities*	*Threats*
Tax breaks	No sales tax; full exemption from business equipment tax for malting facility equipment, New and Expanded Industry Abatements; one for state portion of property tax and the other for corporate income tax	Need for a more comprehensive tax incentive comparison with other states	Show benefits of operating in MT through bottom-line analysis	Expiration or termination of tax incentives
Low interest loans	Available funding from CDBG and Montana Board of Investments	Loan criteria may limit applicability	Lock in low-interest rates	Increasing interest rates; lack of funding from state legislature
State grants	Work force training grants; Big Sky Trust Fund monies	Grant criteria may limit applicability	Possibility of funds made available for public infrastructure, business equipment and more	Removal of funding by the federal government or state legislature

Environment	*Strength*	*Weakness*	*Opportunities*	*Threats*
Meteorology	Ideal barley growing conditions	The prime barely growing regions of the state are limited	Montana's meteorological situation makes this a prime barley growing region that will persist into the future because barely production here is less likely to experience competition from crops like corn and soy beans such as has happened in other barley growing states	Extreme weather events like drought or poorly timed rain
Geology/soils	Ideal barely soils in a headwaters state	The prime barely growing soils of the state are limited	More barely acreage can be brought into production	Poor conservation practices

Transportation	*Strength*	*Weakness*	*Opportunities*	*Threats*
Highway	Well maintained network of highways	Rural interconnection highways	Safe delivery of goods and workforce	Weather and flooding in remote areas
Interstate	I-90, I-94, and I-15 provide east-west, north-south interstate access with I-90 and I-15 intersecting in Butte	No interstate access in the northern third of the State; however, strong highway infrastructure is present	Access to all regional markets	Weather and flooding in remote areas
Rail	Extensive rail network	Much of rail capacity has gone to oil, coal, and wheat	Possible decreased rates in empty return loads	Increased shipment of Montana's natural resources decreases rail capacity
Air	Eight large commercial airports; five Essential Air Service commercial airports; 120 general aviation airports	Limited number of direct flights	Increased market activity from malting activity would increase demand for air service	Other locations provide more direct air service to multiple markets

Economic Impact

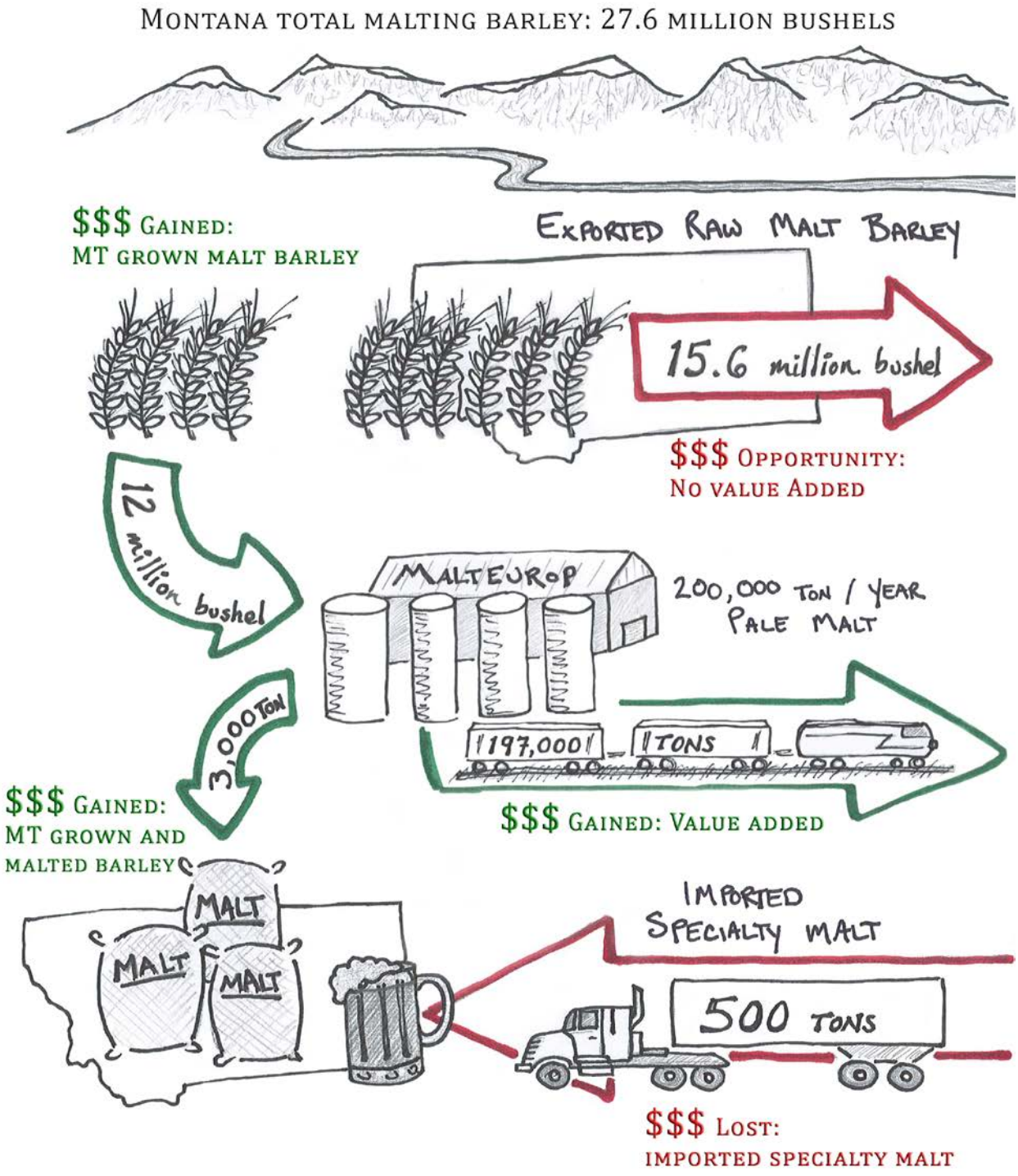
Since signing and filling contracts in 2008, Malteurop has helped Montana's malt growers increase their profit margin. This value adding facility has economic impacts both upstream and downstream within the malt industry. Upstream, growers have increased their presence in the market and decreased their input in transportation costs. Downstream from the malthouse, brewers have benefited from the decreased costs associated upstream while realizing their own savings in purchasing their base malt within the state's boundaries.

A specialty malthouse would provide similar economic benefits to the industry. Furthermore, a facility of this nature would provide growers and brewers more alternatives and flexibility in their operations. Specialty malts would allow growers to make use of many different varieties of barley which can be very beneficial to an agricultural systems health and immunity; and, brewers would have the opportunity to use a much wider variety of malts with greater accessibility at a lower price point.

Bolstering the economics of these sections of the malt industry would increase the strength and longevity of an industry that is already carrying substantial economic momentum.

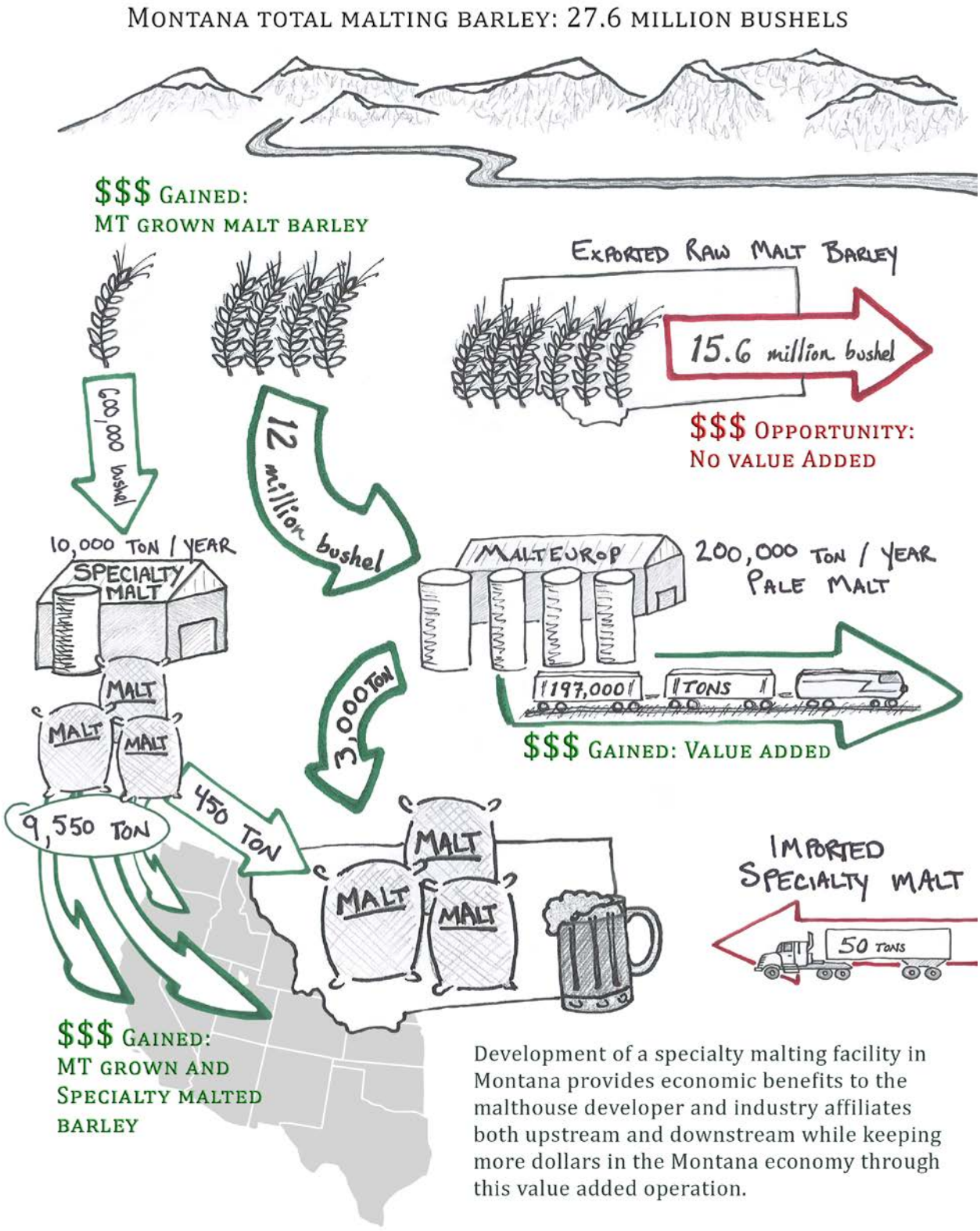
Jim Koch, founder of one of the earliest and largest craft breweries, the Boston Beer Company, pours one of his signature brews, Samuel Adams Boston Lager. Photo Credit: Associated Press

Current Economic Impact



Infographic design by: Dustin de Yong – Montana Dept. of Commerce

Potential Economic Impact



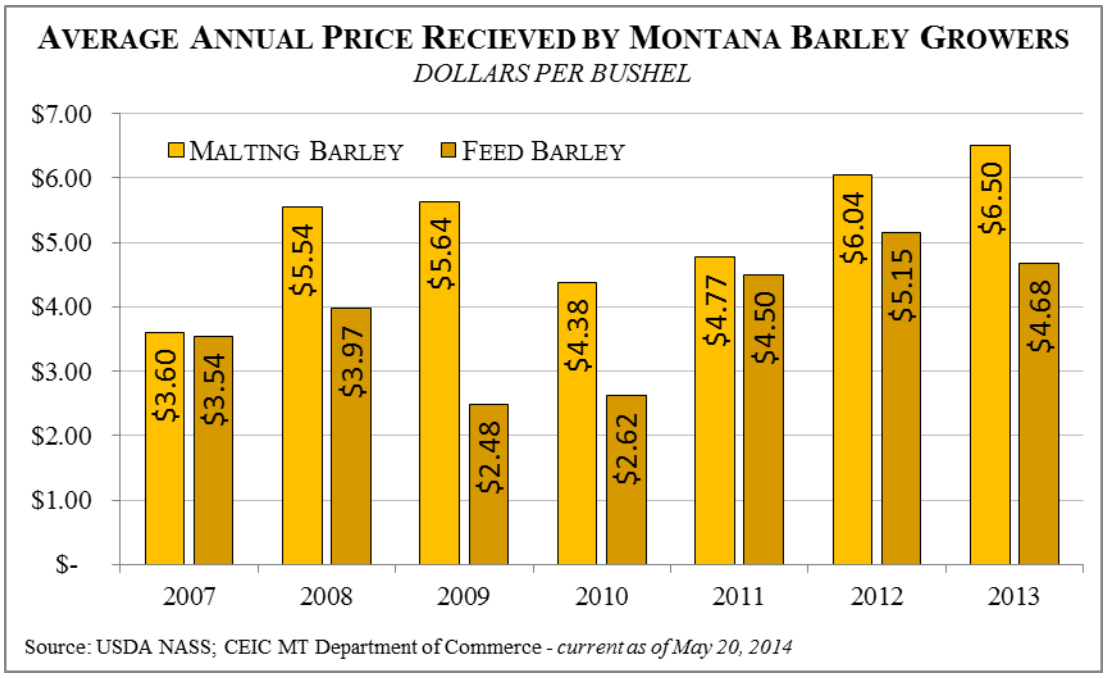
Infographic design by: Dustin de Yong – Montana Dept. of Commerce

Upstream – Agricultural Impact

In 2013, Montana growers planted 990,000 acres with barley – more than any other state in the US. Since 2010, the annual average production of malt variety barley in Montana has increased both in value and volume (see figures below).

From 2010 to 2013, production value of malting barley increased by 30% from 22.8 to 29.7 million bushels, respectively. During the same time, non-malting barley – used for feed, forage, or other uses – has remained fairly constant in both production value and volume. Malting barley is considered a high risk crop as there are many chances for failure in achieving malt grade; making grade is the difference between a good return and low or no return. Risks include fusarium head blight (scab), other diseases, drought / heat stress and not meeting quality requirements. Montana possesses the right growing conditions and growers with the skills necessary to consistently produce high grade malting barley. This again indicates that Montana has competitive advantages in this industry.

While overall production volume of malting barley in Montana has continued to increase, so too has the average price received by barley growers in the state (see below figure). The value of Montana's malting barley has more than doubled (102% increase) from $93.9 million in 2010 to $189.5 million worth of production in 2013.



Economic theory suggests that prices are determined by demand for a good or service. If more of a good – such as malting barley – is demanded by the consumers, such as breweries, then the price paid for that good will rise, generally speaking. In the case where both supply – malt barley production volume – and price is rising, it suggests that the current demand for malt barley is not being met. Looking forward, it would appear that, at least in the near term, more malt barley varieties are going to be demanded from producers in Montana and across the country.

The increasing demand for malting barley from breweries in Montana and across the nation will have to be met by malting facilities. Montana producers led the country in acres planted with barley in 2013 (990,000 acres) including an increasing amount of malting varieties. A malting facility that could meet the increasing demand for varietal malts from the growing brewery industry and which used Montana barley as the primary input makes strategic and logistical sense.

The USDA indicates that maltsters and brewers purchased 27.6 million bushels of Montana's barley crop between July 1, 2012 and June 30, 2013 to make malt. This is up 15.8% from the previous year, according to a recent survey conducted by the USDA NASS Montana Field Office. At an average price of $6.75 per bushel, this increase produced an estimated total of $186.3 million for producers.

Downstream –Craft Brewing Impact

In October of 2012, the Bureau of Business and Economic Research at the University of Montana reviewed the economic impact of the state's craft brewing market. Based on data collected from Montana breweries, the industry grew rapidly from 2010 to 2011.

Montana Brewery Survey Data Summary (BBER)			
Category	**2010**	**2011**	**% Change**
Production	87,442 barrels	102,925 barrels	18%
Beer Sales	$21.8 million	$26.1 million	20%
Employment	231 jobs	320 jobs	39%
Compensation	$5.2 million	$6.4 million	23%
Expenditures	$15.6 million	$18.8 million	21%

Production rose 18%, sales were up 20%, employment (both full- and part-time) was up 39%, compensation increased 23%, and expenditures were up 21%. Operations of craft breweries provided a significant impact outside of the industry to the state economy. More than 430 jobs, nearly $50 million in private sector sales, $9.8 million in private non-farm compensation, $1.8 million in government compensation, and $1.5 million in state government revenues exist in the economy as a result of craft brewing operations in Montana. Jobs are spread across a wide spectrum of the economy and impacts reoccur every year the brewing industry operates. The Bureau of Business and Economic Research is currently collecting data from the state's craft beer industry and will be providing updated numbers sometime in 2014.

Nationally, craft beer production rose 18% in 2013. Regional craft breweries like Sierra Nevada and New Belgium made up 77% of the production volume, while microbreweries made up 15.5%. The industry directly contributed 108,440 jobs in 2012 and $33.9 billion to the national economy through the three tier system of breweries, wholesalers, and retailers. (Brewers Association)

Montana Competitors

Malteurop has put Montana on the map as a prime location for malting facilities. However, other states have far more production of malts than Montana. Reasons for locating revolve around logistic proximity to upstream or downstream markets.

Map design by: Dustin de Yong – Montana Dept. of Commerce

Industrial / Commercial Malting Companies

Alberta

Canada Malting – Calgary, AB

Located in the heart of the Canadian prairies, a prime malting barley growing region, the Calgary facility has convenient access to an excellent source of malting barley. Outbound freight allows the loading of trucks and railcars, and is a few days transit from container and bulk-loading facilities. The Calgary plant is positioned to deliver malt to Western North America and throughout the world via the Pacific Ocean.

Rahr Malting Canada, Ltd. – Alix, AB.

This facility was constructed in the middle of Alberta's prime barley-growing region in 1993. The central location ensures both dependable supplies of premium quality malting barley and proximity to key markets. This modern and efficient tower malthouse has an annual capacity of 140,000 metric tons (9 million bushels). The facility is serviced by truck and by the Canadian Pacific and Canadian National Railroads.

British Columbia

Gambrinus Malting Corporation – Armstrong, BC

The malthouse originally belonged to the Schlossquell Brewery of Heidelberg, Germany. In 1992, the malthouse was dismantled and shipped to Armstrong where it still resides today producing Canadian 2-Row malts.

Saskatchewan

Prairie Malt Limited (Cargill Malt) – Biggar, SK

Prairie Malt Limited is located in the heart of Canada's vast prairie region. Some of the best barley in the world is grown within a one hundred kilometer radius of this malthouse which has an annual capacity of 105,000 metric tons. Prairie Malt utilizes the Fleximalt system which combines germination and kilning in one malt compartment.

Ontario

Canadian Malting – Thunder Bay, ON

Located at the west end of Lake Superior in a major Canadian grain port, the Thunder Bay plant is well situated to pull malting barley from the Eastern Canadian prairies. It ships malt via rail and truck to Eastern North America and can load malt directly onto vessels from its malt storage elevator.

Quebec

Canadian Malting – Montreal, QC

The Montreal plant is located very close to a significant number of breweries in Eastern North America. A competitive rail rate allows barley from the Canadian prairies to be brought in to Montreal. This rate, coupled with the close proximity to its customers, allows the Montreal plant to offer competitive

delivery pricing. The plant can also load containers and bulk malt onto oceangoing vessels to service customers through the Atlantic region.

Colorado

MillerCoors – Golden, CO

MillerCoors operates the nation's 4th largest malthouse at their Colorado brewing operations in Golden. The facility malts barley produced in Montana and other states supplying 530 million pounds per year to the brewhouse.

Idaho

AB InBev – Idaho Falls, ID

AB InBev malting operations in Idaho Falls produce 350,000 ton per year. Anheuser-Busch contracts more than 20 million bushels of Idaho barley each year.

Great Western – Pocatello, ID

Great Western also operates a malt and brewing supplies warehouse and distribution system known as The Country Malt Group. Great Western operates malting facilities in Pocatello, ID and Vancouver, WA producing a variety of pale and specialty malts.

Located in the barley fields of southern Idaho, the Pocatello malt plant has easy access to some of the best quality barley and most reliable crops grown anywhere in the world.

InteGrow Malt LLC – Idaho Falls, ID

InteGrow Malt, LLC (IGM) is a Joint Venture between Grupo Modelo, S.A.B. de C.V., the leader in the production and marketing of beer in Mexico, and Cargill, Inc. IGM's principal market is supplying part of the malt needs of Grupo Modelo's seven breweries located in Mexico. Grupo Modelo brews and distributes ten brands including Corona Extra, the number one Mexican beer sold in the world, Modelo Especial, Victoria, Pacifico, Negra Modelo, and other regional brands.

North Dakota

Cargill Malt – Spiritwood, ND

Cargill is the nation's second largest malting company providing approximately 19% of malt consumed. Cargill, unlike Malteurop, dabbles in providing specialty malts to brewers. Cargill's malting plant is located in Spiritwood, ND.

Minnesota

Anheuser-Busch InBev – Moorhead, MN

This 250,000 ton per year malthouse provides malt to four AB InBev breweries.

Malteurop – Winona, MN

This 115,000 ton per year facility produces Pilsen and special kilned malt. This location allows for bulk shipping by barge along with truck and rail.

Rahr Corporation – Shakopee, MN

The Shakopee production facility annually produces 380,000 metric tons (24.6 million bushels) of malt, making it one of the largest single site malt production facilities in the world. The campus consists of five individual malthouses. Two major North American rail carriers, the Union Pacific and Canadian Pacific, service this site. The Shakopee site serves as the headquarters for the Rahr Malting Companies.

Washington

Great Western Malting – Vancouver, WA

This malt plant is located on the Columbia River, within easy reach of the prime malt barley growing areas of Idaho, Montana, Oregon and Washington. Located within the Port of Vancouver, this is one of only two malt plants in North America with direct access to the ocean, the other being the Canada Malting plant in Montreal, Quebec.

Wisconsin

Briess Malt and Ingredients Co. – Chilton, WI

The Briess Malthouse in Chilton, Wisconsin is one of the most unique and specialized malthouses in North America handcrafting more styles of malt than any malting operation in the world (Briess). From it comes such unique specialties as Carapils® Malt, Victory® Malt and Dark Chocolate Malt.

Briess Malt and Ingredients Co. – Waterloo, WI

In 1997 new roasting operations with multiple drum roasters were built directly next to the Waterloo malthouse making the Waterloo malting operation capable of producing the entire line of Briess specialty malts. In 2005 supply was outpacing demand for malt and the Waterloo malthouse was closed. In 2008, after setting idle for three years, Briess re-commissioned the malthouse after an extensive remodeling project in response to increased demand for malt. Today, the Briess malthouse in Waterloo is operating at full capacity. Other features at the plant include railroad service for cost effective transportation of raw materials and finished goods and an environmentally-friendly wastewater treatment system.

Malteurop – Milwaukee, WI

The largest of Malteurop's American malthouses, the Milwaukee facility produces 220,000 tons per year of Pilsen malt. Malt is shipped in bulk by truck and rail.

Micro / Craft Malting Companies

Colorado

Colorado Malting Company – Alamosa, CO

This company has been providing a wide variety of malts since 2008. Like many malthouses this size, CMC focuses on serving local markets. The company also has a gluten-free product line of 6 different malts, some of which are made from millet or seeds.

Massachusetts

Valley Malt – Hadley, MA

Valley Malt started in 2010 with the support of local farmers and brewers. For the first time in many decades, barley is being grown in organic fields helping to build healthy soil. Valley Malt now offers base malts for local brewers and is bringing an innovative twist to many traditional malts. Being a micro-malthouse has its advantages offering unique malts that are made from heirloom or gluten-free grains, smoked with native woods, and roasted fresh to order.

Michigan

Michigan Malt Co. – Shepard, MI

This micro-malthouse provides high quality locally produced malts for both craft brewers and home brewers interested in making a more authentic and environmentally sustainable product. All the barley and wheat is locally grown in partnership with other Michigan growers that make up a "family of farms".

Nevada

Rebel Malting Co. – Reno, NV

Rebel Malting Company is small and produces malted products with local and niche markets for the brewing and distilling industries. Micro malting operations are located in Reno, Nevada. Grain is primarily sourced from two locations - Fallon and Yerington, Nevada. The Rebel focus is to sow and grow grains within 100 miles of the malthouse and hand deliver this product to local brewers and distillers near Reno, Nevada. The company promotes its malting process which claims to use 30% less water, an important commodity in the arid region.

New York

Farmhouse Malt – Newark Valley, NY

This malthouse uses a combination of new technology and centuries old methods to craft its malts sourced from growers across the state of New York.

North Carolina

Farm Boys Malt – Pittsboro, NC

Farm Boy Farms was created to provide locally grown American Malting Barley Association recommended barley, wheat, and hops to microbrewers and expert homebrewers of North Carolina. The company grows AMBA 2-row, wheat, rye, milo, and five varieties of hops.

Riverbend Malt – Ashville, NC

Riverbend Malt House pledges to provide the area’s craft brewers with locally-farmed, artisan malts that bring depth and character to their passion while greatly lessening the local industry’s impact on the planet. Riverbend retains the tradition of the original three-step process implying that the artisan characteristics of traditional malting techniques provide an artisan quality malt.

Oregon

Christensen Farms Malting Co. – McMinnville, OR

Christensen Farms capitalized on Oregon's large craft beer market by creating local malt for the local breweries. Controlling the process from the seed at planting, the sustainable production practice employed through harvest, and through the malting process delivers an all Oregon beer for the first time in years.

Texas

Blacklands Malt – Leander, TX

This Texas malthouse grows and malts its barley all within the Lone Star State to capture the unique flavor of Texas.