Essential Dates of AWiFS Data for the Identification of Corn and Soybean Fields in the U.S. Heartland

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USDA/NASS
Cropland Data Layer (CDL)

- Refined state acreage estimates
- Improved county acreage estimates
- Image product available to the public

CDL Classification

Resourcesat-1 AWiFS, 13 August 2007
To determine the necessary dates of AWiFS data for the identification of corn and soybean fields in the U.S. Heartland.
Methodology

• 12 Study Sites Across the U.S. Heartland

High Concentration of Corn and Soybean Acreage in Study Sites
AWiFS Imagery Time Series
(South Dakota Study Site)
AWiFS Imagery Time Series
(South Dakota Study Site)

July 20

Aug 13
AWiFS Imagery Time Series

May 28

June 11

July 20

Aug 13
Ground Truth - Agriculture

Farm Service Agency (FSA)
- Common Land Unit (CLU) 578 reporting data

AWiFS Scene - 8/27/07
FSA CLU Polygons on AWiFS
Ground Truth – Non Agriculture

2001 National Land Cover Dataset
Methodology

- Identical Methodologies using ERDAS Imagine and See5 Decision Tree Software

- Seven Classifications (per study site) vary only by the dates of AWiFS data used
  - 4 dates- May, June, July, August
  - 3 dates- May, June, July
  - 2 dates- May, June
  - 1 date - May
  - 1 date - June
  - 1 date - July
  - 1 date - August
Nebraska Study Site
Polk, York, Fillmore, Butler, Seward, Saline, Saunders, Lancaster Counties

Soybeans
Corn
Other Crop
Non Agriculture

4 dates – 5/18, 6/07, 7/06, 8/27 AWiFS
3 dates – 5/18, 6/07, 7/06 AWiFS
Nebraska Study Site
Polk, York, Fillmore, Butler, Seward, Saline, Saunders, Lancaster Counties

Soybeans
Corn
Other Crop
Non Agriculture

2 dates – 5/18, 6/07 AWiFS
1 date – 5/18 AWiFS
Close-up of Nebraska Study Site

4 dates – 5/18, 6/07, 7/06, 8/27 AWiFS

1 date – 5/18 AWiFS
Accuracy Measures

• **User’s Accuracy**: indicates the probability that a pixel from the classification actually matches the ground truth data and measures errors of commission.

• **Errors of Commission**: occur when a pixel is included in an incorrect category.

• **Producer’s Accuracy**: relates to the probability that a ground truth pixel will be correctly mapped and measures errors of omission.

• **Errors of Omission**: occur when a pixel is excluded from the correct category.
Ohio: Soybean Accuracy

Image Dates

Percent Accuracy

May - August
May - July
May - June
May
June
July
August

Soy: Producer Accuracy
Soy: User Accuracy
North Dakota: Corn Accuracy

![Bar chart showing corn accuracy in North Dakota for different image dates from May to August. The chart indicates the percentage accuracy for both producer and user accuracy, with data points highlighting specific months like May, June, July, and August.](chart.png)
Crop Progress: Corn in North Dakota

_______ 2007, _____ 2002-2006 Average

Imagery Dates
5/27, 6/20, 7/20, 8/07
Crop Progress: Soybeans in North Dakota

Progress %

Reporting Dates

Imagery Dates 5/27, 6/20, 7/20, 8/07

June 24 - Soybeans 100% Emerged

Dates

2007, 2002-2006 Average
Corn Across the U.S. Heartland
Date of 100% Emergence, 2007

Corn crop across the U.S. Heartland was one week ahead of the five year average for 100% emerged.

Five Year Average (2002-2006)
June 17 for 100% Emergence
-Except South Dakota (6/10)
Soybeans Across the U.S. Heartland
Date of 100% Emergence, 2007

Soybeans are planted on average two-three weeks after the corn crop.

Soybeans in Kansas, Missouri and Arkansas are planted later due to double cropping with Winter Wheat.

Five Year Average (2002-2006)
June 24 - July 8 for 100% Emergence
Average Soybean Accuracy – U.S. Heartland

![Graph showing average soybean accuracy from May to August]

- **May - August**
- **May - July**
- **May - June**
- **May**
- **June**
- **July**
- **August**

**Percent Accuracy**

- **Soy: Producer Accuracy**
- **Soy: User Accuracy**

Legend:
- Yellow: Soy: Producer Accuracy
- Green: Soy: User Accuracy
Average Corn and Soybean Accuracy  
U.S. Heartland

Percentage loss in accuracy highlighted from 4 date (May – Aug) classification

<table>
<thead>
<tr>
<th>May - Aug</th>
<th>May - July</th>
<th>May - June</th>
<th>May Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. P</td>
<td>C. U.</td>
<td>C. P</td>
<td>C. U.</td>
</tr>
<tr>
<td>94.55%</td>
<td>94.48%</td>
<td>92.61%</td>
<td>93.07%</td>
</tr>
<tr>
<td>(1.94%)</td>
<td>(1.41%)</td>
<td>(11.97%)</td>
<td>(12.38%)</td>
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</tbody>
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<tbody>
<tr>
<td>S. P</td>
<td>S. U.</td>
<td>S. P</td>
<td>S. U.</td>
</tr>
<tr>
<td>93.90%</td>
<td>92.81%</td>
<td>89.88%</td>
<td>88.88%</td>
</tr>
<tr>
<td>(4.02%)</td>
<td>(3.93%)</td>
<td>(21.65%)</td>
<td>(18.30%)</td>
</tr>
</tbody>
</table>

Accuracy Measures
- C.P. - Corn Producer
- C.U. - Corn User
- S.P. - Soybean Producer
- S.U. - Soybean User
Conclusions

• Without August AWiFS Data - Reductions in Accuracy
  – Corn: 1.41% - 1.94%
  – Soybeans: 3.93% – 4.02%

• Without July and August AWiFS Data - Reductions in Accuracy
  – Corn: 11.97% - 12.38%
  – Soybeans: 18.30% - 21.65%

• AWiFS collects through July are essential to produce highly accurate corn and soybean classifications.
Conclusions

• **Most Valuable Single Date AWiFS**
  – Corn: July or August
  – Soybeans: August

• **Future Research**
  – Incorporate MODIS 16-Day Composite Data into the analysis
Thank You

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