



NORTH DAKOTA Irrigation Association

Irrigated Malt Barley Production...

Managing risk to increase PROFIT

Revised March 2008

NDIA recommendations for producing irrigated malt barley

North Dakota has a variety of existing irrigation opportunities. Western North Dakota has emerged as an area with high potential for irrigated malt barley production. With established markets and contract prices competitive with other small grains, irrigated malt barley is getting a second look by farmers in western North Dakota.

As with any crop, nature poses a great risk, but utilizing irrigation as a management tool helps reduce risk as well as increase yields and the probability of meeting malt specifications. With the proper water management, irrigated malt barley has the potential to out-yield dryland barley two to one. Yields of 120 bushels or more per acre are possible under good water and nutrient management.

What does it take to produce irrigated malt barley?

If farmers are armed with complete information on water and agronomic management, including general requirements, crop inputs, disease control, and production goals, the level of risk is considerably reduced. With the right management techniques, irrigated malt barley has great potential for farmers in western North Dakota.

The following information provides **general guidelines** to assist irrigators and potential irrigators generally west of Highway 83 on the management necessary to grow irrigated malt barley. Estimated crop budgets are available at www.ext.nodak.edu/ext-pubs/ecguides.htm. If there are any questions regarding irrigated malt barley production, contact the North Dakota Irrigation Association at 701-223-4615 or e-mail ndirrigation@btinet.net.



General Specifications

Quality specifications are set by individual buyers. The most common malt barley quality problem is the percentage of protein exceeding the maximum allowed protein content. Generally, malt barley needs to meet the following specifications to be accepted as malt quality:

- Plump – 70% or greater
- Thin – 5% maximum
- Protein – 13.5% maximum
- Moisture – 13.5% maximum
- Sprout – 1% maximum
- Total volunteer crops (including green barley kernels and wild oats) – 2% maximum
- Insects – None

General Requirements

- Most irrigable and conditionally irrigable soils are suitable for the production of malt barley. Each type of soil must be evaluated on the basis of its physical characteristics in order to prepare a crop management plan that has the potential to produce an economically feasible yield.
- Malt barley can be irrigated with both surface and sprinkler irrigation methods.
- Barley is tolerant of moderately saline soil and irrigation water. When this condition is prevalent, a soil scientist should be consulted to evaluate potential crop effects.
- Conventional tillage, seeding and harvesting implements and machines used for most small grains are suitable for barley.
- Avoid fields where the previous year's crop may result in volunteer grain that cannot be removed. This can include wheat, durum, oats, or other barley varieties. Row crops, such as sugar beets, corn, peas or lentils, are best suited for preceding barley.
- The seed requirements are set by individual buyers and may include variety, seed source, and certification of seed.

Varieties

- Most contracts in North Dakota are for 6-row barley, which is more sensitive to drought stress than 2-row varieties.
- Current 6-row varieties produced under irrigation include Legacy, Tradition, Stellar, and Lacey
- Under irrigation, these varieties get quite tall and have a greater tendency to lodge, or for heads to break off under wet and/or windy conditions. Varieties should be selected that exhibit the best growing characteristics under irrigation and meet the approval of the buyer. Management practices, which are developed based on the irrigation method, can be used to minimize these potential problems. Growth regulators may be recommended to reduce plant height under irrigation.
- The buyer may provide advice on the variety that is best suited for the onsite soil, water, irrigation method, and climate conditions.
- The seed should be treated at planting for protection against soil fungi and insects.

Planting

- Barley is frost tolerant and can be planted in early April or as soon as soil and climate conditions permit.
- The seeding rate is approximately 1.5 to 2 bushels per acre. One million live seeds per acre, which is the equivalent of slightly less than 2 bushels per acre, is the objective of some producers.
- At the higher seeding rate, some producers will put down half the seed in one direction and half in another direction to achieve more even distribution under sprinklers. Over seeding has shown negative standability (lodging).

Fertilizer

- Proper nitrogen management of malt barley is critical. The general guideline for nitrogen application is 1 to 1.2 pounds total nitrogen per bushel of yield goal. Excess nitrogen will cause high protein and may lead to lodging problems.
- The amount and uniformity of fertilizer application are important factors. The nitrogen must be used prior to the plant reaching the milk stage. Nitrogen options include urea, ammonium sulfate and anhydrous ammonia. (Nitrogen will cause higher protein levels in all varieties.) A selection should be made based on individual conditions. The use



of urea may allow for a more uniform application, but it must be incorporated into the soil within two to three days with at least one half-inch of rainfall or irrigation or by sufficient tillage.

- The nitrogen may be broadcast and tilled into the soil or applied in a band offset from the seed row during planting.

Producers seem to prefer the broadcast and tillage method.

- The desirable soil test level of phosphate should be 10 or 11 parts per million (ppm) or above. A higher level (16 ppm) may be desirable to increase availability during the cooler part of the growing period. Potassium should be above 200 parts per million. Applications prior to or during seeding are the methods used by many producers. For additional information, refer to "Fertilizing Malting and Fee Barley", NDSU SF-723 (Revised) April 2007.



Irrigation

- A high-yielding barley crop meeting malt specifications requires 16 to 18 inches of effective moisture per year. The actual amount used will vary depending on field and climate conditions requiring an accurate irrigation scheduling program. The North Dakota State University Extension Service has developed the Checkbook method of irrigation scheduling. This system can be used manually or by computer. For more information or assistance, contact Tom Scherer, NDSU agricultural engineer – water quality/irrigation, at 701-231-7239 or Jerry Schaack, NDIA field representative at 701-223-4615.
- Although the effective depth of the root system is 36 to 42 inches, for irrigation scheduling purposes it would be considered to be about 24 inches under center pivots.
- The moisture content of the soil under pivots should be maintained slightly below field capacity to allow for storage of precipitation. The critical times for maintaining good soil moisture are tillering (2 to 4 leaf), heading, and early seed fill. Depending on growth stage, research has shown the yield can be reduced by 2 to 6.4% for every 10% reduction in water use caused by soil moisture deficits below 50% allowable depletion even for short periods. An irrigation scheduling method should be used.
- Limited moisture at tillering will reduce the number of heads and a moisture deficit at flowering will reduce the number of kernels per head.
- The soil should be moist to at least 18 to 24 inches at planting.
- The peak water use will be .3 to .35 inch per day in western North Dakota. To achieve the requirement, the pumping rate through a low pressure center pivot irrigation system should be approximately 7.5 gallons per minute per acre irrigated for a 130-acre pivot. Lower pumping rates of 6 to 7 gallons per minute per acre may be adequate under normal temperature and rainfall or in eastern North Dakota.
- If the amount of rainfall is very low in warmer years, the irrigation system will likely run continuously from late May or early June until the crop reaches soft dough stage.
- The irrigation should be discontinued at soft dough stage with the soil profile filled to near field capacity to achieve the best yields. In areas where fusarium head blight is a concern, adjustments in irrigation water application should be considered.
- Barley may require as much as 3 to 4 inches of available water to finish the plant to maturity after irrigation is discontinued at the soft dough stage. A shortage of moisture during this period will increase the number of thin kernels. Course textured soils should be evaluated for water holding capacity in the top 24 to 36 inches.

Weed Control

- A number of herbicides are available for the control of most weeds in barley. The latest Crop Production Guide published by the NDSU Extension Service provides a guide for herbicide selection, or a crop consultant can be contacted. Wild oats may be a dominant problem due to the inability to separate it from the barley.

Fungicide

- At least one fungicide application at 75% heading may be necessary for the control of fusarium head blight. Net or spot blotch on the flag leaf will be controlled with this application. Crop inspection and consultation with a chemical company representative or local agronomist is recommended. Be sure to vary chemistries of all pesticide applications to delay resistance.



Harvest

- The barley harvest must be managed to achieve optimum grain quality. The crop must be ripe with a moisture level less than 13.5% to minimize or eliminate green kernels.
- Swathing will help ensure ripe grain when there is a broad mix of maturity, and reduce associated shatter and head breakage. But the wind-rowed grain is more susceptible to sprout damage and staining if moderate to heavy rainfall occurs.

Storage

- The barley must be stored in thoroughly cleaned bins free of insects. The bins should be treated with a labeled residual insecticide before filling.
- After filling, the bins should be monitored frequently for insects. If insects are found, the insecticide Aluminum Phosphid may be used for treating malt barley in the bin.
- A bin aeration system is important to maintaining a maximum moisture level of 13.5%.
- Bins and truck boxes must be absolutely free of any treated seed previously stored or hauled. One treated kernel can result in rejection of a load, if not the entire crop.

Delivery Destination

- Delivery destinations are determined by the company that contracts the barley. The contract price is FOB delivery destination.

Busch Agricultural Resources, Inc. – West Fargo; Amenia; Sutton; Sidney, Mont.; Campbell, Minn.; Modern Grain, Beulah; Dakota Quality Grain, Ross, Parshall and New Town.

Cargill Malt – Spiritwood

International Malting Company – Ruthville; Devils Lake; Milton; Wahpeton; and Alverado, Minn.

Rahr Malting Co. – Taft



North Dakota Irrigation Association

PO Box 2254
Bismarck, ND 58502
701-223-4615
701-223-4645 (fax)
ndirrigation@btinet.net
www.ndwater.com