



# PHYTOSANITARY IRRADIATION TO CONTROL QUARANTINE PESTS

**Peter Follett, *Research Entomologist***

**USDA-ARS**

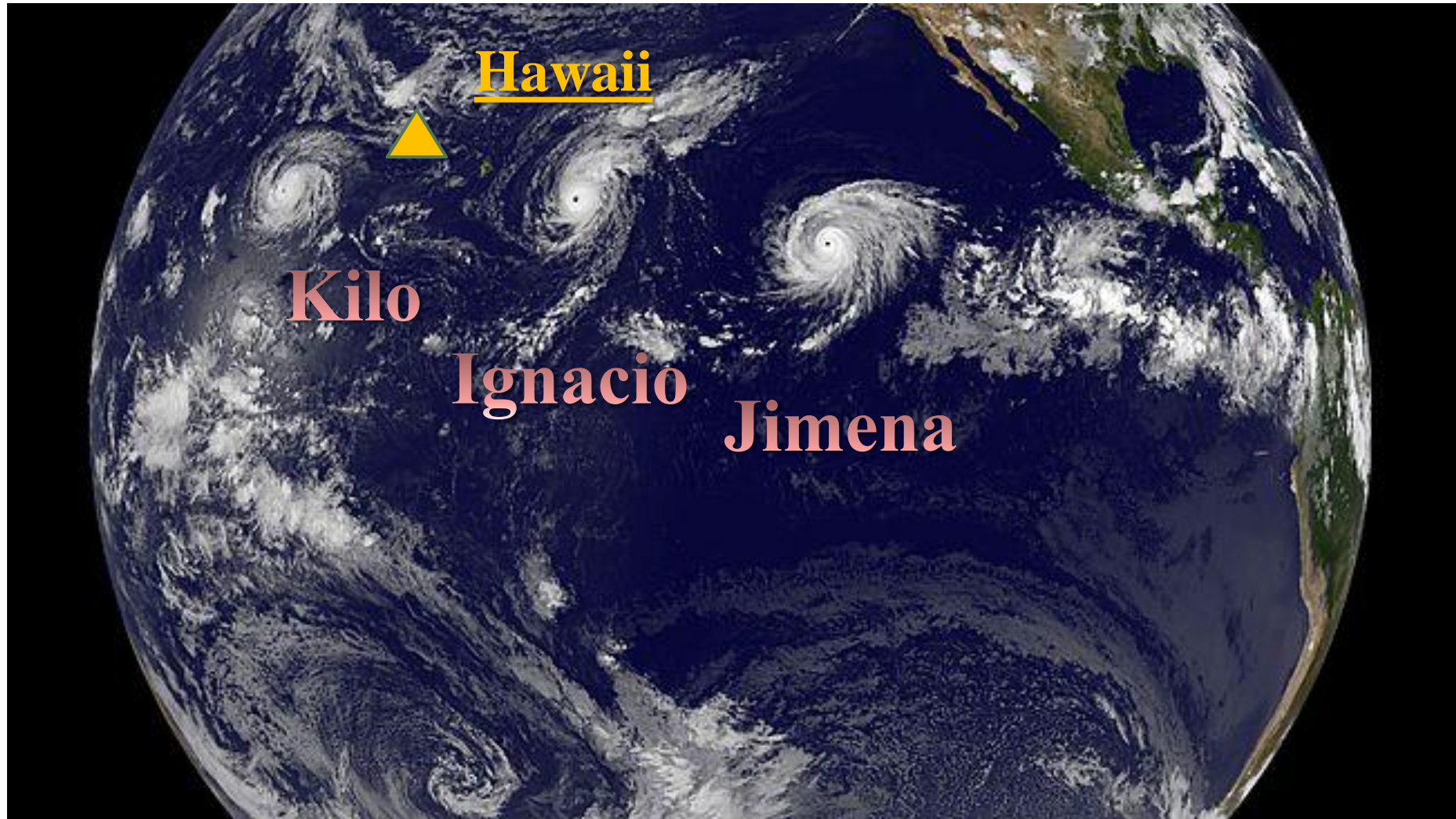
**U.S. Pacific Basin Agricultural Research  
Center**

**Hilo, Hawaii**



Tropical Crop and Commodity Protection Research Unit

# Los huracanes de Mexico





**Agricultural trade brings quarantine pests**

# Overview

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- Phytosanitary treatments
  - Insect pests
  - Market access
  - Treatment options
- Irradiation
  - ISPMs
  - Commercial use in Hawaii - *video*
  - Research
  - Irradiation treatments for Latin America

# Phytosanitary insect pests

## □ Internal pests



## □ Surface pests

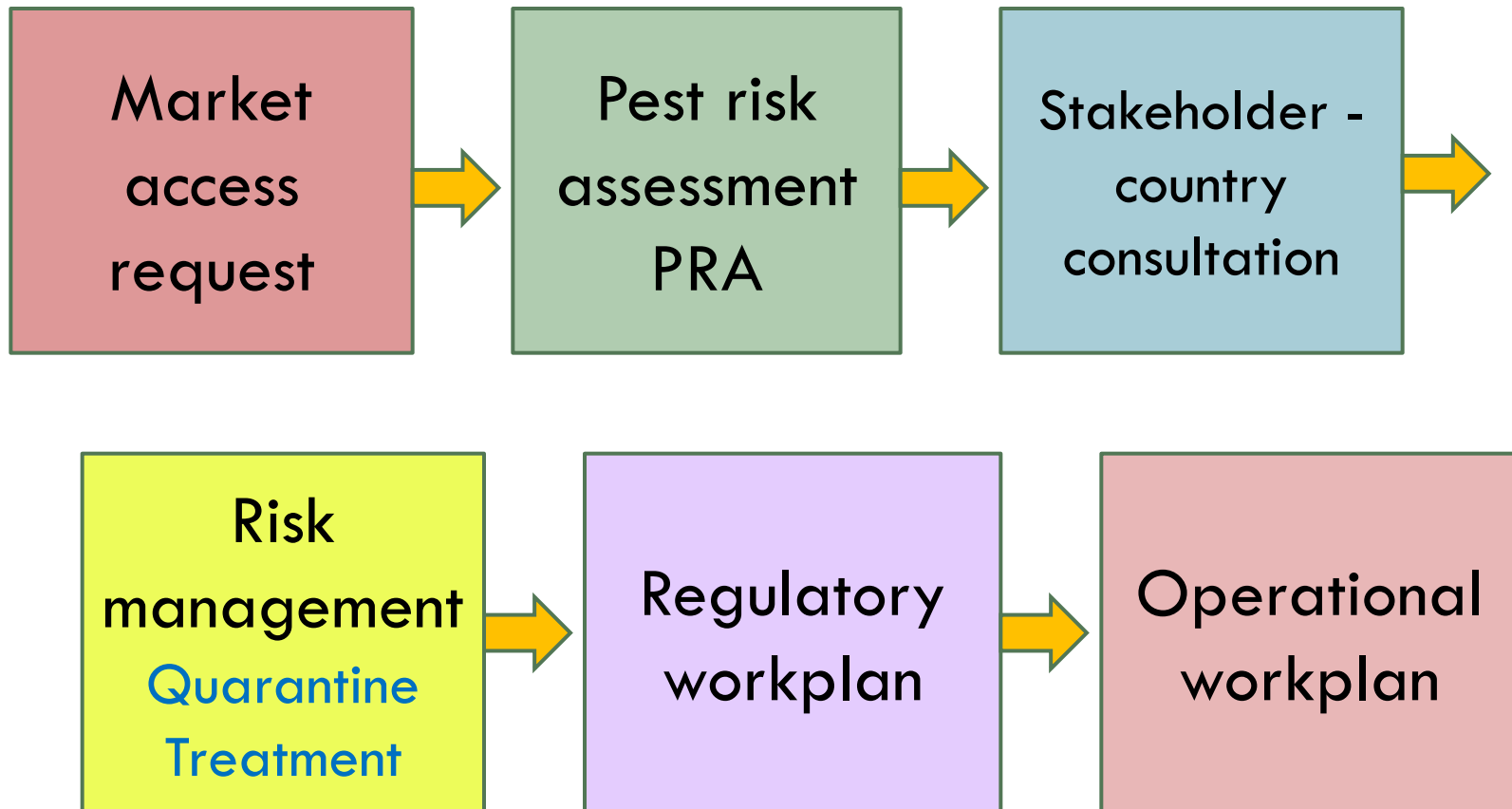


## □ Hitchhikers



## □ Irradiation may be required or “insurance”

# Steps to gain market access *overview*



# Comparison of quarantine treatments

## Treatment type

- Cold
- Heat
- Fumigation
- Systems approach
- Irradiation

## Shortcoming

- 12-22 d treatment time
- Quality reduced
- Toxic
- Complicated
- Retailer reluctance --  
Fast, no quality loss,  
non-toxic, simple

# Phytosanitary irradiation

## Advantages



- Broadly effective
- Good product tolerance
- Extend shelf-life
- Competitive cost
- Treatment is fast
- Treat in final packaging

- Treat at any temperature
- Alternative to Methyl Bromide
- Generic treatments



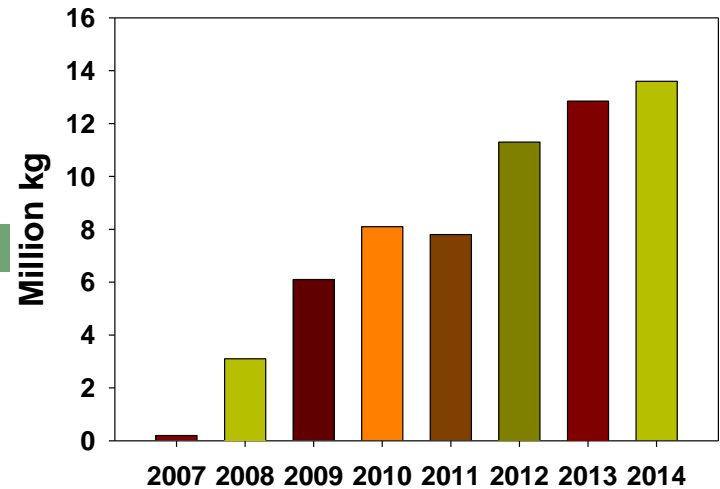


# Regulations key to the adoption and application of irradiation

- US FDA approved irradiation doses up to 1000 Gy for preservation and disinfestation of fresh fruits and vegetables (1986)
- USDA APHIS approved generic irradiation doses for quarantine disinfestation of fresh commodities (2006).
  - *150 Gy tephritid fruit flies*
  - *400 Gy all insects except Lepidoptera*
- Export approvals

# International use

*Since 2007*



## To United States

- India, Pakistan – mango, pomegranate – 400 Gy
- Thailand – 7 tropical fruits – 400 Gy
- Vietnam – dragon fruit, rambutan – 400 Gy
- Mexico – guava, mango, citrus – 150 or 400 Gy
- South Africa – table grapes, lychee, persimmon, sweet cherries – 400 Gy

Australia to New Zealand – mangos, lychee, papayas, tomatoes, capsicums

# International Standards for Phytosanitary Measures - ISPM

Members of the World Trade Organization  
(182 countries) – IPPC treaty

34 ISPMs - standards, guidelines and  
recommendations to:

- Harmonize phytosanitary measures
- Facilitate trade
- Prevent unjustifiable barriers to trade

# ISPMs - Irradiation



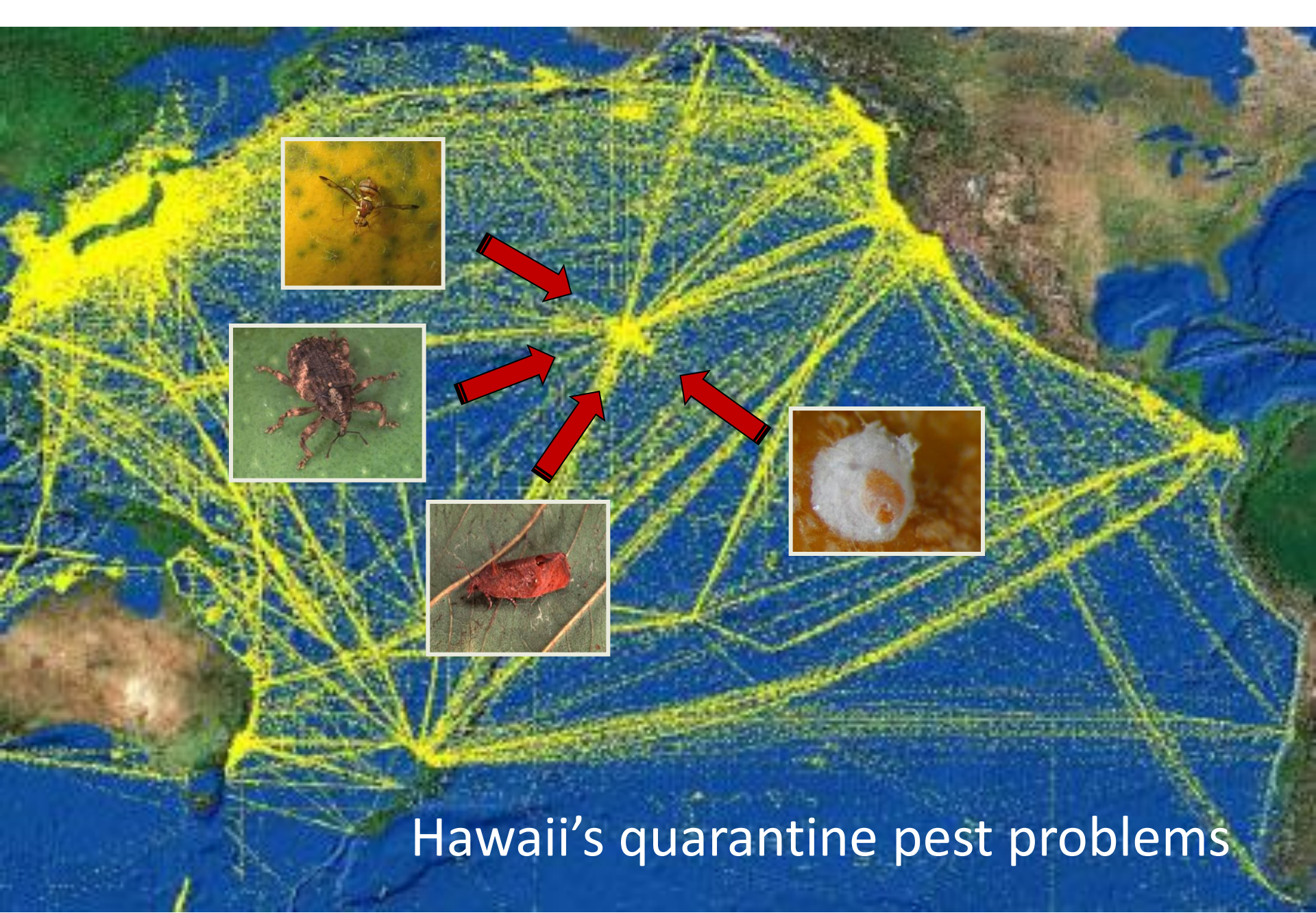
*'Radura'*

ISPM No. 18

- Guidelines for the use of irradiation as a phytosanitary measure (2003)
  - Technical guidance on procedures for application of irradiation for regulated pests or articles

ISPM No. 28

- Phytosanitary treatments for regulated pests (2007)
  - Requirements for submission and evaluation of efficacy data for new phytosanitary treatments
  - Annexes – 150 Gy and doses for specific pests



Hawaii's quarantine pest problems

# Economically important fruit flies in Hawaii

- **Melon Fly**

(*Bactrocera cucurbitae*)

1895



- **Mediterranean fruit fly**

(*Ceratitidis capitata*)

1910



- **Oriental fruit fly**

(*B. dorsalis*)

1945



- **Solanaceous fruit fly**

(*B. latifrons*)

1983



# Hawaii's commercial irradiators

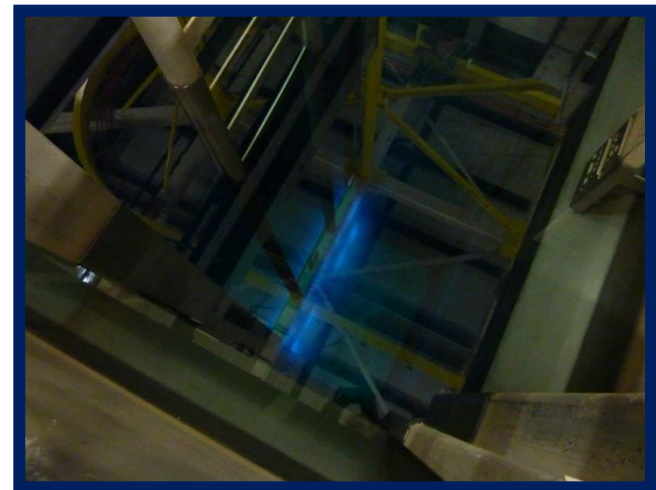


## *Hawaii Pride*

- E-beam/X-ray source
- Opened in 2000
- Designed for fresh produce
- Expensive

## *Pa'ina Hawaii*

- Cobalt source
- Started in 2013
- Designed for fresh produce
- Relatively inexpensive



# Hawaii irradiation treatments

## Approvals for export to the U.S. mainland

### Fruits

- Abiu
- Atemoya
- **Banana**
- Breadfruit
- Cherimoya
- **Dragon fruit**
- Guava
- Jackfruit
- **Longan**
- Lychee
- **Mango**
- Mangosteen
- Melon
- **Papaya**
- Pineapple
- **Rambutan**
- Sapodilla
- Star fruit

### Vegetables

- Bell pepper
- Eggplant
- Long bean
- Moringa
- Squash
- **Sweet potato**
- Tomato





# Lowering the dose for pests or commodities

- US FDA approved irradiation doses up to 1000 Gy (1 kGy) for preservation and disinfestation.
- DUR = Maximum / minimum dose typically 1.5-3.0
- 400 Gy (generic dose) x 2.5 = 1000 Gy
- Advantageous to lower the dose:
  - Avoid problem of 1 kGy limit
  - Cost
  - Capacity
  - Quality

# Phytosanitary irradiation

## *Research methods*



# Hawaii irradiation research

## Lowering the dose for pests

### Pest

- Fruit flies (3)
- Sweet potato pests (3)
- Mango seed weevil
- Litchi fruit moths (2)
- Armored scales (2)
- Banana moth
- Ants (4)
- Light brown applemoth
- Spotted wing drosoph.
- Coffee berry borer

### Dose (Gy)

- 150
- 150
- 300
- 250
- 150
- 150
- 100
- 150
- 80
- 100



# Latin America

## Phytosanitary irradiation



# Latin America to U.S.

## Lower doses for specific pests



### Pest

- *Anastrepha ludens*
- *Anastrepha obliqua*
- *Anastrepha serpentina*
- *Anastrepha suspensa*
- *Ceratitis capitata*
- *Copitarsia declora*
- *Brevipalpus chilensis*
- European grape vine moth

### Dose (Gy)

- 70
- 70
- 100
- 70
- 100
- 100
- 300
- 150 (in progress)



# U.S. to Latin America

## Example: Sweet cherries



### Quarantine pest

- Spotted wing drosophila
- Western cherry fruit fly
- Codling moth
- Peach twig borer
- Oriental fruit moth
- Oriental fruit fly (outbreak)

### Irradiation dose (Gy)

80  
150  
200  
200  
200  
150



# Sweet potato irradiation

## *Video*

