



Biotech and Apples – Do they Fit?



What will we be covering?

Overview of this presentation

- Who is Okanagan Specialty Fruits
- A bit about agricultural biotech globally
- What other specialty crops are using biotech
- Arctic® apples – why, what and when
- Where OSF is going with apple biotech
- Biotech and apples – Do they fit?
- Questions and discussion



Who is Okanagan Specialty Fruits?

Company Founder



- 🍏 Apple & cherry growers
- 🍏 Summerland, BC
- 🍏 Bioresource engineer
- 🍏 31 yrs global experience
- 🍏 Unique perspective on value of biotechnology
- 🍏 Driven to maximize value to the fruit industry



Who is Okanagan Specialty Fruits?

Unique in tree fruit breeding

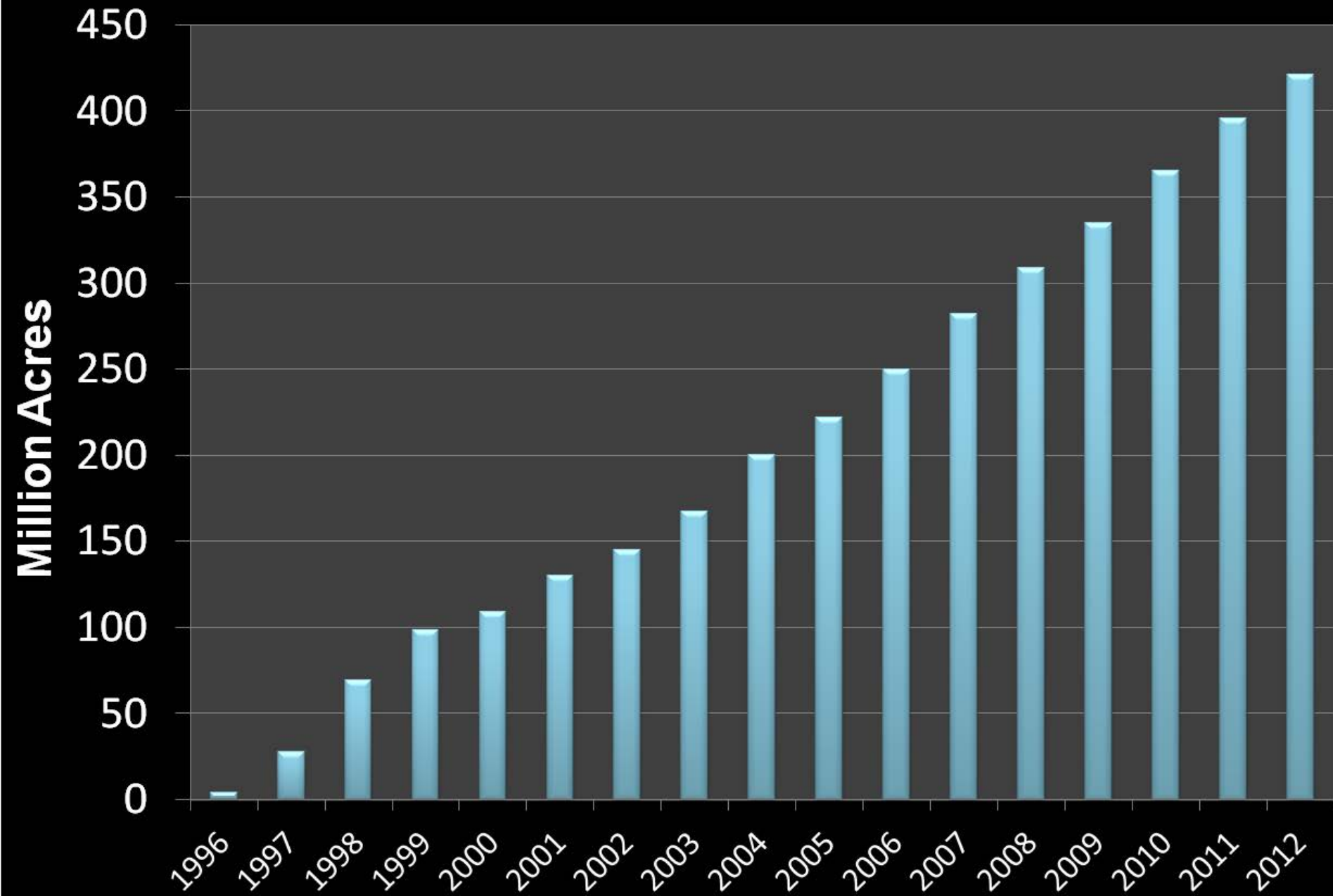
- Established in 1996
- Privately owned
- A technology company
- Commercially focused
- Using new breeding tools
- Motivated, highly trained staff



- Many shareholders are from the tree fruit industry
- Many US and international collaborators
- Lab is located in Saskatoon, SK

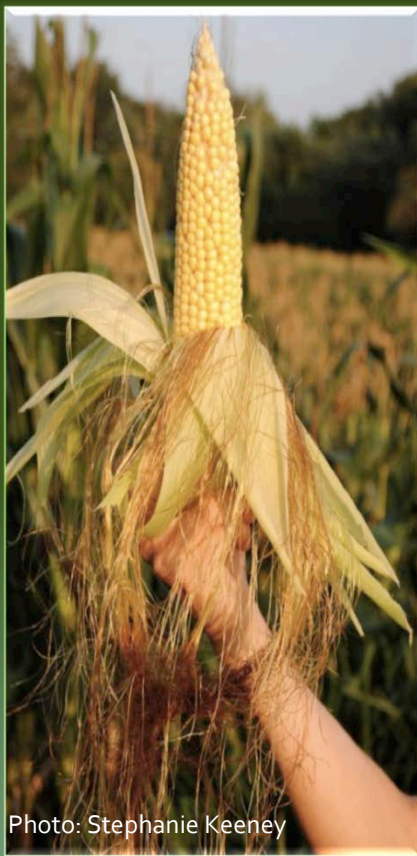


Global Area of Biotech Crops



First Wave of Biotech Crops

Corn



Soybean

Cotton



WHO estimates that unintentional pesticide poisonings kill **355,000** people each year.

Biotech crops reduced pesticide use by 438 MI Kgs in past 15 years



Photo: UN Photo/Stuart Price



Millennium goals to reduce poverty and hunger have had success, yet...

Approximately 800 Million go to bed hungry ever day

Biotech crops can help...

Reduce Food
Waste



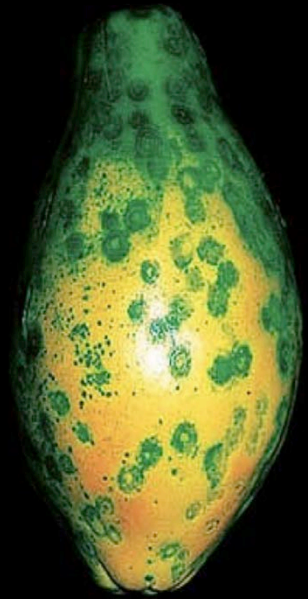
Increase Yields

Improve lives!

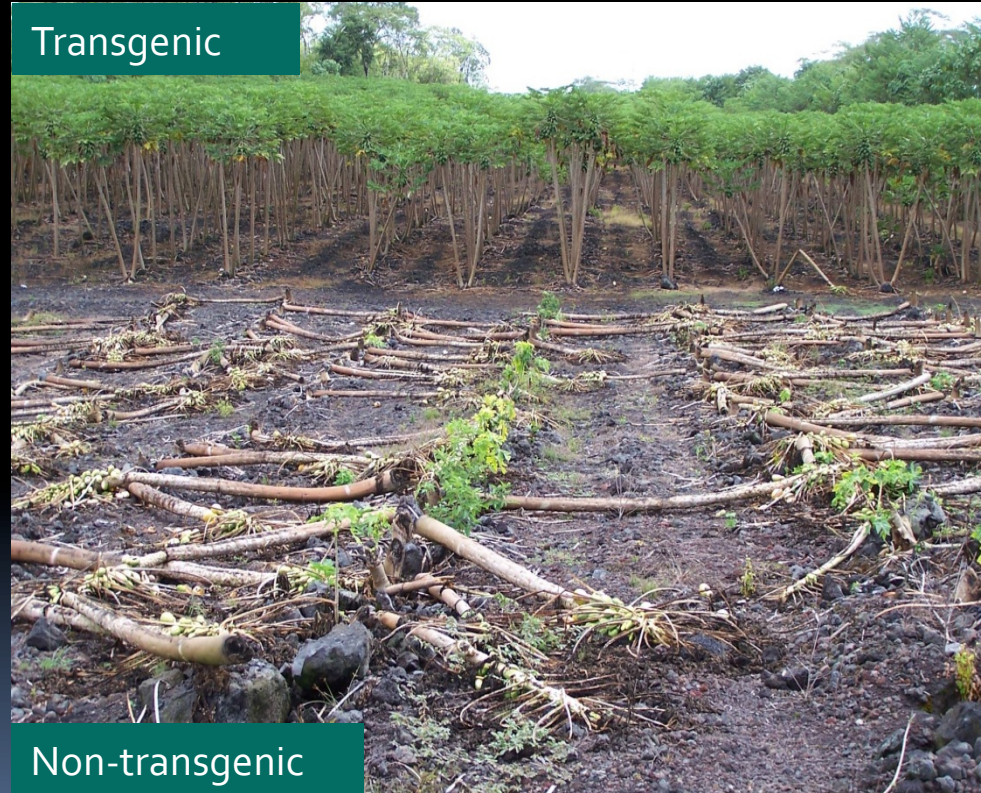
Reduce Water
Use



Hawaiian Papayas

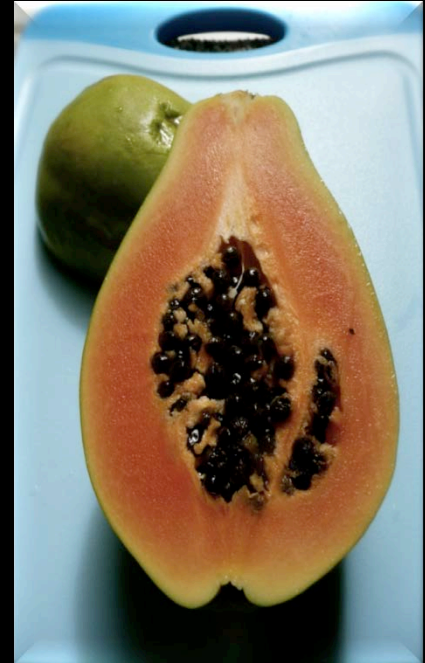


Ringspot Infected Papaya



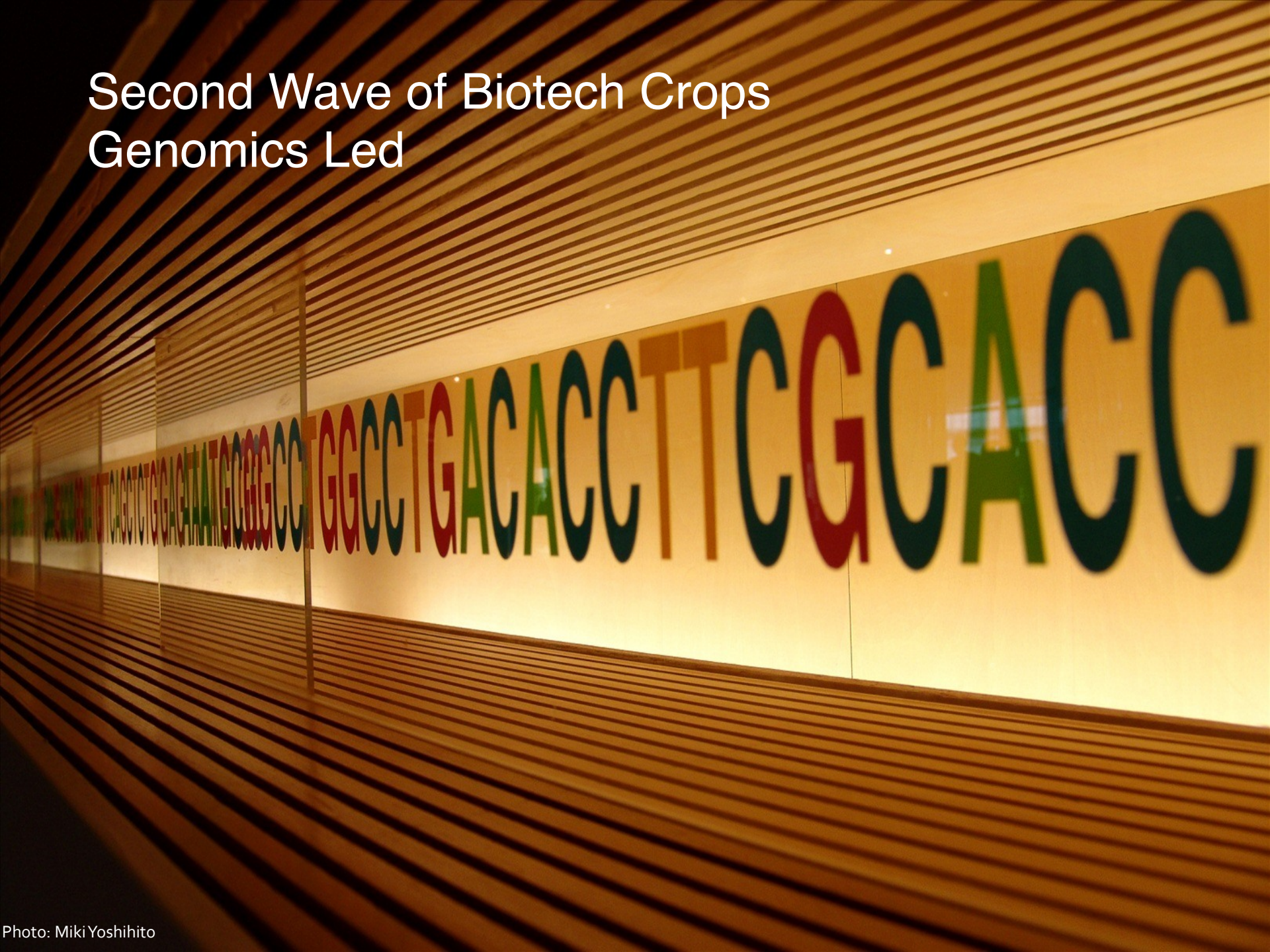
Transgenic

Non-transgenic



Healthy Papaya

Second Wave of Biotech Crops Genomics Led





**Conventional
Rice**



**Golden
Rice**



Biotech Cassava



Photo: CraneStation



In 2012, costs associated with drought related crop losses are estimated at **\$20 billion** for the U.S. alone

Drought resistance biotech corn proved its benefit

Photo: Wyman Meinser



Photo: D. Mahendra



Why use biotechnology for tree fruit?

Global benefits of GM crops – 15 yrs & rising

- Crop biotechnology has reduced pesticide sprays by 438 million kg from 1996 through 2010
- In 2010, biotech crops were responsible for removing the equivalent of 8.6 million cars from the road for a year
- Global farm income gains from ag biotechnology have been \$78.4 billion (1996-2010), mostly to farmers in developing countries
- Apples are repeatedly on the top of the dirty dozen list – biotech can change that

Source: Brookes, G., & Barfoot, P. (2012). *GM crops: global socio-economic and environmental impacts 1996-2010*. Dorchester, UK: PG Economics Ltd. <http://www.pgeconomics.co.uk/page/33/global-impact-2012>



Increased use of biotech specialty crops

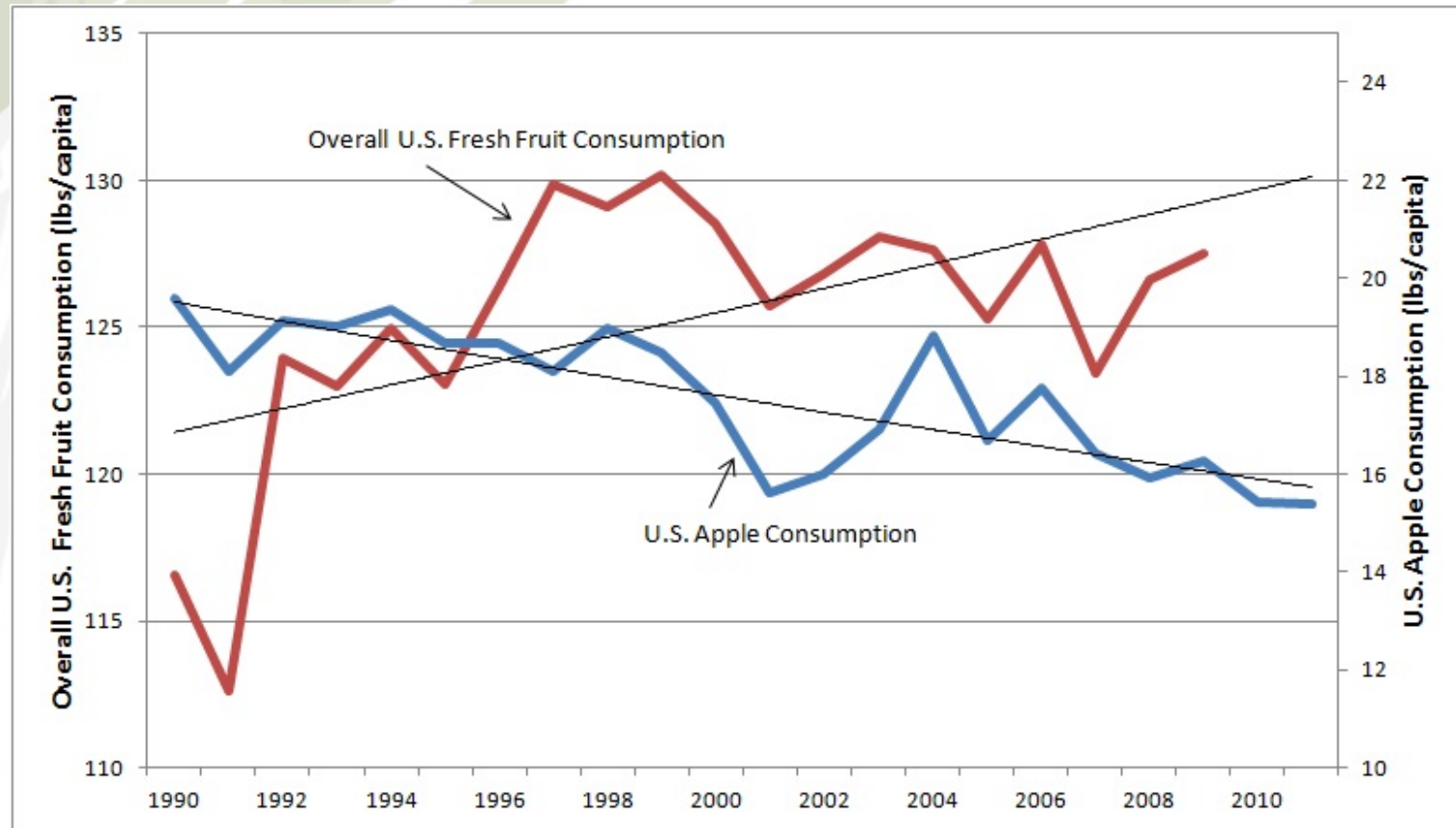
Which Specialty Crops Use Biotech?

- Papaya – about 95% of Hawaiian crop
- Zucchini – about 30% of US crop
- Sweet corn – Syngenta >10 yrs, Monsanto in 2012
- Citrus – Not yet, but seen as the best chance to beat citrus greening disease



Why did we develop nonbrowning apples?

Increase apple consumption



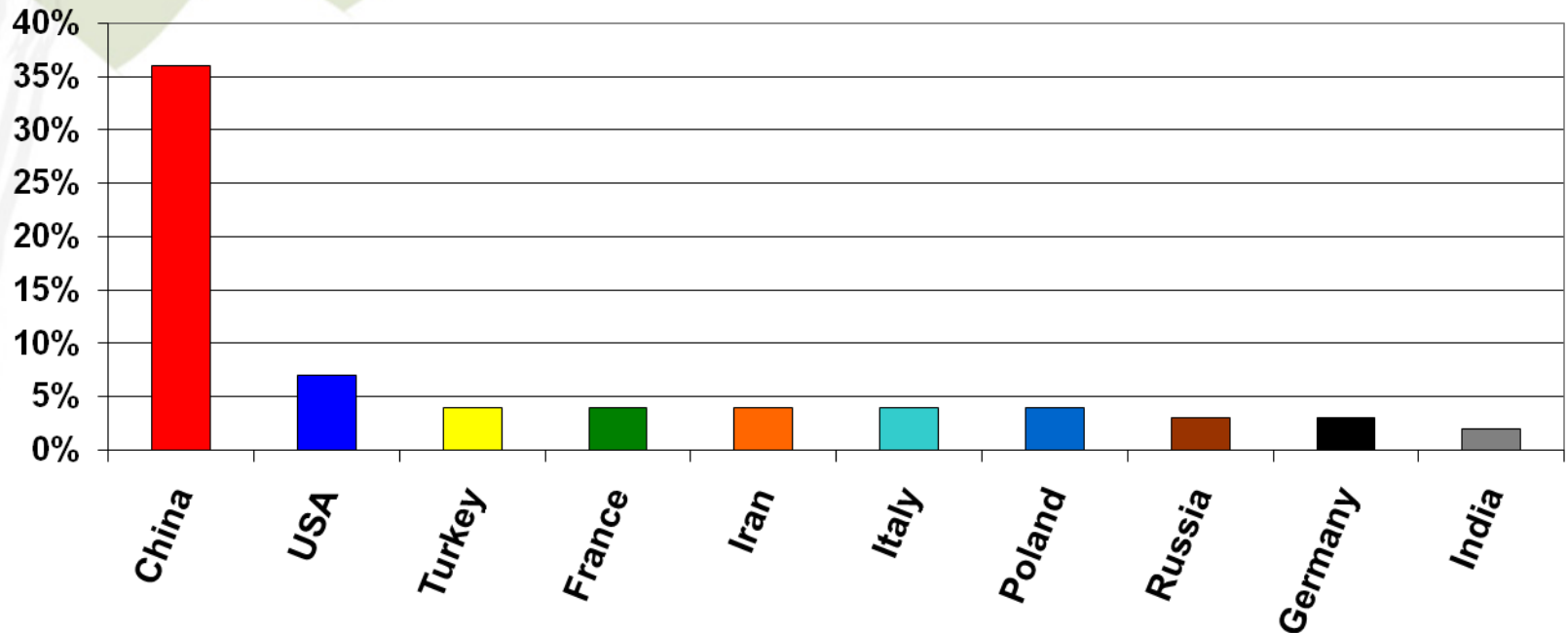
Source: USDA Economic Research Service



Why did we develop nonbrowning apples?

Increased foreign competition

Top 10 Apple Producing Countries
(% of world apple production)



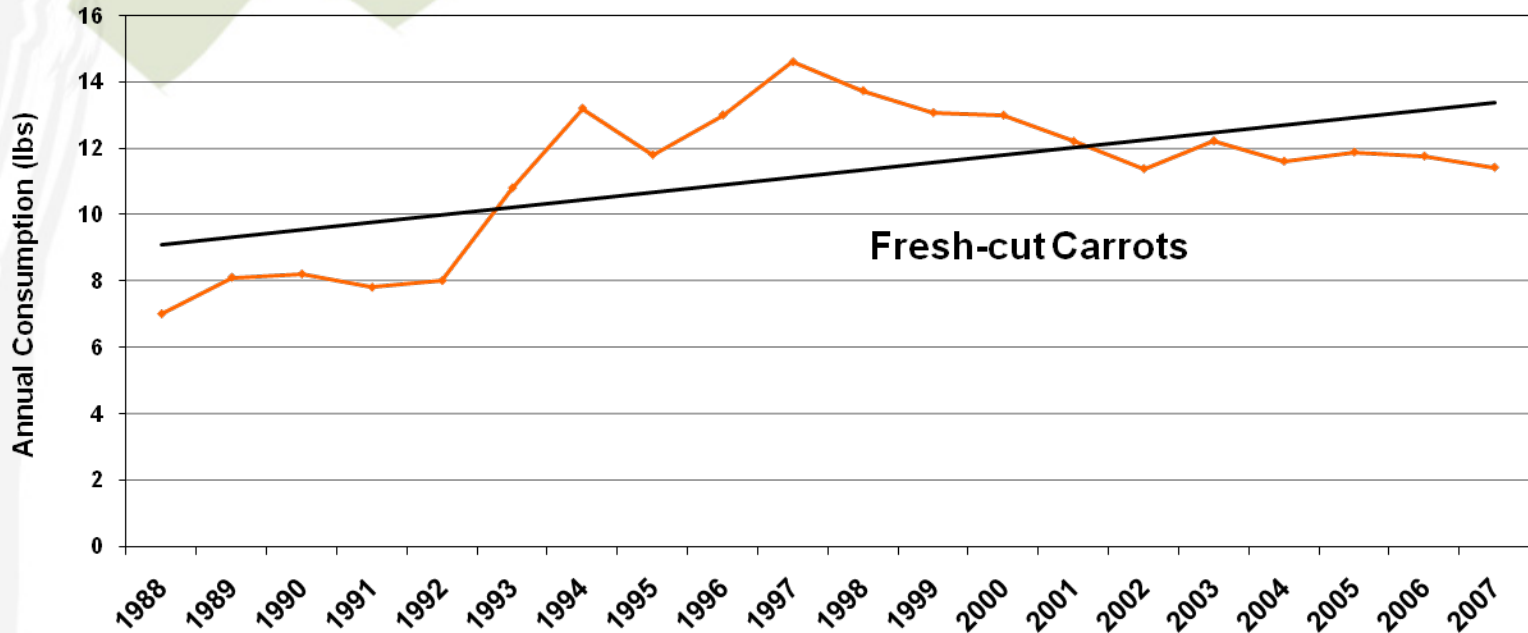
Source: USDA Foreign Agricultural Service



Why did we develop nonbrowning apples?

To create a consumption trigger

U.S. Per Capita Consumption (lbs)



Source: USDA Economic Research Service



Why did we develop nonbrowning apples?

Arctic[®] apples lead the way



- Offers a consumer benefit
- Assures biotechnology is a tool available for the tree fruit industry
- Other technologies in pipeline to keep apples competitive



What is an Arctic® apple?

The first nonbrowning apple

- Nonbrowning; not low-browning
- Slices do not brown
- Bruises do not brown
- Any variety can be made nonbrowning
- Patent protected



What is an Arctic[®] apple?

It is just like a normal apple tree

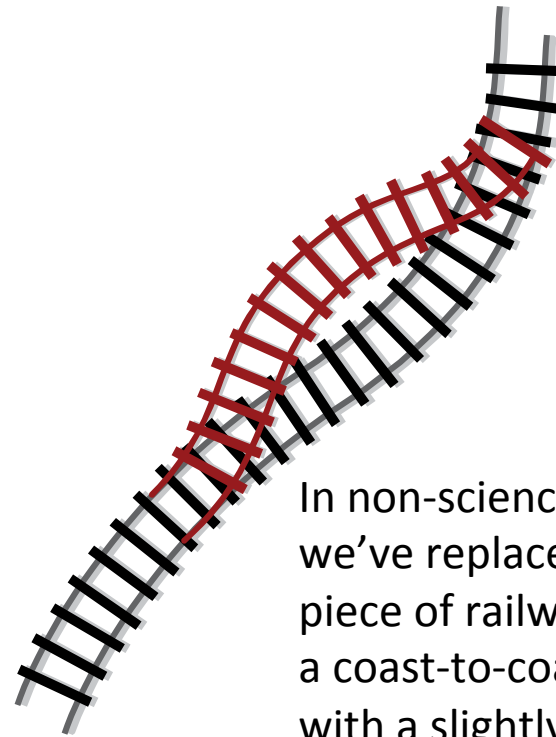


....until the fruit is bruised, bitten, or cut

How'd we do that?

Relatively simple science

- Uses apple genes to silence apple's own browning genes
- Aided by proven enabling science
- First generation product



In non-science terms:
we've replaced one
piece of railway track of
a coast-to-coast railway
with a slightly different
piece of track



Benefits of Arctic® apples

Benefits all along the Value Chain



Benefits of Arctic® apples

Consumer benefits

- Less waste
- Convenient, at-home freshcut preparation
- More enjoyable, blemish-free eating experience
- Leads to increased consumption
- Pristine natural fresh color



Like the snow-driven landscape for which they are named, the flesh of Arctic® apples remain pristine and unspoiled



Benefits of Arctic® apples

Growers / Packer benefits

- Apples do not show bin rub or other superficial marks
- More efficient packing – example: no warming prior to packing
- Ideally suited to mechanical harvesting
- Better returns & happy clients!



Benefits of Arctic® apples

Retailer benefits

- Create excitement
- Reduce shrink
- New line of value-added products
- Enhanced display appeal
- Unique, simple and different



Benefits of Arctic® apples

Foodservice benefits

- Foodservice apple use currently limited
- Prep labour savings
- Commercially available fresh-cut option is expensive
- Healthier, lower-cost dishes
- New serving ideas & opportunities



Benefits of Arctic® apples

Freshcut apple processors' benefits

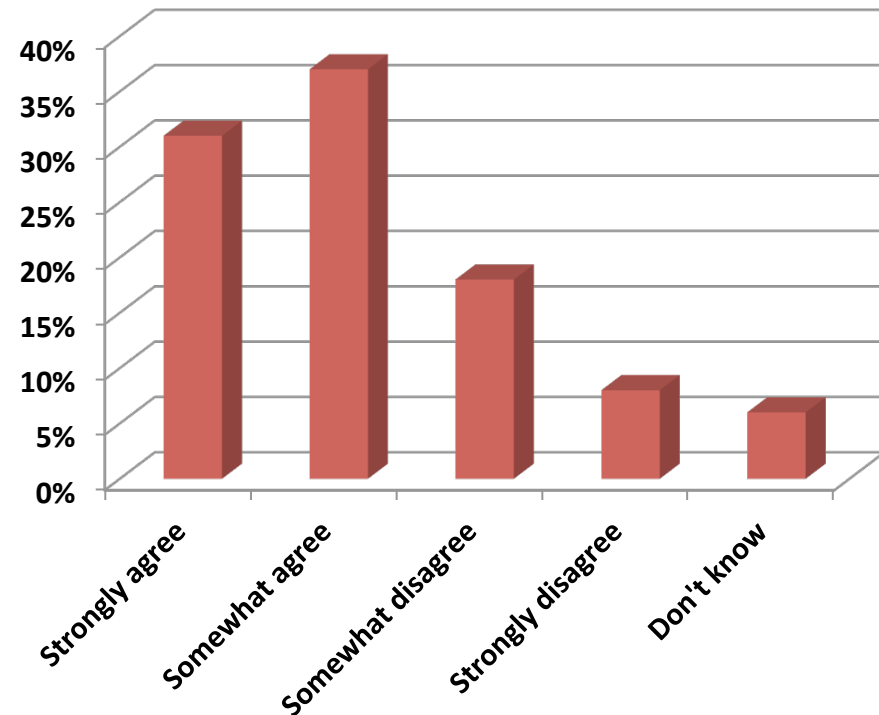
- Arctic® apples lower production costs of freshcut apples
- Increase use of apple slices in food service
- Deliver a higher quality product
 - Slicing damage less evident
 - More flavorful product
 - A more natural product



Freshcut consumption trigger

- In 2011, we surveyed 1,000 self-identified apple eaters
- We educated them on our Arctic® apples and how they are produced
- We then asked if they'd be more likely to purchase apple slices that didn't use chemicals or treatments to stop browning

Over two-thirds somewhat or strongly agreed



Benefits of Arctic® apples

Traditional processor benefits

- Make nonbrowning sauces, juices
- Products keep their natural color
- Cultivar's sensory attributes maintained
- Less need for anti-oxidants, reduces costs
- New product & ingredient opportunities

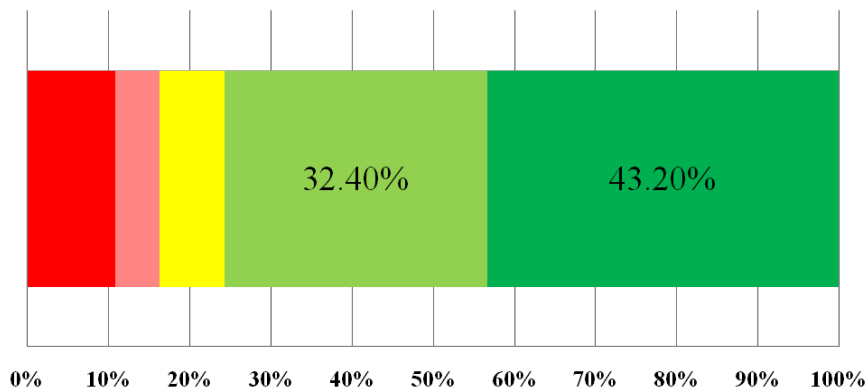


What do industry and consumer surveys tell us?

Industry interest survey (2007)

Survey of 40 leaders:

- Generally very positive response
- Freshcut potential strongly recognized
- Questions re: consumer perception of GM foods



Q: Is OSF's nonbrowning apple of interest to your company?



What do industry & consumer surveys tell us?

Consumer focus groups (2007)

- >80% positive interest in a nonbrowning apple
- Skepticism over technology subsided with exposure
- Seeing was very influential
- Greater interest among parents
- **ALL** wanted to taste them

... experience is best path to acceptance



What do industry & consumer surveys tell us?

Consumer web survey (2011)

Arctic® apples impact consumers' top 5 important attributes

5= Extremely Important

1= Not Important



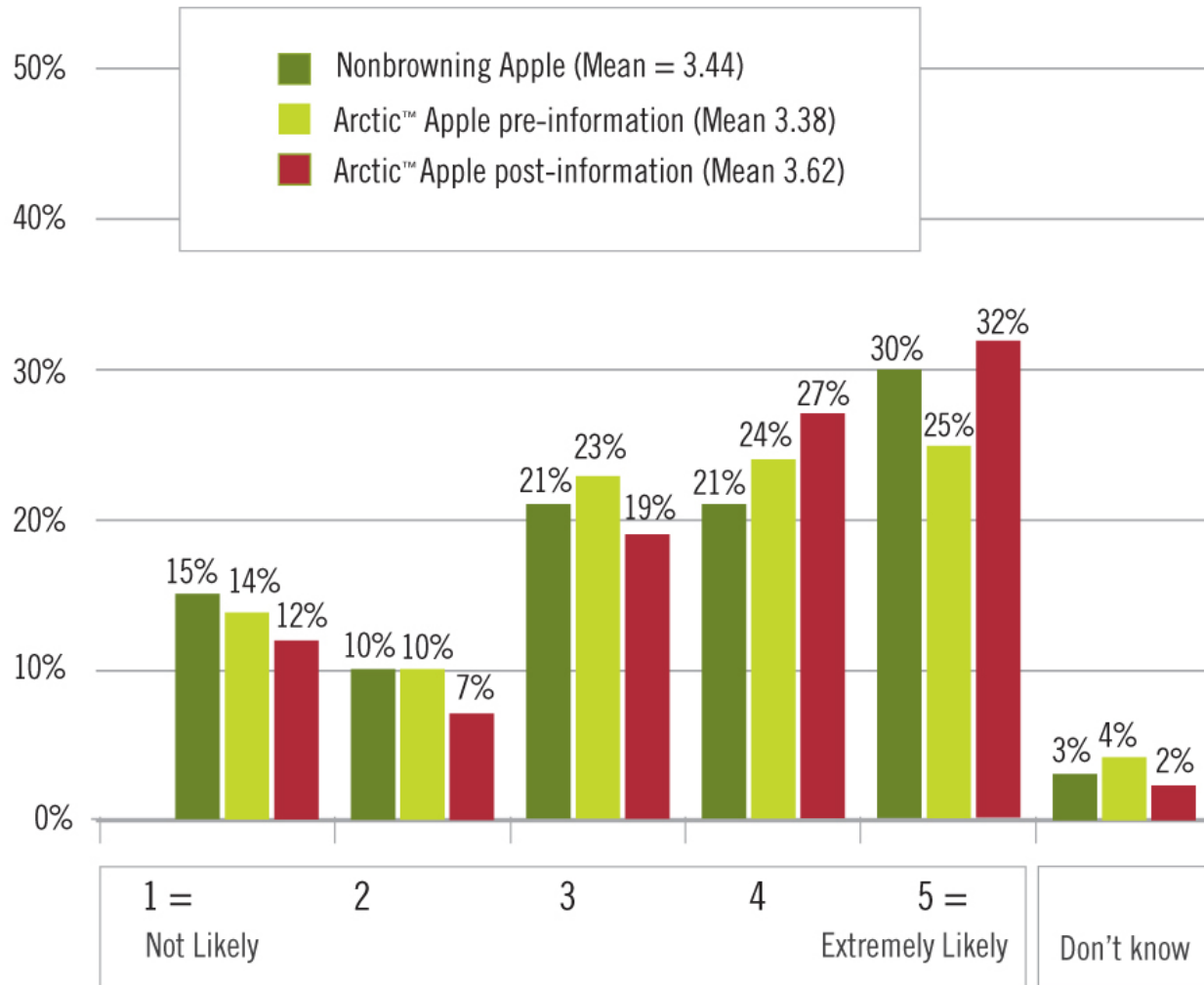
0%

100%



What do industry & consumer surveys tell us?

Likelihood to buy Arctic[®] apples



Our path to market

Marketing & Communications

- Personal outreach
- Active social media
 - Facebook, LinkedIn, Twitter
- Educational & transparent
 - About OSF & AA's
 - About biotechnology
- Prepared & responsive
- Communication stringency



THE PERFECT FRUIT JUST GOT BETTER!

The truly nonbrowning apple delivers value from grower to consumer

Arctic® Apples combine the best of nature and science. From the tree nursery to the orchard to your grocery bag, they are identical to all other apples - until you bite, slice or dice them, when their benefits become clear.



NONBROWNING ARCTIC® APPLES are a novelty, in more ways than one. Okanagan Specialty Fruits addresses supply chain problems by applying biotechnology to the world of tree fruit horticulture. Our first product, the Arctic® Apple,

offers benefits and savings to every link in the food supply chain - from the producer who grows them to consumers. Enjoyable from the very first to the very last bite.



Imagine the possibilities of truly nonbrowning Arctic® Apples, from tree to table.

We know you have questions about Arctic® Apples.

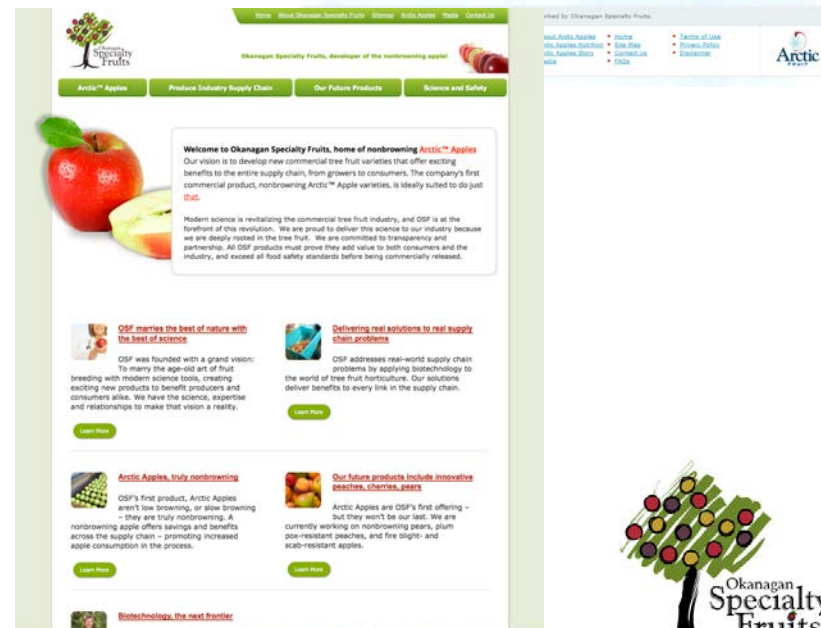
Learn more at:
www.okspecialtyfruits.com
www.arcticapples.com



Our path to market

Our Messages

- Arctic® apples are just like all other apples until their fruit is bruised, bitten or cut!
- Consumer benefit that can drive consumption
- Complete supply chain benefits
- Safe for consumer and our environment
- Our science is straightforward



Our path to market

Branding and licensing



- Licensees to commercialize
- OSF brand requirements:
 - *Stewardship* fundamental
 - *Brand* all Arctic® fruit
 - *Label* all Arctic® products

Our path to market

Canadian regulatory process

- Submitted to CFIA Q4 2011
 - Arctic® Granny & Arctic® Golden
 - Deregulation for environmental release
 - 60 day public comment period completed 3 July 2012
- Simultaneous food safety review by Health Canada
- Have had some preliminary feedback from CFIA and have responded to their questions



Our path to market

United States regulatory process

- Initial 60-day public comment period completed Sep/12
- Plant Pest Risk Assessment nearing completion
- Environmental Assessment in progress
 - Expect completion early 2013
 - Followed by a 30-day public comment period
- APHIS will then make final ruling
- Anticipate approval in Q2/13 for Arctic[®] Granny & Arctic[®] Golden
- FDA “voluntary” consultation initiated Q2/11, expect “approval” by Q2/13



Our path to market

Our commercial status

- Test block planted in USA in Q2/12
- Canadian test block of ~3,000 trees in Q2/13
- Additional test blocks for planting in US confirmed for Q2/14
- Seeking collaborators to plant another 10-20 grower-based, test blocks in North America

Goal: Get trees in the ground so we have adequate fruit to test market!



What's in the pipeline?

Where is OSF Going with Apple Biotech?

- Driving new trait discovery research to market
- Scab Resistance
- Fireblight Resistance
- Storage Scald Resistance
- Developing new trait stacking approaches
- Looking 10+ years out at completely new ways to breed apples



Offering value to the apple industry

Biotech and Apples – Do they Fit?

- We would say YES!
- Arctic® apples are a great starting place; a consumer trait reducing food waste and allowing apples to be used in more places – stimulating consumption
- Biotech apples will reduce production costs and pesticide residues. Helping get apples OFF the “Dirty Dozen” list
- Best technique available to tackle challenging storage issues and internal fruit problems
- Opportunity to take benefit from significant genomics investment to improve existing varieties





Okanagan Specialty Fruits Inc. is a dynamic company dedicated to developing new commercial tree fruit varieties that are attractive to consumers and more profitable to producers and retailers. The company is operated and largely owned by tree fruit growers throughout British Columbia's Okanagan Valley.

For more information, contact:

info@okspecialtyfruits.com

and visit:

www.okspecialtyfruits.com

www.arcticapples.com



TEDx Presentation Agricultural Biotechnology: Feeding a Hungry Planet and Saving Lives

