



CLIMATE SERVICES FOR THE DURUM WHEAT AND PASTA SECTOR

“Facing climate change is amongst the greatest challenges of our times” Chiara Monotti, Barilla G&R Fratelli SPA

Durum wheat, and thus, pasta production is influenced by weather and climate conditions and is highly affected by climate extremes. Thereby, its vulnerability and exposure as well as the potential adaptation strategies under changing climate conditions must be assessed. MED-GOLD will use agro-climatic services deploying climate information at the medium (next 6-13 months) and long-term (2-30 years). To provide the highest value for decision-making, the services will be co-developed with professional users from the sector.

Durum wheat producers face diverse challenges affecting several decision processes in their business, such as agro-management and stock management and strategic decisions. Some examples are presented below to show how climate services - in this case, predictions of climate variables and bioclimatic indices - can support critical decisions along the durum wheat food chain and win over challenges posed by climate variability and climate change.

| Time scale | Decision type | Challenges | MED-GOLD climate service | Benefits |
|----------------------------------|--------------------|--|---|---|
| Mid-term (e.g., 6-13 months) | Agro-management | <ul style="list-style-type: none"> Better planning of soil tillage, fertilization, crop protection treatment and weed management Improve choice of variety and density at sowing Higher accuracy with sowing and harvest setting | <ul style="list-style-type: none"> Wheat phenological development Temperature Precipitation Hydrological balance Heavy rain during winter Useful rain for fertiliser activation | <ul style="list-style-type: none"> Minimize exposure to weather extremes Cost reduction through optimal fertilization and agro-management planning Maximize crop yield and quality Optimize use of fertilizers |
| | Stock management | <ul style="list-style-type: none"> Better contracts and price Better planning of supply chain | <ul style="list-style-type: none"> Frost risk index Heat stress index | <ul style="list-style-type: none"> Better planning of supply chain, contracts and prices |
| Long-term (e.g., up to 30 years) | Long-term strategy | <ul style="list-style-type: none"> Selection of future new cultivation areas Choice of new varieties, breeding and genetic improvement activities Monitoring of new pests, pathogens, weeds Anticipation of purchase needs | <ul style="list-style-type: none"> Projected yield changes Projected risk of climate extremes (i.e., heat stress, drought in critical phenological phases...) Projected risk of quality and nutritional issues Feasible adaptation strategies | <ul style="list-style-type: none"> Indicate suitable cultivation areas Better estimation of production for market and food security Improve regional policy planning and development, national adaptation strategies and EU policies (e.g. CAP) Match adequate varieties to expected climate Prepare for crop protection and prevention of invasive species Better use of investments (e.g., machinery, irrigation) |

Planning of fertilizers' application

Fertilizers are essential for the plant growth. The amount of nitrogen to be applied, the intervention timings and the form of nitrogen to be distributed are mainly influenced by the soil characteristics, the wheat variety and the climate in the cropping season (mainly temperature and precipitation, which drive the effect of fertilisers on the crop). Nitrogen can be distributed to crops in two forms: nitric nitrogen (NO_3^-), or ammoniacal nitrogen (NH_4^+). Nitric nitrogen can be readily used by plants and it does not bind to soil particles, so it is more prone to leaching. On the contrary, ammoniacal nitrogen needs to be transformed in nitric nitrogen by the action of bacteria in the soil in order to be used by the plants, and it can bound to soil and humus particles, so that it is less readily available to plants and it is not subject to leaching.

Currently, farmers including those in the BARILLA (MED-GOLD champion user for the durum wheat sector) supply chain, do the first nitrogen application during tillering. This is particularly important for crops grown in poor soils, especially after periods of high rain and low temperatures (it should be limited in case of mild weather and low rains). The second application of nitrogen fertilisers takes place at the beginning of the stem elongation, making nitrogen available during the most demanding period for the crop and setting the base for the quality of the grains. The last application is done at booting, with effects on both potential production and grain quality in terms of proteins.



Advantages of having access to seasonal climate predictions:

1. **Improved choice of the type of nitrogen fertiliser** in order to optimise plant uptake and reduce losses (i.e. leaching)
2. **Better anticipation and planning of fertilizers' application** enhancing cost reduction
3. **Efficient stock management** accounting in advance for the fertilisers to be used

Glossary

Climate predictions: probabilistic forecasts of climate variables that extend further into the future than weather forecasts, from months and seasons up to decade

Climate projections: probabilistic forecasts of climate variables that extend even further into the future than climate predictions, from decades up to centuries

Climate services: transformation of climate-related data and other information into customized products such as trends, economic analysis, advice on best practices, and any other climate-related service liable to benefit that may be of use for the society

Frost risk index: number of days with minimum temperature below 2°C from wheat heading to end of flowering

Heat stress index: number of hot days with maximum daily temperature above 28 °C between wheat heading to the end of grain filling period

Heavy rain during winter: number of days with cumulate rainfall above 40 mm

Hydrological balance: Standardized Evapotranspiration Index (SPEI) calculated for several time intervals linked to wheat phenology

Seasonal predictions: probabilistic forecasts of climate variables for the next season (up to 6 months)

Useful rain for fertilizer activation: number of days with rainfall above 10 mm during wheat tillering

About MED-GOLD

MED-GOLD, Turning climate-related information into added value for traditional **MED**iterranean **G**rape, **O**Live and **D**urum wheat food systems, is a 4-year project contributing to make European agriculture and food systems more resilient, sustainable and efficient in the face of climate change by using climate services to minimize climate-driven risks/costs and seize opportunities for added value



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med-gold.project@enea.it