

# Pack #110, Item

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**Backgrounder: Malt barley production in Ethiopia**

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***Why is this subject important to listeners?***

* Barley is a traditional crop in Ethiopia. It has a deep-rooted history of being used in traditional food and beverages.
* Production of malting barley has a very short history. It is mainly associated with beer making in Ethiopia, which started in the early 1920s with the establishment of the St. George Brewery.
* There are opportunities for promoting malting barley as a high-value cash crop in the highlands.

Because farmers interested in production of malt barley should know:

* How to cultivate malt barley.
* Recommended malt barley production practices, including agronomic practices (row planting, weeding, drainage), seed rates, application of fertilizers, and use of chemicals (herbicides and fungicides).
* How to harvest, thresh, and clean malt barley.
* Rogueing and removing off-types.
* Postharvest handling of malt barley.
* How to process and store malt barley.
* The right moisture content for storing malt barley.
* That malt barley grain should be free from impurities like stones, seeds of other crops, stones, broken seeds, and straw.

***What are some key facts?***

* After sowing, malt barley matures in four to five months, depending on the variety. Early-maturing varieties can be harvested in three and a half months.
* Stems of ready-to-harvest malt barley are hard and can be broken by hand.
* When malt barley ears bend downwards, the barley is ready to harvest.
* Dry and store malt barley at moisture levels below 13-14% to avoid infestation by pests and harmful fungal microorganisms.
* The recommended planting density for malt barley is 250-300 plants per square metre.
* Malt barley does not grow well in heavy black clay soils with waterlogging problems. It prefers well-drained red to brownish soil.
* Malt barley growing areas in the central highlands are affected by soil acidity. For better production, it’s recommended to apply lime and fertilizer.
* Malt is the key ingredient in beer and it provides the starch and enzymes needed to produce the fermented sugars which turn yeast into alcohol.
* Malt extract is the key product for brewers. It contains all the soluble components of malt, primarily carbohydrates and proteins and their breakdown products, as well as colour and flavour compounds.
* The high level of starch in barley kernels is the most necessary ingredient during malting.
* The protein content of malting barley should be 9-11.5 %. Protein levels are affected by many factors, especially growing conditions. Applying nitrogen-rich fertilizers may also impact the final protein level.

*For further information, see documents 1, 2, 3, 5, 6, and 13.*

***What are the big challenges of malt barley production?***

* Traditional systems of land management and poor agronomic practices.
* Land degradation, soil acidity, and loss of soil fertility particularly because of soil erosion and continuous planting of the same type of crop (for example, malt barley, wheat, and tef) year after year in the highlands.
* Lack of high quality seeds of improved varieties.
* Extremely wet conditions during malt barley harvests results in Fusarium infections.
* The limited number of high malting quality and high-yielding varieties.
* Weak market and supply chains in the malt barley value chain.
* Inadequate availability and use of inputs such as improved seeds, chemicals, fertilizers, etc.
* Farmers lack basic knowledge of malt barley production practices, including agronomic practices, soil management, protection against insect pests and diseases, and postharvest practices.
* Farmers lack knowledge of how to grow malt barley to meet quality standards.

***Gender aspects to malt barley production***

* In the major barley growing areas of Ethiopia, women are more knowledgeable about many aspects of barley, including grain texture, hardness, qualities related to making flour, cooking qualities, malting qualities, and qualities related to making food and beverages. Men are more knowledgeable about agronomic traits such as plant height, maturity, disease tolerance, threshability, yields, and straw quality.
* Where harvesting and threshing are mechanized, men take up active roles traditionally undertaken by women.
* In Ethiopia, women process barley and sell to cater for households needs.
* In northern Ethiopia, the lack of oxen and ploughing skills in female-headed households puts them at a disadvantage since they have to rely on men to plough their farms during land preparation for barley production.

*For further information, see documents 7, 10, and 14.*

***Predicted impact of climate change on malt barley production***

* Drought due to climate change stresses barley in the field.
* The shift in the timing and distribution of rainfall during the crop growing period affects the yield and quality of malt barley.
* Climate change increases the pressure of diseases and insect pests.
* In East Africa, regions where barley was traditionally grown are no longer viable due to increased temperatures and water scarcity.
* The prevalence of hot and dry weather in growing seasons is increasing protein levels in malting barley, making it less viable for brewers.
* Rising temperatures during the growing season lower the amount of starch in the grains, the ingredient most important in malting.

*For further information, see documents 6, 8, 9, and 11.*

**Key information about malt barley production**

**Cultivation**

Malt barley is used to produce beer and animal feed, and as pearl barley for human consumption. For malt barley to grow properly, farmers should use the following practices:

* Before planting malt barley, conduct a soil test to identify missing nutrients. If soils are acidic, apply lime. Apply nutrients/fertilizers based on what’s missing in the soil test.
* Land used to grow barley land should be rotated every three to four years to highland pulses, potatoes, and oilseed crops (for example, linseed or rapeseed) to ensure sustainable production.
* To ensure uniform germination during the malting process, plant barley seeds of a single variety.
* For the harvest to be uniform and good quality, plant on even (level) land. Planting on uneven land results in irregular crop development.
* Plant about 28 seeds per square foot to account for non-germinating seeds. On average, this will result in 25 malt barley plants.
* Plant malt barley seeds at a depth of 1.5 to 2 inches. Deeper seeding reduces germination or causes the plants to be weak.
* Before planting, farmers should treat seeds with fungicides against smuts and other seedborne diseases. Rotating crops and burning infected crop residues before planting can also lower the prevalence of smut disease.
* It’s important to weed when malt barley is young since weeds inhibit growth and yields by competing for nutrients. Weed by hand or use herbicides to control both broad leaf and grass weeds, especially wild oats and Snowdenia species.
* Barley requires significant nitrogen for best growth. If possible, plant malt barley after harvesting leguminous crops to take advantage of the nutrient-rich soil.
* The recommended nitrogen application per hectare depends on the nutrient status of the soil and varies from location to location.
* Malt barley farmers should guard against adding excess nitrogen to the soil. This will increase protein levels in grains beyond the 9.5-11.5% that’s optimal for malting.
* Planting malt barley after cereals results in low yields. If planted after wheat, teff, or highland maize, there may be infections of Fusarium head blight, also called head scab.
* To ensure optimum yields, grow varieties adapted to the local climate.
* To break the cycle of diseases and pests in barley cultivation, farmers should rotate barley, preferably with highland legumes like faba bean or field peas that add nitrogen to the soil. Barley can also be rotated with other highland crops like linseed, rapeseed, and potato.

*For further information, see documents 3, 4, 5, 6, 9, 15, and 16.*

**Harvesting**

Farmers should harvest malt barley when the field turns yellow. At that point, barley heads bend downwards and are no longer green, indicating maturity. Timely harvesting of malt barley prevents shattering of grain and reduced seed quality.

* Depending on a farmer’s income, malt barley can be harvested by a sickle or scythe, uprooted by hand, or by a tractor with a harvesting mechanism.
* To hasten drying, cut barley and place in rows, holding plants together with interwoven straws supported above ground by remaining stubble. This is called swathing.
* The moisture content when malt barley is swathed should be 20-30%.
* If farmers do not have access to moisture meters, they can press their thumbnails into the kernel. Below 30%-35% moisture content, the malt barley kernel can’t be dented by a thumbnail.
* Leave swathed malt barley in the field to dry until moisture content drops to 12-12.5%.

**Postharvest**

*Threshing*

Farmers should take care to ensure malt barley grains are not damaged or husks peeled off the kernel during threshing. Peeled or broken husks stop germination during the malting process, or produce poor quality malt because of poor germination. Farmers can thresh with a tractor that has a threshing machine, with homemade equipment, or by using horses or oxen to trample on the barley. Thresh when the moisture content is 12-14%.

*Drying*

Dry malt barley before processing or storing. Harvested barley is sun dried until the moisture content is below 12%. At that moisture content, malt barley can be stored with little risk of harmful mould growth.

*Storage*

To prevent spoilage, malt barley should be stored in cool, dry, and clean conditions, with moisture content below 12%. These conditions limit mould growth and preserve the ability to germinate needed for malting.

*The malting process*

Clean malt barley before processing to remove diseased kernels and other impurities, then grade.

Malting is a biological process that turns barley into malt. It is a three-stage process that includes steeping, germination, and kilning. The process takes 4-5 days.

During steeping (soaking), the moisture content of the barley increases to prepare the kernels for germination.

Germination (growth) is carefully controlled with temperature, moisture, and time to allow the kernels to progress to the point where the plant generates the enzymes necessary for brewing but root and shoot growth is limited.

Kilning (drying) reduces the moisture content of the kernels, stops the biochemical processes within the kernels, carefully preserves the enzymes generated during germination, and generates colour and flavour compounds.

*For further information, see documents 1, 2, 12, and 13.*

***High quality malting barley should have the following characteristics:***

* Pure lot of an acceptable variety
* Germination of 95% or higher (in a three-day test)
* Protein content of 11%-11.5%
* A maximum moisture content of 13.5%
* Plump kernels of uniform size
* Fully mature
* No signs of pre-harvest germination
* Free from Fusarium head blight
* Free from other diseases
* Free from frost damage
* Not weathered or deeply stained
* Less than 5% peeled or broken kernels
* Free of insects, other types of seeds, smut, and odour
* Free of chemical residues

***Definitions***

*Malt:* The key ingredient in beer that provides the starch and enzymes needed to produce the fermented sugars which turn yeast into alcohol. Malt also gives beer its colour.

*Malt extract:* The amount of fermentable sugars extracted from the malt. This determines the amount of alcohol that can be made from a tonne of grain. The higher the extract level, the more alcohol that can be made.

*Malting:* The process of fermentation by which barley is turned into malt through controlled germination with water. Malting releases the sugars held in the barley kernel.

***Where can I find other resources on this topic?***

*Documents*

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