# MSc thesis – Crop-Specific Agricultural Drought Early-Warning System Using Earth Observation and Weather Data.

**About UM6P**



University Mohammed VI Polytechnic is an institution dedicated to research and innovation in Africa and aims to position itself among world-renowned universities in its fields. The University is engaged in economic and human development and puts research and innovation at the forefront of African development. A mechanism that enables it to consolidate Morocco's frontline position in these fields, in a unique partnership-based approach and boosting skills training relevant for the future of Africa. Located in the municipality of Benguerir, in the very heart of the Green City, Mohammed VI Polytechnic University aspires to leave its mark nationally, continentally, and globally.

**About CRSA**

Center for Remote Sensing Application (CRSA) is a transversal structure across several UM6P Programs. Research within CRSA is organized around several major areas that aim to ensure the challenging Food and Water security goal in Africa, with a special focus on developing methods/tools that use multi-source remotely sensed data. The research aims to improve our understanding of the integrated functioning of continental surfaces and their interaction with climate and humans, with emphasis on sustainable management of natural resources (soil, land, water, agriculture) in the context of Climate Change. One of center's goals is to provide a set of services and operational products to users (local, national and international) that aid in the decision support of water and food systems.

**Job description**

Agricultural drought can develop rapidly and affect crop growth even before its effects are clearly visible in traditional vegetation indices. This short-term master's thesis project will aim to develop and evaluate a prototype crop-specific drought early warning system by integrating meteorological data, soil moisture derived from satellite data, vegetation status, soil surface temperature, and crop phenology. The study will focus on a major cereal crop, such as wheat, within a selected agricultural region in Morocco or as part of a comparative analysis between Sweden and Morocco.

Open-access datasets from Sentinel-1, Sentinel-2, ERA5-Land, and other relevant Earth observation products will be used to calculate indicators of meteorological conditions, soil moisture, and plant stress. The student will investigate how drought signals propagate, from precipitation deficits to declining soil moisture and the resulting stress on crops. Particular attention will be paid to crop developmental stages, as water deficits occurring during sensitive periods can have very different consequences for final yield.

Historical drought events and available data on crop yields or from field observations will be used to identify and validate warning thresholds. The performance of individual indicators and a combined drought warning index will be evaluated in terms of detection accuracy, false alarm rates, and potential warning lead time. The final output will consist of reproducible processing scripts, drought risk maps, and a prototype dashboard classifying conditions into "normal," "watch," "alert," and "severe stress" levels. The project will contribute to the development of transferable and operationally relevant tools, promoting climate-resilient crop management and drought preparedness.

**Experience and Qualifications**

- Bachelor in Remote Sensing, Environmental Science, Agronomy, or a related field.
- Current enrolment in master's degree in mandatory.
- Experience in Soil sciences (e.g., physics, chemistry, pedology).
- Demonstrated experience in digital soil mapping and remote sensing.
- Programming (e.g., Python, R) and GIS tools (e.g., QGIS) experience.
- Excellent communication skills.

**Supervisors:**

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