



PROFITING FROM IMPROVING TABLE POTATO QUALITY AND PACK-OUT

CASE STUDY



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Maintaining quality through attention to detail and improved storage practices can create \$17,000 in additional revenue per 50,000 lb load shipped from the farm, and reduce grading/packing costs.

Not meeting customers' and consumers' expectations of quality and value can be hugely damaging. The cumulative impact on growers' and downstream businesses' profitability of not providing the right products at the right quality, on time, every time, can be significant. The benefits of growers and downstream businesses working collaboratively to continually increase the effectiveness and efficiency with which they are able to create value for consumers include reduced waste and costs, increased sales and higher margins/profitability. The ability to predict and deliver consistently high quality enables growers and packers to differentiate themselves in a competitive market defined by unprecedented consumer demand for freshness, convenience, taste and value-added products.¹

Potatoes can experience higher waste than other vegetables – along the chain and in households.² As part of the Ontario Produce Marketing Association's (OPMA) food waste reduction initiative, Value Chain Management International (VCMI) worked with EarthFresh and growers from its supply base to identify ways to increase the quality and value of table potatoes, from field to retail store. The study did not extend to measuring store shrink or waste in the home, both of which are impacted by potato quality and supply, along with how potatoes are packaged and merchandized in the store and stored in the home. The insights are enabling EarthFresh to work closely with growers on introducing controls, processes and infrastructure to reduce waste and capture greater value. The work is also enabling EarthFresh and its suppliers to capture additional market opportunities.

How table potato growers and packers can profit from increasing consumer quality and value:

- There is a growing demand for small potatoes offering shorter preparation, cooking and serving time.
- Improved production, post-harvest handling and storage can extend potatoes' shelf life by months, resulting in opportunities to market an additional 10,000 acres of ON potatoes.
- A 29 percent increase in pack-out produces a 74 percent increase in grower margin.
 - If growers receive \$0.60/lb and packers receive \$1.10/lb for bagged potatoes, a 29 percent increase in pack-out results in a compound improvement on grower and packer revenue of over \$17,000 for each 50,000 lb load of potatoes shipped from the farm.
- Sizing and sorting potatoes going into storage enables growers and packers to reduce costs and waste, while optimizing returns, by possessing the ability to strategically market potatoes and extend shelf-life in ways that are impossible if storing field run potatoes.
- The environmental benefits that could stem from reducing waste and not transporting potatoes thousands of kilometres from other parts of North America is enormous.

¹ Insights into changing potato consumer demands include [VCMI research](#) and [industry publications](#)

² For example, see [2012 WRAP study](#)

Determinants of Profitability

Three inter-related factors determine growers' and downstream businesses' ability to profit from the production, grading and distribution/marketing of potatoes:

1. Quality
2. Yield
3. Price

Quality determines market opportunities. The predictability and consistency of quality is pivotal to securing higher value markets and maximizing margins/profitability.

Price influenced by quality, along with supply and demand. The clearance of stock by "In and Out" summer producers can negatively impact the floor price going into fall/winter.³ Prices rebound in the new year, when table potato sales primarily comprise Ontario production, which has typically been stored for a minimum of two-to-three months, or potatoes sourced from elsewhere.

Yield has two parts: field yield and pack-out yield. While ultimately it is pack-out yield (expressed as a percentage) combined with price that determines returns, many growers place less attention on pack-out than field yield (expressed as weight per acre).

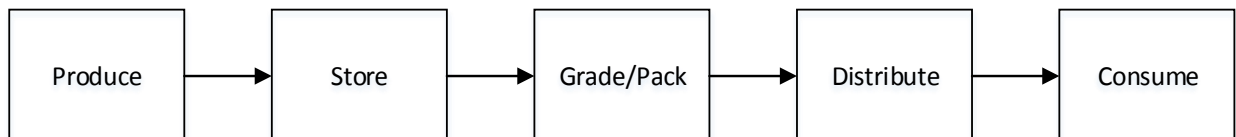
Responding to Market Dynamics

Consumer preference for smaller (C-size) potatoes that are prepared whole with skin-on increased by six percent in 2016, driving growing demand for unblemished, consistently-sized potatoes.

Factors driving a need in Ontario's table potato industry to focus on market quality and consistency ahead of traditional considerations, such as field yield, include that, while an estimated 30 percent plus of consumers regularly eat C-sized potatoes, a market does not exist for lower grade C-sized potatoes. Because of this, and the fact that varieties suited to the production of smaller potatoes can be more susceptible to poor handling and storage, the pressure on growers and packers increases for them to get the product right, first time, every time: from field to retail.

While potatoes' journey from farms to consumers involves several steps, the potato value chain comprises five distinct segments, presented in Figure 1 below.

Figure 1: Table Potato Value Chain Segments



³ [Ontario potato case study](#)

The performance of each segment of the value chain relies heavily on the effectiveness with which operations undertaken in each of the segments are conducted; yet, it is common for each of these segments to operate in relative isolation. Without proactive communication and information exchange occurring between producers and their customers, greater opportunity occurs for waste to negatively impact each businesses' profitability. It also limits their market opportunities.

Production associated wastes include lost potatoes or the downgrading of potatoes due to quality issues. The impact of incorrectly managed processes during potato production or storage may not become apparent until the crop is graded, retailed or in the home – at which time the issues will be costlier to address than if managed at the farm level. This leads to two key factors affecting the involved businesses' margins and profitability:

1. The financial returns available for sharing amongst those businesses participating in the production, storage, grade/pack and distribution are strongly influenced by the quality of products and percentage of crops grown that reach consumers; and
2. The earlier in the chain quality issues (including consistency and predictability) are addressed, the less they will negatively impact the overall chain's financial performance.

The extent to which waste – in the form of culls and potatoes of suboptimum quality – negatively impacts growers' and downstream businesses' profitability is highlighted in the table below. The analysis used actual pack-out data to show the impact that the difference of pack-out percentages has on growers' returns and margin for an identical variety of potato. For both scenarios, field yield, cost of production and price paid for packed C- and B-size potatoes are also identical. The only difference is that Scenario A shows a pack-out rate of 70 percent and Scenario B shows a pack-out rate of 50 percent. The analysis (presented below) shows that a 29 percent increase in pack-out results in a 74 percent increase in margin.

	Scenario A	Scenario B	Comparative Difference
Total field yield lb/acre	20,000	20,000	0
C-size field yield/acre	12,000	12,000	0
Average pack-out yield	70%	50%	-29%
Pack-out \$/lb	\$0.60	\$0.60	0
Return on C size	\$5,040	\$3,600	-\$1,440
B-size field yield/acre	8,000	8,000	0
Av pack-out yield	70%	50%	-29%
Pack-out \$/lb	\$0.20	\$0.20	0
Return on B-size	\$1,120.00	\$800	-\$320
Total return (B- and C-size)	\$6,160	\$4,400	-\$1,760
COP / acre	\$4,000	\$4,000	0
Margin	\$2,160	\$400	-\$1,760
Gross margin %	43%	11%	-74%

On a 50,000 lb load of potatoes, a 29 percent difference in pack-out rate equates to an approximately \$6,000 shortfall in a grower's returns, while incurring identical production, storage, handling and transportation costs. For EarthFresh, selling packaged potatoes at a wholesale price of \$1.10/lb, a 29 percent variation in pack-out yield on a 50,000 lb load equates to an \$11,000 difference in revenue.

Reductions in pack-out rates also lead to packers incurring additional costs. These include the transporting and disposal of culls, along with increased grading and handling expenses (labour, energy, etc.). Reduced quality and yield also negatively impact market opportunities, further impacting potential revenues for both grower and packer.

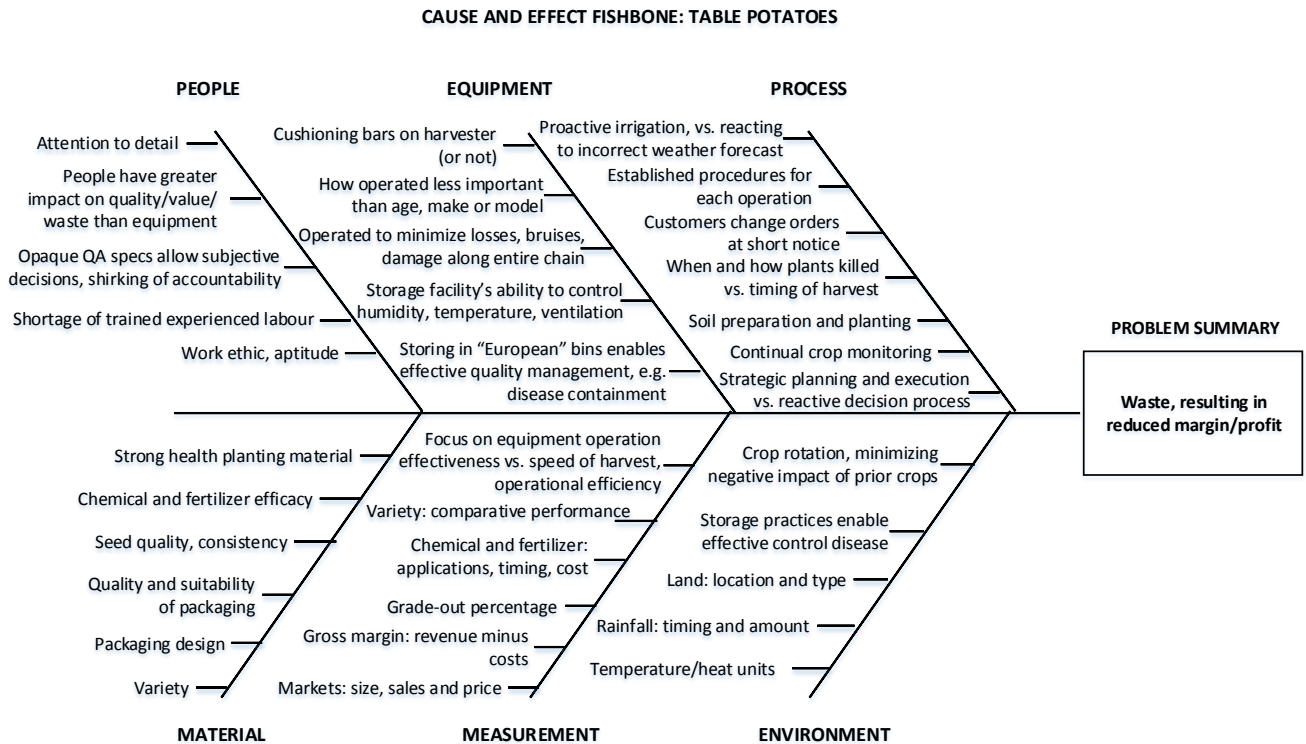
For out-graded potatoes above a certain size, dependent on variety, some revenue could be captured by selling to processors. Typically, however, the revenue provided by this market is only slightly higher than the cost of transportation.

For these reasons, purposely aligning operations to enable the creation of maximum value for consumers produces considerably greater long-term opportunities than the traditional focus of primarily cutting costs and maximizing field yield in isolation of downstream considerations.

Root Causes

Discussions with growers and EarthFresh, along with extensive data analysis, enabled the development of the cause and effect diagram shown below (Figure 2). Overlaid on each of the fishbones, which together comprise the diagram, are factors identified as potential causes of the difference in waste occurring at grading and packing, and potentially at retail and in the home too. Their impact on each of the four elements of the chain identified above are discussed below.

Figure 2: Cause and Effect Fishbone



Produce

Each of the determinants of profitability identified above (quality, price and yield) has elements that growers can and cannot control. Factors that can be controlled include variety, labour, equipment (type and operation) and timing of field practices (including planting and harvest), along with the location of where the crop is grown. Factors that are more difficult to control include the environment and the prevalence of pests or diseases.

Proactive attention to detail enables growers to positively influence quality and yield, which in turn positively influences prices. Proactive attention to detail also lessens the negative impact that factors which cannot be controlled can have on crop quality and yield. Examples of factors that cannot be controlled directly, though could be mitigated by proactive management, include addressing low or inconsistent rainfall by irrigating, and using soil or leaf tissue samples to determine fertilizer application.

This and a market-driven business oriented mindset leads to some growers experiencing lower on-farm waste and higher margins/profitability than others – regardless of variety grown. Potatoes lost from disease or damage, or those downgraded due to quality issues, constitute lost revenue. Other losses include unnecessary or excessive use of chemicals, fertilizer, labour and other resources – resulting in increased costs.

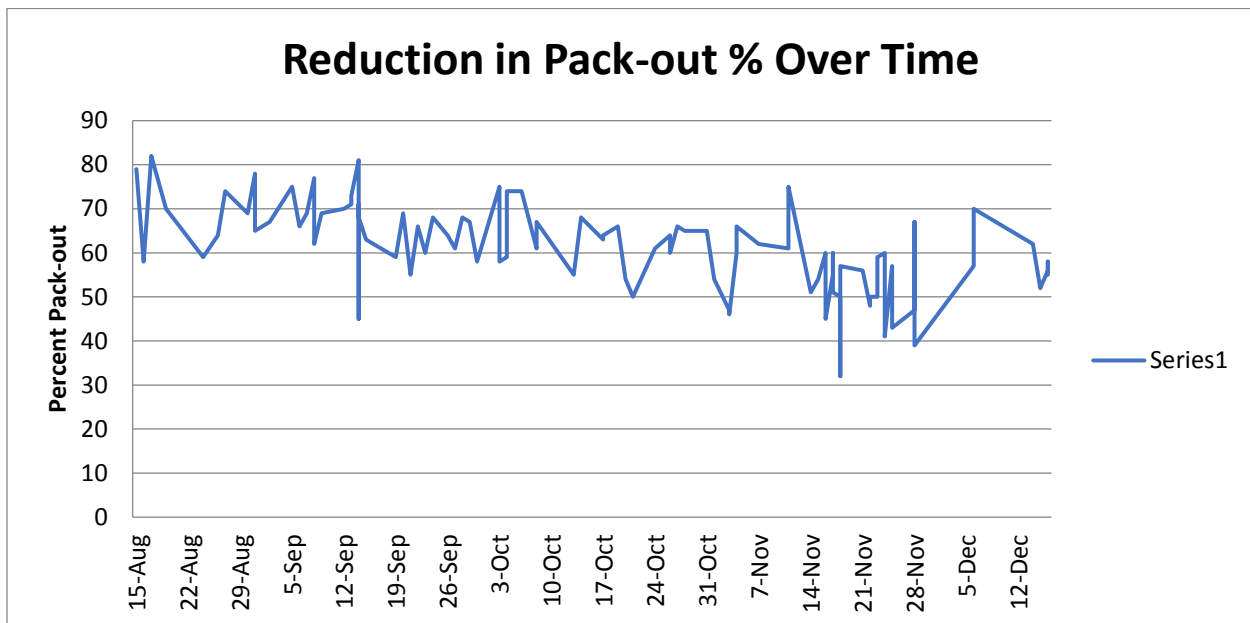
Store

The majority of table potatoes grown in Ontario are not sold directly from the field; instead they are placed in storage for a period of days or weeks to months prior to sale. The longer a potato spends in storage, the more likely it is that ineffective production, harvest and post-harvest practices will manifest as quality issues – resulting in waste and lost revenue. Practices employed prior to storage have the potential to further limit marketing opportunities – potentially resulting in further waste and missed revenue generating opportunities. The ideal solution is to only store the best available potatoes using the best possible storage techniques.

Losses occurring during the grading and packing of table potatoes regularly exceed 20 percent. The graph below (Figure 3) emphasizes the direct correlation that exists between storage time and pack-out percentage for the same variety of Ontario-potato grown. The graphic was produced from analyzing real data provided by a leading grower.

As can be clearly seen, quality and resulting pack-out percentages deteriorated over a four-month period. The peak of approximately 80 percent pack-out was for potatoes sold straight from the field or stored for a matter of days. As time progresses and potatoes are stored for a longer period, pack-out percentages reduce from an average of approximately 70 percent to an average closer to approximately 50 percent. The impact of this was demonstrated in the table on page 3.

Figure 3: Timeline of Storage and Reductions in Pack-out Percentage



The quality and value of potatoes removed from storage is impacted by 1) the suitability of facilities for storing potatoes and management practices employed when placing potatoes in storage, and 2) handling practices followed during storage. The standard means of storing potatoes is in bulk. This arrangement works well with hardy varieties grown for processing, though can be detrimental for thinner skinned table varieties, which are sensitive to less than ideal growing conditions or harvesting practices that negatively impact the quality of potatoes going into storage. Removing dirt, stones and diseased or poor quality potatoes prior to storage leads to increased quality. Storing potatoes in individual “European” style bins versus bulk enables more effective evidence based management of individual lots. Storage in bins also mitigates the potential of pressure damage or other factors, such as fluctuations in temperature and humidity negatively impacting potato quality. The two methods of potato storage, bulk (L) and in bins (R) are shown below.



As illustrated below in Figures 4 and 5, growers can increase their marketing and revenue opportunities by segregating potatoes by size prior to storage. Figure 4 demonstrates the impact of placing what is essentially a field run directly into storage on segmented market opportunities and, in-turn, revenue. Having to move all sizes of potatoes at once, the distribution in size unknown prior to packaging results in the pushing of potatoes to market. This invariably translates into growers and marketers being price takers, reliant on prices offered by retail and foodservice customers.

Figure 4: Impacts of Field Run Storage

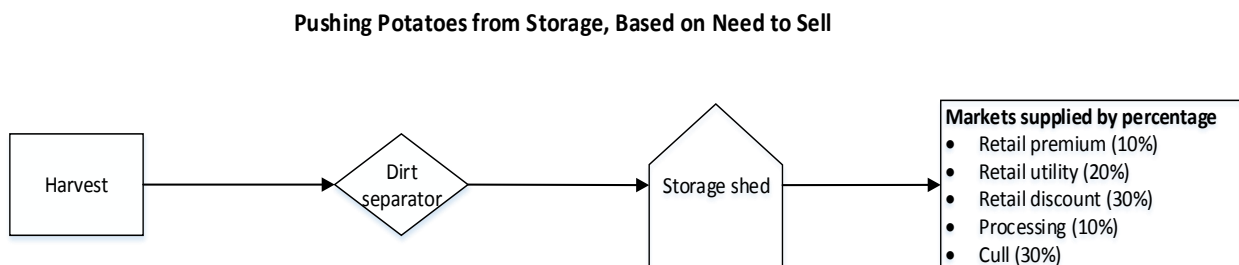
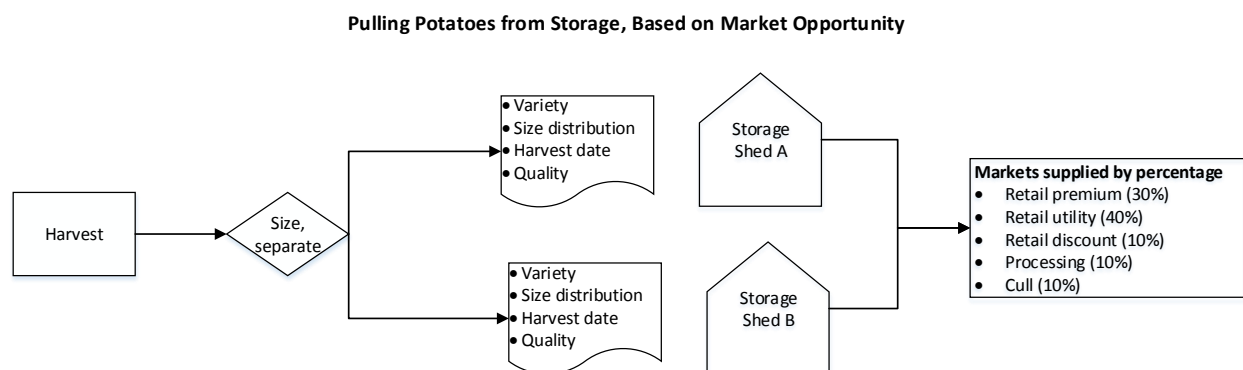


Figure 5 demonstrates the comparative impact that sizing potatoes and separating out lesser quality potatoes prior to storage has on marketers’ opportunities to strategically target higher value markets. Knowing what is in storage enables growers and packaging to adopt a more price maker strategic position when negotiating with customers. For reasons discussed below, compared to field run storage, this approach also results in less downstream waste and losses.

Figure 5: Impacts of Sizing and Separating Prior to Storage



Knowing the volume and quality of potatoes within a specific size range provides the ability to strategically supply customers according to specific requirements, or proactively target retail or foodservice customers with an offer. Removing field runs from storage always results in potatoes of undesirable sizes, which might only be moved through discounting to incentivize a sale. The other option for handling undesirable grade-outs – an inevitable consequence of field run storage – is to hold a specific size and variety of potato in inventory until sufficient volumes are available to make a viable offer to customers. This will undoubtedly, however, incur waste due to washed and graded potatoes having only a finite shelf life.

Reasons that Ontario table potato producers are not investing in optimum storage facilities include economy of scale, along with unpredictability in price and demand. This could be addressed by growers jointly investing in the construction of shared storage facilities, perhaps in conjunction with a packer/marketer.

While evaluating energy use and costs was not part of this study, it is known that modern storage facilities typically require considerably less electricity to operate than older traditional facilities.

Grade/Pack

Price is a function of supply and demand, along with available quality. As identified by the VCM I potato study referenced previously, Ontario potato prices are also impacted by early- to mid-crop potato growers pushing potatoes onto the market in the fall, leading to depressed prices through to when supply tightens up in the new year. This results in a reiterating cycle that ultimately limits the Ontario potato industry’s overall access to market.

The extent to which packers can capture the full potential value of potatoes is determined by the consistency and predictability of supply and quality (including uniform size to ensure consistent cooking time and eating experience), customers' expectations, market specifications and demand. The ability to capture value is also determined by the packaging format in which potatoes are distributed, retailed and stored. Depending on the light and temperature to which they are exposed, the shelf life of loose unpackaged potatoes or those packaged in clear plastic can be as short as four days, due to turning green or softening.

Packaging potatoes in light blocking bags, such as those shown below, increases shelf life by an additional 21 days, especially when kept in a cool environment.



For reasons discussed previously, more strategic handling and storage of potatoes increases producers' and packers' ability to capture value from the grading, packaging and marketing of potatoes. This is particularly important for newer, thinner skinned varieties that, while possessing the attributes desired by a rapidly changing consumer market, are more susceptible than traditional varieties to inappropriate handling and storage.

Improved, more consistent year-round supply and quality would also reduce waste and cost, by extending shelf life during distribution through retail stores or foodservice outlets, and in the home. Another proven means of driving consumer behaviours that leads to extended shelf life and reduced waste in the home is the inclusion of storage guidance on packaging.

Distribute

The ability to capture value by distributing potatoes to consumers through retail and foodservice relies on the involved businesses' ability to consistently and predictably satisfy consumer expectations. Consumers' perceptions of value, and therefore willingness to pay, are shaped by three distinct interrelated factors:⁴

⁴ Fearne (2014). Building competitiveness through value chain management: The role of consumer insight.

1. **Benefits:** What solution to my problem does this product offer compared to alternative options?
2. **Costs:** What financial and opportunity costs will I forgo or gain by choosing this product compared to alternative options?
3. **Risks:** What is the likelihood of unfulfilled promises negatively impacting my eating experience and the value that I attribute to this product versus alternative options?

For reasons described above, not viewing production and storage operations as one interlinked process – for example storing potatoes as a field run – negatively impacts potatoes’ quality and shelf life. The less potatoes are able to meet consumer perceptions of value, the less inclined consumers – particularly those who are price sensitive – will be to pay above minimum price.

This, combined with habitually buying on promotion, leads consumers to accept greater waste than associated with higher value items – further driving down the perceived value of potatoes.

Aligning operations along the entire value chain, resulting in a consistently good eating experience, enables growers and packers to maximize market opportunities and differentiate their products and secure above commodity prices. It also provides a platform for the chain to differentiate their potatoes from an expanding array of competing carbohydrates such as pastas and rice, and healthy alternatives such as quinoa. Equally important, it also leads to less household waste.

Conclusion: Next Steps

Changing consumer attitudes and behaviours, including an increasing desire to buy local, offers Ontario’s agri-food industry exciting new opportunities. At the same time, whatever its cause and wherever it occurs along the value chain, unnecessary waste can have an enormously negative impact on growers’ and downstream businesses’ financial performance.

The effective management of production, handling and storage enables the strategic marketing of table potatoes. This presents opportunities to increase profitability in ways that are not otherwise possible. In the example provided, a 29 percent increase in pack-out rate equated to a 74 percent rise in grower margin. On a 50,000 lb load of potatoes, this amounted to a \$6,000 variation in grower’s returns. Potatoes typically cost \$4,000 an acre to grow.

Guided by factors found to impact the quality and value of table potatoes, investments in people, processes and infrastructure enable growers and packers to capture value by strategically marketing potatoes and, simultaneously, reducing waste and costs at multiple points along the value chain. EarthFresh is working with its supply base, retail and foodservice customers, as well as Ontario’s wider potato industry, to implement the study’s findings through applying new processes and practices from farm to consumer.

Method of Analysis

The study involved 1) engaging in detailed discussions with potato growers and EarthFresh staff involved in procurement, operations and marketing; and 2) visiting farms and EarthFresh's packing facilities in Grand Bend and Burlington.

The table potato value chain was then mapped to identify causes and effects, with production and pack-out data analyzed to measure performance over time. The resulting insights showed the extent to which the financial performance of growers, packers and other downstream businesses are effected by variations in quality that can be addressed through proactive management.

Involving key individuals from along the value chain enabled the development of solutions for improving table potatoes' quality and value. Improved performance relies on the establishment of key performance indicators (KPIs). This, along with constructive communication between growers and their customers, enables wastes/costs to be extracted and revenue created in ways that would be impossible if not for having adopted a market-driven collaborative approach to business.

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