

Drought risk monitoring research program in Romanian forests

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In the last 4 years The Romanian Forest Research Institute has developed in the frame of the National Research Program MENER (Environment Energy Resources) the project "Drought Risk Monitoring in Romania's Forest" which tries to estimate in real time the risk of drought occurrence on the ground of a network of precipitation measurement in whole forested area (about 400 forest districts). In 2002 were installed the rain measurement network in representative plots located in each forest district. The deficit/excess of rainfall in relation with the multi annual mean of precipitations are computed and mapped using the modern tools (database, geostatistics, GIS etc).

On the ground of manuals and training programs the foresters from the forest districts measure and send the data of total and effective (precipitation – evapotranspiration) rainfall to coordinators of the project at each Forest Directorate. The data are faxed or e-mailed in the first 3 days of each month to the database in the Forest Research Station Campulung Moldovenesc.

Raw data is checked, validated and processed in the first 7 days of each month (fig. 1). Results are presented in an e-mail report (4-6 pages) and 8-16 maps showing the rainfall indices for the last 1-12 month, on the site www.icassv.ro/seceta. At the end of the year an annual report summarizes the dynamics of rainfall regimes and their potential impact on the forests.

The access of our beneficiaries (decision-makers) to the real data in real time allows a better objectification of the decisions concerning the forest management. On the other hand data from this monitoring project are useful for the evaluation of the impact of rainfall deficit on the health state of trees and on the incidence of other disturbing factors on the forest (forest fires, insects, pests, grazing etc.).

Data used for the monthly reports is obtained from 402 forest districts in which rainfall samplers are installed in couples of 2 total rainfall (P) and 2 effective rainfall (P-ETP) which permit a good estimation of the monthly rainfall in each point of the network. The drought indices are computed in relation with the multiannual mean of precipitations in each point. The flowchart of the data processing is presented in Barbu & Popa, 2003.

For the evaluation of the level of the deficit/excess of precipitation we use the standardized precipitation index (SPI) computed for each point of the network. The SPI represents the number of standard deviations that the observed values deviate from the long term means for a normally distributed random variable.

For the computing of SPI we use the relation (assuming the normal distribution of precipitations) :

$$SPI = \frac{P_i - P_m}{SD_i}, \text{ in which}$$

P_i = precipitation registered in the period i (1...12 months)

P_m = mean of precipitation in the period i

SD_i = standard deviation of mean precipitations in period i

Transforming the SD in coefficient of variation (s)

$$s\% = \frac{SD}{P_m} * 100$$

The SPI can be computed with the formula

$$SPI = \frac{\frac{P_i - P_{mi}}{P_{mi}}}{s_i}$$

Using this simple formula it is possible to estimate the SPI for every point of the land on the ground of measured precipitations in the "i" period and the multianual mean values of precipitations (P_{mi}) and the coefficient of variation estimated for the territory, and mapped for different periods (Barbu, Popa 2003).