



BENEFITS AND CHALLENGES OF USING MULTIPLE SENSORS FOR:

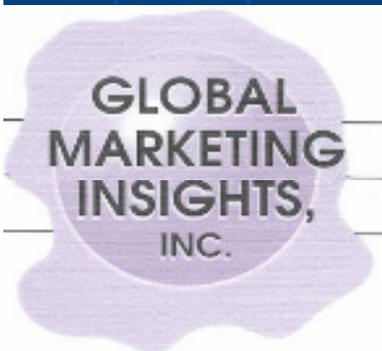
Iraq Operational Agricultural Monitoring Project:
United States Department of Agriculture (USDA)
Foreign Agricultural Service (FAS)
Office of Global Analysis (OGA)
International Production Assessment Division (IPAD)

Presenter:

Dr. Shawana P. Johnson, GISP
Global Marketing Insights, Inc.
USDA FAS Commercial Data
Negotiator & Vendor Liaison

Authors:

J. Edward Kunz, GISP
Geospatial Program Manager
ASRC Management Services
Sean Griffin
Remote Sensing Crop Analyst
Supporting USDA/FAS/OGA/IPAD





Iraq Operational Agricultural Monitoring Project

- Project Overview
- Benefits/Challenges
Imagery
- Benefits/Challenges
Operationally
- Conclusions





Iraq Operational Agricultural Monitoring Project

■ Project Overview

- USDA FAS and NGA join forces to develop new remote sensing processes for assessing crop health where minimal ground information is available.



Methodology: Convergence of evidence

The International Production Assessment Division (IPAD) applies a “convergence of evidence” methodology to agricultural production assessments and forecasts. This all source methodology integrates both qualitative and quantitative datasets of various spatial and temporal scales in order to cross-validate the multiple sources and scrutinize forecast assumptions. Datasets are in the form of:

- ***Agro-meteorological time-series***
- ***Land observation remote sensing - MODIS, AWiFS, QuickBird, SPOT, Jason 1***
- ***Economic analysis reports***
- ***Crop calendars***
- ***News services***
- ***Direct ground observations***

■ Benefits Imagery

- Remote Collection-All Data
- Long Time Series - MODIS
- Repeat Coverage - AWiFS
- Validation - QuickBird
- Timeliness



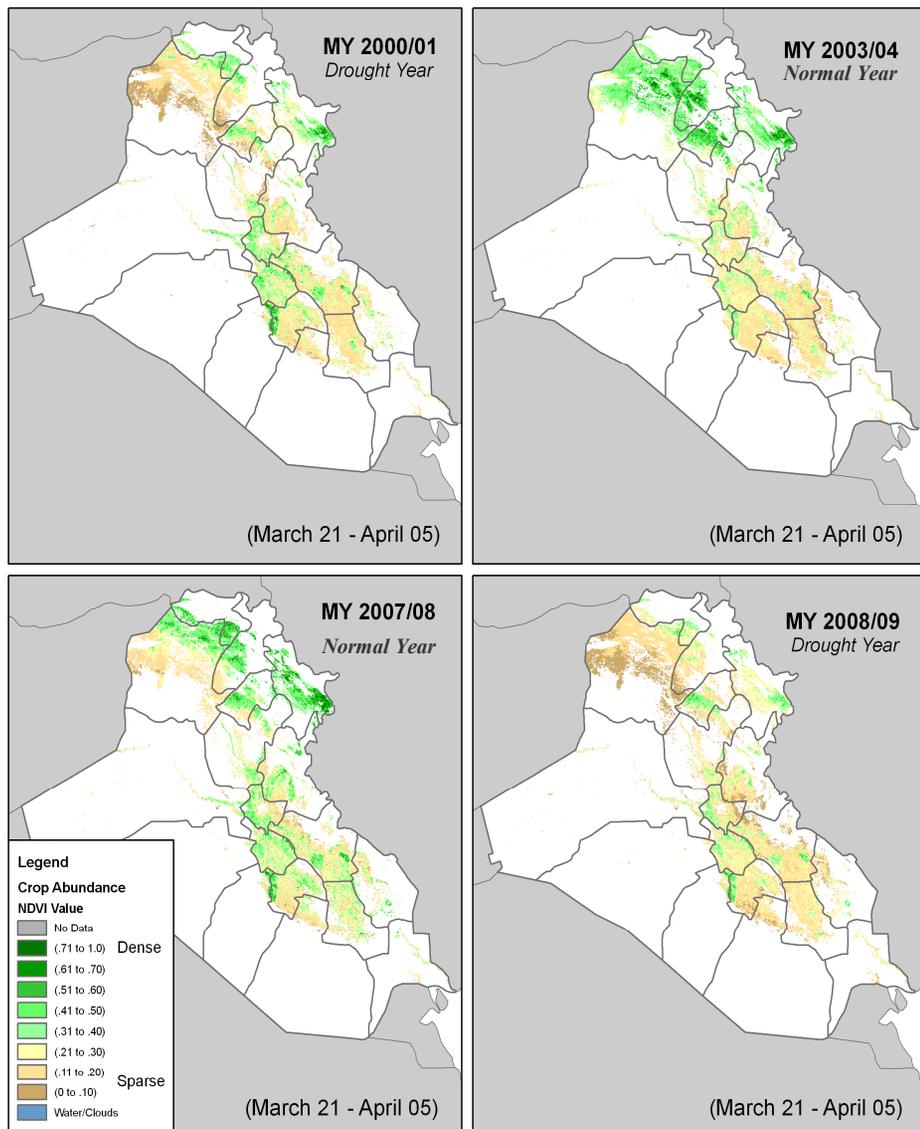
- **Challenges Imagery**
 - Quickbird spatial limitations
 - AWiFS and SPOT lack of time series
 - MODIS Course Resolution
 - Data not timely in 2009 to Date





Agro-climatic Data (MODIS NDVI Time Series)

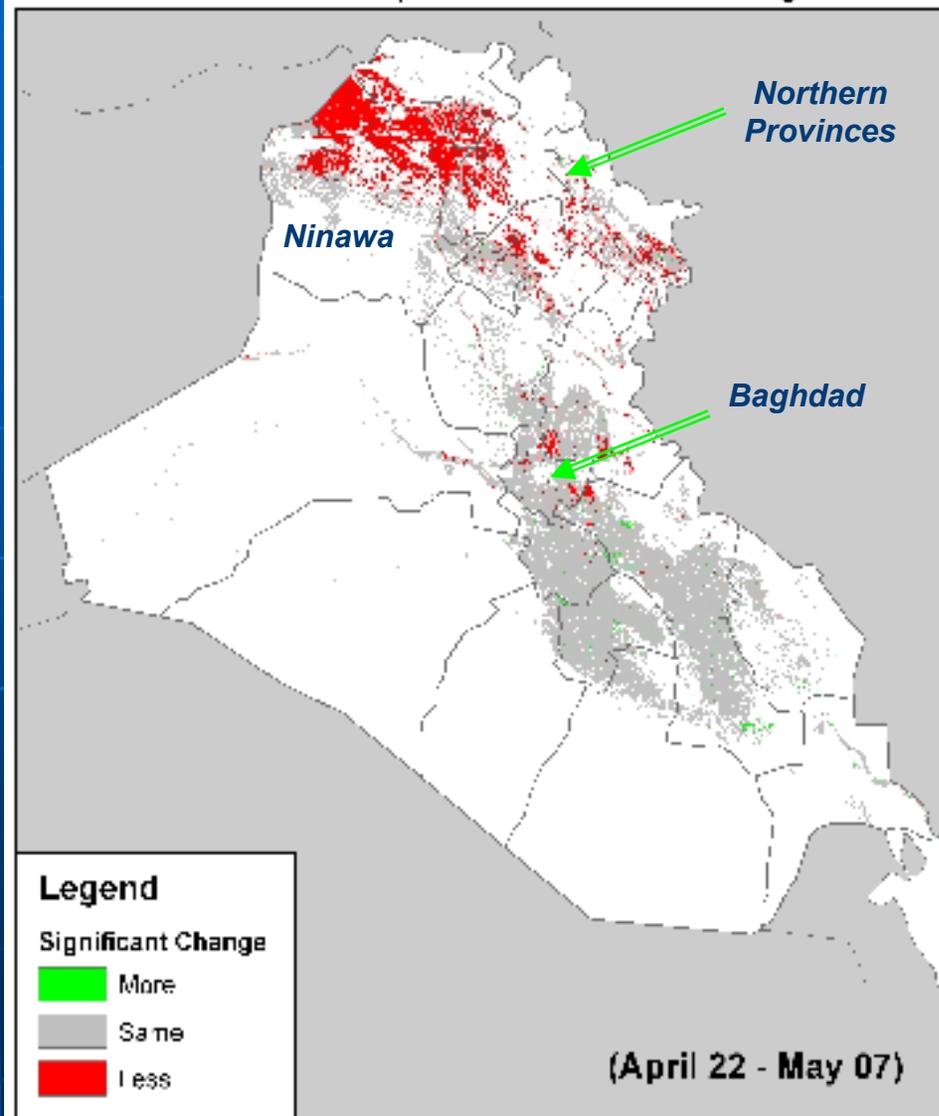
Crop Abundance Image Comparison: MY 2000/01 to MY 2008/09



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



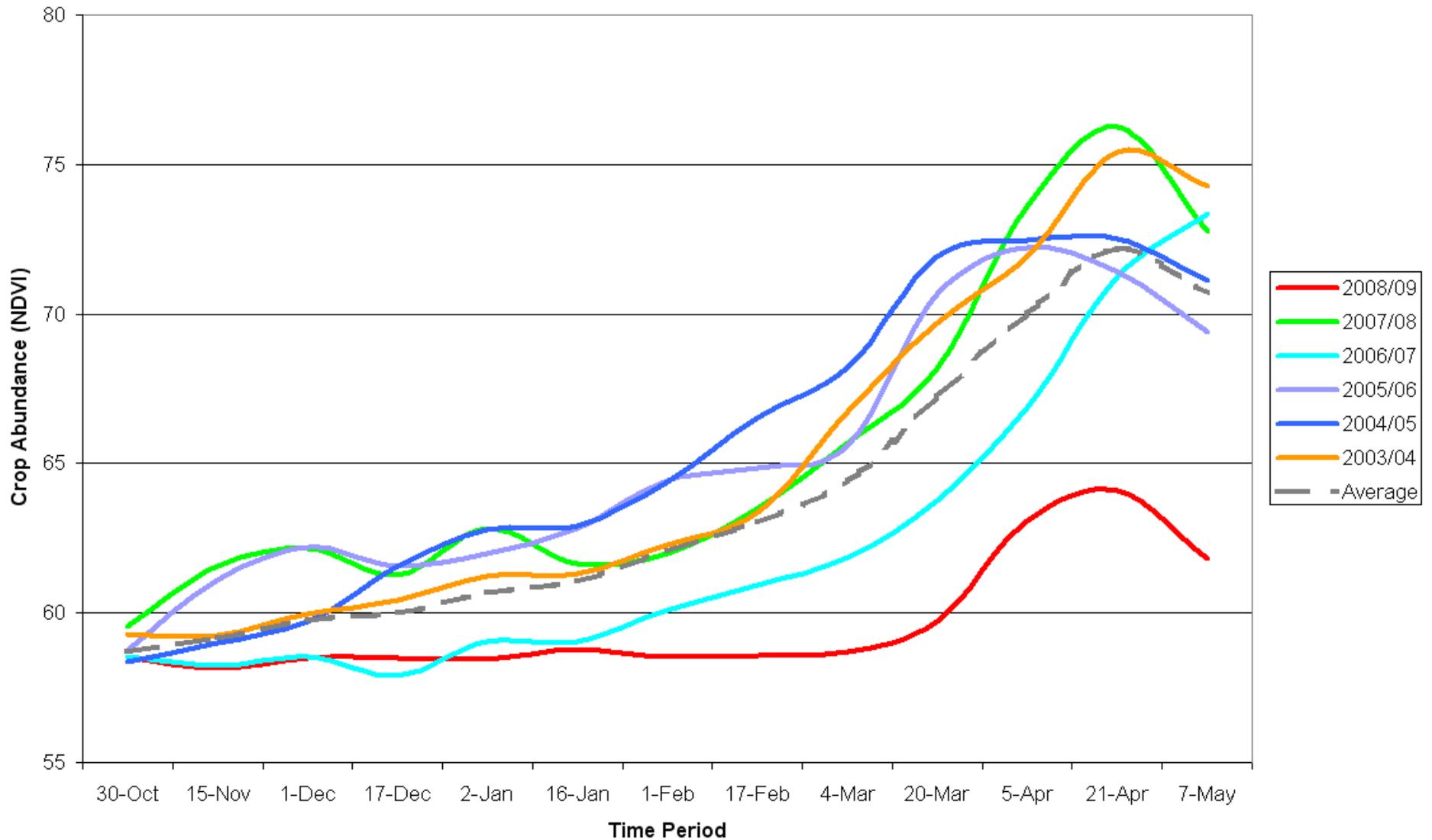
Data Source: MODIS 250-meter NDVI
 Data Provided by: University of Maryland
 Supporting: USDA/FAS/OGA
 International Production Assessment Division





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

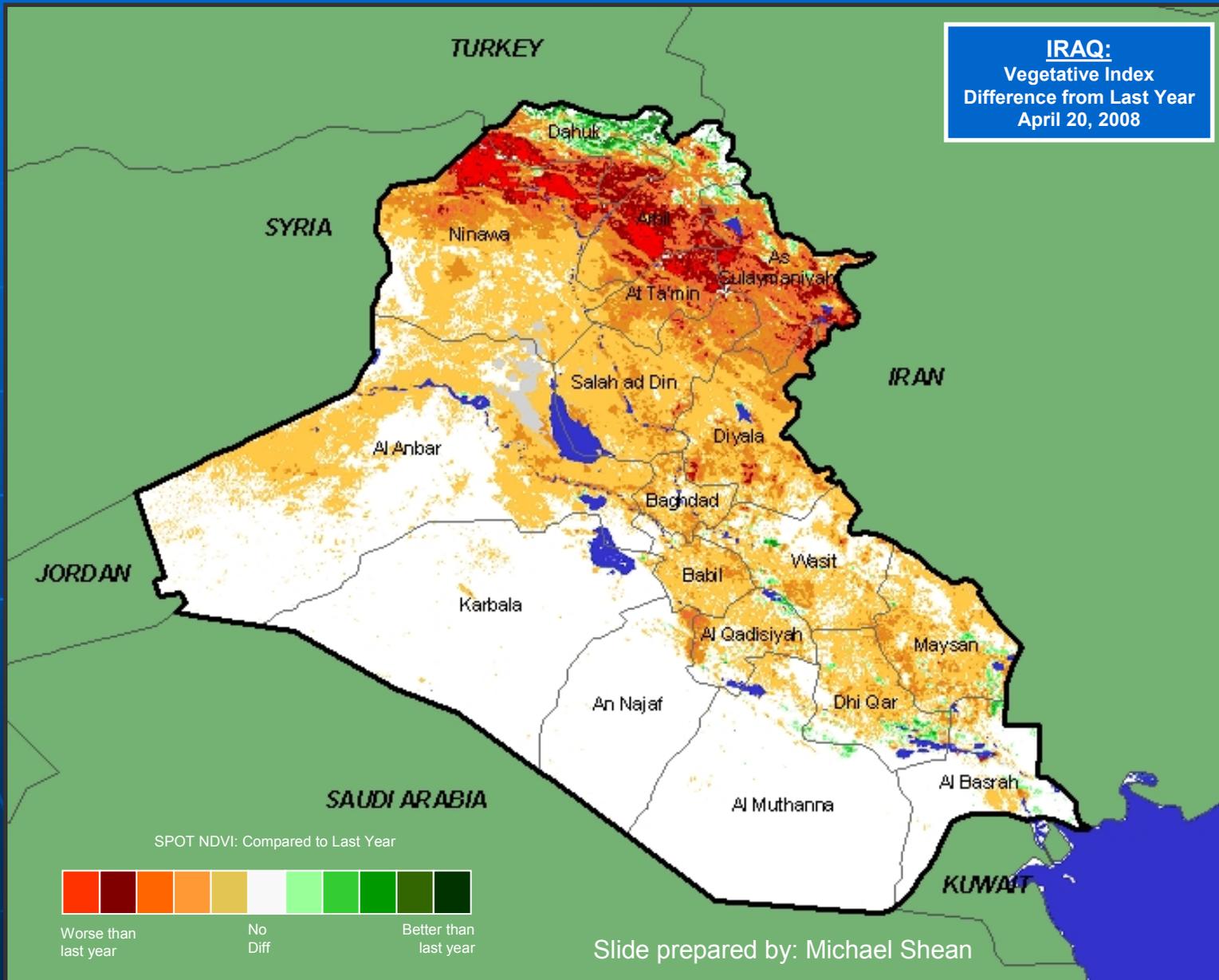
MODIS NDVI Time Series: Northern Iraq

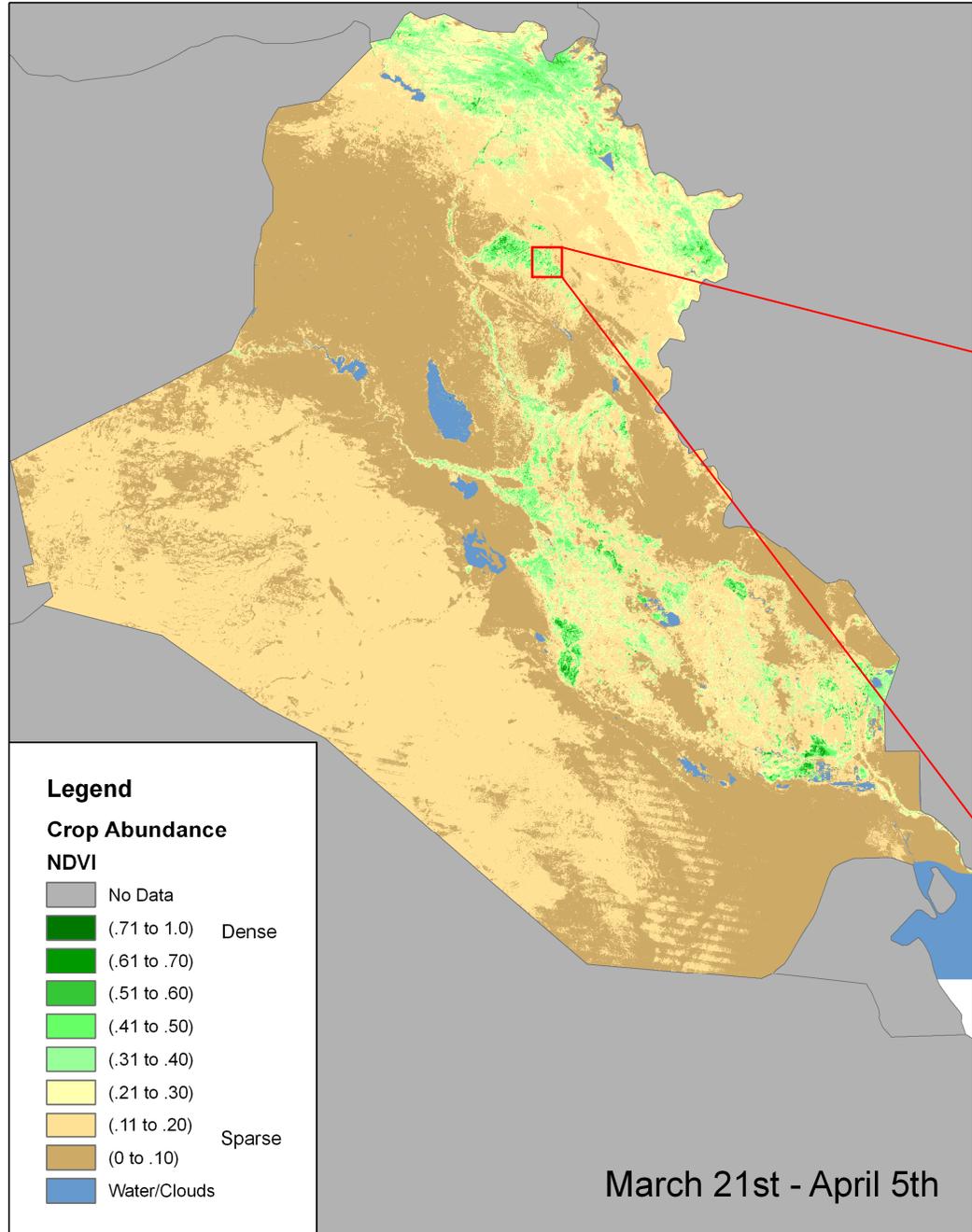
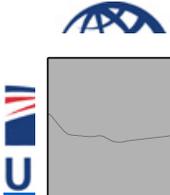




U S D A

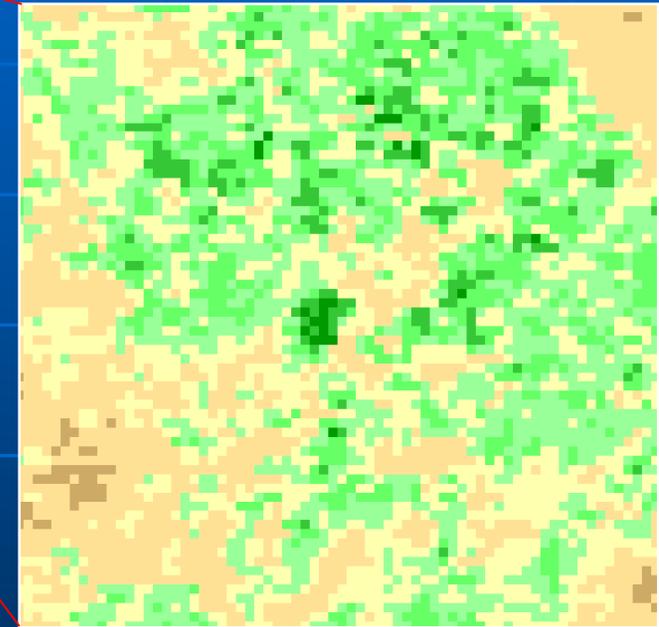
Agro-climatic Data (SPOT VEG Time Series)

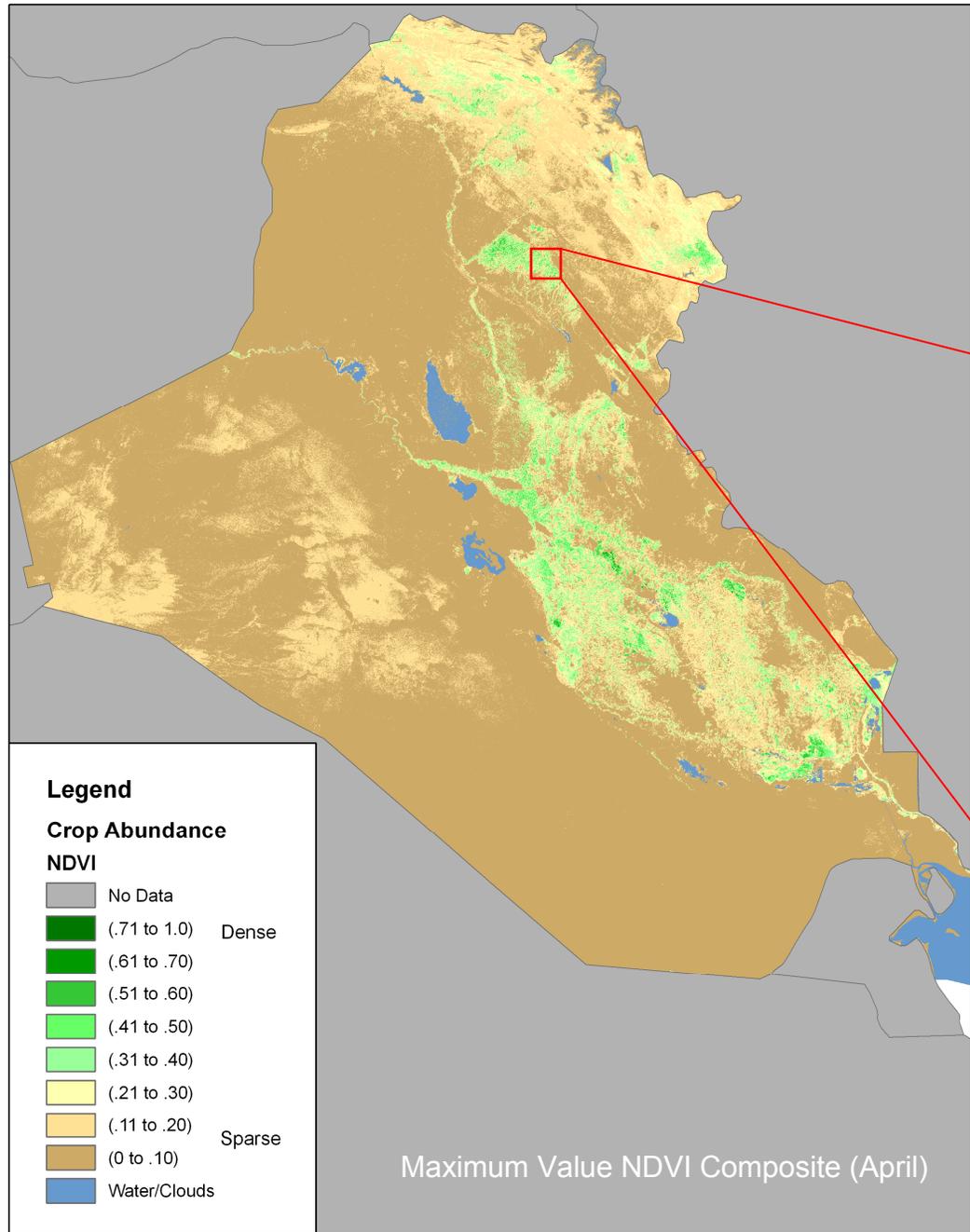
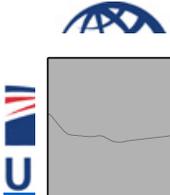




MODIS 250-meter:

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





AWiFS 56-meter:

1. Large Scale Regional Analysis
2. Moderate spatial resolution
3. Lacking time series data (2008 - First Year of Collection)

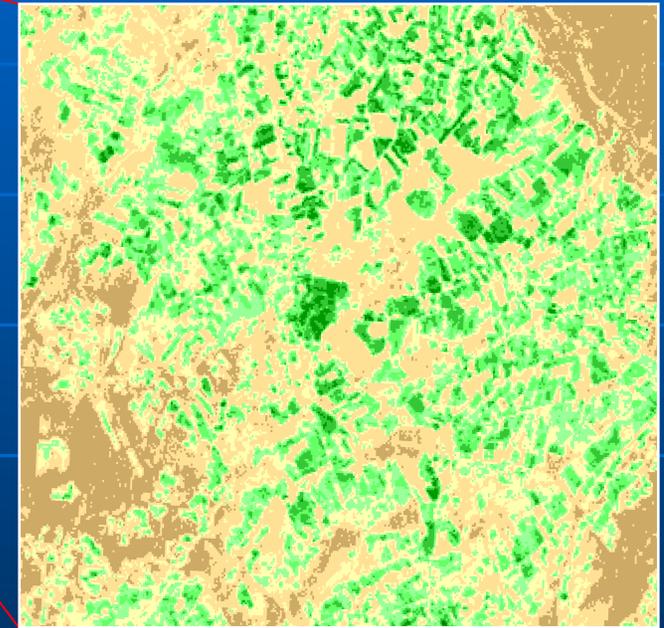
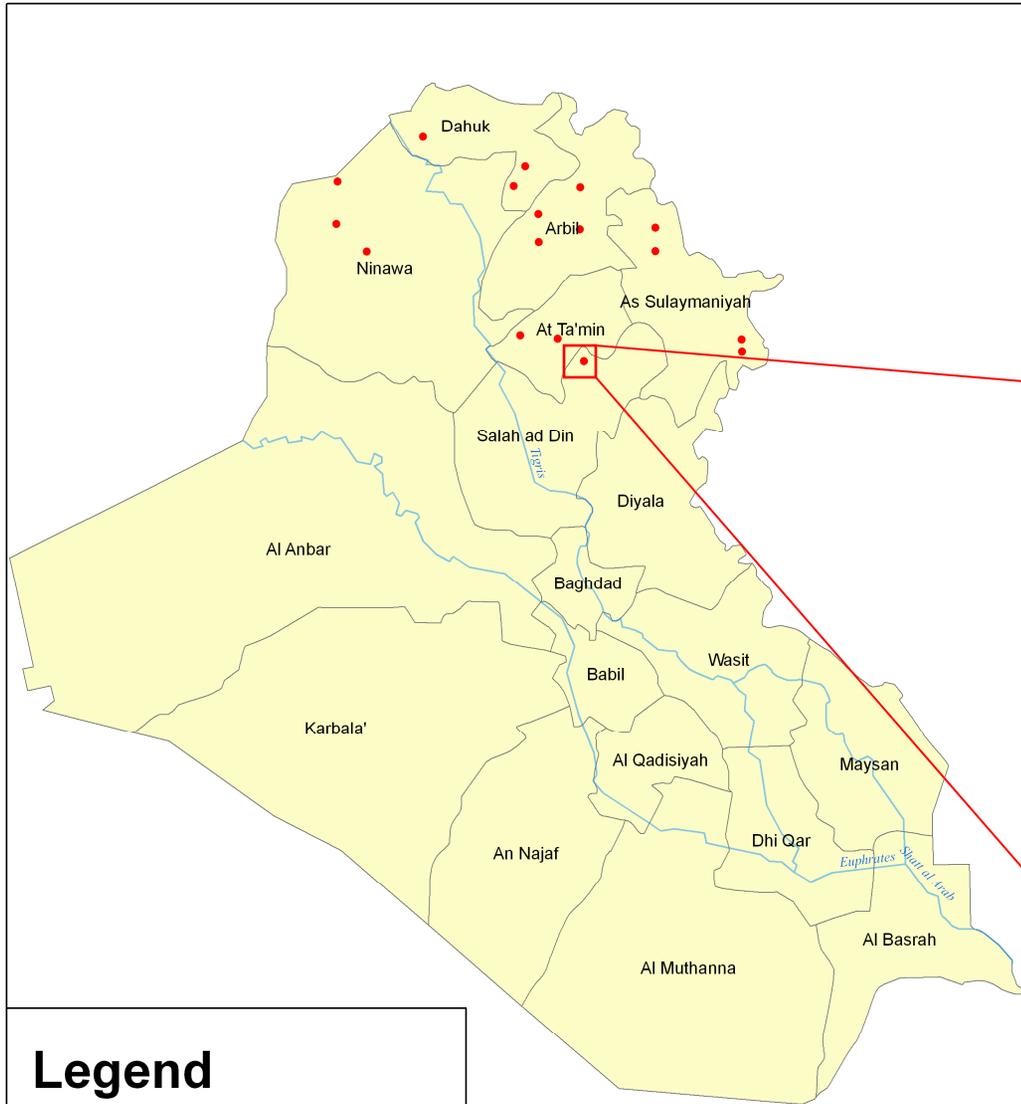




Image-based Ground Truthing

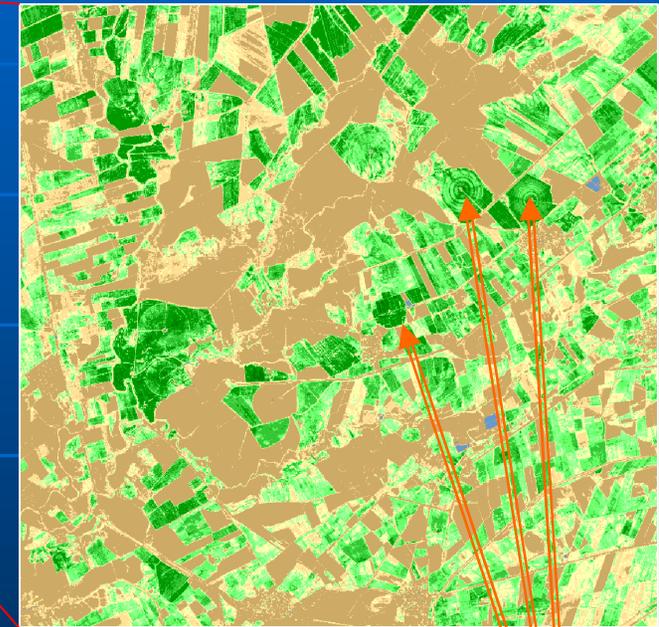
Digital Globe Quickbird

1. Support through NGA
2. Acquired over Northern Provinces
3. ~ 2.44 meter multispectral (Limited Coverage – 13km Swath)



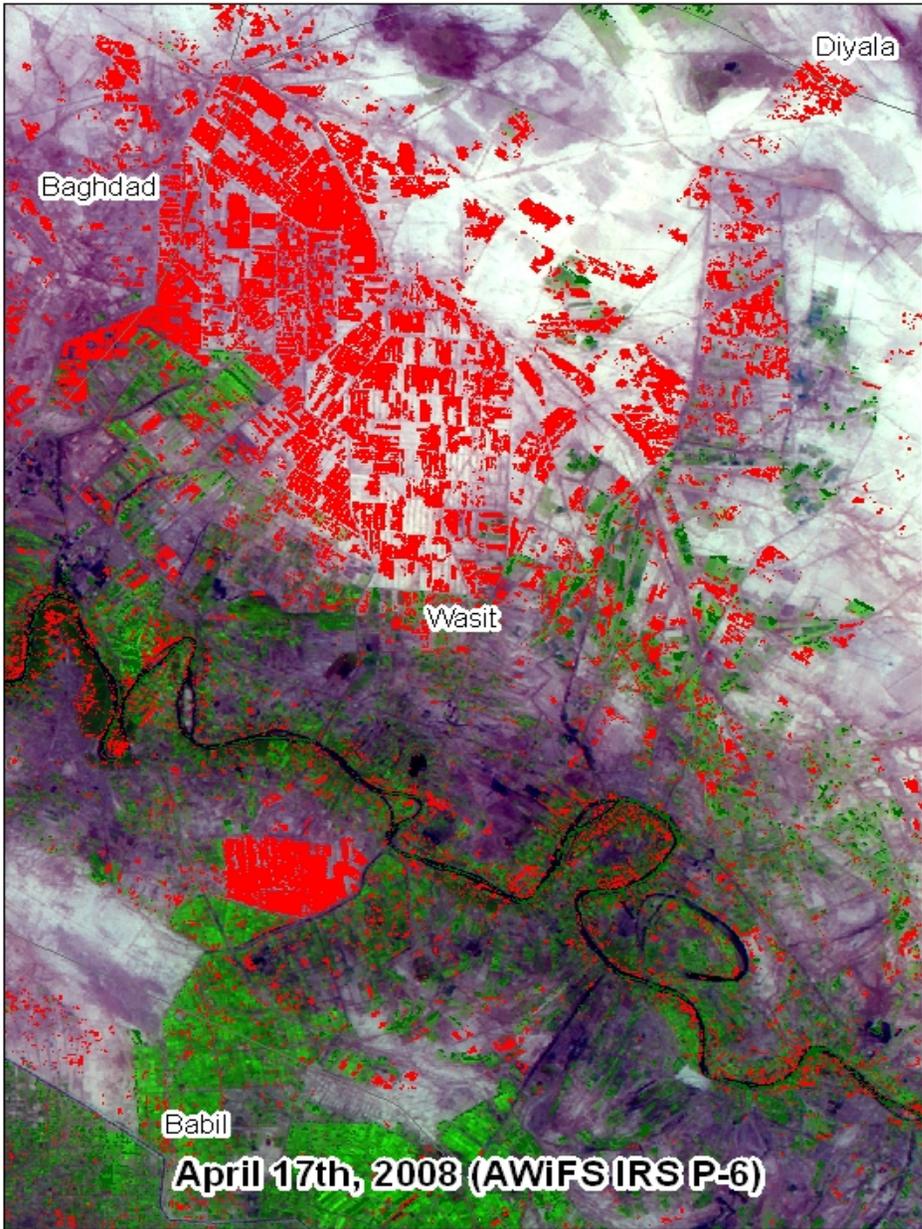
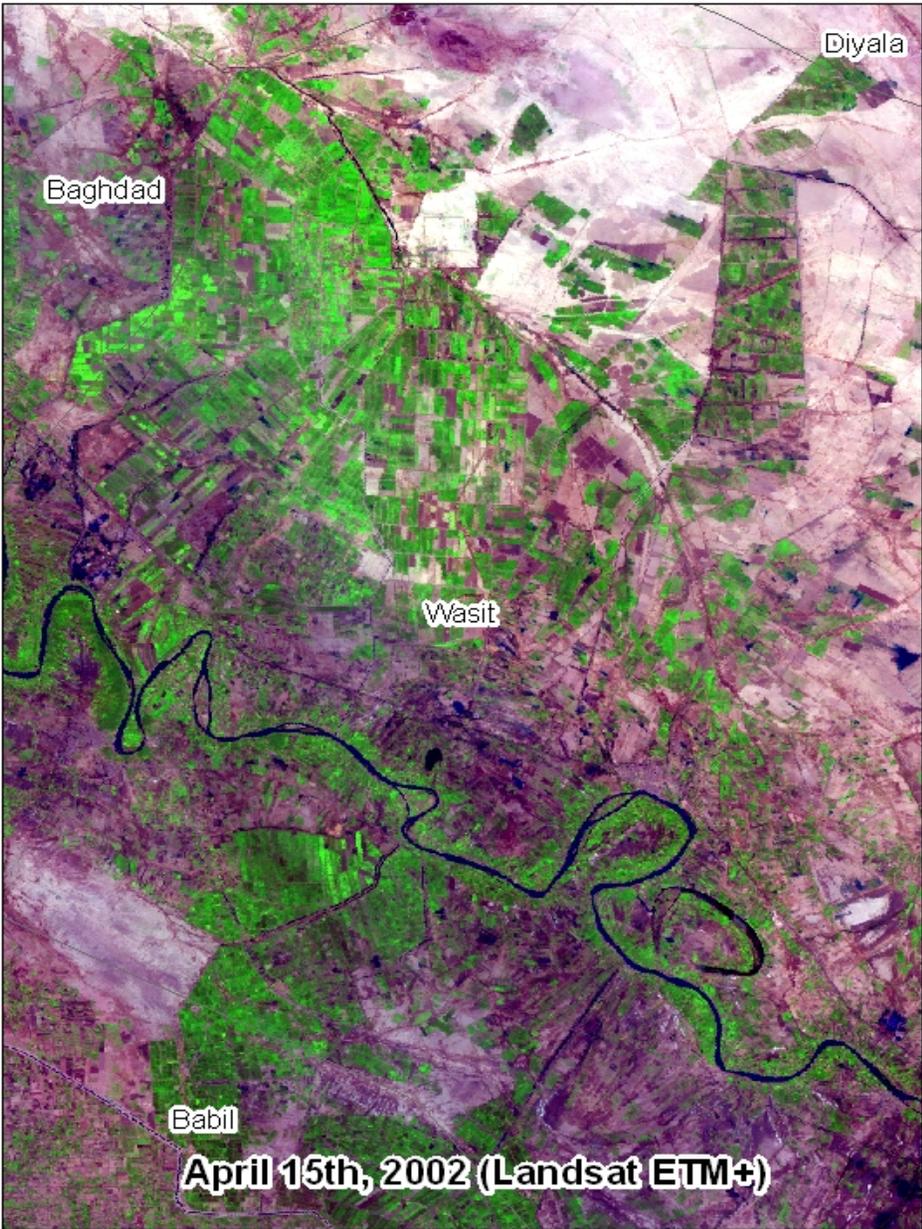
Legend

- Quickbird AOI's
- Governorate



Center Pivot Irrigation

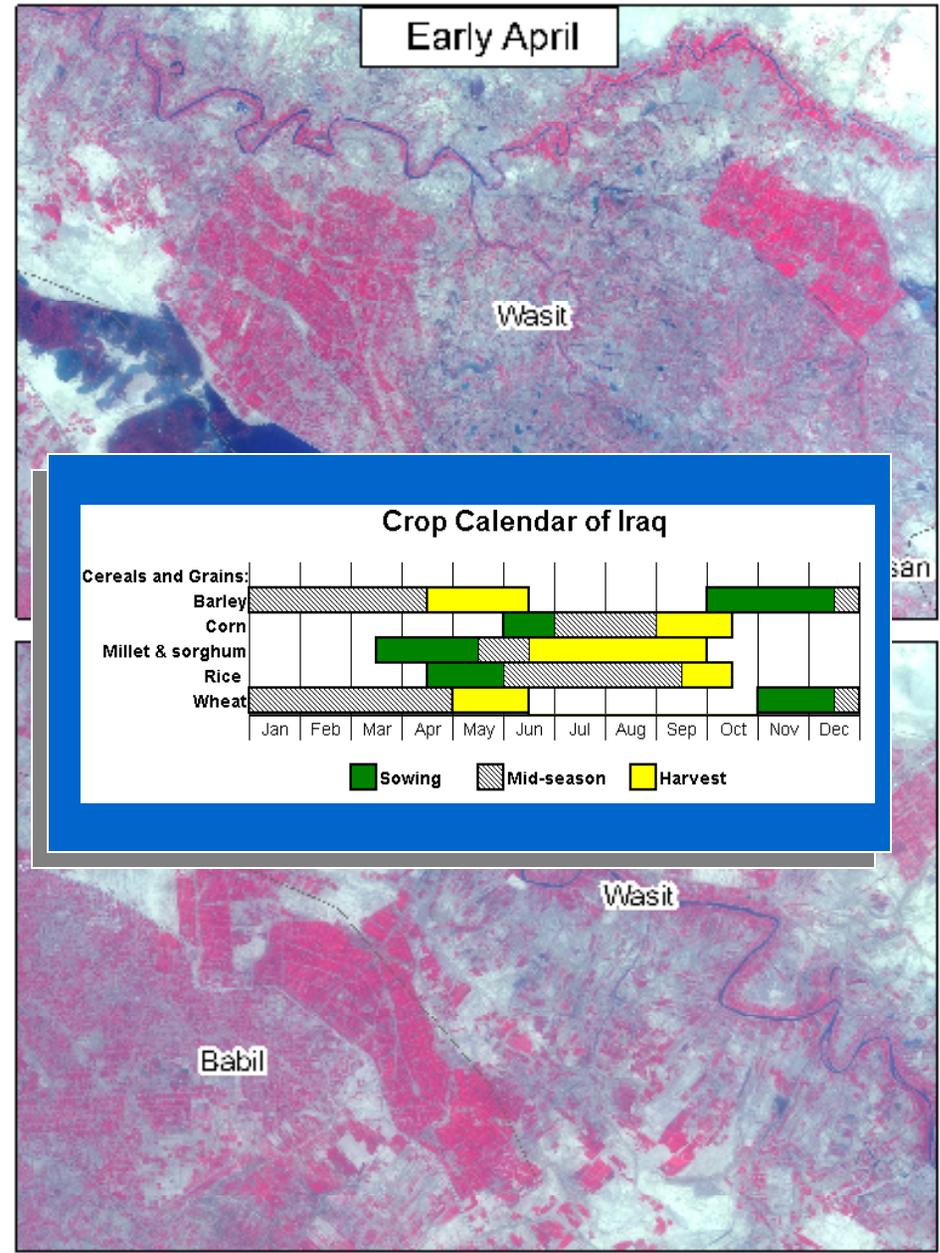
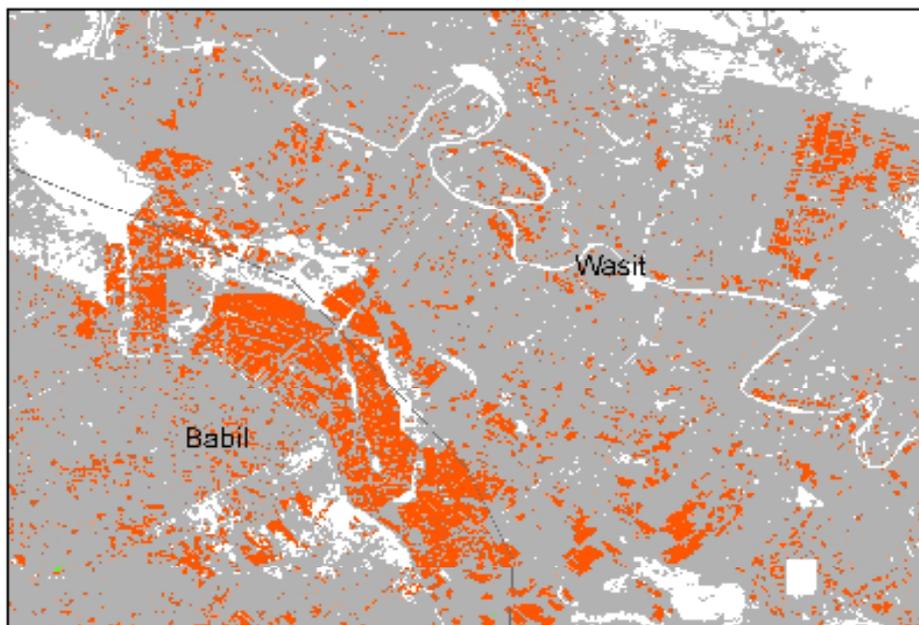
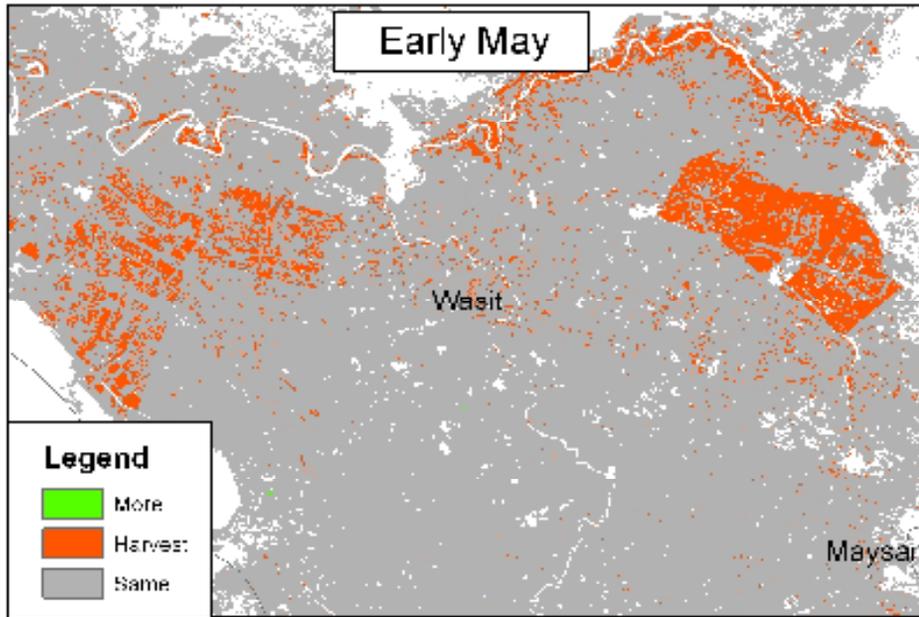
Multi-temporal Change Detection: Comparison of Current and Archived Data



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



Winter Grains Harvest Map: MY 2008/09

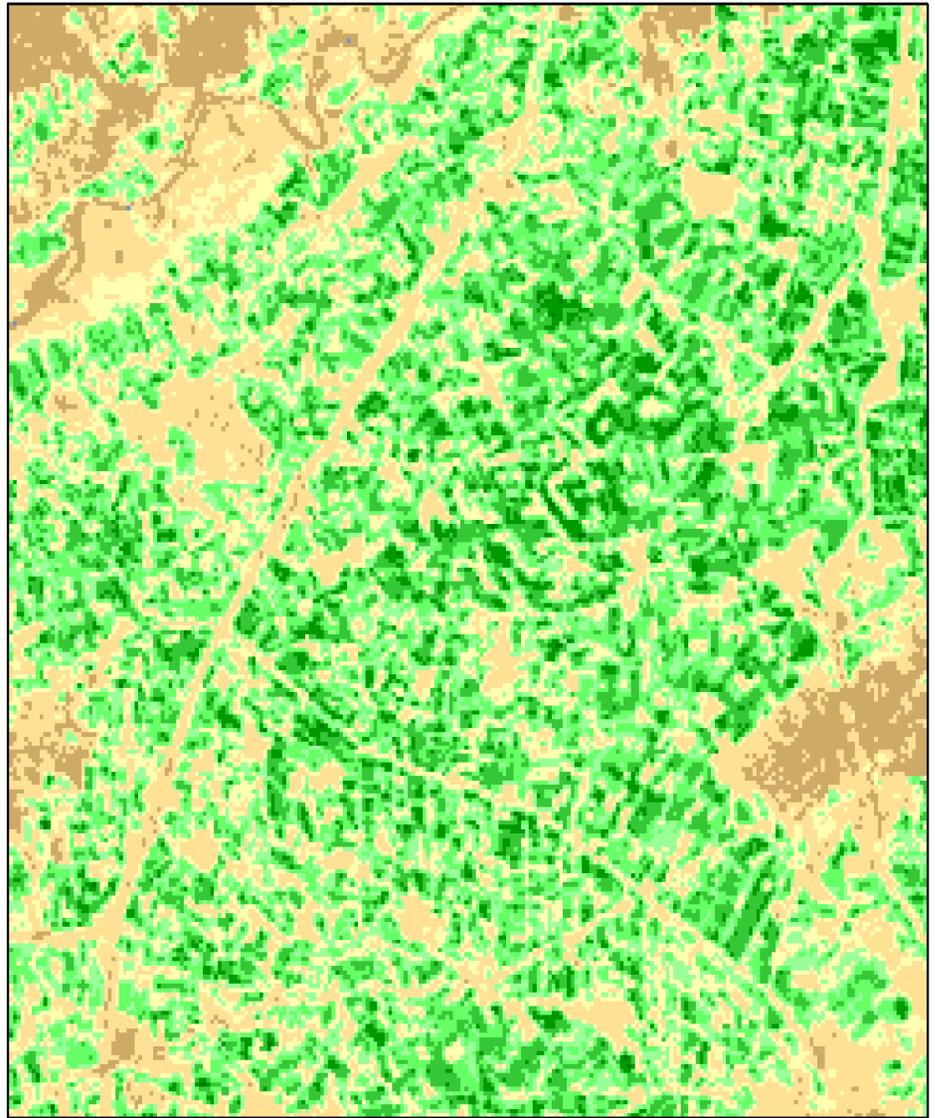
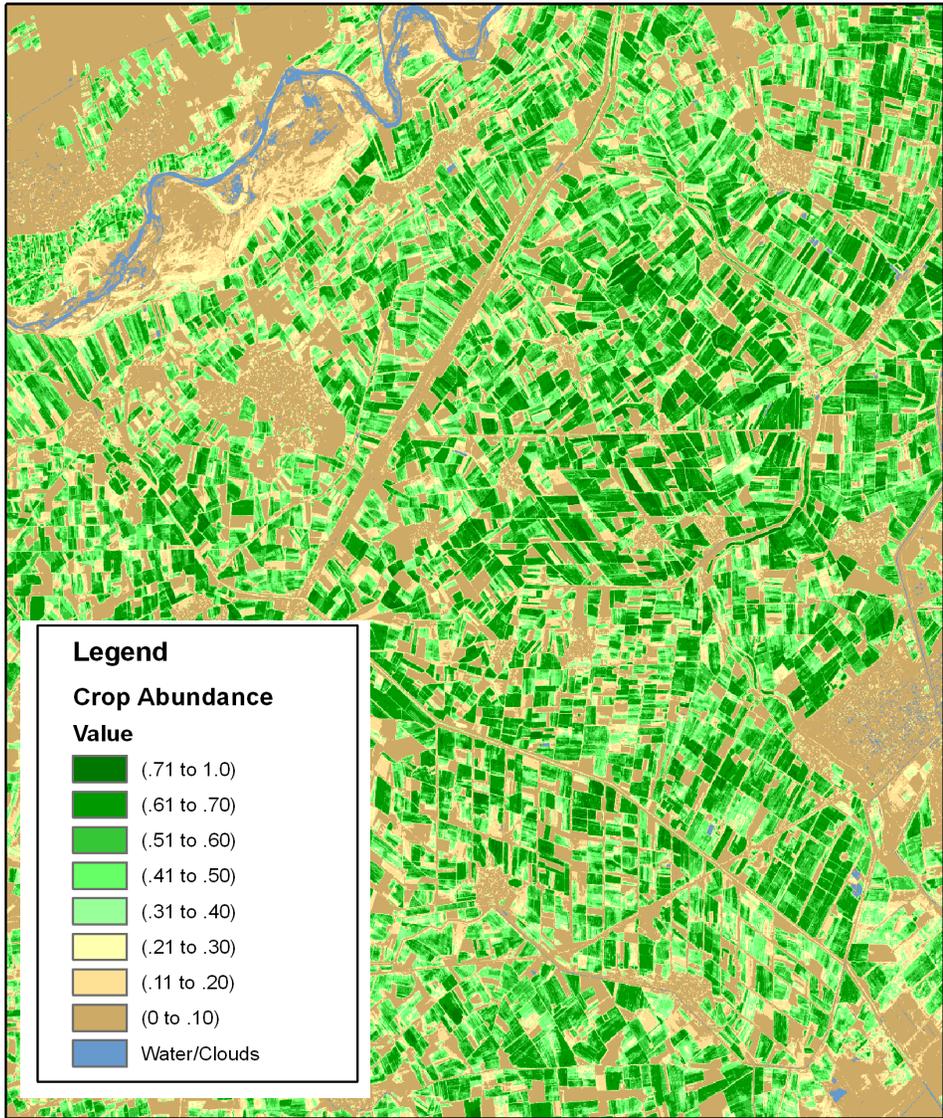


Data Source: AWI/S-185-P-5
 Data Provided by: National Geospatial Intelligence Agency
 Supporting: USDA/FAS/OGA
 International Production Assessment Division





NDVI comparison: Quickbird & AWiFS IRS P-6



Quickbird

Mar 29, 2008

AWiFS IRS P-6

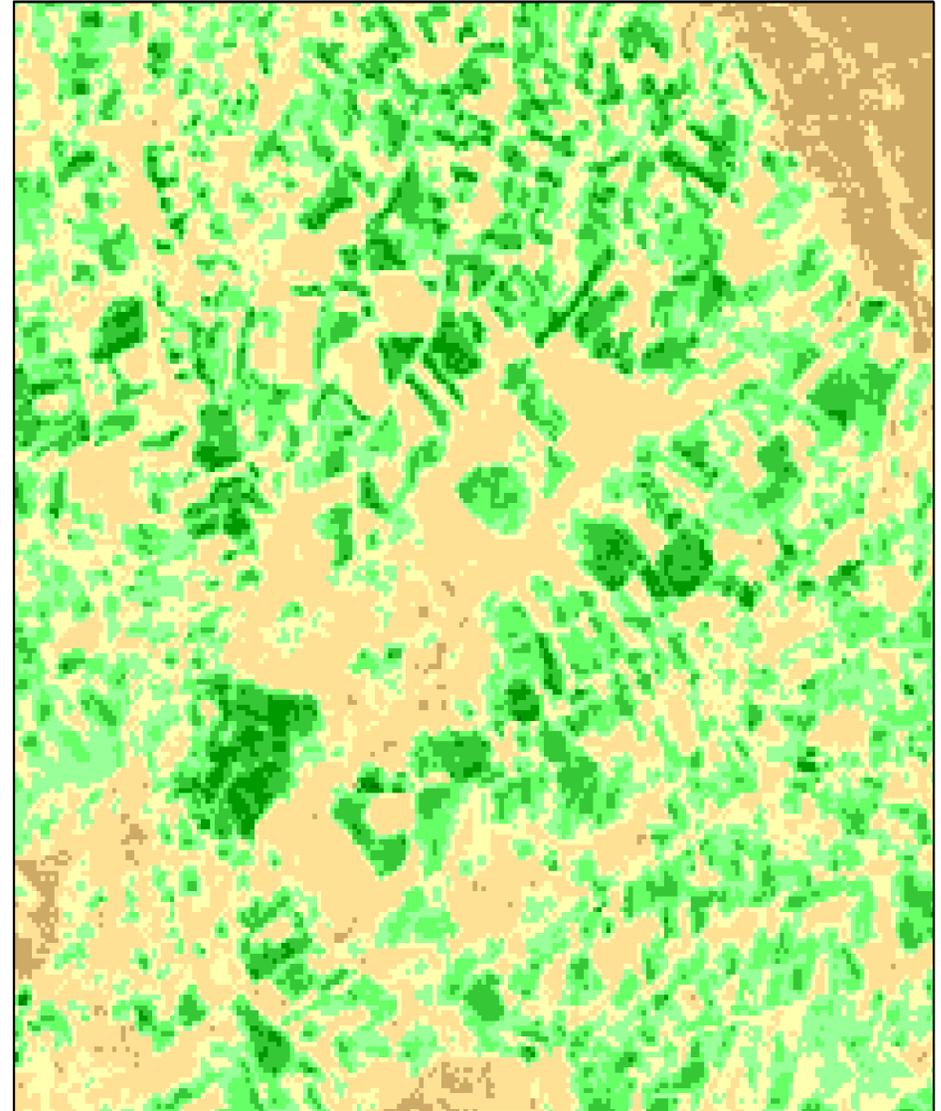
April 3, 2008

NDVI comparison: Quickbird & AWiFS IRS P-6



Quickbird

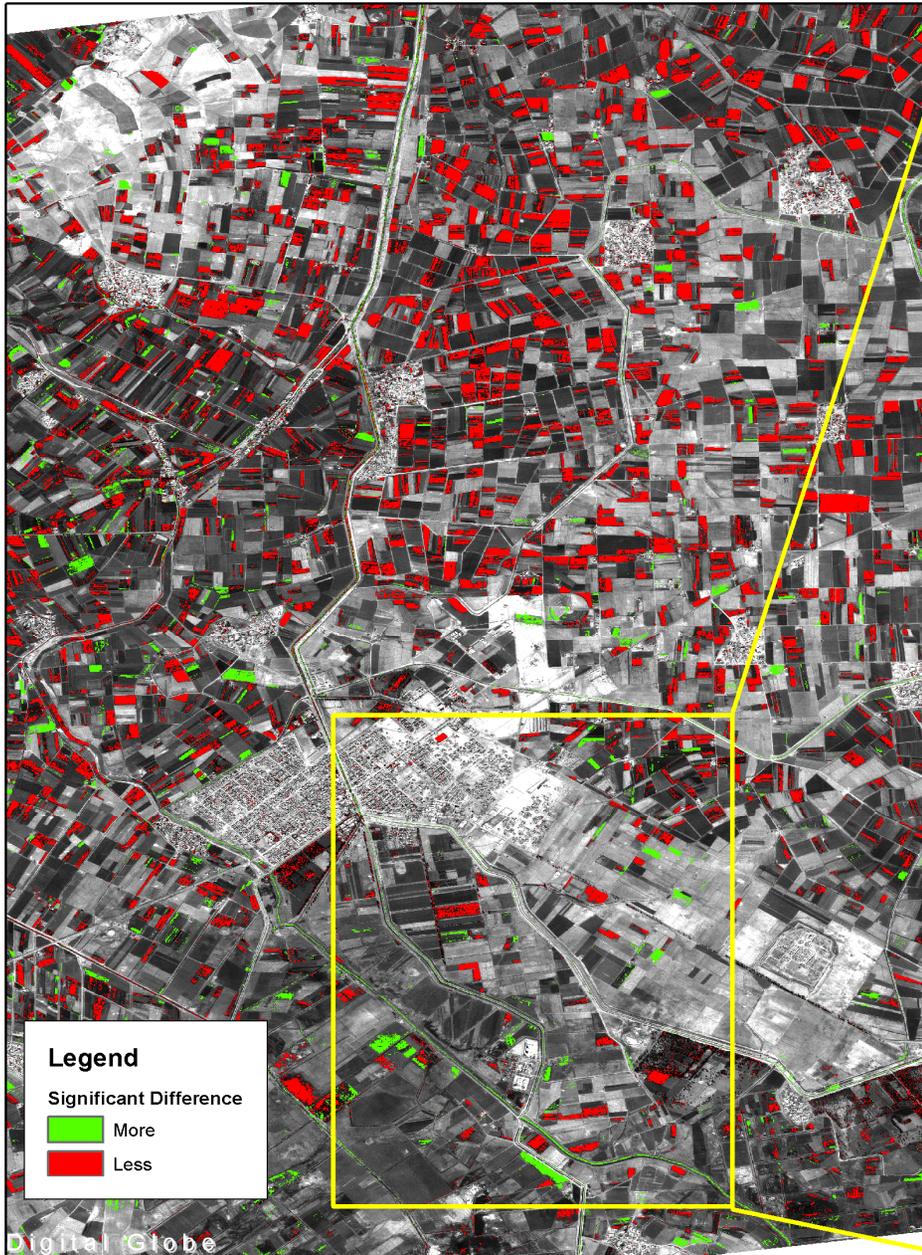
April 1, 2008



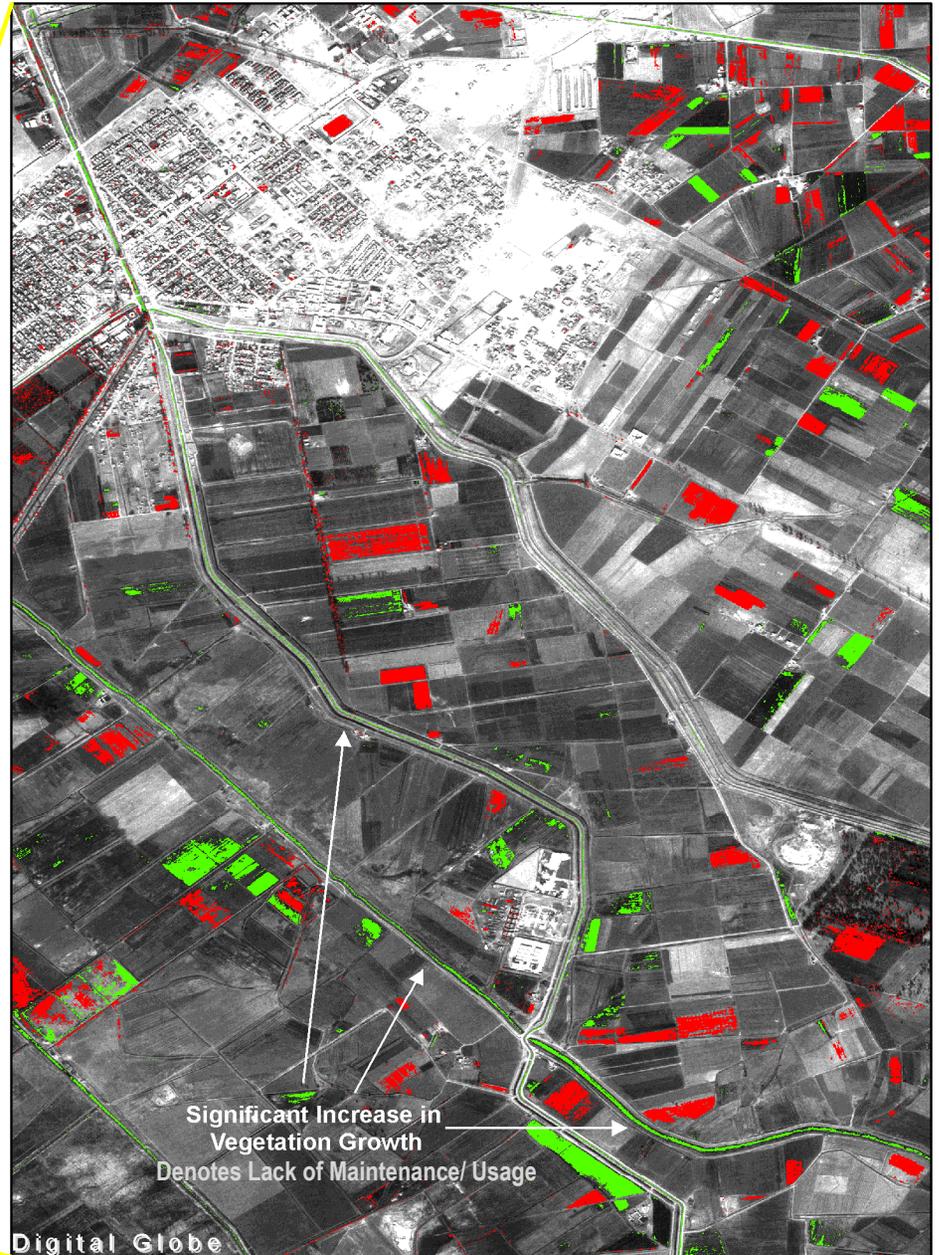
AWiFS IRS P-6

April 3, 2008

Multi-Temporal Change Analysis between October 26th, 2005 and December 14th, 2007



December 14th, 2007



December 14th, 2007



Data source: Digital Globe Quickbird Panchromatic
Data provide by: National Geospatial Intelligence Agency
In support of: USDA/FAS/OGA/IPAD

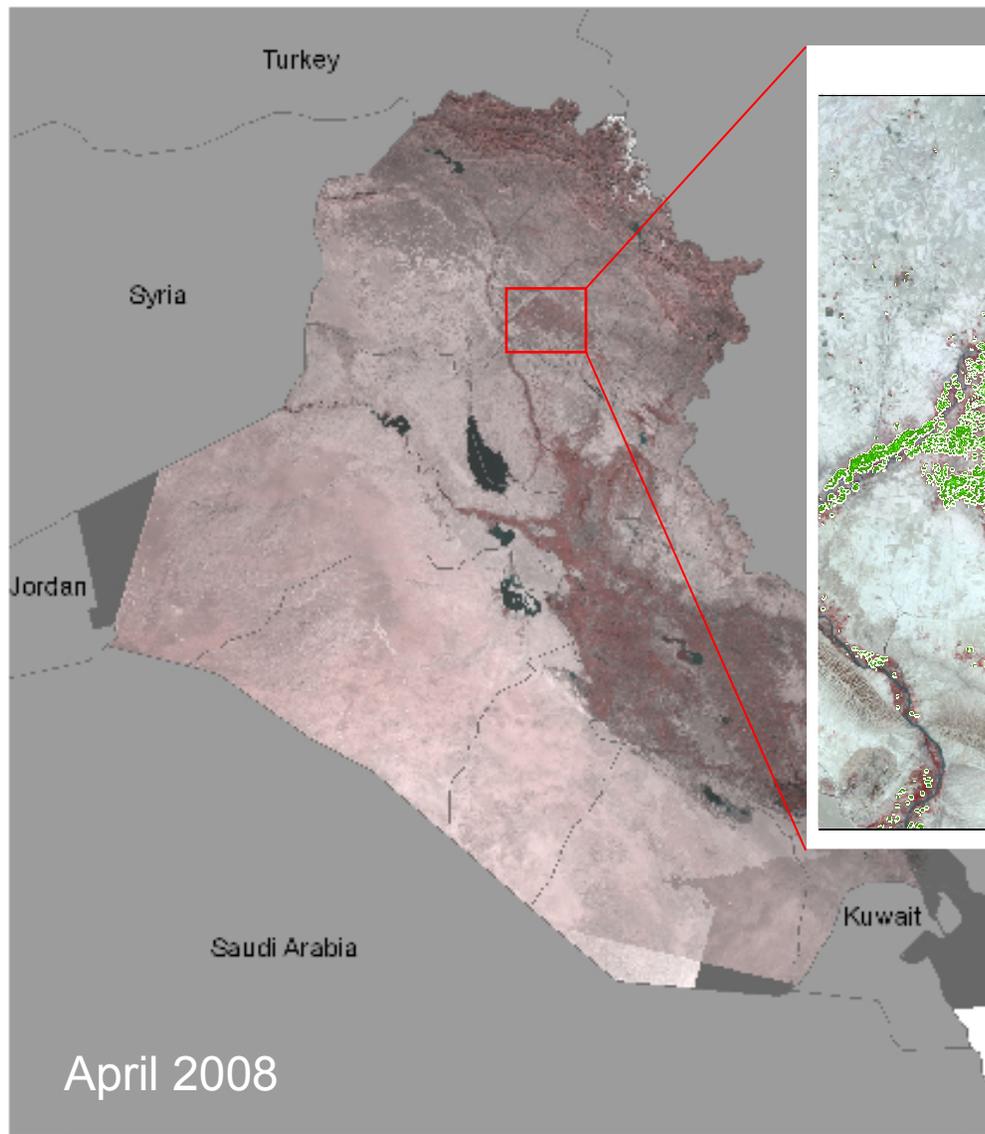




Production Statistics: Area

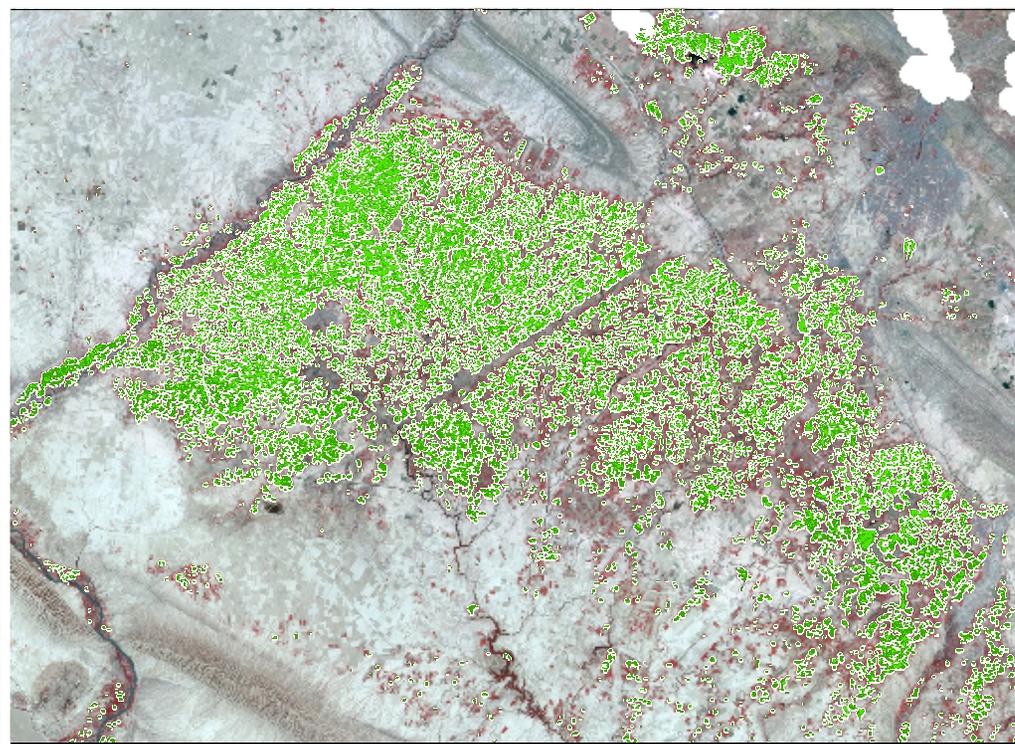
U

GDA Corp: SASR Mosaic



April 2008

GDA Corp: Scene-based Dominant Crop (SBDC)



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



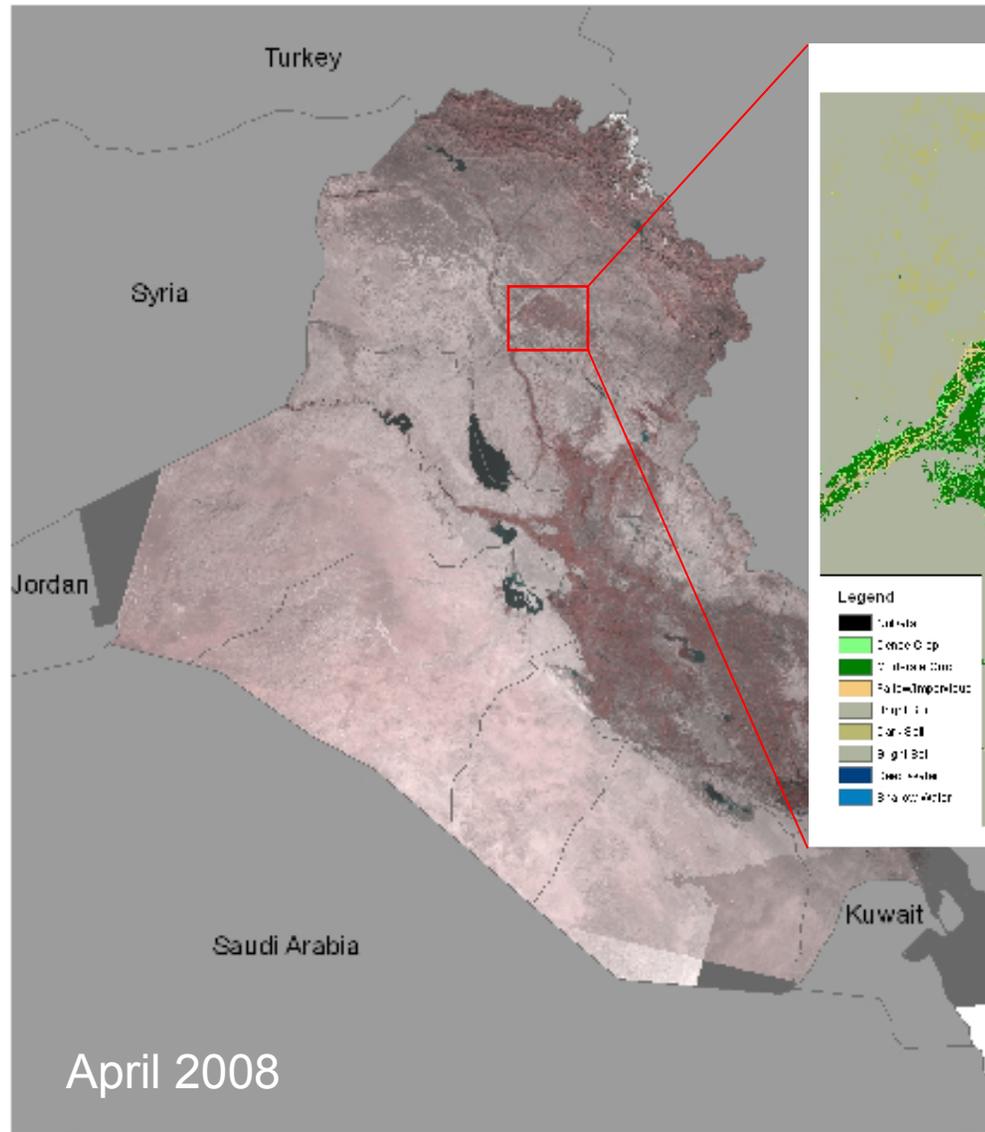
Data source: FAO, IHS - S
Data provided by National Geographic Intelligence Agency
© 2008 National Geographic Society
© 2008 National Geographic Society





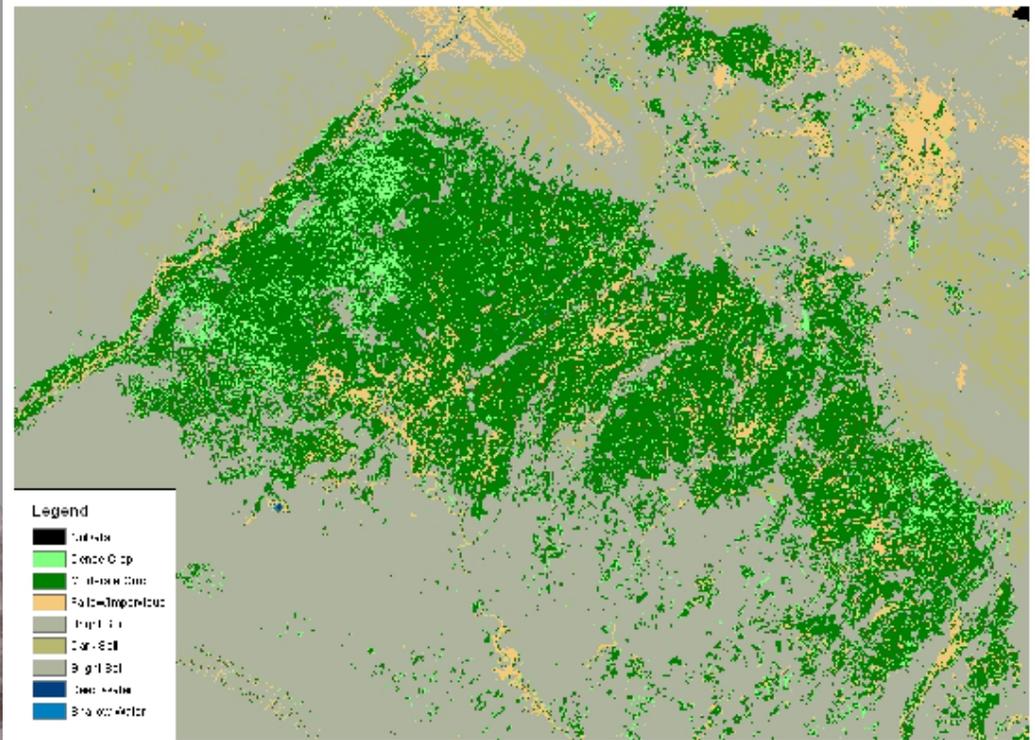
Production Statistics: Area

GDA Corp: SASR Mosaic



April 2008

Scene-based Classification: Decision Tree



**USDA Produced Image
Classification (Dominant Crops)
Classification Trees**



Data source: FAO, IHS - B
Data provided by National Geographic Intelligence Agency
© 2008 National Geographic Society
All rights reserved. No part of this publication may be reproduced without the prior written permission of the National Geographic Society.



■ **Benefits Operationally**

- Allows Provincial Reconstruction Teams (PRTs) information over time
- Accurate and Timely

■ **Challenges Operationally**

- Skilled Analysts Necessary
- Not an entry level field product





■ Conclusions

- Methodology is Correct
- Within 1% margin of error in Iraq – imagery was timely

■ Future

- Lack of commercial imagery could cause crop estimates to be off
 - Automated Procedures





THANK YOU!

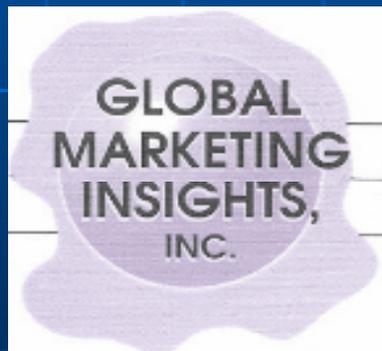
Iraq Operational Agricultural Monitoring Project:

United States Department of Agriculture (USDA)

Foreign Agricultural Service (FAS)

Office of Global Analysis (OGA)

International Production Assessment Division (IPAD)



Presenter:

Dr. Shawana P. Johnson

Global Marketing Insights, Inc.

USDA FAS Commercial Data

Negotiator

shawana@globalinsights.com

216-525-0600

