



Co-funded by the  
Erasmus+ Programme  
of the European Union



# MOODLE COURSE PRESENTATION ON CREATING TOOLS FOR CAPACITY BUILDING ON THE GENERATION OF WEATHER-BASED CROP CALENDARS TO SUPPORT CLIMATE SERVICES: FROM RESEARCH TO TEACH

*Jon Xavier Olano, Enric Aguilar, Anna Boqué, Caterina Cimolai*

*Centre for Climate Change*

*Institut Universitari de Recerca en Sostenibilitat, Canvi Climàtic i Transició Energètica*

*Universitat Rovira i Virgili*

*Training V of ClimED Project, Tartu, October 1st, 2024*



Co-funded by the  
Erasmus+ Programme  
of the European Union



## Context

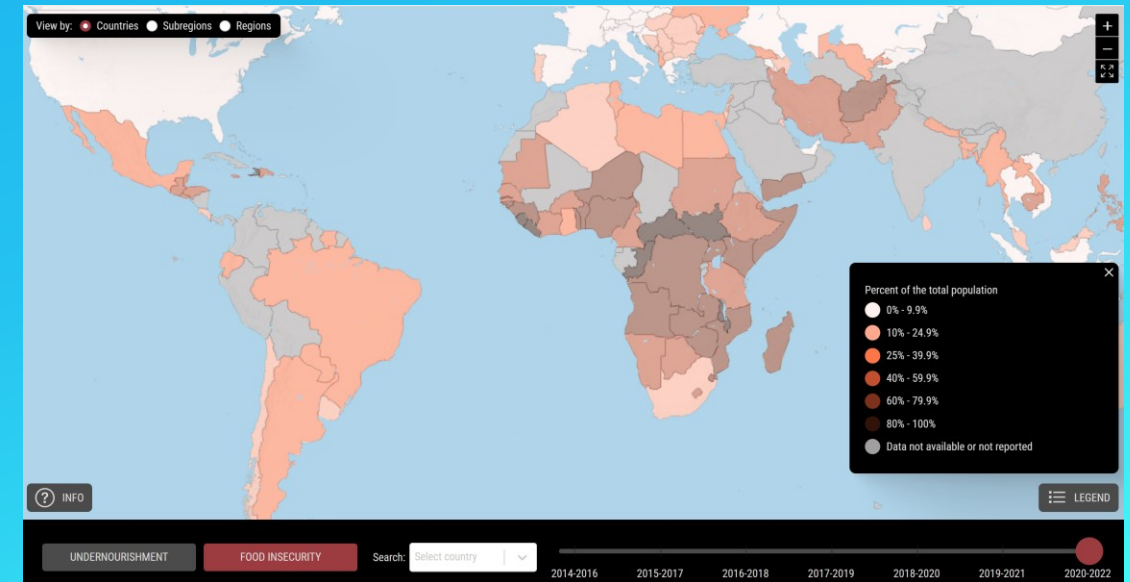
1. Background and Contextualization
2. Competency development, performance criteria and learning outcomes
3. The Research
4. The Teach
5. The moodle course
6. Next steps





# 1. Background and Contextualization

- The UN's 2030 Sustainable Development Agenda sets a crucial target: eradicating hunger. Yet, progress has been insufficient.
- Over 735 million people still suffer from hunger (FAO, 2023).
- Hunger is not evenly distributed globally; it hits hardest in less developed nations where agriculture sustains many livelihoods.





# 1. Background and Contextualization

- The CREWS (Climate Risk and Early Warning Systems) Initiative
  - It is **an international effort to improve developing countries' capacity**, particularly the most vulnerable, **to anticipate and respond to climate risks** and natural disasters by implementing effective early warning systems.
  - **CREWS focuses on strengthening multi-hazard early warning systems**, including monitoring, forecasting, and communicating threats like floods, droughts, storms, and heatwaves among others.





# 1. Background and Contextualization

- The ENANDES (Enhancing Adaptive Capacity of Andean Communities through Climate Services) project
  - is an initiative designed to strengthen the adaptive capacity of Andean communities in the face of climate variability and climate change through the development and improvement of climate services in the Andean region





# 1. Background and Contextualization

- During last years our colleagues participate in a previous experiences as researchers, trainers and evaluators (in projects such as Climandes I, Climandes II or CREWS initiative projects in Africa.
- In 2022 IURESCAT/C3/URV team participated on trainings for ENANDES project in Bogotá, Lima and Santiago de Chile
  - The objectives were:
    - Quality Control of data
    - Homogeneization
    - Co-creación de indicadores nuevop



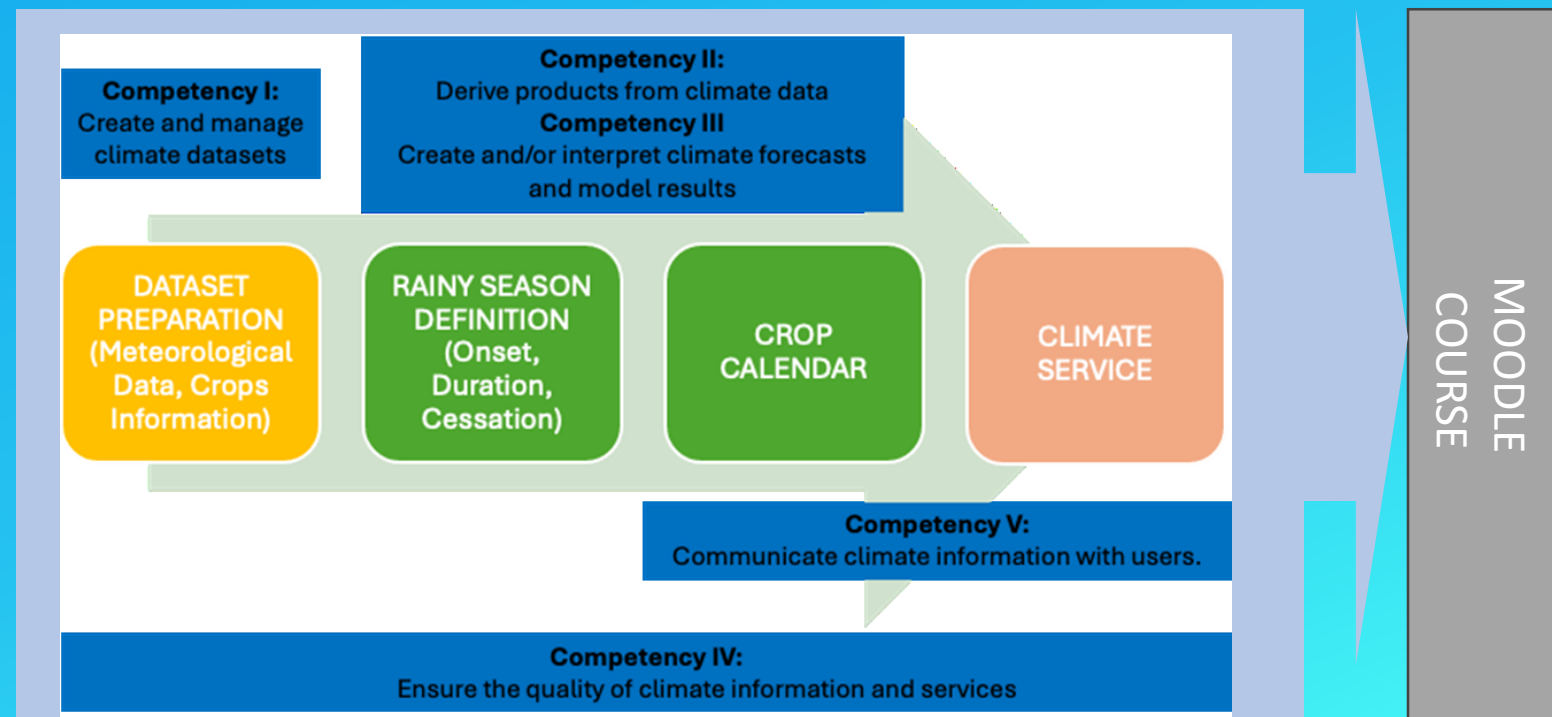
# 1. Background and Contextualization

- Hace un año empieza un nuevo Proyecto con el objetivo de mejorar las herramientas de control de Calidad y calendar crops que se habian desarrollado; testarlar y hacer un curso de moodle para que gente random lo pueda usar.



## From research to teach

- From Data to Service:  
as stated in the  
competences defined  
by the WMO of  
Climate Services  
provision





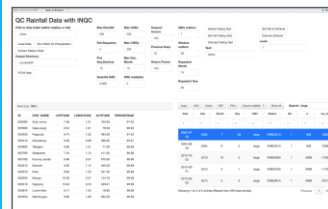


## 2. Developing Climate Service

### The importance of Rainfall Data

- Creating these calendars requires precise rainfall data to pinpoint the start and end of rainy seasons
  - Dayly precipitation data
    - Computation of onset and cessation of a climatological period
  - Includes the crop's growth cycle to determine early, normal, and late periods

### Quality Control of the data



- 1: Wrong, Correct or set to missing value. Negative precipitation
- 2: Most likely wrong. Verify, correct, validate, set to missing. 300 mm precipitation
- 3: Suspect a threshold outlier. Validate, correct, set to missing with great caution. 30 mm, representing 77%+1 Q3
- 4: Correct value but consistency suspect. Only set if it is very clear. For example, 30 consecutive values with 3.5 mm

### Defining and parameterizing the Rainy Season Onset and Cessation

- The **rainy season onset (RSO)** can be defined simply as the date from when **consistent and significant precipitation occurs after a dry season.**
- The **cessation of the rainy season** can be defined simply as the period or day when **the last significant rains of a wet season occur and the dry season begins**

### Defining and parameterizing the Rainy Season Onset and Cessation

- These **dates are often associated with a period within which rainfed agricultural production can normally occur** and provide an indication of the type of crops (especially in relation to their growth cycle in days and their resistance to dry spells) that can be cultivated.
- The **rainy season onset and cessation can be determined using two basic approaches**, the threshold method (also known as agronomic method) and the cumulated anomalies method. We choose the **agronomic method** for its versatility and adequacy to the analysis of station-based data

### Parameterization of the Threshold Based (Agronomic) method. Onset.

- Threshold based methods involve the definition of different parameters influencing the effective onset of reliable rains from an agricultural point of view.
- The correct detection of the onset is critical, as it is assimilated to the start of the sowing period.
- These parameters include the first day to start looking for possible onsets; an accumulation of rain in a given number of consecutive days; the absence of a given sequence of dry days after the accumulation
- The selection of the parameters is local or, at least, by agroecological zone and must take into account the characteristics of the different crops
- The adjacent table, shows the definitions adopted for corn in Togo and for two different rainfall regimes: Monomodal (North of the Country) Bi-Modal (South of the Country).

Season Onset	
Monomodal	First day after March, 15 <sup>th</sup> accumulating 20 mm in 3 days and with less than 10 consecutive dry days in the following 30 days
Bimodal (long rains)	Same as for monomodal, but after 1 <sup>st</sup> February.
Bimodal (short rains)	Same as for monomodal, but after August, 15 <sup>th</sup>

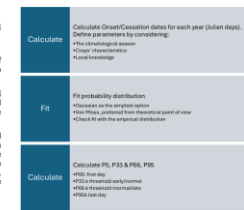
### Parameterization of the Threshold Based (Agronomic) method. Cessation

- Threshold based methods involve the definition of different parameters influencing the effective cessation of reliable rains from an agricultural point of view.
- The correct detection of the cessation is critical to understand whether the crops will be harvested with or without water availability
- The parameterization looks at identifying the first sequence of a given number of days accumulating less than a prefixed amount of rain
- The adjacent table, shows the definitions adopted for corn in Togo and for two different rainfall regimes: Monomodal (North of the Country) Bi-Modal (South of the Country).

Season Cessation	
Monomodal	First day after October, 1 <sup>st</sup> accumulating less than 15 mm. in 17 days
Bimodal (long rains)	Same as for monomodal, but after 1 <sup>st</sup> July.
Bimodal (short rains)	Same as for monomodal, but after October, 15 <sup>th</sup>

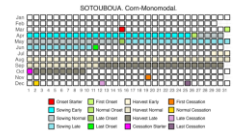
### Fitting parametrical distributions to the empirical season for the determination early, normal and late onsets and cessations

- Onsets and cessations can be determined using rainfall data for each year
- Using a long enough rainfall series (see Step 1 presentations), we generate an empirical time series of onsets and cessations, expressed in Julian days (1 to 366)
- We can compute percentiles over the empirical distribution to divide each series (onsets and cessations) in early (p5-p33), normal (p33-p66) and late (p66-p95) periods using percentiles
- In order to improve our estimates done over a limited number of observations (years) we can fit a parametrical probability distribution. Even though the Gaussian distribution has been traditionally the preferred one, given the circular nature of the data (i.e., day 1 is closer to day 365 than to day 4), we suggest the usage of the Von Mises distribution



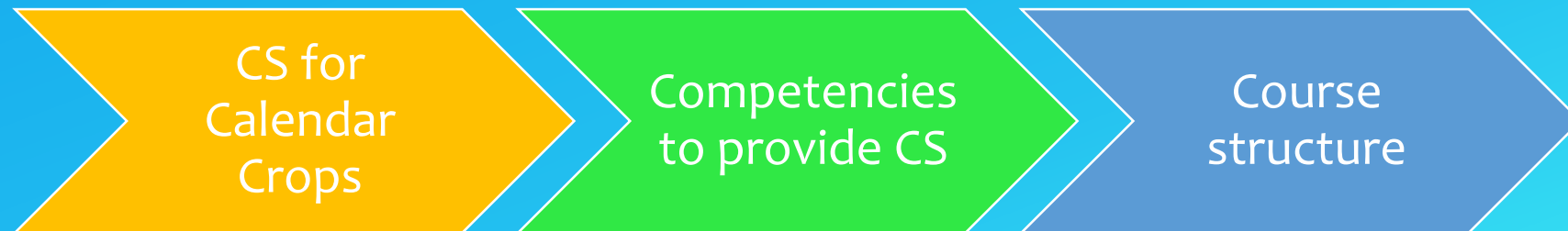
### Example

- The example shows the climatological calendar for Sotouboua station in Togo.
- The early sowing period starts at the end of March, the normal sowing in late April and the late sowing in mid May.
- After a growing period of 120 days, early harvest starts in late July, normal harvest in the second half of August and late harvest the first decade of September.
- According to the calendar, all the harvesting periods happen before the climatological end of the rainy season





### 3. Transforming a research and transference information

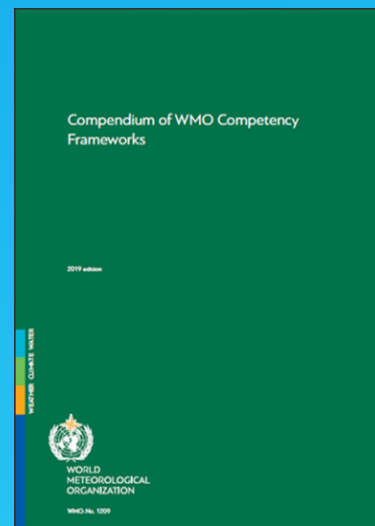






### 3. Competencys, performace criteria and LO

- The course is based on developing basic activities to achiveve learning outcomes in the main competencies to provide climate services



C1. Dataset  
Management

C2. Derive  
Climate  
Products

C3. Forecasts  
and Projections

C4. Quality  
Management

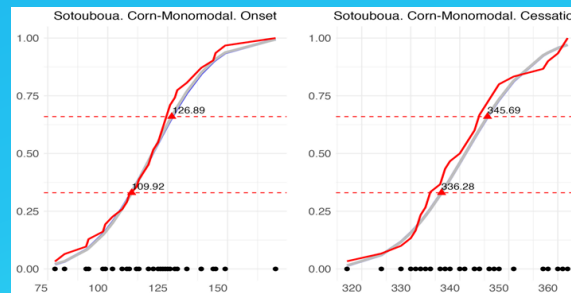
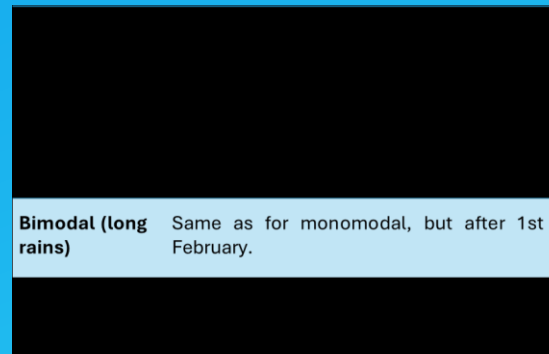
C5.  
Communication





## 3.3. Competency 2: Derive Products from climate data

- PC2.1: Identify and retrieve climate data from different sources to generate climate products
- PC2.3: Compute basic climate products, normals and averages, or anomalies defined in relation to a reference period
- PC2.4: Compute sector-specific climate indices and other sector-oriented climate products
- PC2.6: Create value-added products, such as graphics, maps and reports to explain climate characteristics and evolution, according to the needs of specific sectors such as health, agriculture, water, energy and disaster management

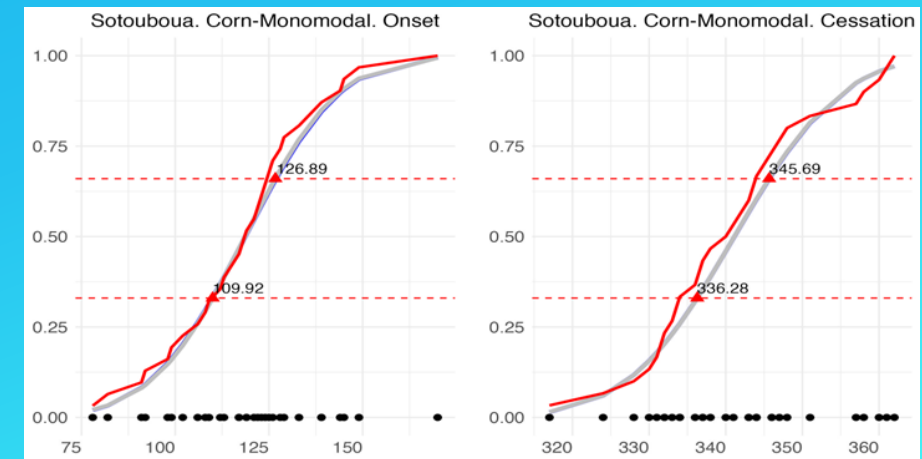


- LO1.1: Characterize the climate of the area of study and describe its variability and recent changes
- LO1.3: Define the impact of climate on strategic sectors, especially GFCS key sectors: agriculture
- and food security, disaster risk reduction, energy, health and water
- LO1.7: Retrieve sectorial data from original sources inside and outside the organization, and
- organize, store and document them
- LO1.6: Prepare climate and sectorial datasets for own usage, considering the necessary spatial and temporal coverage
- LO1.9: Represent climate data and climate indices time series and test them for temporal changes,
- including significance analysis
- LO1.12: Explain the meaning and applications of widely used climate indices, such as those included in the RClindex and Climpack packages



## 3.4. Competency 3: Forecast and projections

- PC3.2: Create sub-seasonal, seasonal and longer scale forecast products;
- PC2.3: Create future climate projections using climate models over selected domain for different scenarios and parametrization;
- PC3.6: Create value-added products, such as graphics, maps and reports to communicate climate forecasts and climate model information management
- **LO3.7: Create sub-seasonal, seasonal and longer-scale forecasts including measure of uncertainty tailored to specific user needs**
- **LO3.16: Create products from models relevant to end user needs such as climate means, indices specific to each sector, box plots, drought analysis, climate trends and climate extremes**





## 3.5. Competency 4: ENSURE THE QUALITY OF CLIMATE INFORMATION AND SERVICES

- PC4.4: Provide training to personnel so that they can fulfil their job requirements and expand their capabilities
- PC4.5: Conduct refresher courses at regular intervals to update knowledge;
- PC4.6: Define and implement a catalogue of climate datasets, products and services to meet user requirements at the national and regional level
- **LO4.6: Identify stakeholder needs and characteristics**

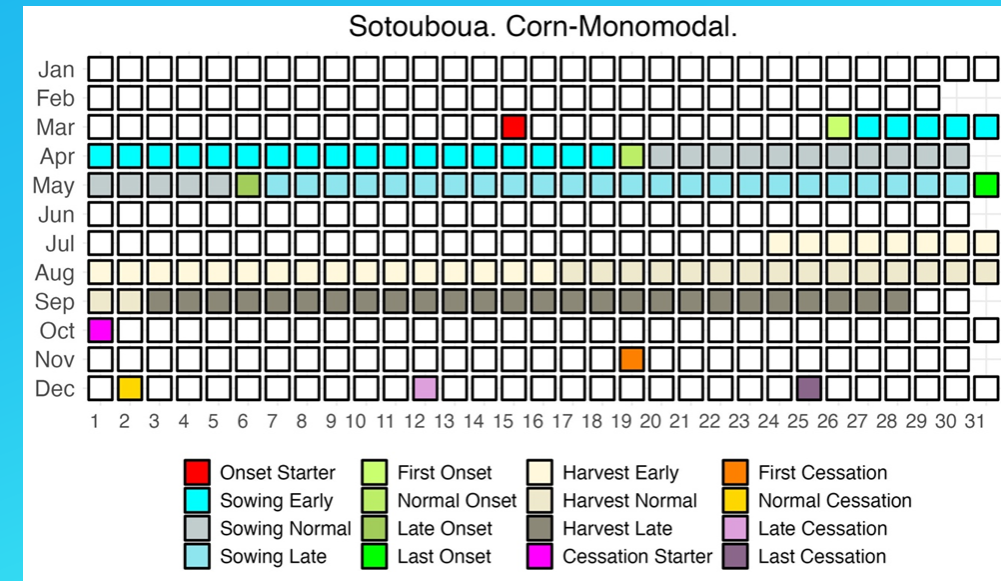






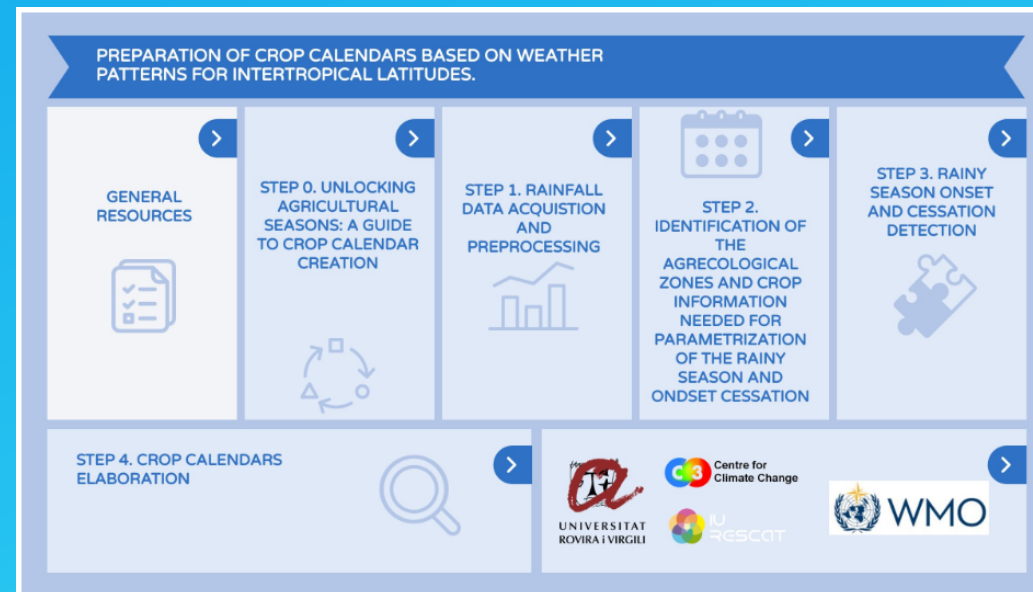
## 3.6. Competency 5: Communicate climate information to users

- PC5.1: Prioritize the communication of climatological information according to social, political and economic relevance
- PC5.2: Establish effective communication channels with users of climate services and build outreach capacities, such as Regional Climate Outlook Forums ;
- PC5.5: Develop and deliver, in partnership with users, specific applications to facilitate understanding and use of climate products and services
- LO5.2 Characterize the climate of the area of study and describe its variability and recent changes
- LO5.4. Express the impact of climate on the different sectors of economic activity, and on social and geopolitical key issues in the area of study and give examples
- LO5.9 Formulate climatological information in a language that is both scientifically sound and adapted to the foreseen users





## Course structure (Draft)





Co-funded by the  
Erasmus+ Programme  
of the European Union



# Thank you!