Integrated Pest Management, Trade, and MRLs: example California Almonds

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California Almonds

- ~650,000 ha (~538,000 bearing ha)
- 7,600 growers, 102 handlers (sell the almonds)
  - Some 70% of the growers are < 40 ha.
- Farmgate value US$4.5 billion (20/21)
- 99% of U.S. production
- 72% export; 28% domestic
- 80% of worldwide production

Almond Board of California:

- Federal Marketing Order (under USDA purview)
- Grower assessment on every pound sold
- Funding used for global market development, research, outreach, quality standards, etc.

Sources:
USDA National Agricultural Statistics Service, Pacific Region (NASS/PR)
U.S. Department of Commerce, Foreign Trade Statistics
Economic Impacts of the California Almond Industry, UC Ag Issues Center, 2014

Pest Management Needs in California Almonds

- Insects
  - Navel Orangeworm (worm damage can lead to aflatoxin contamination), Peach Twig Borer, web-spinning mites, leaf-footed bugs, stink bugs, ants, etc.
- Diseases
  - Bloom diseases: brown rot (*Monilinia*), *Anthracnose*, shot hole, jacket rot, bacterial blast
  - Summer: *Alternaria*, hull rot, scab
  - Root pathogens and nematodes: replant disorder, *Phytophthora*, *Verticillium*, oak root fungus
- Weeds
  - Keep irrigation system clear, frost protection, clean floor for harvest
- Vertebrates
  - Ground squirrels, pocket gophers, coyotes, birds, etc.
- Post-harvest
  - Storage insects, human pathogens, phytosanitary requirements

Shot hole lesions on fruit and leaf.
Photo by Jack Kelly Clark.

Grower Funded Research: Navel Orangeworm (NOW, *Amyelois transitella*)

- Improve understanding of NOW biology to understand treatment options
- Efficacy/thresholds of winter sanitation (removal of nuts left in the tree)
- Importance of avoiding other damage e.g. PTB, bird damage – provides access for NOW
- Attractants – sex pheromones and kairomones
- Improvements in monitoring systems
- Resistance development/detoxification mechanisms
- Efficacy of chemistries and of biological controls
- Spray efficiencies
- NOW genome
- Pheromone Mating disruption
- Sterile Insect Mating disruption

ABC Funding for NOW Research (1973-2021): ~$4.5 mill

- AF36 - non-aflatoxin producing *Aspergillus* species

IPM outcomes of the research:

- 1973 Start research with Univ. of California and USDA
- 1978-83 “The Four Point Program” adopted – combines cultural controls and insecticide use
  - Winter sanitation => remove overwintering sites
  - Dormant sprays => reduce overwintering population
  - In-season sprays => reduce damaged
  - Timely harvest => reduce damage
- 2004 Seasonal Guide to Environmentally Responsible Pest Management Practices in Almonds ➔ eliminated dormant sprays based on research
- 2007-2012 USDA testing of commercial pheromone mating disruption
- Current IPM program:
  - Winter sanitation => remove overwintering sites
  - Pheromone mating disruption => reduce population
  - 2-3 in-season sprays => reduce damaged
  - Timely harvest => reduce damage

Continuous Improvement in IPM:

- Navel orangeworm damage reduced
  - 1978 = 8.8%
  - 1980's > 4%
  - 2000's > 2%
  - Currently ~ 1%

Colusa East

Forecast | High Risk | Moderate Risk | Low Risk | Unlikely Risk

Date (YYYY-MM-DD)	5-Day Risk Index	Daily Risk Index	21-Day Risk Index	Avg Temp °F (in canopy)	Precip (in)
2022-03-24	0	0	0.4	70.4	0
2022-03-23	0.4	0	0.4	71.2	0
2022-03-22	0.4	0	0.4	74.2	0
2022-03-21	0.4	0	0.4	64.5	0
2022-03-20	0.4	0	0.4	56.3	0
2022-03-19	0.4	0.36	0.4	57	0.21
2022-03-18	0	0	0	57.1	0
2022-03-17	0	0	0	55.5	0
2022-03-16	0	0	0	57.8	0
2022-03-15	0	0	0	61.2	0.03
2022-03-14	0	0	0	55.5	0
2022-03-13	0	0	0	56	0

Regional Disease Prediction based on UC model, Semios weather data)

Other IPM research efforts in recent years:

- Disease prediction models, now combining with regional weather data by a technology company for more precise predictions
- Reliance on beneficial insects to control mites, with thresholds when to apply a miticide
- Resistance management for weeds
- Use of hulls & shells with water saturation to create anoxic conditions in the soil to reduce soil pests.
- Seeking pheromones of leaf footed bug to develop better monitoring tools.

➔ Outreach Program:

https://www.almonds.com/almond-industry/orchard-management/crop-protection

Recommended Management Practices

Reduce Spray Drift

- calibrate equipment every year
- drive at a groundspeed of 3 mph or less in low-wind environment
- apply the lowest possible pressure necessary to provide uniform coverage
- use shields and drift guards
- consider inference spraying (requires the use of two spray rigs)

Promote Pollinator Health

Follow the Almond Board's Honey Bee Best Management Practices, available at Almonds.com/Pollination

General Efficacy

- use the lowest label rate
- avoid broad spectrum products and rotate applications when possible, to reduce resistance

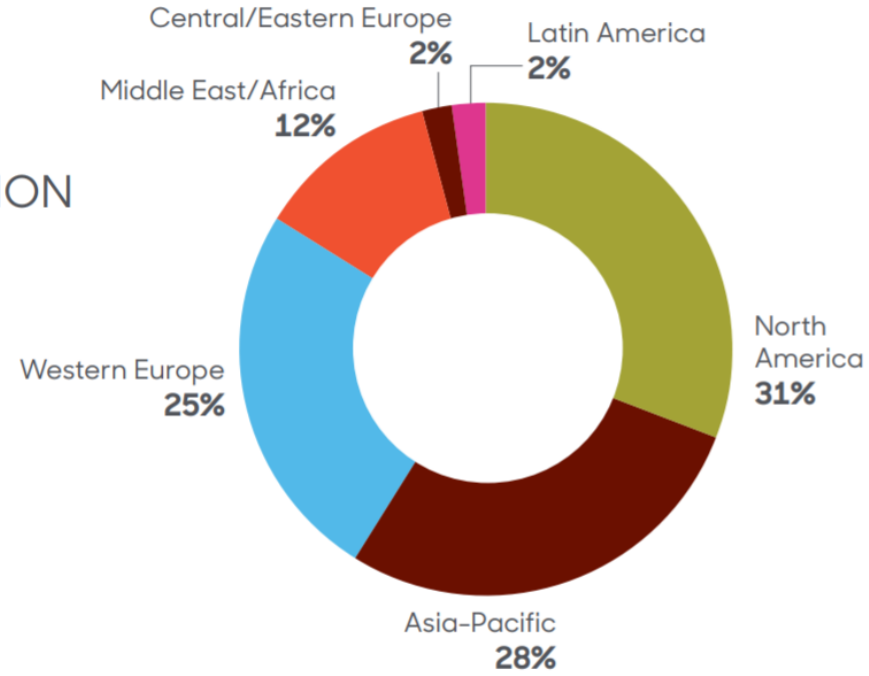
california almonds
Almond Board of California

Pest Management and Trade

Where do California Almonds Go?

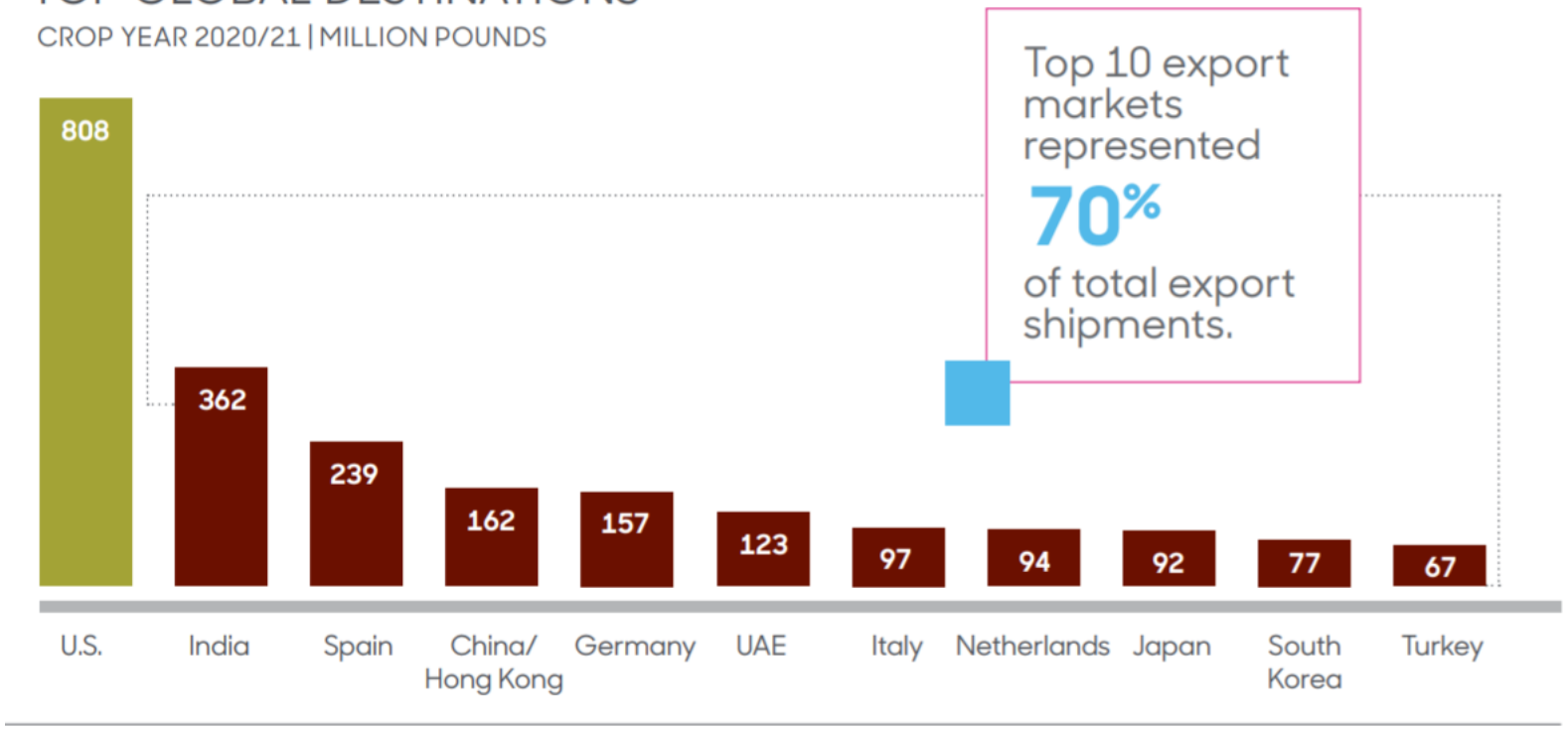
SHIPMENTS BY REGION

CROP YEAR 2020/21



TOP GLOBAL DESTINATIONS

CROP YEAR 2020/21 | MILLION POUNDS

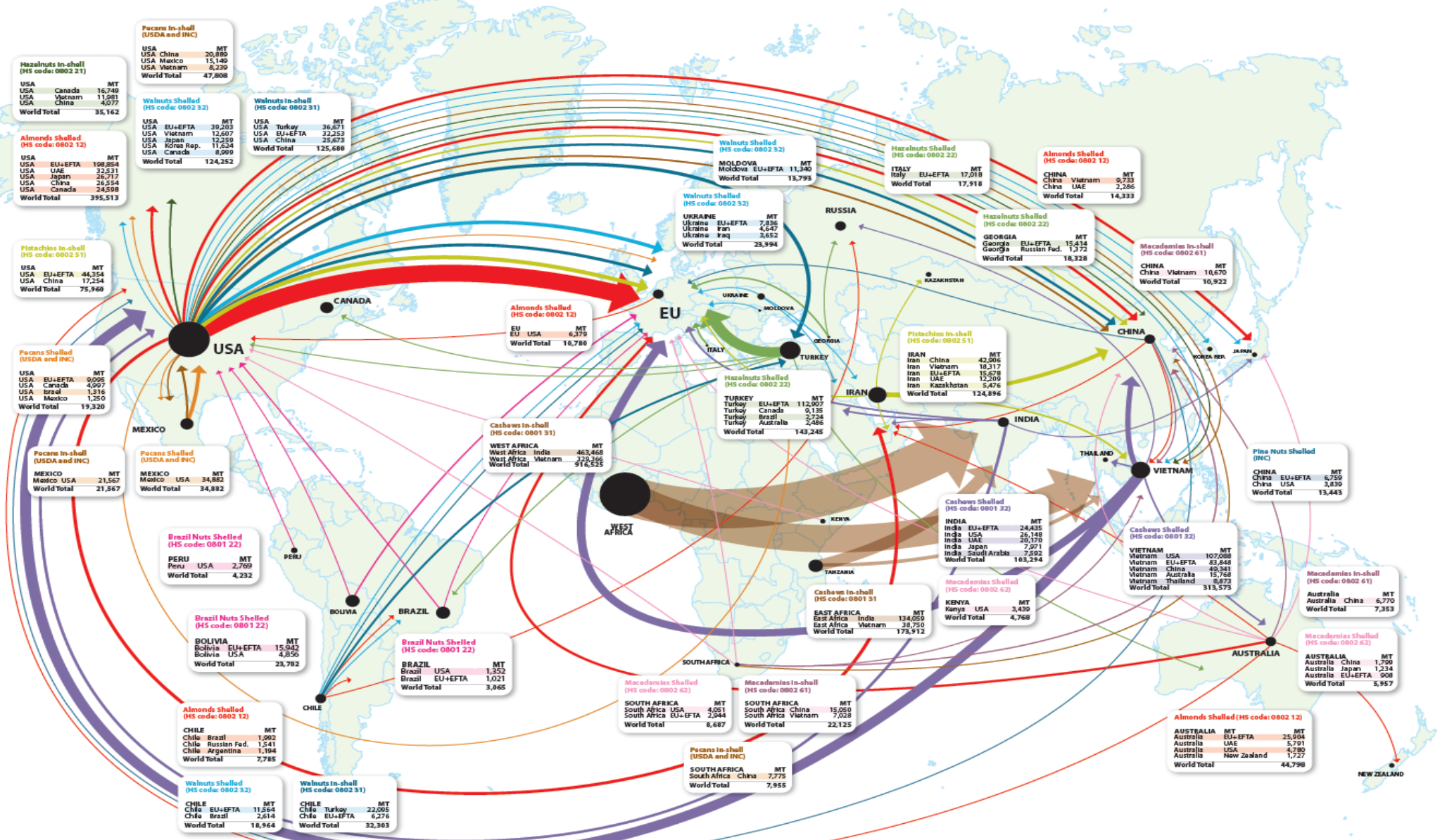


Top 10 export markets represented **70%** of total export shipments.

Source: Almond Board of California July 2021 Position Report.

MRLs: Almond Growers don’t know what market(S) their nuts will go to

Tree Nut Export Flows



Thus, the need for Trade Facilitative MRL measures - Examples:

- Having a functional import MRL process

  e.g., in the US, EU, Australia, S. Korea, Japan among others.

- Australia: Annually has a call for missing import MRLs and assesses to add import MRLs
- EU: Rapidly assesses and adopts Codex MRLs if meet EU risk/hazard standards
- US: import MRLs can be established using Codex data package for the assessment
- South Korea: Using existing Codex or other national risk assessments, then using their dietary patterns to assess MRLs for positive list system
- Japan: no longer waiting until fully registered somewhere in the world before starting their new product (import MRL) assessments
- US: FDA channels of trade provision: accounts for shelf-life of products when enforcing lowered/ removed US MRLs

- OECD MRL calculator
- Global Joint Reviews
  - Working to see if can include work with Codex Committee for Pesticide Residues
- Efforts to harmonize data requirements (e.g. via OECD, NAFTA)
- Crop Groupings

But:

- Observing increased differences in risk/hazard standards or assessment processes
- Need to harmonize processes for biological pesticides more

Thank You!

Questions at end of Panel Presentations