



NATAE
North African Transition
to AgroEcology

Dual-purpose crops adapted to mixed crop-livestock systems in the Mediterranean: the example of barley

Agroecological zones

Cereal plain

Mountains

Irrigated

Oasis

Introduction



Source: INAT, Tunisia



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Barley (*Hordeum vulgare* L.) is an important crop in mixed crop-livestock systems in the Mediterranean. Its grains are used for human or animal consumption. The green stems can be grazed or mown to make hay or silage. This versatility makes it a key element in sustainable and resilient agriculture in the Mediterranean.

By choosing dual-purpose barley varieties and adopting appropriate agronomic practices, we can optimise grain and fodder production, adapt crop management to the year's climatic and economic conditions, and improve farm profitability and resilience against a backdrop of climate change (drought and erratic rainfall), increasing pressure on resources and degradation of natural pastures.

The benefits of dual-purpose barley varieties in the Mediterranean

Integration into mixed crop-livestock production systems

Livestock farming is an essential component of agroecological production systems in North Africa. Fodder production enables livestock farming systems to adapt to climate change and pressure on natural pastures. Because of its versatility, barley is a particularly interesting crop in mixed systems where livestock farming is integrated with agricultural production. Barley can provide greens, silage and hay, as well as grain and straw. Barley fodder products are of good nutritional quality. Dual-purpose barley production is a good way of making the most of cultivated land in a context of high land pressure.

Flexibility in the face of climatic contingencies

Mediterranean cereal-growing systems are subject to increasingly irregular rainfall. Dual-purpose barley varieties can adapt to this variability.

Winter barley is less sensitive to water stress than wheat, as it completes most of its cycle before the onset of marked water stress.

In the case of dry springs, farmers may decide to harvest barley for silage production or as hay when the water reserve in the soil does not allow the grain to fill properly.

On the other hand, when the start of the growing season is particularly favourable, or in irrigated systems, early sowings may allow the crop to be mown before grain formation. If conditions at the end of the cycle deteriorate, the crop can be grazed.

Diversifying income, improving profitability and self-consumption

Barley is often self-consumed on the farm, for human or animal consumption. Grain and straw can also be sold. These multiple outlets enable farmers to diversify their income and reduce their dependence on a specific market.

In countries south of the Mediterranean, barley is commonly consumed in a variety of preparations. Several regional culinary recipes are prepared using green barley grains that are not yet fully mature. For example, barley is used to prepare bread in Tunisia or cakes in Morocco (*harcha* from barley), *Mathouth* (in Tunisia), to prepare soups (*chorba frik/tchich* in Tunisia or *Tchicha* in Algeria). In Algeria, *Mermez* is made from unripe barley.

Selecting dual-purpose barley varieties

Barley varieties are often classified according to their **growth cycle**:

- **Winter barley** sown in autumn and harvested in spring or early summer. It is suited to areas with relatively mild winters. It can be harvested early and used for fodder in winter or early spring. Early or very early varieties are recommended for soils with very low water reserves.
- **Spring barley** sown in spring and harvested in summer. It is ideal for late fodder harvests or for animal feed in times of food shortage, but is susceptible to drought during the bolting period and to scald at the end of the cycle.
- **Hybrid barley**: Crossbred varieties are designed to maximise both grain and fodder yields. They can be selected for their resistance to common diseases such as rust, powdery mildew and mosaic, and their biomass yield.

The varieties chosen must meet a number of criteria:

- **Grain yield**: The barley variety must offer a good grain yield, whether for human or animal consumption. The variety chosen must be suited to local market demand (type of grain consumed, use, processing).
- **Fodder quality**: Barley fodder must be high in fibre and protein, yet easily digestible by livestock (low in lignin).
- **Adaptation to mowing**: when planning green mowing, varieties that are specific to this type of operation, produce a large quantity of biomass at the start of the cycle and have a high recovery potential should be favoured.
- **Resistance to Mediterranean soil and climate conditions**: Barley grown in this region must be resistant to drought, high temperatures and poor, chalky soils. It must also be able to tolerate temperature variations that are sometimes high between day and night.

Examples of Mediterranean dual-use barley varieties

- **Local barley varieties** can be a good example of dual-purpose varieties, such as the 'Arbi' barley widely grown in Siliana in northern Tunisia.
- **Barley** (*Hordeum vulgare*): adapted to Mediterranean conditions, used for both grain and fodder production. It has good drought resistance and a satisfactory yield for animal feed.
- **Triticum-Hordeum hybrid barley**: a cross between barley and wheat, combining the robustness of barley with the characteristics of wheat, giving optimum grain yields while producing a good amount of fodder.

Barley is the subject of a great deal of research in the Mediterranean, particularly for its resistance to drought and its potential for dual use in semi-arid environments. For example, certain genotypes of **'Giza' barley** are particularly resistant to drought and produce a good yield of fodder during the winter. **'Rihane' barley** is drought tolerant and retains very good grain yields after cutting.

Farming practices in agroecological systems

In agroecological transition contexts, barley should be grown as part of crop rotations that include legumes. Minimal tillage and No-till seeding of barley are also recommended. In addition, the choice of variety and sowing date should be based on the type of farming planned. Early sowing is recommended for plots that are due to be mown before grain formation. Fertilisation must be balanced, taking into account the needs of the barley crop and soil analyses. Priority should be given to organic fertilisers such as manure and compost. It is advisable to apply nitrogen after green mowing to stimulate vegetative development.

Irrigation: barley is one of the cereals that is most tolerant of water stress. Nevertheless, in the event of severe water stress, it may be beneficial to irrigate the crop when water is available, particularly after green mowing.



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