Food Security and Famine Early Warning System (FEWS)

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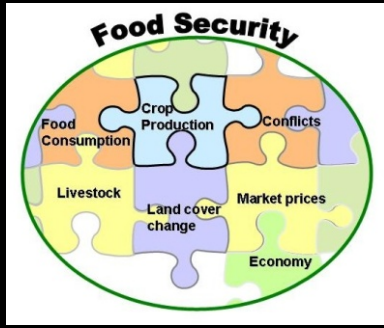
EEF Director and Sarmap Senior Associate



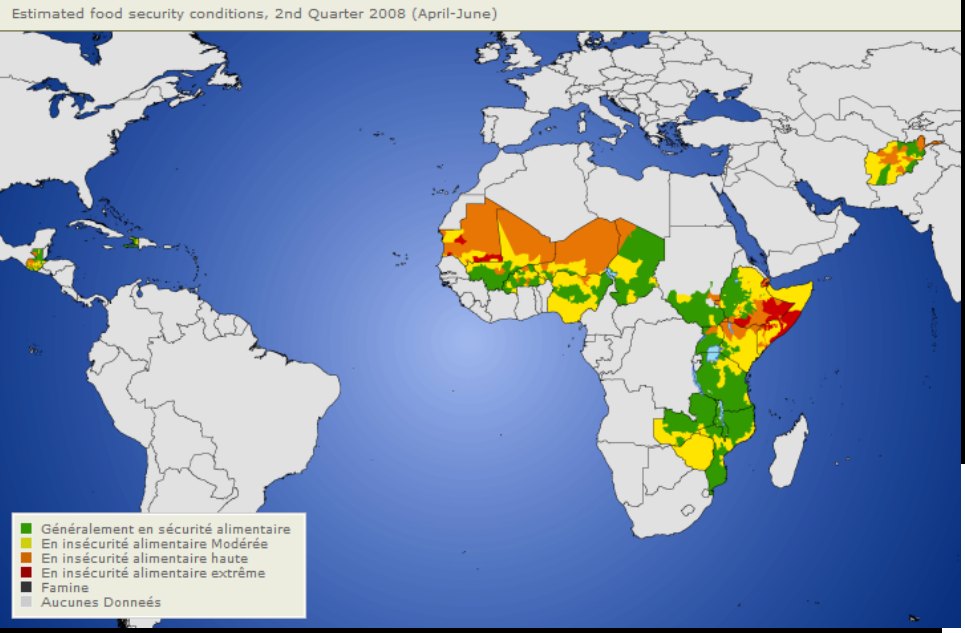
Food is one of the most basic needs of mankind.

A primitive man has enjoyed the abundance of food at his own stake, only requiring his desire and effort to acquire it.

But, modern man, despite the sophisticated and tremendous technological advances made during the past century is unable to meet one of the most basic needs of mankind.

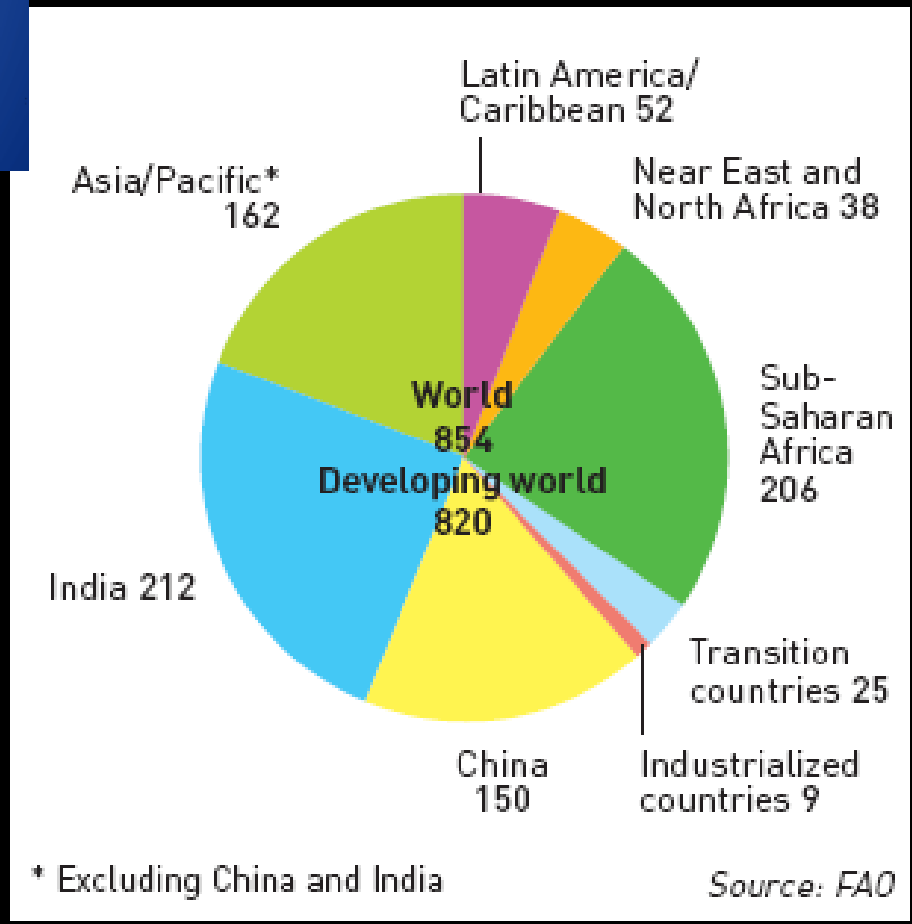
Millions of people are sick and dying due to the lack of food. It is disgracing not to be able to feed everyone in a world, which produces enough food for everyone to meet their daily minimum energy requirement.

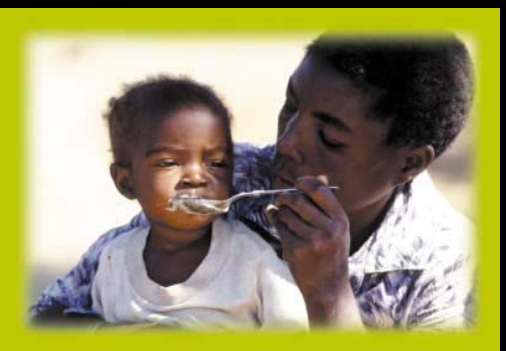
Source: FAO Report, 1999

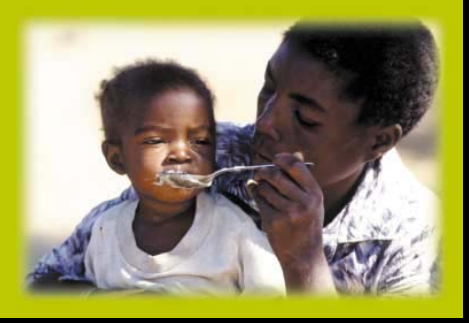


Food security condition in May 2008

Under-nourished 2001-2003 (in million)

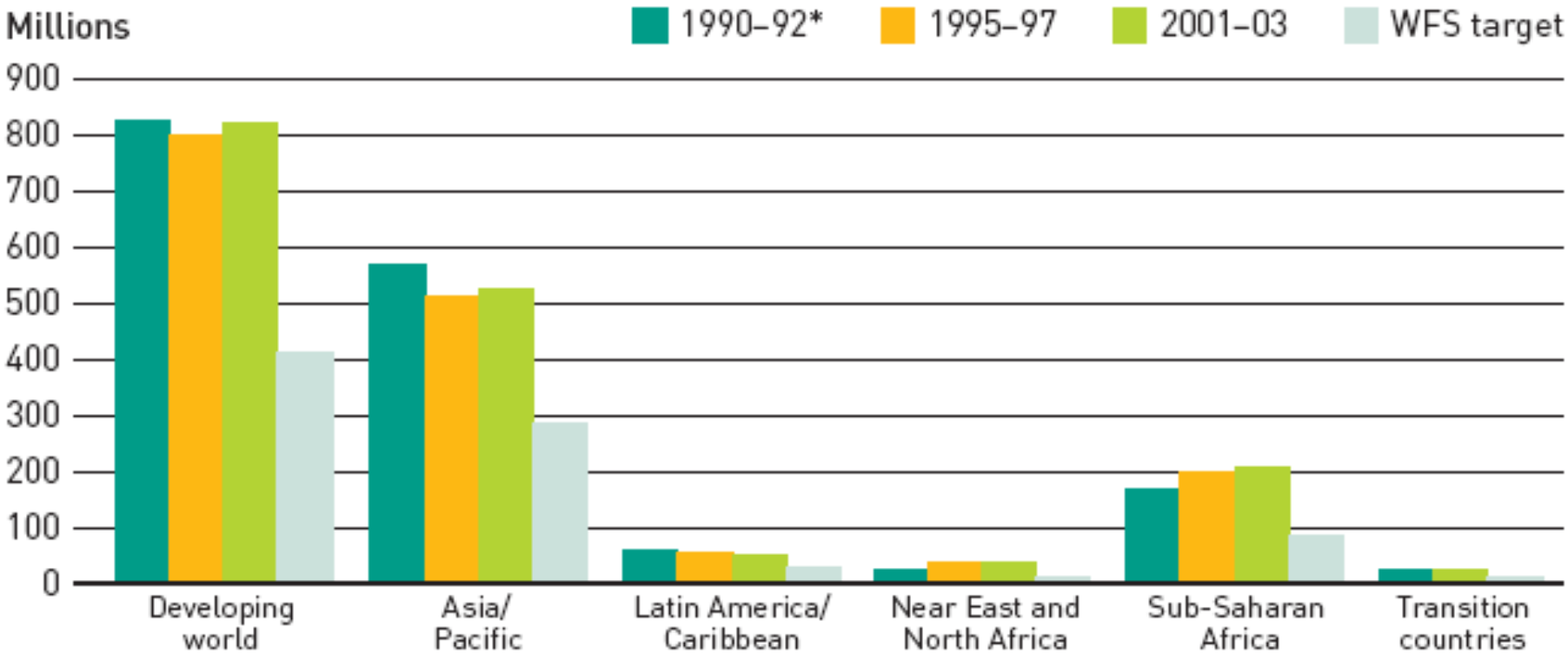






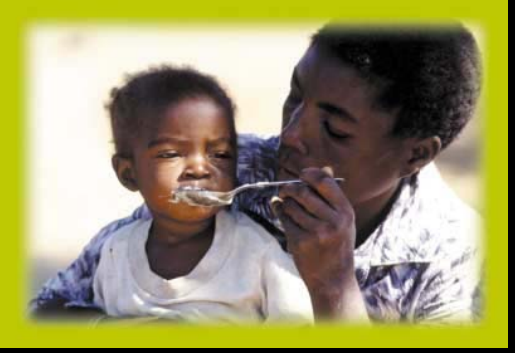
Since 1990, virtually NO progress towards meeting the WFS target

Number of undernourished and the World Food Summit target

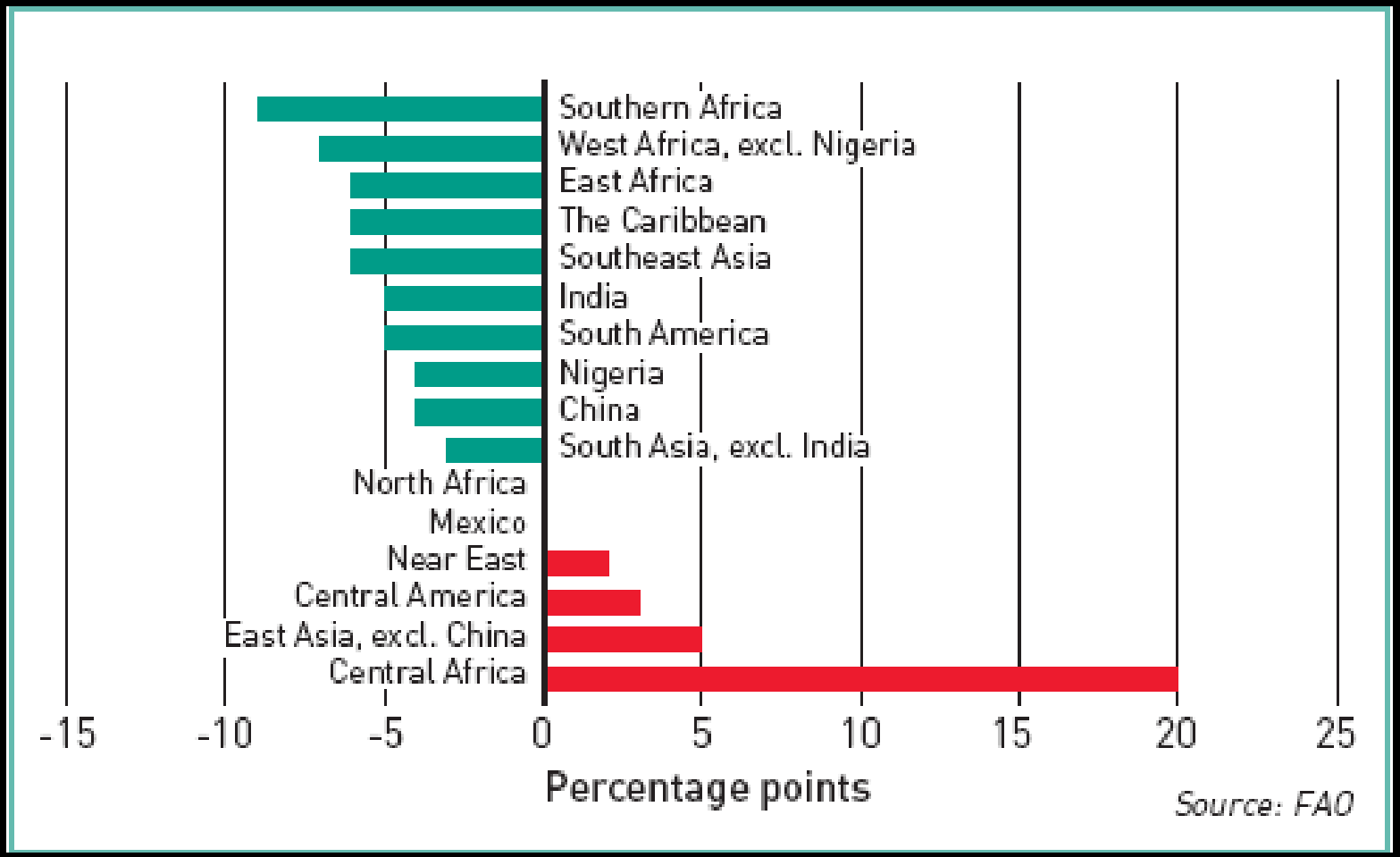


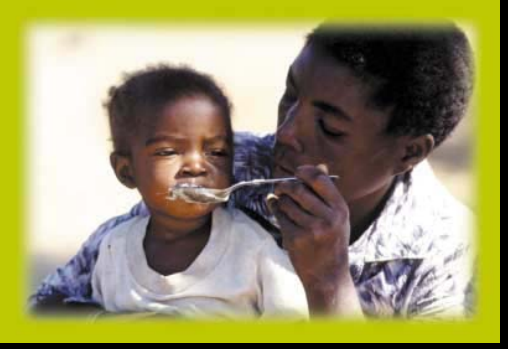
* For the transition countries: 1993–95

Source: FAO

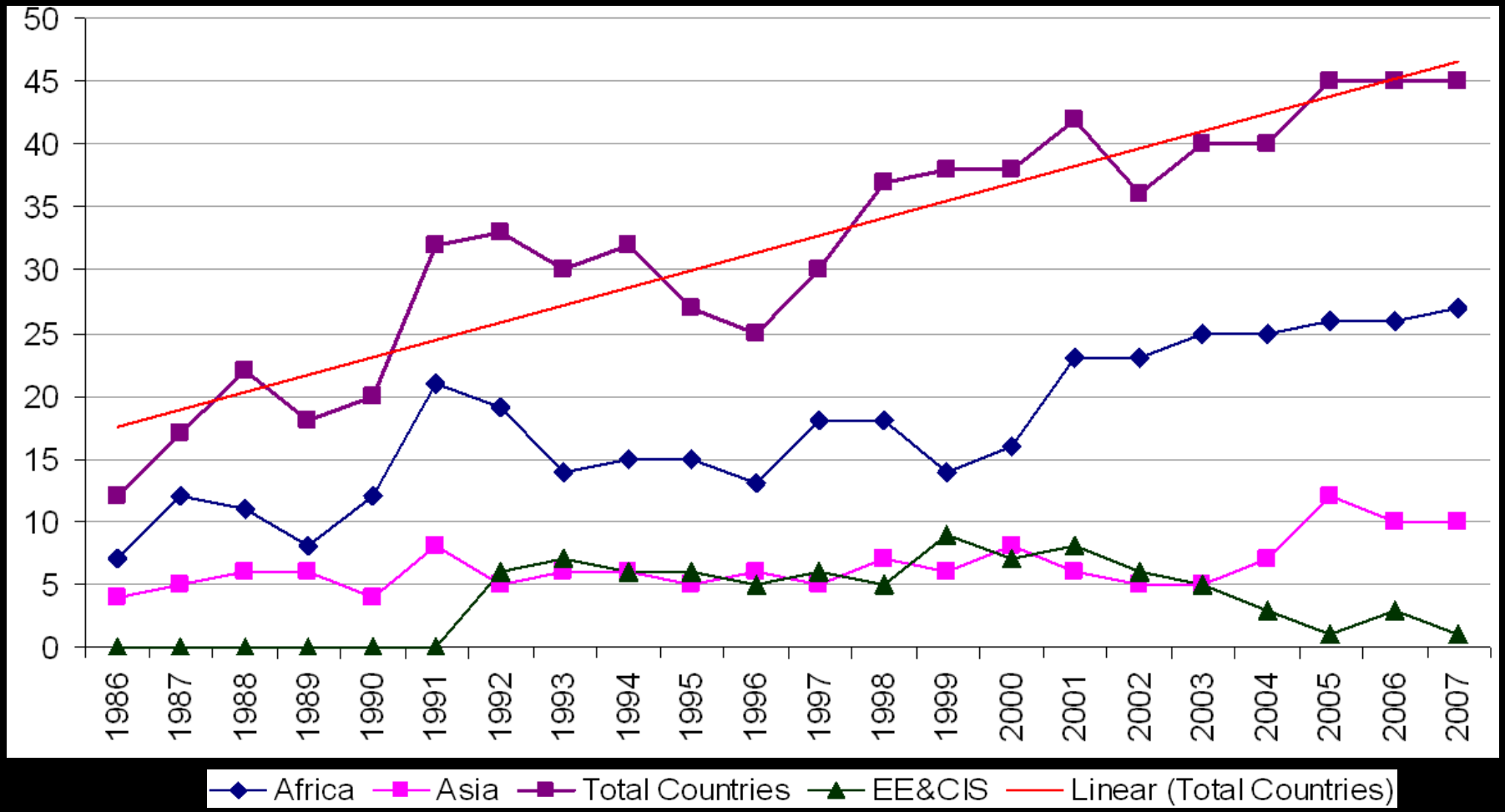


Change in the proportion of under-nourished in subregions from 1990 to 2003

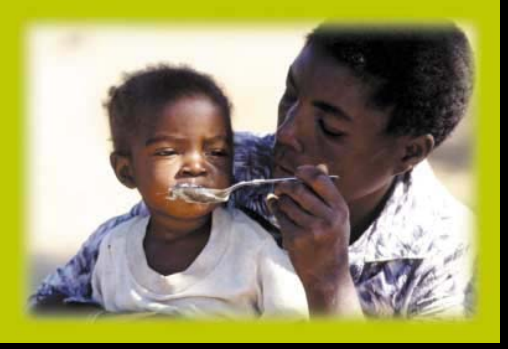




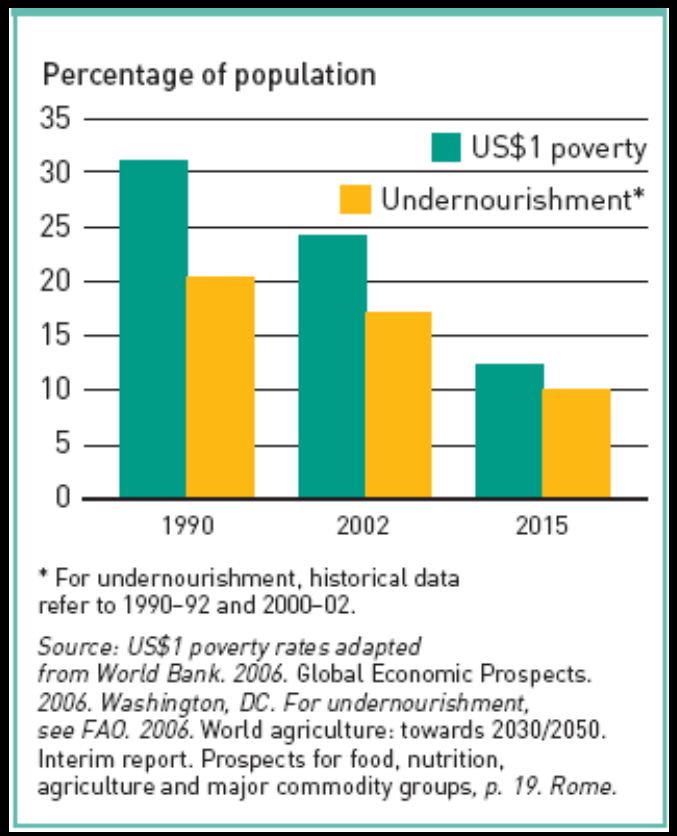
Number of countries facing food emergencies 1985-2007



Source: Sarris FAO 2008



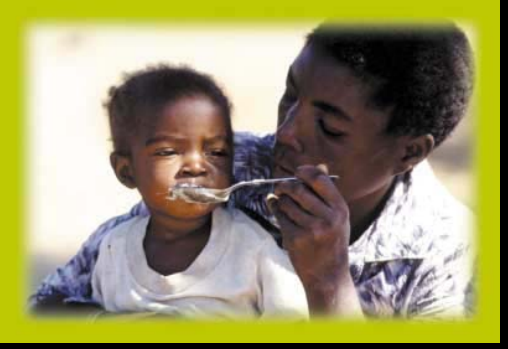
Main Factors affecting Food Security in Developing Countries



* For undernourishment, historical data refer to 1990–92 and 2000–02.

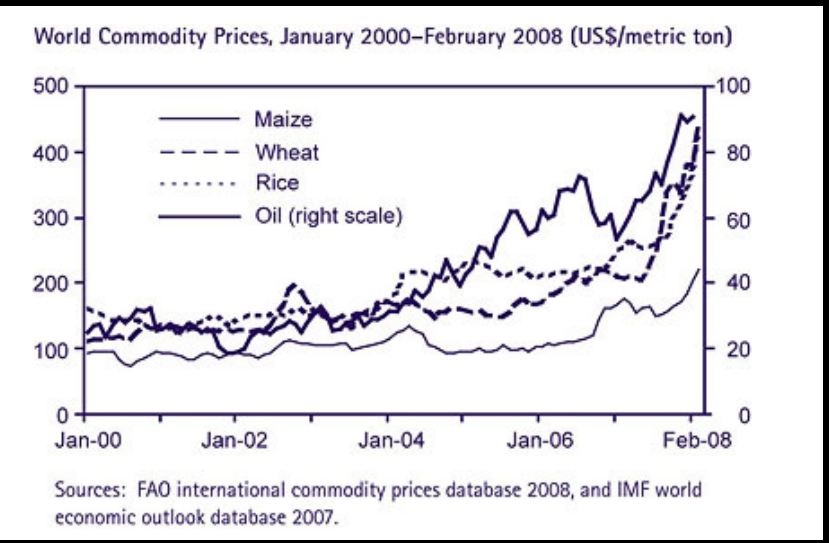
Source: US$1 poverty rates adapted from World Bank. 2006. Global Economic Prospects. *2006. Washington, DC. For undernourishment, see FAO. 2006.* World agriculture: towards 2030/2050. Interim report. Prospects for food, nutrition, agriculture and major commodity groups, *p. 19. Rome.*

- **Poverty**
- Population pressure
- Low agricultural productivity
- Environmental degradation
- Natural disaster, conflicts, violence
- Innapropriate macroeconomic and trade policies
- Lack of off-farm employment
- Limited access to education
- Poor health and sanitation conditions (HIV-AIDS)
- Gender discrimination
- **Low capacities to resist external shocks** (disasters, economic crisis, market and price fluctuations)

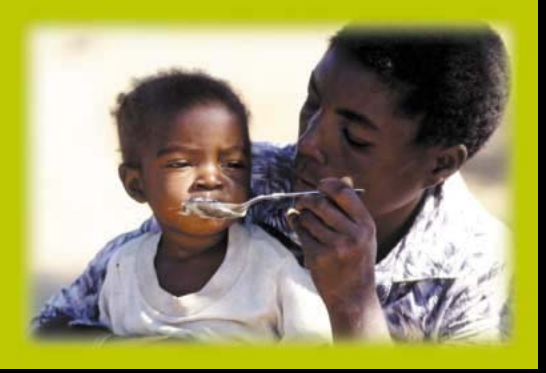


Recent Trends further affecting Food Security

- In addition to the underperformance of developing countries in terms of food/crop production:



  - A boosting demand for food products in China and India (as a result of two decades of growth and diet changes)
  - A switch of agricultural production from food supply to biofuels
  - Poor harvests due to bad weather in some major grain producing countries (Australia, USA)
  - Increasing transport and agricultural inputs costs due to booming fuel prices
  - Speculation (… assuming that food prices will continue to rise)



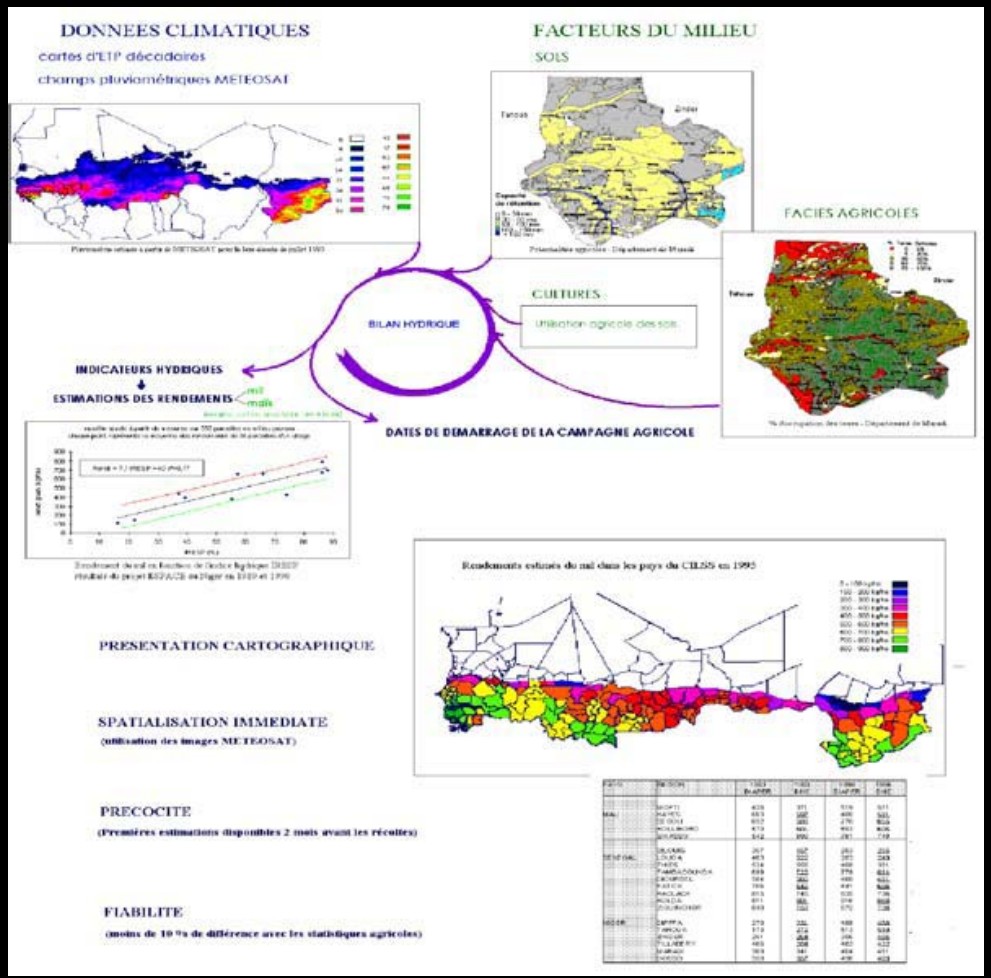
Famine Early Warning Systems seeks answers three key questions:

- *Which population groups are facing food insecurity or famine, and for how long?*
- *What are the extend and impacts of extreme impeding events on the population's food security?*
- *What are the best ways to respond to food insecurity and famine and mitigate adverse trends or shocks to livelihood systems?*

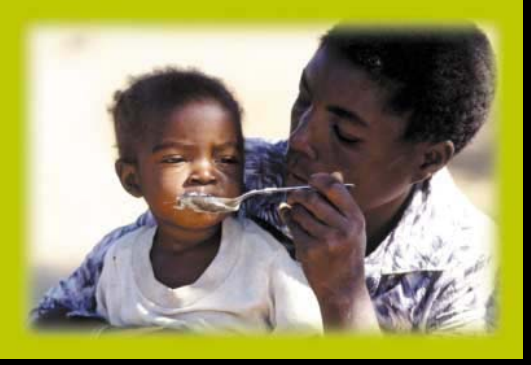
Overall Objectives of FSIEWS

- **Monitor food security situation**, notably in vulnerable countries through the continuous assessment of the availability and access to food and its nutritional value
  - Provide adequate information on agricultural production during and between crip seasons
  - Detect in advance changes, or (natural and/or man-made) crises that could affect food security situations and provoke famines (ex-ante risk management)
  - Improve the knowledge of causes and circonstances of famines
  - Assess vulnerabilities (conjunctural and structural) that could affect the populations' resistence to shocks (or coping capacities) – risk mangement)
- Facilitate the identification of strategies and means to be promote to **limit the socioeconomic and health impacts of famines**
- Improve **the efficiency and effectiveness of food aid interventions** in the event of food crisis through the advanced identification of risk or vulnerable areas
- Improve the making of **food security and poverty alleviation policies** and their implementation at national level

FSI&FEWS Basic Segments

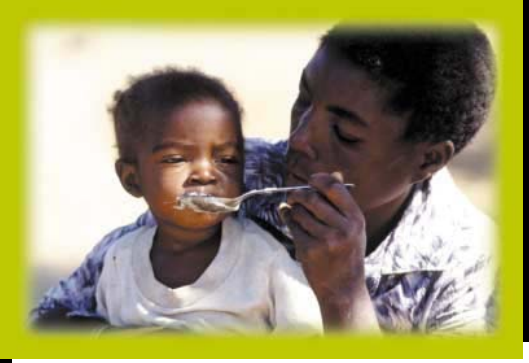


- *Forecast and Prediction*
- *Warning*
- *Reaction*



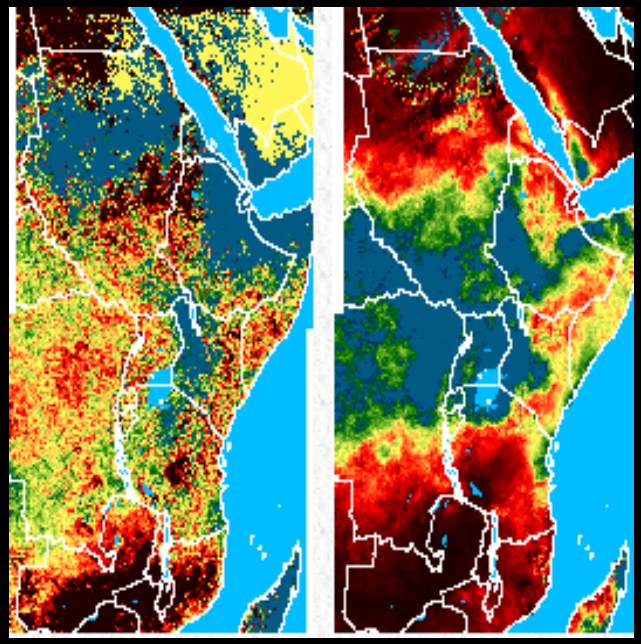
FEWS End-User Community

	Public Sector	Non-Profit Private Sector	For-Profit Private Sector
Global level	Global Conventions Declaration and International Agreements		
International level	Intergovernmental Organizations (IGOs) and multilateral Early Warning Systems	International non-governmental organizations (INGOs)	Multinational Corporations
National level	National Governments (Ministries) and Famine Early Warning Systems	International non-governmental organizations (NGOs)	National Corporations



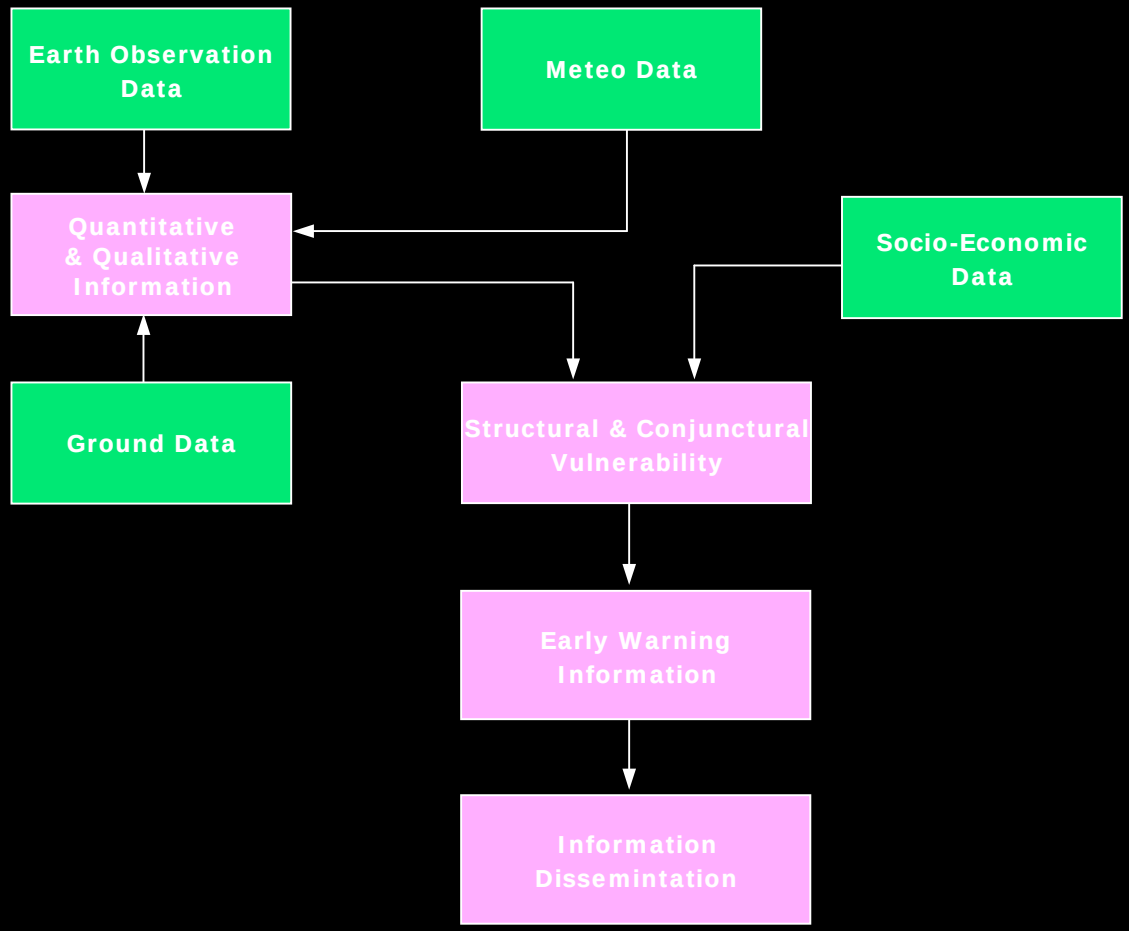
Basic indicators for assessing food security

Category	Variables	Indicators
Food availability	Food production Food imports Food storage	Annual food output per capita Cereal import dependency ratio Strategic grain reserve capacity
Access to food	Poverty Market integration Access to markets	Headcount incidence on poverty Food price seasonality index Kilometers of road in rural areas
Food utilization & consumption	Food uses practices Food intake	Dietary diversity Number of meals per day
Nutritional status	Anthropometry Micro-nutrient deficiency	Wasted and stunted children Prevalence of goiter (iodine deficit)



	Maize yield % (*)	Sorghum yield % (*)
Burundi (sec.)	-4	-3
Congo Dem. (sec.)	-3	-
Ethiopia	1	5
Kenya	5	9
Rwanda	0	-3
Somalia	-10	-3
Sudan	-15	-6
Tanzania (sec.)	-3	-3
Uganda	-3	2

The Basic Concept Food Security Information and Famine Early Warning Systems



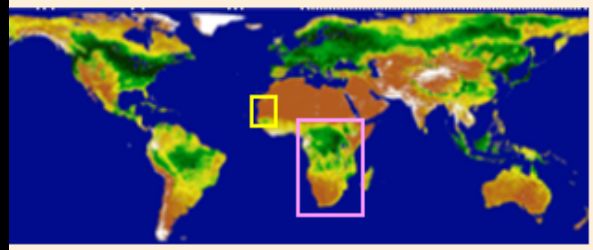
Continental

Regional

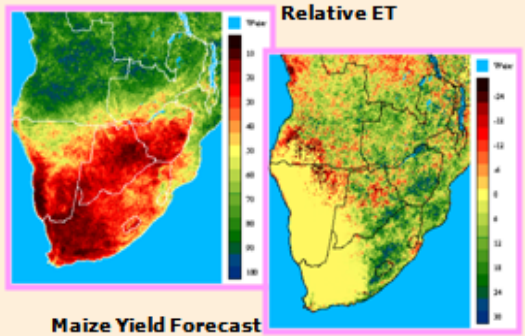
GMFS providing information on crops

National

Local



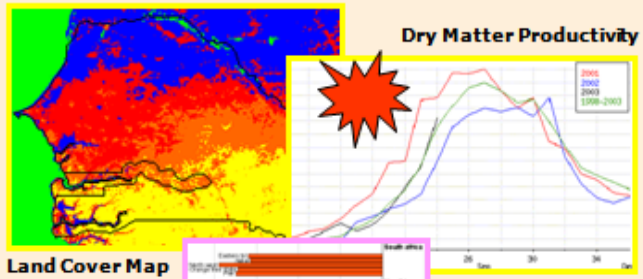
ry Matter Productivity



Relative ET

Maize Yield Forecast

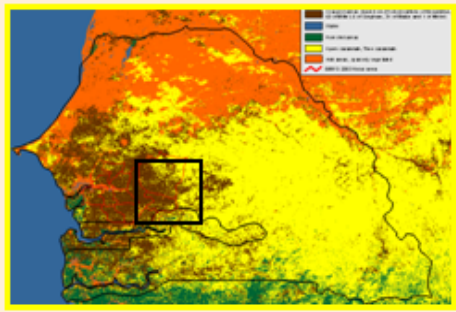
TRENDS AND FORECAST FIGURES



Dry Matter Productivity

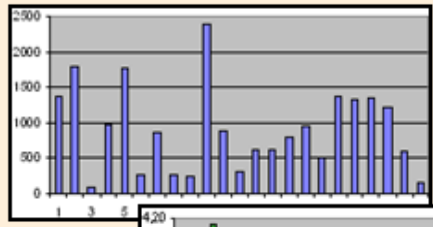
Land Cover Map

Yield Forecast

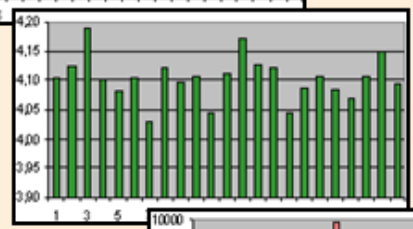


Land Cover Map

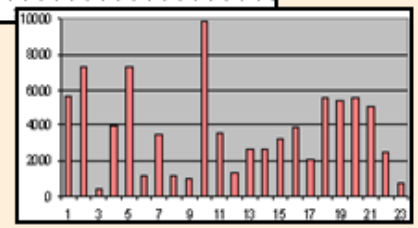
CROP FIGURES



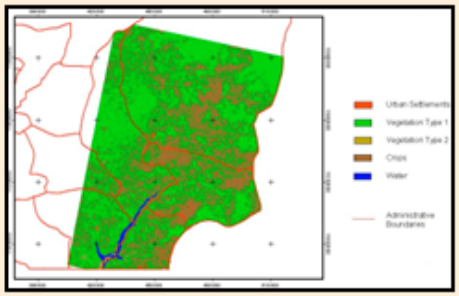
Acreage



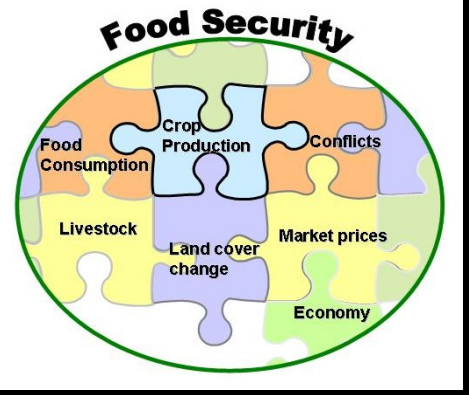
Yield



Production



Acreage Map



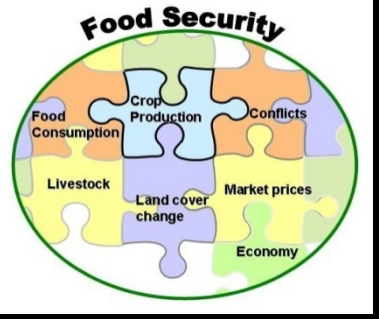
Famine Early Warning Systems currently operating in SSA

Transnational FEWS

- **FEWSnet** - USAID Famine Early Warning System
- **GIEWS -** FAO Global Information and Early Warning System
- **VAM -** WFP - Vulnerability Analysis and Mapping
- **MARS FOOD** - Monitoring Agriculture with Remote Sensing (EC/JRC)
- **FIVIMS -** Food Insecurity and Vulnerability Information and Mapping Systems

Regional/National FEWS

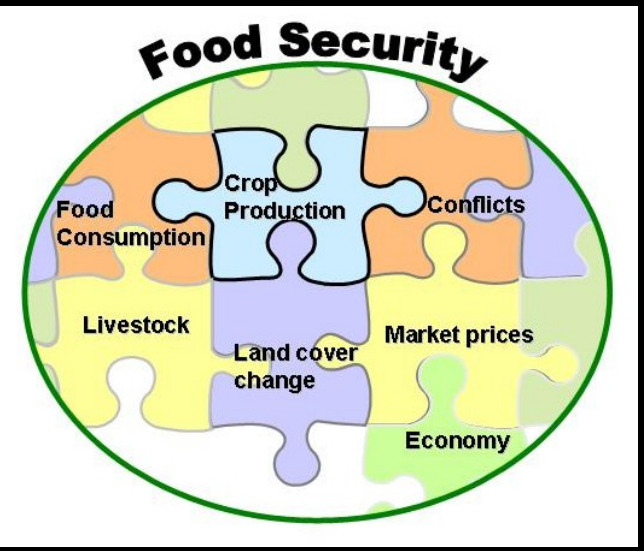
- **AP3A** - Alerte Précoce et Prévision des Productions Agricoles (CILSS/Aghrimet - Sahel)
- **SADC** - Regional Early Warning System for Food Security
- **DMC -** Drought Monitoring Centers (SADC/IGAD)
- **AEDES -** Systèmes d'information sur la sécurité alimentaire (SISA)



Problems affecting the efficiency of existing FSI&FEWS

- Lack of common language, common indicators and lack of coordination between existing systems
- Difficulties and lack of transparency in accessing basic data on food security, notably socioeconomic data
- Spaceborne information are generally only available at global or regional level in spite of the fact that requirements are at national, sub-national and/or local level
- The use of NDVI to assess vegetation vigor and/or forecast yields remains questionable, notably under arid or semi-arid conditions
- Estimating or forecasting yield at national or sub-national level on the basis of low-resolution data remains risky
- Estimating crop acreage through low-resolution data remains questionable, if not impossible
- Spaceborne technologies currently in use in many existing FEWS do not reflect new technological advances in the field of earth observation as well as the capacities of existing sensors on board recent satellites

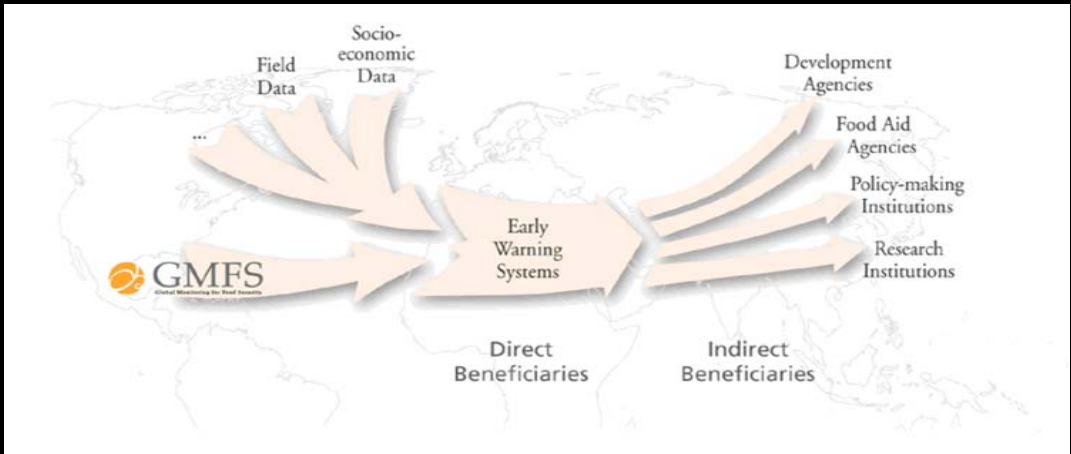
Transnational, Regional and National FEWS



Frequently used Indicators for Food Security

	AP3A	FIVIMS	GIEWS	SADC	FEWS	VAM	MARS
Food crop performance	■	■	■	■	■	■	
Crop conditions	■		■	■	■	■	■
Crop yield forecast							■
Crop production forecast	■		■	■			■
Marketing and price information		■	■	■	■	■	
Food supply/demand		■	■	■	■	■	
Health conditions		■			■	■	
Food crops and shortage			■	■	■	■	
Food supply		■	■	■			
Food consumption		■	■	■			
Crop areas	■	■	■	■	■	■	■
Pests			■	■			
Food balance		■	■	■	■	■	
Vegetation front	■						■
Cold Cloud Duration	■		■	■	■	■	
Normalized Difference Vegetation Index	■		■	■	■	■	■
Biomass	■						■
Seeding risk areas	■						
Expected season length	■				■	■	■
Estimated seeded areas	■			■			■
Estimated seeded date	■						■
Vegetation cover		■					■
Agro-ecological zones							
Crop use intensity						■	■
Variation coefficient of agricultural production						■	
Cash crop production area		■				■	
Coping strategies	■	■	■	■		■	
Average cost to travel to nearest market		■				■	
Livestock production	■	■					
Population density	■	■	■	■	■	■	
Access to water		■				■	
Children education		■				■	
Radiation/Evapotranspiration							■
Soil moisture							■
Rainfall	■	■	■	■	■	■	■

GMFS Basic Objectives



- ***Strenghten existing famine early warning systems ……***
- ***…..for improved information on food (in)security for decision making, as part of a global network***

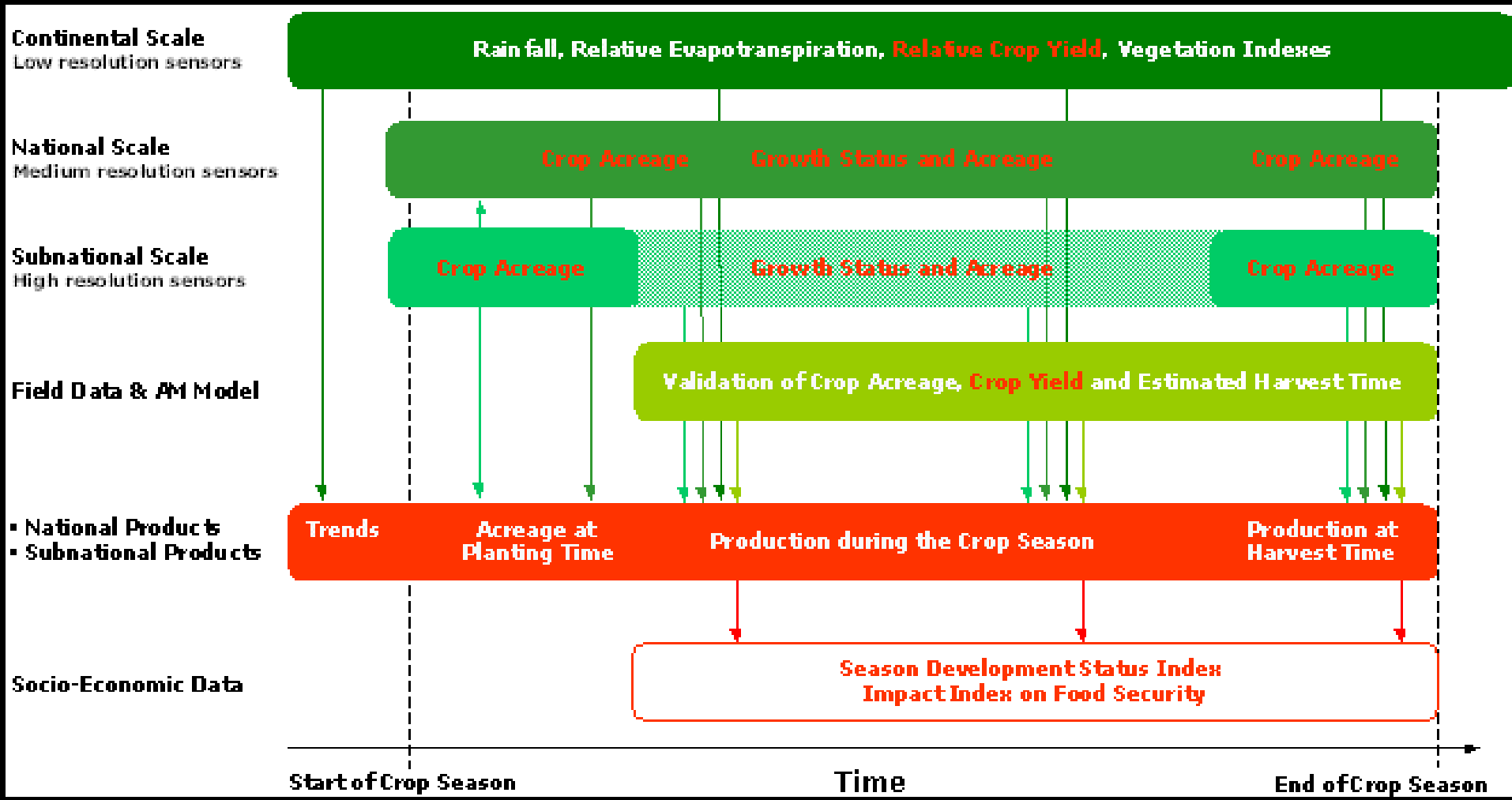
GMFS
Global Monitoring for Food Security

Satellite data support service for existing early warning systems

From users to partners

- More than 30 user organizations & networks, notably existing FEWS currently operating in SSA
- Annually renewed agreements with legally mandated organizations (SLA's)
  - FAO-GIEWS,
  - World Food Programme - VAM,
  - EC – JRC/MARS
  - AGRHYMET (Niger),
  - RCMRD (Kenya),
  - SADC (Botswana)
  - SUDAN: Federal Ministry of Agriculture & Forestry, Remote Sensing Authority, FAO, WFP,..
  - ETHIOPIA: Central Statistics Authority, FAO, WFP, Ministry of Agriculture, Mapping Agency, …
  - SENEGAL: Ministry of Agriculture, CSE, Meteo,..
  - ZIMBABWE: Ministry of Agriculture, FAO, WFP, Central Statistics Office, …
  - MOZAMBIQUE: Ministry of Agriculture, Meteo
  - MALAWI: Ministry of Agriculture & FS, Meteo, FAO, WFP

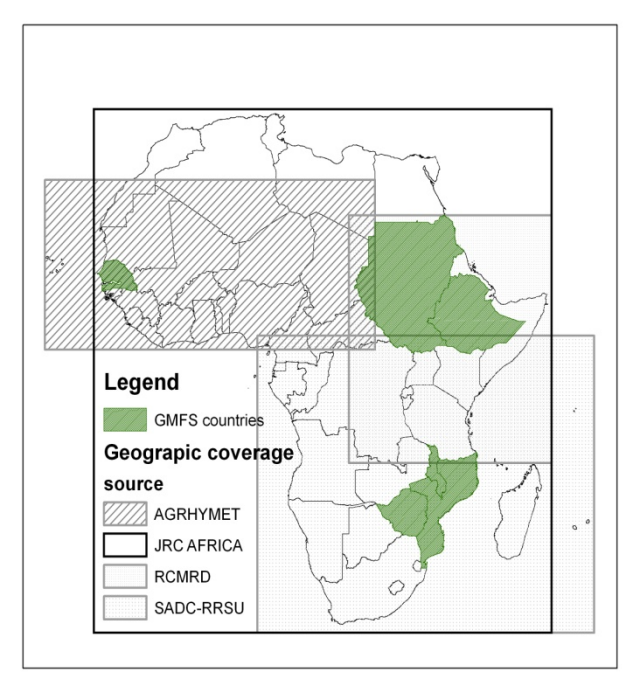
The GMFS Multi-Scale Earth Observation Concept



Satellite data

- **Optical - high resolution data (3-15 m)**
  - SPOT, Landsat, Formosat, LISS, AWIFS, …
- **SAR data – medium and high resolution (3-200 m)**
  - ENVISAT ASAR, ALOS PALSAR, COSMO-SKYMED
- **Low resolution optical data (+ 1km)**
  - SPOT-VGT, MERIS, MODIS

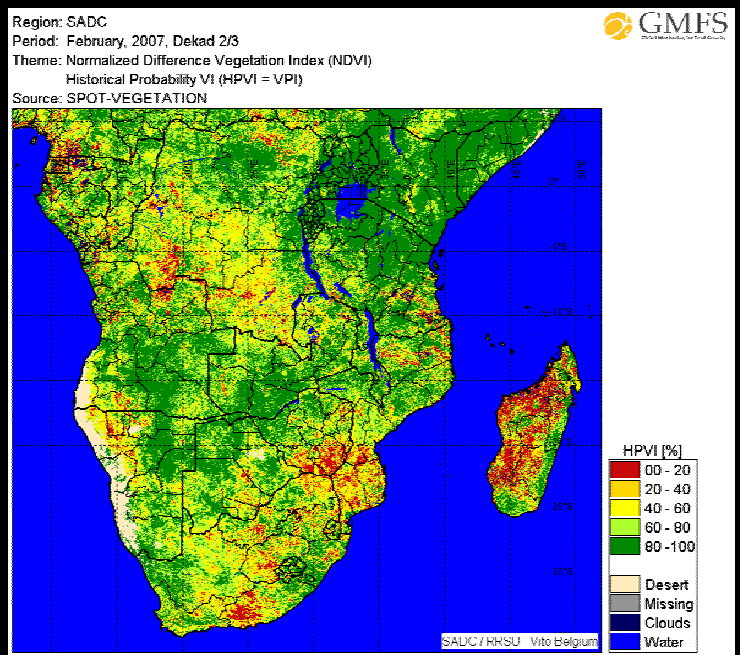
GMFS Services provided to end-users

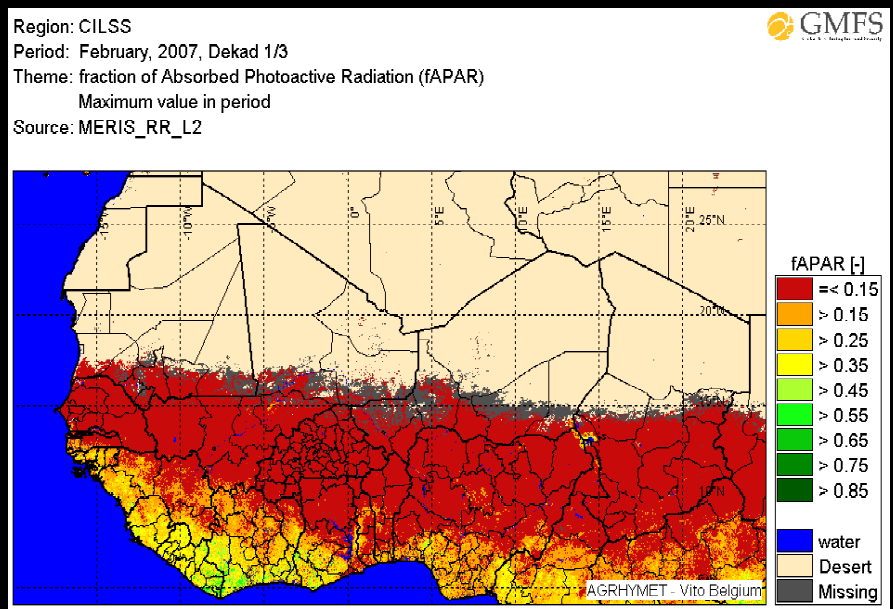


- **GMFS provides four information services:**
- - Early Warning service (continental)
- - Agricultural mapping service (national)
- - Yield assessment service (national)
- - EO based support to FAO/WFP CFSAM missions
- **+ Support to Users: training, capacity building** …

Services to Famine Early Warning

- Data distribution through email service
  - 7 Regions of interest, 10-daily updates
  - Monitoring of the progress of the growing season
  - Various indicators (VPI, fAPAR, …), JRC-MARS indicators
  - Use & building applications!



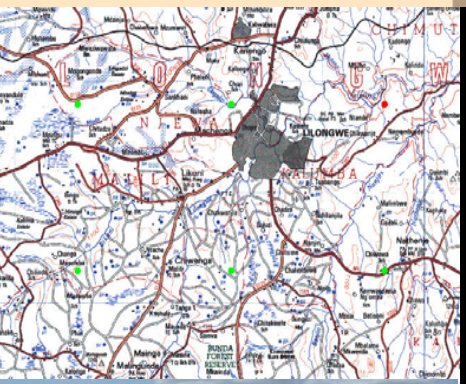


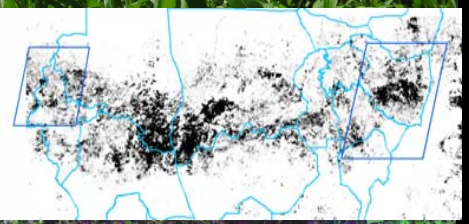
GMFS
Global Monitoring for Food Security

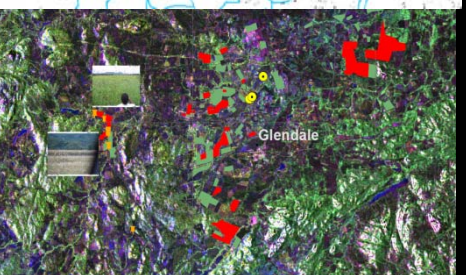
Satellite data support service for existing early warning systems

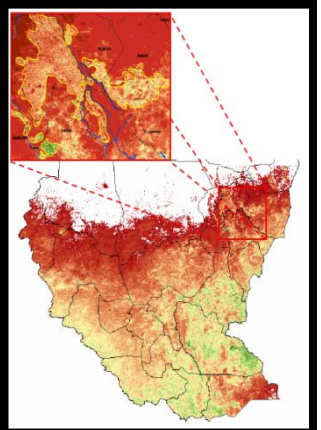
Monitoring Agricultural Production

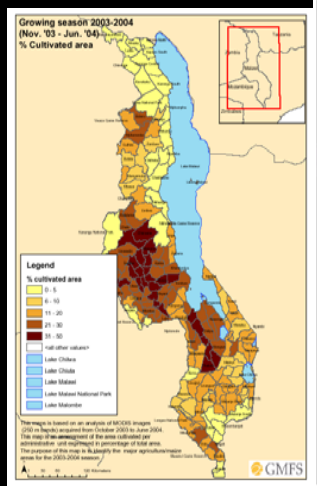
- Estimating total cropped area
  - Based on Fieldwork, integrated with Remote sensing data
  - Sudan, Malawi, Senegal, Zimbabwe, Ethiopia
  - Multi-annual, yearly
- Crop yield estimates
  - Yield models: remote sensing & meteo data
  - Malawi, Senegal

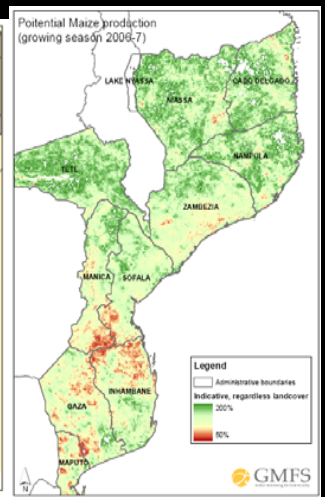


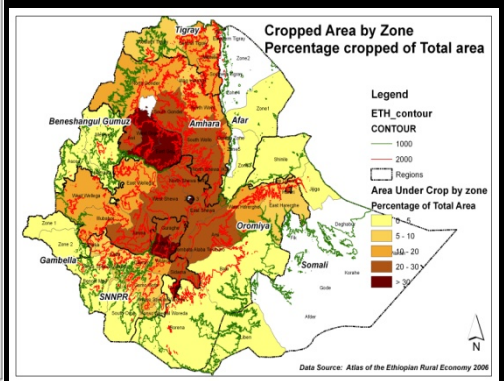






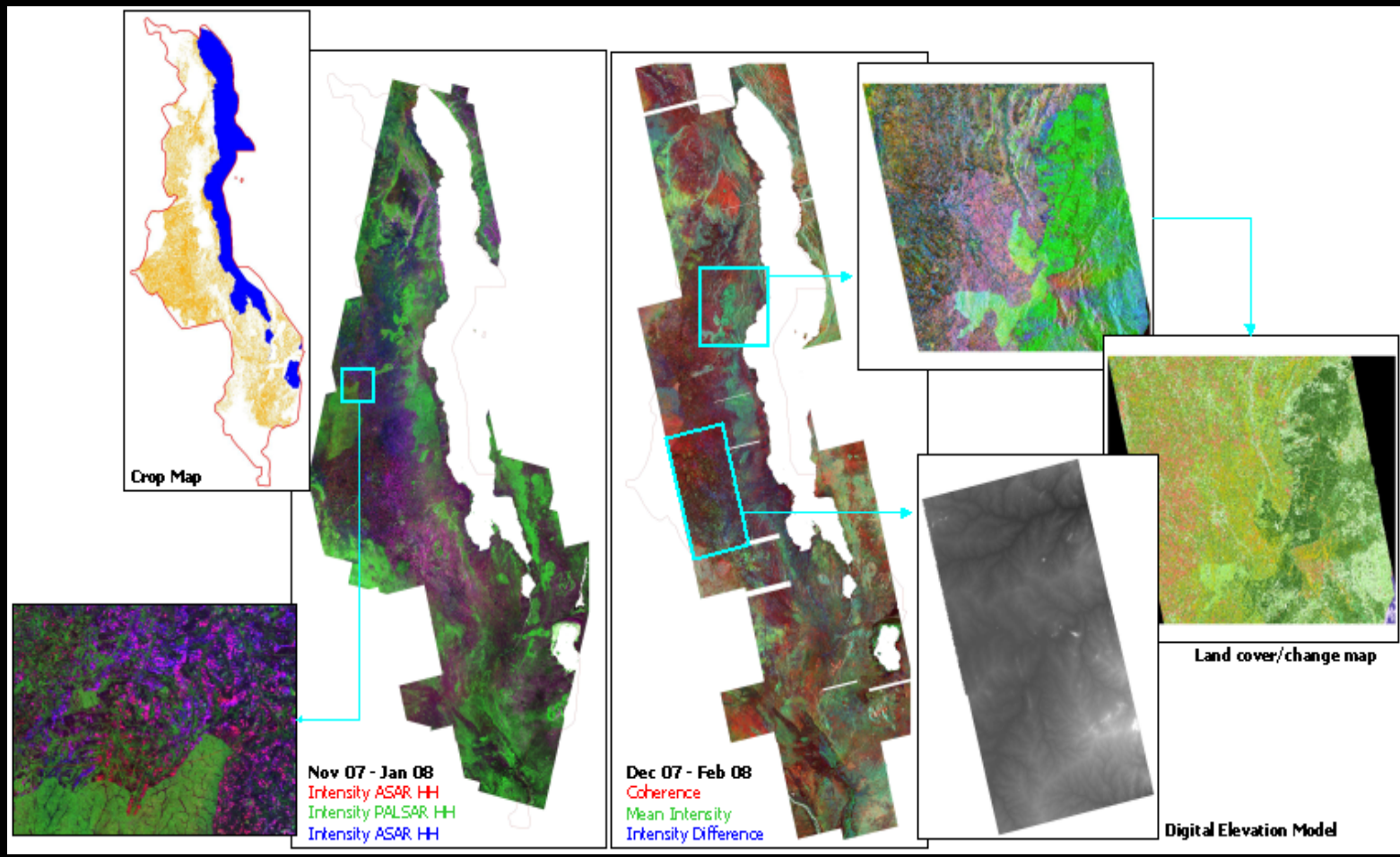


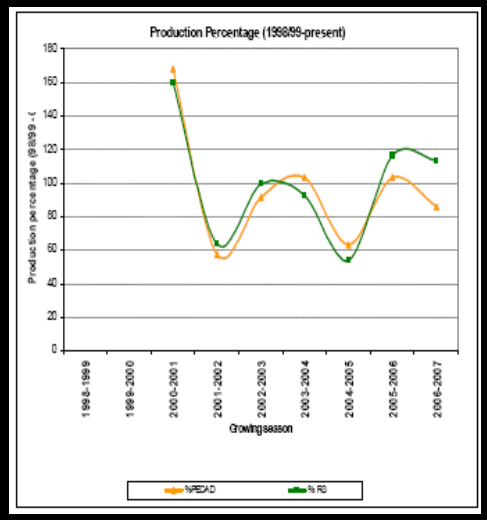


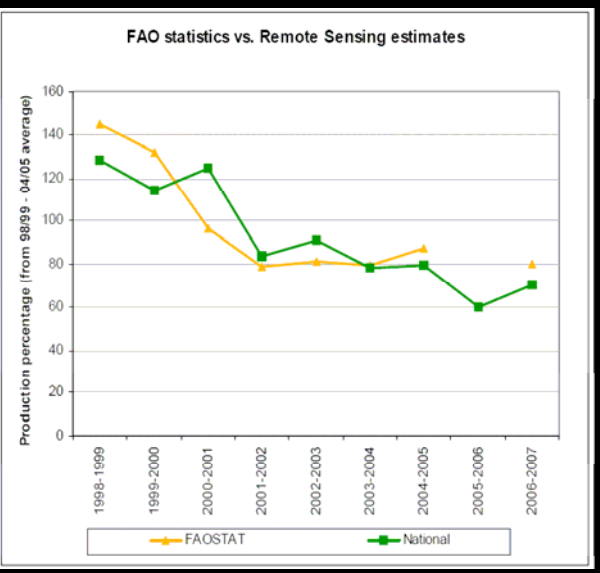


Example: Estimating crop yield for Malawi in 2007

The color composite on the left illustrates a multi-temporal data set based on ENVISAT ASAR AP (120 images) and ALOS PALSAR FBS (70 scenes) data covering the whole Malawi (100,000 sqkm, 15m resolution). The image on the right shows an interferometric color composite based on ALOS PALSAR FBS data (70 image pairs). The enlargements highlight the extensive information included in this type of multi-temporal multi-source data set, which allows the generation of products such as crop map, main land cover/change classes, and digital elevation model. All processing has been performed starting from raw data.







Support to FAO/WFP Crop and Food Supply Assessment Missions (CFSAM)

- Providing information further to Government requests for WFP/FAO production assessment mission
- Participating to CFSAM field visit organized jointly by Government and FAO, WFP staff and observers

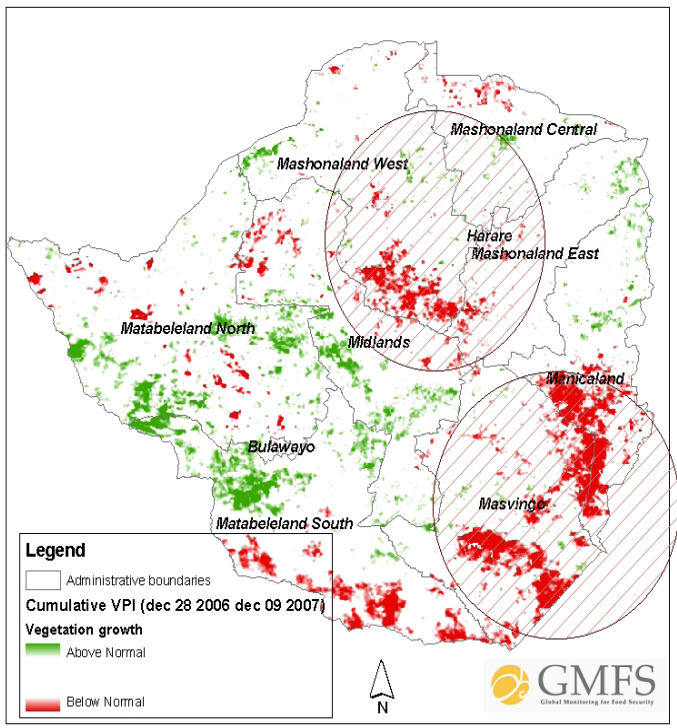
- Example: Zimbabwe

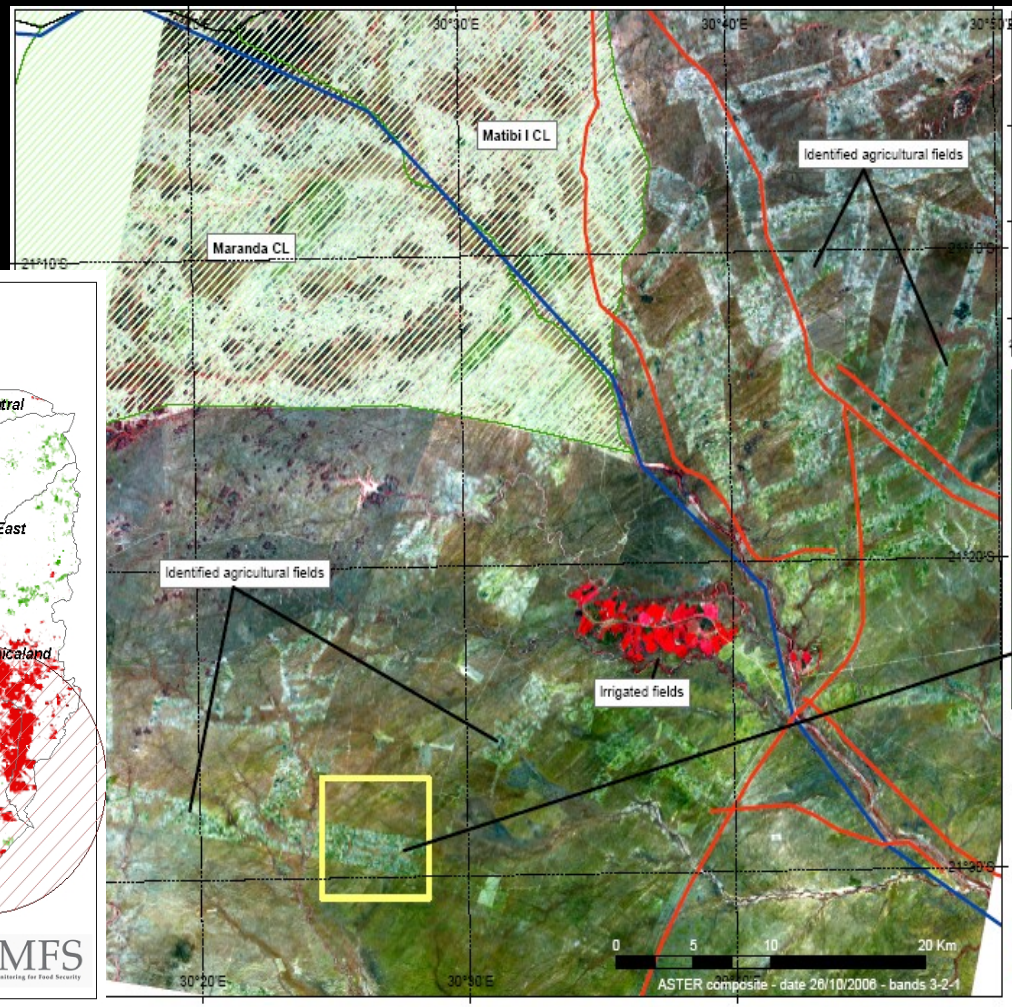
  - GoZ declared 2006/7 'drought' year
  - GoZ Requested for FAO/WFP CFSAM mission
  - Estimating Food Production in Zimbabwe
    - April 2007: Joint evaluation meeting: FAO, WFP, EC, USAID, FEWSNet, GMFS
  - Hot spot analysis

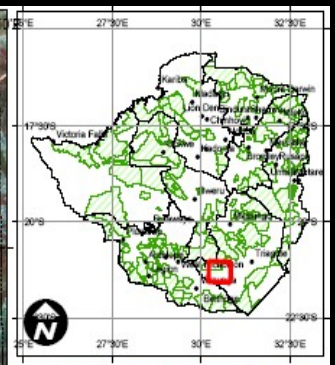
GMFS
Global Monitoring for Food Security

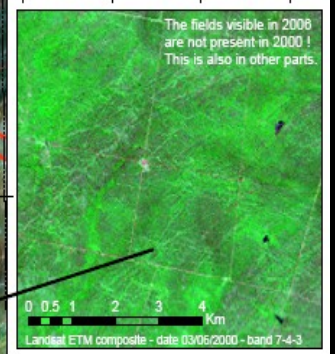
Satellite data support service for existing early warning systems

Example - Zimbabwe 2007









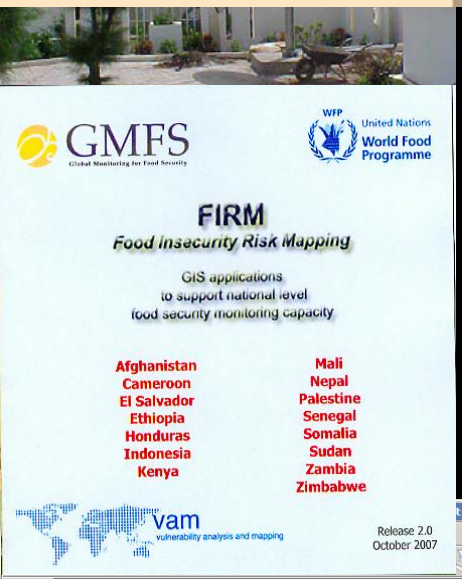
Data
Provinces, communal lands: WFP
Cities, rivers and roads: Sahims

Purpose
This map is produced for FAO as support to the CFSAM mission in Zimbabwe starting at 14 April 2007.

Legend
Province
Communal land
Secondary road
Main River
City

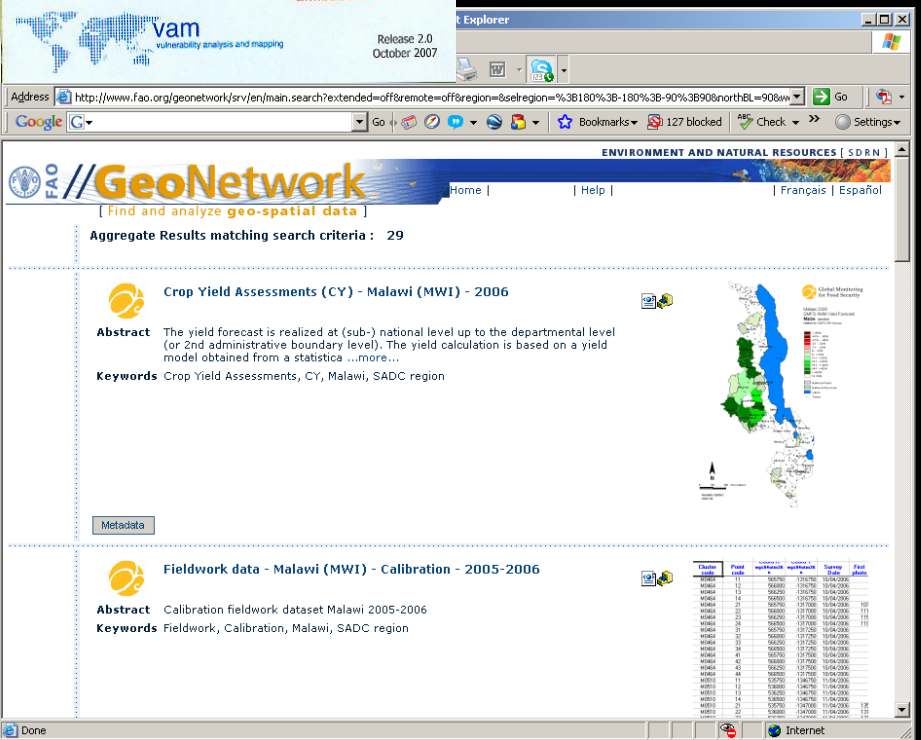
Map Date: 23 March 2007
Projection: UTM Zone 36S
WGS84

GMFS



Data integration & information management

- Objective: integrate services into established systems



- FAO GEONETWORK catalogue
- WFP Food Insecurity Risk Mapping (FIRM)
- (FAO GIEWS)
- ESA Data Dissemination Services (DDS)
  - CSE, AGRHYMET, RCMRD, (SADC)
- EUMETCAST system for Africa
- Making use of the infrastructure of Centre for Image processing

Conclusions

- GMFS can provide today, on a operational way, reliable information on agriculture at national scale. Improvements are continuously on-going.
- The service has been developed based on a low cost approach. Note that data availability and cost is no more a major issue as in the past.
- Local expertise is essential for i) a correct understanding of the land management, ii) data calibration, and iii) products validation.
- Capacity building at all levels (technical, institutional, political) is conditio sine qua non in order to include the local expertise and obtain service's awareness.

The Way Ahead

- Integration of Earth Observation based products with other methodologies, in particular statistical approaches.
- Expand the on-going activities to new countries.
- Expand the spectrum of the products, in particular by considering natural resources (water and forestry) and infrastructures (roads and settlements).