

# Fresh Market Processing Feasibility Study March 2022



 Managing Today for Tomorrow

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### **EXECUTIVE SUMMARY**

The project considers the development of a model fresh pack/fresh frozen facility for wild blueberries. It assesses the economic viability and associated risks, considering the investment required for infrastructure as well as operational costs. The project is to serve as a benchmark for existing operations and a reference for anyone considering future operations. The facilities are deemed 'model' in that they meet food safety guidelines and principles, to optimize fruit quality and to permit sales beyond the provincial borders, nationally and internationally.



The characteristics of the wild blueberry, its growth habits and production regime, equate to a product that doesn't lend itself easily to the fresh fruit sector. The opportunity is evident by implementing best management practices at every stage from field to product consumption. Key factors influencing berry quality include: proper field selection; harvest during cool, dry conditions; removal of field

heat upon harvest; avoid temperature fluctuations; avoid damage to berries; and process and distribute within 36 hours of harvest.

A 'model' facility must be licensed with CFIA, be in compliance with all food safety guidelines and have traceability capabilities. All food sold in Canada must meet Safe Food for Canada Act (SFCA), Safe Food for Canada Regulations (SFCR) and Food & Drug Act & Regulations. Regulations do not prescribe the requirements of a facility, but rather define desired outcomes. In NS, the provincial Fresh Fruit & Vegetable Regulations also apply, and if discrepancies occur, the provincial regulations overrule federal. National food safety certification is a requirement when selling to wholesalers, with some specifying the program they accept. If exporting product, regulations that must be met will depend on the country of destination, but the GFSI (Global Food Safety Initiative) program is one of the better options.

The project considers the economic feasibility of two model facilities: Model #1 has capacity to process ~100,000 lbs., while Model #2 processes ~1,000,000 lbs. Both models are hypothetical examples that present all the costs to be considered in terms of infrastructure and operations. Many assumptions are made, as the models are not site-specific, and therefore cannot be deemed representative for any particular business; they are presented as benchmarks only. Model #1 considers an investment of \$632,000, selling a product mix of 60/40%

(wholesale/direct). Model #1 is not economically feasible under the subscribed conditions, generating a negative ROI of (6.90%), although feasibility is evident when more berries are marketed. Model #2 includes an investment of \$1,302,000, selling 97-3% (wholesale/direct); it reveals an ROI of 39.7% under the prescribed assumptions. A template was developed for the project where growers can enter their own data. Professional Engineering expertise should be sought in the planning stages to design the facility and determine costs.

The feasibility 'pinch points' for fresh pack processing of wild blueberries are many: product quality, shrinkage, labour/mechanization, volume throughput, selling price/unit and overhead investment costs. Savings in any of these areas improves the feasibility. Investing in a fresh pack processing facility simply to process wild blueberries for a 4-week period, is tough to justify on its own. Overhead costs can be reduced by using existing buildings, buying used equipment, extending the use of the building by processing other soft fruits/berries, and/or collaborating with other growers to increase throughput. The feasibility is also dependent on securing a market for the product, as it cannot be assumed to be apparent. Both models consider sufficient volumes that must include selling a percentage of product into the wholesale market, mainly as a result of the narrow season and the product perishability. The wholesale market is competitive, where sellers tend to lose the ability to set prices. Wholesalers do not make long-term commitments, enabling them to negotiate for the best deal at any Risk is enhanced when making long-term investments in particular point in time. infrastructure to process a product for which there is no market certainty. As in any business, and especially in agriculture, there are on-going risks. Managing the risks is an essential business management practice to improving the probability of success. Awareness of all the critical points is the first step in managing the risks.

## I. INTRODUCTION

This project was contracted by the Wild Blueberry Producers Association of Nova Scotia (WBPANS) with funding from the Building Tomorrow Fund, NS Department of Agriculture. The project considers the development of a model fresh pack/fresh frozen facility for wild blueberries. The decision was made part way through the project to include two model operations, differing in terms of capacity. The first model (#1) considers a facility with capacity to process up to 100,000 lbs. of fresh wild blueberries and the second model facility (#2), with capacity to process up to 1 million lbs. during the blueberry season. The main difference between the two facilities is the higher capacity model requires more automation to increase product throughput, requiring less manual labour. Product quality, equipment capacity and labour requirements are the limiting factors in terms of efficiently and effectively processing the berries during the relatively short harvest season of 4-6 weeks.

The project objective is to outline the economic feasibility of such an operation to serve as a benchmark for existing operations and reference for anyone considering entering the business. The project is intended to assist growers in assessing the economic viability and risks associated with investing in such an enterprise, preferably in the business planning stages prior to investment. The study analyzes the baseline fixed and operational costs for both models achieving high quality standards, with assumptions on markets. The 'model' facilities must meet food safety guidelines and principles, optimizing fruit quality for distribution beyond the provincial borders and internationally, if so desired. The report highlights the investment potential of this opportunity, accentuating areas where efficiencies and quality can be improved to enhance profit margins. It also highlights areas where economies of scale might allow for access to advanced markets and the extra costs required.

# **II. PROJECT APPROACH**

The project was directed with guidance from the WBPANS Executive Director, Peter Burgess. An initial meeting was held to confirm the project expectations, identify the various components of a fresh line facility, and determine potential information sources for equipment pricing, infrastructure costs, operational costs, regulatory aspects, etc. Extensive research was also conducted on-line to gain an understanding of the various components of a fresh cleaning line for wild blueberries, and possible suppliers. Industry suppliers were contacted via phone and/or email to obtain cost estimates for the necessary equipment and supplies for both model facilities. Securing equipment quotes was initiated in 2020, but continued into 2021 due to challenges in getting responses from suppliers. Some of the challenges were definitely

attributed to the COVID-19 pandemic, but others were simply because the project was not a 'typical' buying customer.

The 'usual' approach to such a project would be to do on-farm visits and in-person calls. COVID-19 created havoc with this approach, with restrictions limiting travel for much of the project time frame. When travel was permitted, visits were made to Glenmore Farms Limited as well as Nova Agri Inc. to view their operations and get an appreciation for the requirements and challenges of a fresh pack facility. Both operations were visited after the season due to restrictions with COVID-19 but also to adhere to the food safety regulations. Several attempts were made to meet with Millen Farms Inc. as they already have a Model #2 facility in place, but efforts were not successful. Glenmore Farms Ltd. located in Glenmore, NS operated three cleaning lines with capacity to clean 100,000 lbs. over a four-week period, by operating 2-10 hour shifts daily. Nova Agri Inc. located in Centreville, NS is a highbush blueberry operation, cleaning and processing over 1 million pounds of fresh berries during a 3-month period. The process (and equipment) for cleaning and packing both the lowbush and highbush blueberries is very similar, however there are critical differences in the berry itself in terms of skin texture, perishability, plant growth, harvesting, and length of season. These features directly influence processing capacity and product quality. Betty Ann Hatt of Nova Agri graciously provided a lot of information on the process, food safety protocol and quality assurance practices as well as a tour of the operations. Todd Burgess of Glenmore Farms willingly shared infrastructure and operational costs from 2018-2020 inclusive for their freshpack facility. Perennia and CFIA staff provided information on the regulatory aspects, especially information sources outlining the requirements for food safety compliance and licensing. Significant time was also devoted to sifting through many of the on-line resources such as CFIA website, CanadaGAP, Safe Food for Canadian Regulations and licensing requirements.

### **III. INDUSTRY OVERVIEW**

Wild blueberries (*Vaccinium angustifolium*) are native plants that grow in thin glacial soils in harsh northern climates. The berries are found in few geographic locations in northeastern North America, predominantly in the Atlantic Canadian Provinces, Quebec as well as the northeastern United States (state of Maine). The plants grow naturally, however fields have been managed for commercial production for well over a century. Blueberries (including highbush and lowbush) are Canada's most important fruit crop in terms of farm gate value (almost \$274 million in 2020) and the country's leading fruit export. Canada is the world's largest producer and exporter of wild blueberries with exports of 94,248 metric tonnes worth

an estimated \$312 million in 2020, reaching over 30 countries (Agriculture & Agr-Food Canada, 2021). Ninety-three percent of the exported product is frozen.

Nova Scotia is one of the top four producing provinces of wild blueberries in Canada, and the economic impact of the sector is estimated to exceed \$100 million annually. The wild blueberry continues to be the largest fruit crop of the province in terms of acreage, production and export value. Statistics Canada (2020) reported 38,016 cultivated acres of blueberries in NS; 15,776 bearing acres, producing 17,553,000 ton, with a farm gate value of \$29,993,000. The average price per pound was lower from 2016 to 2018 due to large inventories from three consecutive years of bumper crops. With much of the inventory depleted, 2019 was the first year of improved field prices, with the trend continuing for 2020 and 2021. WBPANS reported provincial production of 50 million pounds in 2021 (WBPANS, AGM report), with an average price of \$0.80/lb. received by growers for processed berries.

Most of the Nova Scotia crop is processed/sold IQF (individually quick frozen) with less than 5% sold as a fresh product (WBPANS). Some additional product has been directed to the fresh market in recent years as growers explored other market options when the commodity prices for the IQF product was well below cost of production. According to Statistics Canada, Canadian consumption of blueberries has not changed much over the last ten years, remaining steady at 800 grams/person/year.

### 3.1 The Fresh Product

Wild blueberries are available fresh within the province during harvest season which is typically a 4-6-week window from early August to mid-September, depending on location. The wild blueberry is a delicate product with an extremely short shelf life, typically 7 days following harvest under ideal conditions, and when maintained at optimal temperatures of 0 to 8°C. As such, the crop doesn't easily lend itself to the fresh fruit sector. Success requires meticulous attention at every stage of the process from production, harvest, cleaning, storage through to delivery. Excellent management practices combined with properly designed facilities and equipment, will optimize the potential for success.

Wild blueberries are generally sold fresh within 24-36 hours of harvest due to their perishability. The fresh product is typically marketed within close proximity to the harvest area through farmers markets, supermarkets, and restaurants, for the same reason. Growers also sell product direct from their farm gate through a farm stand and some operate U-picks. Fresh wild blueberries are not washed, mainly because washing results in faster deterioration of the product quality. The fresh (unwashed) berries maintain their natural 'bloom', the blue

pigment coating on the skin, which is a distinguishing feature of the fresh product compared to the IQF product. Washing of the berry is also considered further processing, hence requiring compliance with additional regulations. The fresh berries are dry sorted, manually via a conveyor belt cleaning line with a series of air blowers. If the fresh product isn't sold within 24-36 hours, it is typically frozen and sold as 'fresh-frozen' throughout the year. Freezing of any type, whether the berry is washed or not, is considered a process, making the fresh-frozen berry a processed product identified as another licensed activity by the Canadian Food Inspection Agency (CFIA).

### 3.2 The Quality Challenge

The wild blueberry is a unique berry with many idiosyncrasies that influence the quality at harvest and the ability to maintain that quality from field to fork (Thyagrissen, 2020). These characteristics impact the potential to increase the volume of fresh wild blueberries available to be marketed in NS or elsewhere. Fresh wild blueberries typically secure a higher price in the market place than IQF berries because of their 'freshness', but also because they are more costly to harvest and prepare for market. Fresh berries are quick to perish, and therefore must be handled gently and sold quickly (Agmrc, 2021).



Demand and price for all produce depends on quality, and consistent high-quality products benefit the whole industry. Customers buy fruit based on how it looks, and they become repeat customers based on how it tastes and how long it lasts (Calderwood, 2020). The WBPANS fresh market study (Thyagrissen, 2020) alludes to numerous challenges in securing significant quantities of quality, marketable fresh product: thin

skin of the small wild berry, genetic diversity, handling frequency from field to fork, high ambient temperatures during harvest, one pass harvesting method, remote location of fields, short harvest season, etc. Charles Forney, AAFC Research Scientist at the Atlantic Food & Horticulture Research Center, Kentville, NS affirms the top four challenges for fresh wild blueberries in terms of quality:

- The range of ripening stages due to field diversity
- Raking technique (or harvesting)
- Bruising due to drop distances on the packing line
- Proper pre-cooling & storage temperature maintenance

Over 90% of the wild blueberry fields in NS are mechanically harvested (Esau & Farooque, 2021). Mechanizing the harvesting process has been incremental to industry growth in terms of acreage. Prior to mechanization the crop was hand harvested using rakes, requiring a sizeable manual labour force augmented by the relatively short harvest season. However, a large portion of the wild blueberries that go into the fresh market in this province continue to be harvested using hand rakes or walk-behind harvesters. A few growers have made modifications to the DBE mechanical harvester allowing for a 'gentler' harvest. A newer option – Grasshopper/D.H. harvester – is a mechanical rake that seems to provide a gentle harvest, has been adopted by some growers producing for the fresh market.

There are many aspects of the process from 'field to fork' where practices will affect quality, positively or negatively, depending on how, what, when and where tasks are carried out. Businesses considering a fresh-pack line, can increase the probability of yielding a quality product by being attentive to all facets.

- Field selection: The first consideration is selecting an appropriate field, as not all fields can be effectively used for fresh pack production. Features to consider as defined by Peter Burgess, WBPANS (via personal communication, Feb. 18, 2022) are described below. He also noted that total variable costs to produce the desired canopy and crop would be \$1500 -\$1800/acre in most years.
  - Flat & mature fields with nearly 100% plant coverage allows for efficient harvesting and canopy support to keep the fruit off the ground. Rough and patchy ground results in harvesting excess dirt and debris with the berries.
  - Lack of weed pressure, reducing the debris.
  - Optimum stage of ripeness most fields have an optimal harvest window of 5-7 days; prior to this there are too many green berries; after this stage there are too many over ripe berries.

- Yields in the 4000 to 6000 lbs./acre range to optimize efficiency and fruit quality. Below 4000 lbs./acre in a mature field there are often weed and/or disease issues affecting quality. In addition, lower yielding fields take longer to harvest, making it difficult to keep the processing line fed. Above 6000 lbs./acre, canopies tend to be denser, creating moisture issues; the stems also tend to droop under the weight of the fruit causing them to lay on the ground, resulting in quality issues.
  - Plants should be between 4 and 10 inches tall.
  - Stem and canopy density should be appropriate to allow for air movement, but also allow for support when stems are laden with fruit.
- Good disease management (monilinia, botrytis and leaf diseases), as well as high level of control for blueberry maggot and SWD (spotted wing drosophila).
- Most wild blueberry fields are located in remote areas, hence fecal matter and/or unusually high levels of animal and bird activity can be an issue. The low growing plant combined with an uneven terrain, presents challenges in harvesting a clean crop.
- Minimize the number of times the berries are handled, as each handling represents an opportunity to compromise quality.
- Harvest when the temperature is cooler, with no dew or moisture on the berries. Esau & Farooque (2021) completed research on the effects of temperature at harvest and post-harvest fruit quality and found that harvest temperatures less than 25°C are best for optimizing berry quality.
- Use smaller lugs to transport harvested berries from the field to the processing facility. The weight of the berries on themselves can result in compression damage, therefore do not overfill rakes and/or containers, and use containers with limited depth. As more berries are added there is less air space between them, causing deterioration especially in warmer temperatures.
- If berries have to remain in the field for a period of time before delivery to the processing facility, provide a canopy cover to provide shade and avoid direct heat from the sun.
- Transport the berries from the field to the processing facility at a slow speed, minimizing bumps and jarring of the berries.
- Ideally place the berries in an air-conditioned, temperature-controlled facility following harvest, to remove field heat and maintain quality prior to cleaning. However, if berries cannot be kept at low temperatures throughout the supply chain, then cooling to low temperature should be avoided. Temperature fluctuations from near zero to room

temperature for a substantial length of time will be a notable factor affecting fruit quality.

- Cover any sharp or rigid edges on the cleaning equipment to avoid damage to the berries.
- Minimize the drop distances when dispensing berries onto the conveyor belt, to reduce possible bruising.
- Packaging can also affect the quality: preferably rigid low sides, minimum depth to avoid compaction, adequate ventilation to allow efficient cooling but not too prevalent to enable drying (Forney, 2021).
- Distribute berries within 24-36 hours of cleaning; hold in cooler until distribution. If distribution is of any distance, use refrigerated vehicle for delivery.

### 3.3 Storage/Cooling Considerations

Most smaller growers who have entered into the fresh market, have not made any substantial investment in adequate storage and/or cooling equipment on-site. Yet research has shown that it is an essential component in maintaining the quality of fresh blueberries. Wild blueberries, like all produce, continue to respire, intake oxygen and release carbon dioxide and heat, following removal from the plant. Respiration cannot be stopped once the berry is harvested but it can be slowed by cooling, and keeping them cool. Calderwood & Tooley (2020) suspect that wild blueberries generate more heat and more moisture per quart than highbush blueberries simply because there are more berries in each container with less air space. Because the berries continue to respire, it is critical to have the ability to move cool air through them before they reach the consumer. Cooling of the berries should begin in the field immediately after the berry is harvested, as it is the number one method to reducing respiration. This is next to impossible with the rough terrain and remote location of most wild blueberry fields. Pulling cold air across berries removes field heat more efficiently than air blown at stacks of berries from above. Berry containers should have slats or holes in them that allow for horizontal airflow (Calderwood, 2020). Esau & Farooque (2021) found berry temperature after harvest should be kept below 20°C to maintain desirable fruit firmness (>3N) prior to moving the crop to the processing facilities.

Various researchers have studied and/or reported on the specific storing/cooling requirements of wild blueberries, although with some inconsistencies. However, the importance of immediate cooling and proper storage to maintain quality is apparent:

- ➤ Work completed at the University of Maine found that berries should only be cooled before packing if they are packed in a room that is the same temperature or colder than the berries themselves. Quick cooling of the berries can cause skins to break, so the goal should be to keep berries at a constant temperature all the way from the field to the consumer, otherwise it may be best not to pre-cool (Calderwood & Tooley, 2020).
- Dr. Charles Forney, AAFC researcher has developed new technologies to extend the life of fresh fruits/vegetables, in particular controlled atmosphere (CA) storage, for highbush blueberries. He stresses the urgency to remove field heat as soon as possible as the outdoor temperature affects product quality (Podcast, Perennia, Oct. 2021). Forced air-cooling is preferred for heat removal. He notes that cooling the berries from 25 to 0°C as soon as possible following harvest will reduce respiration ten-fold.
- OMAFRA (2016) studies indicate that a 1-hour delay in cooling very highly perishable crops such as wild blueberries, during hot weather reduces a products shelf life by 1 day.
- Transport Information Services (2021) identifies risk factors with storing/transporting food products in containers and provides guidelines on desirable conditions to avoid losses. They stress that transport time for wild blueberries has to be short due to their short shelf-life. Refrigerated containers are required with fresh air supply to prevent moisture loss resulting in spoilage and shriveling. The recommended container storage temperature is -1 to 0°C; maximum duration of storage is 21 days; relative humidity of 85-100%; 5 air exchanges/hour. Careful handling of the berries is important as mechanical injury causes the juice to leak and leads to rapid spoilage.
- Perkins-Veazie (2016) provides further parameters from various researchers regarding the cooling and storing of fresh wild blueberries in the USDA Agricultural Handbook Number 6:
  - Blueberries for the fresh market should be force-air cooled to under 10°C, graded, then maintained under refrigeration at 0 to 3°C within an hour after harvest to remove field heat and extend storage life.
  - Jackson et al. (1999) note precooling to 5<sup>o</sup>C can cause condensation problems when the berries are packed at ambient temperatures but should be incorporated when delays between picking and packing exceed 21h.
  - Lowbush blueberries should be held at -0.5 to 0°C and above 90% RH for up to 2 weeks in storage (Perkins-Veazie et al., 1995; Jackson et al., 1999).

- Lowbush blueberries benefit with increased shelf life to 6 weeks from CA storage conditions with 10-15% CO<sub>2</sub> plus 1 to 10% O<sub>2</sub>, when held at or below 5°C (Smittle & Miller, 1988; Prange et al, 1995).
- Blueberries should be stored and displayed under refrigeration in retail outlets with temperature as close to 0°C as possible.
- Betty Ann Hatt of Nova Agri (personal communication, Oct. 14, 2021) confirmed cooling the berries immediately after picking to remove the field heat is an essential practice to maintain shelf life. She noted if the berries are put through the cleaning line without cooling, quality is compromised and shelf life is reduced. The key principle is to avoid temperature fluctuations at all costs.

### **IV. REGULATIONS**

A 'model' facility for fresh wild blueberries must meet food safety guidelines and principles to enable the sale of quality berries to any location, within the province, across the nation or for export to international markets. Regulations within NS allows growers to clean, pack and sell quantities of wild blueberries direct to consumers at the farm gate and/or at farm markets without required licensing of the facilities. Nevertheless, these operations must follow food safety guidelines to ensure product traceability in the event issues were to arise. However, they do not have to comply with the same depth of regulations as those wishing to sell into the wholesale trade.

All food sold in Canada must meet the Safe Food for Canada Act (SFCA), Safe Food for Canada Regulations (SFCR), and Food & Drug Act & Regulations. Provincial and Territorial regulations may also apply; in NS, businesses must meet the standards under the NS Fresh Fruit & Vegetable Regulations, and wherever there is a discrepancy, the provincial regulations overrule federal, for product sold within the province.

The Safe Food for Canadian Act (SFCA) became law in 2012 and fully came into force in January 2019 when the Safe Food for Canadian Regulations (SFCR) were adopted. Compliance with the SFCA and the SFCR was phased in over a two-year period with 2021 being the deadline for full implementation. The SFCR consolidated 14 sets of regulations into one, with the intent of simplifying the process through a focus on prevention and traceability. The SFCR are aligned with internationally recognized standards, such as CODEX Alimentarius, for food safety and consumer protection requirements. In Canada responsibility for all health & safety standards under the Food & Drug Regulations as well as non-health & safety regulations concerning food packaging, health and advertising is enforced by Canadian

Food Inspection Agency (CFIA). Regulations for food labeling is shared between Health Canada under Food & Drugs Act and CFIA – Food & Drug Regulations/FDA, SFCA and SFCR.

Three fundamental elements are of particular interest in the SFCR for a model facility for cleaning/packing fresh wild blueberries:

- 1. Licensing: required to grade, package and label food that is sold interprovincially or internationally. This is administered through CFIA.
- 2. Preventive controls, also known as prerequisite programs, are the measures taken to help prevent food safety hazards and reduce the likelihood of contaminated food entering the market. Prerequisites lay the foundation for the Preventive Control Plan (PCP) which is a written plan documenting how food businesses meet food safety, humane treatment and consumer protection requirements through labelling, packaging, grades, etc. Businesses that have less than \$100,000 in gross sales and do not intend to export, are exempt from the PCP requirement. However, for the purposes of this project, both facilities are assumed to exceed the gross sale exemption and to have export capability.

The steps and procedures of the PCP are documented as standard operating procedures (SOPs), and employees must be trained to effectively carry them out. Prerequisite programs deal with the following key areas: premises (building internal & external environment; personnel facilities; water), purchasing/receiving/shipping and storage, equipment, personnel, sanitation, pest control, recall & traceability, and allergens and food additives. Each aspect must be proactively implemented and managed to ensure quality, safe food products. The PCP should start with selection of the facility site - away from or protected from any potential source of contaminants, with adequate drainage, vegetation control, litter removal followed by design features during construction, such as concrete footing and screening of intakes, etc. to deter the entry of wildlife and rodents. The plan requires documenting practices and recording procedures that have been implemented. It is similar to HACCP (Hazard Analysis Critical Control Point), but the PCP goes beyond identifying the hazards and stipulates how to control them.

Perennia has developed an excellent food safety resource - Safe 4 Market, A Primary Producers, Processors and Storage Facility's Guide to Quality and Food Safety. There are now three editions - 2018/2019, 2019/20, and 2020/21 - each edition building on the previous one. The booklets outline all items that need to be considered, suggestions for implementation, and checklists to use for monitoring. They can be found on Perennia's website (www.perennia.ca) under Quality & Food Safety/Food Safety Resources. You can also obtain a hard copy of each edition by contacting Perennia (Tel: 902-678-7722; 902-896-8782). A summary factsheet on the SFCR (Perennia) as well as the respective checklists used to monitor compliance (Perennia) are included in Appendix A.

- 3. Traceability requirements include tracking food forward to the immediate customer and backward to the immediate supplier to allow easy identification and retrieval of potentially non-conforming product. Traceability is typically achieved through product labeling. All pre-packaged foods require labeling. Fresh blueberries are sold as prepackaged foods directly to consumers in their final packaging and are typically not repacked. A list of ingredients is not required on the label when no additional ingredients are added to the food product, which is the case with fresh wild blueberries. As such labels of fresh or fresh/frozen blueberries require the following information:
  - Common name of product
  - Net quantity (e.g., 5 lb.)
  - Business name and principal location
  - Grade
  - Lot code identifies the source of the berries specific to a field, as well as time of processing, grading, packaging, or labeling.

CFIA establishes the grade and grade name for blueberries as Canada No. 1. The grade requirements are outlined in Sections 27-30 inclusive (copied in Appendix A) under the CFIA Canadian Grade Compendium for Fresh Fruits and Vegetables, Volume 2. In general, to be labeled as Canada No. 1, blueberries must be fairly uniform in size, well colored, properly packaged, dry and sound, free from green berries, leaves, stems, dirt or other foreign material, apparently free from insects, insect larvae or diseases and free from any other damage or defect. The regulations do allow for a general tolerance of defects, not to exceed 3% by weight of the blueberries per lot, however the provincial regulations (NS Fresh Fruit & Vegetable Regulations) supersede federal when product is sold in NS. They stipulate an additional 5%

tolerance for condition defects in a lot as set out in Fresh Fruit and Vegetable Regulations under Canadian Agricultural Products Act for Canada No. 1 blueberries. The provincial regulations also state no more than an additional 2% above the grade standards may be decay, except at the time of shipment.

The regulations indicate that grades can only be used in connection with produce that is packed, however they do not specify package size or type for blueberries other than stating 'suitable package'. Graded product packaged in one-half bushel or more capacity, must be securely closed. The regulations also state that any package containing fruit shall not be so stained, soiled, warped, broken or otherwise damaged as to affect the shipping quality or salability of the fruit packed therein. Applying appropriate management practices along the entire value chain will reduce the probability of the berries bleeding.

In the wholesale/retail environment, national food safety certification is a requirement of most produce buyers. Some retailers have a program that they support which may vary somewhat from SFCR. CanadaGAP (Good Agricultural Practices) is an example of another globally recognized food safety program designed to help implement and maintain effective food safety procedures for businesses that produce, handle and broker fruits and vegetables. However, it does not deal with frozen products, which is an issue if the supplier freezes surplus fresh wild blueberries to be sold throughout the year. CanadaGAP is audited by a third party, and comparable in principle to SFCR except there is a void in the consumer protection items such as grading, labeling, weighing, etc.

Businesses wishing to export food products, may have to meet additional requirements depending on the country of destination. Global Food Safety Initiative (GFSI) certification program is their best option. GFSI is an industry-driven initiative established to ensure confidence in the delivery of safer food to consumers, while continuing to improve food safety throughout the supply chain. Global standards address food packaging, packaging materials, storage and distribution for primary producers, manufacturers and distributors. The most common GFSI benchmarked schemes include SQF (Safe Quality Food), BRC (British Retail Consortium), CanadaGAP, IFS Pacsecure Standard, FSSC 22000 and Global GAP. The most frequently used options in the Maritimes are CanadaGAP, SQF, and BRC. CanadaGAP applies only to fresh fruits and vegetables, while SQF and BRC applies to both fresh and frozen product. SQF standard encompasses the whole food supply chain, from primary production to ingredient manufacturing and product packaging and distribution. BRC is applicable to all food processing facilities where products are handled, processed or packed.

Other regulatory considerations in exporting wild blueberries include the following:

- Transport Information Services GDV Quarantine regulations of the country of destination must be complied with and a phytosanitary certificate may have to be enclosed with the shipping documents. It is important to obtain information from the phytosanitary authorities of the countries concerned.
- Blueberry maggot (Rhagoletis mendax Curran) is the main post-harvest pest limiting shipments of fresh blueberries. Quality control of fresh product is important to ensure no product is shipped containing maggots.
- The international standard setting body Codex Alimentarius (2017) provides a recommended code of hygienic practices for fresh fruits and vegetables to maintain quality and enable traceability very similar to the SFCR. Section 3.3 onwards specifies that wild berries are required to be cooled after harvesting to remove field heat.
- Labeling requirements will often vary according to the country of destination be sure to clarify requirements with the customer/country prior to signing any arrangements, as noncompliance means product rejection.

Although there are commonalities amongst all programs, there are also subtle differences. It is vital to clarify expectations regarding standards with the customer before developing and implementing a food safety scheme.

### V. PREPARING FRESH BERRIES FOR MARKET

Preparing fresh wild blueberries for market involves a process of sorting and cleaning, without applying water or liquids of any sort. Washing the berries reduces the product shelf-life. The distinguishing feature of the **fresh** wild blueberry is the 'natural bloom' which remains intact on the skin. This section describes the various steps involved in taking fresh wild blueberries from the field, cleaning them to remove debris and poor-quality berries, and packaging them for distribution. The primary goal is to market premium quality berries, which requires attention to every detail to avoid damaging the berry. Achieving the quality product is challenging because as previously noted, there are many characteristics of the berry, its growth habits & environment, and the season, all complicating matters and influencing success. Wild blueberries can be harvested using hand rakes, walk-behind harvesters or mechanical harvesters. Efficiency in terms of acres harvested per hour is poorest with hand held rakes, and highest with mechanical harvesters. Typically, non-mechanized equipment is used to harvest smaller volumes, and mechanical equipment for large volumes, unless a significant labour force is readily available to harvest manually. This is the strategy some growers have chosen as they bring in significant numbers of immigrant workers each year through the Temporary Foreign Worker program. Growers who use mechanical harvesters have had to modify the harvesters to reduce damage to the berries. The harvesting process needs to be gentle to minimize bruising or damaging of the berry. Harvested berries should be placed in small bins or lugs, limiting the volume/bin to avoid compression and damage. The bins should be transported to the cleaning facility as soon as possible after filling, and with a mode of transport that is gentle, minimizing jarring of the berries. Timely delivery is an issue for some operations due to the remote location of their blueberry fields and/or the disperse nature of the fields over a wide geographic area.

Upon arrival at the cleaning facility the bins are weighed and tagged for identification and traceability purposes. Tags note the date, temperature and field location. The berries should be cooled to remove the field heat, if at all possible. Section 3.3 of this report speaks to the value of removing field heat and maintaining constant temperatures to optimize/preserve product quality. The most effective, but also more expensive route, is a cooler especially designed for the berries and sized according to the volume of product to be cooled in any given day. A cheaper, but less effective alternative, is a system of floor model fans with an air funnel directing air through the bins of berries. Cooling of the berries to room temperature will reduce the damage in the cleaning process.

The bins of berries are gently poured into a funnel that places them evenly over a conveyor belt system. The first stage is a gentle air blower which removes foreign material and stems; next a tilt belt that removes clusters of berries and soft berries; then onto a grated or sizer belt, where undersized berries drop through as waste; and the final stage is an extended conveyor belt where laborers manually remove clusters of berries, damaged fruit and any remaining foreign material. The goal is to clean and sort the berries such that the product meets the



standards of Canada No. 1 Grade. At the end of the cleaning conveyor belt, the sorted berries are placed into packages, typically 5-or-10 lb. cardboard boxes. The net weight of the cleaned berries is recorded electronically to ensure correct volumes in each package but also to determine percent waste. Growers report that waste can be between 20-30% depending on the incoming product quality. Packaged berries are placed in a cooler to maintain temperature until they are ready for distribution, usually within 12- 36 hours of harvest. Most small processors use a half-ton truck with a series of small Styrofoam coolers. However, to maintain quality of any volume of berries, a refrigerated truck is preferred for product distribution to maintain the constant temperature. Fluctuating temperatures reduce the shelf life of the berries quickly as noted previously by many researchers. For berries delivered to retailers, it is recommended to engage with Produce Managers informing them of the importance of displaying berries in a cooler, to maintain the constant temperature to preserve quality. Berries that are not delivered within 24-36 hours of harvest are usually frozen, and sold throughout the year as fresh-frozen product. Slow freezing of the berries over a period of days dramatically reduces the number of cracked berries. Growers with larger volumes of berries would invest in a freezer unit, ensuring it is adequately sized and designed to freeze the berries in a timely manner, again to maintain product quality.

# VI. INFRASTRUCTURE REQUIREMENTS

One of the frustrations fresh pack businesses will experience, is the lack of one location or source that clearly stipulates the specifications for a licensed fresh blueberry cleaning/sorting facility. The SFCA and SFCR do not prescribe the exact requirements of a physical building but rather specify expectations for outcomes, in terms of food safety, preventive controls and traceability. Such an approach allows for flexibility and innovation in how a facility is constructed, with the ultimate outcome being safe food products that can be verified and traced. There are numerous food safety certification programs as discussed in Section IV, but sometimes the buyer specifies the program to be followed. For example, Loblaws supports CanadaGAP which is a globally recognized program with third party audits. This situation makes it challenging for a potential processor to determine what regulatory compliance means in terms of facility specifications. In consulting with food safety specialists at Perennia and inspectors at CFIA, the direction given was that the facility must comply with food safety standards and therefore construction features must enable compliance.

The first piece of infrastructure required for cleaning/sorting fresh blueberries is a building to house the equipment and enable the processes. The design of a 'model' fresh pack operation has to be such that it can facilitate the following activities, while ensuring the safety of the food product:

- ➤ Cleaning
- Processing

- > Packaging
- ➤ Storage
- Delivery/distribution

The facility must be designed, constructed and maintained in such a manner that the movement of persons and things within, into and out of, is controlled such that operational flows do not pose a risk of cross-contamination. Key features to be incorporated in a cleaning facility for fresh wild blueberries are discussed in this next section. Perennia's Safe 4 Market series of booklets are a valuable resource for anyone considering such a facility. The Safe 4 Market 2018/19 edition provides checklists for each aspect of the prerequisite programs. These checklists are included in Appendix A but are also available on the Perennia website (www.perennia.ca). The criteria referenced will establish a model facility that complies with all the regulations of food safety such that product can be shipped around the globe. Two model facilities are considered:

- Model #1, capacity to process 100,000 lbs.
- ➤ Model #2, capacity to process 1,000,000 lbs.

The main difference between the two models is the infrastructure investment – the building and the specialized equipment – as the capacity increases, the investment required increases. The volume of quality product that can be processed is an extraordinary limiting factor for fresh wild blueberries due to product perishability and the relatively short season when the product is available. The model facilities are sized assuming a 4-6 week harvesting period, with the processing facility operating for 4-weeks. Engineering input/expertise was not sought (or expected) for this project as the facility is not site-specific. However, it is essential that anyone considering such a facility, seek the expertise of a Professional Engineer to size and design the facility. Proper design and layout will enable efficient throughput of product, compliance with food safety in design features, and the ability to maintain premium product quality.

The building for Model #1 is presumed to be 8000 sq ft. (devised from Glenmore Farms building of 7800 sq. ft. with 3 cleaning lines), to house three cleaning lines and the necessary space for product movement to avoid cross contamination. The building for Model #2 is presumed to be 12,000 sq. ft., requiring two high volume cleaning lines, and two laser color and soft sorters to mechanically remove non-ripe/soft berries. The building virtues are common to both Models, but Model #2 is of larger scale compared to Model #1.

Considerations in site-selection, design and lay-out of the exterior and interior of the building are described below:

#### **Building** Exterior:

- Located in an area away from possible contamination sources, such as livestock operations (manure), swamps, litter, or waterways.
- Land graded away from the building to prevent pooling of water and enable good drainage.
- > Paved or graveled yard and driveway to prevent excess mud and dust.
- Features to enable pest control including concrete footing with wood frame and steel exterior siding; screened air filter, windows and air inlets; and self-closing, tight fitting, lockable doors.
- Loading bays and docks for easy loading and unloading of bulky products to carry out shipping activities. Building should have two separate loading docks located at opposing ends of the facility to avoid cross contamination; one to receive the berries from the field, and the second to load processed product for delivery.
- Concrete area (outside of building) to wash dirty bins used to deliver berries from the fields to the facility.
- ➤ Waste disposal facilities to properly deal with berry waste produced from the processing facility. Smaller operations such as Model #1 may be able to compost it on a cement pad with run-off control; Model #2 will require an extensive system to store the waste, perhaps a concrete above or below ground storage tank, or find a buyer willing to utilize the waste product. If the waste is removed from the property, the storage facility can likely be downsized to handle a few days of waste product.
- > Drilled well to provide potable water supply, with back-flow prevention.
- Sewer system for washrooms and wash water.

### Building Interior:

- Floors, walls, ceilings, windows, and doors constructed of washable, smooth, nonabsorbent material impervious to moisture. All junctions properly sealed and covered.
- All pipes, ducts and beams located away from walls/ceilings to permit cleaning accessibility.
- Adequate lighting, with protection from breakage and properly sealed to allow washing.

- ▶ Windows of shatter proof glass or protected from possible breakage.
- Concrete floors with adequate drainage to prevent pooling of water.
- > Appropriate facilities for short-term waste and garbage control.
- HVAC (heating, ventilation, air conditioning) system to enable climate control of temperature, relative humidity (RH) and air quality within the facility. For efficiency and effectiveness of the HVAC system, the building must also be insulated.
- ➤ Water heater to provide warm potable water.
- Additional space required in the building to enable the following functions:
  - Separate entrance to bring in uncleaned product from the field, and additional area to place uncleaned product waiting to be cleaned. Separation distance must be sufficient to avoid possible contamination with clean berries.
  - Area/closet to store sanitizers, cleaning supplies and non-food chemicals.
  - Insulated cold storage unit with capability to control temperature, humidity/moisture, and ventilation. Uncleaned product would need to go in the cooler upon arrival from the field to remove field heat prior to sorting; a second unit may possibly be needed to store cleaned packaged product prior to delivery. Both coolers must be sized to enable efficient cooling, depending on volume throughput. A cheaper but less effective alternative for Model #1 is a system of stand-up fans blowing air through the picking bins as they are delivered from the field, but maintaining quality product will be more difficult.
  - Separate area to store unmade packaging; separate area to hold ready-madepackaging prior to filling, and another area to hold filled packages prior to being placed in the cooler.
  - Freezer to store product that doesn't sell within 36 hours. The freezer must be appropriately sized to ensure relatively quick freezing of the product. Freezer capacity will be dependent on the typical daily volume of product that cannot be marketed as fresh and requires freezing. One also needs adequate space to enable product distribution without cross contamination; moving oldest product out first with a skid steer or pallet jack. The freezer investment is more difficult to justify for Model #1, so growers may rent commercial freezer space elsewhere. However, rental cost is not necessarily inexpensive, and growers need to consider the cost of traveling to the rental location to pick up product for delivery, on an as-need-basis throughout the winter months.

- Personnel Facilities
  - Handwashing stations in all production area entrances and throughout the production area.
  - Lunchroom and break areas for staff, separate from production area.
    - Office room for owners and inspectors.
    - Area for employees to change clothes and store personal items.
    - At least two washrooms readily accessible, maintained and equipped with potable water for hand washing.
- Equipment: all equipment must be constructed of food grade material (stainless steel), non-corrosive, non-absorbent, non-toxic, impervious, cleanable material; free of crevices, angles, etc. where food can get trapped; smooth seams; free of sharp edges, etc. The equipment must be able to withstand frequent washing and sanitizing.
  - Forklift/pallet jack to bring in pallet loads of uncleaned product and a separate pallet jack for moving cleaned product ready for shipping
  - Floor scale (4 x 4) to drive over, tracking product volumes received
  - Cleaning line which includes air blower cleaning unit, tilt belt, grader/sizer belt with set of strings with ¼ inch or smaller, and pick over table and packing line. For Model #2, the system would incorporate a laser color and soft sorter which would mechanically remove non-ripe/malformed berries as well as debris. The sorters decrease labour requirements from 6 to 8 individuals/line down to 5 to 6 per/line, reducing operating costs but increasing overhead capital investment if purchased.
  - Packaging/filler with automatic weigh scale
  - Lot coding machine for traceability
  - High pressure washer for frequent cleaning of equipment and the facility
  - Miscellaneous pieces for ease of mobility:
    - Aluminum steps (4 ft) to access dumping line
    - Aluminum catchers under the belt to catch waste product
    - Aluminum racks to hold constructed packaging
    - Aluminum racks to hold cleaned, packaged product
    - Large plastic buckets for waste removal

#### 6.1 Costs

The cost of producing and harvesting a pound of blueberries varies greatly between growers and from one field to another, depending on a number of variables: the management program, yield/acre, and harvesting method. Past industry references to costs of production have been stipulated as \$/lb., yet every field is different. Peter Burgess (via personal communication, Feb. 18, 2022) noted that costs are best calculated in terms of variable costs/acre. In Nova Scotia, the variable costs for growers range from \$1400 to \$1700/acre. Yields less than 2000 lbs./acre are simply not viable; yields for fresh pack enterprises should be between 3000-6000 lbs./acre with improved harvesting efficiencies at the higher volumes. As noted in Section 3.2 of this report, yields exceeding 6000 lbs./acre will present challenges in achieving quality berries. Growers need to strategically select fields for fresh pack, imploring good management practices which will cost around \$1600/acre in terms of variable inputs.

Most wild blueberry fields in NS today are able to be mechanically harvested, yet most growers selling fresh berries in smaller volumes chose to harvest manually using rakes or walk-behind harvesters. Regardless of how the berries are harvested, efforts need to be directed to managing the volumes harvested such that the processing lines can be continually fed. This approach will maximize efficiency of operations while maintaining berry quality.

For the purpose of this study, the costs being assessed begin after harvest, with delivery of the freshly picked blueberries from the field to the cleaning facility. The quality of the wild blueberries coming into a cleaning facility directly and immediately affect efficiency, productivity and operational profit of the facility (personal communication, T. Burgess, Jan. 25, 2021). There are numerous factors impacting the quality of fresh wild blueberries, such that a deficit in any one, triggers losses that cost money. Efficiency and profitability of an operation improves when every effort is made to minimize damage/bruising to the berries at each step of the process, from field selection through to product distribution.

#### 6.1.1. Infrastructure Costs

Infrastructure costs for both model facilities are presented in Table 1. Accompanying notes follow, explaining the basis and source of each item.

# Table 1: Infrastructure Costs

Item	Model #1	Model #2
Building	\$480,000	\$720,000
Power & Water	\$8000	\$15,000
Cleaning lines, includes	3 @ \$21,060/unit	2 @ \$105,220/unit
blower cleaning unit, tilt		
belt, grader, and pick over		
table		
Shipping, handling,	\$5000	\$15,000
installation of cleaning		
lines		
Floor scale (4 x 4)	\$4300	\$4300
Pallet jack/fork lift	2 @ \$4250/unit	\$4250/\$20,000
Walk-in cooler	\$16,000	\$50,000
Walk-in freezer	\$30,000	\$80,000
Refrigerated truck		\$120,000
Stacking totes @ \$8.50	250 = \$2125	800 = \$6800
each		
Plastic buckets (waste	\$100	\$500
disposal)		
4 ft. aluminum steps (to	\$870/unit	\$870
reach dumping line)		
Aluminum racks for	\$300/unit	\$300
holding empty 'made'		
boxes		
Aluminum racks for	\$500/unit	\$500
finished packaged product		
Rubber mats (30 x 36 @	10 = \$1200	15 = \$1800
\$120/unit)		
Pressure washer	\$1250	\$1760
Portable scale	\$365	
Wooden pallets	\$24/pallet	\$24/pallet

- > Building costs: features of the building are detailed in Section VI, Infrastructure Requirements. A model facility would include concrete footing, concrete floor, wooden stud walls and wooden trusses, steel exterior covering, and washable sealed interior covering, insulation and climate control system for heating, air conditioning and humidity. Sizing of the building is important as it must be adequate to avoid the risk of product crosscontamination. This requires separate areas, without overlap, for holding uncleaned product, market-ready product, chemicals, inputs/supplies, etc. These costs are rough estimates, extrapolated from information provided by Glenmore Farms which had a facility that met most of the specifications, except insulation and HVAC system. The Glenmore Farms building was 7800 sq. ft., built in 2004 at a cost of approximately \$29/sq. ft. Building size for Model #1 is proposed as 160 x 50 ft., providing a total of 8000 sq. ft. Costs indicated by Air Fixture on-line for installing a commercial HVAC system ran between \$17-22/sq. ft. All-inclusive costs to construct the building are estimated at \$60/sq. ft. As previously mentioned, this project provides insight into everything that must be considered for a cleaning facility without being site specific. A business considering such a project must hire a qualified Professional Engineer to provide services in design, layout and costing. Location of the facility will affect many of the costs including site preparation, sewer, drilled well, power, waste disposal, road construction, to name a few. Planning and consulting services will add to the construction costs however they will save money in the long run, if done properly.
- Model #2 building cost is presumed to be the same per sq. ft. as Model #1 but a larger building of 12,000 sq. ft. to accommodate the handling and storing of larger volumes of berries.
- Power and Water: an additional cost allocated for both models to get power and water (via drilled well) to the facility. There can be huge variability in these costs depending on location, emphasizing the need to secure quotes.
- Cleaning line:
  - Model #1, cleaning lines were priced from Maine Blueberry Equipment, using an exchange rate of \$1.28 CDN/US dollar as reported on February 4, 2022. Shipping and handling are additional, and roughly estimated. A single cleaning line occupies a 15 x 10 ft. section of the building. Capacity of a cleaning line is reported at 600 lbs./hr. by the supplier under ideal conditions, but in speaking with growers, it is closer to 150-200 lbs./hr. with 6 people on the cleaning line. Assuming operations would be 7-days/week, for a 4-week harvesting period,

operating 10 hrs./day, Model #1 would require at least 3 cleaning lines. Time is needed in between the shifts to sanitize equipment and the facility to comply with food safety guidelines.

- Model #2, cleaning line and other processing equipment was quoted by A & B Packing Equipment Inc., Michigan, USA. A proposed lay-out of such a facility is included in Appendix B. The supplier reports capacity of the cleaning line at 1000 to 4000 lbs./hr. depending on the quality of the incoming berries. The capacity of the cleaning line is greatly enhanced with the inclusion of a laser color and soft sorter, electronically removing unripe and soft berries, on each line. To process 1M lbs., 2 cleaning lines are required, with at least 5 people/line to manually remove poor quality product. The color and soft sorters are included in operational costs as it is assumed they will be leased, as opposed to purchased.
- ➢ In-floor weighing scale priced from Avery Weigh-Tronix, Dartmouth, NS. A 4 x 4 electronic floor scale to be driven over with a forklift, steel top with stainless steel weigh bars, to trace in-coming product. The unique weigh bar sealing prevents air, gas and moisture from infiltrating gauge and wiring areas. It is suited for food and beverage and legal trade weighing, required for business transactions where goods are bought or sold by weight. It also has washdown certification and NSF (National Sanitation Foundation) approved sanitary design.
- Electric powered pallet jack to move pallets of uncleaned product from the loading dock to the cleaning line for Model #1, and market-ready product from the cleaning line to the cooler/freezer for both models. Priced by Global Industrial, 300 lb. capacity with 2-12 volt/65AH battery. For Model #2, shear plant capacity would likely require a forklift for incoming product. Minimum pricing was retrieved from Liftow Limited, Dartmouth, NS for a standard capacity machine.
- Walk-in cooler to remove field heat from uncleaned product as it is received from the field. Priced on-line from Webstaurant Store (8' x 12' x 7.7') with aluminum floor and top mounted refrigeration for Model #1. Ideally the cooler is large enough that unclean product and market-ready product can be separated, otherwise two separate coolers are required. Pricing for Model #2 is assumed to be three times that of Model #1 as capacity would need to be higher considering throughput, however effort needs to be directed to size the cooler according to volume of production.
- ➤ Walk-in freezer: Freezer size estimated for Model #1 is 10' x 10', providing 12,000 lb. capacity, capability of freezing 100, 10-lb. boxes in 24-hours; freezer size for Model #2 to

accommodate 120,000 lbs. of frozen product is assumed 50' x 50'. The larger issue with the freezer is the compressor capacity as it needs to freeze the berries fast enough to avoid spoilage and slow enough to avoid cracking of the skin. Price for Model #1 was retrieved from Glenmore Farms purchased 5 years ago; Price for Model #2 was retrieved on-line from iFoodequipment.ca.

- Model #2, processing 1 million lbs. annually, includes the purchase of a refrigerated vehicle to deliver berries twice per day during the 4-week harvest season and bi-weekly/monthly during the remainder of the year.
- Miscellaneous equipment to enable efficient & effective operations:
  - Plastic stacking totes (Yellow #3; 23.6" x 15.7" x 7") for berry delivery from the field to the facility; plastic buckets for waste collection, both priced by Ropak Canada Inc, Springhill, NS.
  - 4 ft. aluminum step ladders, priced by Global Industrial. 2-step, 24" width aluminum tilt and roll ladders, serrated grating.
  - Aluminum racks with castor wheels to hold made boxes, and
  - Aluminum racks with castors to hold/move finished product, priced by Acadian Machine Works, Tignish, PEI.
  - Rubber floor mats for staff comfort at the cleaning/sorting belt; priced through American Floor Mats approved for food grade/processing.
  - Pressure washer, 3000 PSI for Model #1; 4200 PSI for Model #2. Priced through Global Industrial.
  - Portable scale for Model #1, to weigh filled boxes at end of cleaning line; Koltech KPC 1500 SS, digital portion control scale, 11 lb. capacity; priced on-line at iFoodequipment.ca.
  - Wooden pallets priced from Scotia Pallets Limited, Goshen, NS. Certified for export to other countries as defined by CFIA.
  - Small allowance for other miscellaneous items of \$1000 for both models.

### 6.1.2. Operational Costs

Operational costs were determined using various sources: actual costs provided by Glenmore Farms averaging three-years of operations; quotes for supplies and inputs secured from various industry suppliers; and quotes from suppliers of leased equipment. Operational costs are indicated in Table 2, with accompanying notes below.

- Labour: is the largest single expense especially for Model #1 because it requires 5-6 people per cleaning line, plus one administrator. Labour is paid at a rate of \$17/hr. as this is what is required to get people who are committed to work long hours for a very short employment term of 4-6 weeks. Labour cost for the cleaning/sorting facility as reported by Glenmore Farms was \$0.74/lb. This did not include labour for administration, supervision, or product delivery. If the berries were extremely clean and of excellent quality, this cost could decrease to \$0.68/lb., but achieving that level of quality for the entire crop is not typical (personal communication, T. Burgess, Jan. 26, 2021). Labour costs for Model #2 will be significantly less with increased throughput and the mechanization of the color/soft sorter, reducing labour needs to around 5 people/line. Employer payroll deductions calculated at 7% are also included in labour costs.
- Packaging: Fully compostable, EnviroShield, plant-based wax alternative coating, 5 and 10 lb. boxes quoted by Maritime Paper Products, in minimum quantities of 2500. Master boxes, priced by Maritime Paper Products: required if shipping to wholesalers, holding 10 or more of the 5 & 10 lb. boxes; typically, 10% of the cost of the boxes containing the berries.
- Utilities: includes electricity to run the lights, HVAC, cooler during harvest season and the freezer for the year to hold inventory. Costs for electrical during the off-season include the lights and freezer and is estimated at \$150-200 per month for Model #1. When the cleaning facility is operational as well as the cooler, costs double per month to approximately \$400. Model #2 costs will increase according to the capacity of the freezer and cooler, but are projected to be five times that of Model #1.
- Fuel (excluding delivery): allowance for fuel needed for operating the forklift or for a tractor to clear waste product.
- Marketing/advertising: will certainly vary depending on marketing strategies, but a base amount is indicated, with a much larger budget for Model #2.
- Administration: includes items such as office expenses, professional fees for accounting and legal, telephone, interest & bank charges, etc. A nominal amount is included for both models.
- Equipment and Building Repair & Maintenance again a base amount is allotted, but actual cost will depend on the facility. As both these facilities are costed as 'model' facilities it is assumed the repair and maintenance will be minimal, at least in the early years. However, with the HVAC system, annual tune-up costs alone can run between \$50-\$200.

- Supplies: includes items such as hair nets, gloves, PPE, aprons, cleaning supplies, food grade sanitizing solution, soap, paper towel, toilet paper, etc. The cleaning lines need to be cleaned on a regular basis to maintain food safety standards; frequency depending on the cleanliness of the incoming product. Food grade sanitizer is required to comply with food safety standards as there is no washing of the berries. The entire facility should be pressured washed following every 8 to 10-hour shift.
- Communications: includes a general amount for internet, cell phones, etc.
- ➤ Leasing/rental
  - Vehicle rental for distribution: to maintain product quality, the preferred route is a refrigerated vehicle to avoid temperature fluctuations of the berries. Model #1 considers the rental of two cube vans for direct delivery during the season estimated at \$1000/week plus fuel costs, with estimated travel distances for delivery to customer. Model #2 assumes larger volumes to be delivered at one time, allowing costs for renting two delivery vehicles in addition to the one purchased refrigerated vehicle. Fuel costs are included based on a projected distance to market. It is difficult to warrant the purchase of a refrigerated vehicle if the season only extends to 8 weeks, however, with fresh/frozen product, a vehicle with a freezer unit would be needed to transport the product throughout the year. Licensing and insurance costs also included for the owned vehicle.
  - Color/soft sorter: Quotes to lease the color and soft sorter were provided by Wulftec International Inc., via A & B Packaging Equipment Inc. Conversion rate of \$1.28 Cdn/US dollar as reported on Feb. 4, 2022 was used.
- Licensing/audit costs: NSF (National Sanitation Foundation) international services in Canada indicate a 4-year audit cycle costs \$600/year plus costs for audit, auditor, travel expenses, etc. Fees for auditing are dependent on the tasks performed: grading minimum of \$70.89 or \$17.72/quarter hour; monitoring produce quality, packaging and labeling fee of \$70.89/hr. or \$0.62/100 kilograms of monitored produce; compliance assistance \$17.72/quarter hour with minimum fee of \$70.89 (CFIA website). License fee for SFC is \$260.61 for 2021.
- Property insurance estimated based on value of the building and its contents.
- Property taxes, again estimated based on building value as commercial.

Item	Model #1	Model #2
Labour	\$0.68 to 0.74/lb.	\$0.25/lb.
Packaging (boxes) -5 lb.	\$1.37/unit	\$1.37/unit
Packaging (boxes) -10 lb.	\$1.77/unit	\$1.77/unit
Utilities	\$3700	\$15,000
Marketing/Advertising	\$2000	\$10,000
Administration	\$2000	\$4000
Fuel (excluding delivery)	\$500	\$5000
Equipment R & M	\$600	\$4500
Building R & M	\$2000	\$5000
Supplies	\$2000	\$7000
Communications	\$1000	\$2000
Rental of refrigerated	\$800/week	\$1000/week
vehicle for distribution		
Leasing		
$\blacktriangleright$ color sorter		\$28,085/unit
$\blacktriangleright$ soft sorter		\$19,150/unit
Licensing/auditing fees	\$1500	\$5000
Building insurance	\$3000	\$6000
Property taxes	\$1500	\$5000

### Table 2: Operational Costs

### 6.1.3. Product Pricing

The price of the incoming berries is stated as \$0.602/lb. This price is based on the 10-year average market price of \$0.552/lb. received by growers for IQF berries as reported by WBPANS, plus a \$0.05/lb. inconvenience bonus for dealing with the idiosyncrasies of the fresh berry.

Product prices for the fresh processed berries varies depending on whether they are sold direct to the consumer or wholesale. Direct sale prices reported by growers (Thyagrissen, 2020) varied from \$15-20/5 lbs., therefore an average of \$17.50 is used in the report for 5 lb. boxes; double that for 10 lb. boxes. Wholesalers typically take up to 40% of the selling price (Chapman, 2021), therefore the wholesale price is reduced to \$12.50/5 lb. box; \$25.00/10 lb.

box. Past practices of growers have been that they sell fresh-frozen product for the same prices as the fresh product.

The other important factor influencing income generating potential of such a facility is the percent of product that can be sold direct versus wholesale. With approximately a 40% difference in pricing, it heavily influences profitability. The short-season and the quick product perishability, restrict options. The smaller Maritime population and the perishability of the fresh product, limits the percent of fresh product that can be direct marketed within a short distance. According to Peter Chapman (personal communication, Mar. 9, 2022), wholesale volumes in Nova Scotia are limited to 40,000 to 50,000 lbs./week. Processing facilities handling larger volumes typically have to sell more product wholesale. For the purposes of this study, the percent of wholesale-direct sales for Model #1 is 60-40; Model #2 is 97-3.

### VII. MARKETS

The other facet that is difficult to measure when assessing feasibility, is the necessity to have a market for the product. A market for the berries cannot be assumed to be evident; it needs to be secured and maintained. Marketing will require initial and ongoing effort, with no guarantees. Realistically this should be the first aspect of a business plan to be explored – where are the market opportunities; who will buy your berries? The market for the fresh product is a very narrow window (4 to 6 weeks max), depending on location and weather conditions. For this reason, many growers freeze the fresh product to extend the season and provide product year-round to their customers. However, freezing the fresh product and holding it in storage, costs additional money. Additional investment is required for freezing capability and added operational costs are incurred in utilities, maintenance, product delivery and labour. These added costs should translate into a higher price for the fresh-frozen product compared to the fresh product, but such is not the usual practice in the market place. Model #1 with production of less than 100,000 lbs. can target smaller markets that are direct to consumers, while Model #2 will have to expand into wholesale markets to move the volume produced in a short-time frame.

The feasibility of cleaning/sorting wild blueberries for the fresh market is dependent on infrastructure costs as well as operational costs. Economies of scale indicate that increasing the volume throughput can decrease the cost per unit, especially overhead costs. However, feasibility can also improve if a higher price could be attained for the product, as is the case when viewed as a specialty product as opposed to a commodity. Selling wild blueberries in 10 and 5-pound boxes, sends the 'commodity' message. It takes significant investment and effort

to produce that pound of fresh berries and it is only available 4 weeks of the year in very limited areas of the world. There are many factors that influence the quality of the product from field to table; all the more reason why a premium quality product should be priced accordingly. Capturing the uniqueness of the fresh wild blueberry is where the focus needs to be directed in order to capture a unique price. Information presented by Peter Chapman (Perennia podcast, Oct. 2021), emphasizes the need to tell customers of the benefit of wild blueberries, differentiate them from other berries, and educate consumers on how to use them. Wild blueberries can be incorporated easily as a snack, into a meal or in a smoothie, with very little effort. You want consumers to be looking for them other times of the year, not just those four weeks. Consumers prefer fresh compared to processed, so that should be emphasized in advertising initiatives as well.

Packaging of fresh wild blueberries is another big challenge; functionality in the store and for the consumer is important, and there are a number of concerns with wild blueberries: they should not spill easily; shelf life in a retail environment is not ideal as they are usually placed in a non-refrigerated stand; premium quality with cooling will extend the shelf life, maintaining flavor and appearance for longer periods; is todays' consumer looking for the large box – smaller options for eating fresh blueberries, rather than for baking; as price increases shift to smaller sizes, two sizes will broaden the reach with individual versus family (Chapman, Perennia podcast, Oct. 2021)

# VIII. MANAGING THE RISKS

Investing in a cleaning/sorting facility for fresh wild blueberries doesn't come without risk. There are many features of the fresh wild blueberry itself that present challenges in maintaining a quality product from the field to consumption. The growth habits of the wild blueberry - low lying bush, natural, rough terrain, remote location – means a harvested bin of berries includes leaves, twigs, stones, and possibly even items like bird droppings or bear dung. The fresh product is not washed and yet with the wild growing habitat of the plant, food safety protocols must be a priority to avoid contamination with bacteria such as E. Coli.

With wild blueberries being a one-pass crop for harvesting - unripe, immature berries are harvested with ripe berries. Growers with processing facilities report 20 - 30% waste berries when the crop is cleaned/sorted for the fresh market. The berry is a thin-skinned, delicate fruit, more so than highbush blueberries, making it more susceptible to damage. Harvesting in cooler conditions when the berries are dry, also increases the probability of maintaining quality. Removing the field heat from the berries was discussed earlier in the report, and

research has shown maintaining the constant temperature stabilizes the quality. Utilizing technology such as laser color and soft sorters eliminates handling of the berries, minimizing the impact on quality. Taking every precaution, at every step of the process from harvesting, to handling, processing, and to distribution, to minimize damage will result in a superior quality product, maximizing product shelf-life.

The short harvest season of the wild blueberry is problematic in justifying a substantial investment in overhead. Larger growers who have made the investment, tend to spread the risk by using the facilities for other crops throughout the year. Having all the equipment and the facilities sitting idle for 10-11 months of the year simply doesn't make economic sense. The value of the crop cannot justify this practice. Establishing a central cleaning/sorting facility for the province is another idea that has been suggested, however there are a number of factors that make this option very challenging. The delicate nature of the berry, remote location of the fields, and the fact that the season is still only 4-6 weeks long, means it is very difficult to process huge volumes and maintain the berry quality. In addition, a cooperative model requires careful consideration of those who are involved as there needs to be like-mindedness amongst the players, as incoming product quality is a key ingredient to efficient operations.

The other consideration that must be evaluated with facilities such as Model #2 where the volumes processed exceed 1 million lbs. is that, they need to sell the greater percentage of product in the wholesale market. The wholesale markets are competitive, in that they typically set the price and the standards that are to be met. Wholesalers tend not to make long-term commitments, enabling them to negotiate for the best deal. This adds risk when making long-term investments in infrastructure to process a product for which there is no market certainty.

As in any business, and especially in agriculture, there are risks. Managing the risks is an essential business management practice to improving the probability of success. Presenting a quality product is the number one goal of any business. Awareness of all the critical points where quality can be impacted is the first step in managing the risks.

There will continue to be further challenges into the future for wild blueberries and all agricultural operations. Climate change is and will continue to impact the quality of the fruit. Nova Agri (personal communication, Oct. 14, 2021) reported leaving 50% of the crop in the field because the air temperature during the 2021 harvest season was too hot with high humidity. The desired quality could not be achieved under those environmental conditions and so decisions were made to leave the crop unharvested. This is costly, but another affect

of changing climate. Nova Agri is now looking for new varieties to plant that can withstand the heat and humidity. Growers of wild blueberries don't have this option as the crop grows naturally, however it may mean reduced yields as the weaker cultivars die off and the more resilient ones thrive. Manual labour is becoming more and more difficult to secure and as a result, businesses are looking to more automation. Specialized automated equipment is expensive, making investment justifiable only when with large quantities of throughput and/or a high-valued product for output.

# IX. FEASIBILITY OF INVESTMENT

The purpose of this project was to consider return on investment (ROI) of establishing a 'model' cleaning facility for fresh wild blueberries, selling direct to the consumer and/or to wholesalers. ROI is calculated by determining the net income generated from a facility over the total cost of investment. Sales are determined for Model #1 processing 126,000 lbs. of berries, selling 60% of the product in the wholesale market and 40% direct. Model #2 considers processing 1,008,000 lbs., selling 97% wholesale and 3% direct. The shrinkage for both Models is a calculated at 25%

An Excel template was developed as part of this project to be used as a resource for anyone considering investing in such a facility. It provides two examples, Model #1 and Model #2 with the costs as indicated in this report. Readers are cautioned that indicated figures for the 'model' facilities are estimates, and costs will vary for both capital investment and operations depending on the site and their particular situation. The examples are provided simply as that – hypothetical examples that present all costs to be considered in terms of infrastructure and operations, and potential return, assuming a market with established pricing.

Financing for both Model's is assumed to be done using a mortgage for all the infrastructure. A minimum of 10% is indicated as a down-payment, but the amount required will depend on the financial position of the borrower as well as the lenders' requirements. The balance of the investment is assumed to be financed at 5.5% interest, amortized over 20 years. The refrigerated truck purchased for Model #2, is assumed to be financed through a short-term loan (5-years) at 5.0% interest.

Under the assumptions presented in this report, Model #1 requires a capital investment of approximately \$632,000. It generates a negative net income of (\$43,610), and therefore (6.90%) ROI. Model #2 requires a capital investment of approximately \$1,302,000, generates \$516,177 of net income, resulting in an ROI of 39.7%.

A business considering entering into the fresh market can use the template to calculate their own costs. Securing accurate quotes based on building design and location, and realistic operational costs are of utmost importance in the planning stages. The more effort invested at this stage, the more accurate the outcome with fewer unexpected costs and/or cost overruns. Enter your own numbers in the green cells on the template; white cells are calculated based on the inputted numbers.

Another approach in assessing the investment for such a business opportunity is to consider break-even, that is, weigh the cost of investing in the new business against the unit sell price or production volume, to determine the point at which you will break-even. In other words, it reveals the point at which you have sold enough units to cover all your costs. Break-even point based on units is calculated as Fixed Costs/Contribution Margin (per unit). Based on the data used in the two examples for this project the breakeven point for Model #1 is 218,402 lbs.; Model #2 breakeven is 212, 453 lbs. Break-even point can also be expressed in terms of price/unit required to cover all costs. Based on the assumptions considered in each model, the break-even price for Model #1 is \$3.35/lb.; Model #2 is \$1.85/lb. Further analysis was conducted on each model considering several 'what if' scenarios: effect of field price on net income and ROI; effect of field price and shrinkage on net income and ROI. Model #1 with the assumptions used in this project is still not feasible when shrinkage is reduced to 20% or field prices reduced to \$0.40/lb. Model #2, under the assumptions used in this project, still shows feasibility, although significantly reduced ROI and net income, when product shrinkage is at 40% and field price is at \$0.80/lb.

A summary page of the data considered and the outcome for each Model follows on the next two pages. Details of all the numbers and the calculations utilized to assess feasibility are included in Appendix C for Model #1 and Appendix D for Model #2. The Excel template for growers to consider their own numbers is available through WBPANS.

	Project Summar	У				
Model #1 - ~ 100,000 lbs						
	Operatio	าร				
Markating Mix	W/bolosalo		60%			
	Direct		00/0			
	Direct		40%			
						<b>.</b>
			<u>Sales</u>			<u>\$/lb</u>
Production	Lbs Processed		126,000			
	Lbs Marketed		94,500			
Total Sales		\$	273,105		\$	2.89
			Expenses			
Cost of Goods Sold		\$	75 600		\$	0.80
Labour		¢	101 982		¢	1 08
Operating Expanses (evaluding lab		φ	101,302		Ψ	0.00
Operating Expenses (excluding labo	Sur)	<b>Þ</b>	62,262		<b>Þ</b>	0.66
Overhead (Administration & Fixed C	Costs)	\$	76,872		\$	0.81
Total Costs		\$	316,715		\$	3.35
Net Income (Before Tax)			-\$43,610		-\$	0.46
	Invectment					
Duildin a	investment	•	504.000		•	5.05
Building		\$	534,000		\$	5.65
Equipment		\$	79,280		\$	0.84
Handling and Delivery		\$	18,700		\$	0.20
Total Investment		\$	631,980		\$	6.69
RETUR	N ON INVESTMENT (RO		CULATOR			
		.,		_		
Net Income Method					Vour	Rusines
					TOUI	Dusines
Original Investment					\$	631,980
Net Income Before Taxes					-	\$43,610
ROI						-6.90%
	Break Even					
Contribution Margin (Sales - Opera	ting Expenses)			\$		33 262
Blended Drice / Ib				\$		2.80
Contribution Margin / lb				¢		0.35
Overhead				¢		76.970
Draduction Needed to Dradu 5				Ф Пала	-	10,012
Production Needed to Break Even				201	2	18,402
Price Needed to Break Even				\$		3.35

	Project Sum	nmary				
Model 2 - ~1 Million lbs.						
	Operatio	ns				
	•					
Marketing Mix	Wholesale		97%			
	Direct		3%			
	Direct		0 /0			
			Sales			\$/lb
Production	I bs Processed		1 008 000			
Troduction	Lbs Hocksted		750 000			
Total Salas		¢	7 30,000		•	0.50
Total Sales		Þ	1,912,113		Þ	2.53
			_			
		•	Expenses			
Cost of Goods Sold		\$	604,800		\$	0.80
Labour		\$	111,869		\$	0.15
Operating Expenses (excluding lab	our)	\$	477,512		\$	0.63
Overhead (Administration & Fixed (	Costs)	\$	201,755		\$	0.27
Total Costs		\$	1,395,936		\$	1.85
Net Income (Before Tax)			\$516,177		\$	0.68
	Investme	ent				
Building		\$	865,000		\$	1.14
Equipment		\$	243,000		\$	0.32
Handling and Delivery		\$	193,730		\$	0.26
Total Investment		\$	1 301 730		\$	1 72
		•	1,001,700		•	
RI	TURN ON INVESTMENT					
			ALCOLATON			
Net Income Method					Your B	usiness
					TOULD	usine 33
Original Investment					Ċ.	1 201 720
Net Income Defere Texes					Þ	1,301,730
Net income Before Taxes						\$010,177
KUI						39.60%
	Break Ev	en				
Contribution Margin (Sales - Operation	ting Expenses)			\$		717,932
Blended Price / Ib				\$		2.53
Contribution Margin / Ib				\$		0.95
Overhead				\$		201,755
Production Needed to Break Even				lbs		212,453
Price Needed to Break Even				\$		1.85

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# **APPENDIX** A

(Regulatory)

The Safe Food for Canadians Regulations Factsheet (Perennia)

Checklists extracted from Safe 4 Market (2018/19 Edition): A Quality and Food Safety Guide for Primary Producers, Processors, and Storage Facilities Part II. (Perennia)

Grade Requirements for Blueberries (CFIA)



#### The Safe Food for Canadians Regulations

The Safe Food for Canadians Act (SFCA) and the Safe Food for Canadian Regulations (SFCR) were developed to strengthen and consolidate the following acts: Canada Agricultural Products Act; Fish Inspection Act; Meat Inspection Act; and Consumer Packaging and Labelling Act as it relates to food. The goal of the SFCA and SFCR is to provide one set of regulations for all food businesses in Canada and to make Canada's food supply safer by focusing on prevention and traceability. The SFCA and SFCR outline requirements for:

- SFC licences
- Preventive controls
- Preventive control plans
- Traceability

Please note that the SFCR are federal regulations and businesses must also meet the provincial **Nova Scotia Fresh Fruit and Vegetable Regulations**<sup>1</sup>.

Which SFCR requirements you need to meet depends on a couple of factors:

- What activity you conduct (e.g. grow, harvest, pack, process, etc.)
- Where you sell the product
  - Within the province of Nova Scotia (intraprovincial trade)
  - Outside the province of Nova Scotia but within Canada (interprovincial trade)
  - Outside of Canada (export)
- Size of business (i.e. gross annual food sales)

#### How to Get Started

 The first step is to determine which requirements you need to meet by reviewing the Fresh Fruit or Vegetables (FF&V) Timelines and the Fresh Fruit and Vegetable (FF&V) Specific Requirements. Determine which activities you conduct in the first column and move across the row to determine which requirements you need to meet.

E.g. If you grow or harvest fresh fruit or vegetables for interprovincial trade you do not require a licence; you may require a preventive control plan (PCP) as of January 15, 2020, depending on gross annual food sales (required if sales are greater than \$100,000), and you do require preventive controls and traceability as of January 15, 2020.

2. Secondly, you will need to learn what these requirements mean:

#### SFC Licence

Some food businesses will require a licence to conduct their activities. Licences help CFIA better identify food safety risks, communicate important food safety information, and take enforcement actions. Determine if you need a licence by using the FF&V timeline or **CFIA's Licensing Interactive Tool.** 

- Typical activities that require a licence include processing, treating or preserving FF&V for export or interprovincial trade, packaging and labelling FF&V in a field for export or interprovincial

<sup>1</sup> Bold text correspond to links on attached resource sheet



trade where the FF&V will not be further processed at a licenced facility, or packaging and labelling in a facility for export or interprovincial trade.

 You will not require a licence for activities such as growing, harvesting, applying agricultural chemicals and pesticides, culling and sorting, fumigating, curing, washing with an antimicrobial agent, cooling during harvest, rinsing to remove organic matter, or trimming to remove inedible parts.

#### Preventive Controls

**Preventive controls**, also known as prerequisite programs, are the steps or measures taken to prevent, reduce or eliminate food safety hazards related to the environment and operation. Examples include good agricultural practices you may already have in place such as sanitation, employee hygiene, pest control, and preventative maintenance.

#### Preventive Control Plan (PCP)

A **preventive control plan**, similar to a HACCP plan, is a written document prepared, kept, maintained and implemented by a food business. The difference between a HACCP plan and a preventive control plan is a PCP describes how food hazards are controlled and how to meet the requirements for the humane treatment of food animals during slaughter activities and the requirements for consumer protection and market fairness (e.g. labelling, packaging, and grading).

#### **Traceability**

**Traceability** means being able to trace the product one step backwards (supplier) and one step forward (consumer) to allow easy identification and retrieval of potentially non-conforming product.

Lot code refers to a code that can be used to identify a lot that was manufactured, prepared, produced, stored, graded, packaged or labelled, under the same conditions. A lot code can be numeric, alphabetic or alphanumeric.

Examples:

- Production date
- Best before date
- Establishment number
- SFC licence number
- Fresh fruits or vegetables may also use a harvest date, grower identification number, GPS coordinates, growing region such as province but not country
- Any other code that may be used for traceability purposes
- **3.** Once you become familiar with the requirements, conduct a self-assessment using the **SFCR self-assessment template** to identify which requirements you do not meet and begin working on them.

#### Labelling Requirements: Consumer Prepackaged vs. Prepackaged

Consumer prepackaged foods are sold solely to consumers in their final packaging and are not repacked. All consumer prepackaging must have these **labelling requirements**:



- Common name of product (e.g. Blueberries, Frozen Blueberries)
- Net quantity (e.g. 150 g)
- Name and principal place of business (e.g. XYZ Farm, 123 Blueberry Lane, NS)
- List of ingredients (only if multi-ingredient; single ingredient are exempt)
- Grade
- Lot Code (e.g. JUN 14, F1 Harvest date of June 14, 2020, from Field 1)

Prepackaged foods are sold to an organization for further manufacturing or food service and can be repackaged. This includes foods packaged in shipping or other bulk containers that are sold only at levels of trade other than retail. This includes shipping containers and master containers. Prepackaged foods have the same labelling requirements as consumer prepackaged but the type height/legibility may vary.

#### CanadaGAP (Good Agricultural Practices)

CanadaGAP is a food safety program for companies that produce, handle and broker fruits and vegetables. It is designed to help implement and maintain effective food safety procedures within fresh produce operations. If you have CanadaGAP implemented, you meet 99.5% of the Safe Food for Canadians Regulations. You will need to meet consumer protection requirements such as, grading, labelling, weighing, etc. to be 100% compliant.

For an **overview of CanadaGAP** and how to begin the certification process, visit their website. There are **manuals** and additional **resource tools** available for free download on their website and can be a valuable resource when you are not ready to be certified but want to implement good agricultural practices at your farm.

#### How Can Perennia Help?

Perennia has a variety of **quality and food safety resources** on our website including fact sheets, links to helpful resources, and the Safe4Market booklet 'A Quality and Food Safety Guide for Primary Producers, Processors, and Storage Facilities'.

We also have the **Agri-Food Accelerator Program** which can provide funding to assist clients with the development and implementation of food safety programs (i.e. PCP, CanadaGAP).

If you have any questions, please contact one of our Quality and Food Safety Specialists.

199 Dr Bernie MacDonald Drive Bible Hill, Nova Scotia B6L 2H5 Phone: 902-896-0277 Fax: 902-896-7299 Email: info@perennia.ca

PREMISES CHECKLIST			
EXTERNAL SURROUNDINGS AND BUILDING EXTERIOR	YES	NO	N/A
Is there a risk of contamination from neighbours?			
Are driveways paved or well-maintained to prevent excess dust and mud?			
Is all vegetation controlled and not growing against or next to the building?			
Is there pooling of water?			
Are there any old pallets, equipment or litter against the building?			
Is the building exterior maintained in good repair (e.g. no holes or cracks in walls, foundation and roof, windows/air filters are screened, pipes are sealed, etc.)?			
Is access secure? Doors are self-closing, close fitting and lockable?			
Are soil amendment processes, storage and sources safe/approved?			
BUILDING INTERIOR	YES	NO	N/A
Are floors, walls, ceilings, windows and doors cleanable, constructed of appropriate materials, and maintained?			
Are wall, floor and ceiling junctions sealed and coved if possible?			
Are exposed pipes, ducts and beams located far enough away from walls/ceilings for cleaning access?			
Are stairs/catwalks constructed of the appropriate materials and do not pose a risk to products?			
Is there adequate lighting and is the lighting protected from breakage?			
Are windows made from shatterproof glass or protected from breakage?			
Is there pooling of water? Are floors sloped to allow for drainage?			
Are there appropriate facilities for garbage and waste?			
Is there adequate ventilation (e.g. any signs of condensation)?			
Are hoses hung up after use and is the nozzle kept off the floor?			

PREMISES CHECKLIST			
PERSONNEL FACILITIES	YES	NO	N/A
Are there an adequate number of handwashing stations provided?			
Do handwashing stations have an adequate supply of potable warm water, soap, paper towels, sanitizers, garbage, handwashing signs? Or if in the field, a supply of hand wipes, sanitizer, garbage and signage?			
Is there a separate lunch/break area for staff to prepare and eat food?			
ls there a separate washroom/ changing area?			
Are there an adequate number of washrooms provided?			
WATER	YES	NO	N/A
Is there an adequate supply of potable water for processing, sanitation, personnel hygiene, agricultural purpose (i.e. irrigation) and as an ingredient?			
Are water testing records maintained?			
Is there prevention of back-flow where required?			
Are water storage facilities designed, constructed and maintained to prevent contamination and tampering of water supply?			

#### PURCHASING/RECEIVING/SHIPPING, STORAGE & TRANSPORTATION CHECKLIST

	YES	NO	N/A
Are ingredients and raw materials purchased from an approved supplier/source?			
Are incoming ingredients and raw materials inspected upon receiving?			
Are the carriers inspected for cleanliness, good physical condition, temperature and any incompatible product/hazardous material upon receiving and before shipping?			
Are incoming ingredients, raw materials and product loaded and unloaded to avoid contamination and damage (e.g. using appropriate equipment, a good seal between the carrier and establishment, appropriate area)?			
Is all product to be shipped neatly stacked, securely wrapped and not placed directly on the trailer floor?			
Are raw materials, ingredients, packaging and finished product stored off the floor and away from walls?			
Are 'first in, first out' stock rotations followed?			
Are expiry dates monitored upon receipt and during storage to ensure products are used prior to expiry date?			
Are raw materials, ingredients, packaging and finished product stored at the correct temperature and is the temperature monitored?			
Are equipment and conveyances stored to avoid contamination?			
Are non-food chemicals transported, received and stored separately? Are they stored in a clean, correctly labeled container in a well-ventilated area with restricted access?			

#### PURCHASING/RECEIVING/SHIPPING, STORAGE & TRANSPORTATION CHECKLIST

	YES	NO	N/A
PRIMARY PRODUCERS			
ls produce transported in a covered vehicle from the field?			
Are agricultural chemicals stored separately from seeds, transplants, row covers, harvested and market-ready product and packaging?			
Is production site equipment stored separately from packaging, product and harvest containers?			
STORAGE FACILITIES			
Are there properly trained personnel for handling repack product?			
Are repack materials records properly maintained?			
Are holding procedures for returned or suspect product/material documented and implemented?			
Are all held items properly identified and adequately segregated?			

EQUIPMENT CHECKLIST			
	YES	NO	N/A
Is all equipment constructed, designed and installed to allow ease of inspection, cleaning and maintenance?			
Is all equipment smooth, durable, non-corrosive, non-absorbent, non-toxic, impervious, cleanable and compatible with your product type?			
Is equipment free of crevices, angles or ledges (i.e. dead spots) where food can get trapped and build up?			
Is equipment fee of rust, lead or exposed wood?			
Are there any open ends or table legs that should be sealed?			
Are seams smooth and continuous with no 'bubble gum' or spot welding?			
Is all equipment assessed for proper requirements before purchasing?			
Is all equipment verified that it is functioning as intended before use?			
Is all equipment on the preventive maintenance schedule and regularly maintained and calibrated?			

PERSONNEL CHECKLIST			
	YES	NO	N/A
Have hygiene and good manufacturing practices been documented for the facility/farm?			
Are employees trained on the facilities hygiene practices, prior to starting employment and at least annually?			
Are employees wearing clean protective clothing, hair coverings, gloves and footwear?			
Are employees following proper hygiene practices (e.g. no smoking, eating, drinking, spitting, wearing jewelry or having personal items in production area)?			
Are employees handling food properly to avoid cross- contamination (e.g. correct use of utensils and equipment)?			
Do employees have proper hand hygiene (e.g. clean, short fingernails; cuts or wounds covered with metal detectable or bright coloured coverings)?			
Are employees washing their hands frequently and at the appropriate times?			

PERSONNEL CHECKLIST			
	YES	NO	N/A
Are employees using the correct technique to wash their hands?			
Are employees using the proper supplies to wash their hands?			
Are employees in good health with no signs or symptoms of any illness/disease?			
Are employees trained on how to prevent cross-contamination (e.g. procedures for glass breakage, product that falls on the floor or is exposed to condensation, visitors and contractors during production, and vomit/bodily fluids protocol)?			
Are employees trained on and following good manufacturing practices (e.g. proper traffic flow, restricted access, etc.)?			
Are food contact and floor contact items kept separate?			
Is product packaging/harvest bins being used for their intended purpose?			

SANITATION CHECKLIST			
	YES	NO	N/A
Are sanitation procedures documented?			
Is the cleaning frequency adequately keeping the facility and equipment clean?			
Are employees trained on how to properly clean both food and non-food contact surfaces?			
Are employees cleaning at the appropriate frequency?			
Are employees using the cleaning and sanitizing chemicals as per the manufacturer's instructions, are they appropriate for a food facility?			
Is Personal Protective Equipment (PPE) provided and used?			
Are pre-operational inspections being performed and documented?			
Are sanitation activities being documented and corrective action taken when deviations occur?			
PRIMARY PRODUCERS	,		,
Pre-season and post-season cleaning occurring on all equipment?			
STORAGE FACILITIES	I		
Is equipment used in receiving and shipping (e.g. forklifts) properly maintained and cleaned?			

PEST CONTROL CHECKLIST								
	YES	NO	N/A					
If outside pest control is in place, is the person properly licenced, insured, trained and providing well documented monthly inspection reports, including bait usage?								
Are the appropriate means of pest control implemented properly and identified on a facility map, the trap and the wall?								
Are controls (e.g. traps, lights, bait stations) regularly monitored?								
Are storage areas kept clean and with all items kept off the floor and away from the wall?								
Is there evidence of pests (e.g. droppings, fur, insects [dead or alive], rodents, birds, etc.)?								
If there are catches documented, are corrective actions completed to correct the issue? Is pest control monitoring increased?								
Are pets not permitted in the facility and storages?								
PRIMARY PRODUCERS	°							
Are fields surveyed prior to harvest for bird and animal droppings?								
Are wildlife controls in place?								
Are pets kept out of the fields?								

RECALL AND TRACEABILITY CHECKLIST			
	YES	NO	N/A
Is there a documented recall plan in place, with step by step instructions of what to do in a recall situation?			
Is there a cross-functional recall team in place whose members understand their designated role and responsibilities?			
Is there complete and accurate recall team, CFIA and customer contact information?			
Are your products and all components used to produce or package your products traceable (lot-code specific)?			
Do you have your method of product traceability as well as your components (ingredients, packaging) documented? Have you tested it?			
Are the harvest/production and distribution records complete and accurate?			
Are measures in place to assess the effectiveness of your recall procedure? Has a mock recall been attempted?			
Are your product labels compliant with SFCR requirements?			
Are lot codes established, are they permanent, unable to be altered, smudged or removed easily?			
Has reworked product been accounted for in inventory?			
Have staff sales, personal use, sales samples, product sampled and sent for testing/analysis been accounted for in inventory?			

ALLERGENS AND FOOD ADDITIVE CHECKLIST								
	YES	NO	N/A					
Are incoming materials and their labels being inspected?								
Are the proper labels that reflect the current formula of your product being used?								
Are measures to avoid cross-contamination between allergen and non-allergen products documented and being followed (e.g. separate production rooms, production times, line/ equipment/utensils, storage, etc.)?								
Are obsolete materials being discarded?								
Are employees properly trained on allergen management?								
If your facility uses food additives, are they approved by Health Canada?								
If your facility uses a processing aid, can you prove that your product is safe?								
If your facility uses vitamins, minerals or amino acids, are they approved and found in Part D of the Food and Drug Regulations?								

DOCUMENT CONTROL CHECKLIST		DOCUMENT CONTROL CHECKLIST			
POLICIES/PROCEDU	RES		RECORDS		
Header/Top of Page	<ul> <li>Company Name</li> <li>Title of Document</li> <li>Date Created/Revision Date</li> <li>Supersedes Date</li> <li>Author/Approved By</li> </ul>		Header/Top of Page	<ul> <li>Company Name</li> <li>Title of Document</li> <li>Date Created/Revision Date</li> <li>Supersedes Date</li> <li>Author/Approved By</li> </ul>	
Body of Document	<ul> <li>Scope/Purpose</li> <li>Responsibility (name and/or position)</li> <li>Frequency</li> <li>Work Instructions/ Procedure/Policy (i.e. what and how, keep it simple, clear and easy to follow)</li> <li>Revisions/Changes Highlighted (for easy reference)</li> <li>Monitoring</li> <li>Verification</li> <li>Corrective Action/Deviation</li> <li>Any Supporting Documents</li> </ul>		Body of Document	<ul> <li>Specification/critical limits that need to be followed</li> <li>Brief outline of procedure (can be a checklist and/ or a brief summary of the task)</li> <li>Space to record information (keep it simple and record only information will be used)</li> <li>Corrective Action (a small space for any issues, or corrective actions taken during production)</li> <li>Monitor's signature/initials and date and time of checks</li> <li>Verifier's signature/initials and date</li> </ul>	
Bottom of Document	<ul> <li>Page Number (e.g. Page 1 of X)</li> <li>Change Log (can be in a separate document)</li> </ul>		Bottom of Document	Page Number (e.g. Page 1 of X)	

DOCUMENT CONTROL CHECKLIST							
DOCUMENT MANAGEMENT							
Ensure that policies, procedures and records are:	<ul> <li>Kept for one year plus the shelf life of the product or two years (this can be dependent on regulatory or customer requirements)</li> <li>Secure and readily accessible to authorized personnel only (electronic or hard copy)</li> <li>Core documents backed up in case of loss due to water, fire, theft, etc.</li> <li>Controlled so that only authorized personnel make updates/changes</li> <li>Outdated copies are collected and destroyed</li> <li>Records are legible and completed in ink and no liquid paper, ditto marks or scratch outs</li> <li>Records are recorded by the monitor (person doing the work) in real time and initialed and dated by the monitor</li> <li>Records are viewed in a timely manner (daily, weekly, monthly, etc. dependent on the record) and initialed and dated by the work being recorded)</li> </ul>						

https://inspection.canada.ca/about-cfia/acts-and-regulations/list-of-acts-andregulations/documents-incorporated-by-reference/canadian-grade-compendiumvolume-2/eng/1519996239002/1519996303947?chap=2#s6c2

# **Grades and Requirements for Blueberries**

# Application

**27.** The grade and the requirements set out in sections 28 and 29 apply to blueberries of varieties grown from Vaccinium angustifolium, Vaccinium corymbosium or Vaccinium myrtilloides.

# Grade and Grade Name

28. (1) The grade and grade name for blueberries is Canada No. 1.

(2) If the grade and grade name set out in subsection (1) are used, the blueberries must conform to the requirements set out in section 29.

# Canada No. 1 Grade Requirements

**29.** (1) The following definitions apply in this section.

"fairly uniform in size" means that the blueberries in any one package do not vary sufficiently in size to materially affect their general appearance. (d'une grosseur passablement uniforme)

"well coloured" means that not less than 90% of the blueberries in a lot, by weight, are of the colour characteristic of mature blueberries. (bien colorés)

(2) Subject to the general tolerances set out in section 30, blueberries graded Canada No. 1 must

- (a) be properly packaged;
- (b) be well coloured, well formed and fairly uniform in size;

- (c) be dry and sound;
- (d) be free from green berries, leaves, stems, dirt or other foreign material;
- (e) be apparently free from insects, insect larvae or disease; and
- (f) be free from any other damage or defect or combination of damage and defects that materially affects the appearance, edibility or shipping quality of the blueberries.

# **General Tolerances**

**30.** (1) In the grading of blueberries, the requirements set out in section 29 are considered to be met when not more than 3% by weight of the blueberries in a lot have defects, including

- (a) in the case of a lot of blueberries inspected at the time of shipping or repackaging, not more than
  - (i) 1% that are affected by decay, and
  - (ii) 1% of the weight of the blueberries that is attributable to foreign material; and
- (b) in the case of a lot of blueberries inspected at a time other than at the time of shipping or repackaging, not more than 1% of the weight of the blueberries that is attributable to foreign material.

(2) Condition defects apply against the grade of a lot of blueberries only when the lot is inspected at the time of shipping or repackaging.

## **APPENDIX B**

Model #2 Facility Lay-out

(A & B Packing Equipment Ltd)



# **APPENDIX C**

Data Sheets for Model #1

Es	stablishment Costs			
Model #1 - ~ 100,000 lbs				
Building		Enter \$/ft	or Total	Total
Building Size (Ft2)	8.000	\$/ft <sup>2</sup>	Total	, otai
Insulated Envelope	0,000	40		320,000
HVAC		20		160,000
Power & Water			8,000	8,000
Freezer (Walk in)			30,000	30,000
Coolers (Walk in)			16,000	16,000
Fotal Building				534,000
Processing Equipment	lf > 1,	Enter # of unit	S	
Processing	# Units	P/R	\$ / Unit	
Cleaning lines (#)	3		21,060	63,180
Shipping / installation			5,000	5,000
Soft sorter (Purchase or Rented)		R		
Color sorter(Purchase or Rented)		R	-	
Misc.			1,000	1,000
I raceability/food safety	r			
Floor scale			4,300	4,300
Pressure washer			1,250	1,250
Stacking totes	250		9	2,250
Plastic Buckets (Waste)	5		20	100
Rubber mats	10		120	1,200
Portable scale			1.000	-
MISC.			1,000	1,000
lotal Processing Equipment				79,280
Handling and Delivery		- / -	<b>A</b> / <b>I</b> I I	
Handling	# Units	P/R	\$ / Unit	
	2		4,250	8,500
FORKIIT	40		24	-
4 Et. Aluminum stone	40		24	960
Aluminum racks (nackaging)			300	1,740
Aluminum racks (product)	10		500	5 000
Auminan racks (product)	10		500	0,000
Delivery	# Units	P/R	\$ / Unit	
Farm truck/tractor				-
Refer Cube van	2	R		
Retrigerated Truck			1.000	-
MISC.			1,000	 1,000
I otal Handling and Delivery				18,700
Fotal Investment				\$ 631,980

P = Purchased

R = Rented ... Remember to include annual rental in operating costs

#### Model #1 - ~ 100,000 lbs

	Finan	<mark>cing</mark>				
Total Investment Equity Invested		\$	631,980 63,000			
Total Borrowing			568,980			
			Loan 1	Loan 2	Loan 3	Total
	Lender		Bank 1	Bank 2	Bank 3	Balance Remaining
	Principal	\$	568,980			\$ -
	Appuel Pote		E E0/	5 09/	7.09/	
	Annual Rale		5.5% 2/0	5.0%	7.0%	
	Monthly Rate	-	0.45%	0.41%	0.57%	
	Monthly Payment		3 871	-	-	3 871
	Annual payments		46.452	-	-	46.452
	Total Amount Payable		929,044	-	-	- , -
	,		,			
Yr. 1	Interest Expense		30,134	-	-	30,134
	Principal		16,318	-	-	16,318
	Depreciation / Am	mort	Ization Rate	S Deels Velue	Denresistion	
	ASSEL CIASS	<u> </u>	200/			1
	Processing	<u> </u>	30% 10%	79.280	7 928	
	Ruilding	┣──	5%	534 000	26 700	
	Total Annual Depreciation	n / A	mmortizatio	n 001,000	40,238	1
					,••	

Model #1 - ~ 100,000 lbs					
	Pro	duction Planni	ng		
Cleaning Lines	Line 1	Line 2	Line 3	Line 4	Total
Consolity (lbs/br)	150	150	150		
Hours /day	10	10	10		
Capacity (lbs/day)	1,500	1,500	1,500	0	
Operating Days /week	7	7	7		
l otal fresh processed / week (lbs)	10,500	10,500	10,500	0	31,500
# weeks Total for Processing Season (lbs)	42 000	42 000	42 000	0	126 000
	42,000	42,000	42,000	0	120,000
Shrinkage (%)	25%				
Total Saleable Product (lbs)					94,500
		abour Planning		11 4	<b>T</b> ( )
	Line 1	Line 2	Line 3	Line 4	Iotal
# Staff required / shift	6	6	6	-	
Hrs / wk.	420	420	420	0	
Max Staff hrs / day	10	10	10	1	
Total Line Labour Req. (Hrs)	1,680	1,680	1,680	0	5,040
# staff required	6	6	6	0	
Total Draduction Johaur			¢/br		Total
Total Production labour			۵/۱۱ 17		\$85,680
			17		<b>403,000</b>
Operations					
How many weeks storage?	1				
How many Drivers needed?	1				
Delivery and Comply	Days / week	\$ / Day	# weeks	)river days/wl	Total
Delivery and Supply	7	150	5	5	\$3,750 \$5,880
	1	120	,		φ3,000
Total Production and Operating Lab	our				\$95,310
Employer Portion of Benefits				7.00%	\$6,672
Total Wages and Benefits					\$101,982
	Ve	ehicle Expense	S		
		Vehicle 1	Vehicle 2	Vehicle 3	
Purchased or Rented ("P" or "R")		R	R	R	
Capacity (lbs / trip)		4,000			
Max Trips /day		2			
# Trips / wk.		10			
Delivery Capacity / wk.		40,000	0	0	Total Wookly
Volume Delivered		31,500	0	0	31.500
Volume remaining/wk.		0	0	0	01,000
C C					
Distance / delivery		200	250	250	
Lotal KM	20	10,000	0	0	
Fuel Cost $(\$/1)   \$$	1 90	\$3,800	50	\$0	
R&M (\$ / km)   \$	0.30	\$0	\$0	\$0	
Rental (\$/wk.): Enter separate rate f	or each	800			
Total Vehicle Expense / Week		\$4,600	\$0	\$0	23,000
Licence (Yearly)					0
					0
Total Vehicle Operating					\$23,000

		Operating				and the second secon
Product Cost	Volume Intake	Operating	Cost / lb			Total
	126,000		\$ 0.60		\$	75,600
Total sales Volume		Marketing Mix		(lbs)		94 500
	% Wholesale	60%		(lbs)		56,700
	% Direct	40%		(lbs)		37,800
		100%				100%
		0				
	T	Container Sizes		Total		
Lbs/Package	% of Total Market	Volume	\$/Package	Packages	Total C	Cost / Category
1	0%	-	0.95	-		-
5	75% 25%	70,875	1.37	2 363		19,420
Master Packages	2070	20,020	1.77	2,000		2,360
<u>_</u>	100%					
Materials & Packaging		(Coloulated)				25,962
Eabour Equipment Lease (Processing)		(Calculated)	\$/ Yr			101,962
	Soft Sorter		φ/ 11.			
	Color Sorter					
	Forklift		-			
Total Equipment Dental \ Lessin	Other					
Equipment Delivery Vehicle Exp	y enses	(Calculated)				- 23.000
Utilities		(Galcalated)				3,700
Fuel (Excluding Delivery)						500
Marketing						2,000
Certification / Audit						1,500
Equipment R&M						2,000
Supplies						2,000
Communications						1,000
					\$	164,243
		Overhead				
Administration		Overhead				Annual 2 000
Administration Insurance (Excluding Vehicle)		Overhead				Annual 2,000 3,000
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca	alculated)	Overhead				Annual 2,000 3,000 40,238
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes	alculated)	Overhead				Annual 2,000 3,000 40,238 1,500
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest	alculated)	Overhead				Annual 2,000 3,000 40,238 1,500 30,134 70 072
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs	alculated)	Overhead			\$	Annual 2,000 3,000 40,238 1,500 <u>30,134</u> <b>76,872</b>
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead	alculated)	Overhead			\$	Annual 2,000 3,000 40,238 1,500 30,134 <b>76,872</b> 241,115
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead	alculated)	Overhead			\$ \$	Annual 2,000 3,000 40,238 1,500 30,134 <b>76,872</b> <b>241,115</b>
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead	alculated)	Overhead Sales			\$	Annual 2,000 3,000 40,238 1,500 30,134 <b>76,872</b> <b>241,115</b>
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead	alculated) Pric	Overhead Sales	Volun Wholesale	10 Direct	\$ \$	Annual 2,000 3,000 40,238 1,500 30,134 <b>76,872</b> <b>241,115</b>
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead Size (lbs) 1	alculated) Price Wholesale \$ 2.50	Overhead Sales cing Direct \$ 4.50	Volum Wholesale	ne Direct	\$ \$ Total	Annual 2,000 3,000 40,238 1,500 30,134 <b>76,872</b> 241,115
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead Size (lbs) 1 5	alculated) Prid Wholesale \$ 2.50 \$ 12.50	Overhead Sales cing Direct \$ 4.50 \$ 17.50	Volum Wholesale - 8,505	ne Direct - 5,670	\$ \$ Total \$	Annual 2,000 3,000 40,238 1,500 30,134 <b>76,872</b> 241,115
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead Size (lbs) 1 5 10	alculated)  Price Wholesale \$ 2.50 \$ 12.50 \$ 25.00	Overhead Sales Direct \$ 4.50 \$ 17.50 \$ 34.00	Volum Wholesale - 8,505 1,418	ne Direct - 5,670 945	\$ \$ Total \$ \$	Annual 2,000 3,000 40,238 1,500 30,134 <b>76,872</b> 241,115 - - 205,538 67,568
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead Size (lbs) 1 5 10 Total Sales	alculated) Price Wholesale \$ 2.50 \$ 12.50 \$ 25.00	Overhead Sales Cing Direct \$ 4.50 \$ 17.50 \$ 34.00	Volum Wholesale - 8,505 1,418	ne Direct - 5,670 945	\$ \$ Total \$ \$ \$	Annual 2,000 3,000 40,238 1,500 30,134 <b>76,872</b> <b>241,115</b> - - 205,538 67,568 273,105
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead Size (lbs) 1 5 10 Total Sales	Alculated) Price Wholesale \$ 2.50 \$ 12.50 \$ 25.00 Cost of Coord of	Overhead Sales cing Direct \$ 4.50 \$ 17.50 \$ 34.00 Sold	Volum Wholesale - 8,505 1,418	1e Direct - 5,670 945	\$ \$ Total \$ \$ \$	Annual 2,000 3,000 40,238 1,500 30,134 <b>76,872</b> 241,115 241,115 - - - 205,538 67,568 273,105
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead Size (lbs) 1 5 10 Total Sales Less	Alculated) Price Wholesale \$ 2.50 \$ 12.50 \$ 25.00 Cost of Goods S Total Operating	Overhead Sales cing Direct \$ 4.50 \$ 17.50 \$ 34.00 Sold	Volum Wholesale - 8,505 1,418	1e Direct - 5,670 945	\$ \$ Total \$ \$ \$ \$ \$	Annual 2,000 3,000 40,238 1,500 30,134 <b>76,872</b> 241,115 241,115 - - 205,538 67,568 273,105 75,600 164 243
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead Size (lbs) 1 5 10 Total Sales Less	Alculated) Price Wholesale \$ 2.50 \$ 12.50 \$ 25.00 Cost of Goods S Total Operating Overhead	Overhead Sales cing Direct \$ 4.50 \$ 17.50 \$ 34.00 Sold	Volum Wholesale - 8,505 1,418	ne Direct - 5,670 945	\$ \$ Total \$ \$ \$ \$ \$ \$	Annual 2,000 3,000 40,238 1,500 30,134 <b>76,872</b> 241,115 241,115 - - 205,538 67,568 273,105 75,600 164,243 76,872
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead Size (lbs) 1 5 10 Total Sales Less <b>Total Expenses</b>	Alculated) Price Wholesale \$ 2.50 \$ 12.50 \$ 25.00 Cost of Goods S Total Operating Overhead	Overhead Sales bing Direct \$ 4.50 \$ 17.50 \$ 34.00 Sold	Volum Wholesale - 8,505 1,418	ne Direct - 5,670 945	\$ \$ Total \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	Annual 2,000 3,000 40,238 1,500 30,134 <b>76,872</b> <b>241,115</b> <b>241,115</b> - 205,538 67,568 273,105 75,600 164,243 76,872 316,715
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead Size (lbs) 1 5 10 Total Sales Less <b>Total Expenses</b> Net Income	Alculated) Prio Wholesale \$ 2.50 \$ 12.50 \$ 25.00 Cost of Goods S Total Operating Overhead	Overhead Sales bing Direct \$ 4.50 \$ 17.50 \$ 34.00 Sold	Volum Wholesale - 8,505 1,418	ne Direct - 5,670 945	\$ \$ Total \$ \$ \$ \$ \$ \$ \$ \$	Annual 2,000 3,000 40,238 1,500 30,134 <b>76,872</b> <b>241,115</b> <b>241,115</b> <b>241,115</b> <b>205,538</b> <b>67,568</b> <b>273,105</b> <b>75,600</b> <b>164,243</b> <b>76,872</b> <b>316,715</b> <b>(43,610)</b>
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead Size (lbs) 1 510Total SalesLessTotal ExpensesNet Income	Prio Wholesale \$ 2.50 \$ 12.50 \$ 25.00 Cost of Goods S Total Operating Overhead	Overhead Sales cing Direct \$ 4.50 \$ 17.50 \$ 34.00 Sold	Volum Wholesale - 8,505 1,418	ne Direct - 5,670 945	\$ \$ Total \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	Annual 2,000 3,000 40,238 1,500 30,134 76,872 241,115 241,115 - 205,538 67,568 273,105 75,600 164,243 76,872 316,715 (43,610)
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead Size (lbs) 1 510Total SalesLessTotal ExpensesNet Income	Price Wholesale \$ 2.50 \$ 12.50 \$ 25.00 Cost of Goods S Total Operating Overhead	Overhead Sales cing Direct \$ 4.50 \$ 17.50 \$ 34.00 Sold	Volum Wholesale - 8,505 1,418	ne Direct - 5,670 945	\$ \$ Total \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	Annual 2,000 3,000 40,238 1,500 30,134 <b>76,872</b> <b>241,115</b> <b>241,115</b> <b>241,115</b> <b>205,538</b> <b>67,568</b> <b>273,105</b> <b>75,600</b> <b>164,243</b> <b>76,872</b> <b>316,715</b> <b>(43,610)</b> 16,318 16,318
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead Size (lbs) 1 5 10 Total Sales Less Total Expenses Net Income	Alculated) Price Wholesale \$ 2.50 \$ 12.50 \$ 25.00 Cost of Goods S Total Operating Overhead Principal Repay Less Depreciati	Overhead Sales bing Direct \$ 4.50 \$ 17.50 \$ 34.00 Sold	Volum Wholesale - 8,505 1,418	ne Direct 5,670 945	\$ \$ Total \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	Annual 2,000 3,000 40,238 1,500 30,134 <b>76,872</b> <b>241,115</b> <b>241,115</b> <b>241,115</b> <b>241,115</b> <b>75,600</b> <b>164,243</b> <b>76,872</b> <b>316,715</b> <b>(43,610)</b> 16,318 40,238 <b>(19,690)</b>
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead size (lbs) 1 5 10 Total Sales Less <b>Total Expenses</b> Net Income Net Cash Position	Alculated) Price Wholesale \$ 2.50 \$ 12.50 \$ 25.00 Cost of Goods S Total Operating Overhead Principal Repay Less Depreciati	Overhead Sales bing Direct \$ 4.50 \$ 17.50 \$ 34.00 Sold	Volum Wholesale - 8,505 1,418	ne Direct 5,670 945	\$ \$ Total \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	Annual 2,000 3,000 40,238 1,500 30,134 <b>76,872</b> <b>241,115</b> <b>241,115</b> <b>241,115</b> <b>205,538</b> <b>67,568</b> <b>273,105</b> <b>75,600</b> <b>164,243</b> <b>76,872</b> <b>316,715</b> <b>(43,610)</b> 16,318 40,238 <b>(19,690)</b>
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead Size (lbs) 1 5 10 Total Sales Less <b>Total Expenses</b> Net Income Net Cash Position	Alculated) Wholesale \$ 2.50 \$ 12.50 \$ 25.00 Cost of Goods S Total Operating Overhead Principal Repay Less Depreciati	Overhead Sales Sing Direct \$ 4.50 \$ 17.50 \$ 34.00 Sold ment on	Volum Wholesale - 8,505 1,418	ne Direct - 5,670 945	\$ \$ Total \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	Annual 2,000 3,000 40,238 1,500 30,134 <b>76,872</b> <b>241,115</b> <b>241,115</b> <b>241,115</b> <b>25,538</b> <b>67,568</b> <b>273,105</b> <b>75,600</b> <b>164,243</b> <b>76,872</b> <b>316,715</b> <b>(43,610)</b> 16,318 40,238 <b>(19,690)</b>
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead Size (lbs) 1 5 10 Total Sales Less Total Expenses Net Income Net Cash Position	Alculated) Wholesale \$ 2.50 \$ 12.50 \$ 25.00 Cost of Goods S Total Operating Overhead Principal Repay Less Depreciati	Overhead Sales Direct \$ 4.50 \$ 17.50 \$ 34.00 Sold ment on	Volum Wholesale - 8,505 1,418	ne Direct 5,670 945	\$ \$ Total \$ \$ \$ \$ \$ \$ \$ \$	Annual 2,000 3,000 40,238 1,500 30,134 76,872 241,115 241,115 241,115 75,600 164,243 76,872 316,715 (43,610) 16,318 40,238 (19,690)
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead Size (Ibs) 1 5 10 Total Sales Less Total Expenses Net Income Net Cash Position	Alculated) Wholesale \$ 2.50 \$ 12.50 \$ 25.00 Cost of Goods & Total Operating Overhead Principal Repay Less Depreciati	Overhead Sales bing Direct \$ 4.50 \$ 17.50 \$ 34.00 Sold rment on	Volum Wholesale - 8,505 1,418	1e Direct - 5,670 945	\$ \$ Total \$ \$ \$ \$ \$ \$ \$	Annual 2,000 3,000 40,238 1,500 30,134 <b>76,872</b> <b>241,115</b> <b>241,115</b> <b>241,115</b> <b>241,115</b> <b>241,115</b> <b>75,600</b> <b>164,243</b> <b>76,872</b> <b>316,715</b> <b>(43,610)</b> <b>16,318</b> 40,238 <b>(19,690)</b>
Administration Insurance (Excluding Vehicle) Depreciation / Ammortization (Ca Property Taxes Interest Total Overhead Costs Operating + Overhead Size (Ibs) 1 5 10 Total Sales Less Total Expenses Net Income Net Cash Position Assumptions \ Notes	Alculated) Wholesale \$ 2.50 \$ 12.50 \$ 25.00 Cost of Goods & Total Operating Overhead Principal Repay Less Depreciati	Overhead Sales bing Direct \$ 4.50 \$ 17.50 \$ 34.00 Sold rment on	Volum Wholesale - 8,505 1,418	1e Direct - 5,670 945	\$ \$ Total \$ \$ \$ \$ \$ \$	Annual 2,000 3,000 40,238 1,500 30,134 <b>76,872</b> <b>241,115</b> <b>241,115</b> <b>205,538</b> <b>67,568</b> <b>273,105</b> <b>75,600</b> <b>164,243</b> <b>76,872</b> <b>316,715</b> <b>(43,610)</b> 16,318 40,238 <b>(19,690)</b>

# Variability Analysis

Effect of Shrinkage Variability								
Shrinkage	Sales	Expenses	Net Income	ROI				
20%	291,312	323,486	-32,174	-5.1%				
25%	273,105	316,715	-43,610	-6.9%				
30%	254,898	309,945	-55,047	-8.7%				
35%	236,691	303,174	-66,483	-10.5%				
40%	218,484	296,403	-77,919	-12.3%				

### Effect of Shrinkage Variability

#### Effect of Blueberry Field Price Variability

	Sales	Expenses	Net Income	ROI
\$ 0.40	273,105	291,515	-18,410	-2.9%
\$ 0.50	273,105	304,115	-31,010	-4.9%
\$ 0.60	273,105	316,715	-43,610	-6.9%
\$ 0.70	273,105	329,315	-56,210	-8.9%
\$ 0.80	273,105	341,915	-68,810	-10.9%

### Effect of Field Price and Shrinkage on Net Income

	0.50	0.60	0.70	0.80
25%	-31,010	-43,610	-56,210	-68,810
30%	-43,287	-55,047	-66,807	-78,567
35%	-55,563	-66,483	-77,403	-88,323
40%	-67,839	-77,919	-87,999	-98,079

#### Effect of Field Price and Shrinkage on ROI

			<u> </u>	
	0.50	0.60	0.70	0.80
25%	-5%	-7%	-9%	-11%
30%	-7%	-9%	-11%	-12%
35%	-9%	-11%	-12%	-14%
40%	-11%	-12%	-14%	-16%

# **APPENDIX D**

Data Sheets for Model #2

Fac	Facility Establishment						
Model 2 - ~1 Million lbs.							
Building		Enter \$/ft	or Total	Total			
Building Size (Ft2)	12.000	\$/ft <sup>2</sup>	Total				
Insulated Envelope	,	40		480,000			
HVAC		20		240,000			
Power & Water			15,000	15,000			
Freezer (Walk in)			80,000	80,000			
Coolers (Walk in)			50,000	50,000			
Total Building				865,000			
Processing Equipment	lf >	1. Enter # of uni	its				
Processing	# Units	P/R	\$ / Unit				
Cleaning lines (#)	2	-	105,220	210,440			
Shipping / installation			15,000	15,000			
Soft sorter (Purchase or Rented)		R	,	,			
Color sorter(Purchase or Rented)		R	-				
Misc.			1,000	1,000			
Traceability/food safety							
Floor scale			4.300	4.300			
Pressure washer			1,760	1,760			
Stacking totes	800		9	7,200			
Plastic Buckets (Waste)	25		20	500			
Rubber mats	15		120	1,800			
Portable scale				-			
Misc.			1,000	1,000			
Total Processing Equipment				243,000			
Handling and Delivery							
Handling	# Units	P/R	\$ / Unit				
Pallet Jack			4,250	4,250			
Forklift	1	Р	20,000	20,000			
Wooden pallets	1,000		24	24,000			
4Ft. Aluminum steps	4		870	3,480			
Aluminum racks (packaging)	20		300	6,000			
Aluminum racks (product)	30		500	15,000			
Deliverv	# Units	P/R	\$ / Unit				
Farm truck/tractor		. ,	<b>•</b> • • • • •	-			
Refer Cube van				-			
Refrigerated Truck	1	Р	120,000	120,000			
Misc.			1,000	1,000			
Total Handling and Delivery				193,730			
Total Investment				¢ 4 204 720			
i otai investinent				φ i,301,730			

P = Purchased

R = Rented ... Remember to include annual rental in operating costs

#### Fresh Blueberry Processing Enterprise

woder z	- ~1 Million Ibs.					
		Fi	nancing			
		•				
Total Inv	restment	\$	1,301,730			
Equity In	vested		130,000			
Total Bo	rrowing		1,171,730			
			Loan 1	Loan 2	Loan 3	Total
	Lender		Bank 1	Bank 2	Bank 3	Balance Remaining
	Principal	\$	1,051,730	\$ 120,000		\$-
	Annual Rate		5.5%	5.0%	7.0%	
	Term (Months)		240	60	36	
	Monthly Rate		0.45%	0.41%	0.57%	
	Monthly Payment		7,155	2,258	-	9,414
	Annual payments		85,864	27,101	-	112,966
	Total Amount Payable		1,717,290	135,507	-	
V= 4	Interest Evenence		55 700	5 20 4		64.096
TI. I	Interest Expense		30,702 20,162	0,004 01 717	-	51,000
	Filicipai		30,103	21,717	-	51,000
	Depreciati	on /	Ammortization I	Rates		
	Asset Class		Rate	Book Value	Depreciation	
	Handling and Delivery		30%	193,730	58,119	
	Processing		10%	243,000	24,300	
	Building		5%	865,000	43,250	
Total Annual Depreciation			Ammortization		125.669	

Model 2 - ~1 Million lbs.	-				
Cleaning Lines	F Line 1	roduction Plann	line 3	Line 4	Total
		Line z	LINE 5	LINE 4	TOTAL
Capacity (lbs/hr)	1,000	1,000			
Hours /day	20	16			
Capacity (lbs/day)	20,000	16,000	0	0	
Operating Days /week	7	7	6		
Total fresh processed / week (II	140 000	112 000	0	0	252 000
# weeks	4	4	5	Ū	202,000
Total for Processing Season (Ik	560,000	448,000	0	0	1,008,000
Obvielance (0/)	05%				
Shrinkage (%)	25%				756 000
					730,000
		Labour Planning	g		
Production	Line 1	Line 2	Line 3	Line 4	Total
# Staff required / shift	5	5			
Hrs / wk.	700	560	0	0	
Max Staff hrs / day	10	10	1	1	
Total Line Labour Reg. (Hrs)	2,800	2,240	0	0	5,040
# staff required	10	8	0	0	,
•					
Total Production labour			\$/hr		Total
			17		\$85,680
Operations					
How many weeks storage?	1				
How many Drivers needed?	3				
······································	Days / week	\$ / Day	# weeks	Driver days/wk	Total
Delivery and Supply	-	150	6	14	\$12,150
Administration / Maintenance	7	120	8		\$6,720
Total Draduction and Operating	Labour				¢404 550
Employer Portion of Benefit	te			7 00%	\$104,330 \$7 319
Total Wages and Benefits	15			7.0078	\$111.869
					<i><b></b></i>
		Vehicle Expense	S		
		Vahiala 1	Vahiala 2	Vahiala 2	
Purchased or Rented ("P" or "R	8")	P	R	R	
Capacity (lbs / trip)	. )	10,000	10,000	10,000	
Max Trips /day		2	2	2	
# Trips / wk.		10	10	7	
Delivery Capacity / wk.		100,000	100,000	70,000	
Volume available/ wk.		252,000	152,000	52,000	Total Weekly
Volume remaining/wk		152,000	52 000	52,000	252,000
volume remaining/wk.		132,000	52,000	0	
Distance / delivery		200	250	250	
Total KM		12,000	15,000	10,500	
Fuel (Litres /100 km)   Litres	20	2,400	3,000 ¢5 700	2,100	
R&M (\$ / km)   \$	0.30	\$3,600	φ5,700 <u>\$</u> 0	43,990 A	
Rental (\$/wk.): Enter separate ra	ate for each	ψ0,000	1000	1000	
(, , , , , , , , , , , , , , , , , , ,					
Total Vehicle Expense / Week		\$8,160	\$6,700	\$4,990	119,100
Licence (Yearly)		\$250			250
Insurance (Yearly)		\$2,500			2,500
Total Vehicle Operating					\$121 850
					ψι21,030

			0	perating				
	Product Cost	Volume Intake	_		Cost / Ib	-	¢	Total
		1,008,000			\$ 0.6	0	\$	604,800
				orkating Mix				
	Total sales Volume		IV	arketing wix		(lbe)	1	756 000
		% Wholesale		97%		(lbs)		733,320
		% Direct		3%		(lbs)		22.680
				100%		(		100%
			Co	ntainer Sizes	6			
	Lbs/Doskogo	% of Total Markat		Volumo	¢/Dookogo	Total Dookogoo	Total	Coat / Catagony
	LDS/Fackage			volume	5/Fackage	Total Packages	TOLAI	Cost / Category
	5	75%		567 000	1.37	113 400		155 358
	10	25%		189.000	1.77	18,900		33.453
	Master Packages			,			·	18,881
		100%						
	Materials & Packaging							207,692
	Labour		(C	alculated)	<b>*</b> 111			111,869
	Equipment Lease (Proces	sing)			\$/ Yr.	0		
		Soft Softer			38,30	0		
		Forklift			50,17	0		
		Other			-			
	Total Equipment Rental \ I	Leasing						94.470
	Equipment Delivery Vehic	le Expenses	(C	alculated)				121,850
	Utilities							15,000
	Fuel (Excluding Delivery)							5,000
	Marketing							10,000
	Certification / Audit							5,000
	Building R&M							5,000
	Supplies							4,500
	Communications							2 000
	Communications						\$	589,381
								,
			0	and the second				
			0	vernead				Appual
	Administration							4 000
	Insurance (Excluding Vehi	icle)						6,000
	Depreciation / Ammortizat	ion (Calculated)						125,669
	Property Taxes	(,						5,000
	Interest							61,086
	Total Overhead Costs						\$	201,755
	Operating + Overhead						\$	791,136
				Solos				
		Driair	าต	Sales		ime		
	Size (lbs)	Wholesale	чy	Direct	Wholesale	Direct	Total	
	1	\$ 2.50	\$	4.50	-	-	\$	-
	5	\$ 12.50	\$	17.50	109,99	8 3,402	\$	1,434,510
	10	\$ 25.00	\$	34.00	18,33	3 567	\$	477,603
	Total Sales						\$	1,912,113
	Less	Cost of Goods Sold					\$	604,800
		Total Operating					\$	589,381
		Overhead					\$	201,755
							\$	1,395,936
	Net Income							516,177
		Principal Repayment						51,880
	Not Cach Position	Less Depreciation						125,669
	NEL CASH FUSILIUN							209,907
\ssi	umptions \ Notes							

# Variabilty Analysis

Effect of Shrinkage Variability								
Shrinkage	Sales	Expenses	Net Income	ROI				
20%	2,039,587	1,450,102	589,485	45.3%				
25%	1,912,113	1,395,936	516,177	39.7%				
30%	1,784,639	1,341,769	442,869	34.0%				
35%	1,657,165	1,287,603	369,561	28.4%				
40%	1,529,690	1,233,437	296,253	22.8%				

### Effect of Shrinkage Variability

### Effect of Blueberry Field Price Variability

	Sales	Expenses	Net Income	ROI
\$ 0.40	1,912,113	1,194,336	717,777	55.1%
\$ 0.50	1,912,113	1,295,136	616,977	47.4%
\$ 0.60	1,912,113	1,395,936	516,177	39.7%
\$ 0.70	1,912,113	1,496,736	415,377	31.9%
\$ 0.80	1,912,113	1,597,536	314,577	24.2%

Effect of Field Price and Shrinkage on Net Income

	0.50	0.60	0.70	0.80
25%	616,977	516,177	415,377	314,577
30%	536,949	442,869	348,789	254,709
35%	456,921	369,561	282,201	194,841
40%	376,893	296,253	215,613	134,973

Effect of	Field	Price	and	Shrinkage	on	ROI

			0	
	0.50	0.60	0.70	0.80
25%	47%	40%	32%	24%
30%	41%	34%	27%	20%
35%	35%	28%	22%	15%
40%	29%	23%	17%	10%