

BENEZION: PHYTOSANITARY IRRADIATION AS A BUSINESS.

IAEA Workshop 2015












Making money irradiating produce

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- Making money irradiating produce: The business case
 - Planning to get there
 - Choosing the right location for a plant
 - Selecting the right equipment
 - Designing and building the facility
 - Getting permits and approval
 - Certifying the plant.

Making Money irradiating produce: The Business Case

The first easy business case: New product: First to market opportunities with tropicals that cannot otherwise be exported due to insect quarantine restrictions and intolerance to conventional heat / cold / MB treatments

- Guava
- Starfruit
- Manzano Pepper
- Sweet Lime
- Dragon Fruit
- Passion fruit
- Fig



Making Money irradiating produce: The Business Case

Easy business case because:

- Unique product with limited market supply and high prices (e.g Indian mangoes, Mexican manzano peppers, etc.)
- Insensitive to irradiation and USDA compliance cost
- Insensitive to the issue of consumer perception.

Downside

- Low volumes due to market introduction
- Lack of experience in growing export quality product
- Lack of professional distribution, marketing
- Lack of packaging infrastructure and orchards that are certified-
- Lack of revenue

Making Money irradiating produce: The Business Case

The second easy business case: Irradiation because everything else becomes illegal (Methyl Bromide phase-out)

- Sweet Citrus in Mexico (2015?)



Making Money irradiating produce: The Business Case

The second easy business case: Irradiation because everything else becomes illegal (Methyl Bromide phase-out)

Easy business case because:

- Everything else has become illegal
- Existing production, packaging and distribution infrastructure
- Export quality product available
- Professional distribution and marketing
- Potentially high volumes already being exported
- Existing investments in businesses and high demand cause relative insensitivity to consumer perception issues.

Downside:

- Hasn't happened yet

Making Money irradiating produce: The Business Case

The not so easy business case: Better quality product through irradiation than through other means.

- Tree ripened mangoes without hot water dipping
- Mango with a week of additional shelf life than hot water dipped product.
- Citrus without methyl bromide burn
- Citrus without dehydration through forced hot air treatment.



Making Money irradiating produce: The Business Case

The not so easy business case: Irradiated product has better quality attributes than product treated otherwise:

Not so easy business case because:

- Interests in existing technologies make communication an uphill battle
- Political resistance
- Complex attributes to sell on paper


Upside:

- It actually works! And it works well.
- Will Cavan president of the IMO: “this is a game changer, sweet but yet firm!”
- Retailers: Surprising shelf life, Sweet but not tart.
- Currently more demand than supply

Making Money irradiating produce: It works well if:

- There is sufficient legitimate product to be treated
- If the business model allows for a slow innovation curve.
- There is political will to get bilateral agreements and work plans into place
- There are growers / exporters with an entrepreneurial mindset that are willing to invest in the switch.
- Product is not overwhelmingly price sensitive and there is a drive for quality.
- There are sufficient non phytosanitary products to treat to complement the business model.

Planning to get there

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Planning to get there

Regulatory Roadmap


- National Regulations in place
- Framework equivalency work plan agreement with the US.
- Work plan in place
- Facility building permit
- Cooperator Agreement

Planning to get there

Technical planning

- Logistics planning, site location
- Geology
- Facility design
- Shield design
- Choice of equipment
- Installation
- Dosimetry
- Isotope loading
- Equipment validation and run off
- Operations management
- Data management system

Choosing the right location for a plant

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Choosing the right location for a plant

Logistical planning

- Production areas
- Points of exit
- Means of transport
- Highway nodes
- Geology
- Political environment
- Qualified workforce



- Citrus
- Mango Manila
- Guavaa
- Mango

Plant 1: Matehuala

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Choosing the right technology for the plant

Ebeam: Insufficient penetration for USDA work plan compliance for pallet level packaging. Repackaging operation required.

X-Ray: Little experience and complex to operate, high energy consumption and sensitive to the quality of the power supply.

Gamma: Most experience and proven technology

MDS NORDION:

- Most experience in the Industry (150+ plants)
- Excellent competence in cobalt production, transport and loading
- Only established high volume gamma irradiation equipment provider in the world.
- Equipment targeted to the phytosanitary market developed. (GAMMAFIT)

Experience:

- Excellent support
- Equipment performed to or above spec
- Great to work with
- Helpful in resolving road blocks.
- Knowledgeable

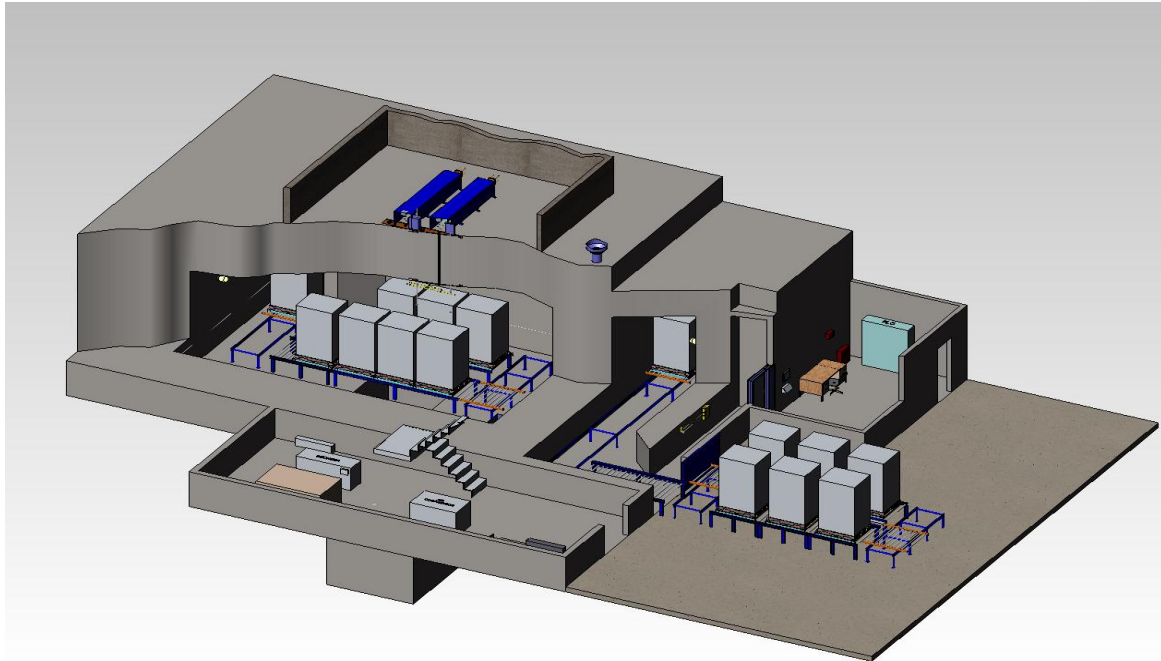
Equipment Choice

Two pass parallel row pallet irradiator

- Pallet capability
- Low activity (200kCi) sufficient for fruit
- Current activity 330kCi
- Early 2016: 540kCi
- Single pass important
- Bruker EPR Alanine Dosimetry

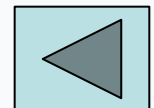


GammaFIT Automatic Pallet



- Automatic Pallet Interchange
- Process full Pallets with universal slave
- Good thput, dose uniformity
 - 1.66 @ 0.1 g/cc
 - 2.36 @ 0.4 g/cc
- Process product up to 0.4 g/cc

Features	2-pass Auto Pallet 120-cm L x 100-cm W x 200-cm H (2.4 m ³) 47.2" L x 39.4" W x 78.7"H (84.7 ft ³)
Upgrade	Most Efficient GammaFIT Pallet
Annual Throughput	3,080 m ³ (108,770 ft ³) medical 20 kGy
200 kCi	41,600 tonne (45,860 ton) 400 Gy
8000 irradiation hr.	1,660 tonne (1,830 ton) spice 10 kGy



Designing and building the facility

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Designing and building a facility

- Phytosanitary facilities can be small (1000^{m2} including shield) : Just in time approach best for perishables, no warehousing required, same truck delivers and picks up product usually within 2 hours depending on activity.
- Biological safeguarding per Work plan:
 - Air curtains
 - Double doors
 - Fly traps
 - 5 loading docks (two load, two unload and one auxiliary sufficient)
- Cooling of shield recommended in hotter areas.

Getting permits and licenses

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Certifying the Plant

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Getting permits and licenses

- Facility operational license
- Isotope import permit
- NPPO plant certification
- USDA plant certification
- Configuration certification
- Production certification
- Orchard Certification
- Packaging house certification.



Certifying the plant

- Nuclear Review Comission
- NPPO certification
- Aphis certification
 - Biological safeguarding
 - Dosimetry
 - Dose mapping, calibration of the field
 - Procedures and SOPS
 - Workplan compliance
 - Data management system
- Certifications: Boxes, sizes, varieties, Simplification needed.



Fully USDA / SAGARPA certified and in operation.



Full support by the US and Mexican government



Pallet Load capability: Fast throughput. Quick turn around

