



Government Partnerships: USDA Foreign Agricultural Service and National Geospatial Intelligence Agency

USDA Foreign Agricultural Service and National Geospatial Intelligence Agency, Partnership in Iraq

Iraq Operational Agricultural Monitoring Project:

United States Department of Agriculture (USDA)

Foreign Agricultural Service (FAS)

Office of Global Analysis (OGA)

International Production Assessment Division (IPAD)

Presenter:

Robert Tetrault

FAS-OGA

Satellite Imagery Archive

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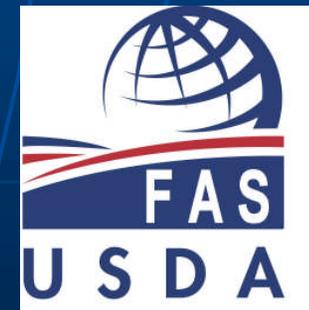
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Supporting USDA/FAS/OGA/IPAD





Agenda

- **Partnership Description**
 - Data sharing: NGA joins with existing FAS and NASA partnership.
- **Project Description, Iraq**
 - Iraq suffered a drought in marketing year 2008/09--the same year as project.
 - MY2008/09 wheat production was 1.304 million tons, down 44% from previous year.
 - MY2008/09 = wheat crop harvested May/June 2008.
- **Results**
 - Accurate crop production estimates delivered quickly.
- **Partnership Benefits and Challenges**



Government Partnership

- **NGA provides high spatial resolution commercial satellite imagery to FAS.**
 - Field and crop identification accomplished through high resolution imagery.
- **NGA provides funding to FAS so that FAS can purchase medium resolution commercial satellite imagery.**
 - Provincial-wide analysis accomplished by using medium resolution imagery.
- **NASA provides access to low resolution satellite imagery (NASA satellites Terra and Aqua and the MODIS sensor).**
 - Multiple year analysis accomplished by using low resolution imagery.
- ***FAS integrates data and produces a point estimate for crop production.***
 - Crop production estimate is key component of supply and distribution analysis—the official US government estimate of agriculture.



Benefits and Challenges of Using Satellite Imagery

Spatial Resolution	Satellite/Sensor	BENEFITS	CHALLENGES
LOW: 250 to 1000 meters	MODIS SPOT-Vegetation	Multiple year data sets, Daily revisit, Regional view	Can't see agricultural fields
MEDIUM: 56 meters	AWIFS	Provincial-wide view, Revisit ~ 6 days	No time-series data
HIGH: 2.4 meters	QUICKBIRD	Validation of field and crop identification	Small amount of geographical coverage

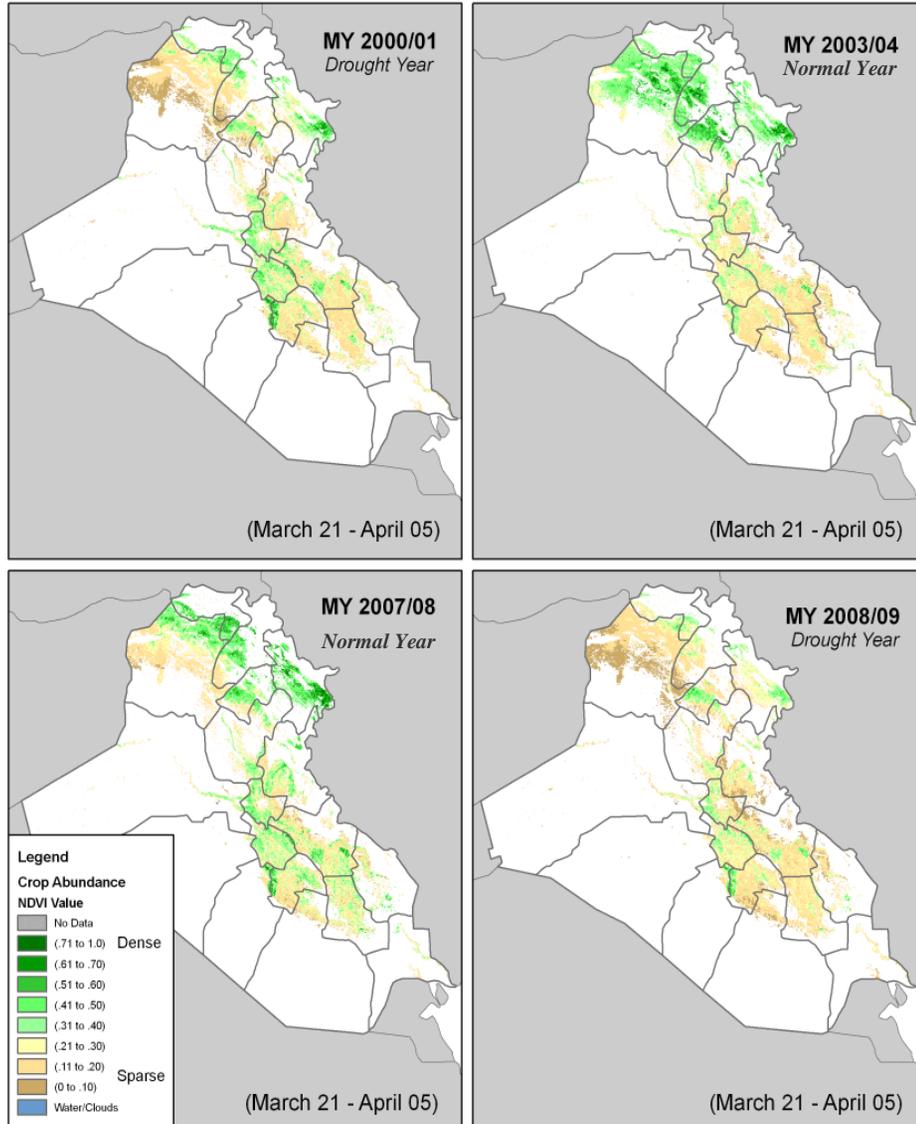
Three-tier agricultural monitoring uses multiple sensors. Rapid data delivery allows for in-season data integration.

Three Tier Agricultural Monitoring: Regional to Local Scale



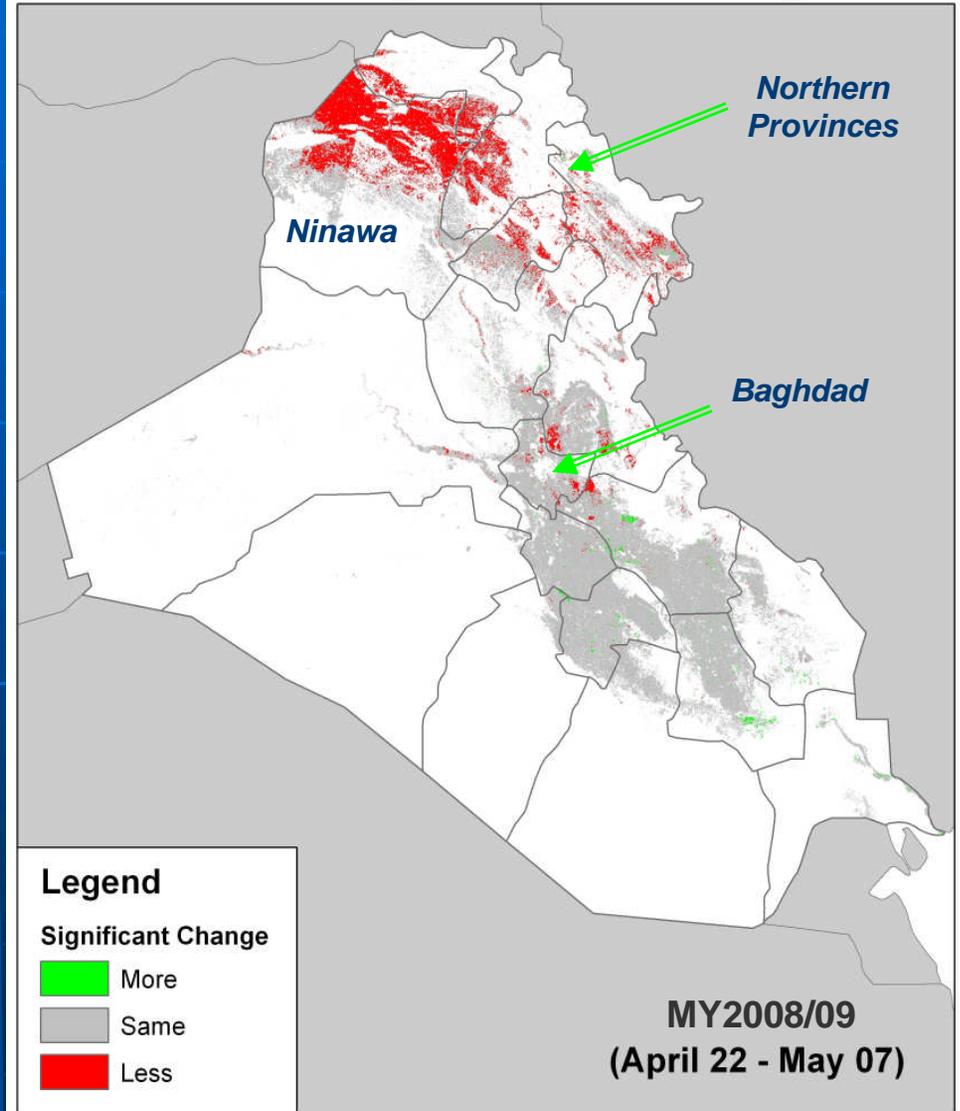
Agro-climatic Data (MODIS NDVI Time Series)

Crop Abundance Image Comparison: MY 2000/01 to MY 2008/09



Data Source: MODIS 250-meter NDVI
Data Provided by: University of Maryland
Supporting: USDA/FAS/OGA
International Production Assessment Division

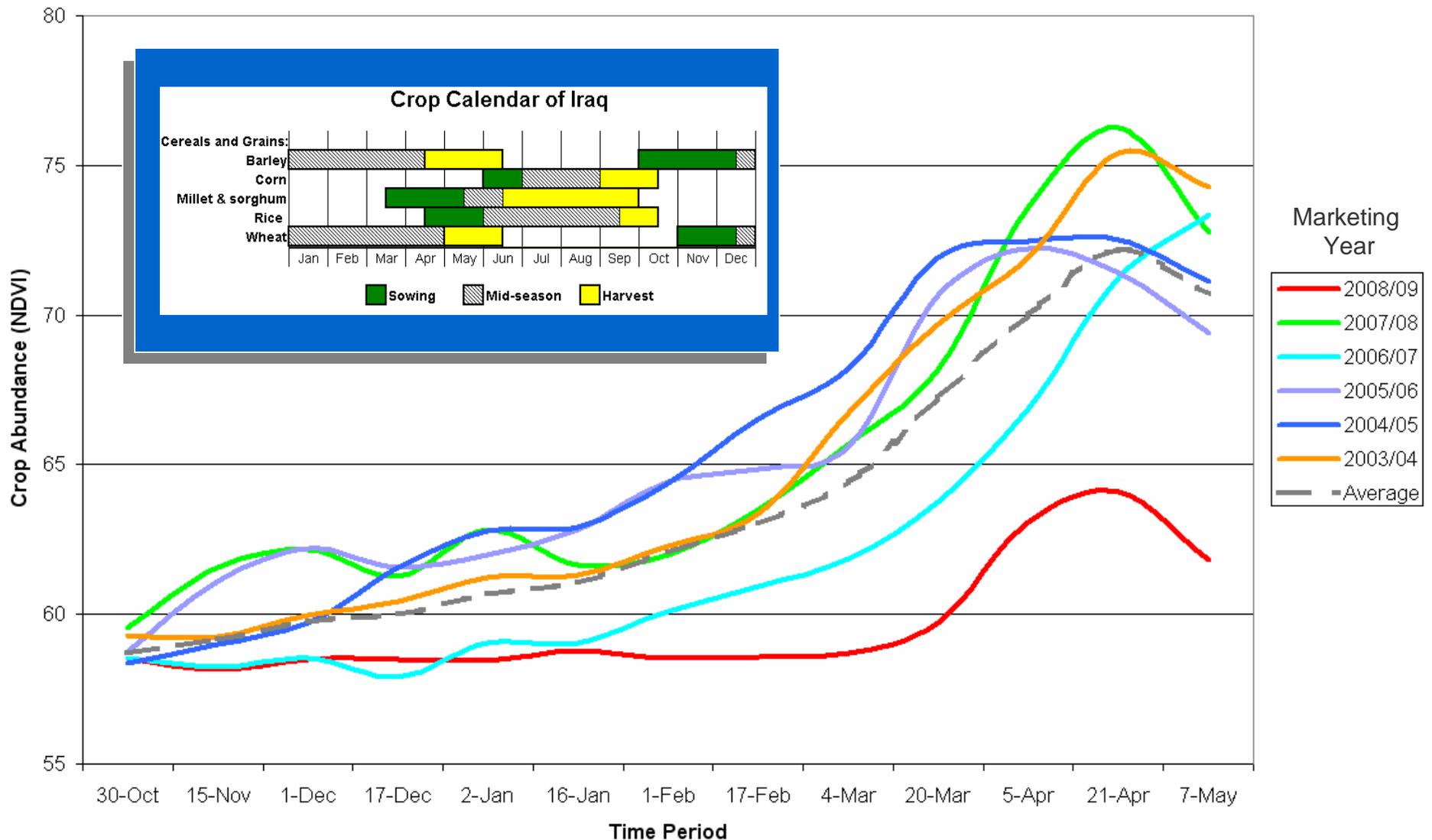
MODIS NDVI: Departure from 9-Year Average



Data Source: MODIS 250-meter NDVI
Data Provided by: University of Maryland
Supporting: USDA/FAS/OGA
International Production Assessment Division

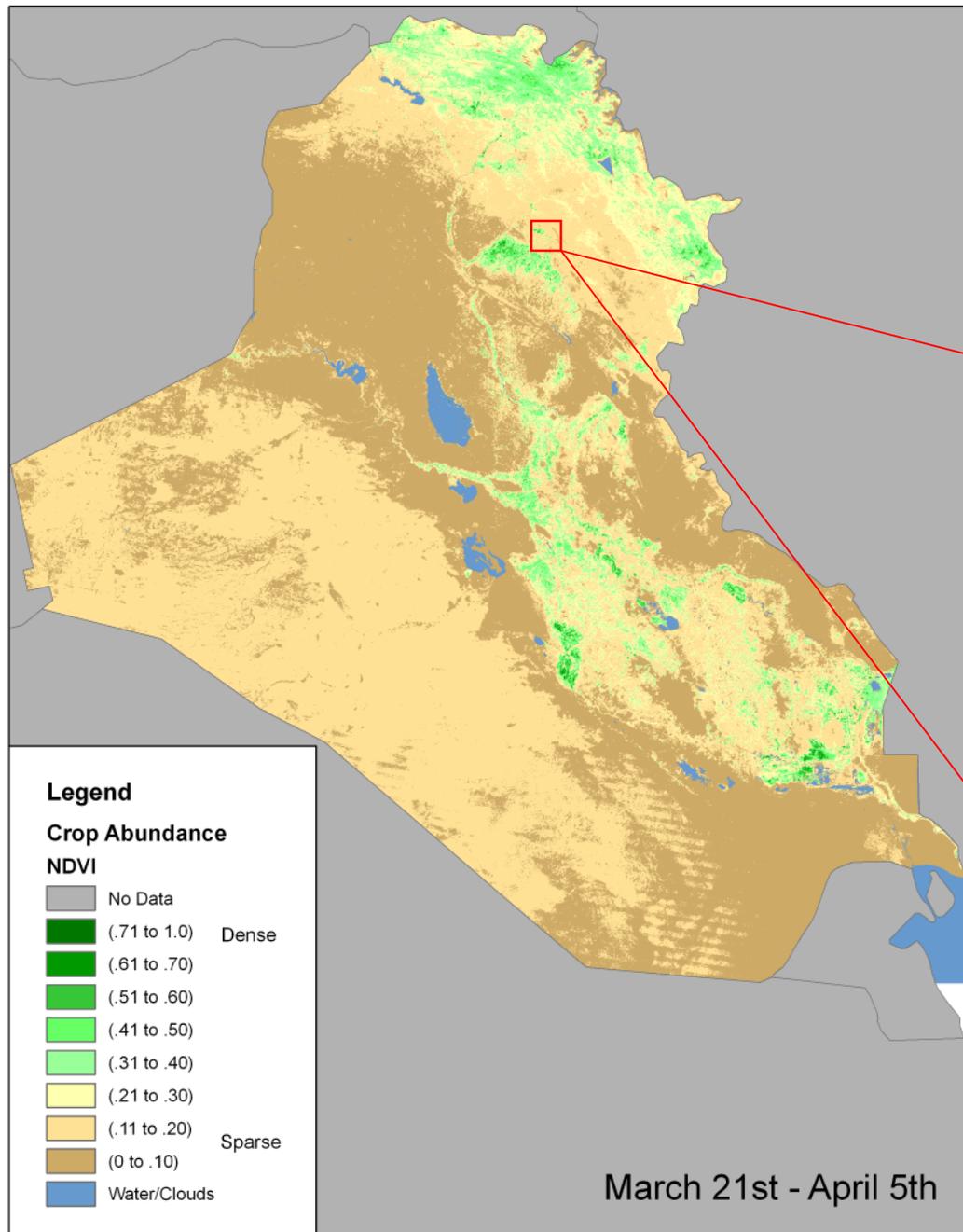
Agro-climatic Data MODIS Normalized Difference Vegetation Index (NDVI)

MODIS NDVI Time Series: Northern Iraq



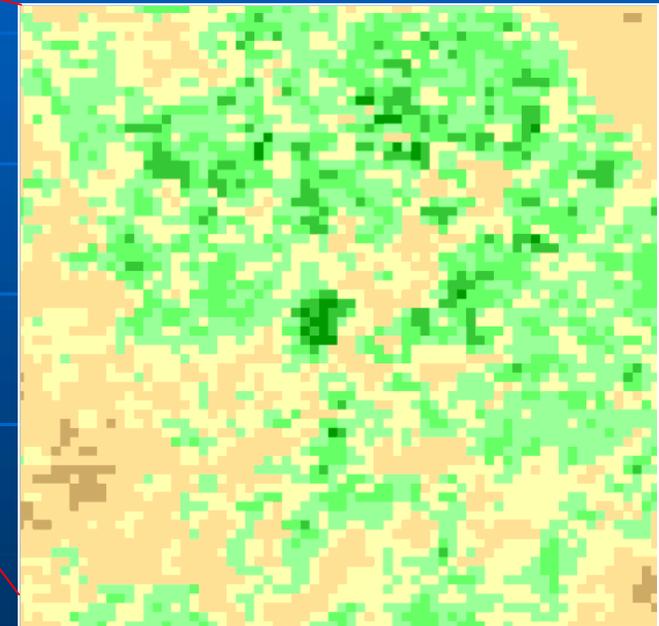


Multiple Year Analysis



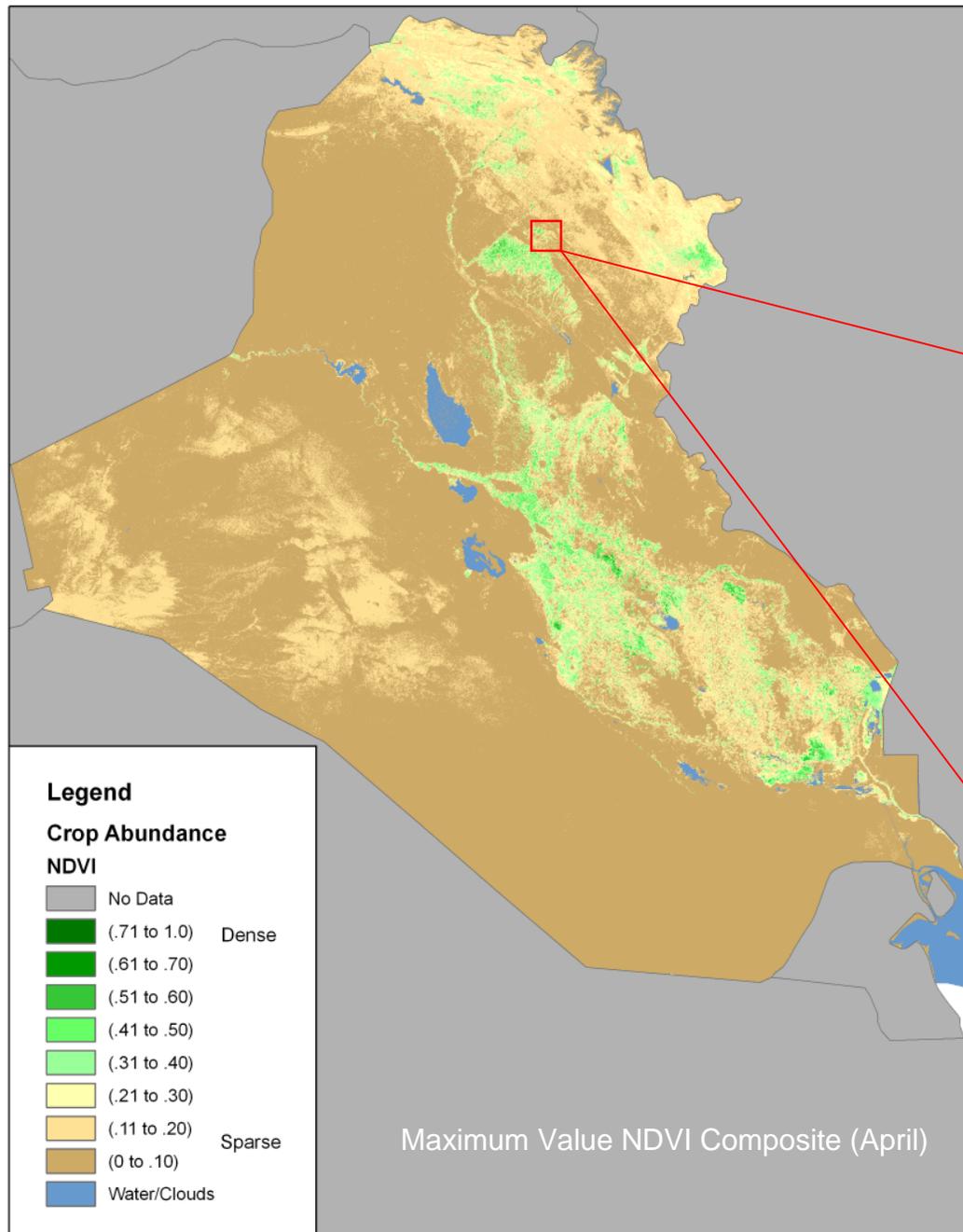
MODIS 250-meter:

1. 1st tier Regional Analysis
2. Time series analysis
3. Coarse spatial resolution
(You Can Not Discern Individual Fields)





Province-wide View



AWiFS 56-meter:

1. 2nd Tier Provincial Analysis
2. Indian government satellite
3. Lacking time series data (2008 - First Year of Collection)

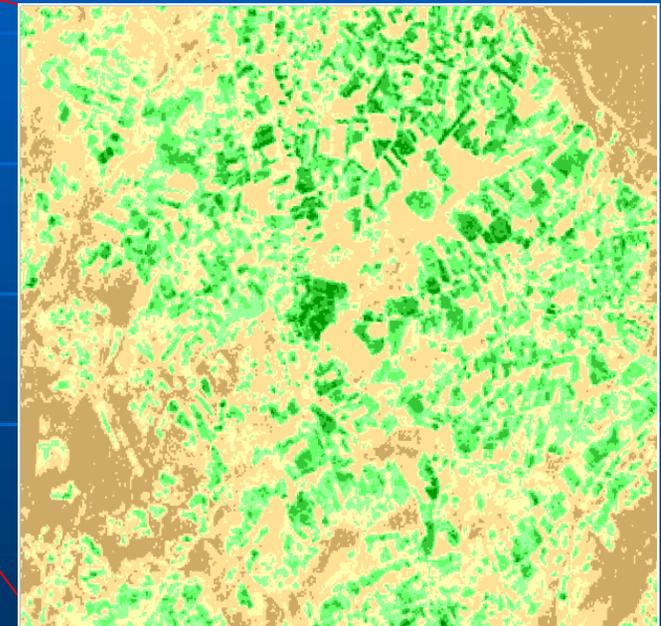
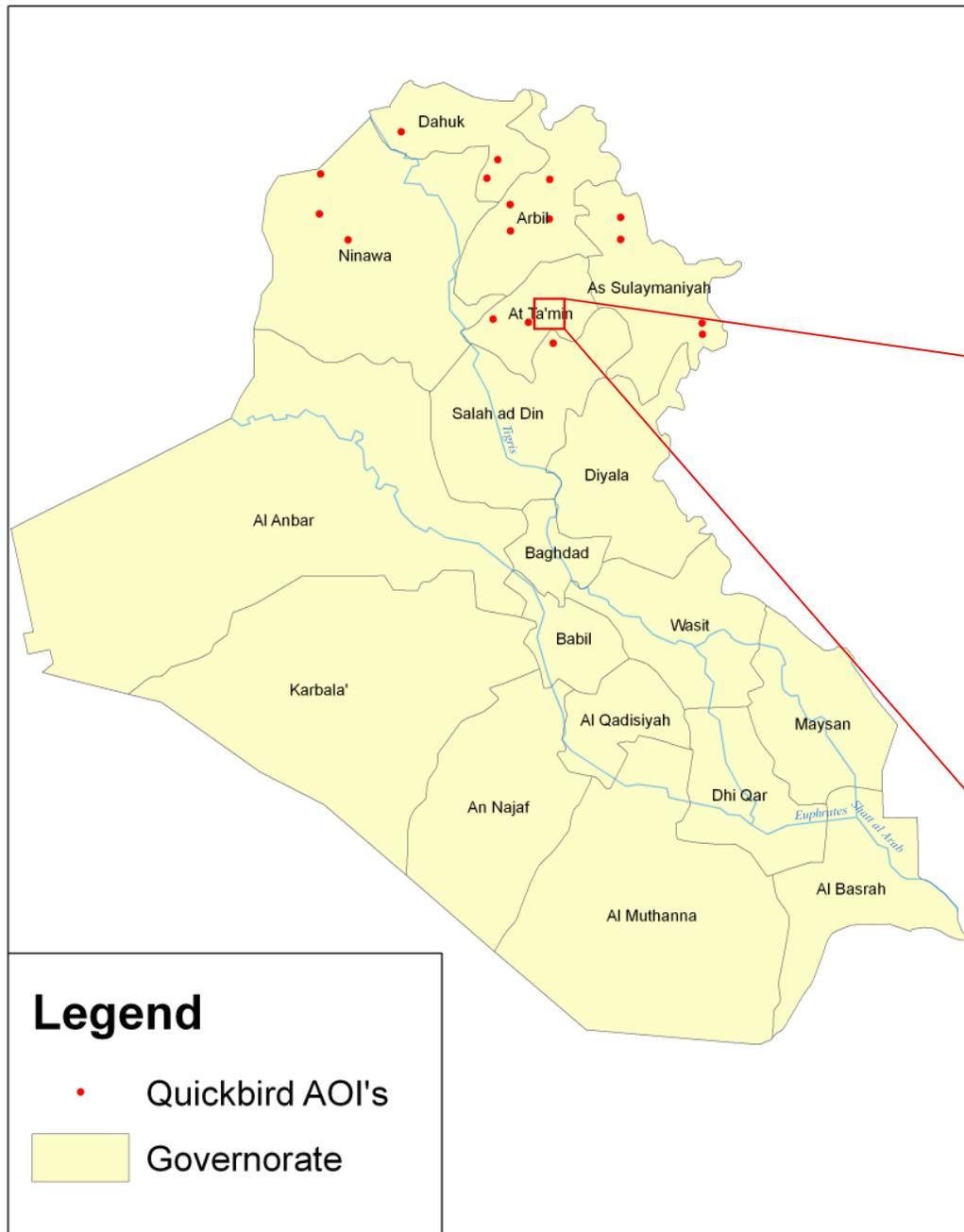




Image-based Ground Truthing



Digital Globe Quickbird

1. 3rd Tier Field Level Analysis
2. Acquired over northern provinces
3. ~ 2.44 meter multispectral
(Limited Coverage – 13km Swath)



**Center
Pivot
Irrigation**

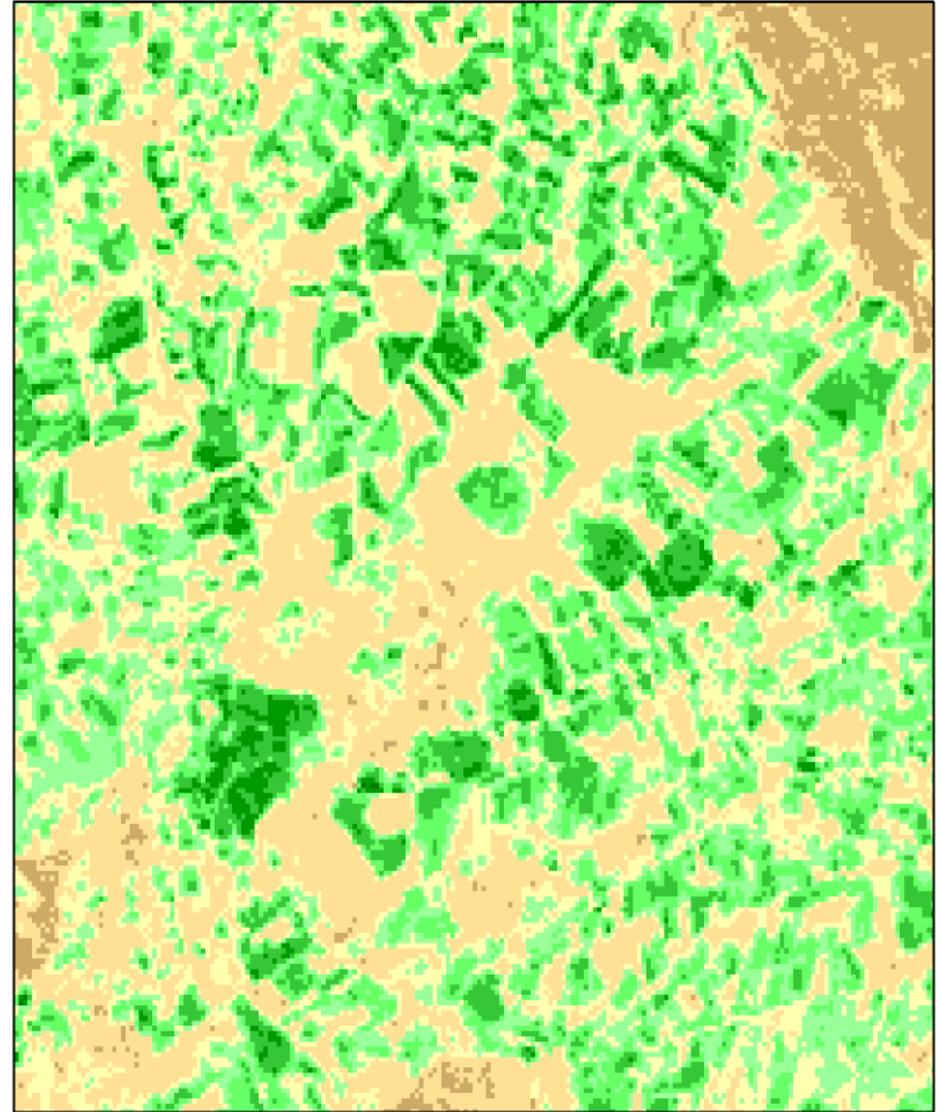


NDVI comparison: Quickbird & AWiFS IRS P-6



Quickbird

April 1, 2008

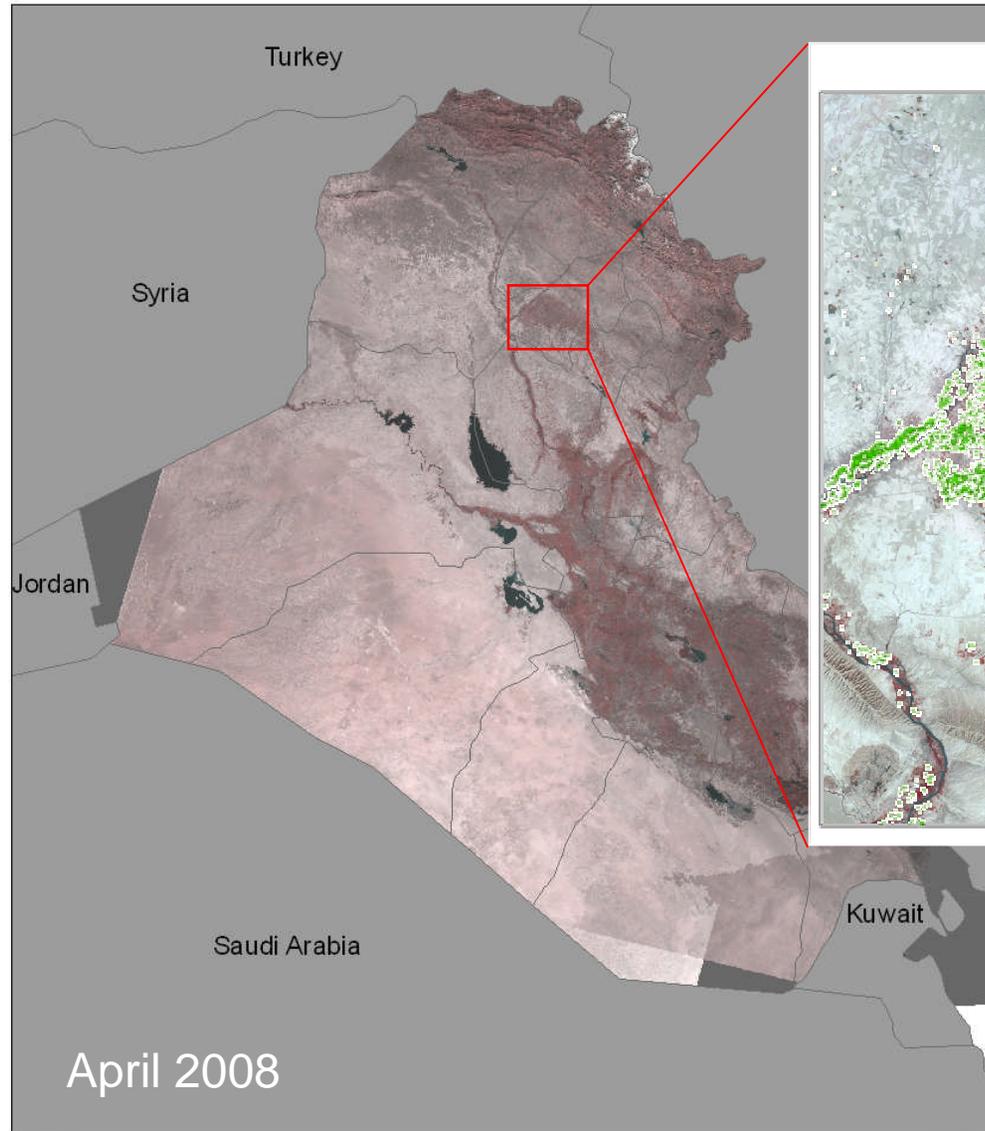


AWiFS IRS P-6

April 3, 2008

Production Statistics: Area

GDA Corp: SASR Mosaic



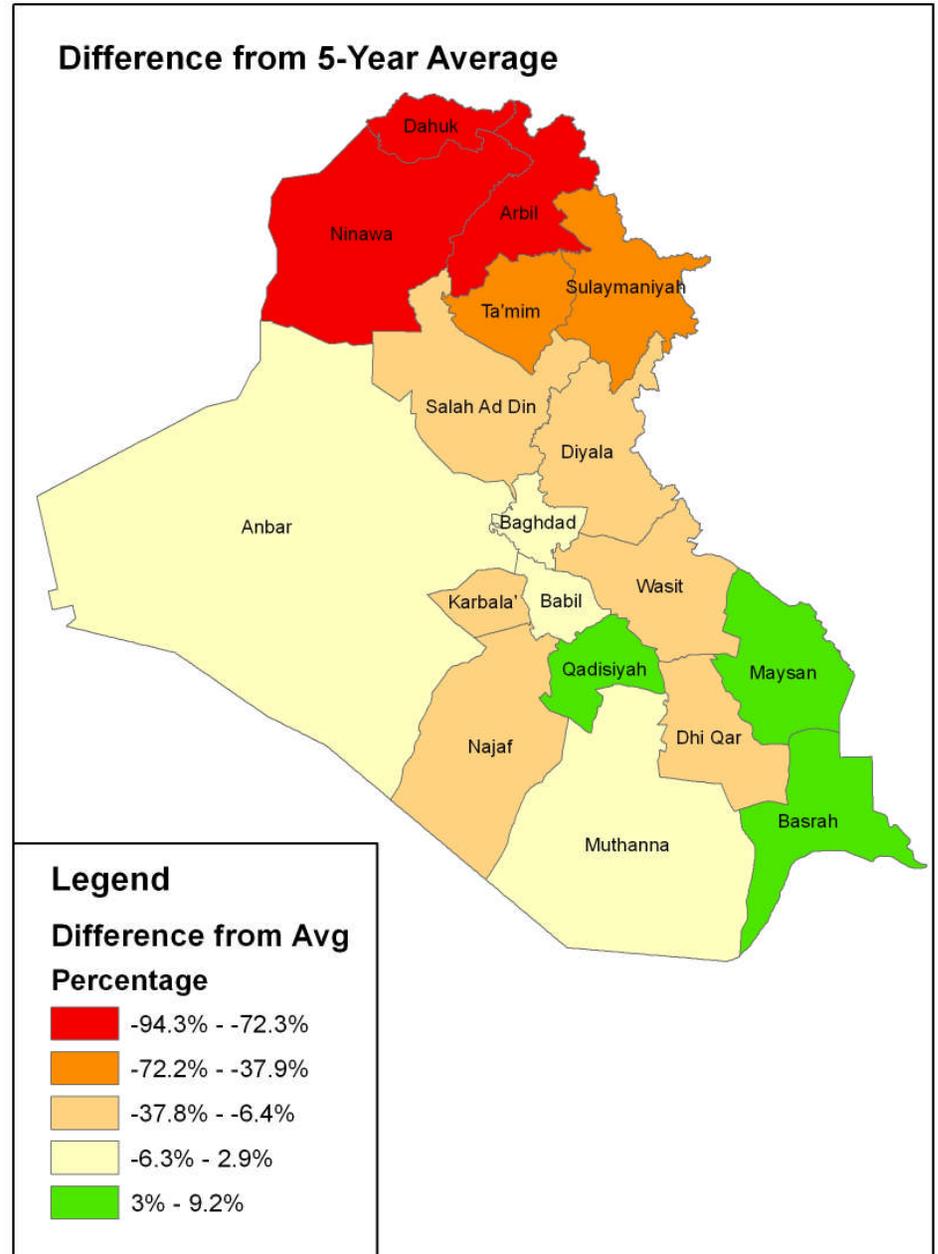
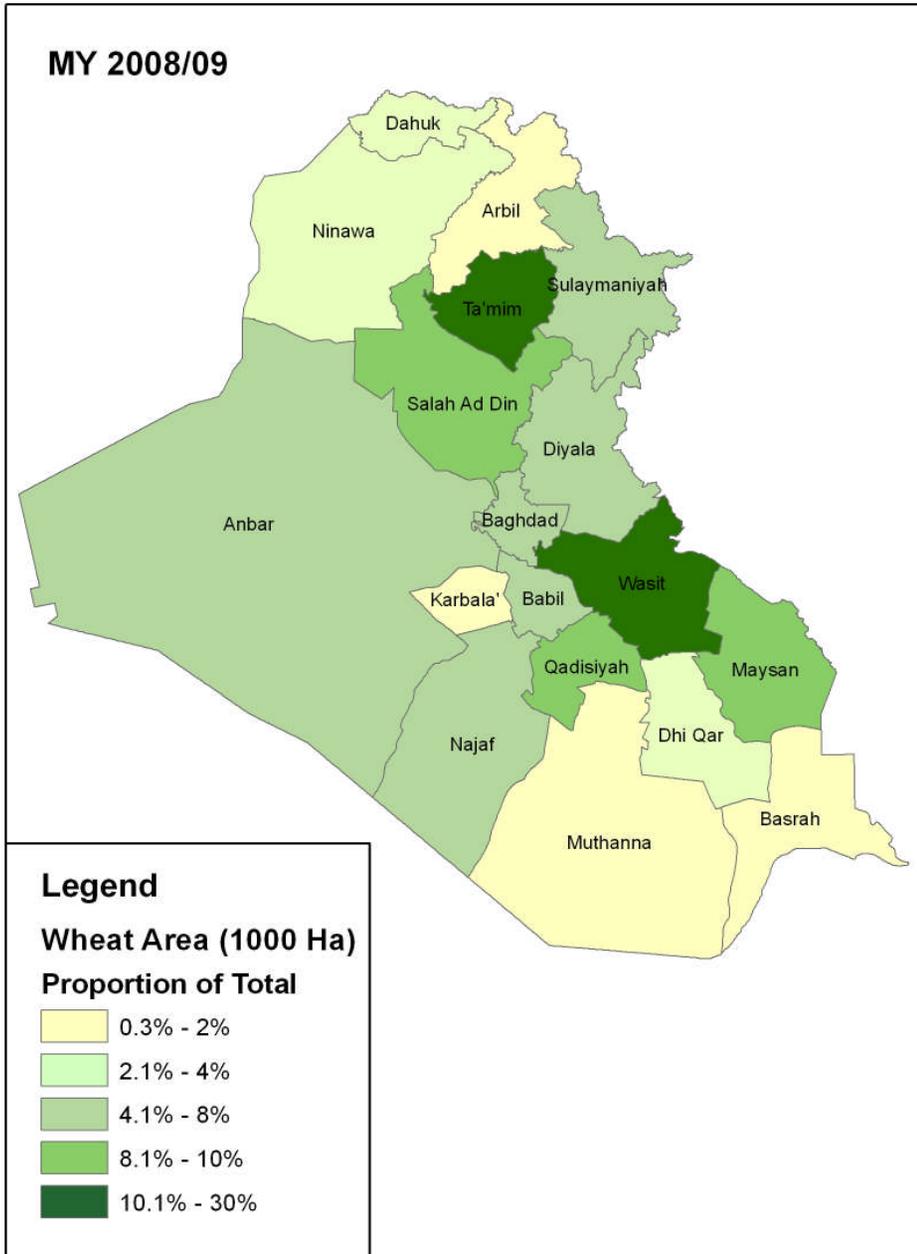
GDA Corp: Scene-based Dominant Crop (SBDC)



**GDA Corp. Scene-based
Dominant Crop (SBDC) mask**

April 2008

Winter Wheat Area: MY 2008/09 vs. 5-Year Average



* Note: Ninawa typically produces up to 30% of the national total. Ninawa was 94% below average production for MY 2008/09.



Results

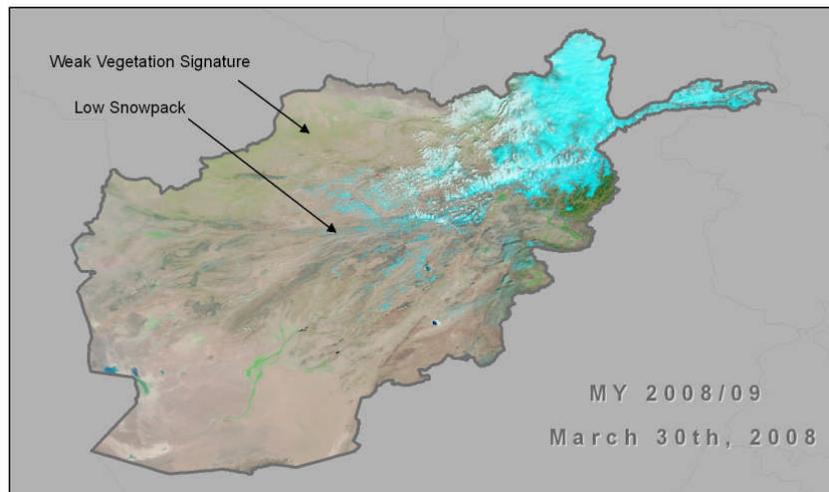
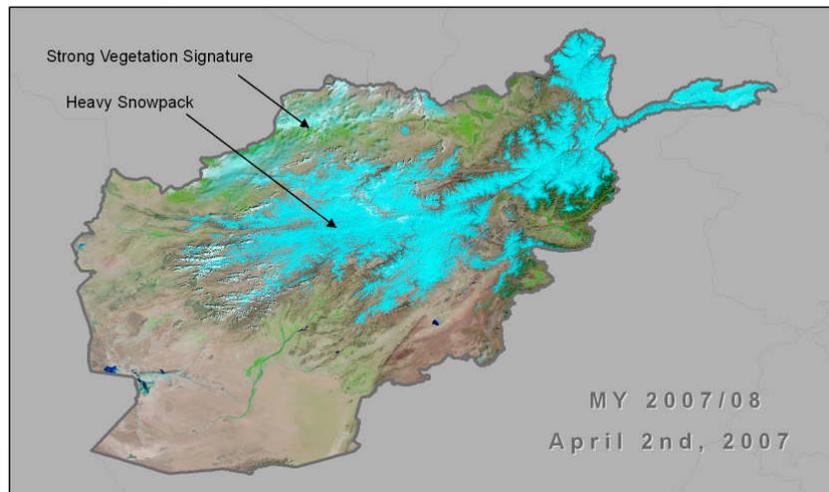
- Support to FAS/Baghdad in their briefings to Iraq government Ministries.
 - Estimates provided to FAS/Baghdad in early 2008 at the national and provincial level.

- Crop production estimate for Iraq at national level released in May 2008 (official USDA release)
 - Estimate **within 1%** of first Iraq government estimate which was released by Iraqi MOA ten months after USDA's.

- Provincial estimates for Iraq used as input into drought mitigation plans.

Project Realities

Afghanistan: Winter Snowpack Comparison



Data Source: MODIS Terra 250-meter
Data Provided by: MODIS Rapid Response
Supporting: USDA/FAS/OGA/IPAD

- Afghanistan was not in the pilot project in MY2008/09 (2007/08).
 - No AWiFS data
 - No Quickbird data
- FAS estimated crop production, but no provincial level analysis.

Partnership Benefits

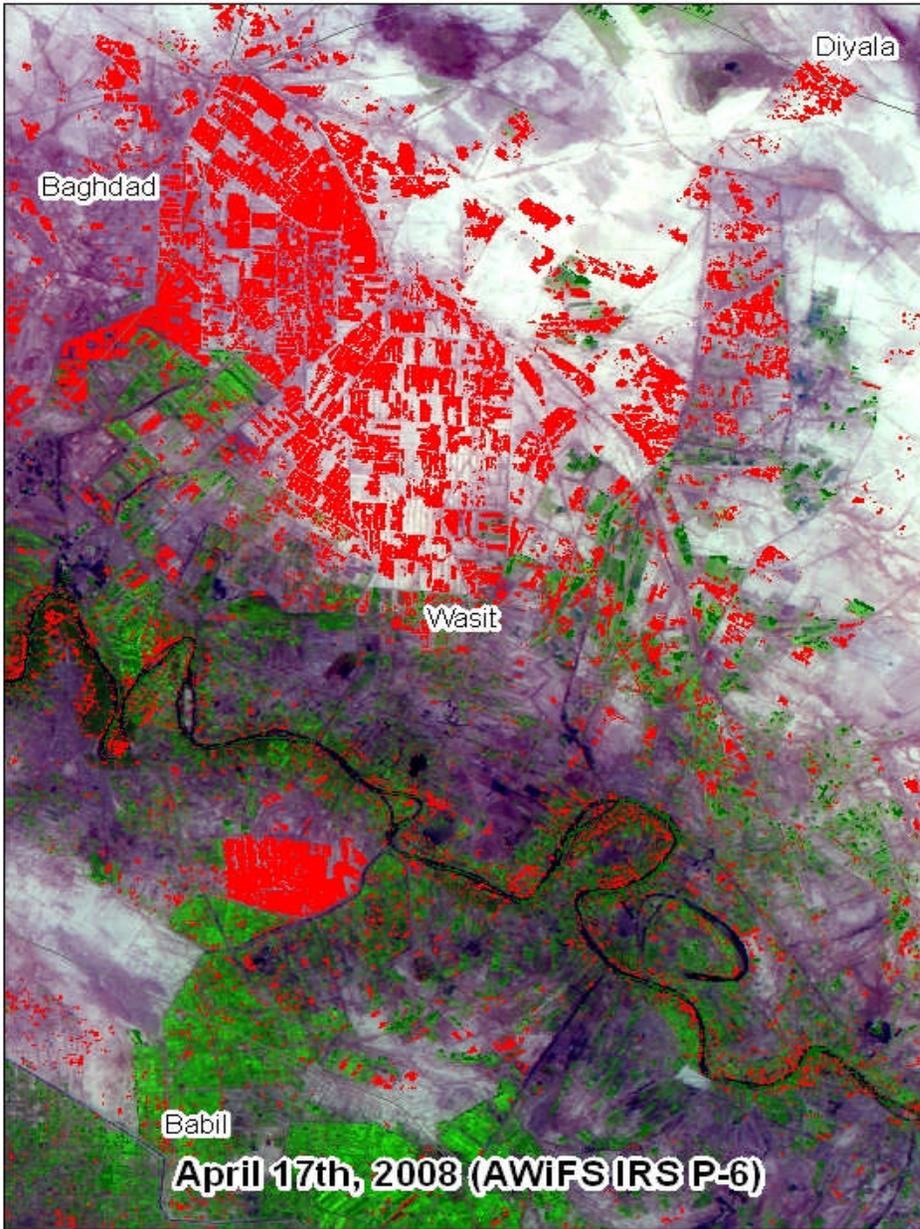
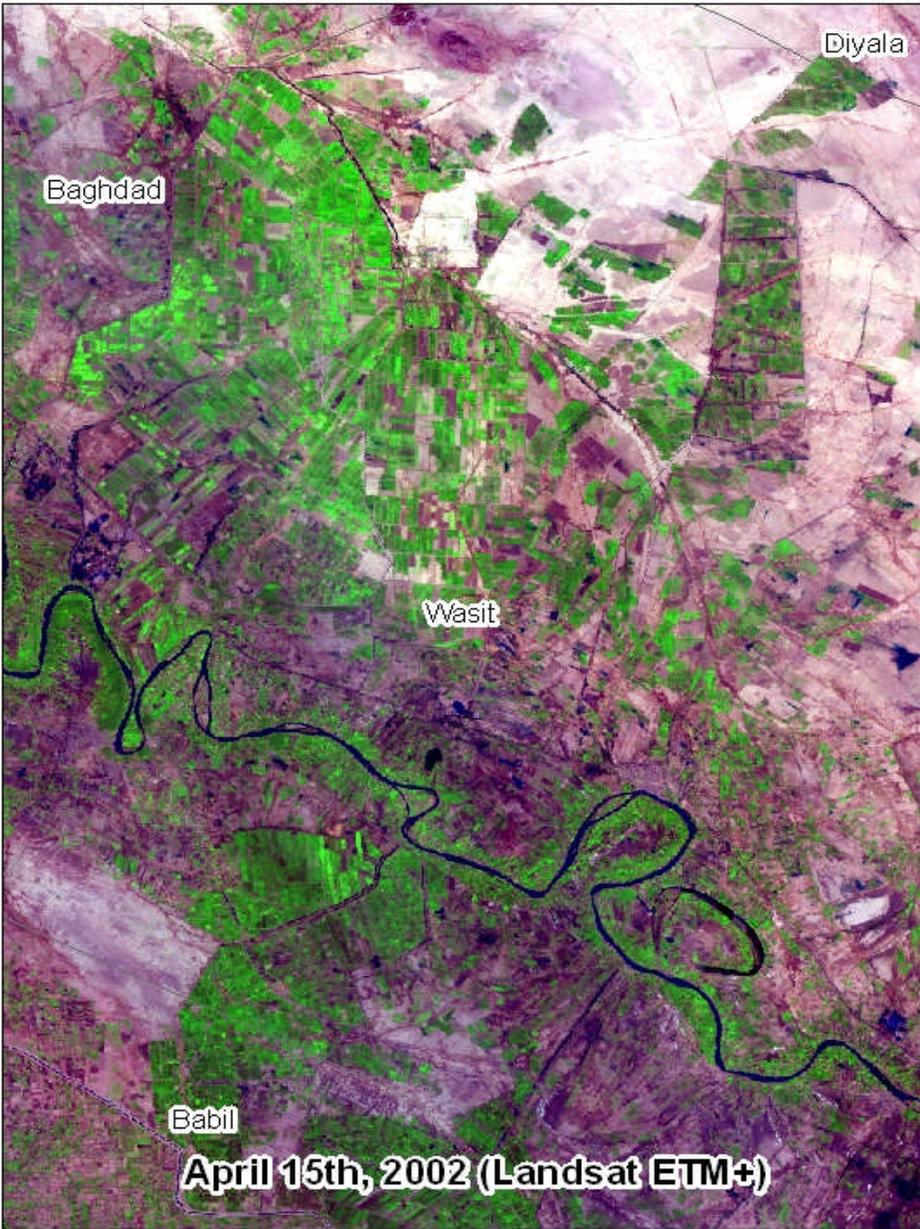
- **Improved efficiency and effectiveness**
 - Early and accurate crop production estimates supported FAS/Washington, FAS/Baghdad and others.
 - Information products supported drought mitigation plans.
- **Shared burden of data collection and leveraged expertise**
 - NGA has expertise in high resolution satellite imagery
 - NASA has expertise in low resolution satellite imagery
 - FAS has expertise in medium resolution satellite imagery and integration of multiple resolution data sets.
- **Extended Geographical Coverage**
 - Iraq (MY2008), Iraq, Iran, Syria, Afghanistan (MY2009)



Challenges to Monitoring Earth Resources

- **More geographical coverage needed**
 - New areas with a more complicated agricultural landscape need to be analyzed using the three-tier methodology.
- **Significant resources needed**
 - Skilled analysts and data costs
- **Commercial satellite imagery suppliers**
 - Data delivery needs to be emphasized.
- **More advanced information products**
 - Multiple sensor, multiple dates--traceability
- **Funding transfers and allocating costs between agencies remains problematic**

Multi-temporal Change Detection: Comparison of Current and Archived Data



Data Source: Landsat ETM+/AWIFS IRS P-6
Data Provided by: Archive Explorer/NGA
Supporting: USDA/FAS/OGA
International Production Assessment Division





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Thank You!

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