Okanagan Specialty Fruits
A small company making exciting biotech products
OSF Founder Neal Carter

Bioresource engineer & grower

- Worked in >50 countries, primarily in the developing world
- Wide variety of crops & project experiences
- 20+ years as hands-on apple grower
- Persuaded of ag-biotech’s value through firsthand experience
Who is Okanagan Specialty Fruits?

Small, innovative biotech firm

- Founded in 1996 by growers Neal & Louisa Carter
- Research Manager Dr. John Armstrong joined OSF in 1999
- Highly credentialed science team based in Saskatchewan, Canada
- Sought out by leading global tree fruit research institutions for collaboration
Why found OSF?

Developing value-added fruits

OSF Mission: To develop tree fruit varieties with novel attributes that benefit growers and consumers alike

- Utilize cutting edge biotech tools to do so

Platform project: Arctic® apples

- The only truly nonbrowning apple
- A biotech food that directly benefits consumers!
Why develop nonbrowning apples?

Increase apple consumption

Average U.S. Apple Consumption Per Capita (lbs)

Why develop nonbrowning apples?

Emulate success of baby carrots

U.S. Per Capita Consumption (lbs)

Source: USDA Economic Research Service
Benefits of Arctic® apples

More apples in more places

- Nonbrowning apples can create consumption-trigger
- Higher quality, reduced costs for freshcut & dried apples
- Children eat ~70% more apples when pre-sliced¹
- Apples: #1 requested packaged produce item²

²PMA “Consumer Attitudes Toward Packaged Fruits and Vegetables”, Aug. 2011
Benefits of Arctic® apples

Value across the supply chain

1. Increase grower returns
2. Improve quality
3. New product excitement
4. Decrease shrink & increase eye appeal
5. Ultimate convenience
How’d we do that?

Arctic® apple transformation

- Using RNAi technology, we have reduced the expression of polyphenol oxidase, the enzyme that causes apple browning.
- Arctic apples contain no novel proteins, have the same nutrition as conventional apples.
Small but mighty

Core differences in our model

**KEY:** Success depends on hiring a team made up of the right people!
- Entrepreneurial attitude, experience
- Emphasizing teamwork
- Wearing “many hats”
- Staying positive
- Having thick skin

With a small team, little time for supervision so employees must be self-motivated
Many OSF employees work from home – good way to save money, but not possible without a trustworthy team.

Willingness to take initiative key to maintaining forward momentum.

Streamline communications to be solution & action-oriented.

Costly to train new employees, look for long-term fits that can grow together.
Investors and shareholders

Maintaining a long-term view

- Stay committed to long term objectives, not just short term gains
  - Finding investors who recognize & understand this can be a challenge
- Critical to be honest with shareholders
- For small companies, many distractions
  - Especially when times are tough, easy to be pulled off course
- Keep confidence, perseverance
- Surround yourself with trusted advisors – don’t do it alone!
Key advantages

The value of low overhead

- Common perception that it costs tens of millions of dollars to bring a biotech crop to market
- Small team & budget = razor-tight focus on our objectives
- Must leverage research dollars much more effectively
- Deliberately frugal with expenses

Result: Ability to develop, deregulate & commercialize Arctic® apples at a fraction of the perceived cost
Our science

R&D hurdles

**Freedom to operate issues:**
- Must determine who holds intellectual property rights for trait & enabling tech
- Lots of concerns over enabling IP licenses

**Science not straightforward:**
- Apple transformation far less efficient than most crops
- Nonbrowning is a multi-gene solution
Our science

Keeping expenses low

- Contract out work that can be handled more quickly by specialists – it’s worth the money!
  - Leaves more time & focus for core objectives (e.g. transformation done in-house)

- Being a member of an association often gives you access to discounted rates

- Take advantage of areas where access to resources & talent is readily available
  - OSF lab is rented space with shared facility services, reducing costs, adding benefits
Regulatory process

What we learned

- Multiple pre-submission consultations with regulatory bodies prior to petition submission
  - Initially anticipated Arctic® apple deregulation a decade earlier
  - Quickly learned that everything takes 3x longer and costs 4x more than expected
- The goal posts are always moving
- Deadlines often are repeatedly pushed back
Regulatory process

USDA & FDA

- USDA APHIS & FDA review is an interactive process
  - With the regulatory bodies’ learning about your product, expect additional questions
  - Data generation and submission occurs over time, not all at once
  - Being a new crop and trait, this has been a learning process for all, including regulatory authorities
Regulatory process

CFIA & HC

- Canadian Food Inspection Agency (CFIA) is the USDA counterpart
- Health Canada mandatory review of biotech crops
- While similar information is required & process is similar in both countries, differences exist.
- Canada has a *Novelty* trigger
- *Example:* In Canada, deregulation is based on the species and vector; in U.S. every event must be deregulated
Regulatory process

Arctic® apple timeline

1996  OSF Founded by Neal & Louisa Carter

2002  Arctic® apple science successfully proven

2003-2005  Field trials planted in Washington & NY State

May 2010  Petition for deregulation submitted to the USDA

May 2011  OSF initiates voluntary consultation with the FDA

Dec 2011  Petition submitted to the CFIA, HC review also begun

2012-2013  Public comment periods with USDA APHIS (x2) & CFIA initiated

2014  Deregulation expected from USDA (Q2 2014) & CFIA (Q3 2014)
As a biotech crop approaches deregulation, R&D becomes a smaller “piece of the pie”

Reach out to industry and supply chain players *early & often*

The amount of work spent on outreach & education is staggering

R&D leveraging is much easier to accomplish than commercialization expenses
Underestimating commercialization cost, both in terms of time & money, is a potentially fatal mistake.

Too much focus often placed on R&D.

Reinforces necessity of *product focused* efforts.

Don’t let the money run out before the product gets to market!
Our path to market

Consumer pushback

- Highly motivated anti-GMO groups spam social media, ag-biotech media coverage with misleading messages, scare tactics directed at the public
- Numerous petitions oppose introduction of new biotech crops
- You must be prepared to deal with this, but also know how not to fuel the fire!!
Commitment to transparency

Transparent, readily available information eases consumers’ concerns, helps gain support

- Consumer-aimed website, blog, social media engagement

Educational, simplified info:

- About OSF & Arctic® apples
- About ag-biotech

Drive home key points with digestible messages & images!
**Value of education:** Consumer survey found 51% of consumers somewhat/extremely likely to buy nonbrowning apples.

When asked if they’d buy a GE nonbrowning apple, interest dropped to 49%.

After learning the basic science behind Arctic apples, that number rose to 59%.

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**Graph:**
- Generic nonbrowning apple
- Arctic apple pre-info
- Arctic apple post-info

**Likelihood to buy Arctic® apples:**
- Don't know
- Not at all likely
- Not likely
- Neutral
- Somewhat likely
- Extremely likely
Our path to market

Branding & licensing

- Working with growers to get trees in the ground
- Test agreements, followed by licensing agreements to assure Arctic® brand integrity
- While growers responsible for marketing/selling the fruit, OSF is working to create awareness throughout supply chain
- Initial test fruit positioned with both processors & retailers
Perseverance pays off

Putting together the jigsaw puzzle

The science is like the border, clear outcome in mind

Regulatory work has some definition, but is more complicated

Commercialization is ill-defined & requires careful testing and alignment to get it right

As entrepreneurs, we have never done any of this before!!!

So, what’s next?

- Leverage our expertise with PPO-suppression
- Expanding our trait portfolio with other value-added tree fruit varieties
Okanagan Specialty Fruits Inc. is a small, 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.

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