Africa RiskView Online
Climate and Disaster Risk Solutions

Africa RiskView online is the web-based version of the _Africa RiskView_ software platform that aims to quantify and monitor weather-related food security risk in Africa. To date it focuses on drought, but inclusion of other weather risks is planned.

Africa RiskView translates satellite-based rainfall information into near real-time impacts of drought on agricultural production and grazing. By overlaying this data with vulnerability information, the software produces a first order estimation of the drought-affected population and, in turn response cost estimates. Through this process, *Africa RiskView* combines four well-established disciplines: crop monitoring and early warning; vulnerability assessment and mapping; humanitarian operational response; and, financial planning and risk management.

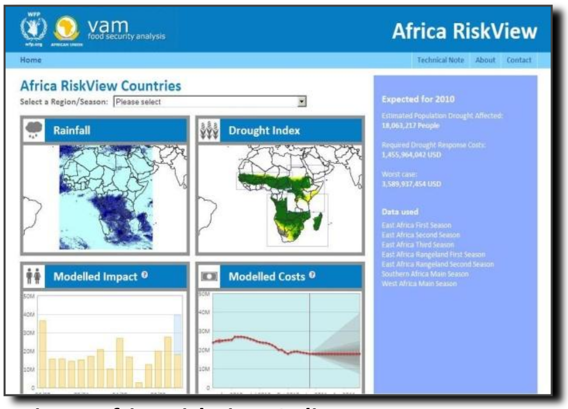

Fig.1: Africa RiskView Online – Homepage

Africa RiskView interprets different types of weather data and remote sensing products such as rainfall estimates and information about crops, soils and cropping calendars. Rainfall data are updated every ten days and fed into the software for each of the 261,135 satellite pixels (or squares of about 10 km^2 near the equator) covering Africa, and together with the other information can be converted into meaningful indicators for agricultural production and for vulnerable populations dependent on rainfall for crops and rangeland.

Africa RiskView allows users to see how the rainfall season is evolving in the countries or regions of interest, observe weather impacts on agriculture and rangelands and estimate how many people could potentially be affected and in need of food assistance as a result. This information could help to target early food security assessments in specific geographic areas. Studying historical data can help with contingency planning and emergency preparedness for future shocks in the country. *Africa RiskView* might also be helpful in guiding planning and investment decisions aiming to enhance agricultural productivity or market development as outputs contain valuable information as to the spatial distribution of weather risk for crop production and the areas most suited for crop production. It could also be used as a model for establishing contingency financing for extreme drought-related emergencies on a parametric basis. *Africa RiskView* incorporates data for drought hazard monitoring and analysis, e.g. rainfall data, WRSI, as well as vulnerability data, for 32 countries at present (see Fig.2). Users can choose between different regions and seasons (agricultural or pastoral):

<u>East Africa:</u>
1st Agricultural Season (1 Feb - 20 Jul)
2nd Agricultural Season (1 Apr – 31 Oct)
3rd Agricultural Season (1 Sep – 30 Apr)
Rangeland

<u>Southern Africa:</u>
Main Agricultural Season (1 Oct – 31 May)

<u>Western Africa:</u>
Agricultural Season (1 Apr - 31 Oct)
Rangeland

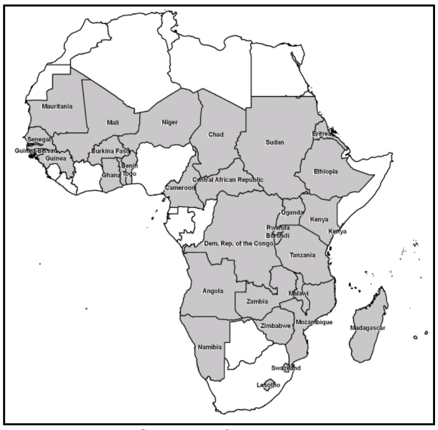

Fig.2: Africa RiskView coverage

***Please Note:** All Africa RiskView products on www.africariskview.org are a work in progress, subject to change at any time and shown for illustration only. They are confidential to registered users of www.africariskview.org and are not to be shared further. WFP makes no representation or warranty of any kind, whether express, implied or statutory, as to the accuracy or fitness for a particular purpose of the products and information contained within www.africariskview.org. In no event shall WFP be liable with respect to any subject matter presented on www.africariskview.org. Please refer to the licensing agreement available on the site.*

Africa RiskView Online

Design & Products

The *Africa RiskView* Online version similar to the desktop application is designed to enable users to quickly access products concerning weather related food security risks for the areas in which they are interested. The user selects her or his region/season of interest and then accesses the products of the successive steps in the analytical process chain (Rainfall > Drought Index > Modelled Impact > Modelled Costs). The *Africa RiskView* analytical layers are presented on the main page of the online version in a dashboard approach providing already a sneak preview of key analytical outputs. A brief overview of selected products follows.

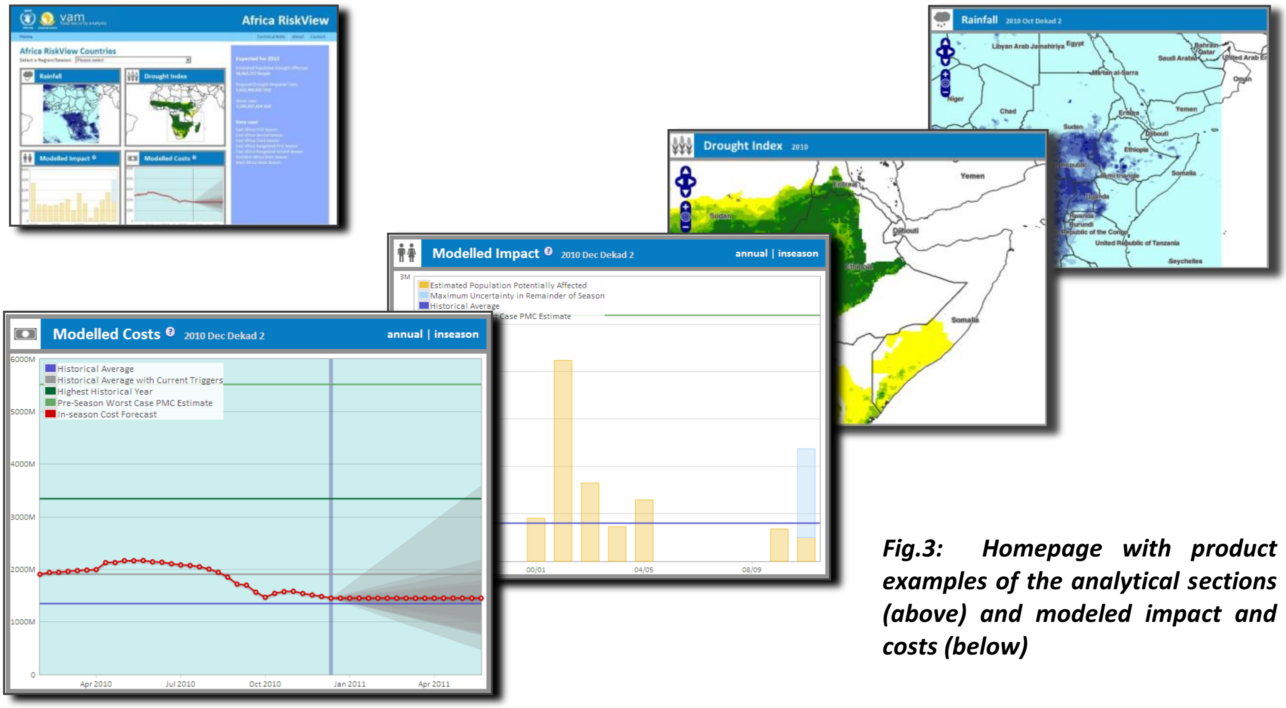

Fig.3: Homepage with product examples of the analytical sections (above) and modeled impact and costs (below)

Key information about the modelled impact of drought and modelled drought response costs, including worst case scenario cost estimates, is provided based on the geographic area selected.

Africa RiskView Products

After understanding how weather will affect food crops and pasture for livestock grazing, the next step is to define how these weather hazards interact with people vulnerable to food insecurity in order to convert information about the magnitude and spatial extent of weather shocks into an estimate of the number of people potentially affected by these shocks.

Africa RiskView does this by considering how peoples' income-generating activities are affected by weather to develop a standardized approach for estimating food insecurity related to weather hazards across the continent, in particular drought. WFP houses a repository of data, such as the Comprehensive Food Security and Vulnerability Analysis (CFSVA) surveys, historical operations data, population and vulnerability studies that contain information to inform, cross-check and refine this approach and the data used. Information about national capacities to respond to shocks and current costs of additional resources allow users to estimate response costs in today's dollar terms. *Africa RiskView* aggregates these costs over countries, providing decision-makers with expected and probable maximum costs of weather-related responses before an agricultural season begins and in near real time as the season progresses for all countries in sub-Saharan Africa in which WFP has a presence. The products that can be viewed online reflect the default model settings of the desktop version of *Africa RiskView*. These online products will automatically update as this model and default settings are refined and improved moving forward.

In the rainfall analysis section, the user can choose between three different products. Actual rainfall can be viewed on a dekadal (10-day) basis as well as normal rainfall and the deviation of the currently viewed rainfall from the average. Standard zoom in and out as well as pan functionalities enable the user to explore the imagery for a geographic area of interest more in detail and information about rainfall values can be obtained for each 10 x 10 km pixel through simple mouse clicks on pixels of interest which are then displayed in the legend information box located on the right side of the image.

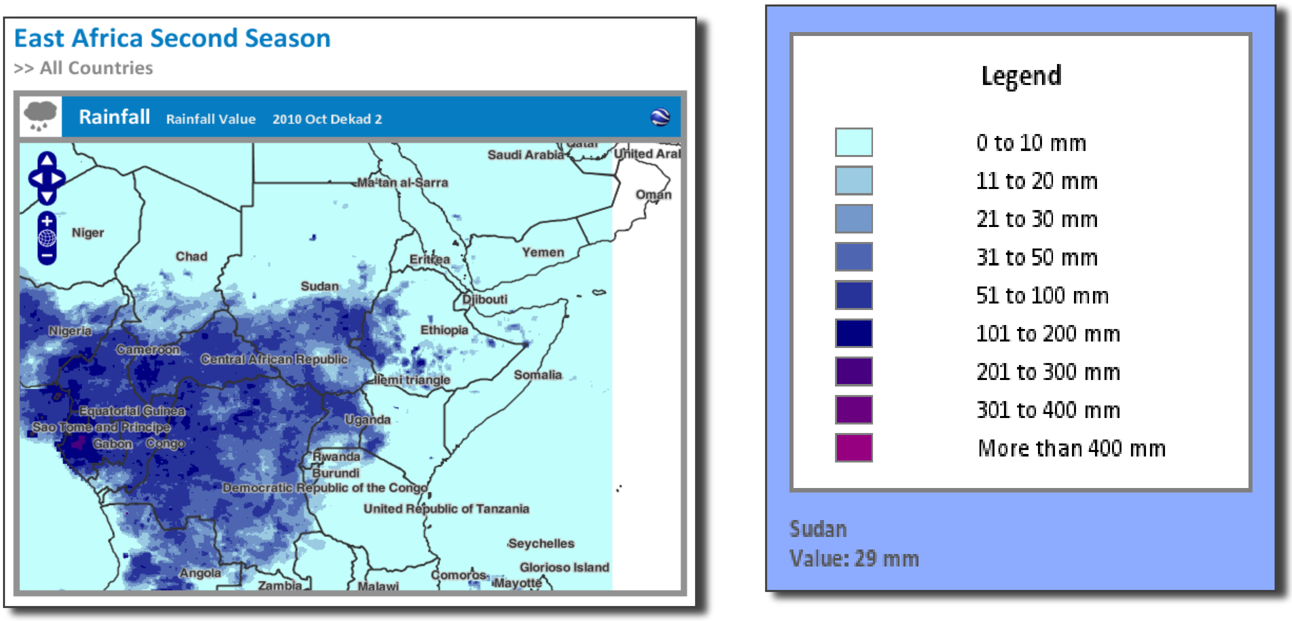

Fig.4: East Africa – Actual Rainfall for October Dekad 2 and the legend and rainfall value information display

Switching between years, months, dekads and rainfall products of interest is made easy through the clear design of the "Navigation" bar. In order to view, at pixel level, where the selected dekadal rainfall is below or above average as well as the extent of the deviation the user clicks on the "Navigation" bar on the **<<Difference>>** button.

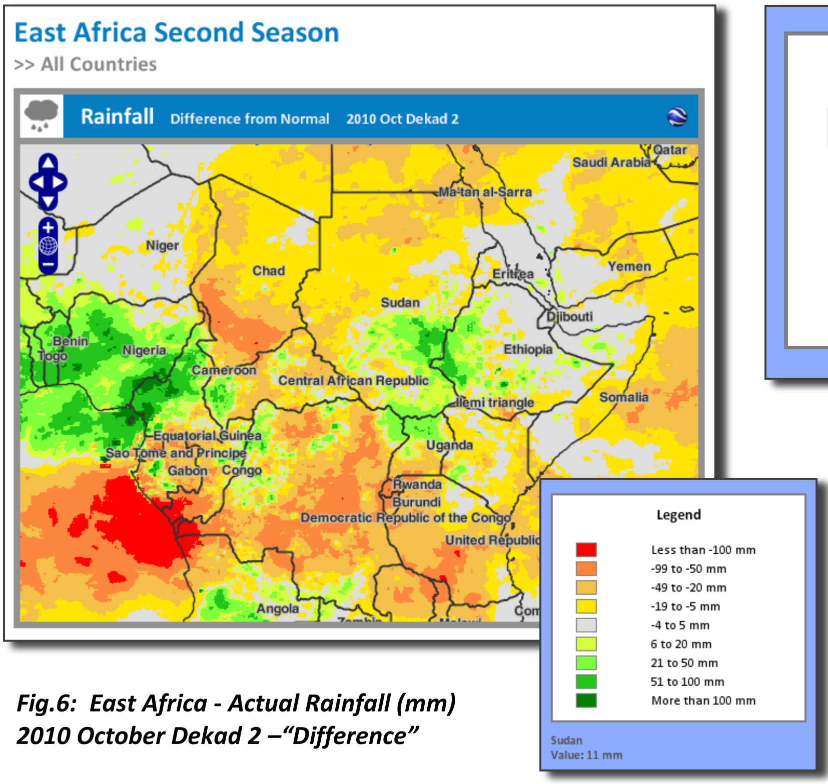

Fig.6: East Africa - Actual Rainfall (mm) 2010 October Dekad 2 –"Difference"

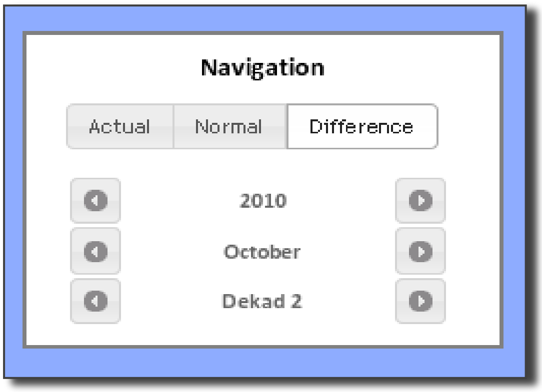

Fig.5: Africa RiskView Online – Imagery navigation bar

In keeping with the project's philosophy of building on proven technologies, *Africa RiskView* uses the ***Water Requirement Satisfaction Index (WRSI)*** for rain-fed crop and rangeland drought analysis. Measuring total rainfall at the end of a season has proven to be too crude an indicator of potential impact of rainfall deficits on production and therefore on livelihoods.

WRSI is a simple water balance model developed by the Food and Agriculture Organization (FAO), which compares the amount of water available throughout the season to how much a plant needs in its different stages of growth and has been shown to relate better to crop yields. Using this simple and transparent crop model, *Africa RiskView* estimates water available to crops (rainfall minus water lost by soil evaporation and plant transpiration) and compares it to how much the plant needs on a dekad by dekad basis. The output of this water balance calculation is the Water Requirement Satisfaction Index (WRSI) for rain-fed crops and rangeland.

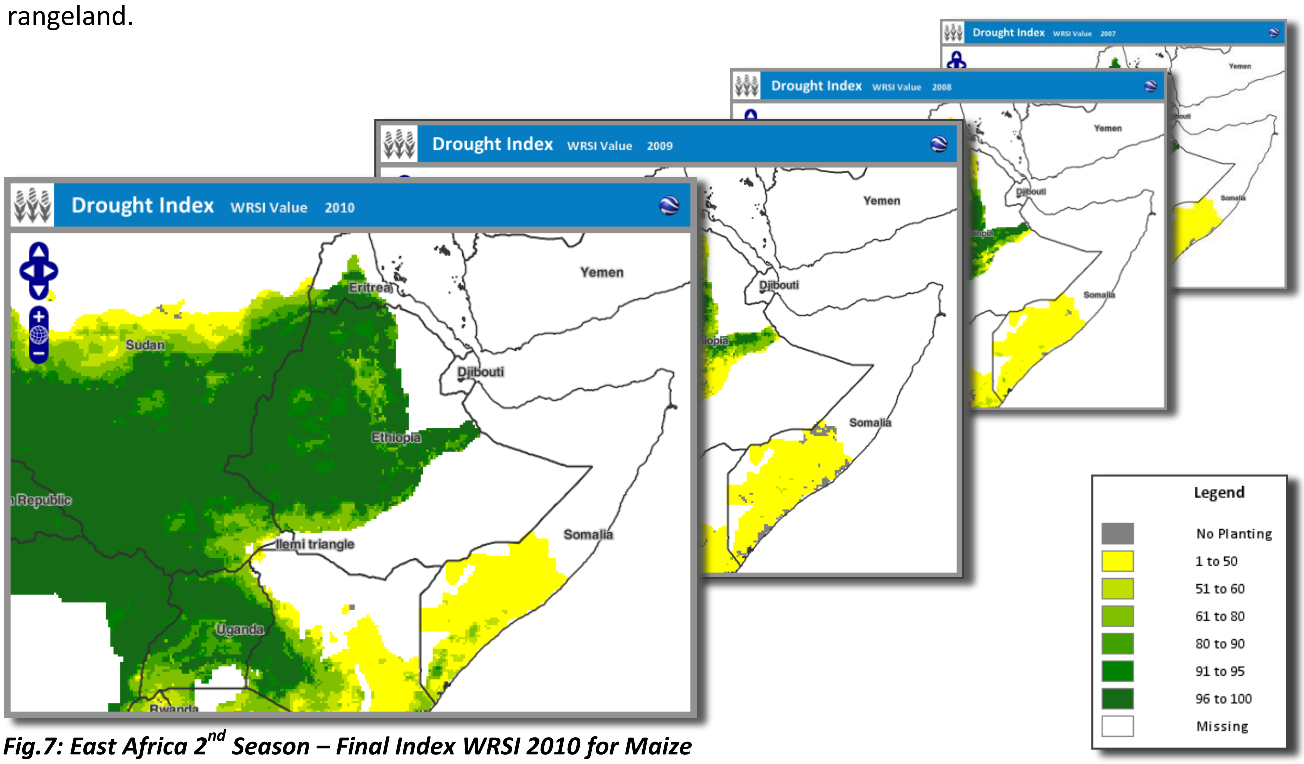

Fig.7: East Africa 2nd Season – Final Index WRSI 2010 for Maize

More specifically, WRSI is defined as the ratio of seasonal actual evapotranspiration experienced by a crop to the crop's seasonal water requirement. FEWSNET, the Joint Research Centre of the European Commission (JRC), and FAO all use the same methodology for calculating WRSI and consider the index a meaningful indicator of how a shortage of rainfall may impact crop yields and the availability of pasture by monitoring water deficits throughout the growing season, capturing the impact of timing, amount and distribution of rainfall. *Africa RiskView* uses FAO's algorithm and FEWSNET's model parameters to calculate WRSI.

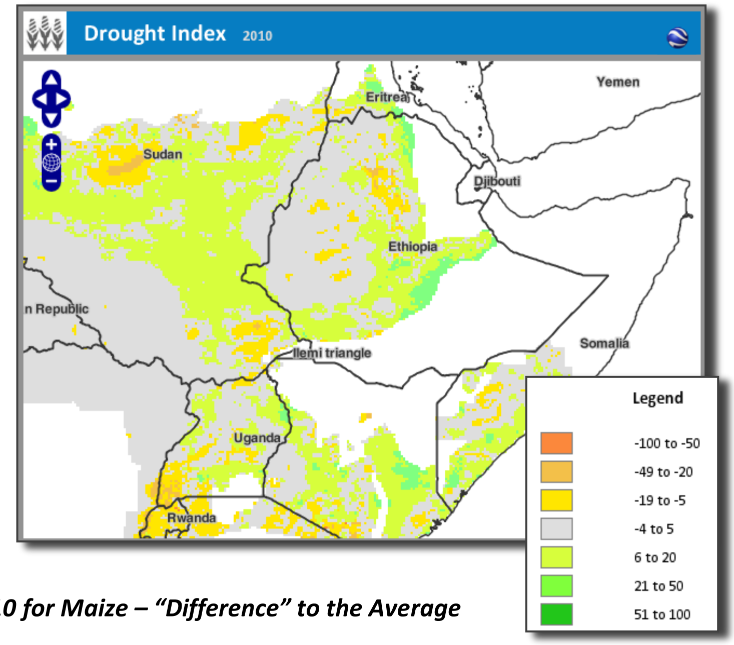

Fig.8: East Africa 2nd Season – Final Index WRSI 2010 for Maize – "Difference" to the Average

As in the rainfall analysis section "Difference" images can be generated in *Africa RiskView* in order to compare the WRSI index of the current season with the average of all years from 1995 onwards.

Africa RiskView Online

Imagery Export Functionality - Product Example:

Viewing Imagery In Google Earth

The *Africa RiskView* Online version enables users to view the data in Google Earth and export images such as dekadal rainfall or WRSI images into "kmz" format. This provides the great opportunity to take advantage of the rich datasets provided in Google Earth such as satellite imagery, roads data and place information. As a prerequisite the Google Earth software package has to be installed on the user's machine.

In order to view self selected imagery in Google Earth the user clicks in the rainfall or drought index analysis section on the top right of the "Imagery Viewer" on the **<<Google Earth>>** Icon. In the following opening dialog box the user is given the choice of saving the file in a specified location or viewing the exported data directly in Google Earth. If the latter option is chosen the application is launched and the respective image visualised in Google Earth.

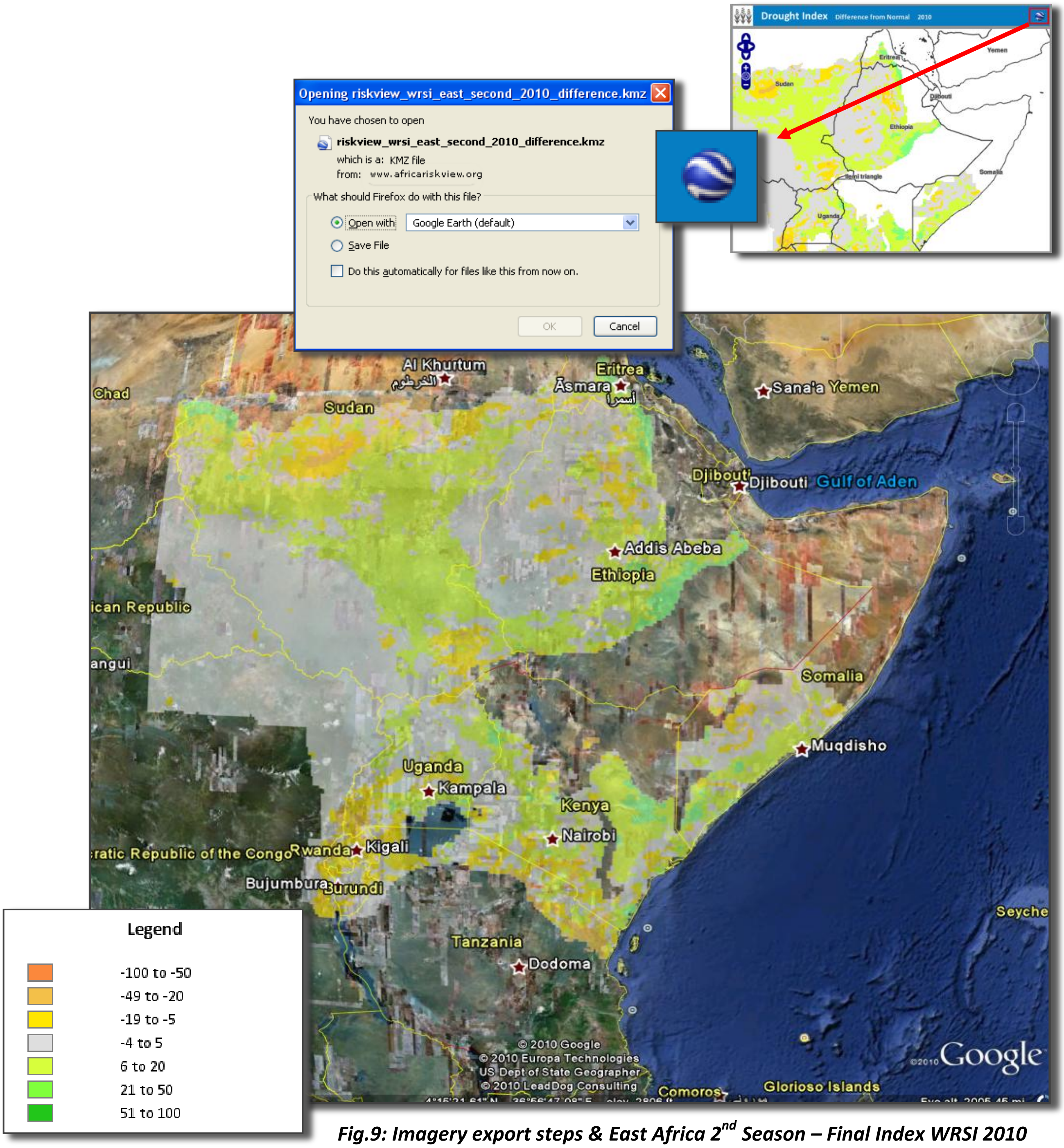

Fig.9: Imagery export steps & East Africa 2nd Season – Final Index WRSI 2010 for Maize – "Difference" to the Average - Image exported from Africa RiskView Online and imported into Google Earth

To model drought impact information generated by the drought index is converted into the number of people potentially affected. This requires an understanding of how drought interacts with people's income-generating activities. The methodology to do so is simple, in line with the current information available and can be applied systematically across sub-Saharan Africa to include all countries where basic economic and household data exists. *Africa RiskView* divides the population within each administrative unit into various drought risk categories determined according to considerations on two dimensions: exposure and resiliency. Exposure to drought risk is defined by the weight of agricultural activities (in terms of production, casual labour and livestock) in the household's total annual income.

Resiliency is measured in terms of a household's distance from the poverty line. Given a drought event of a given magnitude in a particular area (defined through deviations in the drought index in that area) high-level estimates of the people potentially *directly* affected by drought can be generated not only at the end of the rainfall season, but also as the season evolves (as rainfall is reported). Estimates can be generated for each, country, region, season and across all countries using this standardized approach.

WFP has a vast operational response dataset against which triggers and assumptions have been tested to ensure the methodology reflects drought events in the past and with the correct order of magnitude as accurately as possible, taking into account changes in the factors that impact populations and their vulnerability since those events. At the moment the estimated number of people potentially affected by drought correlates at nearly 90% to the actual number of people assisted by WFP due to drought in EMOP and PRRO operations in sub-Saharan Africa from 2000-2008.

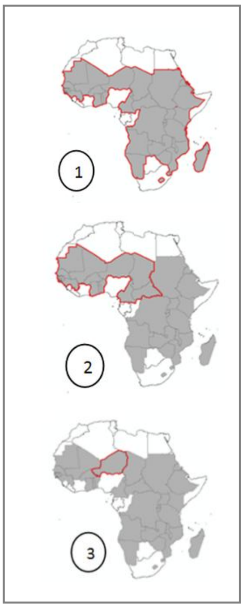

Fig.10: Options for geographical data aggregation: All Countries (1)/Regional (2)/Country (3)

However the model is still a work in progress. It does not correspond well to WFP data in all countries, particularly those that have not had drought-related Emergency Operations in the most recent 10 years or countries with complex emergencies although the recent drought events in the Sahel are captured well.

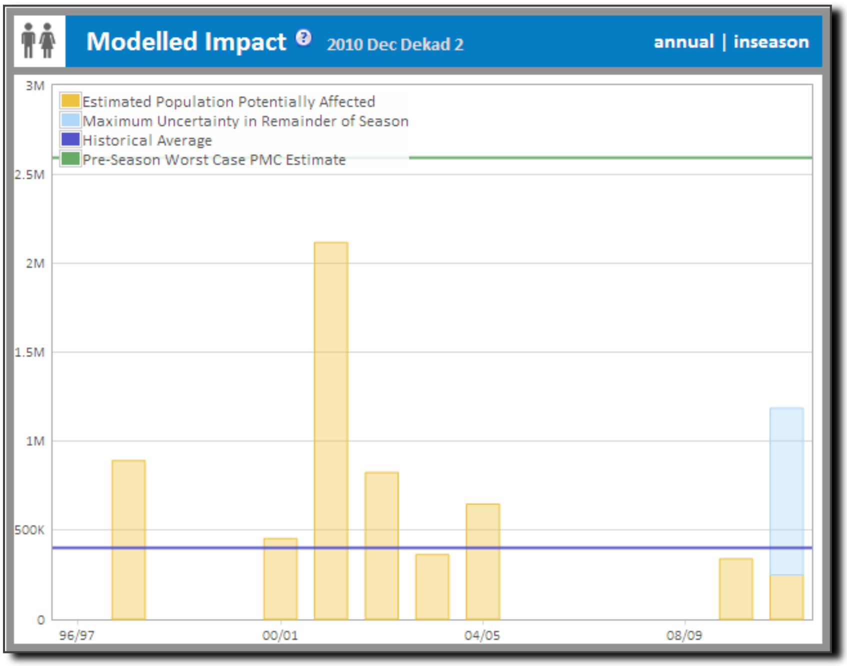

Fig.11: Modelled Impact for Region X / Season X for all years 1996 – 2011

Nevertheless, the model can be refined for those areas and shows promise in many of the countries where WFP is often called upon to assist with a drought response. Using this starting point, the model is fully flexible and can be adapted, refined and strengthened for countries that may wish to use it so that it is customized to suit their needs. The desktop version of *Africa RiskView* allows for this flexibility. The online version will reflect the most current default settings as the underlying model continues to be refined and improved.

Africa RiskView Online

Modelled Costs Analysis Layer - Product Example:

Estimated Response Cost by Country

Based on Modelled Impact data, *Africa RiskView* then estimates the expected and potential (variable) response costs at the continental (sub-Saharan Africa only), regional and country levels, given a selected cost per beneficiary input as defined by the WFP Climate and Disaster Risk Solutions team for the online version. This can be adjusted by the user in the *Africa RiskView* desktop version to reflect the *current* cost of the appropriate food assistance response (e.g. food aid, cash vouchers). So, in addition to estimating people potentially affected, the tool estimates Modelled Costs, i.e. the potential operational costs for a given situation and a given type of response.

Estimated response cost forecasts during the current season can be visualized as shown in the example on the right. The red line indicates the current expected cost estimated for the selected country. This line is calculated by taking the actual rainfall data up to the current date and then finishing the remainder of the season using rainfall data from all the historical years that are available. The last red point represents the average of all these possible future rainfall scenarios.

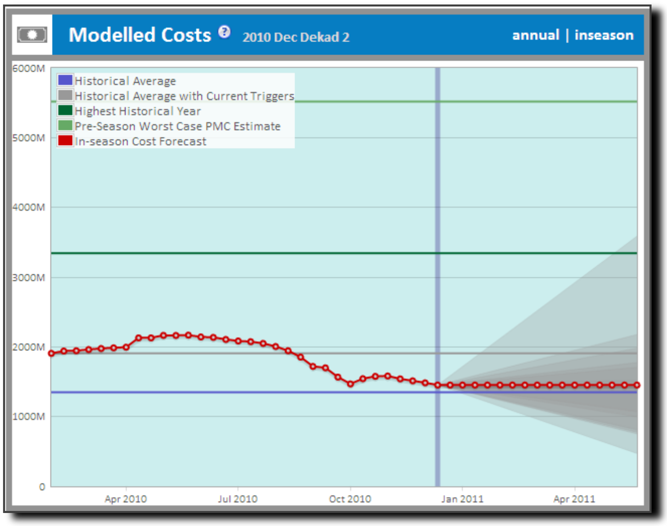

Fig.12: In season cost forecast for Sub-Saharan Africa, All Seasons & Regions 2010/2011

Based on historical RFE data, various estimates of future costs from the present dekad onward are also shown through the various thin grey lines, which produce a "cone of uncertainty" around the current expected cost estimate. This allows users to see how the remainder of the season or the year could evolve and the uncertainty in the expected cost estimate. Seasonal forecasts will be incorporated into *Africa RiskView* to adjust these cones given the information the forecasts contain. The value represented by the highest grey line, with the largest cost value, is reflected by the light blue bar in the annual charts. To put the current year in context, the average (thick grey line) and worst case scenario costs estimate (light green line) made at the beginning of the year/season (estimated from the historical data) are shown. When the rainfall season is finished there is no more uncertainty as to what happened (and therefore no longer any grey lines emanating from the last red point).

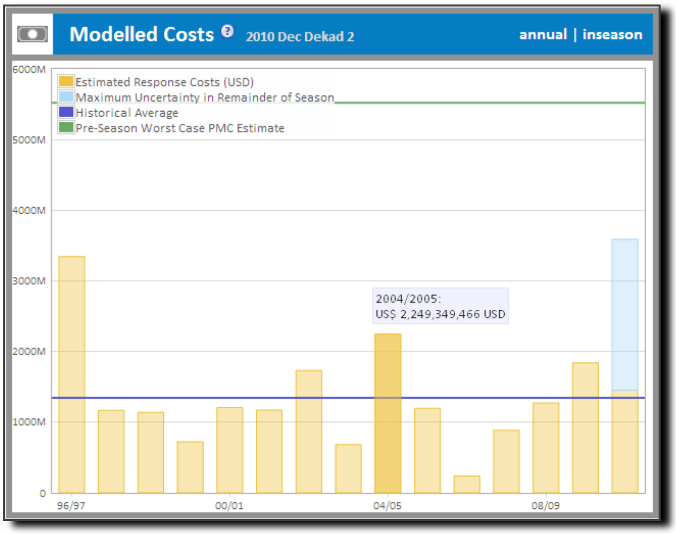

Fig.13: Annual estimated response costs for Sub-Saharan Africa, All Seasons & Regions 2010/2011

Another product example as shown in the graphic at the lower right side of the page are annual graphs of estimated response costs per country incorporating data of all seasons and years, not only to illustrate the evolution of the current year's costs, but also to contextualize it in the historical time-series.

Africa RiskView Support Team:

Please feel free to contact us with any comments or for help on help on how to use the software.

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