STATE OF THE INDUSTRY
HOW WOULD YOU DESCRIBE THE STATE OF THE INDUSTRY?
NEW JOURNEY OF THOUGHT, INNOVATION, AND LEADERSHIP

ALMOND LEADERSHIP CLASS
State of the Industry

• Richard Waycott, Almond Board of California (Moderator)

• Karen Ross, Secretary, California Department of Food and Agriculture

• Joel Kimmelshue, Land IQ

• Mike Mason, Supreme Almonds of California

• Chris Messer, USDA NASS
Karen Ross,
Secretary, California Department of Food and Agriculture
Joel Kimmelshue,
Land IQ
Statewide Mapping of Almonds: Results and Applications

State of the Industry
Joel Kimmelshue, PhD, CPSS
Presentation Summary

• Cooperators, Resources, and Development Timeline
• Acreage Results
• Applications
  – Age Analysis
  – Recharge Potential
• On-Line Web Map
• Conclusions
Cooperators, Resources, and Development Timeline
Cooperators and Resources

• Primary Cooperators
  – Almond Board of California (ABC)
  – Land IQ, LLC

• Main Resources
  – United States Department of Agriculture (USDA) National Agricultural Imaging Program (NAIP) imagery
  – Landsat and other imagery
  – California Department of Water Resources (DWR) County Crop Mapping
  – USDA-National Agricultural Statistics Service (NASS) CropScape Mapping
  – USDA-NASS Tabular Records
  – California Department of Pesticide Regulation (DPR) Records
  – County Agricultural Commissioner Crop Reports
  – Grower Knowledge
  – Agronomic and Remote Sensing Expertise
Development Timeline

• Over Half a Decade of Research and Development
  – Idea Development in 2010 and before – Were average yields slightly elevated?
  – Initial Pilot Study in Madera County in 2011
  – Secondary Pilot Study in Madera County in 2013
  – Statewide almond mapping in 2014 including other crops
  – Retrospective 2010 and 2012 mapping
  – Current analyses – derived from most up-to-date mapping
    • Age Analysis
    • Recharge Potential
  – Future analyses
    • Previous Crop Analysis
    • Regulatory Compliance and Risk
    • Renewable Energy Analysis
    • Water Supply Reliability
  – 2016 mapping complete at the end of 1st quarter of 2017
    • Waiting on imagery to become available
Acreage Results
Total Acreage Results – Bearing and Non-Bearing

- USDA-NASS Acreage

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Total Acreage Results – Bearing and Non-Bearing

- USDA-NASS and Land IQ Acreage

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![Statewide Almond Acreage - 2010, 2012, 2014](chart.png)
Total Acreage Results – Bearing and Non-Bearing

- USDA-NASS and Land IQ Acreage Comparisons

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<td>% Difference</td>
<td>9.4%</td>
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![Statewide Almond Acreage - 2010, 2012, 2014](chart.png)
Total Acreage Results – Bearing and Non-Bearing

• USDA-NASS and Land IQ Acreage Comparisons and Conclusions

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• Key Conclusions
  – Differences are decreasing and have existed for years
  – These acreage differences do not impact volume of production
  – Land IQ has begun a partnership with USDA-NASS to maximize accuracy
  – USDA-NASS will continue to provide official statistics as well as items Land IQ does not provide:
    • Subjective and objective yield estimates
    • Varietal distribution
    • Nursery survey results
Acreage Results – Bearing Only

- USDA-NASS and Land IQ Bearing Acreage Comparisons

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<tr>
<td>USDA-NASS</td>
<td>770,000</td>
<td>820,000</td>
<td>880,000</td>
</tr>
<tr>
<td>Land IQ</td>
<td>810,386</td>
<td>885,575</td>
<td>936,263</td>
</tr>
<tr>
<td>Difference</td>
<td>40,386</td>
<td>65,575</td>
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<td>5.2%</td>
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![Map of California Counties and Perennials](image-url)
Average Yield Results (lbs/acre)

- Land IQ and USDA-NASS Average Yield Comparisons and Conclusions

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<tr>
<td>Crop Volume (lbs)</td>
<td>1,640,000,000</td>
<td>1,890,000,000</td>
<td>1,870,000,000</td>
</tr>
<tr>
<td>USDA-NASS</td>
<td>2,130</td>
<td>2,310</td>
<td>2,130</td>
</tr>
<tr>
<td>Land IQ</td>
<td>2,024</td>
<td>2,134</td>
<td>1,997</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td><strong>106</strong></td>
<td><strong>176</strong></td>
<td><strong>133</strong></td>
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- The ABC and grower suspicions were verified – average reported yields/acre were slightly higher than experienced
- Although average yields/acre were actually lower, this was a result of higher acreage, not additional volume of crop
Applications – Age Analysis
Applications – Age Analysis

• Question: Can you also determine the age of each orchard?

• Answer: Yes
  – Once orchards are mapped, only then can age be determined
  – A backwards looking approach (through 1984) at various imagery sources is conducted
  – Once “signature” appears as open ground, then this establishes planting date
  – +/- 1-2 years
  – Accuracy = 90-95%

• Significance: Potential Uses
  – Yield forecasts/enhancements
  – Biomass/carbon accumulation
Applications –
Groundwater Recharge Potential
Application – Groundwater Recharge Potential

• Question: Given increased interest in winter recharge by ABC and state regulations, can you tell which orchards are most suitable for intentional recharge?

• Answer: Yes
  – Developed a Central Valley wide suitability index utilizing:
    • University California Davis (UCD) Soil Agricultural Groundwater Banking Index (SAGBI)
    • California Department of Water Resources (DWR) Groundwater Levels
    • United States Geological Survey (USGS) Central Valley Hydrologic Model (CVHM) well logs
    • California Department of Water Resources (DWR) Irrigation District Coverage
    • Hydrology & Points of Diversion
  – The index provides a locating tool for determination of suitable areas for intentional groundwater recharge in any crop
Application – Recharge Potential

- Overlay almond orchard mapping on top of recharge suitability index
- Inherit the recharge classification to the specific almond orchard itself
- Result is a new map product that shows recharge classification specifically for almond orchards

• Significance:
  - Resulted in approximately 600,000 acres of suitable almond orchards
  - Allows growers and water providers the ability to locate most suitable orchards in relation to water supply infrastructure
  - Prioritizes land for recharge opportunities
  - Does not replace site-specific investigations
  - Allows for interaction with other researchers for assessing impact on crop, soils, leaching, etc.
Web Map Application
Web Map Application

- These research results (mapping and applications) are now available to all interested growers, processors, industry members, and the public.

- Method of dissemination of these research results is a web based mapping tool.

- The tool can be accessed at the ABC web site at www.almonds.com/maps

- Web map considerations:
  - View only
    - No modifications to underlying information possible
    - Protects integrity, management, and updates of the base layer data
  - No identifying information is contained within this web site or map
On-Line Web Map Site

• For public use
• It’s a “living” map and will continually be updated over time as new analysis results become available (e.g. 2016 mapping).
• Web map components:
  – Various map backgrounds
  – Age Analysis by orchard
  – Recharge Suitability by orchard
• Technical support at: technical.support@landiq.com and 916.265.6358
Web Map Demonstration
Conclusions
Conclusions

• Almond Board of California proactively commissioned a map-based (spatial) format to better understand statewide acreage and agricultural issues

• The mapping that has been completed for 2010, 2012, and 2014 is greater than 96% accurate as to orchard location and acreage

• 2016 mapping will be completed at the end the first quarter of 2017 once USDA NAIP imagery becomes available

• There are multiple uses of the base layer information for analysis purposes, including age determination, intentional almond recharge potential, regulatory compliance, renewable energy analysis, water supply reliability, crop forecasting

• A public use web map has been developed that allows for viewing of almond mapping for various years and analysis results www.almonds.com/maps

• Technical support for the web map can be reached at technical.support@landiq.com or 916.265.6358
Acknowledgements

- Almond Board of California
- Land IQ
  - Mica Heilmann, CPSS
  - Zhongwu Wang, PhD
  - Seth Mulder, MS, CPAg, CCA
  - Chris Stall, MS
  - Matt Twietmeyer, MS
  - Stephanie Tillman, MS, CPAg
  - Ruth Spell, MS
  - Nolan Schultz
  - Kyleigh Turnquist
  - Andrew Loberg
Chris Messer,
USDA NASS
USDA’s National Agricultural Statistics Service

The Almond Conference
December 6-8, 2016
Sacramento, CA

Chris Messer
Almonds and NASS program

• Federal Program
• Agreements
• Resources

About NASS
Mission Statement

The National Agricultural Statistics Service provides timely, accurate, and useful statistics in service to U.S. agriculture.
Almonds – Federal Program

• Almonds
  – Noncitrus Fruits and Nuts - June annual
  – Crop Production - May and July

2017 Guide To Products and Services
Almonds - Agreements

• Almond Acreage Report
• Almond Objective Measurement Survey
• Almond Nursery Survey
Almonds - Resources

- Fruit Acreage Database
- CropScape
- LandIQ data?
Almonds – The 3 Cs

• Collaboration
• Communication
• Cooperation
NASS Thanks You!

• [www.nass.usda.gov](http://www.nass.usda.gov)
  – [www.nass.usda.gov/ca](http://www.nass.usda.gov/ca)

  – Email nassrfopcr@nass.usda.gov
  – Telephone 800-851-1127
Meet Land IQ and NASS at The Almond Board Booth

Tuesday, December 6:
• 5:30 - 7:00 pm – Joel Kimmelshue and Chris Messer

Wednesday, December 7:
• 9:30 - 10:15 am – Mica Heilmann
• 1:15 - 2:15 pm – Joel Kimmelshue
• 3:30 - 5:30 pm – Joel Kimmelshue or Mica Heilmann

Thursday, December 8:
• 1:30 - 3:00 pm – Joel Kimmelshue
STATE OF THE INDUSTRY
WHAT A DIFFERENCE A YEAR MAKES

Some of last year’s important uncertainties are now more certain

Almond Shipments November 2015 - October 2016

235,550,542

140,521,992
FOCUS ON THE LONG TERM NEEDS OF THE INDUSTRY AND WHERE WE CAN MAKE A DIFFERENCE
5% increase = 500 million pounds
COURAGE OR BOLD NEW INITIATIVES

TWO ESSENTIAL CONSIDERATIONS:
ADDITIONAL FUNDING DECISION PENDING AT USDA
A BIG DIFFERENTIATOR
Industry volunteerism
SUCCESSFUL PARTNERING

1+1=3 OR 4 OR 5
ACCELERATED GROWER AND HANDLER ADOPTION IS KEY
STATE OF THE INDUSTRY
Questions?