**Lecture 9**

**USDA Crop Reports**

by

Professor Scott H. Irwin

**Required Readings:**

Good, Darrel L. and Scott H. Irwin. “USDA Corn and Soybean Acreage Estimates and Yield Forecasts: Dispelling Myths and Misunderstandings.” Marketing and Outlook Brief 2011-02, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, March 2011. (ACE 427 class website)


Introduction

USDA crop reports are the most important consistently released in the corn and soybean markets

Substantial misunderstanding of the USDA’s methods, performance and market impact

“There has been considerable dismay in the industry as to USDA’s August corn and soybean estimates. Most do not see them as real objective analysis…We think that NASS just missed it by being too conservative with an immature corn and soy crop.”

USDA Forecasting Process

Corn and soybean _____________ are made for the following dates:

- August 1  Forecast
- September 1  Forecast
- October 1  Forecast
- November 1  Forecast
- January 1  “Final”
Once forecasts are generated, reports containing the forecasts are released to the public about the _____ of each month

Note that _____________ estimates are also updated for each report

Usually, little change in acreage from June planting intentions report, so nearly all of the variation in _____________ forecast is due to variation in ________ forecasts

All phases of the process are conducted by the National Agricultural Statistics Service (NASS), an agency within the USDA

**Sampling and USDA Production Estimates**

Previous to the 1940s, respondents for USDA agricultural surveys were not __________ selected

Instead, a panel of state agents, county reporters, and township reports

In late 1930s, the USDA pioneered the use of __________________
• Probability sampling both reduced ______ and increased the__________ of production and inventory estimates

**List Frame Samples**

• Samples drawn from a list frame consisting of the names, addresses, and telephone numbers of producers and agribusinesses, grouped by size and type of unit

• Needed for surveys in which the commodity to be estimated is highly __________ within a comparatively small __________ area:
  - Cattle in feedlots, hogs, poultry or rice
  - __________ sampling may not be very accurate in these cases

• Strong points
  - Inexpensive data_________
  - Small sampling_________
• Weak points
  ▪ May not include all farms
  ▪ Lists may become ________ quickly

**Area Frame Samples**

• Satellite imagery, aerial photos, and maps used to divide the US land area into small ______

• Each segment is about 1 square mile, and each has unique and identifiable boundaries outlined on aerial photographs or maps

• An area frame sample is a ______________ of these __________ drawn onto aerial photos

• Field ___________________________ information about agricultural activity within the segment

• Strong points
  ▪ Includes all farms
  ▪ Slowly outdated
• Weak points
  ▪ ____________ data collection
  ▪ Large sampling error for rare items

**Components of USDA Crop Forecasts**

Reported NASS yield forecasts are based on two types of information

  • ________________ survey
  • ________________ survey

We will discuss both surveys in the context of the October 1999 crop report:

  • Reference Date          Oct 1
  • Data Collection         Sep 24 - Oct 1
  • Edit, Sum, Analysis     Oct 1-4
  • Release                 Oct 8
Farm Operator Survey

- Farm operator’s assessment of ____________

- Sample drawn from list of farm operators who responded for the June Agricultural Survey

- Once selected for a given year, the ______ farm operators are surveyed for each report

- 12,312 farm operators surveyed in the US for the October 1999 crop report

- Of the total, 659 Illinois farm operators surveyed for the October 1999 crop report

Survey methods:

<table>
<thead>
<tr>
<th>Method</th>
<th>US</th>
<th>IL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mail</td>
<td>3%</td>
<td>23%</td>
</tr>
<tr>
<td>Phone</td>
<td>10%</td>
<td>0%</td>
</tr>
<tr>
<td>CATI</td>
<td>86%</td>
<td>77%</td>
</tr>
<tr>
<td>Interview</td>
<td>1%</td>
<td>0%</td>
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</tbody>
</table>
Objective Yield Survey

- Only conducted for _______ producing states

- Sample fields are selected based on June Agricultural Survey area frame

- Same ______ visited for each report

- __________________________ made in two plots in each field

- Number of fields for 1999 objective yield survey:

<table>
<thead>
<tr>
<th></th>
<th>US</th>
<th>IL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>1,361</td>
<td>294</td>
</tr>
<tr>
<td>Soybeans</td>
<td>1,153</td>
<td>225</td>
</tr>
</tbody>
</table>
7 States represent 73% of 1998 US corn production
8 States represent 76% of 1998 US soybean production
- Typical measurements:

<table>
<thead>
<tr>
<th></th>
<th>Corn</th>
<th>Soybeans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rowspace</td>
<td>2 rows x 15 ft</td>
<td>2 rows x 3.5 ft</td>
</tr>
<tr>
<td>Stalks</td>
<td></td>
<td>Plants</td>
</tr>
<tr>
<td>Ears &amp; ear shoots</td>
<td></td>
<td>Lateral branches</td>
</tr>
<tr>
<td>Ears with kernals</td>
<td></td>
<td>Blooms, dried flowers &amp; pods</td>
</tr>
<tr>
<td>Kernal row length</td>
<td></td>
<td>Pods with beans</td>
</tr>
<tr>
<td>Ear diameter</td>
<td></td>
<td>Pod weight</td>
</tr>
<tr>
<td>Ear weight</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Computation of objective yield:

\[
\text{Heads, ears or pods} \\
\times \\
\text{Weight per head, ear, pod} \\
= \\
\text{Gross yield}
\]

Net yield = Gross yield - harvest loss
It is important to note that __________ of the objective yield indications can change through the growing and harvest seasons

- Early in the season, the yield indications are influenced by assumed ____________ between plant counts and fruit numbers, and an assumed fruit weight adjusted for moisture content and harvest loss

- As the season progresses, fruit counts become known

- At the end of the season, plots are ________, and yields are calculated based on ________ grain weights and harvest losses

- In addition, an __________ is conducted with the farm operator immediately after harvest to determine acres actually harvested and the yield realized in the sample field
Preparation of Crop Reports

- The USDA’s ______________________ reviews all indications and determines ______ national and regional yield estimates

- Farm operator and objective yield indications are ____________ in a multistage process

- The process used to determine final production estimates is described by Gardner (1992) this way:

  “A NASS board in Washington then assesses all the indicators of yield, including the estimates of a month earlier. This is not done using a pre-specified formula---in which case a computer could replace the NASS board---but through a consensus of the Board members based on their experience and the full information before them.” (p. 1068)
• It is important to emphasize that crop production forecasts are based on the assumption of ______ __________________ for the _________ of the season as reflected by historical records

• The USDA does not incorporate any ______ forecasts or factor in ____________ as reflected by weekly crop progress reports

**Comparison of USDA Corn Yield Indications**

![Comparison of USDA Corn Yield Indications](image)

Source: Private Communication, Rich Allen, NASS
Lockup

- Lockup occurs on the date that a *Crop Report* is to be released

- Since reports are released at 8:30 am, before grain futures markets open, lockup may be much of the previous night

- Only ________ of the Agricultural Statistics Board (ASB) and ____________________ are allowed to be present during lockup

- ________ are stationed outside of lockup rooms

- Doors ________

- Windows ________

- Telephones and computer networks ________

- No one may _____ during lockup for any reason

- Every effort is made to avoid information about the Crop Report from leaking out early (No *Trading Places*!)
Publication/Dissemination

- Written release is prepared
- Estimates and reports are released at a pre-announced time
- Hard copies available in DC and field offices
- Electronic versions posted on the Internet
- Further dissemination through newspapers, radio, and wire service networks
USDA Forecast Performance

There are a number of aspects of forecast performance, which are covered in detail in the AgMAS report by Good and Irwin

- We will focus on ____________ here

USDA corn and soybean production forecasts are available for the 4230-year period covering _____________1971-2000.

USDA crop production estimates released in ______ of the year after harvest generally are considered to be ________ estimates

- While January estimates may be subsequently ______ based on stocks reports or agricultural census data, such changes tend to be rather small

Forecast errors are presented in ____________ terms, rather than in bushels, in order to standardize for increasing crop size over time:
\[
\left( \frac{USDA_5 - USDA_i}{USDA_5} \right) \cdot 100 \quad i = 1, \ldots, 4
\]

**Corn forecast errors:**

Panel A: August
Panel D: November

![Graph showing forecast error percentage over time]

Forecast Error (%)
**Soybean forecast errors:**

Panel A: August

![Graph showing forecast errors in August from 1970 to 2009.]

Panel B: September

![Graph showing forecast errors in September from 1970 to 2009.]

Panel C: October

Panel D: November
This analysis indicates that the ______ of USDA corn and soybean production forecast errors has been ______ over time.

However, this leaves open the question of ______ forecast performance by the USDA.

- How well did the USDA perform relative to the forecasts available in the ____________?

For the period 1970 through 2000, private market forecasts are represented by an average of the production forecasts by _____________ and _____________.

- Forecasts from these two firms are selected because they generally were considered to be the most ______ and were _____________ in the popular press during this period.

- Conrad Leslie used a postcard survey of grain marketing professionals, mainly elevator managers and market analysts.

- Sparks used a “small-scale” version of the USDA forecasting process.
For the period 2001 through 2005, the expected private market changes are represented by changes in the “average trade guess” as reported by Oster/Dow Jones (ODJ) or Reuters.

The change was made because Conrad Leslie discontinued his service after 2000.

We will compare __________________________ for the USDA and the “private market”

- USDA absolute forecast error:
  \[
  \left| \frac{USDA_5 - USDA_i}{USDA_5} \right| \cdot 100 \quad i = 1, \ldots, 4
  \]

- Private market absolute forecast error:
  \[
  \left| \frac{USDA_5 - Market_i}{USDA_5} \right| \cdot 100 \quad i = 1, \ldots, 4
  \]
Table 1. Mean Absolute Percentage Errors (MAPE) for USDA and Private Market Forecasts of Corn and Soybean Production, 1970-2011

<table>
<thead>
<tr>
<th></th>
<th><strong>Corn</strong></th>
<th></th>
<th><strong>Soybeans</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>USDA Forecast</td>
<td>Private Forecast</td>
<td>Difference</td>
</tr>
<tr>
<td>August</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970-2011</td>
<td>5.0</td>
<td>5.2</td>
<td>-0.2</td>
</tr>
<tr>
<td>1970-1984</td>
<td>5.9</td>
<td>7.0</td>
<td>-1.1</td>
</tr>
<tr>
<td>1985-2011</td>
<td>4.5</td>
<td>4.1</td>
<td>0.3</td>
</tr>
<tr>
<td>2007-2011</td>
<td>3.3</td>
<td>3.9</td>
<td>-0.5</td>
</tr>
<tr>
<td>September</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970-2011</td>
<td>3.8</td>
<td>4.2</td>
<td>-0.3</td>
</tr>
<tr>
<td>1970-1984</td>
<td>3.9</td>
<td>4.2</td>
<td>-0.3</td>
</tr>
<tr>
<td>1985-2011</td>
<td>4.0</td>
<td>4.3</td>
<td>-0.3</td>
</tr>
<tr>
<td>2007-2011</td>
<td>2.0</td>
<td>2.1</td>
<td>-0.1</td>
</tr>
<tr>
<td>October</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970-2011</td>
<td>2.3</td>
<td>2.9</td>
<td>-0.7</td>
</tr>
<tr>
<td>1970-1984</td>
<td>2.4</td>
<td>3.1</td>
<td>-0.7</td>
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<tr>
<td>1985-2011</td>
<td>2.2</td>
<td>2.8</td>
<td>-0.6</td>
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<tr>
<td>2007-2011</td>
<td>1.2</td>
<td>1.9</td>
<td>-0.7</td>
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<tr>
<td>November</td>
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<tr>
<td>1970-2011</td>
<td>1.1</td>
<td>1.5</td>
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<td>1.0</td>
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<tr>
<td>2007-2011</td>
<td>0.9</td>
<td>0.8</td>
<td>0.0</td>
</tr>
</tbody>
</table>
Conclusions

Overall, the analysis presented in this section suggests the USDA ________ reasonably well in generating crop production forecasts for corn and soybeans

- There is nonetheless room for _____________

- Commenting on similar forecast accuracy results, Egelkraut et al. (2003), offer this suggestion:

  “The improved performance by the private agencies for August for both crops during the most recent years, and the ability of the private agencies to generate relatively accurate forecasts in soybeans suggest that it might be useful for USDA to investigate expanding the scope of their subjective yield analysis to incorporate a wider range of market and industry participants. Such a strategy, if proved effective, might lead to improved crop production forecasts.” (p. 94)
Market Impact of USDA Forecasts

Theoretically, the ________ of USDA corn and soybean production forecasts should be determined by how well the market__________ the forecasts.

If the market ________ anticipates USDA production forecasts, then, under the theory of ____________, prices will ________

If the market does not perfectly anticipate the forecasts, prices ________ in relation to the degree that the market is _________ by the new ________

- Market surprise is the “unanticipated component” of the USDA forecast

- Explains the widespread collection and distribution of analyst ____________before the release of government reports

To compute surprises, a measure of market ___________ (forecasts) is needed
Once again, private market forecasts are represented by an average of Conrad Leslie and Sparks Companies, Inc. forecasts from 1970-2000 and ODJ averages for 2001-2005.

For example, the computations for the August 1998 corn crop report are:

\[
Surprise_t = Aug_{USDA,t} - Aug_{Private,t}
\]

\[
Aug_{USDA,t} = 9592 \text{ mil. bu.}
\]

\[
Aug_{Private,t} = 9536 \text{ mil. bu.}
\]

\[
Surprise_t = \underline{56} = \underline{56}
\]

- A _______ surprise number is considered _______ because the USDA forecast is larger than the market expectation (increased supply)

- Likewise, a _______ surprise number is considered _______ because the USDA forecast is smaller than the market expectation (decreased supply)
Corn market surprises:
Panel A: August

Soybean market surprises:
Panel A: August
Efficient Price Reaction after Release of Crop Reports

Bearish reports:

![Bearish report graph]

Bullish reports:

![Bullish report graph]
Price impact measured by ______________ in __________ corn futures and __________ soybean futures:

<table>
<thead>
<tr>
<th>Futures Close</th>
<th>Futures Open</th>
<th>Futures Close</th>
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</thead>
<tbody>
<tr>
<td>3:00 pm EST</td>
<td>Release of CR</td>
<td>8:30 am EST</td>
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</table>

Price Reaction if market not limit up or down

<table>
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<tr>
<th>Futures Close</th>
<th>Futures Open</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Release of CR</td>
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Price Reaction if open limit up or down

Price Reaction if market not limit up or down

<table>
<thead>
<tr>
<th>Futures Close</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Release of CR</td>
<td></td>
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</tr>
</tbody>
</table>
Corn price reaction:
Panel A: August

Soybean price reaction:
Panel A: August
Corn price reaction regression:
Panel A: August

\[ y = -1.1028x + 0.4629 \]
\[ R^2 = 0.4582 \]

Soybean price reaction regression:
Panel A: August

\[ y = -0.6845x + 0.4229 \]
\[ R^2 = 0.2112 \]
Price impacts illustrated in this section provide strong evidence that ________________ view USDA corn and soybean production forecasts as important ______

This suggests that USDA forecasts improve ________________ by moving prices closer to the ________ market equilibrium

It is important to point out that earlier forecast performance results appear to ________ some of the price impact results

• The forecast performance results indicate that private market forecasts early in the season (August) for both crops tend to be ________ as accurate as USDA forecasts

• At the same time, corn and soybean futures prices continue to _____ to the release of these same USDA forecasts??
USDA Forecasts of Foreign Crop Production

USDA is responsible not only for domestic crop production forecasts, but _________ production estimates as well.

The Production Estimates and Crop Assessment Division (PECAD) of the Foreign Agricultural Service (FAS) has specific responsibility for foreign production estimates.

In addition to foreign crop production estimates, PECAD is tasked with:

- _______________ analyses related to areas of contention, political disturbance, droughts and disasters

- Special assessment requests from USDA and other agencies related to _________ and _________ response

- U.S. _______________ and crop conditions assessments
Regional PECAD analysts use a number of data sources and tools to generate production forecasts

- __________ data
- __________ data
- __________ models

PECAD regional analysts _______ extensively in the countries they cover to more fully develop the _______ and _______ within which the assessments will be made.

FAS also has a global network of _________ that provide ______________ reports of observed crop conditions.

Other contextual information plays a significant role in determining final estimates:

- Official governmental ______ where available
- _____ and _____ sources
FAS has extensive information on foreign crop conditions available at its website:

http://www.pecad.fas.usda.gov/

Also of interest is the Crop Explorer web site:

http://www.pecad.fas.usda.gov/cropexplorer/

- This site features near-real-time global crop condition information based on satellite ________ and ________ data

- Thematic ____ of major crop growing regions depict vegetative vigor, precipitation, temperature, and soil moisture
The following paragraph contains a nice description of the entire WASDE process, including the role of FAS/PECAD:

Once a month, the US Foreign Agricultural Service and experts from the Economic Research Service are “locked up” in one room to develop an estimate of worldwide agricultural production and yield. During that day, the analysts offer their respective crop production numbers and sometimes have to show the data and reasoning that support these estimates. During lock-up the group may be organized in as many as five (5) committees based on the commodity (i.e. wheat). The process serves as a ‘virtuous circle’ where validity of production numbers is supported and reviewed until consensus is achieved. The end result is concurrence on the production estimates that are presented by the World Agricultural Outlook Board. The National Agricultural Statistic Service (NASS) provides the production estimates for domestic agriculture. They enter the lock-up at 2:30 a.m. and provide the fodder on the current US production estimates. The first item undertaken is the balancing of the world supply and demand for these commodities. Next, the U.S. supply and demand is balanced by the NASS estimates. U.S. crop forecasting based on a full survey process is then reviewed. The results of this lock-up process directly affect commodity prices and farmers income and often result in millions of dollars in trade. Monthly revisions of the production estimates are needed to account for changes in weather and other possible factors that have an impact on the harvest.

---Hutchinson et al. (2003)