



NATIONAL ACTIVITY FOR LEBANON

LARI Early Warning System in the Bekaa Valley

Task 4 Training and Technical Assistance

AWS management and maintenance, Soil moisture sensors and monitoring techniques and Climatic data download, validation and management

Tal Amara Station 23 January – 3 February 2017

Agenda

UNIT 1: Agrometeorological Sensors - Data-loggers and data transmission devices

23 January 2017 : Fundamentals of agrometeorological measures

Purpose: To introduce the concepts of meteorological measures and to describe the first step in designing an Agrometeorological Weather Station (AWS)

Topics:

- 1) Informal meeting with the attendants
- 2) Introduction to the training and field activities
- 3) PESSL AWS infrastructure and Sensors overview. Problems and relevant issues
- 4) Introduction to metrology and errors of measures

Projects: define the problems in evaluating AWS or AWS's spare parts; which tools and devices should be present in a laboratory; the sensors selection

Handouts: list of sensors and data-logger (DL) required; the useful accessories

24 January 2017: Air and soil temperature, air humidity and soil moisture, solar radiation, wind speed and direction, rainfall. Introduction to the acquisition devices; Data-logger protection and Data-logger-to-PC communication – Data Transmission

Purpose: To introduce the concepts of measure of these parameters

Topics:

- 1) Overview of sensors type
- 2) Problems and aspects of measuring these meteorological variables
- 3) agrometeorological methods to estimate the evapotranspiration
- 4) Radiation flux types
- 5) Types of data-loggers and State of art
- 6) data retrieving from data-logger (*see also day 7, UNIT 4*) and Introduction to Campbell Scientific data loggers and programming
- 7) Data-logger protection
- 8) GSM/GPRS data transmission devices

Projects: set-up the air temperature and soil temperature measurements, rainfall and wind speed. Data-logger settings and configuration; data-logger protection; data-logger -> PC RS-232 / USB communication; software management

Handouts: Graphic description of the meteorological variables. Evapotranspiration calculation; organization of a data set by the Personal Computer (PC). Sensor's characteristics; type of acquisition; data-logger installation; test RS-232/USB communication; test GSM/GPRS modem communication.

UNIT 2: Installation and management of Automatic Agrometeorological Stations

25 January 2017: problems related to station's installation and power (Strongly suggested as outdoor activity in a AWS site)

Purpose: to list the practical aspects and the problem in Automatic Weather Stations (AWS) installation; power supply requirements

Topics:

- 1) Instruments and accessories requirements
- 2) W.M.O. rules for standard AWS installation
- 3) Site selection and station footprint
- 4) Choosing the power source
- 5) Step by step field installation – Evaluation and test with LARI Campbell AWS's

Projects: the correct tools and accessories; example of AWS field installation; powering the AWS
Handouts: installation techniques; produce a check-list for field installation

26 January 2017: The fundamental aspect of AWS maintenance

Purpose: sensors maintenance requirements; consideration on environmental conditions; sensor's check and time interval choice (Strongly suggested as outdoor activity in an AWS site)

Topics:

- 1) sensors check and comparison with portable sensors (weather station bag with Campbell Scientific CR1000)
- 2) sensors cleaning and choice of correct products
- 3) Comparison/calibration of temperature sensors
- 4) Test/calibration of humidity sensors
- 5) Test/calibration of solar radiation sensors
- 6) Test/Calibration of rain gauge

Projects: provide a set of portable sensors; example of calendar of maintenance interventions. List of equipment / accessories for sensor calibration

Handouts: consideration on the cost of maintenance operations; compiling a file notes of the station. collect calibration data on a spreadsheet and graph the response curve. Calculate the sensor's coefficient by a linear regression

UNIT 3: Soil moisture observations – Overview of soil moisture observations techniques

27 January 2017: Fundamentals of Soil moisture monitoring

Purpose: To introduce the concepts of soil moisture observations by manual and automatic devices

Topics:

- 1) PESSL soil moisture sensors overview. Problems and relevant issues
- 2) Overview of soil moisture monitoring: principles of operations and available sensors
- 3) Connection and configuration of soil moisture sensors to Campbell data logger

Projects: define the problems in evaluating AWS or AWS's spare parts; which tools and devices should be present in a laboratory; the soil moisture sensors selection

Handouts: list of soil moisture sensors type and number available and at LARI observing network

30 January 2017: soil moisture sensors selection, test, installation and maintenance

Purpose: To introduce the concepts of soil moisture installation and management

Topics:

- 1) sensors selection
- 2) Calibration vs soil type
- 3) sensors test and installation
- 4) soil moisture measure unit and data evaluation
- 5) data retrieving and preliminary analysis

Projects: set-up the calibration check of soil moisture sensors -installation plan and sensors insertion in the soil

Handouts: Guidelines for soil moisture sensor management for LARI network: selection, calibration (required: Yes/No) and installation

UNIT 4: AWS Data downloading

31 January 2017: Introduction to automatic data retrieval and data archiving

Purpose: To describe the general concepts on automatic data downloading with open source approach

Topics:

- 1) Introduction to AWS data downloading (*see also data retrieving from data-logger, Day 2*)
- 2) Discussion and evaluation of present procedures
- 3) Data format overview
- 4) Data download technologies overview
- 5) Check of Personal computer training room setup for practical training

Projects: reassume the entire process from data-logger data retrieval to data downloading on the PC or Server

Handouts: create a report on AWS data retrieval procedures;

01 February 2017: Data archiving and preliminary test over multiple AWS's



Purpose: To test automatic data downloading by the script. Extending the test over multiple AWS's.

Topics:

- 1) Tables vs Database. Introduction to Database: advantages of relational databases.
- 2) Introduction to PESSL WinSync tool for data download management.
- 3) Creation of automatic data download procedure through PESSL WinSync engine
- 4) SpatialLite GUI: the official SQLite management tool.
- 5) Feed the database by the data of a LARI AWS

Projects: SQL database creation; preliminary data import from PWSSL website to SQLite database

Handouts: create the structure of SQL database

02 February 2017: Automatic data retrieval tailored for LARI AWS's network

Purpose: To practice on creating queries over downloaded data and performing simple data analysis using SQL language and SpatialLite GUI tool.

Topics:

- 1) Overview of PESSL tables structure.
- 2) Retrieving data of single or multiple AWS.
- 3) Play with SQL language and data.

Projects: build the summary table containing AWS data with simple data analysis.

Handouts: table with AWS data and analysis results.

03 February 2017: SQLite database vs PostgreSQL database

Purpose: To describe and compare the features of SQLite database vs PostgreSQL

Topics:

- 1) Introduction to **PostgreSQL** database (as multiuser database)
- 2) Discussion about SQLite to PostgreSQL database
- 3) Set the "After training activities": review scripts and data import procedures for all the LARI AWS network
- 4) Unfinished business
- 5) Evaluation and Closure of training course
- 6) Release of Certificate of attendance to trainees

Projects: export SQLite database into the dump file.

Handouts: dump file containing database structure (tables and data).