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Searching for adaptive traits in genetic resources – phenology based approach

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Phenology is an important plant trait not only for assessing and forecasting food production but also for searching in genebanks for adaptive traits. Among the phenological parameters we have been considering to search for such adaptive and rare traits are the onset (sowing period) and the seasonality (growing period). Currently an application is being developed as part of the focused identification of germplasm strategy (FIGS) approach to use climatic data in order to identify crop growing seasons and characterize them in terms of onset and duration. These approximations of growing period characteristics can then be used to estimate flowering and maturity dates for dryland crops, such as wheat, barley, faba bean, lentils and chickpea, and assess, among others, phenology-related traits such as days to heading [dhe] and grain filling period [gfp]. The approach followed here is based on first calculating long term average daily temperatures by fitting a curve to the monthly data over days from beginning of the year. Prior to the identification of these phenological stages the onset is extracted first from onset integer raster GIS layers developed based on a model of the growing period that considers both moisture and temperature limitations. The paper presents some examples of real applications of the approach to search for rare and adaptive traits.