# The Use of Space Technologies for Effective Humanitarian Response to Food Insecurity

Inter-Agency Meeting on Outer Space Activities

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The World Food Programme

# Content of the presentation

- International Commitments to reduce poverty and end hunger
- Main causes of food insecurity
- Data and Information requirements
- Emergency Response Framework
- Collaboration and data sharing
- Conclusion

# International Commitments to end hunger and food insecurity

- The Rome declaration (1996) on World Food Security
- The millennium declaration (2000) of the UN
- The Johannesburg declaration on Sustainable development (September 2002)
- The New Partnership for Africa's Development NEPAD

**In Response National Governments, the UN and the donor community including the various space agencies are eager to contibute**

# The World Food Programme

**The WFP has five strategic priorities**

- Save lives in crisis situations
- Protect livelihoods in crisis situations and enhance resilience to shocks
- Support the improved nutrition and health status of children, mothers and other vulnerable people
- Support access to education and reduce gender disparity in access to education and skills training
- Help governments establish and manage national food-assistance programmes

**Eradicate Extreme Poverty and Hunger**

# Main causes of food insecurity

- **Natural** —droughts, floods, hurricanes, earthquakes;
- **Economic**—fluctuation of income, market failure, lack of employment opportunities;
- **Political**—civil wars, political violence, political instability;
- **Health**-related —epidemics, HIV/AIDS

**Extreme Poverty and Vulnerability**

# Information requirements for humanitarian decision making

Where? Geographical location (geographical targeting)

Why? Insecurity, drought, market failure, HIV AIDS

When? How soon (Early Warning and Preparedness)

How many? Beneficiary estimates

What type of intervention? Intervention modality (Emergency relief, nutritional support, health intervention)

For how long? Duration of intervention

How ? Logistics, procurement, programming

Can this happen again? Monitoring and Preparedness

# Emergency Response and Preparedness Framework

1. Pre-crisis phase
   - Identification of vulnerable populations and disaster risks
2. Monitoring phase
   - Early warning and contingency planning
3. Emergency assessment phase
   - Identification of populations that require assistance
4. Operational phase
   - Timely delivery of appropriate assistance
5. Post-crisis phase
   - Evaluation of impacts of the response

# International / regional initiatives

- USAID Famine Early Warning System (FEWSNET)
- FAO Global Information and Early Warning System (GIEWS)
- The WFP Vulnerability Analysis and Mapping, VAM
- The Global Monitoring for Food Security (GMFS)
- Monitoring Agriculture with Remote Sensing (JRC-MARS FOOD)
- SADC Regional Early Warning System for Food Security (SADC-REWU)
- Regional Centre for Mapping Resources for Development RCMRD
- IGAD Climate Prediction and Analysis Center ICPAC

# Monitoring system

- **Agricultural Information Systems**
  - Agricultural production patterns and performance, trade, inputs, farming systems, and rural income levels.
- **Health and Nutrition Information Systems**
  - Health variables
- **Land, Water and Climatic Information Systems**
  - Topography, landform, soils, climate, water availability, land use, land suitability and productivity, land tenure, irrigation, and infrastructure.
- **Early Warning Systems**
  - crop production, agricultural production forecasts, estimates of stock levels, food requirements, imports and exports and information on household income
- Market Information Systems
  - agricultural input and commodity prices, marketing opportunities, and other information relevant to improving the functioning of agricultural markets.
- Vulnerability Analysis and Mapping Systems
  - Risk factors to which vulnerable population groups are exposed..

# Collaboration and Partnerships at international and regional level

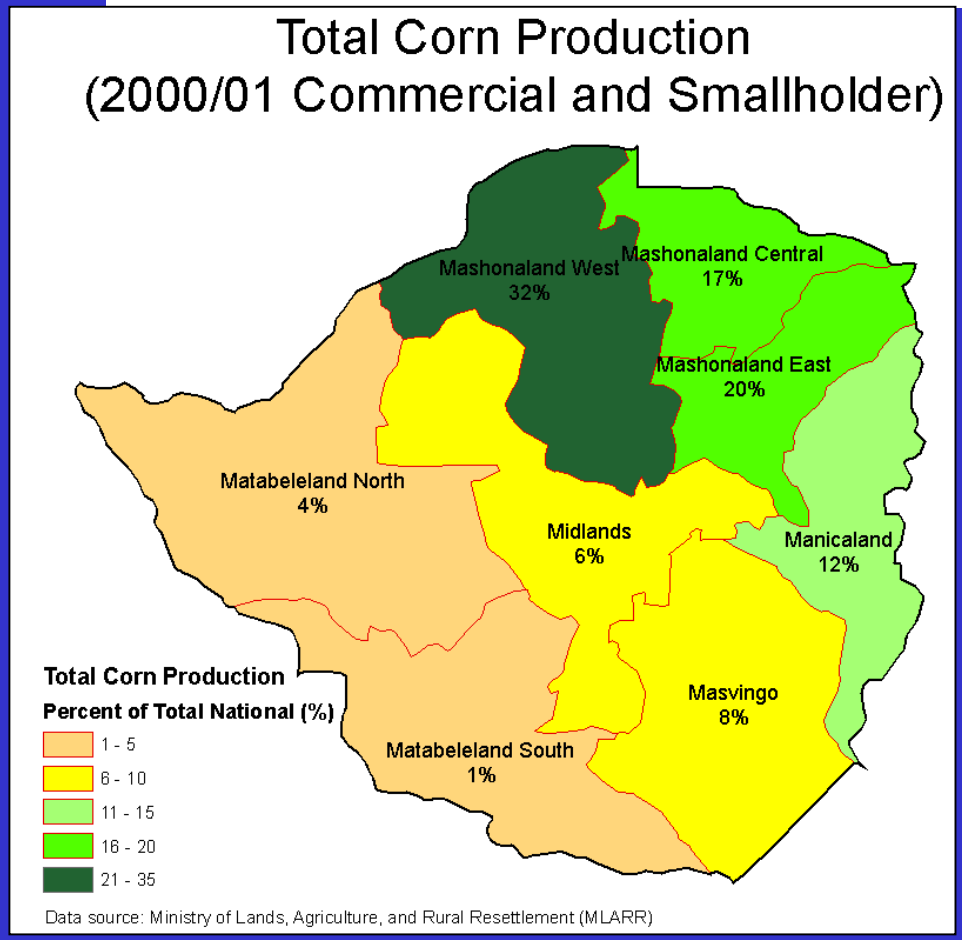
- Basic layers (FAO, WFP, UNOSAT, FEWS Net, USGS, ESA )
- Food Security Profiling (WFP, FEWS Net)
- Food Security Monitoring (WFP, FAO, GMFS and USGS)
- Application of new technologies and techniques to support field assessment (FAO, WFP, USDA)
- Disaster assessment and operational planning (CHARTER, RESPOND, USGS, others)
- Data sharing Spatial Information Environment SIE (WFP, FAO)

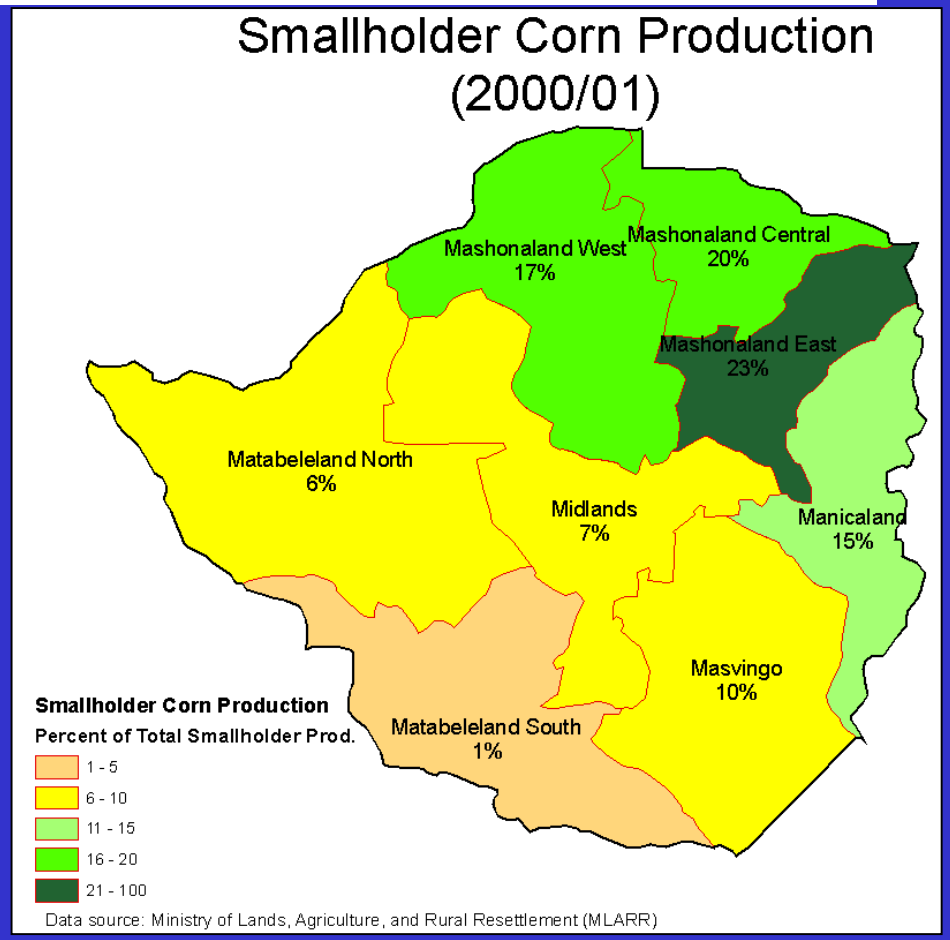
# Example - agricultural monitoring

Key steps

1. Background information
   - Cropping patterns, historical yield and production estimates, LGP (Length of Growing Periods), agronomic information
2. Estimation of area cultivated
   - Use historical data and any other available info
   - GMFS and USGS developing two different approaches
3. Estimation of yield (the WRSI model of USGS)
   - Rainfall estimation as in put to the WRSI model (Start of Season and End of Season)
   - Run the WRSI model through out the growing season
   - Vegetation monitoring using MODIS to compare with other years

# Baseline Info: Production by Province (2000/01)

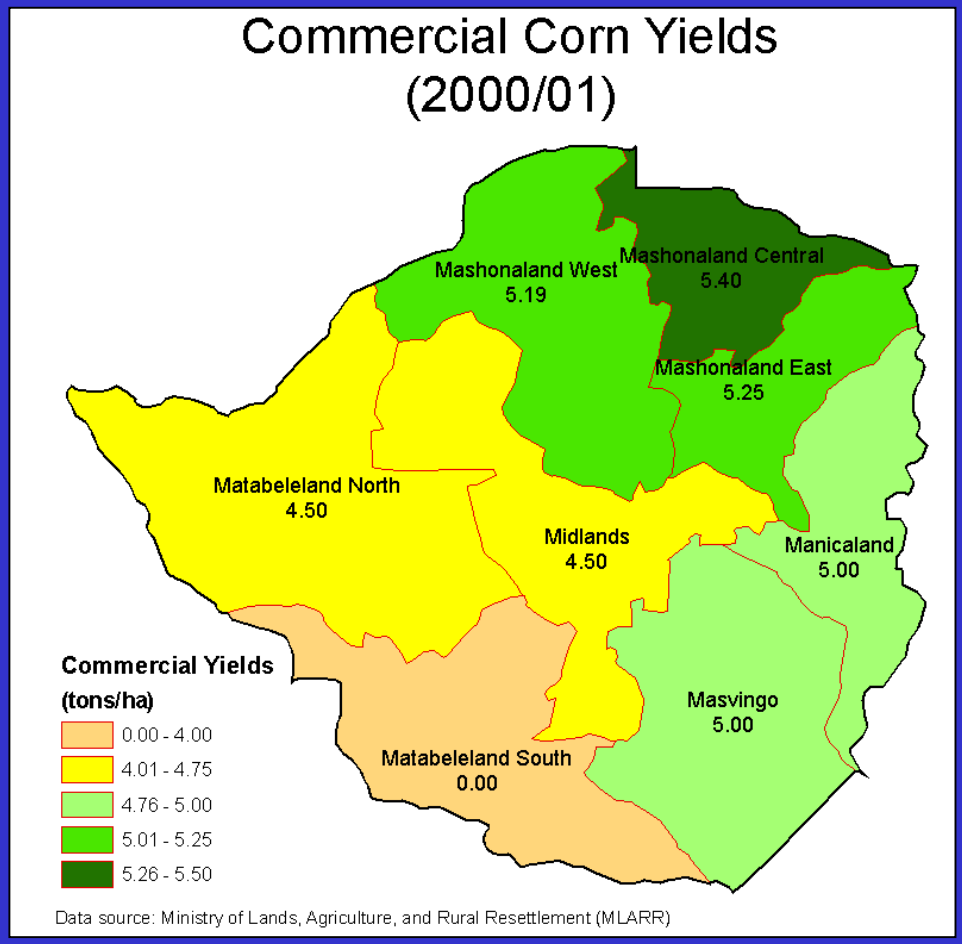


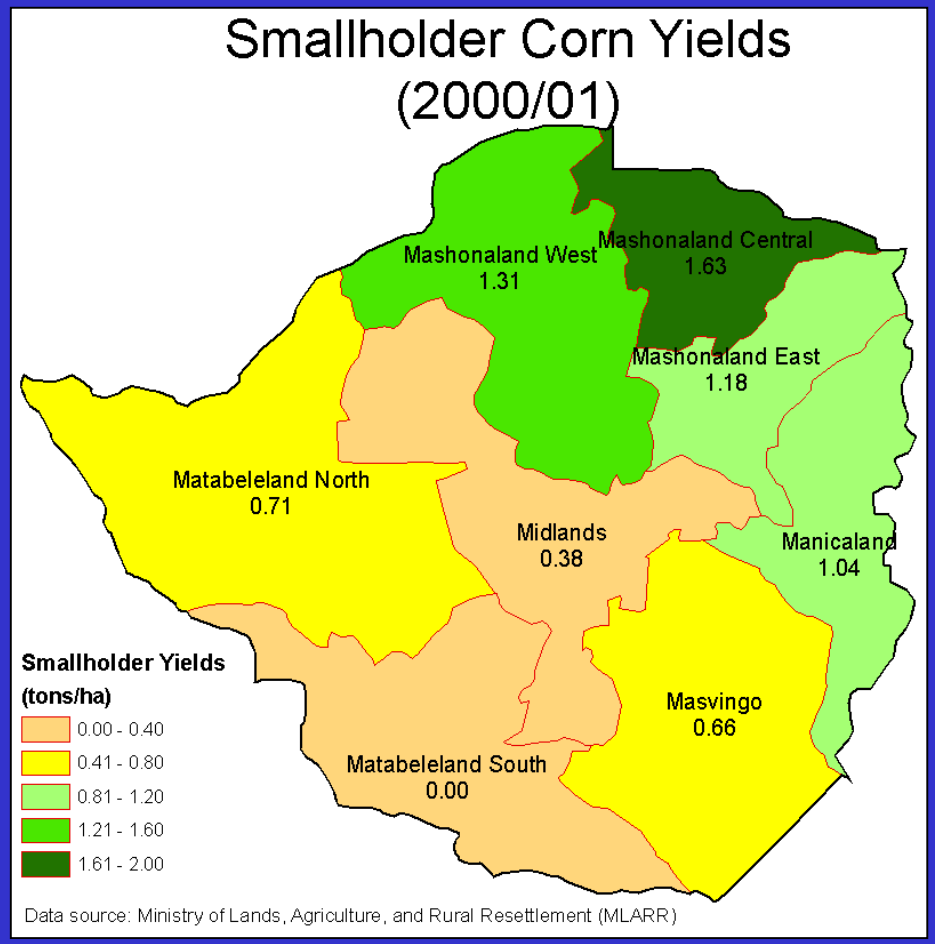




Comments: Greatest production in the northeast and least production in the southwest.

Data source: Ministry of Lands, Agriculture, and Rural Resettlement (MLARR)

# Baseline Info: Corn Yields by Province (2000/01)



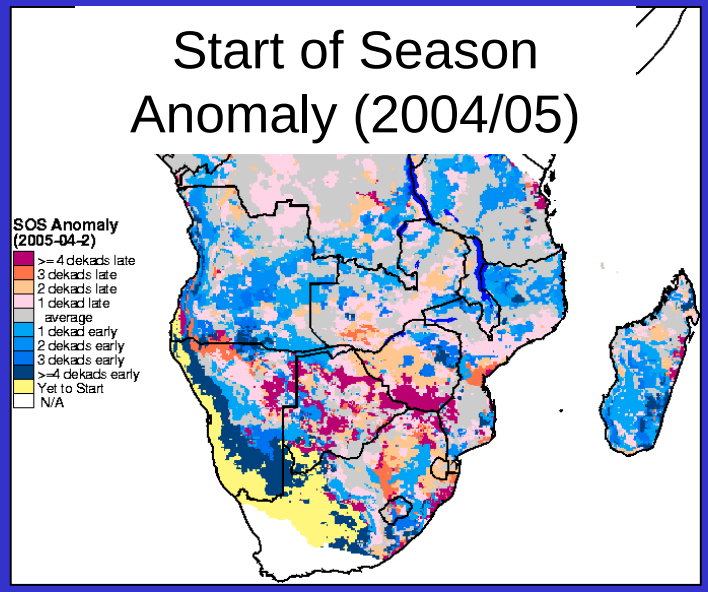




Comments: Greatest yields in the northeast and lowest yields in the southwest.

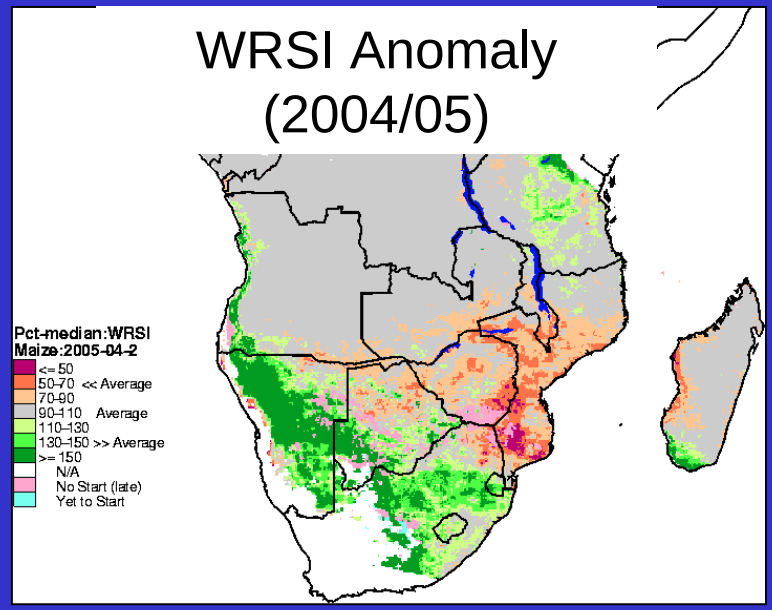
Data source: Ministry of Lands, Agriculture, and Rural Resettlement (MLARR)

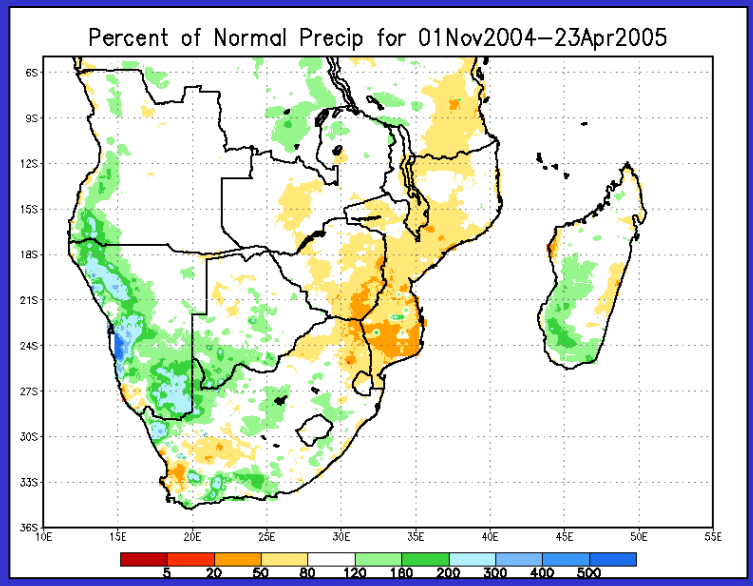
# Four Operational Spatial Products Utilized plus 250-meter MODIS/NDVI time series from 2001-present

## Start of Season Anomaly (2004/05)

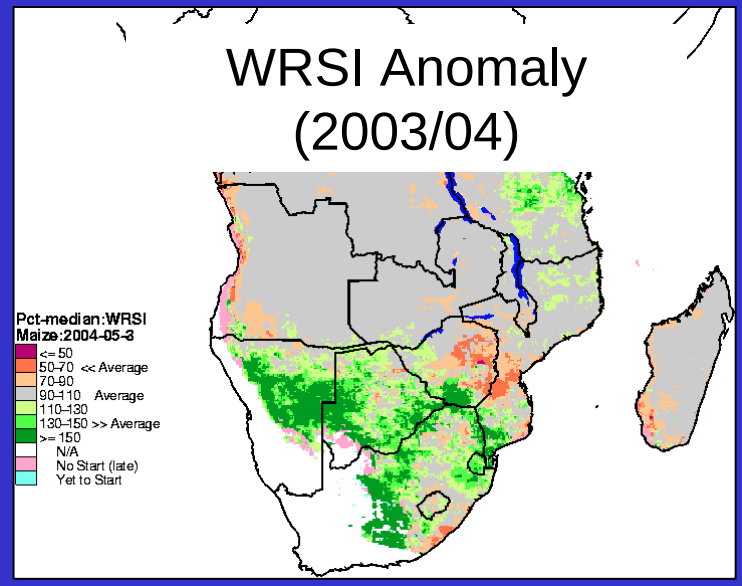



## WRSI Anomaly (2004/05)



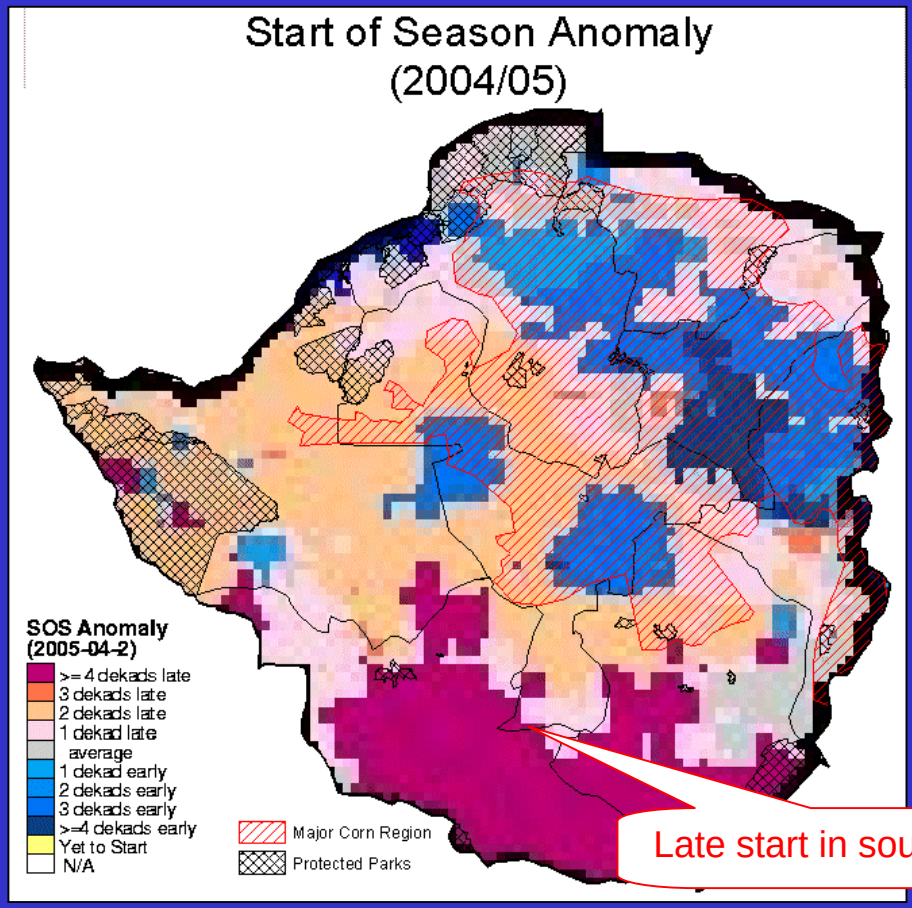




## WRSI Anomaly (2003/04)

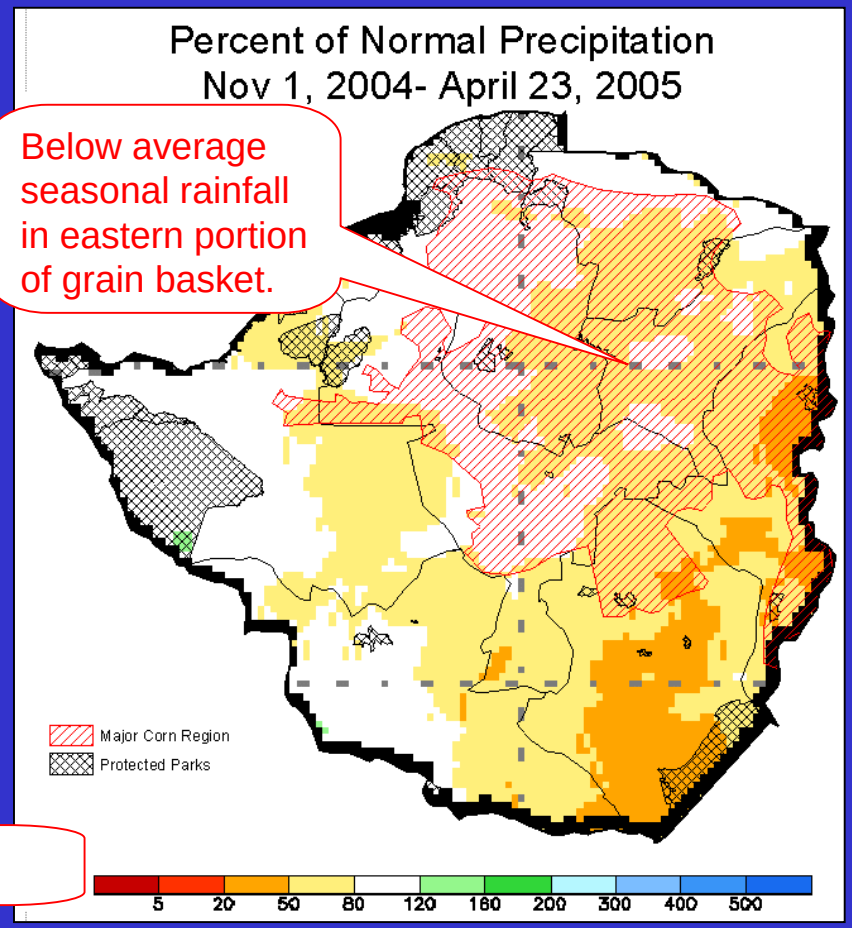



Data sources: http://www.cpc.ncep.noaa.gov/products/african_desk/meteosat/
http://igskmncnwb015.cr.usgs.gov/adds/

# Zoom into Zimbabwe for Seasonal Precipitation Analysis

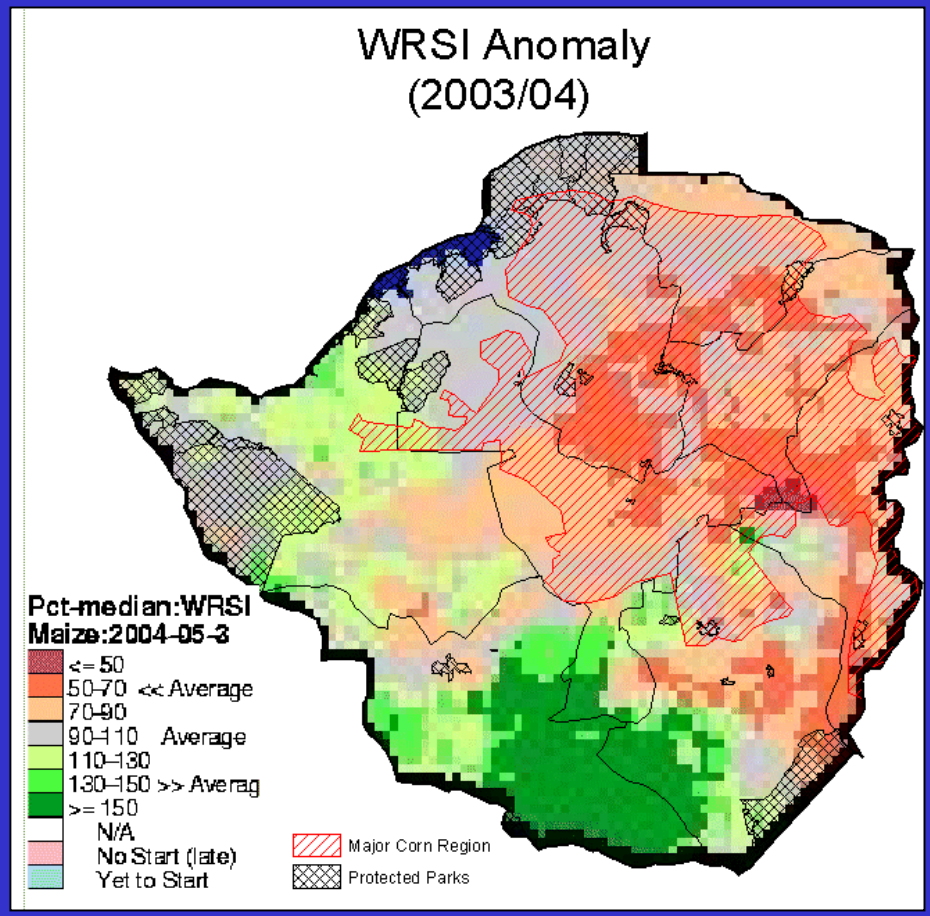


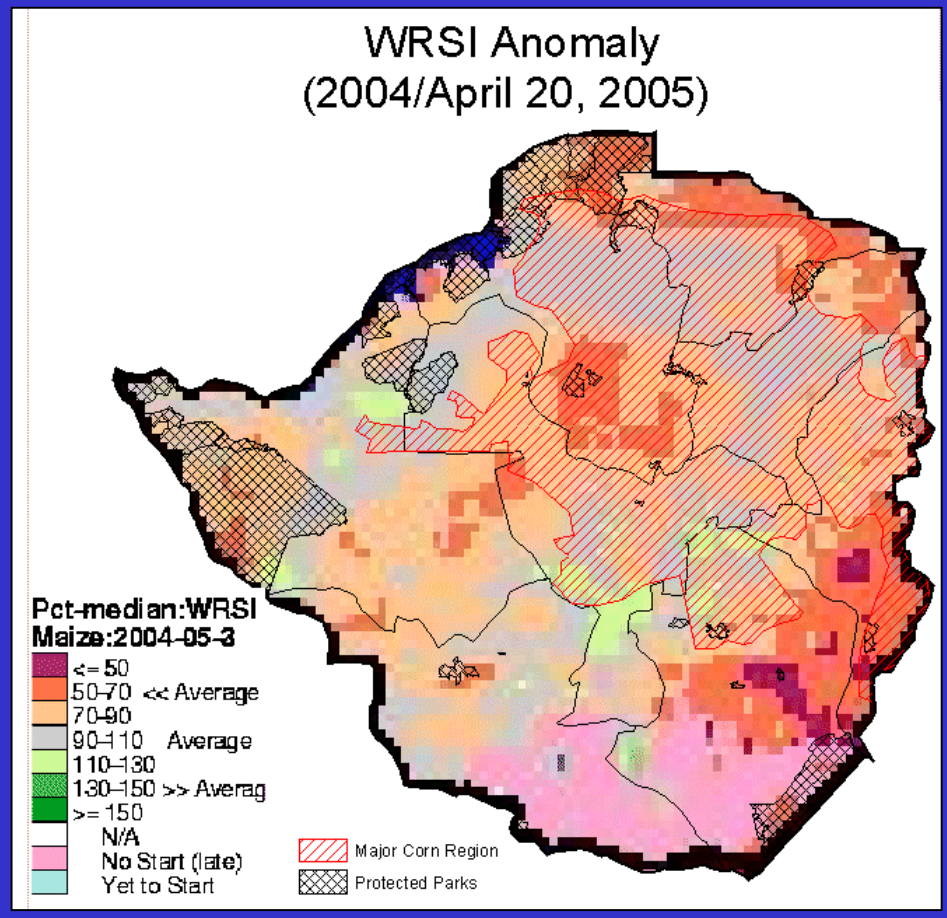

Data source: http://igskmncnwb015.cr.usgs.gov/adds/




Data source: http://www.cpc.ncep.noaa.gov/products/african_desk/meteosat/

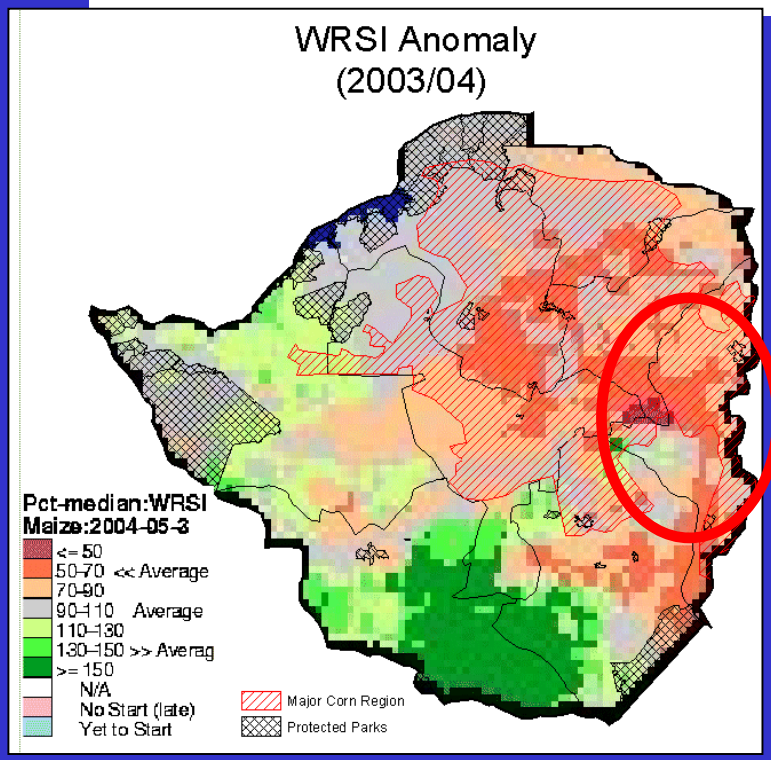
# Zoom into Zimbabwe for WRSI Anomalies for this year and last year

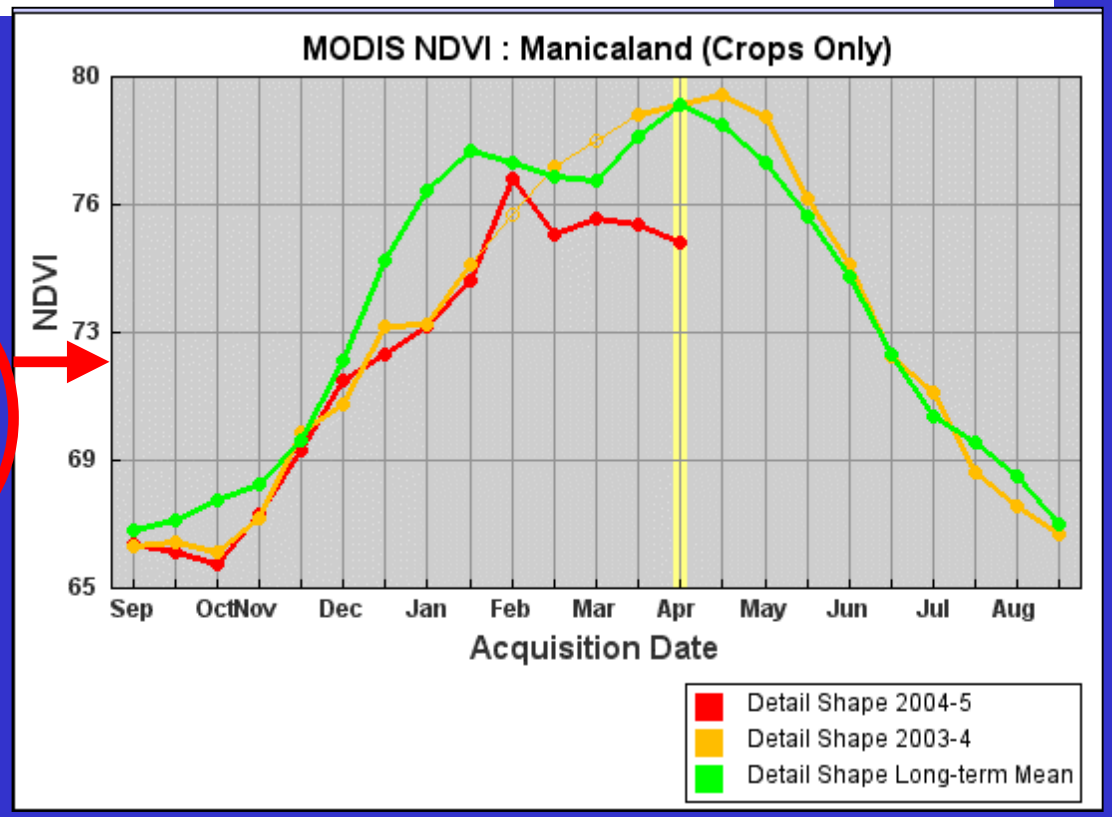


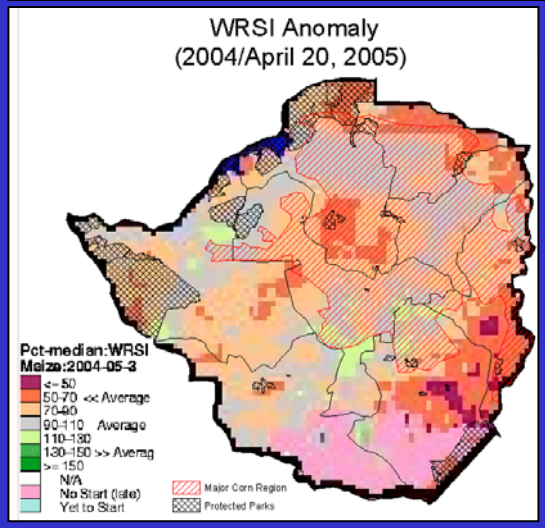




Data source: http://igskmncnwb015.cr.usgs.gov/adds/

# Manicaland: 250-m NDVI / MODIS Time Series



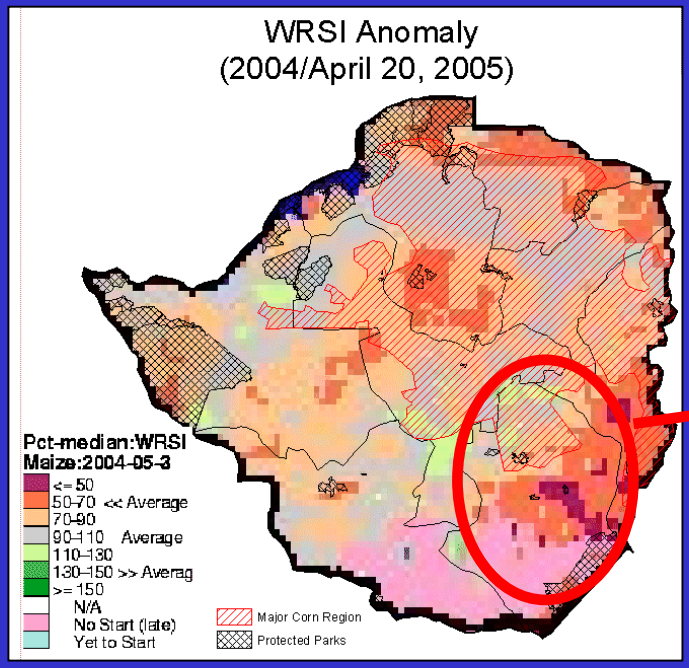



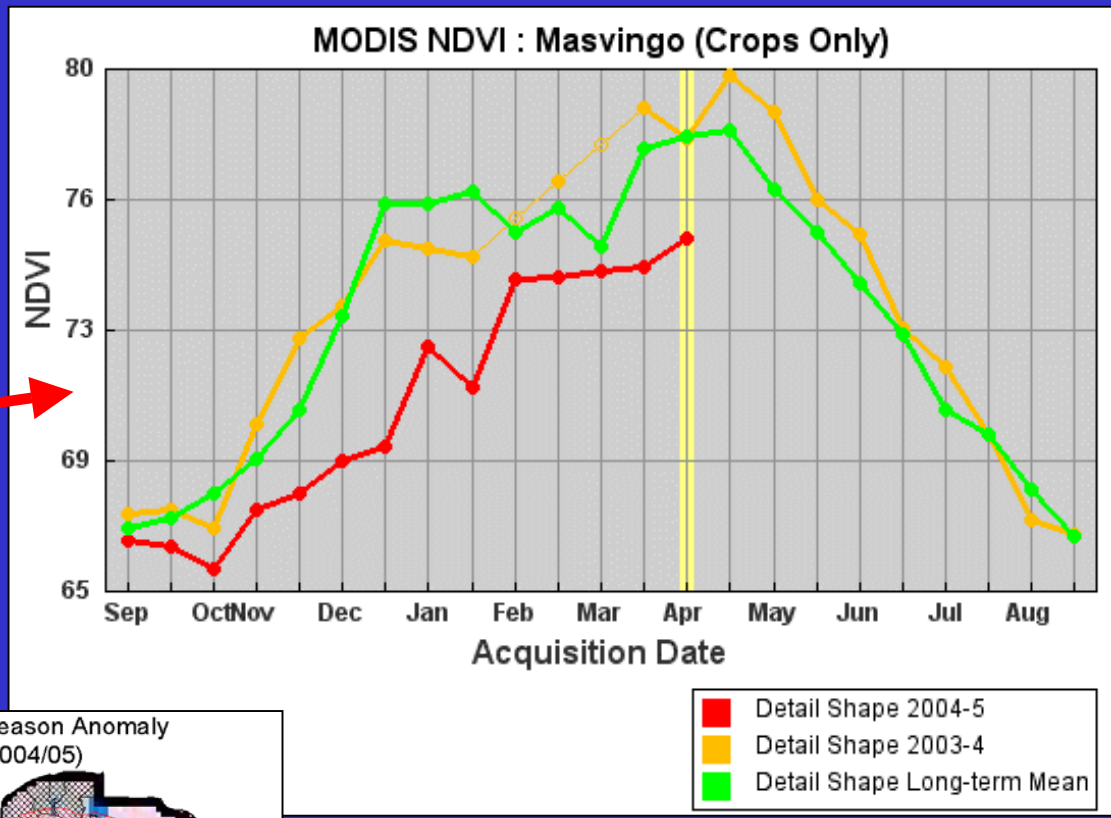



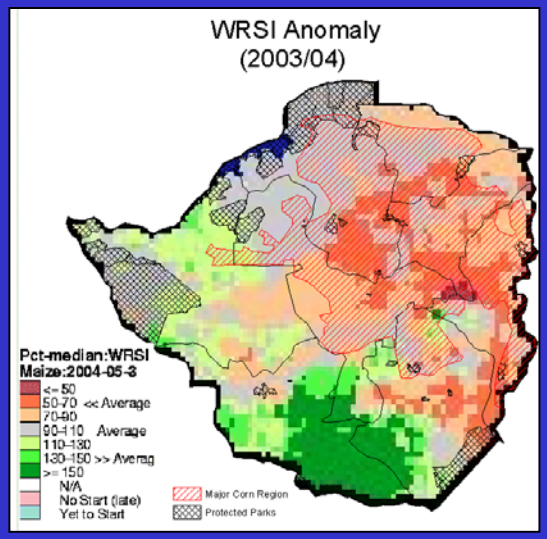

Data Source: 250-m NDVI/MODIS Time Series:
http://pekko.geog.umd.edu/usda/beta/

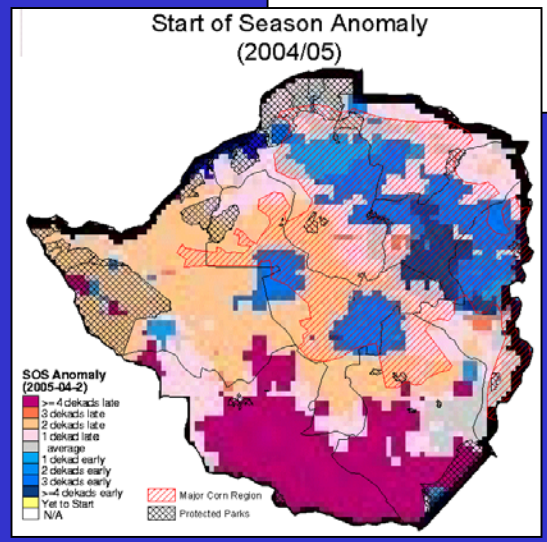
Comments: WRSI & MODIS/NDVI time series indicate below average yields and crop failure in some regions.

# Masvingo: 250-m NDVI/MODIS Time Series



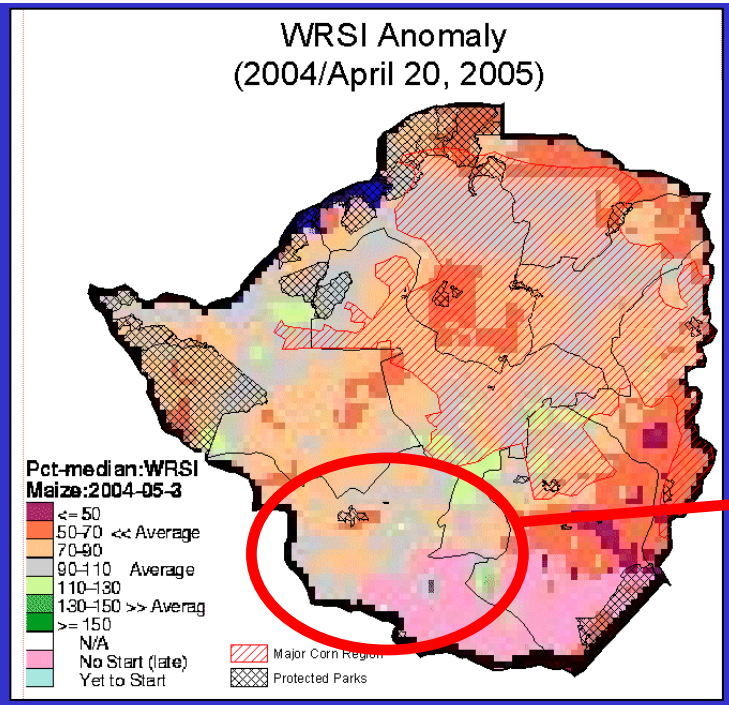



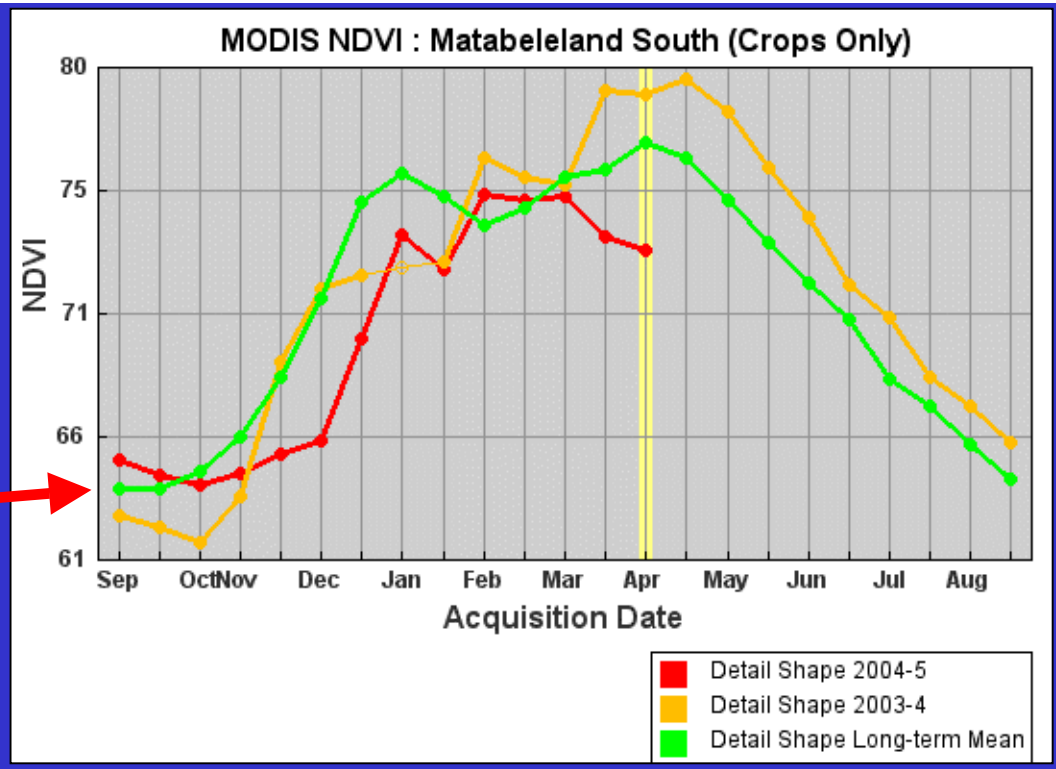



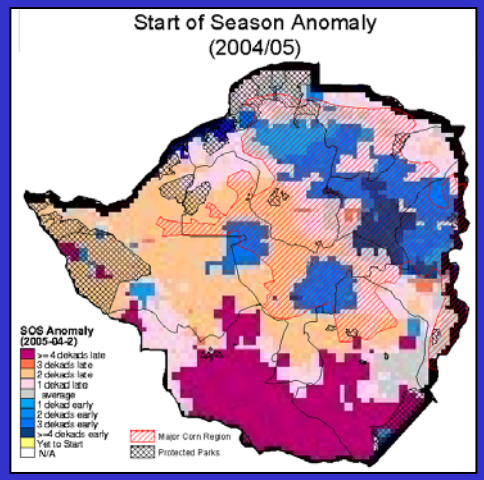

Data Source: 250-m NDVI/MODIS Time Series: http://pekko.geog.umd.edu/usda/beta/

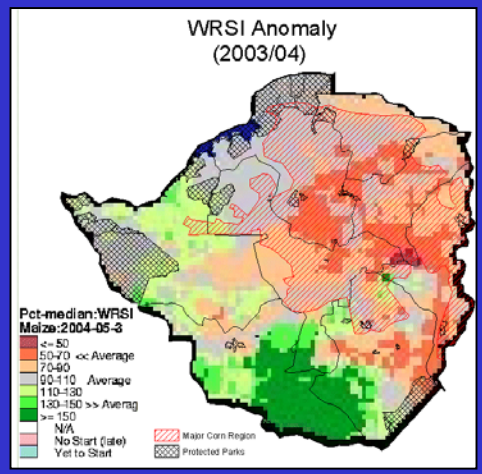
Comments: Small production with SOS & MODIS/NDVI indicating delayed SOS; and WRSI & MODIS/NDVI indicating below average yields.

# Matabeleland South: 250-m NDVI/MODIS Time Series



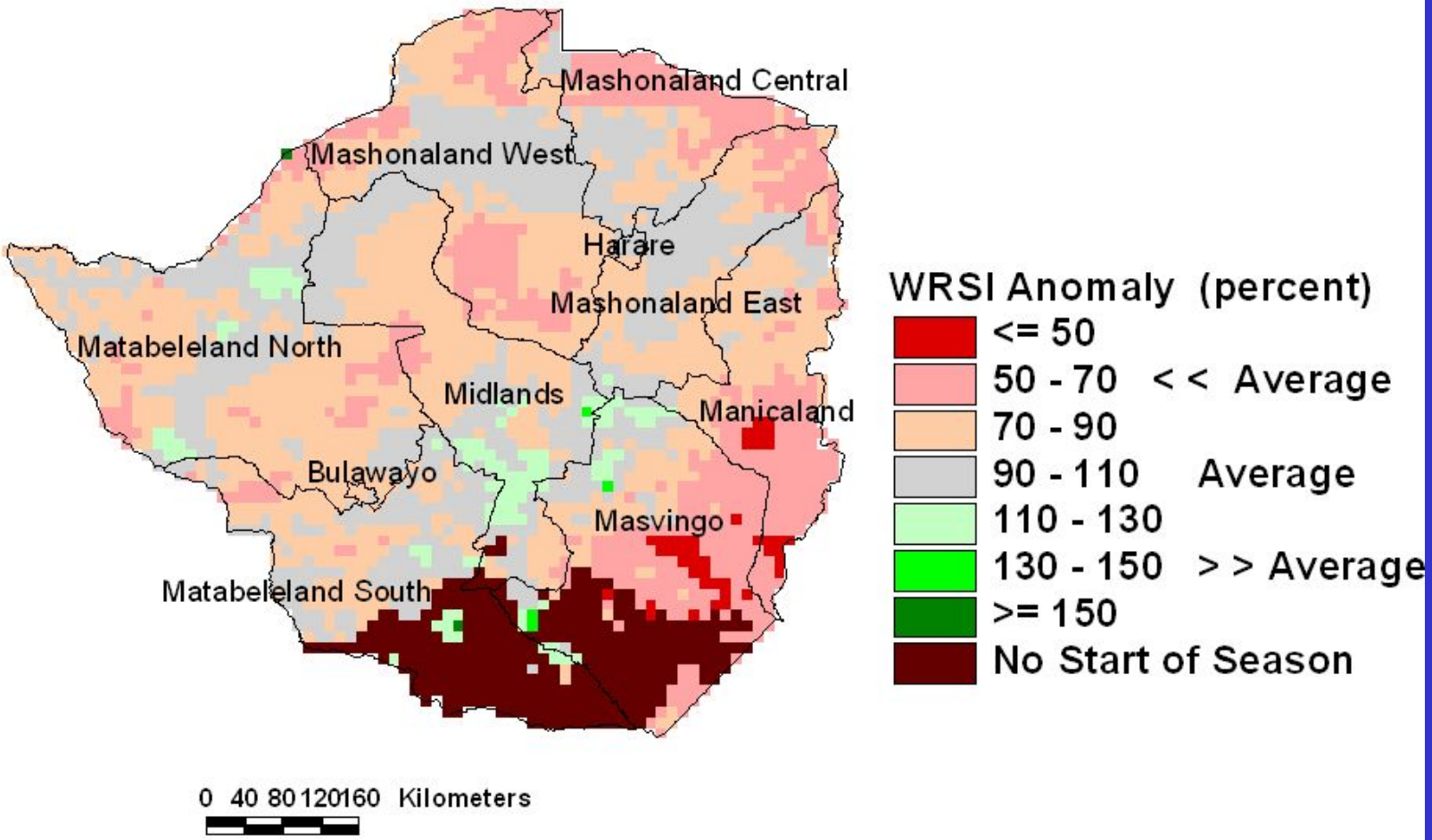




Data Source: 250-m NDVI/MODIS Time Series:
http://pekko.geog.umd.edu/usda/beta/

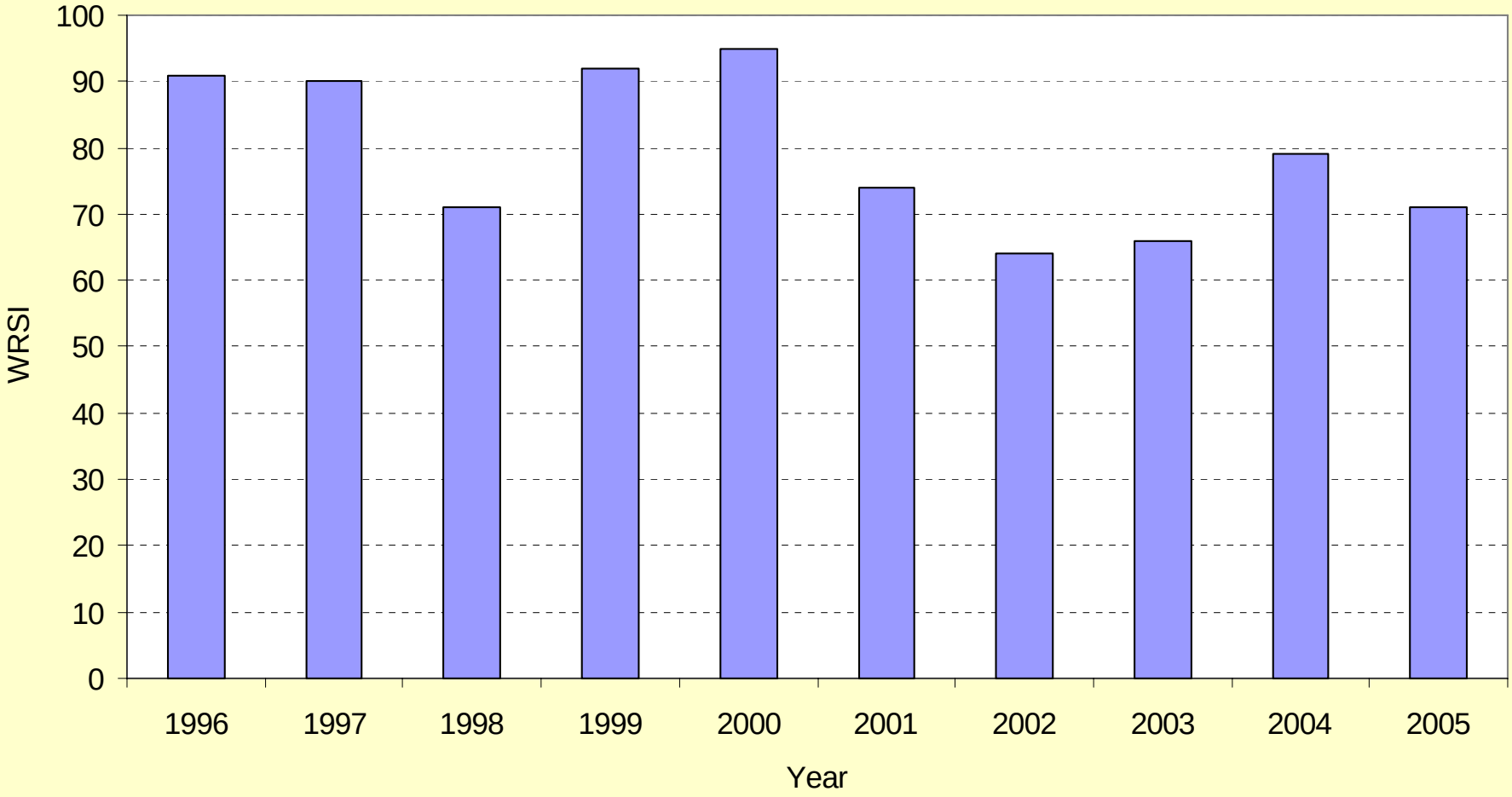
Comments: Small production in province; SOS & MODIS indicate late SOS; WRSI & MODIS/NDVI indicate below avg. yields.

# 2005 WRSI Anomaly as a Percentage of the long-term expected WRSI (Zimbabwe 2004/2005 growing season)



ZIMBABWE

Country-wide average End-of-Season WRSI time series (1995/96 till 2004/2005)



# Conclusion

- There is a role for space technology to contribute to disaster prevention and humanitarian response
- There is a need for a multi-agency and multi-sector framework on emergency response and preparedness strategy
- Need for enhancing practical collaboration and cooperation
- Build a culture of data sharing at all levels
- The various Space Agencies are committed to contribute to disaster reduction – Let us take the opportunity

# Thank you

# Pre-crisis data sets (Basic layers)

## 1. Basic layer mapping

- Administrative maps, demographic maps, socio-economic maps, nutrition maps
- Infrastructure maps (roads, airports, storage facilities, markets, physical accessibility)
- Land use land cover maps, soil maps, elevation maps
- Climatic maps (agro-ecological zones), farming systems

## 2. Disaster risk and vulnerability mapping

- Maps of areas affected by extreme weather evens (droughts, floods, hurricane)
- Conflict maps (tribal maps)
- Health risk maps (malaria, HIV AIDS)

# Food Security Monitoring (EO)

- Weather and climate - from remote sensing and ground observations to provide:
  - Early indication of production shortage
  - Magnitude of shocks and disasters
- Vegetation – from remote sensing and crop development reports to identify:
  - Anomalies and their magnitude
  - Impacts of shocks on food security (when combined with vulnerability indicators)
- Climate change - to assess
  - i.e. the impacts of desertification on food security, poverty, coping capacity
  - The impacts of climate change-induced disasters (flooding, drought, etc.)

# Vulnerability Analysis and mapping

**Vulnerability Analysis**

- to identify where and which people are food insecure, the nature of their problem, factors that would influence their food security, and possible interventions

**Food Security and Vulnerability Profile (FSVP)**

- to identify basic patterns of food security for various population groups over time and analyse mechanisms that cause food security conditions to change

**Current Vulnerability Assessment (CVA)**

- to describe and classify the degree to which populations are vulnerable to food insecurity during the current consumption period

# Geo spatial applications for remote assessment

1. **Baseline mapping** – land use, land cover, agro-ecological zones, cropping patterns, dominant crops
2. **Agricultural Monitoring -** Area cultivated, vegetation status, Rainfall and yield indicators
3. **Disaster assessment** – flooded area, drought affected area, etc
4. **Infrastructure assessment** for humanitarian response – roads, airports, railways, markets

# Collaboration and Partnerships at international level

- Basic layers (FAO, WFP, FEWS Net, USGS, NOAA, NASA, GMFS, RESPOND and ESA )
- Food Security Profiling (WFP, FEWS Net)
- Food Security Monitoring (WFP, FAO, GMFS and USGS)
- Application of new technologies and techniques to support field assessment (FAO, WFP, USDA)
- Disaster assessment and operational planning (CHARTER, RESPOND, USGS, others)
- Data sharing Spatial Information Environment SIE (WFP, FAO)

# Main Objectives of VAM SIE

**(a) Improved food security data collection**

- Create a standardized but decentralized protocols for data collection and archiving
- Enhance the collaboration between national institutions, WFP country offices and other UN agencies on food security data management
- Enhance data exchange and access via INTERNET
- Support geo-referencing of food security related databases when possible

**(b) Improved food security analysis**

- Introduce and integrate geo-spatial techniques for food security/vulnerability analysis
- Use the various analytical skills of WFP staff distributed in the various country offices by using the INTERNET

**(c) Improved presentation and dissemination**

- Enhance access to cartographic products from a variety of sources
- Improve information dissemination using the INTERNET
- Introduce dynamic mapping service at RBs and HQ