Mapping Spatial Distribution of Almonds Using Remote Sensing – Enhancements of Existing Method and Product for Applications

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PROJECT SUMMARY

Objectives:

- Update accuracies for almond crop mapping in a representative area of the Central Valley.
- Apply previously developed crop mapping methodologies for almonds within a representative area of the Central Valley.
- Show importance of spatial distribution of almonds to various example applications.
- Develop approaches to estimate individual almond orchard age.

Background and Discussion:

Land IQ (formerly NewFields) has developed a unique methodology to map almonds statewide (on an orchard by orchard basis) with a minimum accuracy of 95-97%. This methodology has been developed over the past 10 years and includes other cropping systems. Almonds, due to their large acreage and economic impact to the state have been a key crop for identification and increased accuracies of prediction. Other spatial products have lower accuracies (e.g. 75%) or are only produced infrequently (e.g. every 8-10 years). Therefore, application of these types of base layers can, and does result in erroneous interpretation.

Remote sensing analysis is used frequently to extend field-level assessments over large regions in a cost-effective manner. Land IQ has employed in-depth understanding of almond production with the use of object-based image analysis approaches coupled with temporal, spectral, and textural approaches to ultimately determine individual almond orchards.

The approach involves image acquisition, field delineations, ground truthing, in-house remote sensing, initial statistical accuracy assessment/QA-QC, final ground truthing, and final product development.

The purpose of this work for the Almond Board of California (ABC) was to take our already existing almond mapping product and associate that coverage with common applications. Three applications were developed that show the value of having an accurate and timely, orchard by orchard mapping layer.

The first application involved employing a proximity analysis that spatially relates almond orchards to sensitive species habitat as defined by the US Fish and Wildlife Service (USFWS). This clearly showed that some orchards are adjacent to these areas and may have specific requirements for management activities.

The second application focused on determination of the age of each individual orchard. With approximately 90% accuracy we were able to use our orchard by orchard remotely sensed almond coverage and additional remote sensing applications to determine the planting date of each orchard. The value of this information is key when assessing market conditions, changes in production acreage, possible biomass, locations of new orchards, and market planning into the future.

A third application was combining the base layer with soils and irrigation methods for Irrigated Lands Regulatory Program (ILRP) requirements. Land IQ was able to develop an example multi-crop Nitrogen Hazard Index (NHI) for use in regulatory negotiations and compliance. The results showed improved nitrogen and water use efficiency effects over a 21-year cycle.

Three example applications of an accurate and timely remotely-sensed state-wide almond coverage were developed for the ABC. These applications and associated interpretations are only as good as the base layer used. Costs were also developed based on area and frequency of analysis.

Project Cooperators and Personnel: From Land IQ: Daniel Smith, MS, Zhongwu Wang, PhD, Seth Mulder, MS, Stephanie Tillman, MS, Mica Heilmann, BS

For More Details, Visit

- 2012.2013 Annual Report CD (12-STEWCROP4-Kimmelshue); or on the web (after January 2014) at www.almondboard.com/researchreports
- Related Project: 11-STEWCROP4-Kimmelshue