

Sprouted Grain 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.](#)

[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 a premier location for the development of sprouted grain production facilities. The reasons are:

- The Region is the site of abundant small grain and pulse production that would enable a sprouted grain production operation to gain an economic advantage by procuring small grains and pulses for sprouted grain production directly from grain producers.
- The Region has one of the lowest combined costs of industrial energy in the nation including one of the lowest electrical rates for industrial use in grain growing areas in North America, which significantly reduces production energy costs. The Region also boasts low natural gas rates for industrial use, which is necessary for industrial drying and kilning 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 a sprouted grain production facility.
- The Region has the I-15 Interstate Corridor that interconnects with major highway systems for efficient transport of goods by truck throughout North America.
- The Region has BNSF rail for efficient transport of goods by rail.
- The Region is serviced by dozens of Montana-based and out-of-state trucking firms for efficient and cost effective transport of goods by truck.
- The Region has traction in the Intermediate Industrial Products segment of food and beverage manufacturing.

This document outlines the justification for the start-up and operation of a sprouted grain production facility in the Great Falls Region. The opportunity that exists for the sprouting of small grains in Montana is significant. That opportunity is due to three factors; the rapidly increasing demand for specialty sprouted grains, the reliable availability of barley, wheat, specialty grains, and pulses in Montana, and access to plentiful resources available in the Great Falls Region.

Montana is the leading state in the nation for the planting and harvesting of barley and is number four in the production of wheat.¹ Crops grown and harvested in large quantities in Montana include barley, wheat, oats, rye, millet and a variety of other specialty grains and pulses. Montana harvested a total of 5.65 million acres of all wheat and 770,000 acres of barley in 2014. Over 47% of wheat planted and harvested in Montana took place in the Great Falls Region. The majority (73%) of barley planted and harvested in Montana occurred within the Great Falls Region.

Sprouted grain production technology that is featured in this business case is primarily focused upon sprouting and drying small grains and pulses. The variety of sprouted grains and pulses sold in the marketplace is quite large. The sprouting of millet, rye, corn, oats, spelt, and triticale grains along with pea, lentil, and chickpea pulses will be collectively referred to in this study as sprouted grains. Sprouted grains made from wheat and barley represent the vast majority of sprouted grain products used within the snack and baking industries. Sprouted grains are experiencing increasing demand within the health and nutrition industry.

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 throughout the world. The Great Falls Region is also an agricultural processing hub that excels in the conversion of Montana-grown commodities into intermediate products for food and feed industries.

The collection of food and feed component manufacturers in the Great Falls Region has been very successful in supplying food and feed supply chains with efficient production and shipment of a wide variety of intermediate products. 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 operations in the Great Falls Region home are:

Malteurop	Pasta Montana	General Mills
Cenex Harvest States	Cereal Food Processors	Columbia Grain
Great Northern Growers	Montana Milling	Montana Specialty Mills
JM Grains	Montana Eggs LLC	Montana Advanced Biofuels
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. With lower energy and human resources operating costs and operating within substantial barley and wheat acreage, a sprouted grain manufacturing operation in the Great Falls Region would have significant input cost advantages to competition. A sprouted grain production facility in the Great Falls Region would have the opportunity to become the lowest cost producer of sprouted grain products in North America.

Definition of Sprouted Grains

All sprouted grains are classified as whole grains. In 2008, the American Association of Cereal Chemists International (AACCI), St. Paul, MN, recognized that the consumption of sprouted grain products was gaining in popularity in the food retail marketplace. At that time the AACCI formally defined sprouted grains as “Malted or sprouted grains containing all of the original bran, germ, and endosperm shall be considered whole grains as long as sprout growth does not exceed kernel length and nutrient values have not diminished. These grains should be labeled as malted or sprouted whole grain.”^{iv} Malted barley is the largest type of sprouted grain product. Barley malt products are primarily used in the brewing and distilled spirits industry.

The food industry uses mature, dormant seeds, primarily from cereal grasses, as the source material for a wide range of food products. Under proper conditions of temperature and moisture, grains can germinate, sprout, and can continue to grow into mature plants. To produce sprouted grain, the germination and sprouting process for grains is controlled and terminated after limited growth. Sprouted grain growth can be terminated by a wet method of mashing or grinding just prior to incorporation into food products or can be terminated by a dry method where sprouted grain growth can be terminated using drying and/or kilning processes.

Most of the popular sprouted whole grain products currently sold in the marketplace are made from one or more of the following germinated seeds; wheat, barley, corn, rice, kamut, einkorn, spelt, rye, oats, alfalfa, flax, triticale, sorghum, millet, buckwheat, peas, lentils, chickpeas, black beans, navy beans, amaranth, rice, and quinoa.^v Except for rice and quinoa, all of the aforementioned seed crops are grown in Montana.^v For the remainder of this Study, the term sprouted grains will be used to be all inclusive of grains and pulses listed above.

Consumer Benefits of Sprouted Grains

When grains are sprouted, dormant grain mobilizes a host of metabolic activity that converts compounds into nutrients that are more readily absorbed by the body. Complex starches are reduced to highly digestible carbohydrates and enzyme inhibitors are reduced to enhance digestibility. Sprouting increases the availability of B vitamins and vitamin C contain in grains. Sprouting of grains also aids in the absorption of calcium, magnesium, iron, copper and zinc by reducing the activity of metal chelating agents such as phytic acid compounds.^{vi}

Health and nutrition research has shown that a number of positive health benefits can be derived from the consumption of sprouted grains. (Figure 1) Research has shown that sprouted grains have higher levels of nutrients compared to non-sprouted grains. Sprouted wheat has a substantial increase in antioxidants and soluble dietary fiber; sprouted barley has enhanced digestibility; sprouted buckwheat protects against fatty liver and decreases blood pressure; sprouted rye increases the availability of folate; sprouted millet increases the availability of essential amino acids; and sprouted sorghum has enhanced taste and nutritional properties.^{vii}

The fastest growing use of sprouted grains is in the form of sprouted grain flour. Sprouted wheat flour is gaining impetus in the bakery industry. Sprouted wheat flour has several advantages over un-sprouted wheat flour in commercial applications. Kevin Richter, Ardent Mills, Denver, CO gave a presentation at the AACCI Annual Meeting in Providence, RI on October 6, 2014.

Mr. Richter stated that using Ardent Mills' sprouted wheat flour they found that sprouted wheat flour dough had a 50% increase in dough stability, 10% decrease in proofing time, and, remarkably, 8-12% increase in dough volume. Ardent Mills also reported that sprouted wheat flour can reduce or eliminate the addition of vital wheat gluten to bread formulas and that added sugars can be reduced by 50% because of the natural sweetness of sprouted wheat flour.^{viii}



Figure 1: Benefits from Sprouting Grains

Source: Sprout Guide: How to Sprout Grains, Nuts, and Beans

Sprouted Grain Marketplace

Sprouted grains have been utilized in the bread baking industry for decades. Bakers have been producing sprouted grains in-house and using a wet mash to incorporate sprouted grains into bread formulas. Sprouting grains commercially and producing dry intact grains and dry flours is a relatively new industry in the U.S. and is rapidly growing. Sprouted grain foods were introduced into the U.S. food marketplace in earnest ten years ago. In 2004, approximately 35

food products were actively being marketed. In 2013, the number of sprouted grain products swelled to 188 and counting.^{ix}

Essential Eating Sprouted Foods, Waverly, PA, was launched in 2007 and one of the first sprouted grain mills in the U.S. Essential Eating commercially manufactures sprouted organic wheat and organic spelt flour products. A number of milling companies have since introduced sprouted wheat flour and meals into the snack food and baking industries. Bay State Milling, Quincy, MA, has introduced BeneGrain® Sprouted Wheat and Sprouted Rice flour products to the snack food and baking industries. Ardent Mills, Denver, CO is marketing its Sprouted White Whole Wheat flour to its customers. Arrowhead Mills, The Hain Celestial Group, Inc., Boulder, CO sells its organic sprouted wheat flour to the retail food marketplace. King Arthur Flour, Norwich, VT also sells sprouted whole wheat flour in consumer size bags.

Interestingly, Granite Mill Farms, LLC, Trout Creek, MT, produces a range of organic sprouted grain berry and flour products. Included in their product line includes organic sprouted hard red wheat, hard white wheat, soft white wheat, spelt, emmer, rye, red fife, and de-hulled barley berries and flours. Granite Mill Farms, LLC showcases product information, numerous recipes and testimonials on their website. Another early sprouted grain flour pioneer, To Your Health, Fitzpatrick, AL, produces a wide range of sprouted grain and flour products in a 14,400 square foot facility. The business is eight years old and produces 70,000 pounds of sprouted grain and flour products per week.^x

The incorporation of sprouted grains into products is demonstrated by Way Better Snacks, Minneapolis, MN. Way Better Snacks introduced a line of sprouted grain tortilla chips, pita chips, and crackers into the U.S. retail food industry. In just three years, the company has over \$25 million in sales and is carried in over 20,000 retail establishments including most of the grocery and big box retailers. Food Navigator-USA published a prediction that sprouted grain foods will reach \$250 million by 2018, which is dramatically up from \$30 million throughout 2014.^{xi} Food Navigator-USA reported that a Way Better Snacks 2014 consumer survey found that 17% of shopper already knew about sprouted grains. Also, it was reported that sprouted grain snacks command a 25% premium over similar non-sprouted Products.

Sprouted Grain Production Value Chain

The sprouted grain value chain has a number of distribution options for a sprouted grain processing facility in the Great Falls Region. A sprouted grain processing facility would most likely produce whole sprouted grain kernels, cut kernels, and flour. Small scale sprouted grain manufacturers started their businesses by marketing and selling their products directly to consumers via the Internet and small venues such as farmers' markets. Sales growth enables sprouted grain manufacturers to achieve production quantities so that the sprouted grain processing facility can market and sell their products to food manufacturers, food service distributors, and retail distributors.

Figure 2 shows the value chain options available for sprouted grains manufacturer. Sprouted grains manufacturers can sell directly to a number of customers, namely, food manufacturers, food service distributors, retail distributors, food service operators, retailers, and consumers. All of the intermediate customers, except for consumers, have the option of selling sprouted grains products and food manufacturers' products containing sprouted grains to their customers

downstream in the value chain. With projected rapid growth of sprouted grain products, a sprouted grains manufacturer can be selective

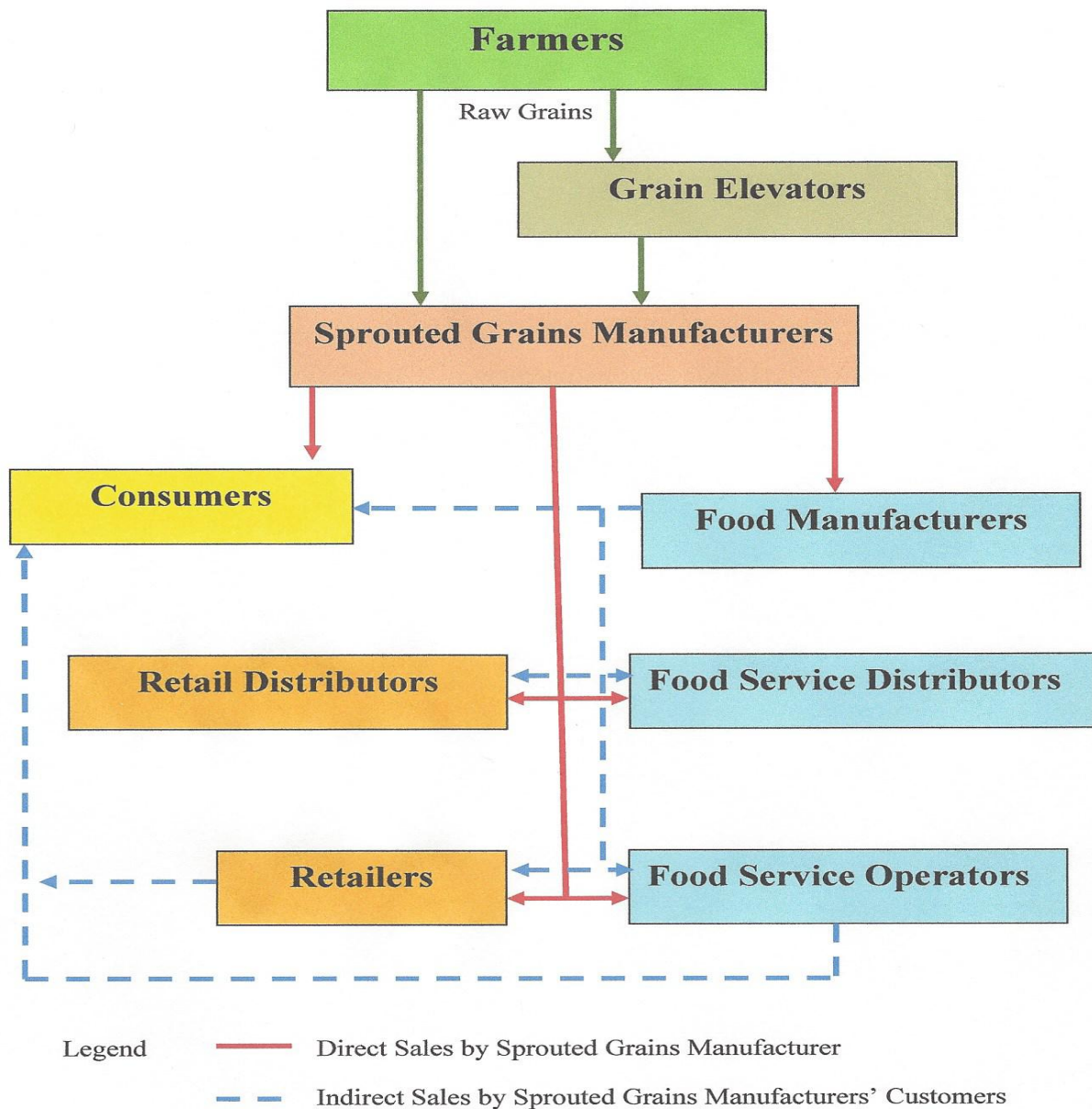


Figure 2: Sprouted Grain Production Value Chain

Production of Sprouted Grains

The commercial processing steps in the production of sprouted grain are nearly identical to the sprouted grain subset: the industrial production of barley malt. Grains are made to germinate by soaking in water and then halted from further germination by drying with heated air. The sprouting process of grains develops enzymes that are formed and become activated to convert grain starch into sugars and convert proteins for improved nutrition. The sprouting process along with careful drying also produces distinctive flavor and color characteristics that can improve flavor and texture of food products made with sprouting grain and flour.

A whole grain contains all three of its original edible parts in their original proportions: The outer bran layers rich in fiber and B vitamins, the nutrient-packed germ, which becomes the new plant, and the starchy endosperm. When a grain kernel is given just the right temperature and moisture conditions, it begins to sprout. A sprouted grain has begun to grow into a new plant and is halted from growth using a drying process. (Figure 3)

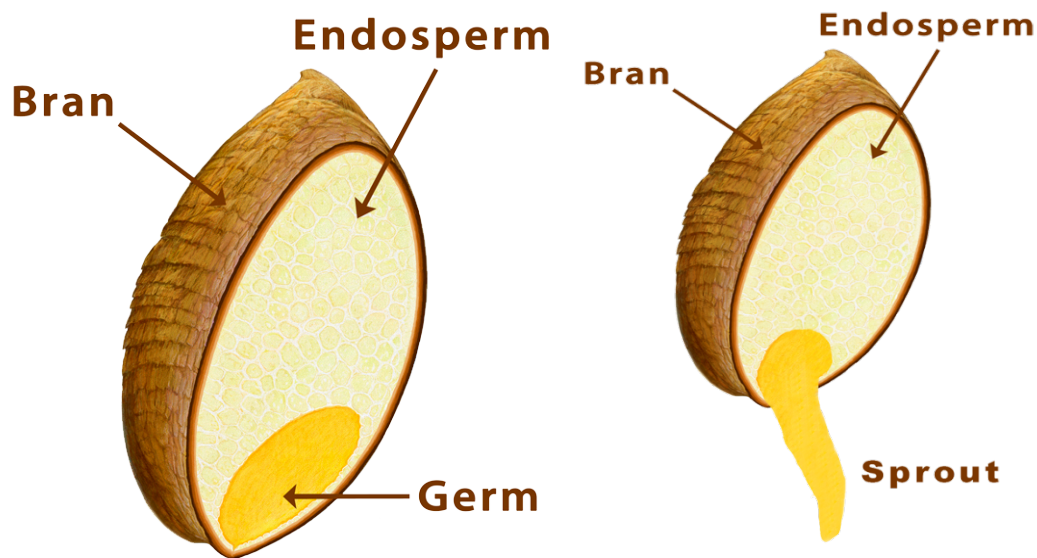


Figure 3: Whole Grain Components Transformed into Sprouted Grain

Source: Whole Grains Council

The production of sprouted grain requires only a cereal grain or pulse and water using a three step process including steeping, germination and drying. (Figure 4)



Figure 4: Three Steps in Sprouted Grain Production

Steeping

Cleaned grain has an average moisture content of 12%. By adding water to grain in the steeping phase of sprouting, the moisture content of grain increases to an average of 45%. Water is added at a temperature between 50°F to 65°F. Water is drained and refilled several times. Oxygen is

introduced to aerate the steeped grain. The total time required for the steeping step is two to four days. Steeping is complete when grain rootlets (acrospires) begin to show.

Germination

The germination step takes place in specialized vessels at temperatures from 54°F to 59°F over a period of three to eight days. Air is routinely passed through the germinating grain bed to maintain germination viability and to remove accumulated carbon dioxide. Mechanical agitation is used to ensure that sprouted grain remains free flowing.

Germinating grain exhibits the characteristic of a growing plant when grain grows acrospires. Acrospires that grow to less than 75% of their grain kernel length are considered to be under modified. Acrospires that grow between 75% to 100% of kernel length are considered to be fully modified.

Drying

Following the completion of germination, sprouted grain is dried. The first step of drying is slow drying at modest temperatures usually below 120°F over the period of ten to twelve hours until a grain moisture content of approximately 5% is reached. At that moisture level, the germination process is halted in the grain. After drying, grain can be heated and cured to give color and flavor character. Temperatures for flavor and color development can range from 180°F to 500°F. After drying, acrospires are retained within sprouted grain and rootlets and loose hulls are removed. Table 2 summarizes sprouting process conditions.

Process Stage	Steeping	Germination	Drying
Processing Conditions Range	Water Temp 50 - 65°F Target Moisture 43-44% Duration: Up to 48 Hours Aeration: Out of Every 30 Minutes Maintain Adequate CO2 Evacuation 15 minutes	Air On Temp: 54 - 59°F Duration: 3.5 - 4 Days Air Flow: 9 - 10 m3/minute/tonne Bed Depth: 32 - 50 inches	Air on Temp: 1) Free Dry at 112 - 155°F for 10-12 hours 2) Heating at 155° - 178°F for 2-3 hours 3) Curing at 178° - 185°F for 4-4 hours Total Duration: Up to 24 hours Air Flow: 60-80 m3/minute/tonne for bed depth of 32-36 inches
Typical Example	40 Hours Total Cycle – 8 hours Wet/10 hours Dry/8 hours Wet/10 hours Dry/4 hours Wet at 57°F	Day 1 and Day 2 @ 57°F Day 3 and Day 4 @ 55°F	20 Hours Drying Cycle with 4 Hour Curing Cycle

Table 2: Processing Conditions for Sprouted Grain Production

Source: Canadian Marketing Barley Technical Centre

Grain and Pulse 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, the raising of small grains and pulse crops has and will continue to dominate agricultural production. The Great Falls Region's agricultural crop profile is dominated by wheat, barley, and pulse crops. The most rapidly increasing crop category in the Region is pulse crops, namely, peas, lentils, and chickpeas.

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

Within the Great Falls Region lies the Pondera County Canal and Reservoir District located in Pondera County. The District has been privately owned for 105 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.

The competitive advantages of prodigious small grain and pulse production in the Great Falls Region point toward engaging in 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 capital investment in sales and marketing in addition to plant and equipment.

Large scale commodity malting of barley in the Great Falls Region is dominated by the 200,000 ton per year malt processing facility, Malteurop. Large scale commodity processing of wheat in the Great Falls Region is dominated by flour mills including General Mills, Montana Milling, and Cereal Food Processors, all located in Great Falls. Smaller scale grain processing, namely, sprouted grain processing is feasible in the Great Falls Region due to abundant, high quality grain and pulse supply, a willing labor force, low cost energy, and a fast growing sprouted grain industry in the U.S..

An excellent example of sprouting source material in the Great Falls Region, barley is grown throughout the Great Falls Region with a high concentration of production in the 80,000+ acre Greenfield Irrigation District in southeast Teton county and northeast Cascade county, centered in Fairfield, MT.^{xii} As the base for wheat-based sprouted grain production, hard spring and hard red winter wheat is also grown predominantly in Teton, Pondera and Cascade counties in the Great Falls Region.

Barley Production

In 2014, Montana planted and harvested more barley acres than any other state. (Figure 5) In 2014, Montana-based farmers harvested 770,000 acres while 580,500, or 75%, of those acres were harvested in the Great Falls Region. (Figure 6) In 2014, Montana-based farmers harvested 44,660,000 bushels of barley, while 32,805,500, or 73%, of those bushels were harvested in the Great Falls Region.^{xiii} Montana's barley production history has been steadily increasing as

shown in Figure 7. The increase came as barley farmers in other barley producing states switched to corn and soybeans.^{xiv}

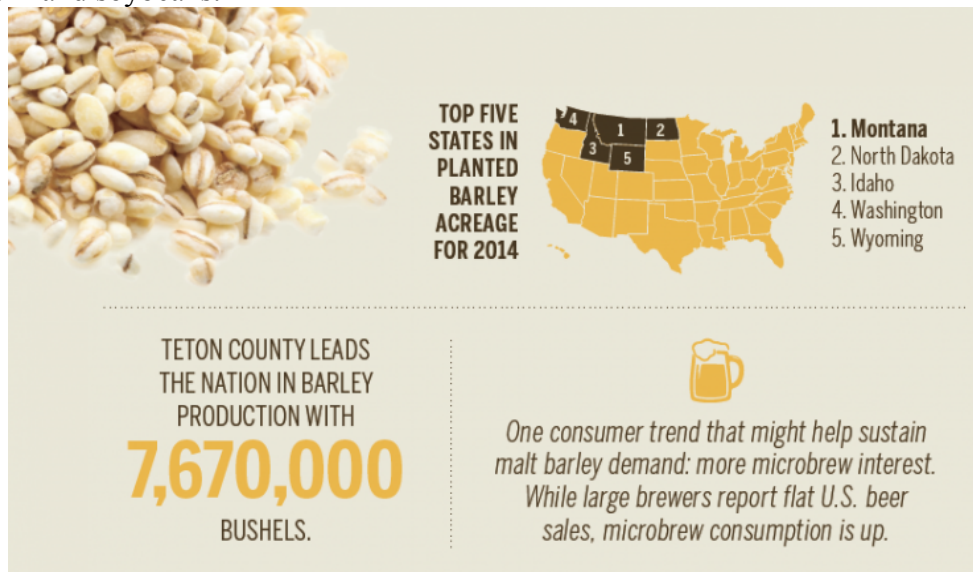


Figure 5: Montana is the Top State in Barley Production
Source: Montana Wheat and Barley Committee

75% of Montana Barley Acres Harvested in Great Falls Region

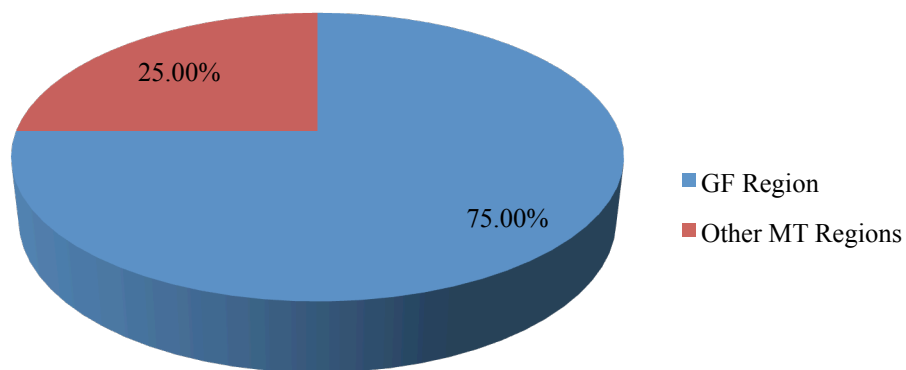


Figure 6: 75% of Montana Barley Acres Harvested in Great Falls Region Trade Area
Source: USDA, NASS 2014 Data

Montana Barley Production

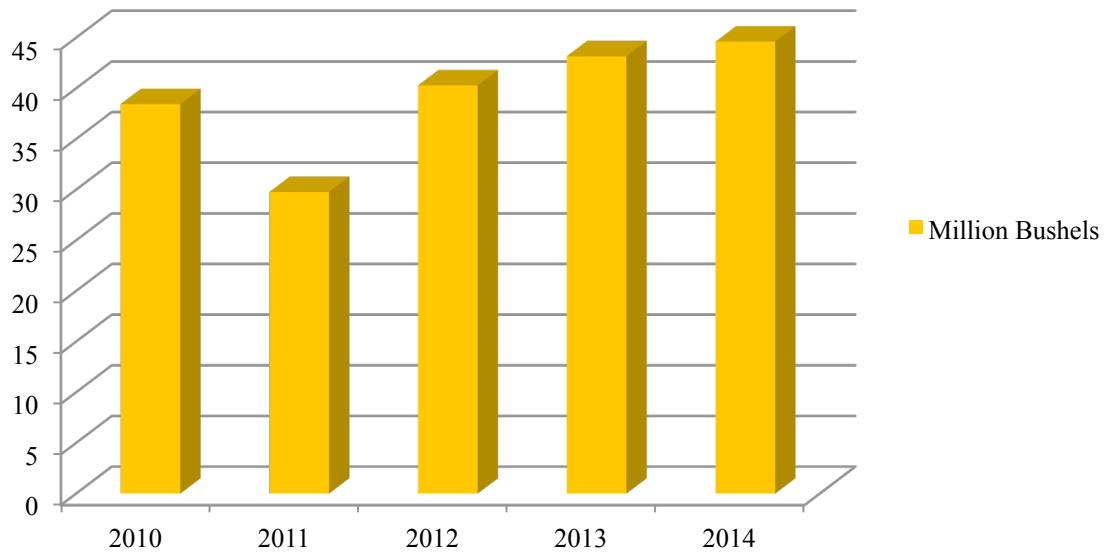


Figure 7: Montana Barley Production 2010 through 2014
Source: USDA, NASS

The USDA National Agricultural Statistics Service (NASS) mapped out barley production for Montana in 2014, which is shown in Figure 8. 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.^{xv} 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 sprouting barley.

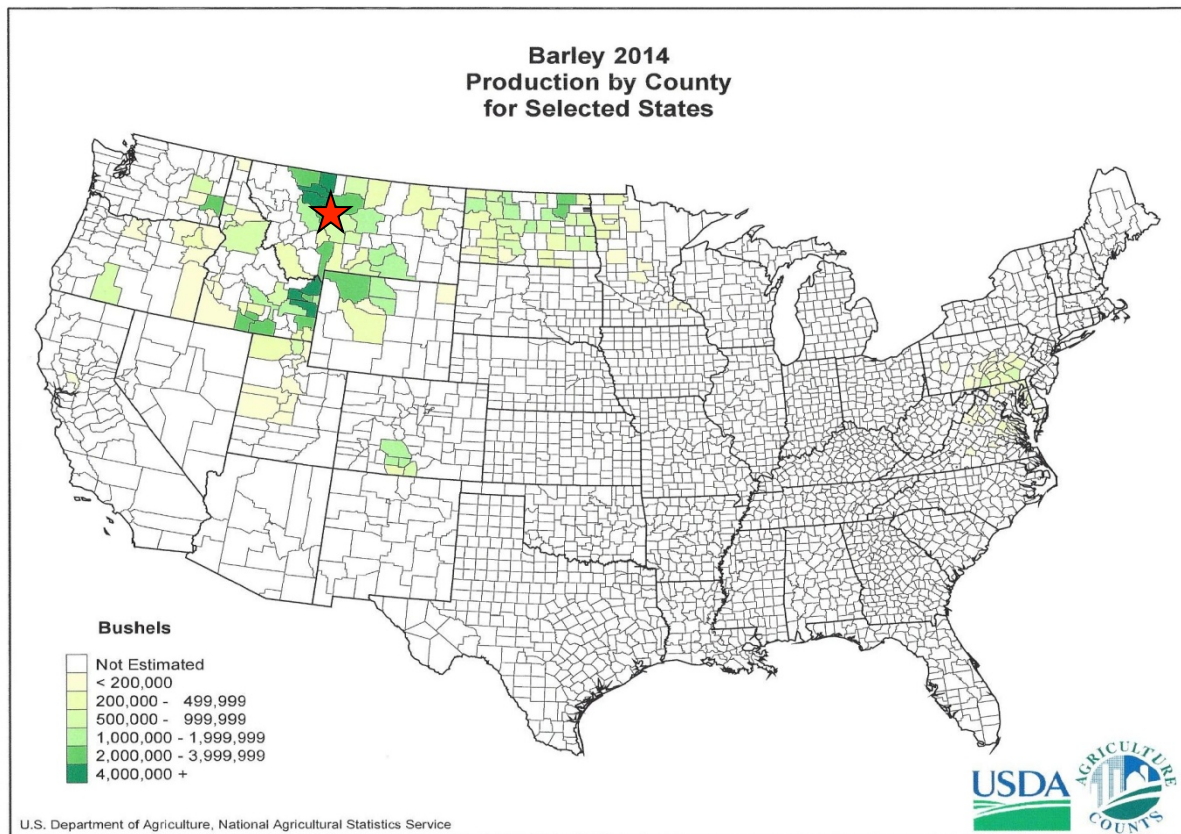


Figure 8: U.S. Barley 2014, Harvested Acres by County
Source: USDA, NASS ★ Great Falls

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 sprouting quality barley on an annual basis. The Great Falls Region consistently produces the majority of its barley that qualifies as sprouting quality barley.

Table 3 shows the individual Great Falls Region county barley production acreage and barley bushel yield. A considerable percentage (29%) 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 2014 had double the yield per acre of dry land production.^{xvi}

Great Falls Region County	Barley Acres	Barley Bushels
Teton	104,100	7,670,000
Pondera	93,000	6,271,000
Toole	89,100	4,480,000
Glacier	86,300	3,555,000
Choteau	52,000	2,250,000
Cascade	45,300	2,683,000

Fergus	25,200	1,000,000
Liberty	23,000	960,000
Hill	17,200	650,000
Judith Basin	17,100	797,000
Lewis and Clark	12,500	1,005,000
Meager	9,700	644,000
Blaine	6,000	260,000
Total	580,500	32,805,500

Table 3: 2014 Barley Acres and Production in Bushels in Great Falls Region Counties
Source: USDA, NASS

Winter and Spring Wheat Production

The thirteen county Great Falls Region harvested 2.67 million acres of wheat in 2014, which accounted for 47% of all wheat acres harvested in Montana.^{xvii} In comparison, the Great Falls Region harvested 580,700 acres of barley, which, comparably, was 21% of wheat acreage as shown in Figure 9. The Figure also shows that the Great Falls Region is dominant in barley acreage within the state of Montana.

Comparative Acres of Barley and Wheat in Great Falls Region in 2014

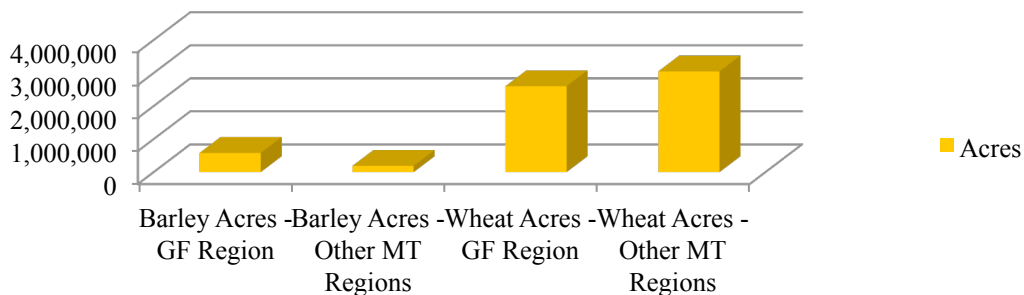


Figure 9: Barley and Wheat Acres Harvested in the GF Region and Other MT Regions
Source: USDA, NASS, 2014 Data

In Montana, the 2014 winter wheat crop was valued at \$532,672,000 with an average price of \$5.80 per bushel. In Montana in 2014, 2,250,000 acres of winter wheat were harvested. The Montana spring wheat crop in 2014 was valued at \$631,015,000 with an average price of \$6.05 per bushel. In Montana in 2014, 2,980,000 acres of spring wheat were harvested. NASS estimated that Montana was ranked third in 2014 among all states in wheat and related products exports at over \$1 billion.^{xviii}

As is shown in the wheat production maps of Figures 10 and 11, the Great Falls Region has excellent wheat growing capacity. A summary of major crops grown in quantity in Montana are shown in Table 4 with percentages grown in the Great Falls Region.

Commodity	Acres Harvested	Annual Yield	% Grown in Great Falls Region
Spring Wheat	2,980,000	104,300,000 bushels	35%
Winter Wheat	2,240,000	91,840,000 bushels	70%
Barley	770,000	44,660,000 bushels	73%
Peas	504,000	9,072,000 cwt	29%
Lentils	119,000	1,761,000 cwt	9%
Chickpeas	31,200	475,000 cwt	62%
Oats	16,000	1,104,000 bushels	29%
Flax	17,000	425,000 bushels	9%

Table 4: Major Crops Grown in Montana (2014)

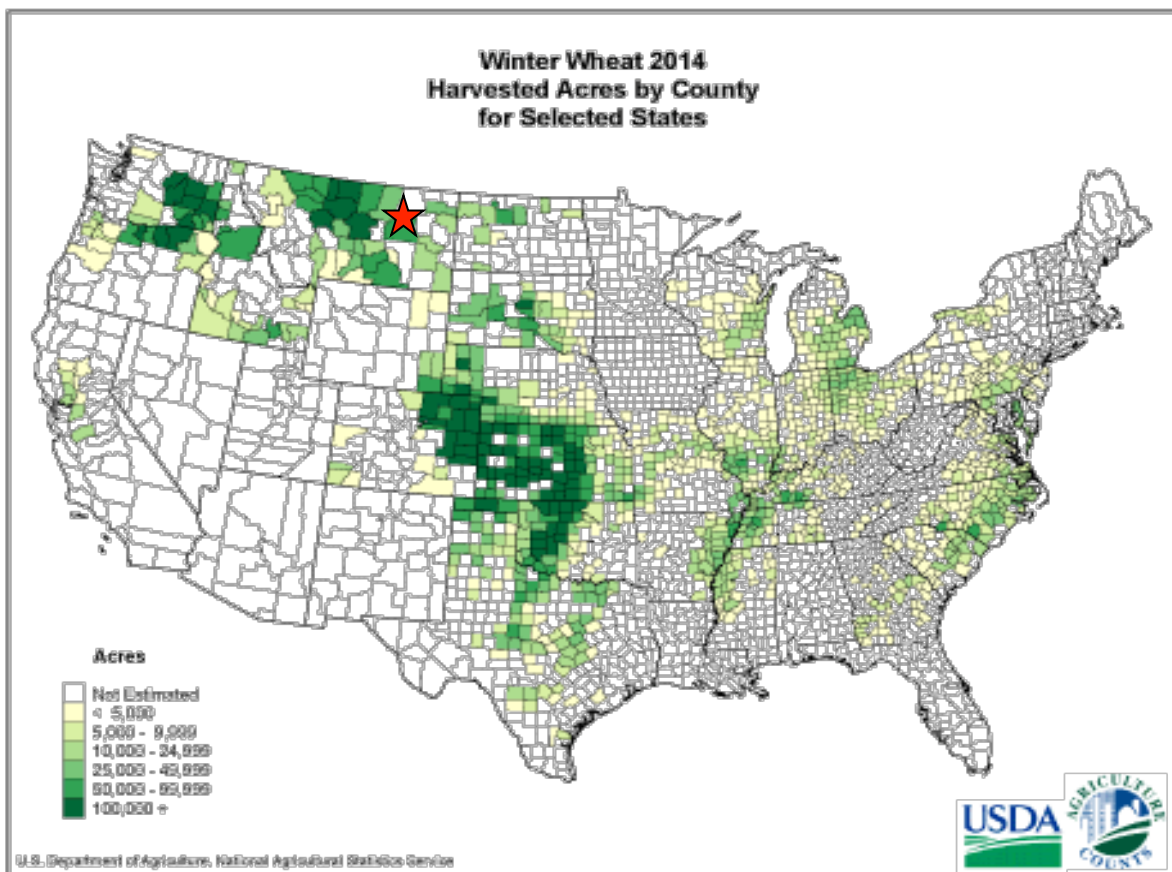


Figure 10: U.S. Spring Wheat 2014 Harvested Acres by County
Source: USDA, NASS, Charts and Maps, 2014 ★ Great Falls

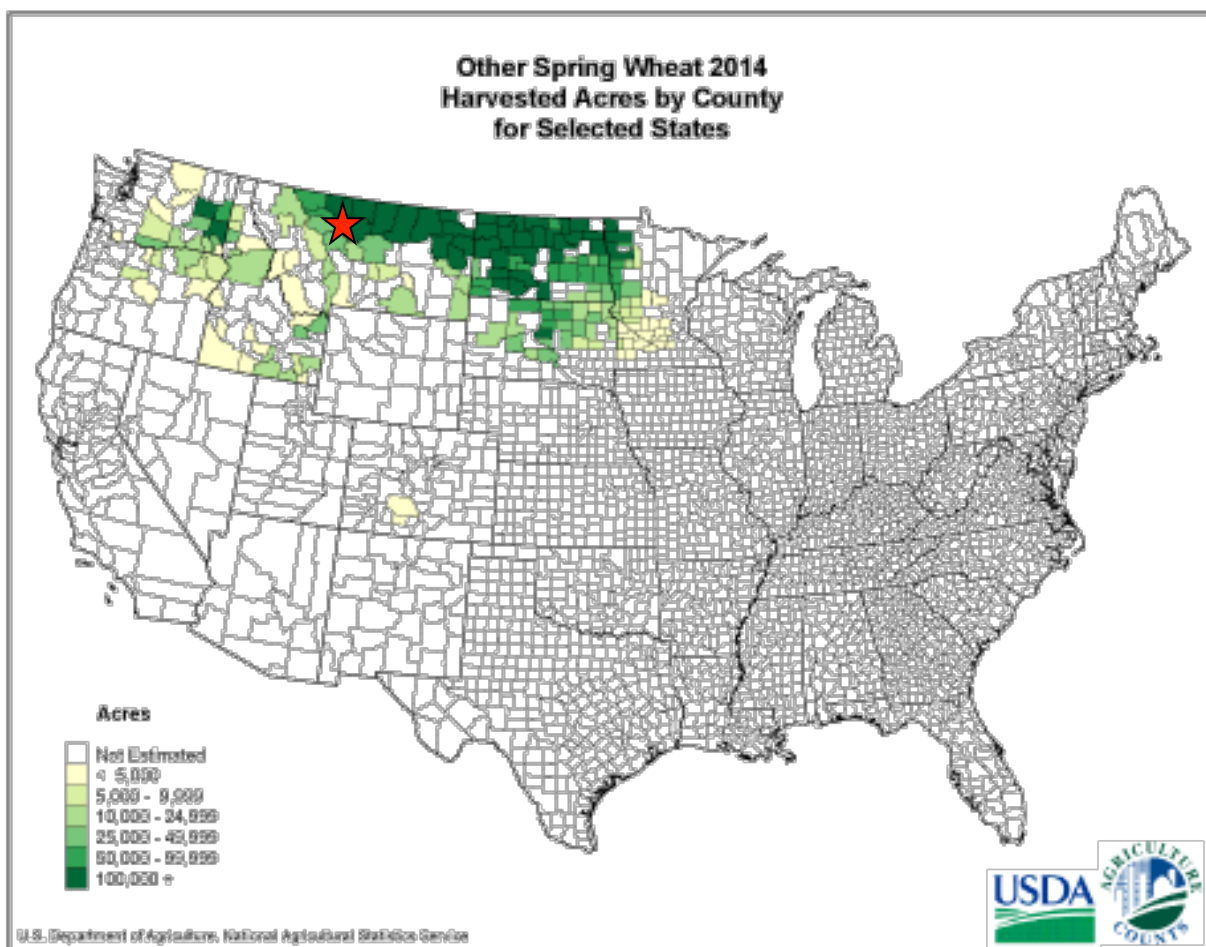


Figure 11: U.S. Spring Wheat 2014 Harvested Acres by County

Source: USDA, NASS, Charts and Maps, 2014 ★ Great Falls

Pulse Crop Leadership

Pulse crops, such as peas, lentils, chickpeas, and dry beans, can be sprouted and milled for use in the food processing industry. The state of Montana has become the nation's leading producer of pulse crops. Montana is ranked number one in the production of dry peas and lentils. In 2014, Montana produced over 9 million hundredweight of peas (52% of U.S. production), over 1.7 million hundredweight of lentils (52% of U.S. production), and over 475,000 hundredweight of chickpeas (17% of U.S. production).^{xix} In the U.S., pea prices have averaged \$10.50/cwt (\$6.30/bushel) over the last ten years.^{xx} The commodity value of pulse crops harvested in Montana currently exceeds \$100 million in sales.

Proximity to Raw Materials

One large benefit derived from operating a sprouted grain production facility within grain production areas is that a sprouted grain production company can contract and purchase its barley, wheat, and other grains and pulses directly from regional farmers and from local elevators. By receiving barley, wheat, and other grains and pulses 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.

For example, Great Falls Region farmers had secured barley contracts for the current crop year with forward pricing established around \$11.00 per hundredweight for 2015.^{xxi} Recent historical prices per hundredweight for on-farm barley has held steady around \$11.00 per hundredweight. By locating a sprouted grain production operation in the Great Falls Region, a sprouted grain production company would be operating in very close proximity to raw materials and thereby driving down the company's highest volume direct cost, grains for sprouting.

Commodity Procurement

The malting and brewing industry employs direct contracting procurement with barley growers. Malt producers and breweries have established long term relationships with barley growers in order to ensure reliability of supply and quality. Direct procurement programs of malt producers and breweries provide complete control of the malting process from the farmer's seed through to malt producers' brewery customers. Sprouted grain producers have the option to adopt the same procurement model of direct contracting with wheat, barley, and specialty crop growers.

Sprouted grain producers have the option of purchasing from procurement sites in the Great Falls Region. Regional grain elevators that receive, clean, condition, and store grains and pulse crops are the primary procurement sites for crops grown in the Great Falls Region. Sprouted grain producers can purchase commodities from regional grain elevators on the spot market or can contract with regional grain elevators for future deliveries.

Sprouted Grain 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.^{xxii} The Great Falls Malteurop facility has the sprouting capacity to use 8.33 million bushels of barley annually. The State of Montana produced 44,660,000 bushels of barley in 2014 and the Great Falls Region harvested 32,805,500 bushels of barley in 2014. The Great Falls Malteurop facility had the capacity in 2014 to process 25% of the Great Falls Regions' barley production and 18% of Montana's barley production.

Financial Illustration – Sprouted Grain Production

In 2014, the Montana Department of Agriculture, Helena, MT in conjunction with the Montana Manufacturing Extension Center, Bozeman, MT conducted a Malting Industry Analysis.^{xxiii} After careful market analysis, the Department of Agriculture sprouting study selected a malt production facility model with an output of 10,000 tons per year. The Study estimated that the total cost for a 10,000 tons per year facility would be \$19.2 million. (Table 5)

Land and Facility	\$5.2 million
Equipment	\$14.0 million
Total Cost	\$19.2 million

Table 5: Estimated Cost of 10,000 tons/year Malt (Sprouted Grains) Production Facility

A 10,000 ton per year sprouted grain facility with drying and milling capabilities is estimated to cost approximately the same as the malt production facility model presented in the Montana Department of Agriculture analysis. A 10,000 ton per year sprouted grain production facility would utilize 300,000 hundredweight of grains to produce 20,000,000 pounds of sprouted grains products.

A conservative average wholesale price of sprouted whole grain, cut kernels, and flour products of \$0.75 per pound would generate \$15 million in revenue per year. Grain input costs at \$17.00 per hundredweight would be \$3,000,000 per year for a 10,000 ton facility. Montana Department of Agriculture estimated additional direct costs to be \$600,000 per year. Annual payroll for 10-15 employees in a highly automated facility would be \$1.1 million as estimated by Montana Department of Agriculture.

The summary financial illustration Table 6 shows a pro forma cash flow forecast for a 10,000 ton per year sprouted grains production facility. Assumptions for future pro formas should include debt paid back over time at a favorable interest rate, plant operation at 75% capacity, and that all sprouted grain products are sold F.O.B. factory at \$0.75/lb for an average of all sprouted grains product produced. The total investment required for capitalization is assumed to include working capital.

Equity Investment	\$9,600,000
Debt	<u>\$9,600,000</u>
Total Investment	\$19,200,000

	Year 1
Sales	\$15,000,000
Cost of Goods	\$5,700,000
Payroll	\$1,100,000
Gross Margin*	\$8,200,000

*Gross Margin available for additional costs (utilities, supplies, marketing, insurance, outside services, debt service, and repairs) and profitability.

Table 6: Financial Illustration for 10,000 Tons/Year Sprouted Grain Production Facility

In the financial illustration shown in Table 6, a gross margin of \$8,200,000 is produced to cover costs in excess of cost of goods and payroll. Provided that additional costs are less than available the available gross margin, profitability will occur. For example, a \$960,000 profit would return a 10% annual return on investment on a \$9,600,000 equity investment.

Summary

The Great Falls Region has significant competitive advantages for sprouted grain production that include close proximity and access to abundant, consistent, high quality grain commodities; access to a variety of cost effective energy sources that include electricity and natural gas; rail transportation in the form of single source service by the nation's second largest railroad, BNSF, and the I-15 Interstate Agri-Business Corridor; abundant water resources from ground and surface water options; and a willing and capable workforce. The Great Falls Region's industrial parks also feature industrial wastewater treatment, fiber optic connectivity, and attractive financial incentives.

Sprouted grain production operations in the Great Falls Region would have the opportunity to obtain high quality wheat, barley, and pulse commodities directly from agricultural producers. Grain procurement transportation costs in the Great Falls Region would be low relative to competitors located outside of grain-growing areas. On-farm storage of commodities throughout the Great Falls Region provide year around access to wheat, barley, and pulse commodity deliveries to sprouted grain production facilities.

The combination of cost effective energy, water, property, wheat, barley, and pulse commodities, and human resources all work together to provide a superior business environment for the establishment of profitable sprouted grain production operations in the Great Falls Region. The Region can provide an optimum environment for sprouted grain production facilities.

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