Linking Research to Practice: FEWS NET and its use of satellite remote sensing data

Molly E. Brown, PhD
NASA Goddard Space Flight Center
Greenbelt, Maryland, USA
Molly.Brown@nasa.gov

Elizabeth B. Brickley
Environment, Society and Development
Emmanuel College, University of Cambridge, UK
eb484@cam.ac.uk

FEWS NET
FAMINE EARLY WARNING SYSTEMS NETWORK

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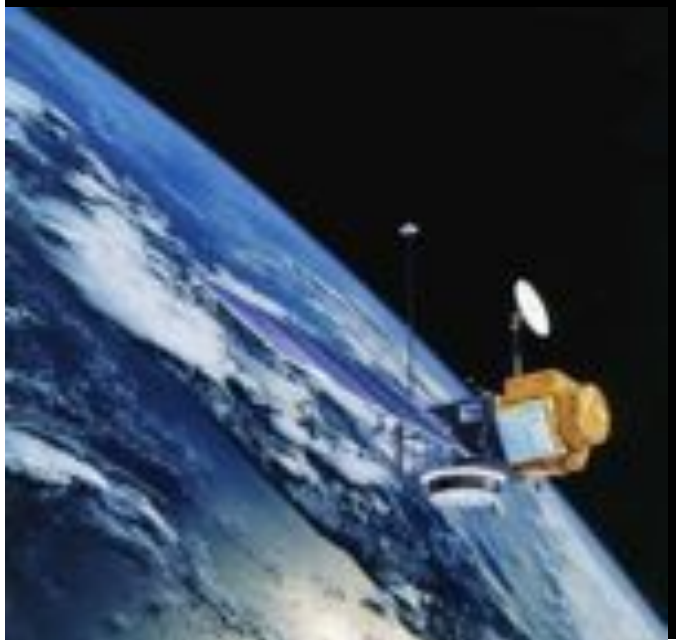
Content

- History of FEWS NET
- Challenges of forecasting food insecurity
- Use of remote sensing data in food security assessments



Fiveprime.org
http://www.digitaltrends.com/lifestyle/england-testing-satellites-to-catch-speeders/

Famine Early Warning Systems Network

FEWS NET

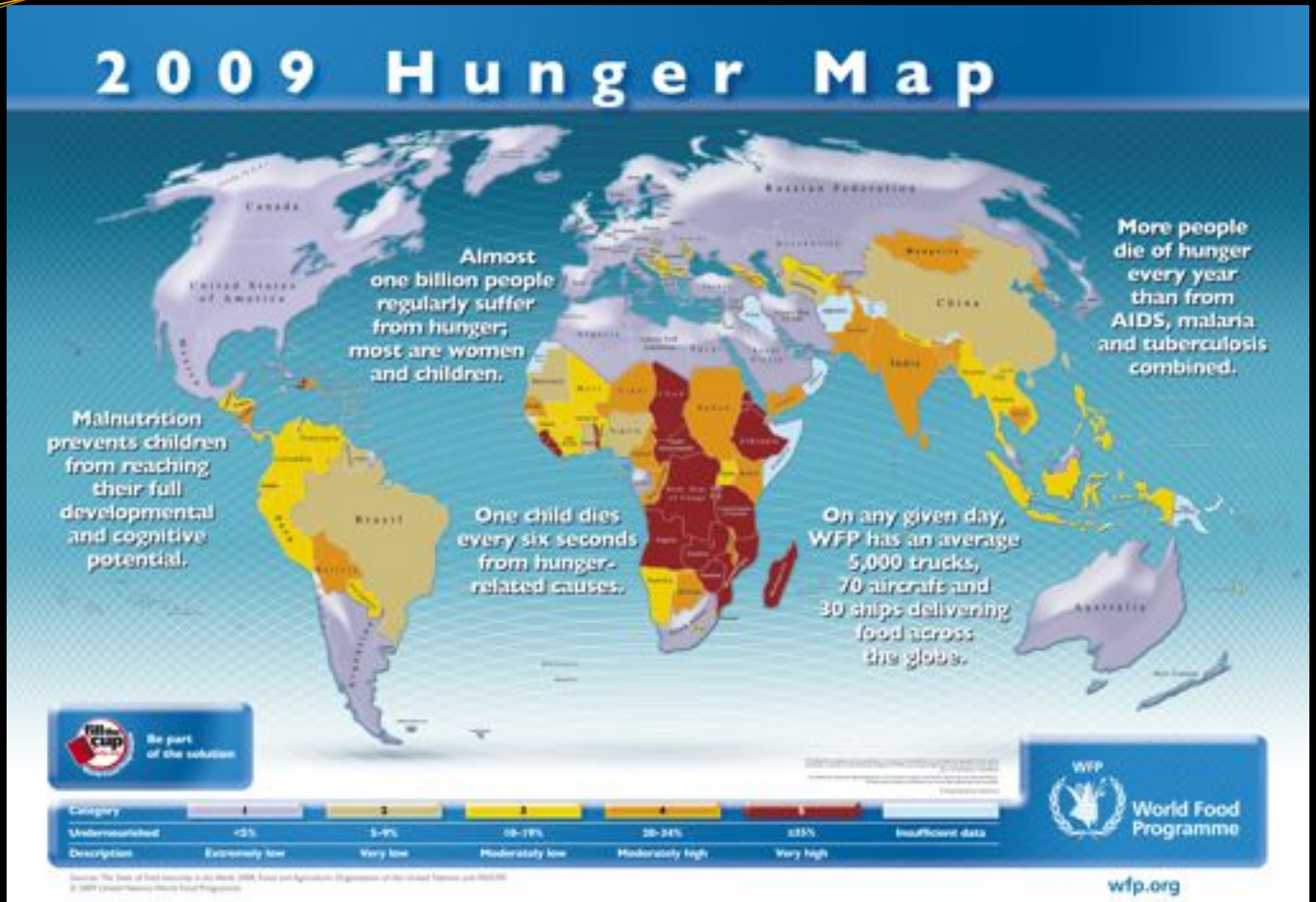
The Purpose:

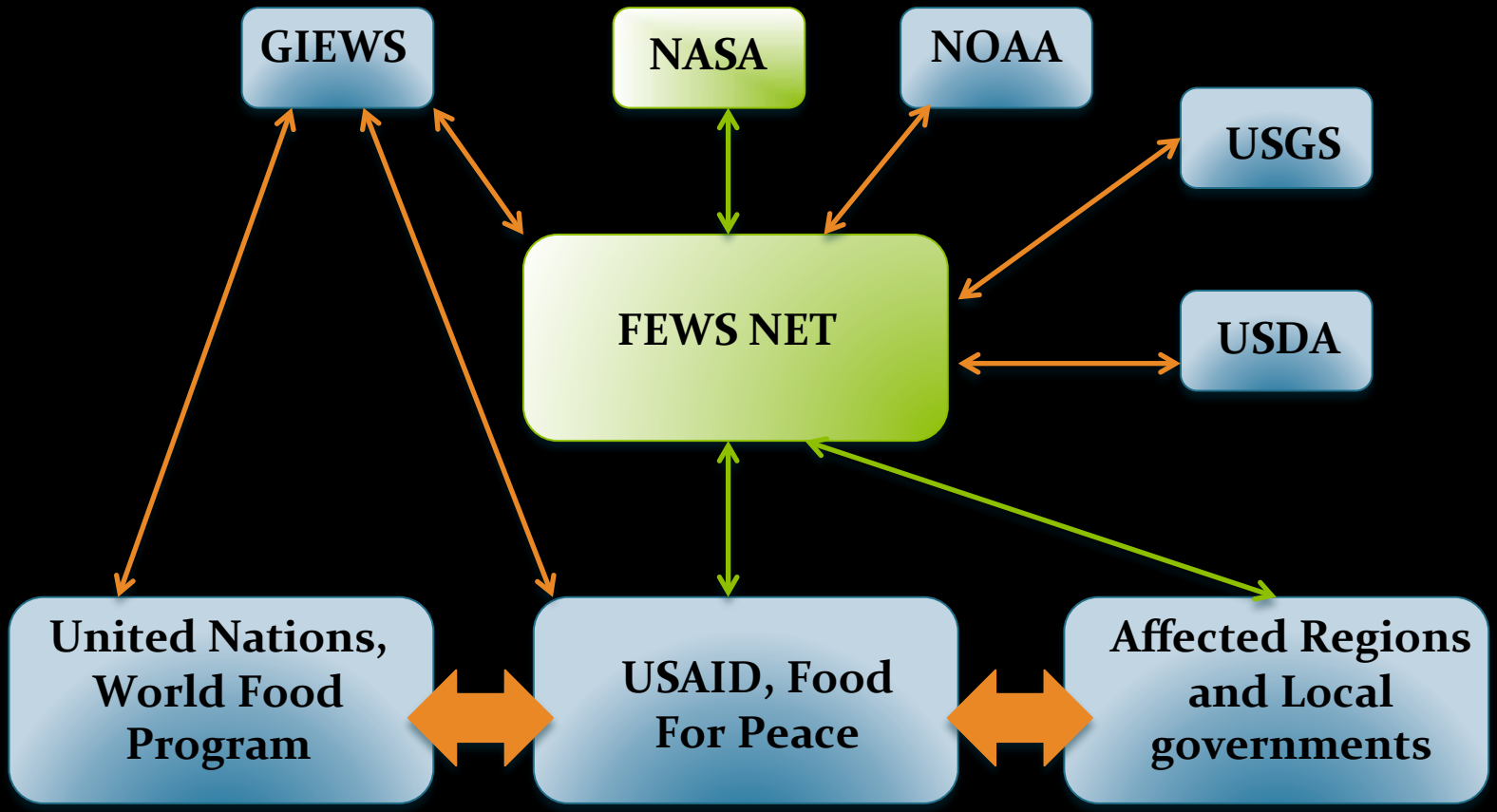
To collaborate "with international, regional and national partners to provide timely and rigorous early warning and vulnerability information on emerging and evolving food security issues."

The Challenge:

How do you predict food security crises and generate policy-useful assessments?

www.fews.net

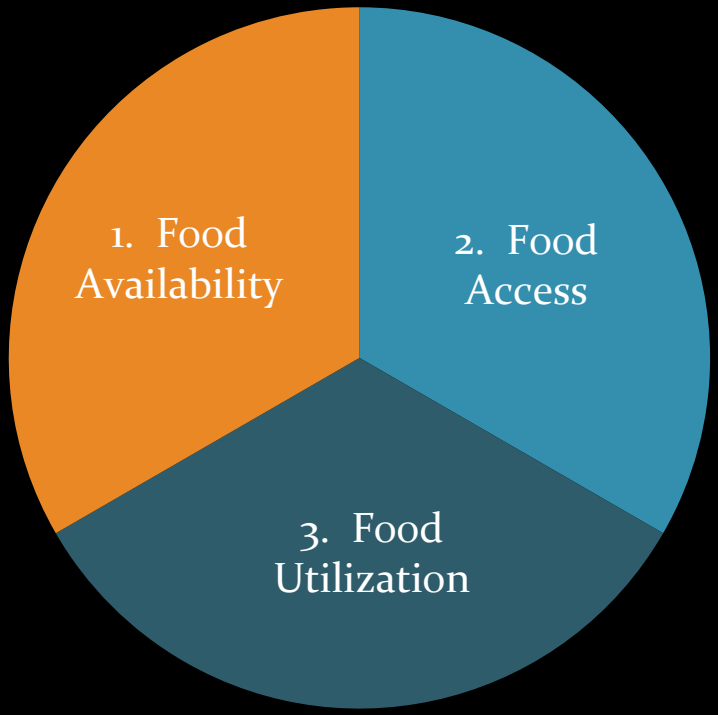

2009 Hunger Map
Almost one billion people regularly suffer from hunger; most are women and children.
More people die of hunger every year than from AIDS, malaria and tuberculosis combined.
Malnutrition prevents children from reaching their full developmental and cognitive potential.
One child dies every six seconds from hunger-related causes.
On any given day, WFP has an average 5,000 trucks, 70 aircraft and 30 ships delivering food across the globe.
Be part of the solution
Category
Undernourished
Description
Extremely low
Very low
Moderately low
Moderately high
Very high
Insufficient data
WFP
World Food Programme
wfp.org



Context of FEWS NET

Challenges of Food Security

Three Domains



- Food Availability: Regional agricultural production.
  - Satellite-derived remote sensing data
- Food Access: Ability to engage fully in local markets.
  - Field analysis of market conditions
- Food Utilization: Individual ability to biologically utilize nutrients.

Adapted from Gary Eilerts, 2010

Assessing Food Security: "A Convergence of Evidence"

- Biophysical factors
  - Rainfall
  - Vegetation and Production Indices
  - Seasonal and Climate Change
  - Pests
- Socioeconomic and livelihood context
  - Terms of trade, Prices
  - Disease, Malnourishment
  - Civil Insecurity, Refugees
  - Food Access

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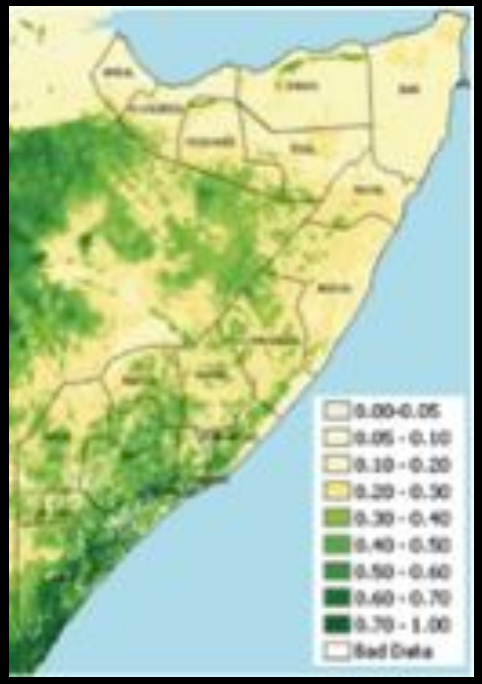
NDVI



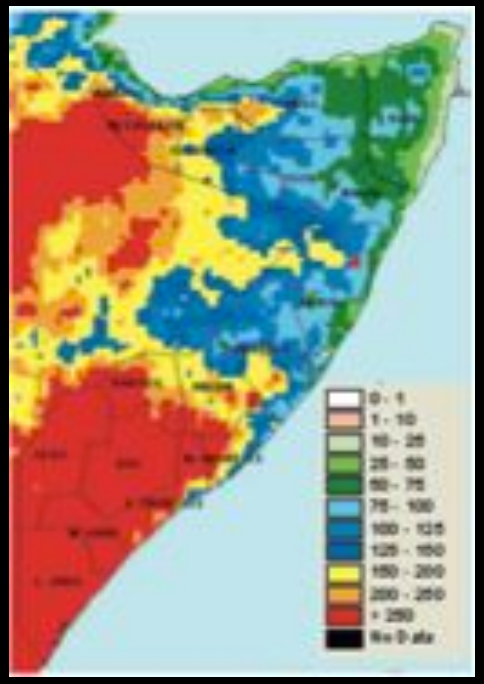
Somalia, July 2010

Normalized Difference Vegetation Index (NDVI)

- Greenness Maps: Indicator of the amount and vigor of vegetation.
- Primarily studied for year-to-year anomalies in 8km x 8km pixels.
- Calculated using the spectral reflectance in the near infrared and red wavelengths measured by the AVHRR sensor.

$$NDVI = \frac{(NIR-RED)}{NIR+RED}$$

RFE



Somalia, July 2010

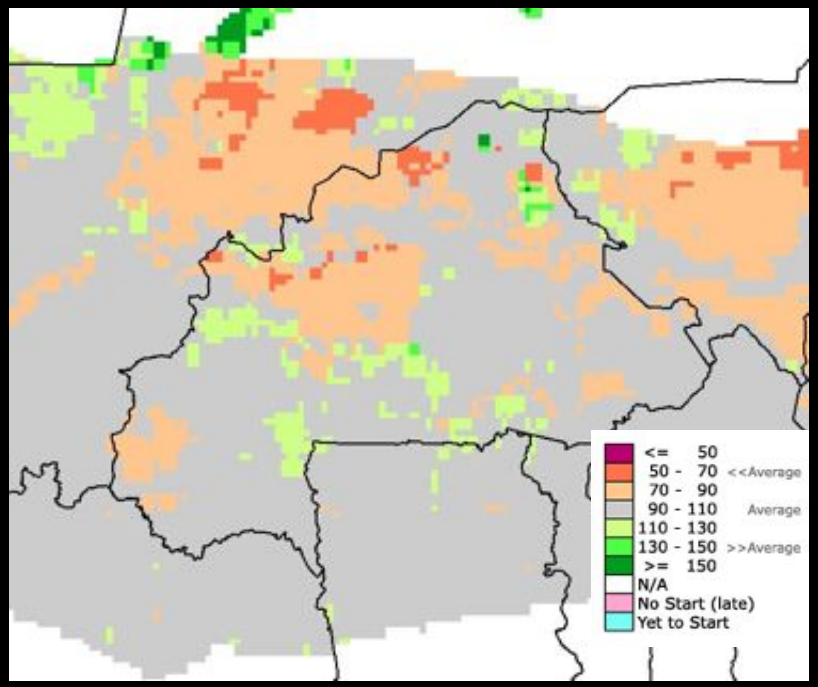
Rainfall Estimation

- Automated product that incorporates Meteosat infrared data, rain gauge data, and microwave satellite observations.
- Primarily studied for year-to-year anomalies in 10km x 10km pixels for 10 day intervals.
- Source information for WRSI and other derivative indices.

WRSI

Water Requirement Satisfaction Index (WRSI)

- Incorporates rainfall estimates from the current growing season and the seasonally and crop specific evapotranspiration rates to forecast a spatially specific projected crop yield at the end of the season.
- 10km x 10km pixels for 10 day intervals.



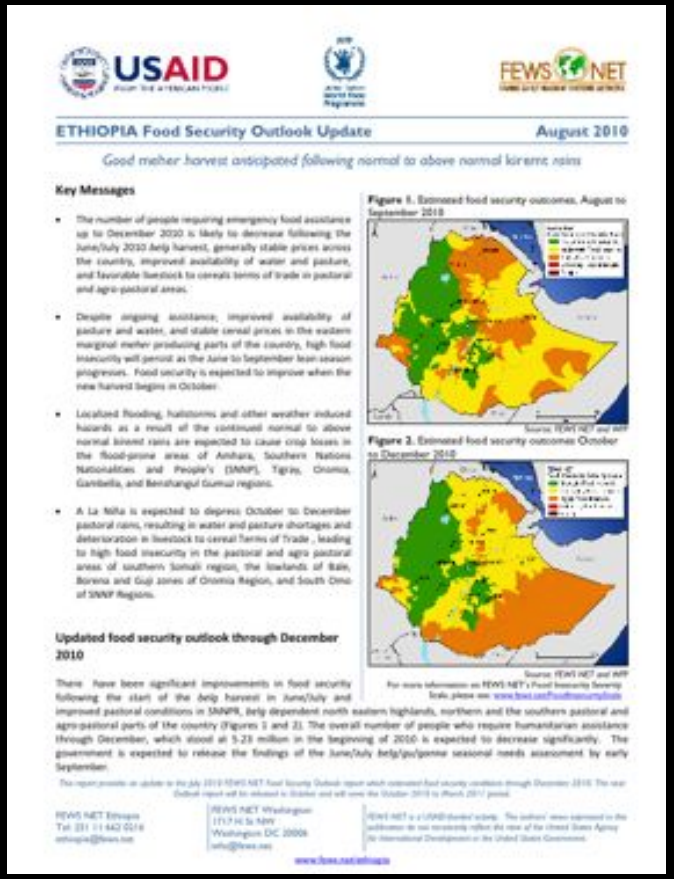
Burkina Faso, October 11-20, 2010

What are the types and the timing of knowledge communicated to policy makers in Famine Early Warning Assessments?

Brown, ME and EB Brickley. (2010) The Use of Environmental and Socioeconomic Indicators of Food Security in Early Warning Assessments. Submitted to *Environmental Research Letters*.

Additional Questions

- How do food security analysts use remote sensing data in Sub-Saharan Africa?
- Are there regional distinctions in data usage?
- Does the data usage respond to seasonal environmental change?
- Does the data usage respond to changes in agricultural productivity?



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ETHIOPIA Food Security Outlook Update **August 2010**

Good meher harvest anticipated following normal to above normal kiremt rains

Key Messages

- The number of people requiring emergency food assistance up to December 2010 is likely to decrease following the June/July 2010 belg harvest, generally stable prices across the country, improved availability of water and pasture, and favorable livestock to cereals terms of trade in pastoral and agro-pastoral areas.
- Despite ongoing assistance, improved availability of pasture and water, and stable cereal prices in the eastern marginal meher producing parts of the country, high food insecurity will persist as the June to September lean season progresses. Food security is expected to improve when the new harvest begins in October.
- Localized flooding, hailstorms and other weather induced hazards as a result of the continued normal to above normal kiremt rains are expected to cause crop losses in the flood-prone areas of Amhara, Southern Nations Nationalities and People's (SNNP), Tigray, Oromia, Gambella, and Benishangul Gumuz regions.
- A La Niña is expected to depress October to December pastoral rains, resulting in water and pasture shortages and deterioration in livestock to cereal Terms of Trade , leading to high food insecurity in the pastoral and agro pastoral areas of southern Somali region, the lowlands of Bale, Borena and Guji zones of Oromia Region, and South Omo of SNNP Regions.

Figure 1. Estimated food security outcomes, August to September 2010

Figure 2. Estimated food security outcomes October to December 2010

Updated food security outlook through December 2010

There have been significant improvements in food security following the start of the belg harvest in June/July and improved pastoral conditions in SNNPR, belg dependent north eastern highlands, northern and the southern pastoral and agro-pastoral parts of the country (Figures 1 and 2). The overall number of people who require humanitarian assistance through December, which stood at 5.23 million in the beginning of 2010 is expected to decrease significantly. The government is expected to release the findings of the June/July belg/gu/genna seasonal needs assessment by early September.

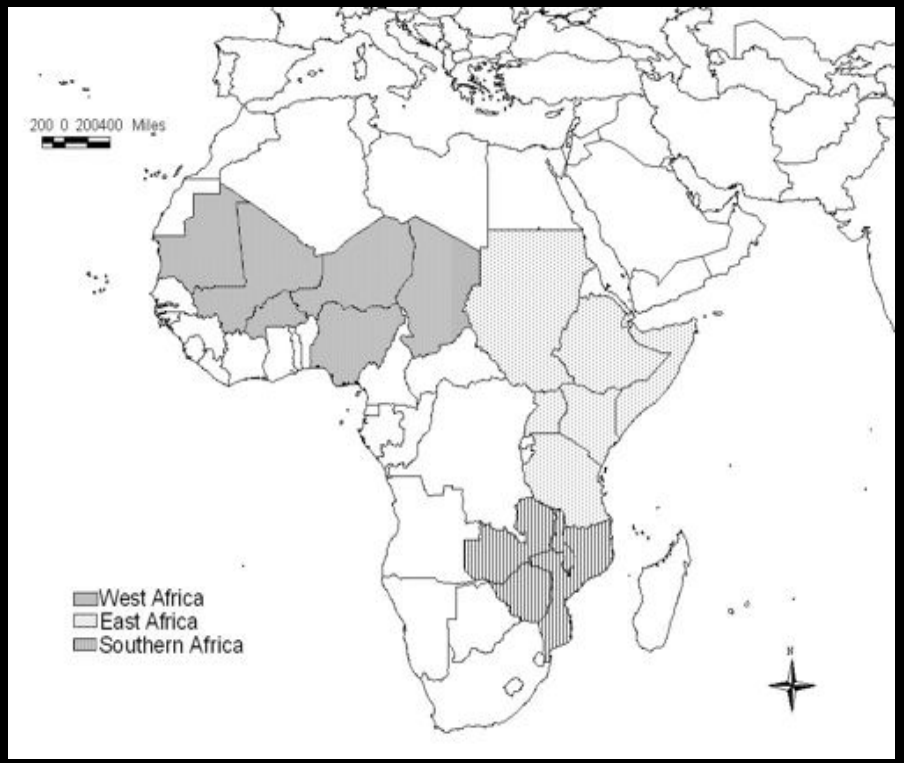
fews.net

Domain of Analysis

Textual Analysis of 72 types of data inputs in 1342 Food Security Assessment Reports

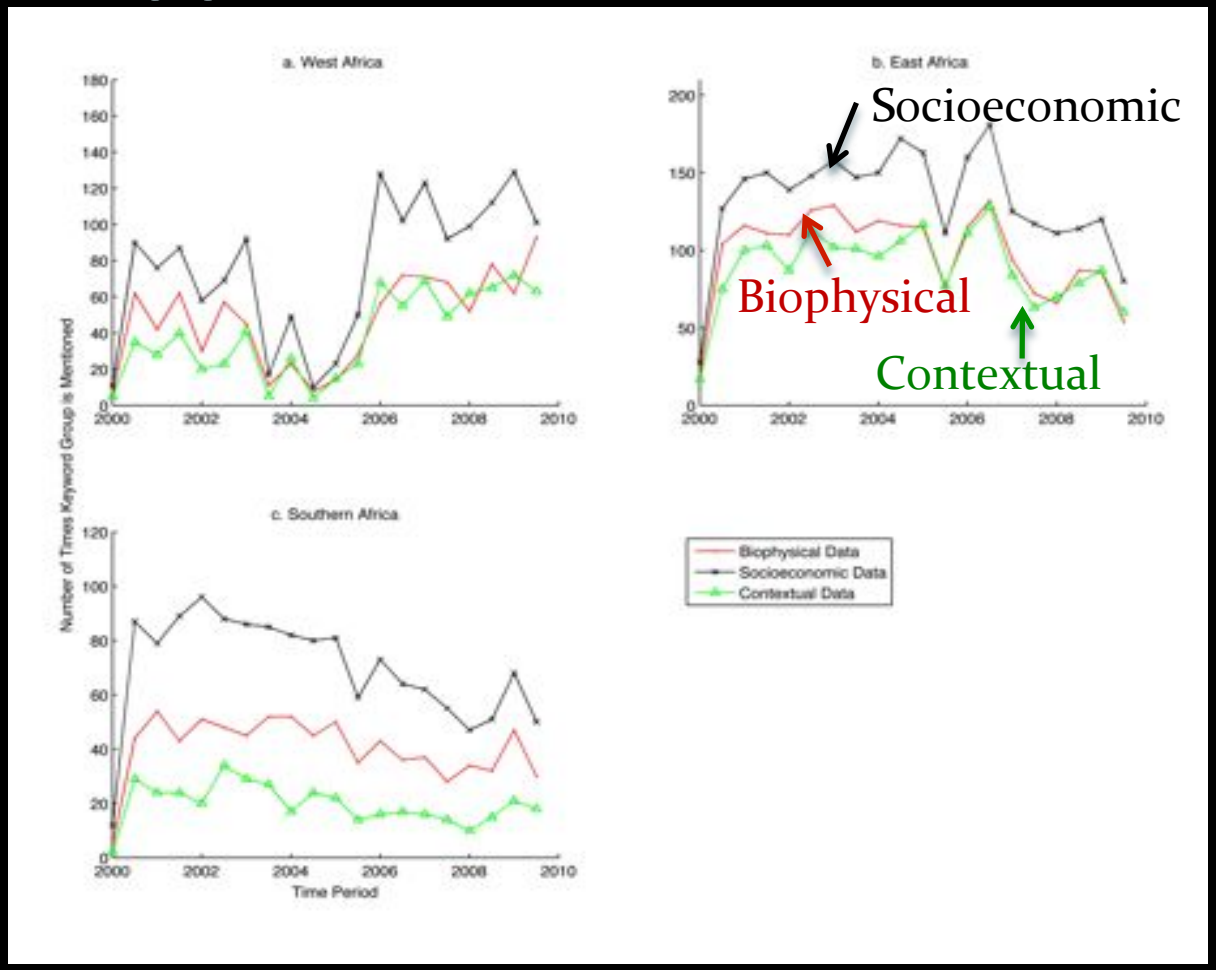
- Spatially: 3 regions, 17 countries
- Temporally: 10 years, 2000-2009
- Seasonally: Growing vs. Dry
- By Production: Good vs. Bad Yield Years

	West Africa	East Africa	Southern Africa
NDVI	36%	46%	3%
RFE	74%	99%	81%
WRSI	17%	10%	6%
Rainfall	100%	100%	100%
Livestock	96%	98%	55%
Production	100%	100%	100%
Pests	37%	16%	14%
Prices	100%	99%	99%
Food Access	88%	91%	89%
Terms of Trade	66%	45%	26%
Civil Insecurity	23%	61%	2%
Disease	63%	85%	53%
Refugee	60%	65%	3%
Malnourishment	43%	64%	32%



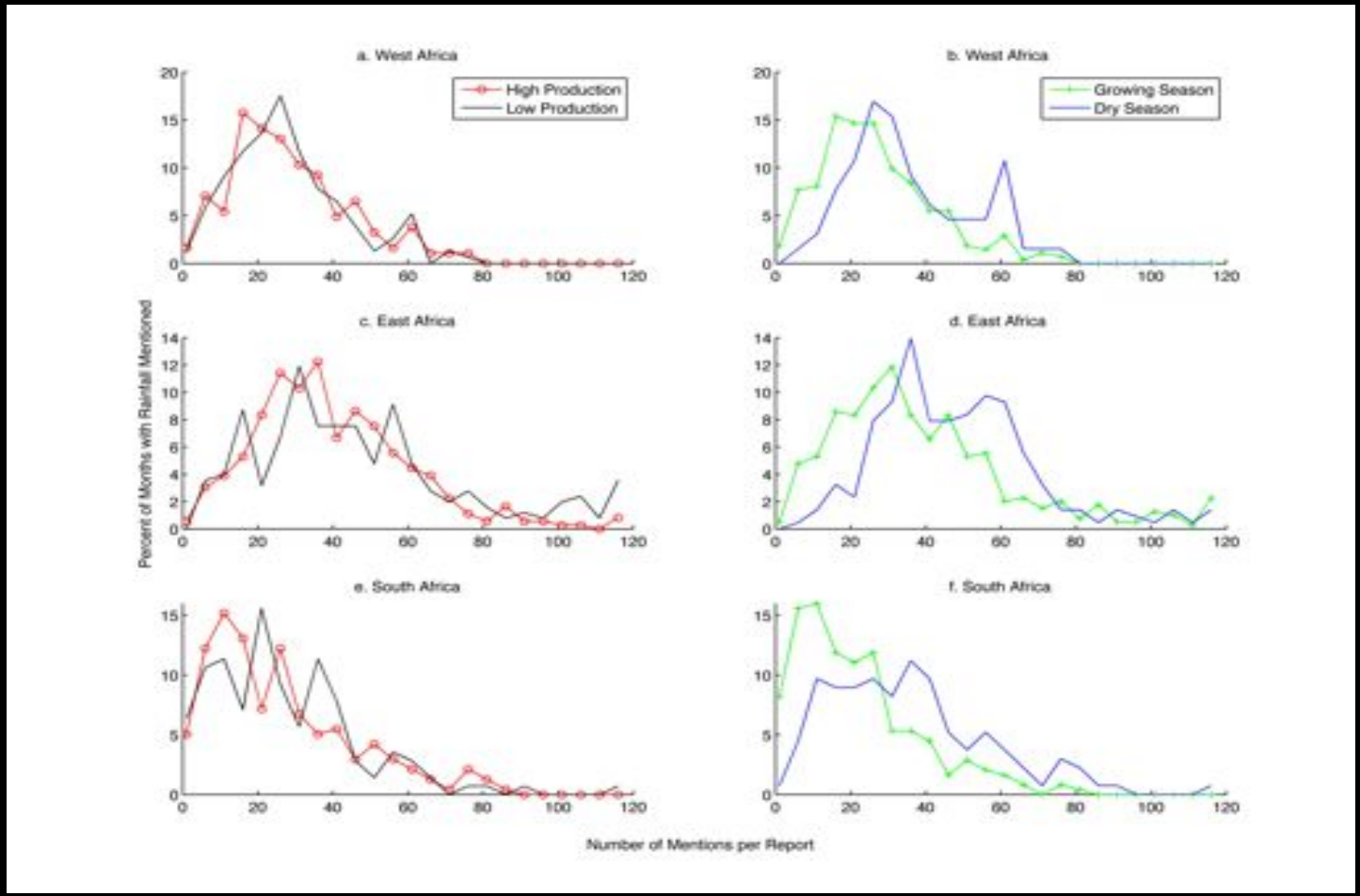
Brown and Brickley, 2010

What type of data is utilized?



Brown and Brickley, 2010

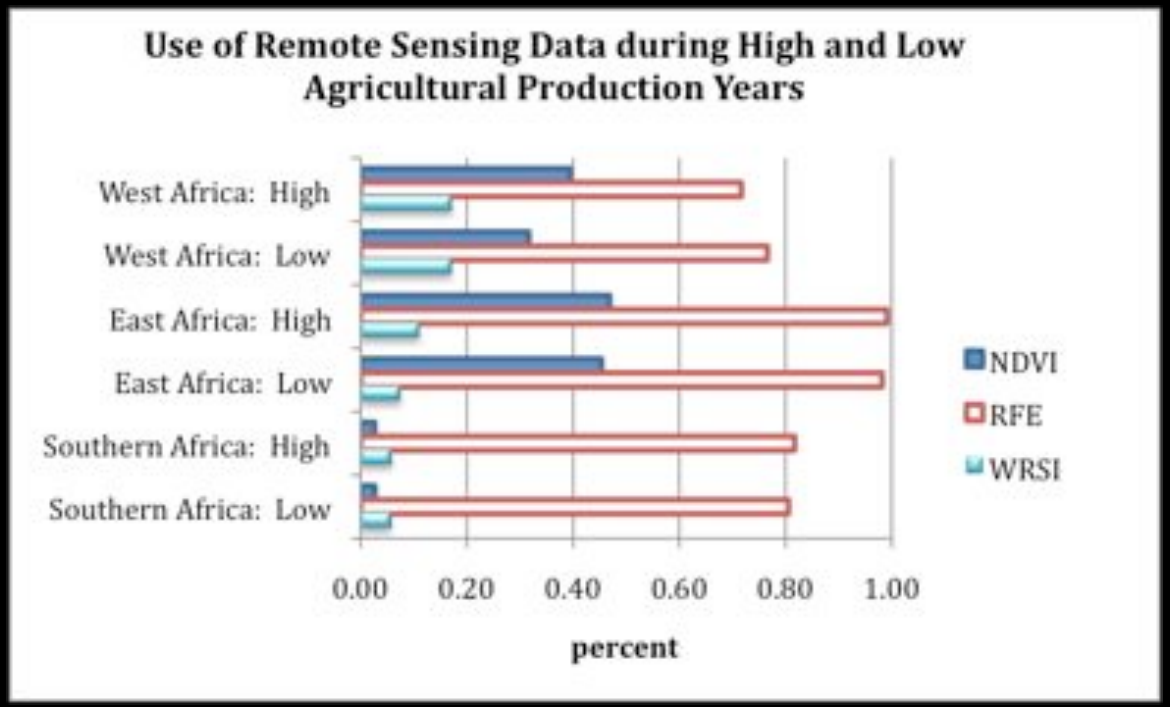
When is biophysical information utilized?



Brown and Brickley, 2010

Remote Sensing Data

- Overall, analysts use:
  - NDVI: 28%
  - RFE: 84%
  - WRSI: 10%
- Analysts in Southern African countries use RFE almost exclusively.



Brown and Brickley, 2010

Explanations

- ‘A possible explanation on the relatively low incidence of the use of WRSI is that it was introduced to the field towards the end of FEWS NET-1, around 2005; while NDVI and RFE has been in use in the project since 1988 and 1991 respectively.’

  – Felix Lee, Deputy Chief of Party, FEWS NET

Future Challenges

- Bridging the disciplinary divide
  - Expanding capacity of social analysts to incorporate biophysical data.
  - Tailoring the products derived from biophysical data to be more policy useful.
- Properly weighting each data category.
- Improving regional and temporal specificity.
- Providing “earlier” early warning.
- Using a consistent vocabulary.
- Understanding the underlying nutritional topography.