

Barley Ingredients Processing

A Business Case for the Great Falls Montana Region

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[The Great Falls Development Authority \(GFDA\)](#) is a public/private economic development partnership serving the 13 county Golden Triangle region of north-central Montana. Our mission is to grow and diversify the Great Falls regional economy and support the creation of higher wage jobs. We are a private-sector driven, award-winning professional economic development team that prides itself on providing excellent service to support long-term business success. We were the first economic development organization in the Rocky Mountain region to earn accreditation from the International Economic Development Council.

[In Addition to World-Renowned Agricultural Production](#), we offer a range of support for agricultural and food processors, including workforce recruitment and training grants, land and equipment grants, access to low cost capital, low cost utilities, competitive shovel-ready rail-served manufacturing sites, abundance of spring and municipal water, the 6th best tax climate in the nation, and more! We are experts at structuring packages focused on long-term client success.

[The Purpose of This Business Case](#) is to document the competitive advantages our region offers for niches in agricultural and food processing operations. We have developed business cases for a variety of other agricultural and food processing niches which may be of interest to you.

[We look forward to learning about your company and how we may be able to find a great location for your start-up or expansion.](#)

Executive Summary

The Great Falls Region is the premier location to develop barley ingredients processing facilities. The Region has the advantages of an abundant supply of high quality barley commodities; agri-processing clusters; low cost electrical and natural gas energy inputs; shovel-ready, fully equipped industrial parks; a robust transportation system; plentiful labor resources; and a pro-business attitude.

Barley crops grow abundantly in the Great Falls Region, giving barley ingredients processors the substantial economic advantage of procuring grains directly from local growers and elevators.

The Region has one of the lowest combined costs of industrial energy in the nation. Those costs include one of the lowest electrical rates for industrial use of any of the barley crop growing areas in North America, which significantly reduces processing energy costs. The Region also boasts low natural gas rates for industrial use, which is economically advantageous for industrial heating purposes.

The Region has plentiful labor resources that can be coupled with Montana-sponsored workforce training financial incentives.

The Region has two impressive, shovel-ready industrial parks with required infrastructure to support barley ingredients processing facilities.

The Region has the I-15 Interstate Corridor and the nearby I-90/94 Interstate Corridor that interconnect with major highway systems for efficient transport of goods by truck throughout North America.

Dozens of Montana-based and out-of-state trucking firms service the Great Falls Region and I-15 Interstate Corridor in this region interconnects with major highway systems for efficient and cost-reducing transport of goods by truck throughout North America.

The Region has BNSF rail for efficient transport of goods by rail.

The Region has established itself as a preferred location for the Intermediate Industrial Products segment of food and beverage manufacturing.

The Region has been active and successful in attracting and supporting a wide variety of food and beverage intermediate ingredients and finished goods manufacturing operations.

This document outlines the justification for the start-up and operation of a barley ingredients processing facility in the Great Falls Region. The profit opportunities that exist for barley

ingredients processing in Montana are uncommonly advantageous due to the rapidly increasing demand for barley ingredients, reliable availability of barley, wheat, and specialty grains, and the plentiful resources available in the Great Falls Region.

Montana ranks third of all states in the planting and harvesting barley in the nation.ⁱ Montana harvested a total 850,000 acres of barley in 2015 and produced a total of 44.2 million bushels in that year. The Great Falls Region accounted for 73% of all barley grown in Montana in 2015. Other small grains grown and harvested in large quantities in Montana include wheat, oats, rye, millet and a variety of other specialty grains.

Barley ingredients processing technology featured in this business case is primarily focused on reviewing dry milling technologies along with a brief discussion on wet milling potential technologies. The vast majority of barley grown in the Great Falls Region is processed into barley malt used for brewing beer. The demand for specialty malt is dramatically increasing within the microbrew and craft brewing marketplaces in Montana and throughout the U.S.

Agriculture is the number one industry for the Treasure State, Montana. According to the 2012 USDA Census of Agriculture, Montana's agriculture industry employed over 9.5 million acres to bring in over \$4.2 billion in revenue to the state.ⁱⁱ Agricultural producers and processors in Montana have demonstrated the ability to efficiently grow and process agricultural commodities for shipment to customers worldwide. The Great Falls Region is an agricultural processing hub that excels in the conversion of Montana-grown commodities into intermediate products for food, pet food, and feed industries.

Food, pet food, and feed component manufacturers in the Great Falls Region have been very successful in efficiently supplying value added ingredients and shipping a wide variety of intermediate products to supply chains globally. Prime examples of bulk, intermediate products produced in the Great Falls Region are conditioned grains, barley malt, oilseeds, and pulses; milled flours, durum semolina, pasta products, vegetable oils, and honey. The Region is also home to a large-scale egg production operation.

Companies that operate manufacturing facilities in the Great Falls Region are:

Malteurop	Pasta Montana	General Mills
Cenex Harvest States	Grain Craft	JM Grain
Great Northern Growers	Montana Milling	Montana Specialty Mills
Montana Advanced Biofuels	Montana Eggs LLC	Columbia Grain
Timeless Seeds	Giant Springs Water	Smoot Honey

Table 1: Great Falls Region Agri-processing Companies

Source: Great Falls Development Authority

The Great Falls Region's electrical costs are among the nation's lowest industrial electrical costs.ⁱⁱⁱ The City of Great Falls has the lowest industrial natural gas cost in Montana, and that cost is lower than nearly all industrial sites in the nation. Operating within such substantial

barley acreage coupled with lower energy and human resources costs, a barley ingredients manufacturing operation in the Great Falls Region would have significant input cost advantages compared with the competition. Additionally, this type of facility in the Great Falls Region would have the opportunity to become the lowest cost producer of barley ingredients in North America.

Barley and Wheat Resources in the Great Falls Region

The Great Falls Region has a near ideal environment for prairie grasslands and their related cousins, small grains. As in other semiarid prairie grassland regions of the world, raising small grains, forage crops, and forage animals continues to dominate agricultural production. Wheat, barley, and forage crops command the Great Falls Region's agricultural crop profile. Only 2.6% of harvested land is used for crops other than wheat, barley, and forage. Of that 2.6%, the majority is made up of another class of wheat, durum wheat for the production of pasta. An alternate crop that is making rapid inroads in the Region is dry peas.

The Great Falls Region has the competitive advantage of possessing a combination of geographic features, climactic conditions, topsoil composition, and water resources to make it a major, intensive supplier of small grains. Montana, specifically the Great Falls Region, produces excellent quality malting barley. Farmers in the Great Falls Region have the resources and knowledge base to consistently produce high quality malting barley in prodigious quantities. Also, the Great Falls Region has the advantage of raising a wide variety of consistently high quality small grain commodities in addition to traditional wheat and barley crops.

The competitive advantage of prodigious small grain production in the Great Falls Region points toward the focusing on agri-processing economic development efforts with two categories of business development. The first category includes large scale, conventional commodity processing involving significant capital investment in plant and equipment. The second category discussed in this business case includes smaller scale, niche oriented processing involving a lower degree of capital investment in sales and marketing in addition to plant and equipment.

Large-scale commodity processing of barley in the Great Falls Region is dominated by the 200,000 ton per year malt processing facility, Malteurop. Smaller scale barley processing, namely, alternative barley ingredients processing is feasible in the Great Falls Region due to abundant, high quality barley supply, a willing labor force, low cost energy, and a fast growing craft brewing industry within Montana. An excellent example of a specialty milling operation located in the Great Falls Region is Montana Milling, a manufacturer of barley ingredient products.

Barley is grown throughout the Great Falls Region with a high concentration in the 80,000+ acre Greenfield Irrigation District in southeast Teton County and northeast Cascade County, centered in Fairfield, MT.^{iv} The 13-county Great Falls Region of Central and North Central Montana produced 32.3 million bushels of barley in 2015. Wheat is the primary crop grown in

the Region with hard red winter wheat grown in the counties bordering Canada and hard red winter wheat grown predominantly in Teton, Pondera and Cascade counties in the Great Falls Region.

Barley Production

In 2015, Montana farmers harvested 850,000 acres of barley, the second largest acreage of all states. Over 78% of that barley acreage, or 667,100 acres, were harvested in the Great Falls Region alone. (Figure 1) In 2015, Montana farmers harvested 44,200,000 bushels of barley, and 32,335,000, or 73%, of those bushels were harvested in the Great Falls Region^v as shown in Figure 2. Montana's barley production history has been steadily increasing as shown in Figure 3. The increase came as barley farmers in other barley producing states have gradually switched to corn and soybeans.^{vi}

In the U.S., 214 million bushels of barley were harvested in 2015^{vii} and more than 43 million bushels in that year were used for animal feed^{viii} and 6.8 million bushels were exported primarily to Japan, Morocco, Taiwan, and South Korea.^{ix} Approximately 50 to 60 percent of the barley crop consumed in the US is annually used for animal feed and pet food. Of the barley grown in the U.S., about 40 percent is used for malt production, 3 percent as propagation seed and 2 percent for food products.^x Therefore, about 4 million bushels of barley produced in the U.S. are used for food products as shown in Figure 4.

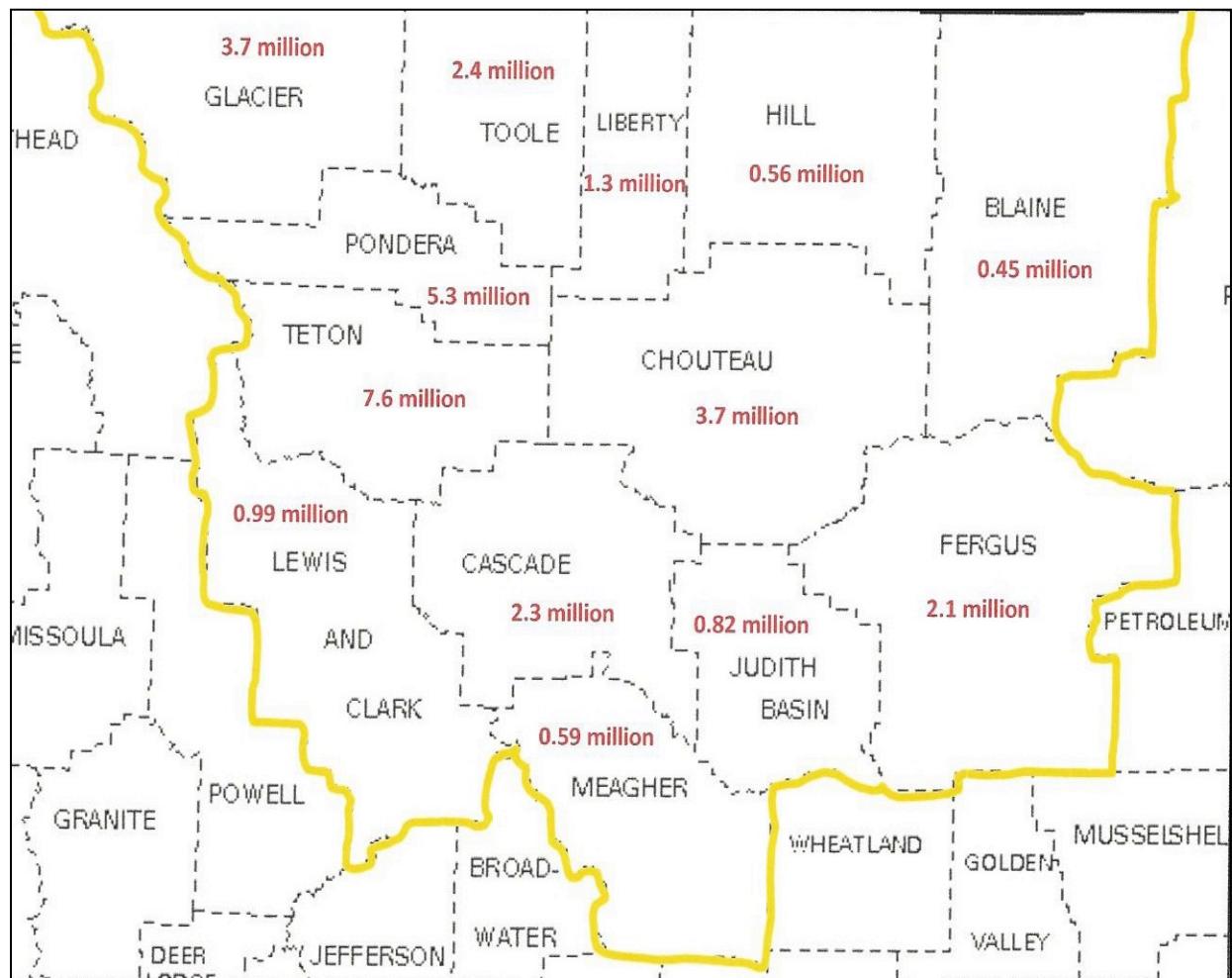


Figure 1: 2015 Barley Production in the Great Falls Region by County – Bushels

Source: USDA, NASS

75% of Montana Barley Acres Harvested in Great Falls Region

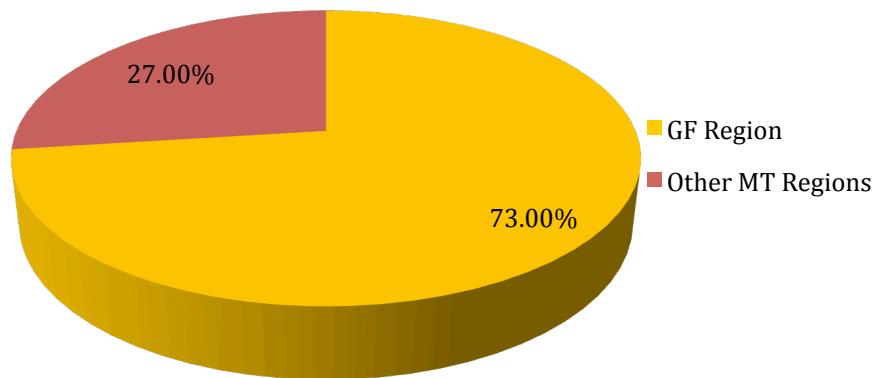


Figure 2: 73% of Montana Barley Acres Harvested in Great Falls Region Trade Area
Source: USDA, NASS 2015 Data

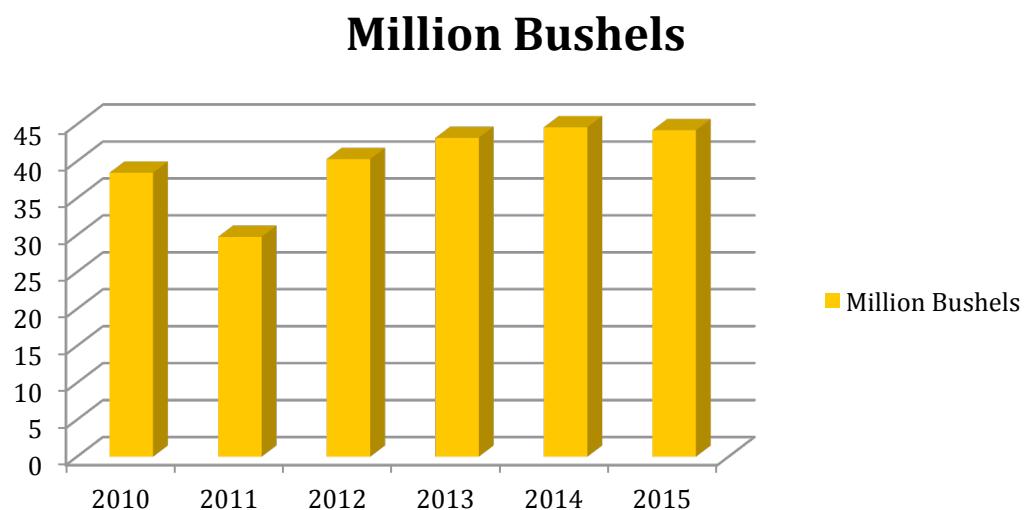


Figure 3: Montana Barley Production 2010 through 2015
Source: USDA, NASS

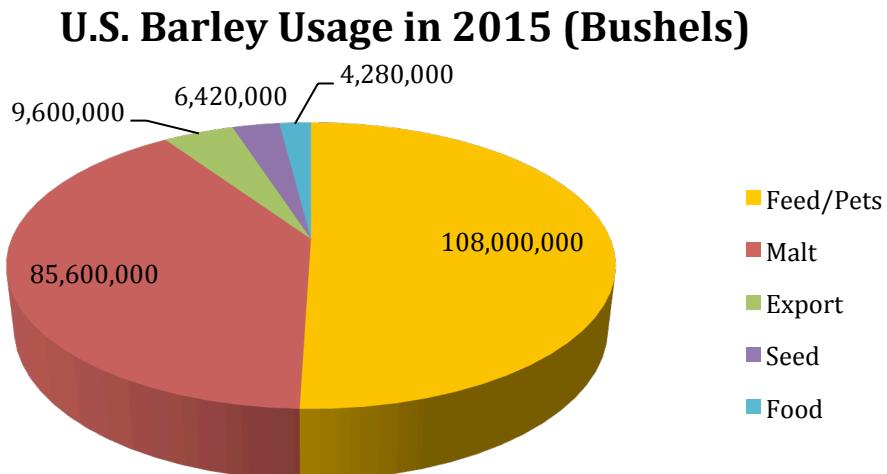


Figure 4: U.S. Barley Usage in 2015
 Sources: USDA, NASS; USDA, FAS; National Barley Foods Council

The USDA National Agricultural Statistics Service (NASS) mapped out barley production for Montana in 2015, which is shown in Figure 5. It can be clearly seen that the preponderance of barley production acres are located in the Great Falls Region. Over 90% of the barley varieties grown in Montana are made up of two row varieties rather than six row varieties.^{xi} Two row varieties are well adapted to Montana's warm summer days and cool summer nights. Montana's Great Falls Region is a preferred area by maltsters to obtain high quality malting barley.

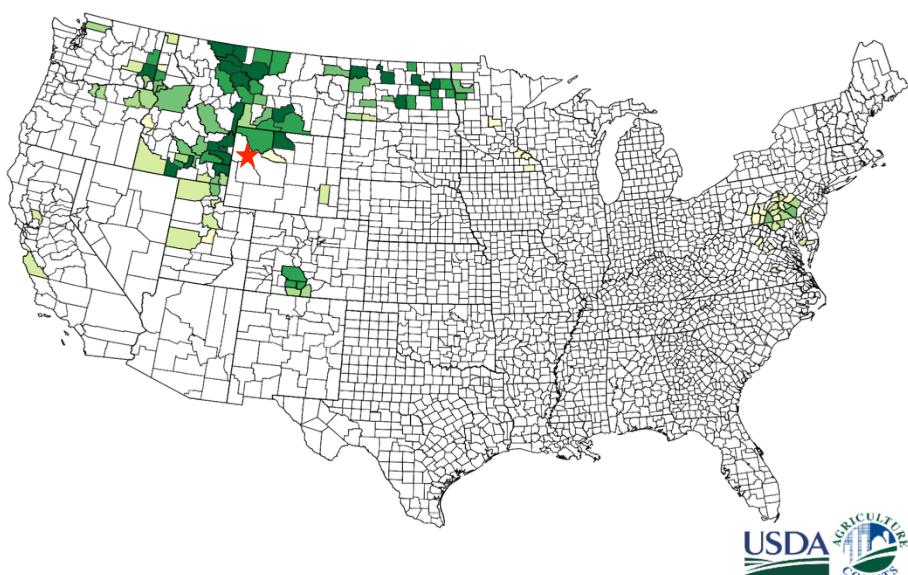


Figure 5: U.S. Barley 2015, Harvested Acres by County

Source: USDA, NASS

★ Great Falls

Farmers in the thirteen county Great Falls Region trade area have become adept at raising barley and wheat in substantial quantities. Major malt production companies and brewing companies contract directly with Great Falls Region farmers to plant and harvest malting quality barley on an annual basis. The majority of barley annually produced in the Great Falls Region consistently qualifies as malting quality barley.

Table 2 shows the individual county barley production acreage and barley bushel yield in the Great Falls Region. A considerable percentage (30%) of harvested barley from the Great Falls Region is grown on irrigated land. Teton county produces more barley than any other county in the U.S. Teton County has significant acres in the “Greenfield Bench” that are irrigated. The USDA National Agricultural Statistics Service (NASS) reported that irrigated acres in Pondera and Teton counties in 2015 had double the yield per acre of dry land production.^{xii}

Within the Great Falls Region lies the Pondera County Canal and Reservoir District located in Pondera County. The District has been privately owned for 106 years and has 400 shareholders. The Company owns 30,000 acre feet of reservoir storage and 500 miles of canals. One of the primary commodities produced in the Reservoir District is barley. The barley grown in the District is among the finest quality barley grown anywhere in the world.

Great Falls Region County	Barley Acres	Barley Bushels
Teton	105,500	7,610,000
Pondera	97,400	5,325,000
Toole	82,500	2,460,000
Glacier	95,700	3,700,000
Chouteau	76,800	3,740,000
Cascade	46,000	2,385,000
Fergus	47,700	2,165,000
Liberty	39,100	1,530,000
Hill	21,300	560,000
Judith Basin	16,800	825,000
Lewis and Clark	13,300	990,000
Meager	11,300	595,000
Blaine	13,700	450,000
Total	667,100	32,335,000

Table 2: 2015 Barley Acres and Production in Bushels in Great Falls Region Counties

Source: USDA, NASS

Proximity to Raw Materials

One obvious benefit derived from operating a barley ingredients production facility within barley production areas is that the operation can contract and purchase its barley, wheat directly from regional farmers and local elevators. By receiving barley directly from regional farmers, the company can capture receiving, cleaning, and conditioning margins that can amount to greater than 10% of annual raw material costs.

Barley contracts and open markets for the current 2016 crop year have been established around \$8.00 to \$9.50 per hundredweight.^{xiii} Recent prices per hundredweight for on-farm barley have drifted downward compared to historical barley prices due to large carryover from 2015. Launching a barley ingredients production operation in the Great Falls Region would mean operating in very close proximity to raw materials, which significantly drives down the company's highest volume direct cost: barley for processing.

Malt Production in the Great Falls Region

Malteurop is the world's largest barley malt producer. The company operates 27 sites in 14 countries within the U.S., Canada, Europe, China, Australia, and New Zealand and produces an annual production of 2.2 million tons of malt. The Great Falls Malteurop facility produces 200,000 tons of barley malt annually. In the U.S., Malteurop operates a 220,000 ton per year facility in Milwaukee, WI and a 115,000 ton per year facility in Winona, MN.^{xiv}

The Great Falls Malteurop facility has the malting capacity to use 8.33 million bushels of barley annually. The State of Montana produced 44,200,000 bushels of barley in 2015 and the Great Falls Region harvested 32,335,000 bushels of barley in 2015. The Great Falls Malteurop facility had the capacity in 2015 to process only 25% of the Great Falls Regions' barley production and 18% of Montana's barley production. The Region is located within Montana's rapidly growing craft brewing industry. The state is home to 53 craft breweries that distribute products to over 5,000 retailers in 24 states. Montana craft breweries use over 10 million pounds of malted grains per year.

Health Benefits from Barley

The Whole Grains Council, Boston, MA, posted a list of benefits from the consumption of barley. Barley is an ancient grain that provides a high degree of nutritional benefits. Barley is a good source of protein, dietary fiber, vitamins, minerals, and antioxidants. Barley is an excellent source of beta-glucan soluble fiber. Beta-glucan fiber consumption aids in reducing blood cholesterol, which aids in lowering risk factors for heart disease.^{xv}

The U.S. and Canada both allow barley foods manufacturers an opportunity to make a heart-healthy label claim for foods containing barley. The US Food and Drug Administration (FDA)

amended CFR 101.81, the regulation authorizing a health claim on the relationship between oat beta-glucan soluble fiber and reduced risk of coronary heart disease to include barley as an additional eligible source of beta-glucan soluble fiber. The final ruling was published in the Federal Register on May 22, 2006.^{xvi}

In the U.S., foods containing barley must have at least 0.75 gram of beta-glucan fiber per serving in order to make a heart-healthy claim. In Canada, foods must contain one gram of beta-glucan fiber to make the claim. Research has shown that barley beta-glucans provide blood sugar stabilization, which is important in the prevention and management of type 2 diabetes. Barley consumption has been shown to reduce blood cholesterol levels that can reduce the risk of cardiovascular disease.

The inclusion of barley in dog and cat pet foods provide a source of sustained carbohydrate energy. Barley is tolerated well by dogs and cats. Barley is especially common in dog food formulations. Once barley is cooked, barley is easily digested by dogs and supplies abundant fiber and micronutrients for pets.

Benefits of barley consumption for humans include:

- Control Blood Sugar
- Lower Blood Glucose Level
- Lower Glycemic Index in Foods
- Improve Insulin Response
- Reduce Blood Pressure
- Reduce Serum Lipids
- Reduce Serum Cholesterol
- Reduce Visceral Fat
- Aids in Weight Control

Table 3: List of Health Benefits from Barley Consumption

Source: Whole Grains Council

Traditional Barley Ingredients Processing

Barley producers primarily grow and harvest hulled barley varieties and, to a lesser extent, hulless varieties. The vast majority of barley grown and consumed throughout the world is grown in the form of hulled varieties. Consequently, the majority of barley consumed in foods, feeds, and pet food is derived from hulled barley varieties. Hulled barley utilized in foods and pet foods undergoes hull removal through abrasive milling technologies prior to further processing.

The most common technology for processing hulled barley utilizes the gradual removal of the fibrous layers of the barley kernel through abrasion in a process known as pearling. The hull represents about 10 to 13 percent of the weight of the barley kernel and consists of insoluble,

indigestible fiber. The removal of the barley hull produces a lighter colored, quicker cooking grain product that has numerous nutritional attributes. Pearling produces barley products that have a longer shelf life through the removal of the barley germ that can result in rancidity. Pearling can remove from 15 to 45 percent of the weight of barley depending upon the type of barley pearl required for food or pet food production. Cooked barley pearls are used in soups, stews, pilafs, tea, and rice extenders.

Barley flakes, grits and flour are produced from dehulled barley using a variety of milling technologies. Grits and flour can be produced using impact or roller mills. Flakes are generally produced utilizing roller mills employing similar technology used in producing oat flakes or rolled oats. Quick cooking barley flakes range from 0.25 to 0.38 millimeters thick and old fashioned barley flakes range from 0.50 to 0.76 millimeters thick. Steel cut barley is made by rotary cutting tempered dehulled barley. Barley flakes, grits, and steel cut barley are all considered to be whole grain products. Figure 6 describes the traditional barley products that can be produced from barley kernels. A list of traditional barley ingredients manufacturers is shown in Appendix I.

Barley flour can be produced from dehulled and hulless barley by employing stone milling, hammer mill, pin mill and roller mill technologies. If barley bran and germ are present in barley flour in the same proportion as whole barley, then barley flour can be considered to be whole grain.

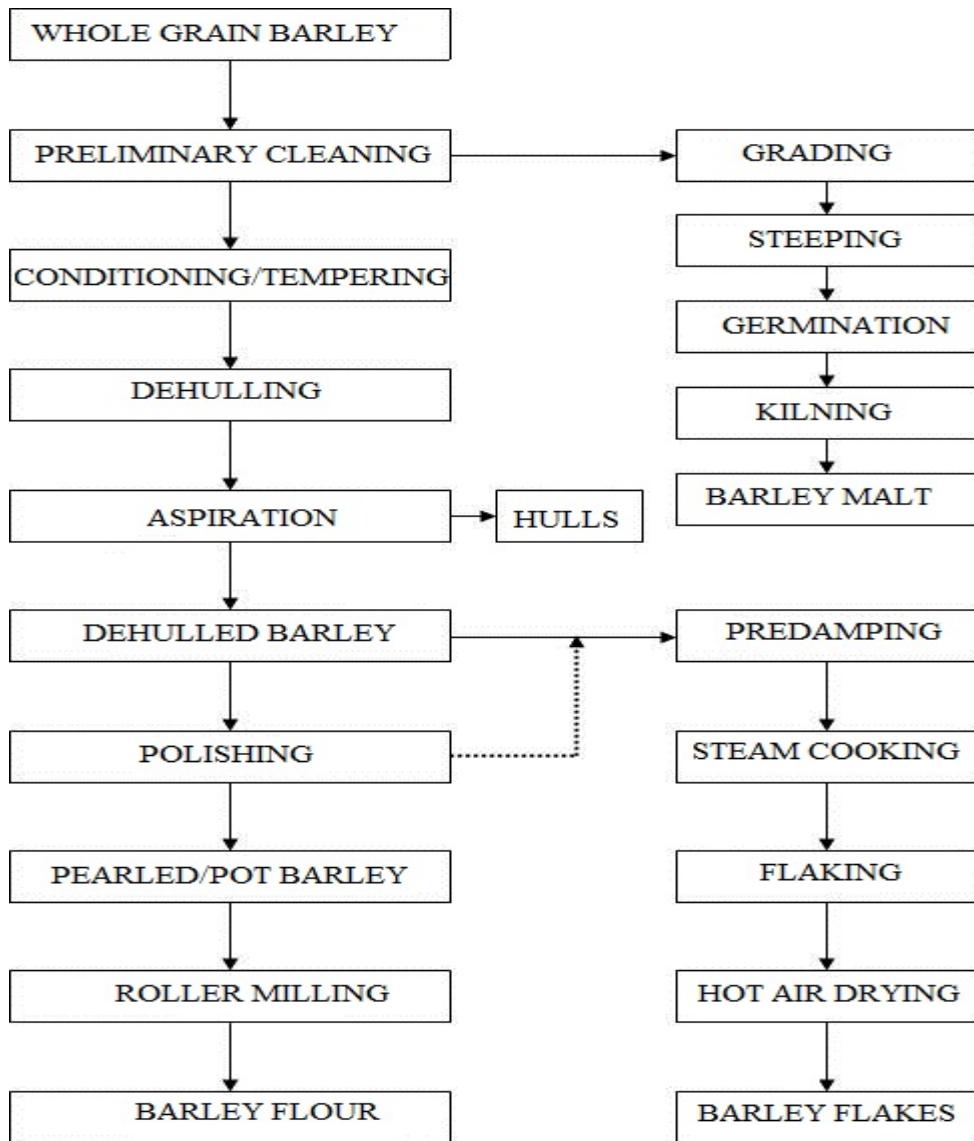


Figure 6: Production of Barley-based Products

Barley Beta-glucan Concentrate Processing

Barley flour can be further fractionated into high beta-glucan fractionated components utilizing a dry fractionation technology involving pin milling in conjunction with air classification. Dry fractionation of barley can produce a beta-glucan concentrated flour. Barley kernels contain 4 to 10 percent beta glucan and dry fractionation can produce a barley flour fraction containing 25% beta glucan. A high protein fraction can also be produced during the barley fractionation process.

Wet fractionation technologies can produce a higher percentage of beta-glucan ingredients. Barley beta-glucan can be concentrated from dehulled barley by water extraction at near

boiling temperatures. The solute is cooled and starch can be removed during by treatment with starch degrading enzymes. Beta-glucan-rich solids can be recovered by precipitation with food-grade ethanol.

Dry Fractionation: Beta-glucan Concentration

Shown in Figure 7 is a Hosokawa Alpine Flour Fractionation Production diagram. The diagram includes equipment names and placement that may be utilized for the production a beta-glucan fraction (>25% beta-glucan) and a high protein fraction.

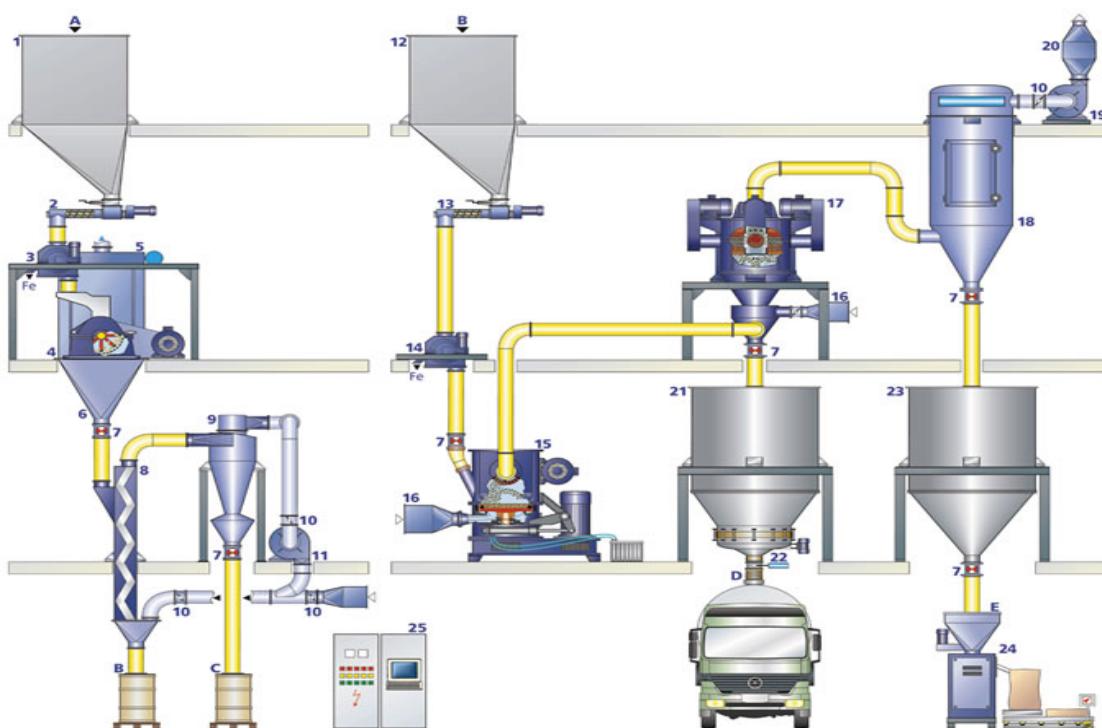


Figure 7: Hosokawa Alpine: Milling and Air Classification System

Up to 5,000 Kg/hr^{xvii}

Source: Hosokawa Alpine

Hosokawa Equipment List

1 = Feed Bin (Barley)	17 = Turboplex Ultrafine Classifier ATP
2 = Feed Metering Unit	18 = Automatic Reverse Jet Filter
3 = Metal Separator	19 = Fan
4 = Hammer Mill	20 = Outlet-side Silencer
5 = Dust Extraction Unit	21 = End Product Silo (Beta-glucan Flour)
6 = Material Collection Bin	22 = Shut-off Valve
7 = Rotary Valve	23 = End Product Silo (High-Protein Flour)
8 = Zigzag Classifier MZM	24 = Packing Machine
9 = Cyclone	25 = Control Cabinet

10 = Butterfly Valve	A = Feed Product
11 = Fan	
12 = Feed Bin (Dehulled, Crush)	B = Dehulled Barley
13 = Feed Metering Unit	C = Barley Hulls
14 = Metal Separator	D = Beta-glucan Flour Fraction
15 = Zirkoplex Classifier Mill	ZPSE = High-Protein Flour Fraction
16 = Suction-side Silencer	

Table 4: Hosokawa Equipment List

Source: Hosokawa Alpine

Wet Fractionation: Beta-glucan Concentration

Shown in Figure 8 is a Wet Fractionation Production – Beta-glucan Concentrate diagram. The diagram includes the processing steps for the production of a >70% Beta-glucan Concentrate.

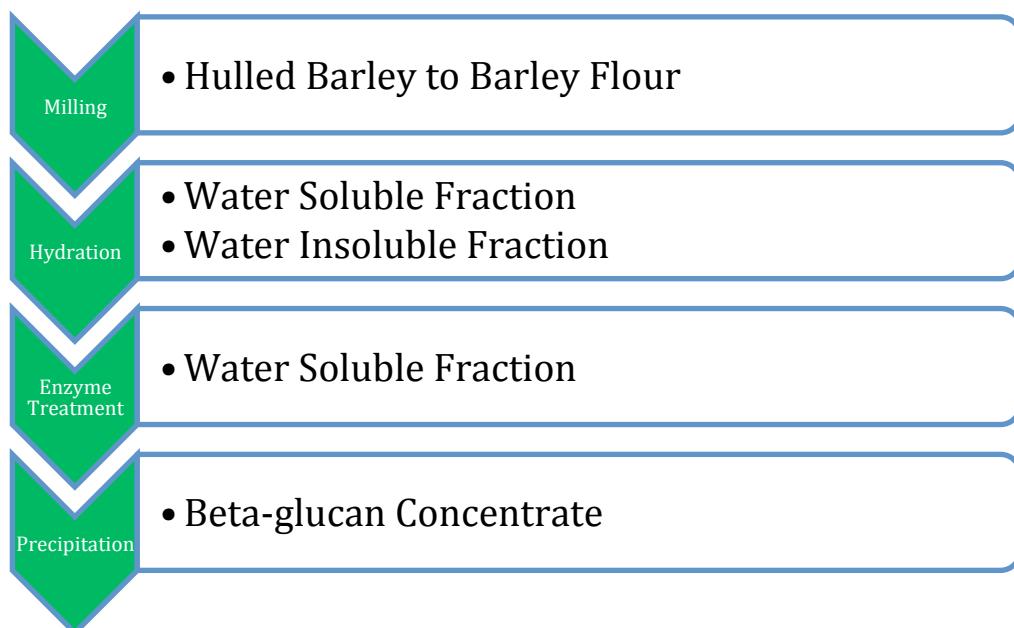


Figure 8: Wet Fractionation Diagram for >70% Beta-Glucan Concentrate

The following procedure can be used to fractionate barley flour using ethanol precipitation, decanting, dewatering and drying.

Starting material: Dehulled, barley flour.

Beta-glucan hydration: Barley flour is mixed with water in agitated, heated vessels (100°C)

Solid-liquid separation after hydration: The solution contains fine particles so that the fine solids are separated to improve the purity of the extract solute.

Enzyme treatment: The extract solute is treated with starch degradation enzymes.

Precipitation: Beta-glucan is precipitated from the extract by the addition of ethanol.

Separation of the beta-glucan precipitate: The precipitated beta-glucan is separated from the supernatant by filtration or centrifugation.

Drying: Drum or spray drying may be used to obtain dried beta-glucan.

The wet fractionation methodology described above has been employed within the soybean isolate industry over the past fifty years. The USDA Northern Regional Research Laboratory (now the National Center for Agricultural Research Utilization) provided energy and water input requirements for the isolation of protein from soybeans. Isolation of beta-glucan from barley would utilize similar levels of energy and water during the wet fractionation process.^{xviii} Wet fractionation processes operate continuously. Energy and water estimates are shown below for a continually processing 300,000 lb/day of dry peas. (Table 5)

Input	Amount
Barley	300,000 lb/day
Water	900,000 gallons/day
Natural Gas	1,400,000 cubic feet/day
Electricity	40,000 kWh
Steam	400,000 lb/day

Table 5: Wet Fractionation Process – Estimated Input Amounts for Water and Energy

Source: USDA, National Center for Agricultural Research Utilization

Capital Requirement for Barley Ingredient Production

The appeal of developing a dry technology, barley-based ingredient production facility lies in the fact that dry milling and/or fractionation production facility sizes can range from the small scale utilization of smaller rented commercial spaces to large scale automated processing facilities occupying sizeable buildings. The choice of facility size and complexity depends upon a number of factors including available capital, market accessibility, manufacturing expertise, and enterprise objectives. With this in mind, small volume barley ingredient production facilities producing pearls, flakes, and flour could be launched with a minimal amount of equipment with installation costing less than \$250,000. Facilities employing dry fractionation equipment, with sophisticated mills and air classification, require a substantially larger equipment capital investment starting at a minimum of \$2 million.

Wet fractionation production of high beta-glucan concentrates of 70% and higher requires large capital investments of equipment involving hydration, separation, treatments, precipitation, and drying. Depending upon beta-glucan concentrate and output volume required, equipment and installation costs can exceed \$25 million. Also, equipment costs must include equipment purchased to deal with processing discharge effluent in order to mitigate all federal and state wastewater requirements.

A factor of 4.55 can be applied to equipment costs to arrive at a total plant cost.^{xix} In addition to equipment costs, total plant costs include equipment installation, instrumentation, piping, electrical supplies, buildings, land, yard structure, rail improvements, engineering, supervision, construction, contractor's fees, contingency fee, certifications, taxes, and working capital. If a small scale dry milling facility had equipment costs of \$250,000, total facility and equipment costs would be estimated to be more than \$1.1 million. On the other end of the scale, a wet barley fractionation facility with \$25 million in equipment requirements could require more than \$110 million in funding. Any proposed barley ingredients production facility must be designed as an FDA food and/or feed facility with full compliance with the 2011 FDA Food Modernization Safety Act in order to address safe ingredients manufacturing for pet food, animal feed and human food markets.

Financial Illustration

Shown below is a summary compilation of the financial performance of 105 U.S-based flour milling facilities from 2010 through the second quarter of 2015. Represented in the data are barley milling facilities. Barley ingredient production facilities have comparable financial performance results within the flour milling industry. The data was compiled by Bizminer.com from a combination of U.S. government and private organization information sources. The average annual sales revenue for the representative flour milling companies averaged about \$20 million. The annual sales volume of the representative companies ranged from \$500,000 to more than \$25 million. Flour milling data shown here includes a compilation of all types of grain milling excluding rice milling.

Table 6 shows Income and Expenses in dollars for the representative flour milling companies from 2010 through the second quarter of 2015. Table 7 shows Income and Expenses as percentages of revenue. Analysis of Table 7 shows annual after tax net profits percentage of revenue range from 2.47% to 4.49%. Discretionary annual owner earnings percentages of revenue range from 5.74% to 8.15%.

Income and Expense- Profit and Loss \$						
	2010	2011	2012	2013	2014	2015q2
Business Revenue	22,292,041	18,546,487	21,198,711	21,062,297	20,568,025	20,245,480
Cost of Sales	17,409,639	14,866,538	17,131,858	17,071,179	16,618,083	16,389,319
Cost of Sales - Labor Portion	477,250	545,278	549,409	443,218	490,871	484,113
Gross Margin	4,882,402	3,679,949	4,066,853	3,991,118	3,949,942	3,856,161
Officers Comp.	340,391	228,604	286,837	265,709	253,324	252,762
Salary-Wages	951,006	899,768	933,355	986,769	936,974	946,470
Rent	242,267	165,543	153,290	216,176	154,890	155,853
Taxes Paid	196,699	124,588	135,695	196,382	154,638	155,523
Advertising	132,555	165,171	38,085	143,087	88,408	89,685
Benefits-Pensions	275,167	94,524	124,879	195,381	179,399	181,928
Repairs	108,699	81,870	104,022	149,685	83,742	84,953
Bad Debt	27,930	24,455	48,703	31,488	27,598	28,745
Sales, General, Admin & Misc.	635,528	561,777	758,316	657,741	781,844	771,467
EBITDA	1,972,160	1,333,649	1,483,671	1,148,700	1,289,125	1,188,775
Amortization Depreciation Depletion	474,577	268,521	374,754	423,479	352,734	364,760
Operating Expenses	3,384,819	2,614,821	2,957,936	3,265,897	3,013,551	3,032,146
Operating Income	1,497,583	1,065,128	1,108,917	725,221	936,391	824,015
Interest Income	5,644	4,405	7,065	4,617	6,194	6,031
Interest Expense	157,739	121,100	59,718	94,101	80,979	77,936
Other Income	172,194	106,368	197,203	156,348	163,640	168,769
Pre-Tax Net Profit	1,517,682	1,054,801	1,253,467	792,085	1,025,246	920,879
Income Tax	516,012	358,632	426,179	269,309	348,584	313,099
After Tax Net Profit	1,001,670	696,169	827,288	522,776	676,662	607,780
Discretionary Owner Earnings	1,816,638	1,193,294	1,488,879	1,211,964	1,282,720	1,225,302

Table 6: Compiled Income Statement in \$ for 105 Flour Millers from 2010 to 2015 (2nd Q)
 Source: Bizminer.com

Income and Expense- Profit and Loss %						
	2010	2011	2012	2013	2014	2015q2
Business Revenue	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Cost of Sales	78.10%	80.16%	80.82%	81.05%	80.80%	80.95%
Cost of Sales - Labor Portion	2.14%	2.94%	2.59%	2.10%	2.39%	2.39%
Gross Margin	21.90%	19.84%	19.18%	18.95%	19.20%	19.05%
Officers Comp.	1.53%	1.23%	1.35%	1.26%	1.23%	1.25%
Salary-Wages	4.27%	4.85%	4.40%	4.69%	4.56%	4.67%
Rent	1.09%	0.89%	0.72%	1.03%	0.75%	0.77%
Taxes Paid	0.88%	0.67%	0.64%	0.93%	0.75%	0.77%
Advertising	0.59%	0.89%	0.18%	0.68%	0.43%	0.44%
Benefits-Pensions	1.23%	0.51%	0.59%	0.93%	0.87%	0.90%
Repairs	0.49%	0.44%	0.49%	0.71%	0.41%	0.42%
Bad Debt	0.13%	0.13%	0.23%	0.15%	0.13%	0.14%
Sales, General, Admin & Misc.	2.85%	3.03%	3.58%	3.12%	3.80%	3.81%
EBITDA	8.84%	7.20%	7.00%	5.45%	6.27%	5.88%
Amortization Depreciation Depletion	2.13%	1.45%	1.77%	2.01%	1.71%	1.80%
Operating Expenses	15.19%	14.09%	13.95%	15.51%	14.64%	14.97%
Operating Income	6.71%	5.75%	5.23%	3.44%	4.56%	4.08%
Interest Income	0.03%	0.02%	0.03%	0.02%	0.03%	0.03%
Interest Expense	0.71%	0.65%	0.28%	0.45%	0.39%	0.38%
Other Income	0.77%	0.57%	0.93%	0.74%	0.80%	0.83%
Pre-Tax Net Profit	6.80%	5.69%	5.91%	3.75%	5.00%	4.56%
Income Tax	2.31%	1.93%	2.01%	1.28%	1.69%	1.55%
After Tax Net Profit	4.49%	3.76%	3.90%	2.47%	3.31%	3.01%
Discretionary Owner Earnings	8.15%	6.44%	7.02%	5.74%	6.25%	6.06%

Table 7: Compiled Income Statement by % for 105 Flour Millers from 2010 to 2015 (2nd Q)
 Source: Bizminer.com

Table 8 shows the dollar based compilation balance sheet of the representative companies for years 2010 to 2015. Table 9 shows the percentage based compilation balance sheet of the representative companies for years 2010 to 2015. The balance sheet shows very favorable current ratios of total current assets divided by total current liabilities. The total liabilities to

total assets ratio is very favorable for the representative companies. Net worth to total liabilities ratio is favorable averaging 42.58% to 47.01%.

Balance Sheet - dollar-based						
Assets	2010	2011	2012	2013	2014	2015q2
Cash	926,290	800,258	639,114	558,535	531,523	536,292
Receivables	2,318,613	1,872,171	1,643,635	1,399,816	1,401,091	1,424,422
Inventory	2,262,010	1,660,855	1,534,996	1,319,092	1,295,301	1,316,123
Other Current Assets	371,052	202,121	208,933	163,816	161,741	165,128
Total Current Assets	5,877,965	4,535,405	4,026,678	3,441,259	3,389,656	3,441,965
Gross Fixed Assets	7,718,043	5,907,662	4,892,444	4,272,809	4,161,732	4,328,830
Accum. Depreciation-Amortization-Depltn.	3,615,959	2,767,782	2,292,145	2,001,842	1,949,801	2,028,088
Net Fixed Assets	4,102,084	3,139,880	2,600,299	2,270,967	2,211,930	2,300,742
Other Non-Current Assets	1,704,944	1,320,023	961,250	944,537	884,857	914,405
Total Assets	11,684,993	8,995,308	7,588,227	6,656,763	6,486,443	6,657,112
Liabilities						
Accounts Payable	1,522,987	1,405,103	1,017,763	958,144	942,015	929,501
Loans/Notes Payable	733,632	592,268	472,503	391,493	417,518	415,569
Other Current Liabilities	712,328	613,347	446,328	465,937	435,102	431,139
Total Current Liabilities	2,968,947	2,610,719	1,936,594	1,815,574	1,794,635	1,776,209
Total Long Term Liabilities	3,223,371	2,554,173	2,128,332	1,848,888	1,779,801	1,820,371
Total Liabilities	6,192,318	5,164,891	4,064,926	3,664,462	3,574,436	3,596,580
Net Worth	5,492,675	3,830,417	3,523,301	2,992,301	2,912,007	3,060,532
Total Liabilities & Net Worth	11,684,993	8,995,308	7,588,227	6,656,763	6,486,443	6,657,112

Table 8: Compiled Balance Sheet in \$ for 105 Flour Millers from 2010 to 2015 (2nd Q) Source: Bizminer.com

Balance Sheet - percentage-based						
Assets	2010	2011	2012	2013	2014	2015q2
Cash	7.93%	8.90%	8.42%	8.39%	8.19%	8.06%
Receivables	19.84%	20.81%	21.66%	21.03%	21.60%	21.40%
Inventory	19.36%	18.46%	20.23%	19.82%	19.97%	19.77%
Other Current Assets	3.18%	2.25%	2.75%	2.46%	2.49%	2.48%
Total Current Assets	50.30%	50.42%	53.06%	51.70%	52.26%	51.70%
Gross Fixed Assets	66.05%	65.67%	64.47%	64.19%	64.16%	65.03%
Accum. Depreciation-Amortization-Depltn.	30.95%	30.77%	30.21%	30.07%	30.06%	30.46%
Net Fixed Assets	35.11%	34.91%	34.27%	34.12%	34.10%	34.56%
Other Non-Current Assets	14.59%	14.67%	12.67%	14.19%	13.64%	13.74%
Total Assets	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Liabilities						
Accounts Payable	13.03%	15.62%	13.41%	14.39%	14.52%	13.96%
Loans/Notes Payable	6.28%	6.58%	6.23%	5.88%	6.44%	6.24%
Other Current Liabilities	6.10%	6.82%	5.88%	7.00%	6.71%	6.48%
Total Current Liabilities	25.41%	29.02%	25.52%	27.27%	27.67%	26.68%
Total Long Term Liabilities	27.59%	28.39%	28.05%	27.77%	27.44%	27.34%
Total Liabilities	52.99%	57.42%	53.57%	55.05%	55.10%	54.03%
Net Worth	47.01%	42.58%	46.43%	44.95%	44.90%	45.97%
Total Liabilities & Net Worth	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Table 9: Compiled Balance Sheet by % for 105 Flour Millers from 2010 to 2015 (2nd Q)Source: Bizminer.com

Table 10 and Figure 9 show favorable percentage returns on EBITA (earnings before interest, taxes, and amortization), assets, net worth, and sales. Review of the financial data of representative flour millers shows that the business of flour millers can be profitable and can provide favorable returns on equity. Additional financial data for representative flour milling companies can be obtained from Bizminer.com.^{xx}

Financial Ratios: Profitability						
	2010	2011	2012	2013	2014	2015q2
EBITDA: Business Revenue (%)	8.85	7.19	7.00	5.45	6.27	5.87
Pre-Tax Return On Assets (%)	12.99	11.73	16.52	11.90	15.81	13.83
Pre-Tax Return on Net Worth (%)	27.63	27.54	35.58	26.47	35.21	30.09
Pre-Tax Return on Business Revenue (%)	6.80	5.69	5.91	3.75	5.00	4.56
After Tax Return on Assets (%)	8.57	7.74	10.90	7.85	10.43	9.13
After Tax Return on Net Worth (%)	18.24	18.17	23.48	17.47	23.24	19.86
After Tax Return on Business Revenue (%)	4.49	3.76	3.90	2.47	3.31	3.01
Discretionary Owner Earnings (%)	8.15	6.44	7.02	5.74	6.25	6.06

Table 10: Financial Returns for 105 Flour Millers from 2010 to 2015 (2nd Q)

Source: Bizminer.com

Profitability Ratios:



Figure 9: Compiled Profitability Ratios by % for 105 Flour Millers from 2010 to 2015 (2nd Q)

Source: Bizminer.co

Summary

The Great Falls Region is well suited for the development and operation of barley ingredient manufacturing facilities. The Region has the advantages of an abundant supply of high quality barley commodities; low cost electrical and natural gas energy inputs; shovel-ready, fully equipped industrial parks; a robust transportation system; plentiful labor resources; and a pro-business attitude.

Barley ingredients for foods, pet food, and feed manufacturing operations in the Great Falls Region will have the opportunity to obtain high quality barley commodities directly from agricultural producers. Barley crop inbound transportation costs in the Great Falls Region would be low relative to competitors located outside of barley crop-growing areas. On-farm storage of commodities throughout the Great Falls Region would provide year around access to barley crop commodity deliveries to barley ingredients for foods, pet food, and feed manufacturing facilities.

The combination of cost effective energy, water, property, pulse commodities, and human resources all work together to provide a superior business environment for the establishment of barley ingredients for foods, pet food, and feed manufacturing operations in the Great Falls Region. The Region can provide an optimum environment for barley ingredients manufacturing operations.

Appendix I: Barley Ingredient Manufacturers

Alexander Company P.O. Box 235 Bancroft, ID 83217	East Grand Forks, MN 56721 Minnesota Grain, Inc. 1380 Corporate Ctr. Curve, Suite 105 Eagan, MN 55121
Arrowhead Mills/The Hain-Celestial Group 110 South Lanton Hereford, TX 79045	Montana Milling 2123 Vaughn Road Great Falls, MT 59404
Barley's Best 25675 Smithtown Road Shorewood, MN 55331	Natural Ways Mill, Inc. 24509 390 th St., NE Middle River, MN 56737
Bob's Red Mill Natural Foods, Inc. 5209 SE International Way Milwaukie, OR 97222	Quaker Oats Company 321 North Clark Street
Briess Malt & Ingredients Co. 625 South Irish Road Chilton, WI 53014	NuWorld Nutrition 816 6 th Avenue NE Perham, MN 56573
Grain Millers, Inc. 9531 West 78 th St., #400 Eden Prairie, MN 55344	Palouse Grain Growers, Inc. 110 West Main Street Palouse, WA 99161
Hesco, Inc. 500 19 th Street SW Watertown, SD 57201	Dakota Specialty Mills 4014 15 th Avenue NW Fargo, ND 58102
MGI Grain Processing, LLC 315 6 th Avenue NE Chicago, IL 60610	Ottawa Valley Grain Products Inc. 405 Donald B. Munro Drive Carp, Ontario Canada K0A 1L0
Parrheim Foods 817 48 th Street East Saskatoon, Saskatchewan, Canada S7K 0X5	

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