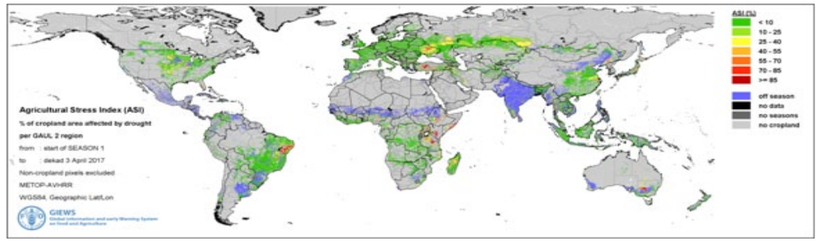
Watching from Space Agricultural Drought Worldwide – using the FAO-ASIS (Agricultural Stress Index System)

Priority for Actions 1, 2 and 4 - Hazard Characterization and Monitoring of Agricultural drought

Figure 1. ASIS shows the agricultural areas with a high likelihood of water stress (red areas) during the third dekad of April 2017.



Application field: FAO has developed ASIS in order to support its global food security monitoring work; by detecting agricultural areas with a high likelihood of water stress (dry-spells and drought), based on Earth observation data and information. The Flemish Institute for Technological Research (VITO) is supporting the scientific and technical development of ASIS, while the Joint Research Centre of European Commission (JRC) and the University of Twente in the Netherlands are members of the steering committee for the development of ASIS.

Methodology and workflow: ASIS is based on the Vegetation Health Index (VHI), derived from NDVI and developed by Kogan (1997). VHI can detect drought conditions at any time of the year. For agriculture, however, we are only interested in the period most sensitive for crop growth (temporal integration), so the analysis is only performed between the start (SOS) and end (EOS) of the crop season and restricted to crop areas. ASIS assess the severity (intensity, duration and spatial extent) of the agricultural drought, and express the final results at an administrative level, given the possibility to compare it with the agricultural statistics of the country (Figure 2).

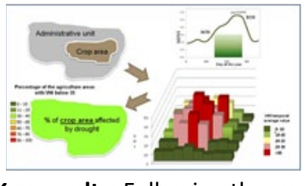


Figure 2. The first step on ASIS is to determine a temporal average of the VHI; assessing the intensity and duration of the dry period(s) incurred during the crop cycle at pixel level. The second step would involve calculating the percentage of agricultural area affected by drought (pixels with VHI<35), as a way of assessing the extent of the drought. Finally, the whole administrative area would be classified according to the percentage area affected.

Key results: Following the successful completion of the global system http://www.fao.org/climatechange/asis/en/, the team is now concentrating on the development of a standalone ASIS to support regional and national early warning systems. In the standalone version, adapting analysis parameters to each region or country´s specific agricultural conditions will allow for more accurate results to be yielded. The final index could be used as a trigger for activating drought mitigation activities in countries, or for the implementation of index-based crop insurance.

Innovative impact: Availability, simplicity, free of charge data, good research literature and citation, and minimum requirements of inputs, are deemed to be the main criteria. Sustainability (will be) guaranteed by the automatization of the analysis.

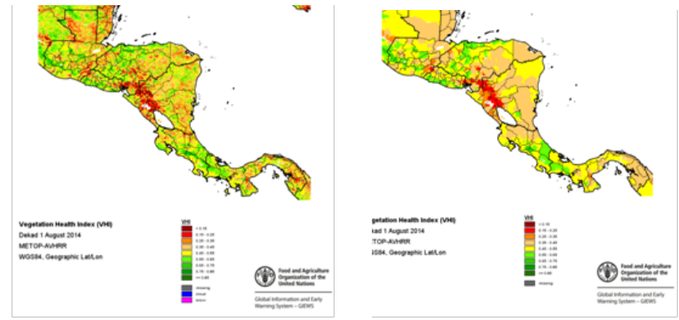
GP-STAR Factsheet

Global Partnership using Space-based technology applications for disaster risk reduction – GP-STAR

Country-Level ASIS (Fully operational) Calibration and National Adaptation

Application status: Country-Level ASIS has been implemented at Regional Level in Central America and at Country-level in: Mexico, Nicaragua, Panama, Bolivia, Chile, Paraguay, Vietnam, Pakistan and the Philippines.

Area of application: Regional or National level ASIS calibrated with local information.



Background: The Agricultural Stress Index System (ASIS) is based on 10-day (dekadal) satellite data, of vegetation and land surface temperatures, from the METOP-AVHRR sensor at 1 km resolution. Data for Country-level ASIS is freely available for download from FAO FTP. Time Series Database from 1984.

Key publications:

ROJAS, O. VRIELING, A. and REMBOLD, F. 2011. Assessing drought probability for agricultural areas in Africa with remote sensing. Remote Sensing of Environment 115 (2011) 343-352 pp.
REMBOLD, F., ATZBERGER, C., SAVIN, I. and ROJAS, O. 2013. Using Low Resolution Satellite Imagery for Yield Prediction and Yield Anomaly Detection. Remote Sensing ISSN 2072-4292 www.mdpi.com/journal/remotesensing. Remote Sensing 2013, 5, 1704-1733; doi: 10.3390/rs5041704.
ROJAS, O. and AHMED, S. 2013. Feasibility of using the FAO Agricultural stress index system (ASIS) as a remote sensing-based index for crop insurance. In: The challenges of index-based insurance for food security in developing countries. Ed. Rene Gommes and Francois Kayitakire, European Commission, Joint Research Centre. 246-253 pp.
ROJAS, O., LI, Y. and CUMANI, R. 2014. Understanding the drought impact of El Niño on the global agricultural areas: An assessment using FAO's Agricultural Stress Index (ASI). Environmental and Natural Resources Management Series No. 22, FAO. 42 p. http://www.fao.org/3/a-i4251e.pdf
VAN HOOLST, R., EERENS, H., HAESEN, D., ROYER, A., BYDEKERKE, L., ROJAS, O., LI, Y. & RACIONZER, P. (2016) FAO's AVHRR-based Agricultural Stress Index System (ASIS) for global drought monitoring, International Journal of Remote Sensing, 37:2, 418-439, DOI: 10.1080/01431161.2015.1126378

http://www.fao.org/giews/earthobservation/

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