

**BREEDING FOR SUNFLOWER HYBRIDS ADAPTED TO CLIMATE CHANGE:
THE SUNRISE COLLABORATIVE AND MULTI-DISCIPLINARY PROJECT**

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ABSTRACT

In the context of climate change, an increased variability is expected in timing and amount of water available for crop production. For sunflower crop, yield losses of 10 to 30 % have been predicted at 2030 horizon in Europe. During the past 10 years, genetic progress was lower than expected to improve yield, which imposes to the sunflower community to re-invest current breeding resources and methodologies. To reach high and stable yields across a wide range of environments a French project of 8 years, named ‘SUNRISE’ (SUNflower Resources to Improve yield Stability in a changing Environment) and supported by the French National Research Agency, is gathering 9 public and 7 private partners since 2012. It associates several approaches: (i) the sequencing and genotyping of the genetic diversity among cultivated and wild sunflowers, (ii) the development of appropriate and high-throughput phenotyping strategies to characterize the molecular, physiological and agronomical responses to variation of the abiotic environment, (iii) the discovery through genome-wide association, linkage mapping and genomic selection of the genetic factors involved in those responses, (iv) the integration of this genetic knowledge into a crop model (SUNFLO) to test in silico G by E interactions and design promising ideotypes in future environments, and finally (v) the evaluation of the outputs for the breeding sector and the transfer of knowledge to agriculture. This partnership will ensure that the developed knowledge, resources and methods will be translated into products and varieties supporting the adaptation of the agriculture to societal and ecological challenges.

Key Words : drought, genetic resources, breeding, crop model, ideotype, genome