Drought Early Warning System (EWS) for the Dominican Republic

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March 11, 2020

XIV International Hydroinformatics Conference
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1. Title.

Drought Early Warning System (EWS) for the Dominican Republic.

2. Summary.

This proposal is the result of the interest of the main actors of the agricultural and socioeconomic sectors of the Dominican Republic to contribute to the knowledge of the drought, its patterns and impacts, especially in the food and nutritional security (FNS) of the population related to consumption and dependence on the main products of the family basket, as vital sources of food and livelihoods.

Given this reality, s and seeks to develop a Digital Platform for Monitoring of each type of drought (meteorological, hydrological and agricultural), in order to visualize the interrelationship between each one of them and their development in different regions of the Dominican Republic. This visualization of the threat of drought is expected to facilitate decision-making from the most local levels to the decision makers of the high government instances.

The development and implementation of this digital platform will allow drought monitoring and surveillance in the Dom. Rep., Thus facilitating decision making and knowing the updated risk of this threat. In the same way, this platform will allow to manage in an integral way the risk of drought in the country , containing information of drought to meteorological and hydrological, as well as of agricultural drought for all the provinces at national level. Likewise, strengthen and / or develop the capabilities of interpretation and analysis of satellite and hydrometeorological information and the correct interpretation of the final products visible on the platform.

3. Keywords.

Early Warning System: Timing alert coordination tool and formal that detonates specific activities and systematized the population and institutional action, the threat of danger which is exposed to an area, region or country.

Satellite Image: Visual representation of the information captured by a sensor mounted on an artificial satellite.

Indicators: Variables that describe a drought condition. Examples: Total precipitation, flows, groundwater or reservoir levels, soil moisture, etc.

Triggers: Specific values of each indicator that determine the beginning or end of actions within a drought action plan. Example: rainfall below the 5th percentile for two consecutive months.

4. Introduction.

The Dominican Republic is a country with a high level of exposure to hydrometeorological events such as hurricanes, floods and droughts that negatively affect the environment, economic activity, livelihoods and undermine the country's achievements in sustainable development. According to the Integrated Context Analysis (ICA) study of the World Food Program (WFP), drought is a recurring threat that affects the country, with greater incidence on the border line and in the southwest region of the country, where the highest reported losses in livelihoods, in the agricultural sector and soil degradation.

Early warning systems for droughts are intended to monitor and evaluate climatic, hydrological and water conditions and trends, and provide relevant information in this regard. In theory, they present a surveillance component and a prediction component, whose purpose is to provide timely information before or during the drought phase, or to adopt measures (by means of triggers that have a threshold as a reference).

Assuming that Drought is a phenomenon responsible for numerous trigger crises and humanitarian disasters with impacts social, economic, environmental and productive, almost always is much less striking than other events harmful, such as the floods and the landslides, because its effects are concentrated in the middle rural and tend to have a less dramatic look. Other times, the drought is under-registered, because it is not possible to assess the entire affected region to establish the dimensions of the damage.

The problem of background of the drought, in addition to its effect on the economy and the production as such, of the impact on health and other sectors, is the loss of basic crops for safety food and nutrition and the effect on systems of water resources. In this order, through this proposal, the gaps in the management of the early warning of drought are addressed to mitigate its impact on national production and the population in a situation of greater vulnerability.

5. Activities and methods.

Activities

a. Work plan and schedule for implementation.
b. Presentation, discussion and validation of the plan and work schedule.
c. Regular meetings of the advances presentation in the development of the platform
d. Conduct training days for government and private sector institutions linked to drought (National Meteorological Office (ONAMET), National Hydraulic Resources Institute (INDRHI), Ministry of Agriculture, Ministry of Environment, Emergency Operations Center (COE), among others) for the

interpretation and analysis of drought satellite images. Such time will be n at central and provincial level.

e. Practical validation of the platform with the partners involved (government and private sector) to ensure that it is manageable, easy to use and understandable.

f. Digital delivery of the final version of the products, including Excel, Word, PPT, Shapefile, PDF materials and other formats used .

g. The duration for implementation will be six (6) months.

Methodology

The methodological aspects considered for the implementation of the EWS for drought monitoring and evaluation are:

a. Selection of methods for monitoring and evaluation of meteorological drought, agricultural and hydrological, with particular reference to drought indices: Index of Severity of Drought (PDSI), Index Standardized Precipitation (SPI), Moisture Index Farming (CMI) and Index of photosynthetically active radiation (FAPAR). They will describe the main methods used internationally in recent years and that have demonstrated one capacity operating in function of their available data requirements, in addition to its simplicity and speed of calculation. Methods to user must be computerized to achieve one full automation of calculations and representation mapping.

b. Selection of pilot areas or crops, which must be agreed with the representatives of the relevant sectors and with the National Focal Points.

c. Identification data necessary for the use of the detection methods and evaluation of drought. These data must be selected for their operational capacity and their institutional location. It must indicate the number of stations, the meteorological variables observed, the length of the time series and the institution that holds the information.

d. Implementation of the system of monitoring and evaluation of drought applied to the stations of l as area s pilot and operational automation.

The Early Warning System Drought should consider the components essential for implementation, which are summarized as follows: a) Monitoring and Forecasting, b) Knowledge of risk and vulnerability, c) Communication and Dissemination, and d) Answer's capacity.

Likewise, the problem between climate, food and nutritional security and extreme events, such as drought, must be taken into account, so it is recommended: a) the collection, consultation and investigation of secondary sources; and b) consultations with national experts to identify the areas that are most prone to drought and the behavior of the crops of interest due to drought.

The recommended methodology considers the use of satellite data and images in the different processing formats required for detection, that will generate monthly maps of the PDSI, SPI and CMI for the regions under study, which allows monitoring and identifying the temporal evolution of drought indices, in order to identify the affected areas and perform meteorological and agrometeorological indices PDSI, SPI3 and CMI and satellite FAPAR index.

Finally, it includes the use of Unmanned Aerial Vehicle, also known as Drones, which use multispectral cameras (able to capture several light spectra of up to 6 spectral bands), and may calculate different rates vegetation that indicates the health and well-being of the vegetation (how much active chlorophyll there is, if the plant is well hydrated or is "stressed", how much leaf it has, etc.). Likewise, the NDVI index (Normalized Difference Vegetation Index) can be obtained through which we can calculate the vigor of the plant (its metabolic state). But there are many other indices that can be obtained through drones, such as: GNVDI, RVI, GVI, NGRDI, RG, SAVI, etc., since these devices are capable of calculating 20 different types of vigor indices of a very simple way.

6. Expected results

a. A database (BDD) developed and structured, integrated by the thematic components (edaphological, agronomic and climatic) that allows the update and automatic feeding of the interface of the Agricultural Water Balance.

b. A web platform for drought monitoring, available on different electronic devices, with several users (standard and administrators) that feeds on hydrometeorological and satellite information. To be developed from the source code, installed, calibrated and operational on a server. It must include the following specificities:

   - Automatic feeding with hydrometeorological and satellite information at the country level. Information on the leading indicators for the three types of drought (meteorological, hydrological and agricultural) must be ensured.
   - Agricultural drought will be visualized for all provinces nationwide, generating hydrometeorological information in combination with satellite.
   - The platform will generate visual products (maps, graphics, projections, etc.) both technical and for the general public. This is in order to meet the needs of technical information, decision-making and public information about drought in the country.

c. Training in the use, interpretation and analysis of the information contained in the platform. This training should be differentiated according to profiles: both technicians (satellite images and hydrometeorological information), as well as decision makers (map reading) at the central level and in the provinces at the regional level.

d. User manual and platform functions with its standardized management and maintenance protocol.

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