

Bee Colony Collapse Disorder Oversight Hearing

Jt. Hearing of the California State Assembly Committee on Agricultural Committee on
Environmental Safety and Toxic Materials

October 16, 2013
State Capitol
Sacramento

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Almonds are grown on some 800,000 acres in the Central Valley of California and have a farm gate value of \$3.87 billion (NASS, 2011). Some 6,500 growers grow and about 100 handlers process almonds. Fifty percent of the almond growers farm 50 acres or less.

The Almond Board of California is a grower-enacted Federal Marketing Order under USDA in which all almond growers and handlers are members. Almond Board programs are financed through an assessment collected from the handlers, which includes funding global generic marketing programs, food safety initiatives, and industry research covering everything from nutrition to food safety to almond production. We have been funding research on honey bee health for nearly 20 years, long before CCD or other recent issues surfaced.

Almonds are the largest user of pollination services in the US, needing some 1.6 million hives each spring. Because almond trees are not self-pollinating - each orchard typically includes 3 different varieties of almonds - honey bees and other pollinators are relied upon to move pollen from one variety to the other. To date, almond growers have had sufficient hives for pollination. Beekeepers rely on almond pollination fees to cover a significant portion of the beekeepers' annual hive costs. Thus, there is a mutually dependent relationship between almond growers and beekeepers.

Honey Bee Health

In May of this year, USDA and EPA released a report based on a stakeholder meeting in October 2012 on the factors affecting honey bee health (Report on the National Stakeholder Conference on Honey Bee Health, May 2013

<http://www.usda.gov/documents/ReportHoneyBeeHealth.pdf>). The report clearly states there is a confluence of factors coming together that include inadequate and/or poor quality food supply (forage), the impacts of various insect pests and various diseases of honey bees, lack of genetic diversity in the honey bee population, and pesticides. The report doesn't state that the ONLY cause was pesticides or lack of forage or disease, but that all of these factors are coming together to impact the overall health of the bee population.

Almond Board Funded Research

As mentioned, the Almond Board of California has been funding research on Honey Bee Health for nearly 20 years. The ABC program has been the most sustained funding for honey bees outside of the USDA-ARS efforts. Thus, the Almond Board has been evaluating where to fund research to best impact honey bee health for nearly 20 years. That research has included looking for better tools to control Varroa mite, including pesticides to control Varroa; research to understand and control various diseases (Nosema, foulbrood, viral diseases); the impact of fungicides used in almonds during bloom; along with seeking better formulations of supplemental nutrition for beekeepers to use; and more recently assessing supplemental forage around almonds. We have also been funding “tech transfer teams” who provide extension to beekeepers on best management practices. This provides you a sense of the range of research on honey bee health the almond industry has funded.

Based on our assessments, the two changes that would make the most difference for honey bee health would be 1) better forage and bee nutrition, and 2) a way to control Varroa mites.

Forage

- 1) Outside of California: The unintended consequence of losing some 9 million acres of Conservation Reserve Lands in the Upper Midwest in the last 5 years due to corn and soybean prices has been poorer forage. That land was prime summer forage for many commercial beekeepers. But with expanded crop acreage both the quality of the forage has declined as well as increasing the chances for exposures to pesticides.
- 2) In California, the issue has two aspects
 - a. Ensuring there is some forage during the winter when hives are brought to CA in preparation for almond bloom, as well as sufficient forage post almond bloom until non-CA-based hives are moved out of CA.
 - i. ABC is working with Project Apis m to encourage almond growers to plant forage.
 - b. CA beekeepers are also struggling to find good year round forage. Due to changes in both crops and management practices, some crops are no longer as available for forage; public lands are making it harder and harder for beekeepers to have access.

Varroa Mites:

The introduction of the Varroa mite into the United States in the late '80s singlehandedly doubled the overwintering hive losses. This insect is a serious pest of honey bees (I describe it as a vampire transmitting HIV) and it is difficult to control an insect on an insect. We need a better understanding of Varroa biology and continued search for additional practical methods for control or reduction.

Pesticides:

While pesticides are part of the issue, based on research to date, we do not consider them to be the primary issue. In almonds, fungicide applications and honey bees have had to find a way to co-exist for over 40 years. When concerns over fungicides used by almond growers has surfaced, we have funded research to understand whether it does have an impact, and if yes, communicate which products to avoid using at full bloom to almond growers.

Best Management Practices

We have found that it works best to have research as well as find mutually acceptable practices to minimize bee pesticide interactions between growers and beekeepers.

In almonds, a key best management practice (BMP), when possible, is to hold off spraying fungicides to the late afternoon and evening during bloom. This is based on recognizing that almonds shed their pollen in the morning, and bees and other pollinators have foraged all the pollen by mid-afternoon. Thus by delaying applications to later in the day, bees and pollen are not directly sprayed. But it is important to recognize what is practical in terms of almond BMPs may not work in other crops – for example night spraying is not an option for many crops – it simply is not safe.

Another example of growers and beekeepers working together for BMP development is California citrus, which doesn't need honey bees. For some 40 years citrus growers have an agreement that allows the beekeeper to access citrus bloom for orange blossom honey for a certain amount of time, but at a date certain each year the hives need to be removed, and then citrus growers can apply the insecticides needed to protect their crop.

EPA and CDPR's work is to evaluate both the risks and the benefits from pesticides from the viewpoint of multiple stakeholders. Both organizations do that quite well. While there is new research on the impacts of both acute and sub-lethal effects of various pesticides on honey bees, almost none of that research (at least being done in the academic arena) is usable in the regulatory process. Thus, it is premature to judge any class of pesticides as being THE cause of honey bee health declines. As pointed out above, it is also better for beekeepers and growers to work together to see if mutually acceptable ways to reduce possible pesticide exposures are possible, rather than have some blanket policy for all. Once the needs of various stakeholders are assessed, recommendations and practices can be adjusted to ensure maximum benefit without penalizing one industry at the expense of another.

Next Steps:

If the State Legislature is looking for ideas for where to focus their energies on how to improve honey bee health, then consider the following:

- 1) Mandate that all CA agencies that manage public lands come to the table with beekeepers to discuss what processes can be put in place to assess where honey bee

hives could be situated for forage at certain times of the year. Currently some agencies categorically refuse to consider where honey bee hive placements might be acceptable.

- 2) Additional funding to UC ANR for beekeeper extension position(s) and development of a PCA system for beekeepers. The grant-funded Tech Transfer teams in the Sacramento Valley have been very valuable.
- 3) Explore ways, whether through funding, technical assistance, or outreach, to assist California growers in planting pollinator habitat on any lands not in ag production.

Last July, we had the opportunity to meet at the National Academy of Sciences (NAS) in DC with Dr. May Berenbaum of the University of Illinois. She was Chair of the NAS panel that published the report "Status of Pollinators in North America (2007 http://www.nap.edu/catalog.php?record_id=11761). She went through the whole list of issues that honey bees face. When asked if she had ONE magic wand, what would she use it for: She immediately said for better forage – a well fed bee is more able to withstand stress.

See attached PowerPoint for additional information on almonds and honey bees.



Almonds and Bees

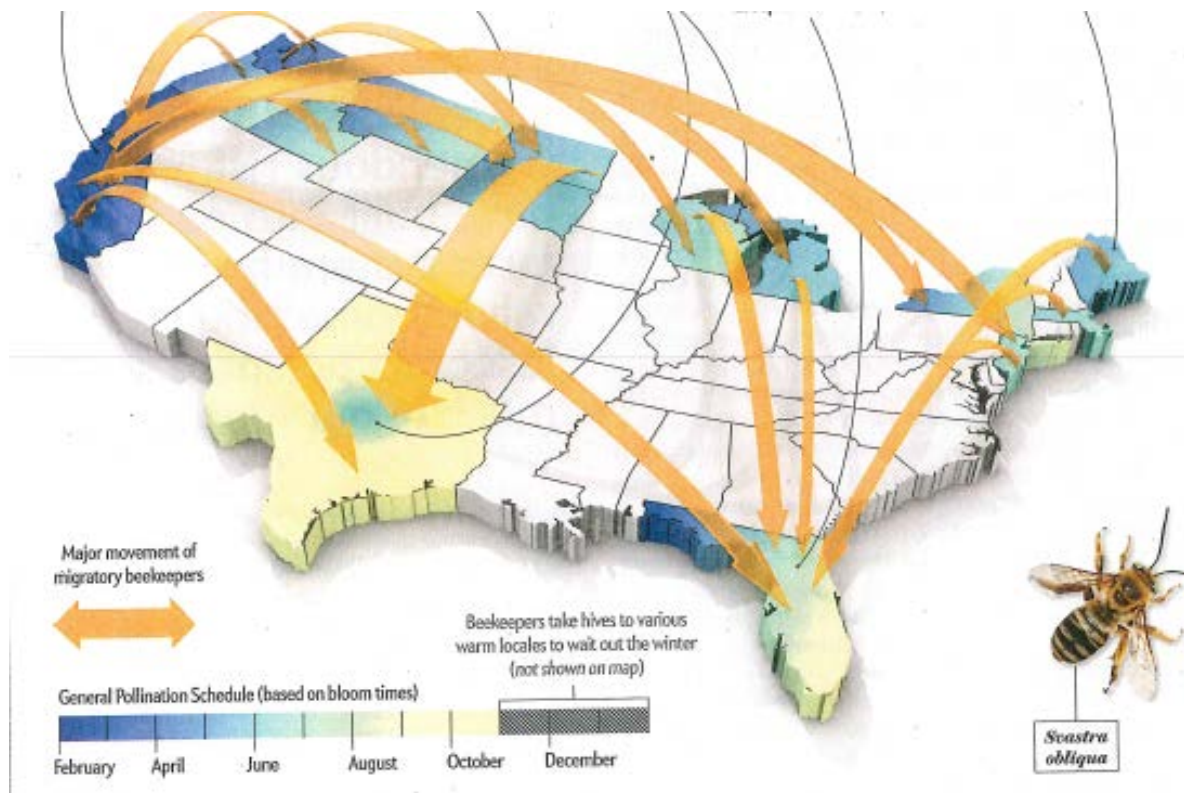
October 16, 2013

Why do Almonds Need Bees?

- Almond varieties are “self-incompatible”: pollen of one variety doesn’t pollinate itself (in contrast to “self compatible”).
- Each orchard is planted with two, typically 3, different varieties of almonds in adjacent rows to allow cross-pollination
- We rely on bees to move the pollen from one variety to another, not just moving the pollen within flower
- We typically need pollination services mid-February through mid-March during almond bloom

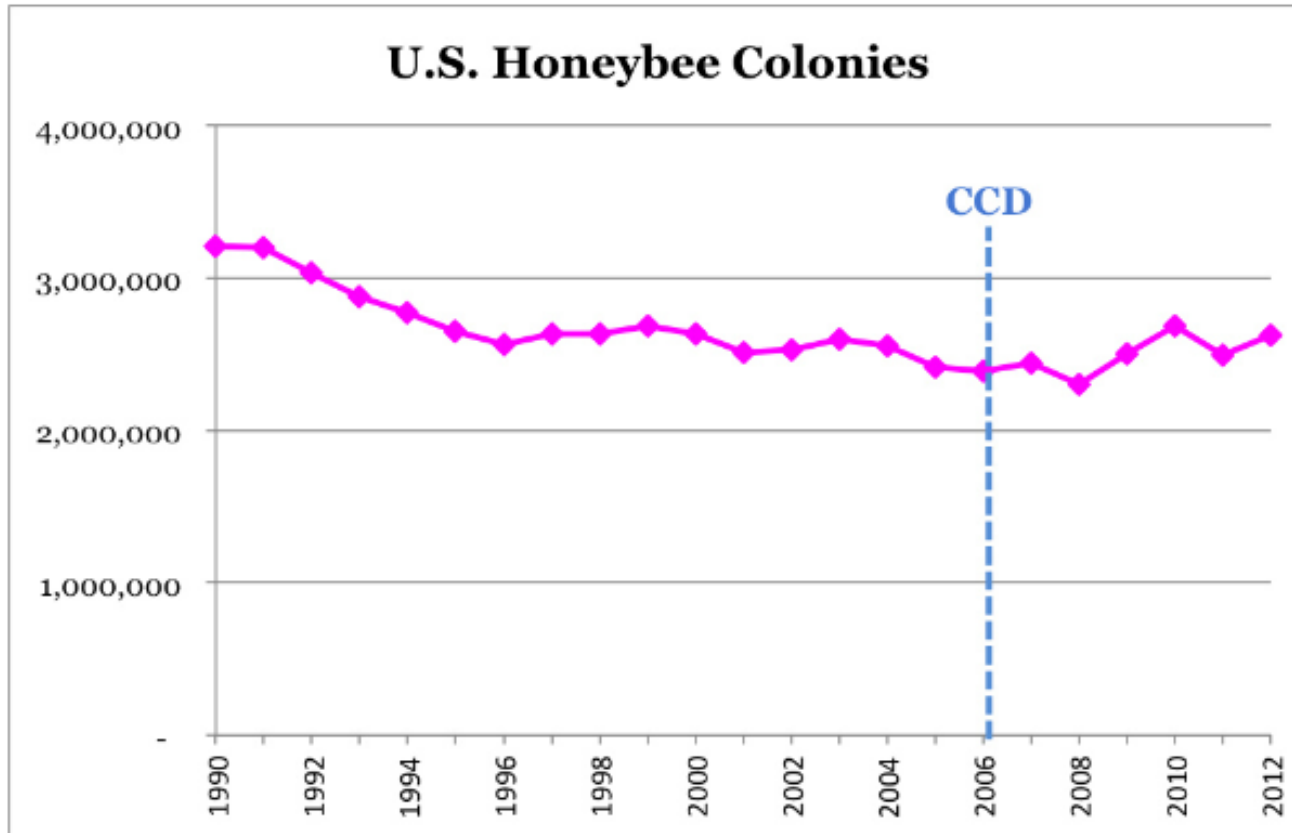


Beeography: Bees without borders



Source: *Scientific American*, September 2013

Pollination Supply vs. Demand: Supply Stable

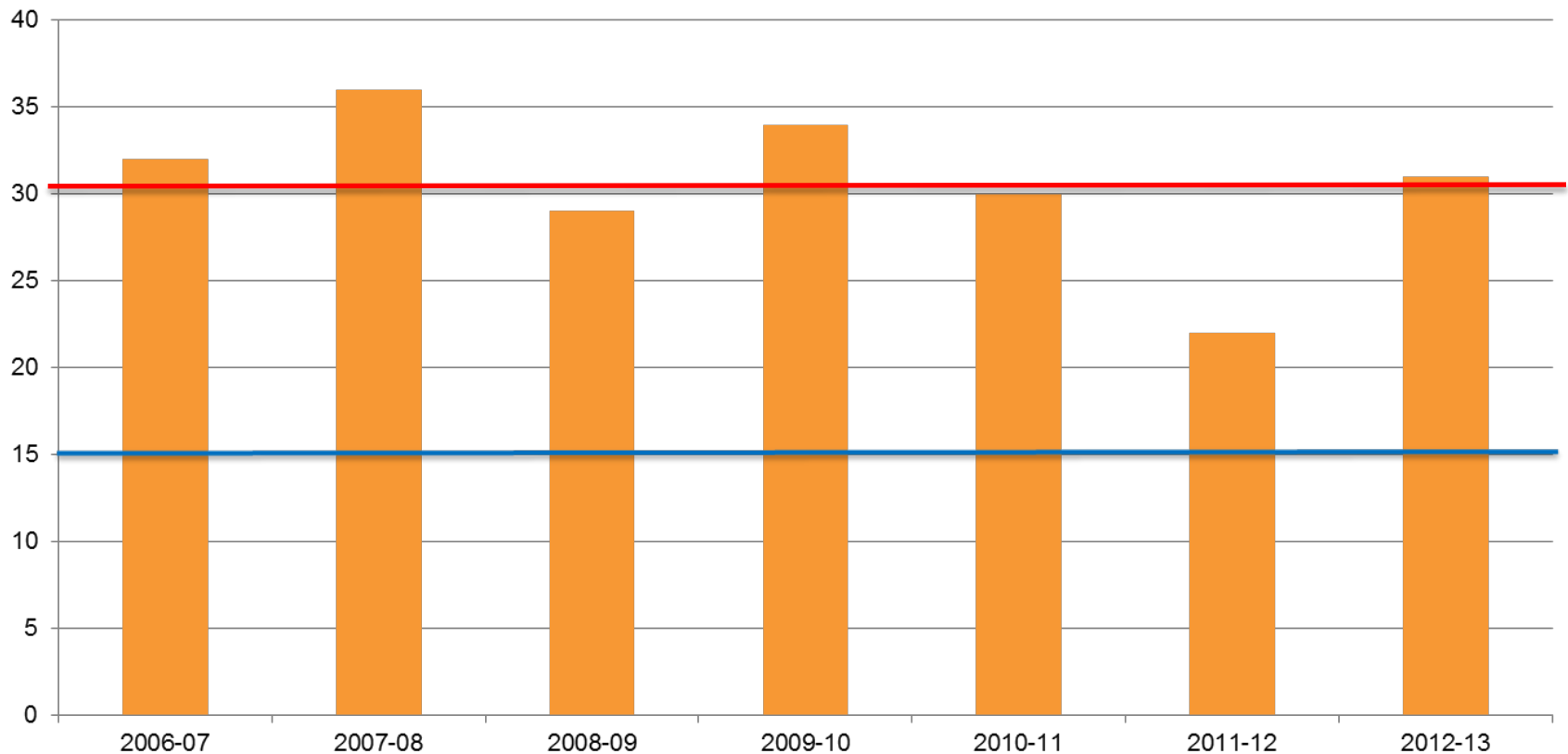


Source: USDA NASS Honey Production Report

Pollination Supply vs. Demand: Overwinter Colony Loss

Average 30.6% vs. Acceptable 15%

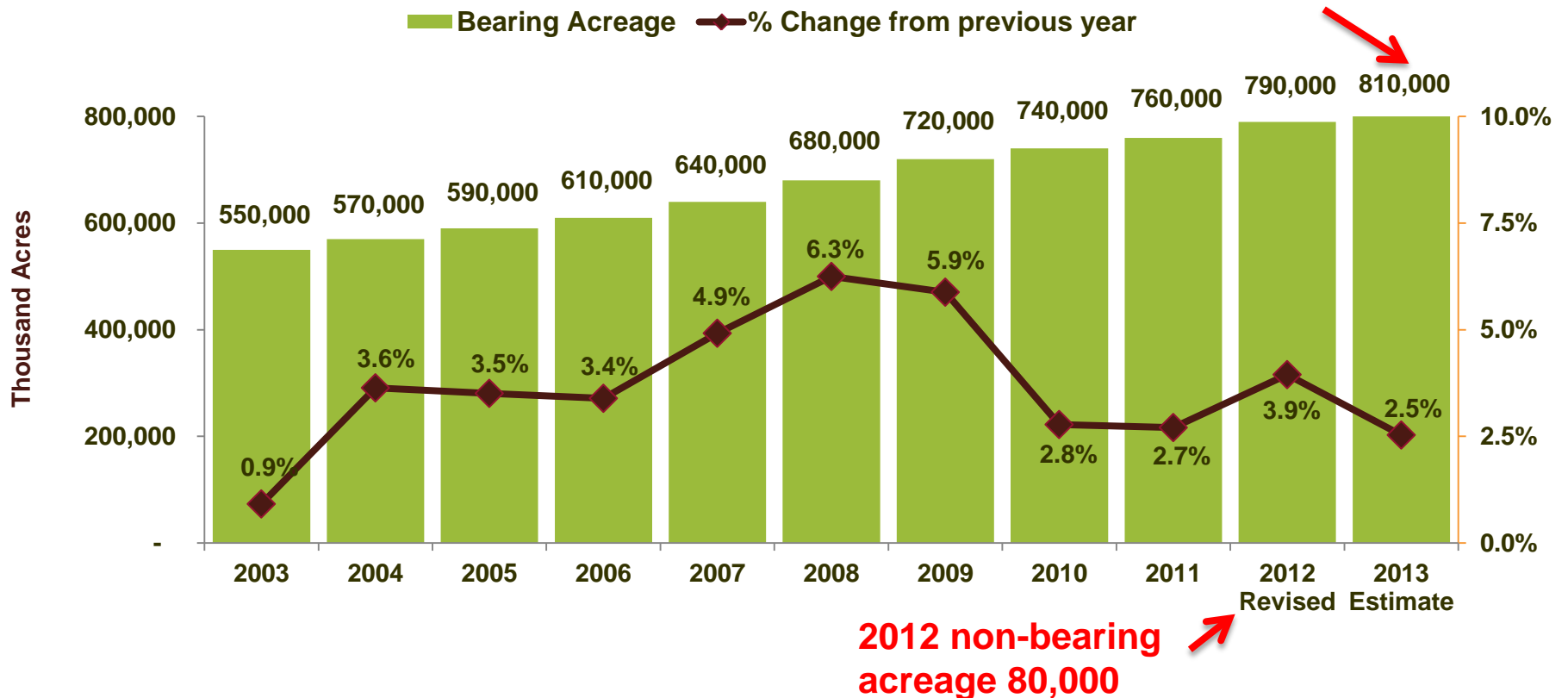
Percent Overwinter Colony Loss



Source: Apiary Inspectors of America and USDA-ARS Beltsville Lab

Pollination supply vs. demand: Almond Acreage

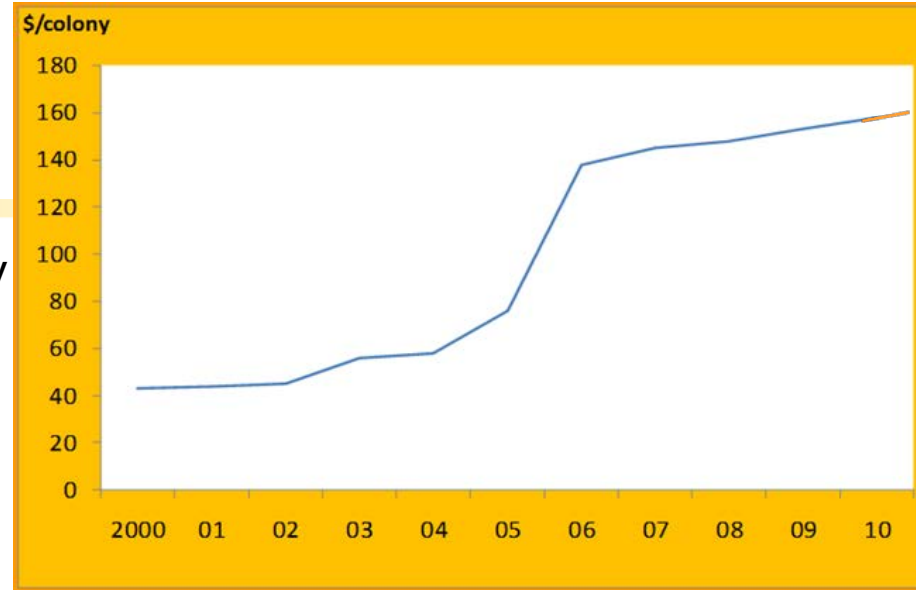
**~ 2 colonies/ac = 1.62 million colonies
vs. 2.62 in US and ~30% winter loss**



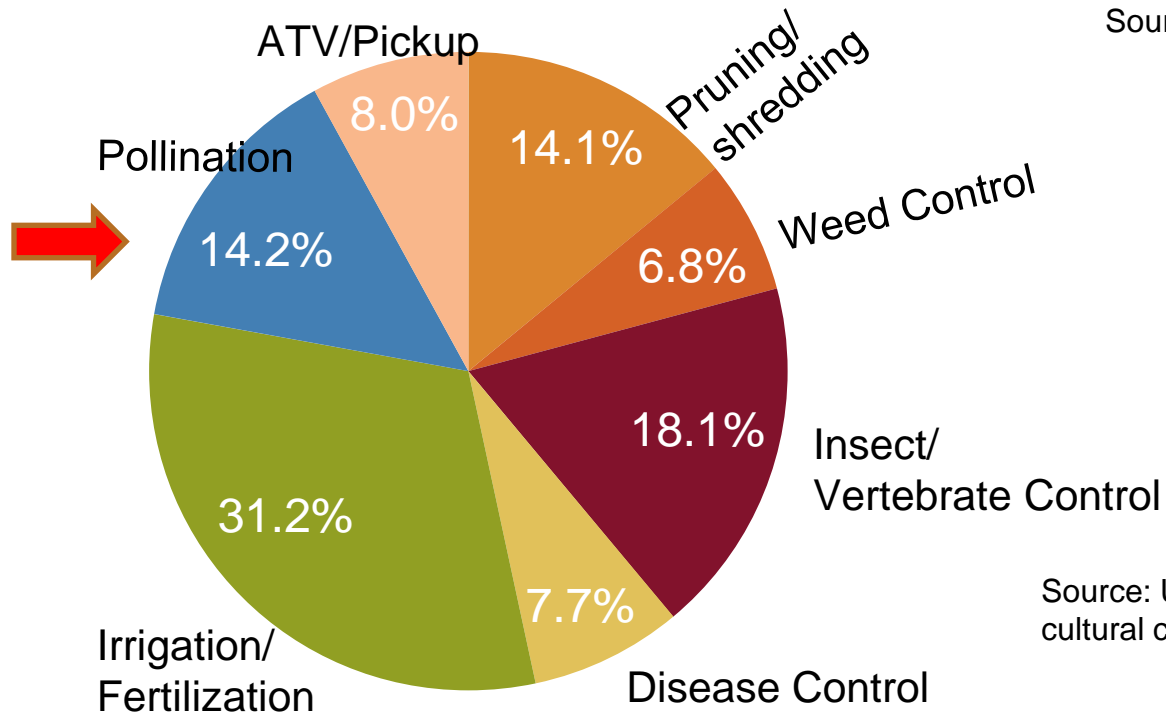
Source: USDA Agricultural Statistics Service, Pacific Region (NASS/PR) 2012 Acreage Report

Honey Bees and Almond Production

- Grower perspective: Sufficient supply to date despite honey bee health challenges
- Beekeeper perspective: likely not in business without almond pollination



Source: CA State Beekeepers Assn.



Source: UC Cost Study, 2011 San Joaquin Valley cultural costs

What has the ABC Done?

Almond Grower Investment into Bee Health

- ABC has funded research in pollination since 1976, investing some \$2.2 million of almond grower dollars
 - Most sustained of any commodity organization
 - Honey bee health has been a focus since 1995 – nutrition, stock improvement, pest/disease management, impact of pesticides - \$1.3 million spent
 - Since 2000, 70 projects with key researchers throughout the United States
- Partnering with beekeepers (e.g., Project Apis m and CSBA) and research institutions across the US



ABC Funding: Priority Honey Bee Priority Research Contributions

Priorities from National Honey Bee Health Stakeholder Conference, October 2012

Research Priorities:

1. Improving honey bee nutrition and forage throughout the year
2. Varroa mite (and other bee pests) control –breeding, new materials, and management techniques
3. Germplasm importation, preservation and stock improvement
4. Balancing the need for pest control materials, both in crops and in the hive vs. possible effects on hive health
 - Impact of fungicides and reduced risk insecticides applied at bloom
 - Developed Best Management Practices for fungicide applications during bloom

ABC Funding: Priority Honey Bee Priority Research Contributions

Priorities from National Honey Bee Health Stakeholder Conference, October 2012

1. Improving honey bee nutrition and forage throughout the year

- Developed bee nutritional supplements
- Assessed impact of single pollen diets on honey health
- Partner with ProjectApis m and CURES in promoting bee forage / bee pastures
- Current research on nutritional effects of protein supplements vs. natural forage



Wildflowers planted in almonds provide an overwintering food source for honey bees brought in to pollinate the California almond crop. Photo: Meg Ribotto



ABC Funding: Priority Honey Bee Health Research Contributions

2. **Varroa mite** (and other bee pests) **control – breeding, new materials and management techniques**

- Varroa mite
 - Tested efficacy of various essential oils, oxalic acid, 2-heptanone and application methods
 - Developed better understanding of Varroa biology
 - Current research on Varroa treatments
- Nosema
 - Determined essential oils not effective for control
- Small hive beetle
 - Tested insecticides for control
 - Developed monitoring method to determine presence in hives
- Bred for hygienic behavior (mid 1990s) to help control diseases and Varroa mite

Varroa mite



Grower Education Program Includes

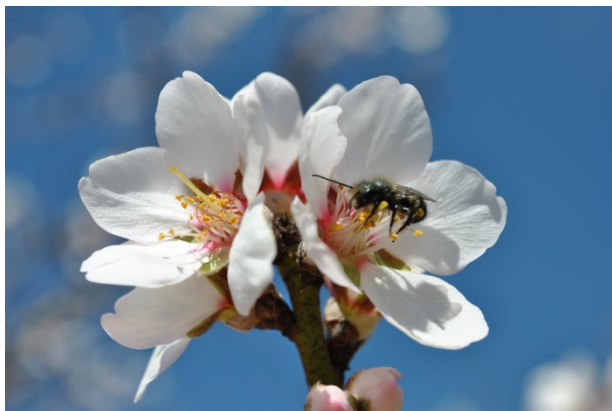
- Production Research Updates
- Best Management Practices for pesticide & fungicide application during bloom
 - Applications of insecticides during bloom should be avoided until more is known about impact on bee larvae
 - Minimize exposure of bees and pollen to fungicides by avoiding applications when pollen is available and bees are foraging
 - Spray after mid-afternoon and at night



✓ Putting it all together: Integrated Almond Pollination

• Integrating

- Honeybees
- Managed native blue orchard bees and native wild pollinators
- Bee forage and pasture
- Best Management Practices for beekeepers and almond growers alike
- Bee “pest control advisors” (tech transfer)
- Self compatible almond varieties – reduce reliance on pollinators
 - Bees only transfer pollen within flower, not between tree rows



*Blue orchard bee
pollinating almond*



Neal Williams (UCD)