

# **Pulse Fractionation**

## *A Sample Business Case for Value-Added Agriculture*

Prepared For  
Battle River Alliance for  
Economic Development (BRAED)

Prepared By  
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# 1.0 Executive Summary

This business case study for a yellow pea fractionation facility was drafted on the request of the Battle River Alliance for Economic Development (BRAED). It was not crafted as a decision-making tool for any particular client seeking to build such a plant, but rather as a general informational tool to complement the BRAED Investment Guide. The two documents were prepared as part of one project to help inform potential investors about the potential for value-added agriculture in the region. This report relies on consultation with industry, first-hand research and our own expertise.

In the operational assessment section, we describe the process of taking raw unprocessed yellow peas through to their final fractions: protein, fibre and starch. This process can be accomplished through both wet and dry fractionation, with the former having larger initial capital expenditure requirements. We then go on to describe the operation of a hypothetical dry processing facility in the BRAED region. Here we begin by breaking down the various operating cost including cost of goods sold, labour, utilities, freight, overhead and other operating costs. Then we move on to describe the capital cost components, focusing on construction costs and land purchase and preparation costs. The information provided in the operations section was then used to develop an economic model for the purpose of providing financial projections.

For the financial assessment of this business case study, we describe the critical cost assumptions adopted in the model. Yellow pea prices and pea protein prices are the two most influential variables on the model.

- Yellow peas cost \$251/MT FOB delivered to the facility
- Pea protein is sold for \$2,640/MT<sup>1</sup>
- The total tax rate used is 17.23%
- Conventional 5-year mortgage rates (5.19%) from the Bank of Canada
- Electricity rates of \$0.10/kWh
- 100% of the fractionations are sold
- Facility operates 22.5 hours per day

After laying out the critical cost assumptions we provide various financial projections to show the potential viability of the fractionation plant under different scenarios. It is important to keep in mind that these projections are based on our best estimates for the operational components of the facility (see caveat in the following section) and they should be interpreted with caution. However, under a base scenario where we have modelled 70% private equity (\$30 million) and 30% commercial loans (\$14 million), the outputs show a theoretical payback period of 4.5 years on the initial investment.

Again, these numbers will require independent confirmation before they are used for business decisions, given the broad assumptions made to arrive at them. The purpose of this business case is not to serve as a decision-making tool for any particular client, but rather as a way for investors to inform themselves about the business realities in the Battle River region.

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<sup>1</sup> Consultation with AGT Food & Ingredients (2020-01-27) provided updated pea protein concentrate prices: \$2,000 USD/MT.

## 2.0 Overview: Business Case Study

A business case study is a document that outlines a potential business venture and all of the unique aspects of the operation including a background review of the market, an overview of the operational and financial aspects of running the business. The following business case study outlines the potential scenario of establishing a pulse (yellow pea) fractionation plant in the BRAED region of east-central Alberta.

The idea of establishing a facility capable of adding value to Alberta's and Western Canada's abundant agricultural commodities is gaining momentum, as is apparent from the recent investments including the \$400 million Roquette protein fractionation facility in Portage La Prairie, and the \$140 million investment by Verdient Foods in Vanscoy. Investors are drawn to the Canadian prairies for the abundant agricultural productive capacity, skilled workforce and affordable utilities, amongst many other factors that make the region attractive.

This business case study relies on careful background research in order to build an economic model that shows the potential operational and financial outcomes from running a protein fractionation plant in the BRAED region. It relies on consultation with industry, first-hand research and our own expertise. However, as with any newer and highly competitive industry, the availability of information is highly restricted, possibly due to the appealing margins attainable from asymmetric access to information. As a result, much of the operational aspects we used to build the economic model for this business case study are notional and have been estimated based on our experience developing similar models for other industries. That is not to say that the usefulness of this document is diminished, it is simply suggesting that the financial projections, payback periods and capitalization rates be taken with a grain of salt. For example, the labour schedule to operate the facility could fluctuate up or down considerably depending on the type of fractionation equipment adopted and the skill of the operators, which in turn alters the net income generated from the facility (as labour is one of the largest expenses).

We suggest that the reader use this as a tool to learn about the BRAED region and its potential for protein fractionation. Rather than focusing on the suggested capital expenditure breakdown, we encourage the reader to keep a key ballpark number in mind: a wet fractionation (pea protein isolate facility) that offers the opportunity for the investor to benefit from economies of scale is going to cost a minimum of roughly \$100 million to put in place<sup>2</sup>, and a dry fractionation roughly half that amount. While our financial projections suggest that a dry fractionation facility in BRAED is potentially financially viable, the real confirmation of that claim is in the fact that large players in the agri-food sector are making very large investments (e.g. Maple Leaf, Roquette, Verdient Foods) in protein fractionation, presumably driven by the growth in demand for plant based proteins.

This business case study outlines the market for protein fractionations, the various steps involved in processing pulses into protein, starch and fibre, and gives some

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<sup>2</sup> Investment estimate has been suggested by Murad Al-Katib, CEO of Alliance Grain Traders Inc., one of the major players in protein fractionation in Canada.

hypothetical forecasts to help potential investors envision pulse processing in the BRAED region. Labour costs, the skill of the workforce, the agricultural production in the BRAED region, the cost of utilities and the municipal tax rates given in this document are all valuable information that can help provide a picture of setting up shop in east-central Alberta.

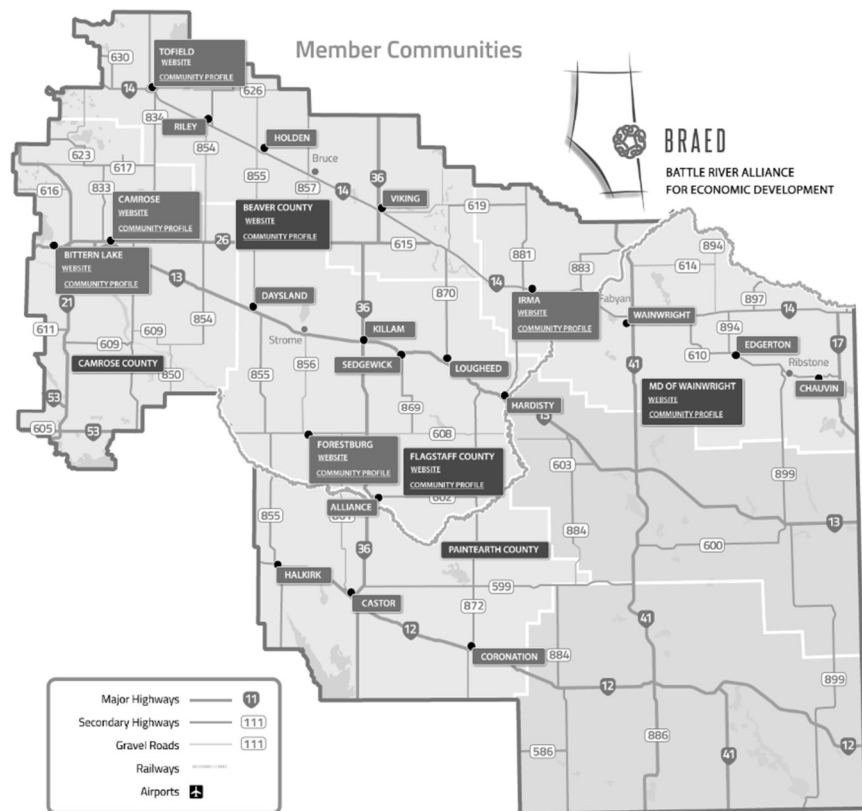
## 3.0 Regional Overview

### 3.1 BRAED Region

The Battle River Alliance for Economic Development (BRAED) is a group of 25 communities and five affiliate members in East-Central Alberta that work cooperatively and voluntarily to address community economic development issues from a regional perspective (Figure 1).

BRAED was established in 2001 and incorporated as a not-for-profit company in August 2002. The Battle River region has a population of over 60,000 residents. As an economic development organization, BRAED’s main source of revenue is from annual membership fees and government and partnership support.

**Figure 1: Map of BRAED Region**



Source: <http://www.braedalberta.ca/sample-page/>

Located in eastern Alberta, Battle River covers an area of 26,298 km<sup>2</sup>. The Battle River region has a diverse economy, highly educated workforce, stable infrastructure, low costs of doing business, abundance of land, and reasonably priced housing (34% lower than provincial average). Opportunities in emerging industries include value-added agriculture which is driven by large-scale primary agricultural production in the region.

3.1.1 Transportation Infrastructure

The Battle River region has an extensive, well-integrated infrastructure. Goods are efficiently moved throughout the region through various transportation services. The Queen Elizabeth II Highway corridor, the province’s major north-south route, is 40 minutes west of the City of Camrose. Well-maintained principal highways in the region include Highways 13 and 14, which bisect the region from west to east, and north-south Highways 21, 36 and 41. An extensive network of paved secondary highways connects the entire region. Battle River is well located with good transportation networks to various key destinations in western Canada (Table 1).

**Table 1: Distance to Major Cities**

Location	Distance to Battle River (km)		
	Camrose	Coronation	Wainwright
Edmonton	100	265	210
Calgary	290	305	420
Saskatoon	455	360	315
Regina	715	615	575
Winnipeg	1,235	1,140	1,095
Vancouver	1,250	1,265	1,365
Coutts (US border)	515	395	525

Camrose, Coronation and Wainwright all offer a favourable business climate, skilled workforce and good transportation networks, making them ideal locations for pulse processing. The three towns also offer favourable municipal tax rates.

Both the Canadian Pacific (CP) and Canadian National (CN) Class 1 railways provide freight and interchange services at many points throughout the region. Rail traffic is increasing in the region through the availability of producer cars. Canadian export terminals to the growing Asian markets are accessed at the ports of Vancouver and Prince Rupert, and the United States has good connections through Winnipeg and Chicago.

The Edmonton International Airport serves the region for major passenger and freight service. A number of other, smaller airports and airstrips exist in many communities throughout the region. Services vary from uncontrolled landing strips operated by private clubs to small regional airports with remote lighting systems and NDB towers.

3.1.2 Workforce

Alberta and the Battle River region offer one of the most diverse labour markets in Canada. The Battle River region has a total workforce of 42,000 and is ahead of the rest of the province regarding the 15-year-old and up segment of the population employed in the trades and agriculture (Table 2), two key sectors for running a processing facility.

**Table 2: Occupations, 15+ population (2016)**

	BRAED	Alberta
Management occupations	16.0%	11.6%
Business, finance and administration occupations	12.9%	15.6%
Natural and applied sciences and related occupations	3.2%	7.7%
Health occupations	7.3%	6.6%



Occupations in education, law and social, community and gov	8.6%	10.1%
Sales and services occupations	18.7%	21.7%
Trades, transport and equipment operators and relate occupations	20.6%	18.0%
Natural resources, agriculture and related production occupations	7.2%	3.2%
Occupations in manufacturing and utilities	4.0%	3.2%

**3.1.3 Business and Innovation**

The Battle River region is home to many large agricultural companies including Cargill, Killiam Feed Mill, Champion Pet Food, Hi-Pro Feeds, Mountain Dog Enterprises Inc., among others. The region is also able to benefit from many key driving forces behind innovation in the surrounding area:

- University of Alberta Augustana Campus (Camrose)
- Leduc Food Development Centre
- Bioresource and Food Processing Research Unit at Agri-Food Discovery Place at the University of Alberta
- University of Saskatchewan (Canadian Feed Research Centre)

**3.1.4 Agriculture**

The BRAED region has close to 3 Million acres of cultivated cropland and over \$1.4 Billion in Gross Farm Receipts (2016). The region’s highest producing crops are wheat, canola, barley, dry field peas, alfalfa and oats. Livestock and poultry representing 8% of the provincial market value total.

Dry pea production is one of the main agricultural outputs from the Battle River region. Dry pea and beans farms in the BRAED region have increased by 367% from 2011 to 2016 according to the latest Census data. Further, the number of acres dedicated to peas increased by 224% from 2011 to 2016. The growing interest in pulses is reflected across the province, with the most recent census showing large increases in seeded acres across Alberta (**Table 3**).

**Table 3: Seeded Acres 2016**

	<b>Alberta</b>	<b>Canada</b>	<b>% Alberta</b>
Beans, all dry	45,000	287,000	16%
Lentils	565,000	5,840,000	10%
Peas, dry	1,860,000	4,274,000	44%
Total 2016	2,470,000	10,561,000	23%
Total 2012	862,312	6,355,000	14%
% increase 2012-2016	186%	66%	72%

There are several pulse cleaning plants located in Wainwright, Alliance and Coronation. There are sizeable investment opportunities for secondary and tertiary processing of pulse into ingredients and higher value products. The BRAED region already has some processing capacity in plants by Bashaw Processors (Bashaw), Cargill (Camrose and Viking), and Viterra (Killam and Provost).

In addition, there are eight seed cleaning plants in the region including Wainwright, Camrose County, Coronation and Lougheed. The main player in terms of pulse protein processing is W.A. Grain & Pulse Solutions which was the 4<sup>th</sup> fastest growing company

in Alberta in 2015. The company runs several pulse and grain/seed processing facilities in Alberta, illustrating the potential for the market.

**Table 4: Seed Cleaning Plant Capacity in the BRAED Region (in bushel)**

Location	Hourly Capacity	Annual Capacity
Alliance	300-550	1,000,000
Beaver County	200	320,000
Camrose	400	800,000
Coronation	450	1,200,000
Edgerton	200	180,000
Forestburg	200	480,000
Lougheed	500-600	600,000
Strome	300	450,000
Wainwright	300	600,000

Total 5,310,000

## 4.0 Operational Assessment

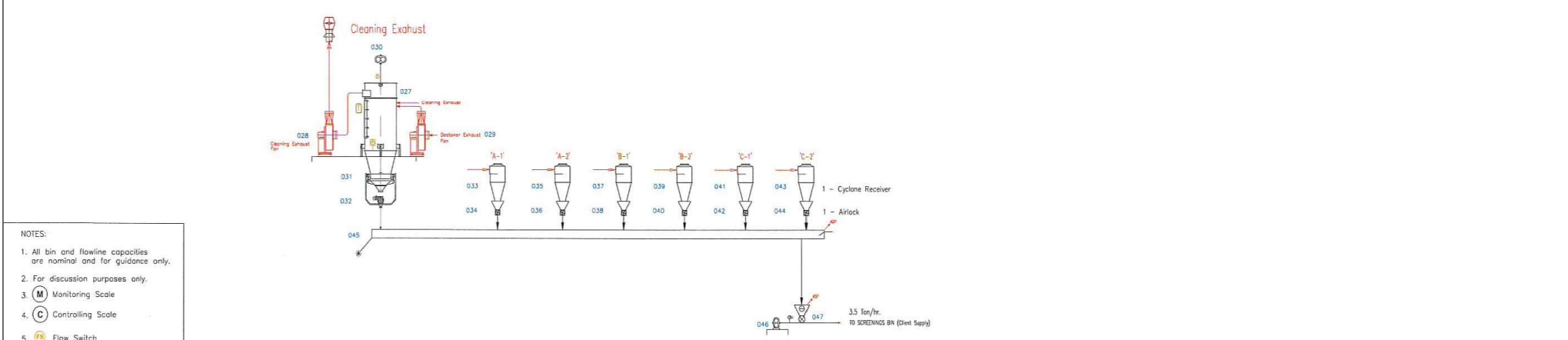
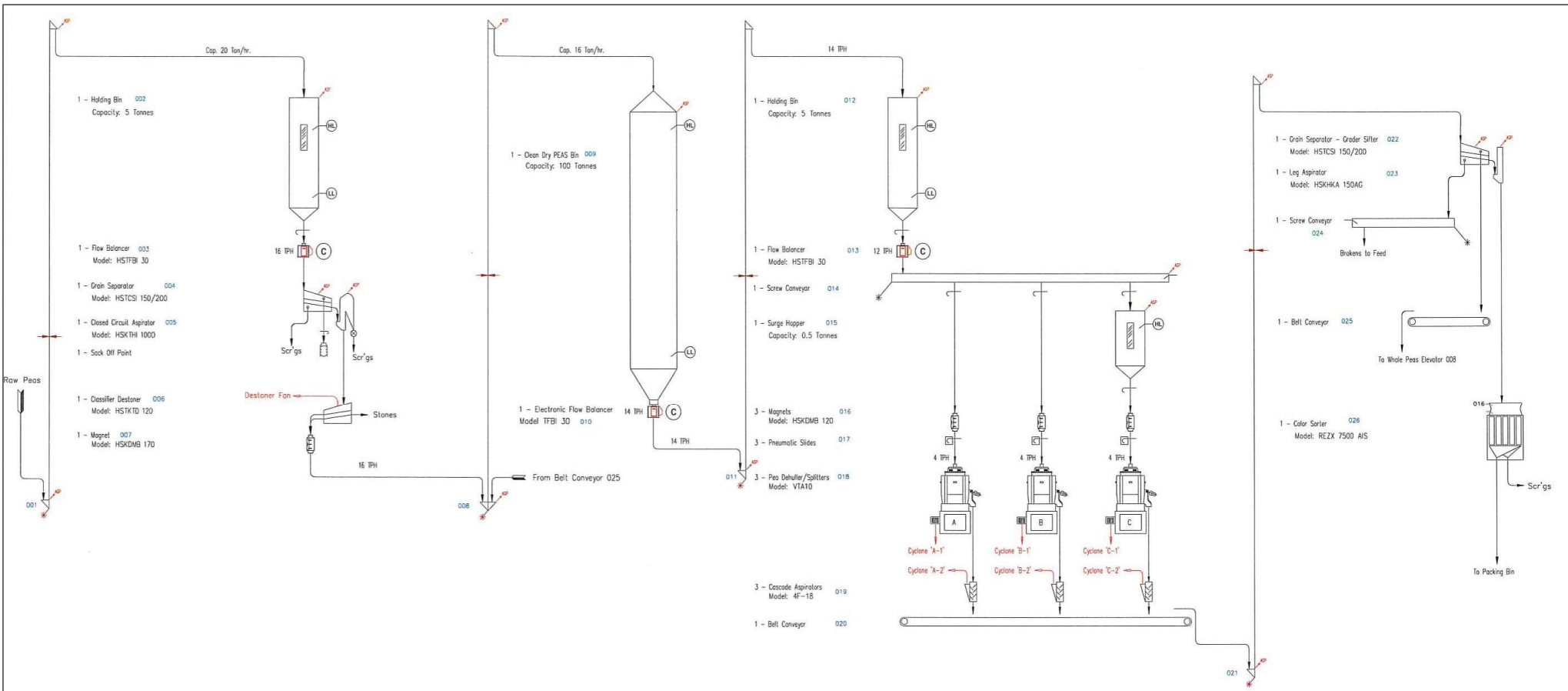
### 4.1 Background

In this section we have identified the various components of the yellow pea fractionation operation that have a critical impact on the cost to produce: labour, utilities, capacity, freight, capital use, the impacts of location, overhead, and other operating costs. As suggested in the overview section, we would like to emphasize that the following operational assessment and the financial assessment are based on best estimates.

The following operational assessment will describe the process of cleaning and conditioning pulses, both wet and dry fractionation and then finish with an overview of the various operating and capital costs associated with the industry. One important consideration is that a facility producing fractionations (e.g. yellow pea protein, starch and fibre) must first bring the pulses through similar processing phases as a standard seed cleaning plant. Once the product is cleaned and sorted, the fractionation facility would draw the pulses from a bin and continue the process to separate out the protein, starch and fibre. Therefore, we are going to describe the processing stages in two parts: (1) pea cleaning and conditioning, and (2) fractionation. However, a fractionation facility could forego the cleaning and sorting and outsource this to another facility or chose to complete the entire process from start to finish depending on the desired configuration.

### 4.2 Pea Cleaning & Conditioning

The process of pea cleaning and conditioning can best be demonstrated by viewing a flowchart that breaks down each individual step. The following diagram has been provided by Satake USA Inc. The following diagram is for a 12 MT/hr pulse processing facility (item list on the following page).



NOTES:

1. All bin and flowline capacities are nominal and for guidance only.
2. For discussion purposes only.
3. (M) Monitoring Scale
4. (C) Controlling Scale
5. (FS) Flow Switch

DRG NO. HB.100

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DRAWN	APPROVED	REVISED	APPROVED	E
PM				D
				C
DATE	DATE	DATE	DATE	B
12.17.19				A
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PROJECT Harvey Bradford  
USA  
For Reference & Discussion

TITLE Proposed  
12 MtpH Peas Processing Line  
Cleaning, Dehulling & Splitting

<b>Item #</b>	<b>Description</b>	<b>Model</b>	<b>QTY</b>
003	Flow Scale	HSTFBA 30	1
004	Grain Separator	HSTCSI 100/200	1
005	Air Recycling Tarar	HSKTHI 1000	1
006	Classifier Dry Stoner	HSTKTD 120	1
007	Tubular Magnet	HSKDMB 170	1
010	Flow Scale	HSTFBA 30	1
013	Flow Scale	HSTFBA 30	1
014	Tubular Magnet	HSKDMB 170	3
016	Pea Dehuller/Splitter	VTA10	3
017	Cascade Aspirator	4F-18	3
020	Grain Separator	HSTCSI 100/200	1
021	Leg Aspirator	HSKHKA 150AG	1
024	Colour Sorter	REZX 7500 AIS	1
025	Air Jet Filter	KFSA 104/30	1
026	Low Pressure Fan – Cleaning Exhaust	HSKTMA 15	1
027	Low Pressure Fan – Destoner Exhaust	HSKTMA 7.5	1
028	Blower for Filter Sleeves	HSDFBA 25	1
040	Blower	HSDFBA 25	1
041	Airlock/Hopper	HSKEKM 22/22	1
	Pipeline	57/63mm – 40 m	1

## 4.2.1 Step-by-step breakdown

The process of cleaning and condition yellow peas (pulses in general) can be broken down into two main components: (1) cleaning whole yellow peas to remove dirt, stones and other debris, and (2) splitting the peas and sorting into different streams. This process requires three storage bins for (a) raw uncleaned pulses, (b) clean whole pulses, and (c) clean split and colour sorted peas. As the diagram above demonstrates, there are various other forms of equipment from electronic scales to aspirators that are critical to the process. While there may be some minor variation between equipment suppliers, the general process of taking raw peas to the final split pea phase is going to be very similar.

**Holding Bin 5 MT (raw commodity)**

- Flow Balancer
- Grain Separator
- Closed Circuit Aspirator
- Sack Off Point
- Destoner
- Magnet
- Belt Conveyor

**Clean Dry Peas Bin 100 MT**

- Belt Conveyor

**Holding Bin 5 MT**

- Flow Balancer
- Screw Conveyor
- Surge Hopper (0.5 MT) (for overflow)
- Magnets
- Pneumatic Slides
- Pea Dehuller/Splitters (three 4 MT/hr units)
- Cascade Aspirator
- Belt Conveyor
- Grain Separator – Grader Sifter
- Leg Aspirator
  - Brokens (separated for feed)
  - Whole Peas (rerouted through system)
- Colour Sorter<sup>3</sup>
  - Split Peas (final product)

**Packing Bin (Clean, split, colour sorted peas)**

The final step in the final step in the process of cleaning and separating yellow peas involves a milling separator machine. An example of one of these machines can be seen in Figure 2. Each machine is rated at 4 MT/hr, for a total of 8 MT/hr. Increases in size must therefore be done in blocks of 4 MT/hr.

<sup>3</sup> We are in consultation with the equipment suppliers for the fractionation equipment and will determine if colour sorting is a necessary prerequisite to the fractionation process, or if this final step can be dropped. We are also considering whether it makes sense to include colour sorting regardless, as a percentage of the throughput may still be sold as bagged split peas, i.e.

Figure 2: VTA10AB-L Pea Splitter



Source: Satake USA inc.

After the peas pass through the pea splitter the conveyor belt takes the brokens, whole peas and split peas (**Figure 3**) to the milling separator. Brokens are removed and typically used as livestock feed, whereas the whole peas that went through the splitter are re-routed back through the system to be split. The split peas are either binned or run through a secondary process for colour sorting.

**Figure 3: Broken, Whole Peas, Split Peas, Chaff**



Source: Satake USA inc.

#### 4.2.2 Pea Cleaning and Conditioning Equipment Costs

The following quotes from equipment suppliers demonstrate the approximate cost for putting in place just the processing equipment to clean and condition yellow peas. The quotes do not include any of the storage bins shown in the above diagram or any freight or assembly costs. The equipment for the 12 MT/hr facility described in the diagram above (less the storage bins) has been quoted at roughly \$750,000 USD (\$990,000 CAD).

Our experience developing financial models for processing facilities suggests that additional costs such as the following need to be factored into the quoted equipment costs.

- auxiliary, delivery and installation
- ductwork
- cables and cable trays
- packing and loading
- Freight costs to deliver equipment
- Budget for supervision of mechanical and electrical installation
- Budget for start-up, commissioning and training staff

Experience on similar projects suggests that adding 20-30% of the quoted equipment price is realistic. Additional contingency also needs to be added for storage capacity and the holding bins outlined in the flow diagram above.<sup>4</sup> Therefore, to provide a conservative estimate, we expect that the pea cleaning and processing equipment delivered and set up in Alberta could cost upwards of **\$1.75-\$2.0 million CAD for the equipment only for a 12 MT/hr facility.**

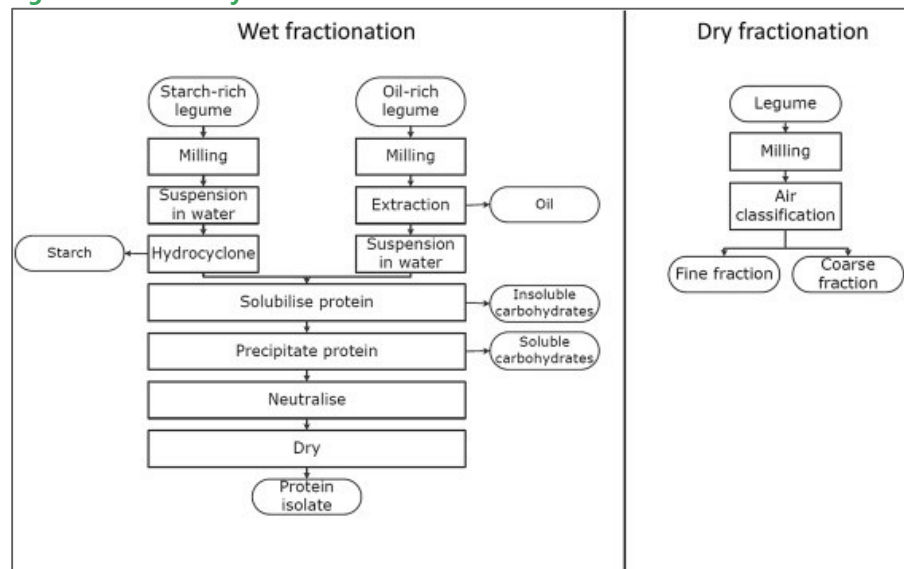
<sup>4</sup> A 5,000-bushel smooth-walled steel storage bin sells for \$18,000 to \$20,000 in Alberta.



#### 4.3 Pulse Fractionation

Pulse fractionation can be broken down into two main facility types: wet and dry processing. The dry fractionation process takes the dehulled split peas from the process described above, mills them into flour and then uses air classification (sorting) to separate the flour into protein, fibre and starch. Protein is lighter than starch and can be separated by a centrifugal air blast. Dry fractionation facilities are considerably more affordable than wet fractionation. Wet fractionation facilities require a complex process (**Figure 4**) of removing the starch, fibre and protein and come at a considerable price premium over dry. However, the high-value end product (protein) resulting from wet fractionation can generate nearly double the revenue per unit than that resulting from dry fractionation.

**Figure 4: Wet vs. Dry Fractionation Flow Chat**



Source: <https://doi.org/10.1016/j.tifs.2015.04.013>

The key difference between the two processing methods, besides the capital expenditure requirements, is the outputs. The protein rich fraction being extracted through the fractionation process is the most valuable and it differs significantly between the two methods. The protein fraction extracted through the dry method has a protein content of roughly 53%, whereas the protein fraction extracted using the wet method has a protein content of roughly 85% (Table 5).

**Table 5: Fractionation Percentages – Protein, Fibre and Starch**

	Protein	Fibre	Starch
Dry Fractionation	53%	87%	73%
Wet Fractionation	85%	87%	98%

Source: Pulse Canada

Therefore, while both facilities described below are producing the same throughput (in theory), the gross revenue generated through the wet fractionation facility will be considerably more than the dry fractionation facility given the value of the protein being produced. Our preliminary estimates suggest that protein from a dry fractionation facility sells for approximately \$2,640/metric tonne (MT) and protein

4.3.1 Dry  
Fractionation  
Capital  
Expenditure

from a wet fractionation facility sells for roughly \$7,550/MT. The values are in Canadian dollars.

In addition to the pea cleaning and conditioning equipment described in the previous section, a pea fractionation facility requires a pelleting line and a fractionation line. The pelleting equipment is used to create animal feed (pellets) from the waste product (hulls, chips and leftover waste product (fibre) from the fractionation process). The fractionation line takes the split cleaned yellow peas and converts them into protein, fibre and starch.

The following estimates include the capital expenditure requirements for setting up the entire fractionation facility that includes the following considerations:

- *Pea cleaning and conditioning equipment*
- *Pelleting waste product equipment*
- *Fractionation equipment*
- *Ancillary equipment*

Throughput capacity: 12 MT/hr

Rough equipment estimate: \$10 million CAD

Rough capital expenditure estimate: \$45 million CAD

Output:

- Protein: 2.3 MT/hr
- Starch: 9.1 MT/hr
- Fibre: 600 kg/hr

Total capital expenditure includes equipment costs, installation, instrumentation, piping, electrical supplies, buildings, land, yard structure, rail improvements (if necessary), engineering, supervision, construction, contractor's fees, contingency fee, certifications, taxes, and working capital.<sup>5</sup> The facility would include the pea cleaning and conditioning equipment described in section 1.2 (with an additional 4 MT/hr of capacity) as well as fractionation equipment and other ancillary equipment (compressors, lifts, etc.).

4.3.2 Wet  
Fractionation  
Capital  
Expenditure

The following estimates include the capital expenditure requirements for setting up the entire fractionation facility that includes the following considerations:

- *Pea cleaning and conditioning equipment*
- *Pelleting waste product equipment*
- *Fractionation equipment*
- *Ancillary equipment*

Throughput capacity: 12 MT/hr

Rough Capital Expenditure Estimate: \$100 million

Equipment estimate: \$22 million

Output:

- Protein: 2.3 MT/hr

<sup>5</sup> We have followed the suggested method of Peters, Timmerhaus & West in their manual titled *Plant Design and Economics for Chemical Engineers (2003)* by applying a factor of 4.55 to equipment costs to arrive at total plant costs.

- Starch: 9.1 MT/hr
- Fibre: 600 kg/hr

Total capital expenditure includes equipment and installation, instrumentation, piping, electrical supplies, buildings, land, yard structure, rail improvements (if necessary), engineering, supervision, construction, contractor’s fees, contingency fee, certifications, taxes, and working capital.

#### 4.4 Operating Costs

The assessment considers operating and capital costs separately so that impacts of scale economies can be assessed. The following section focuses on the operating costs for a dry fractionation facility.

##### 4.4.1 Cost of Goods Sold

The key input for a pea processing plant is the raw commodity. In the case of the BRAED region the input is dry yellow peas. Therefore, a sufficient and reliable supply is critical for the viability of the plant in the BRAED region. In order to be conservative, a yield of 1.1 MT/acre for yellow peas has been used in the benchmark analysis. This is consistent with recent estimates for the Province of Alberta.<sup>6</sup> Increased yields greatly reduce the required land and distance yellow peas must be hauled to a processing plant (Table 6). However, given the earlier analysis conducted for this work, the supply of yellow peas in the BRAED region is currently enough to support a processing facility, and with improved yields going forward the prospects will also improve.

**Table 6: Required land relative to yellow pea yield**

Size of Plant	Required Straw	Yield	Required land
12 MT/hr	65,700 MT	1.1 MT/acre	59,725 acres
12 MT/hr	65,700 MT	2.5 MT/acre	26,300 acres
12 MT/hr	65,700 MT	3.0 MT/acre	21,900 acres

Note: Required farmland assumes that producers are growing peas on a four-year rotation with other crops.

The current spot price of yellow peas in Northern Alberta (December 2019) is roughly \$251/MT. A 12 MT/hr pea processing plant requires roughly 65,700 MT of yellow peas per year.<sup>7</sup> Operating at 95% efficiency, the raw commodity inputs for the facility are just over \$16 million for yellow peas. Additional Cost of Goods Sold include packaging for outputs to ship secondary processors. For this we have calculated a cost of \$0.15/hundredweight. Operating at 95% efficiency and processing 44,000 MT of raw yellow peas per year, the costs for packaging the fractionations is just under \$200,000 per year.

##### 4.4.2 Labour

With the contraction of the oil and gas sector in Northern Alberta many skilled workers have been left searching for new opportunities. This provides a significant advantage as the oil and gas sectors have invested in training employees, especially in the northern half of the province, and this could provide a unique opportunity to

<sup>6</sup> [Canadian Grain Commission \(2018\)](#)

<sup>7</sup> Based on the assumption that the plant operates 22.5 hours per day (three 7.5 hour shifts) and 48.7 weeks per year.

tap into that skilled workforce. The share of the workforce with a diploma, certificate or degree as highest level of education is over 90 percent (2017), suggesting that access to highly skilled labour will not be an issue.

The chosen labour schedule for the yellow pea processing plant is the same regardless of the plant size. It will operate five days per week with three 7.5-hour shifts per day (i.e. the plant operates 22.5-hours per day). The total hours worked by the production staff in a year is 5,475 hours, which means that in the year the processing machines will also run 5,475 hours. We have modelled just under 49 weeks on the job for processing line workers to account for vacations, sick leave and other time away from work. There are various labour schedules that could be applied at this stage in the modelling, however, we have chosen to maximize the hours the machines are operating given the large initial capital expenditure to put them in place.

Determining the employment requirements for a yellow pea processing plant depends on the size of the facility chosen. Based on rough estimates, we expect that a 12 MT/hr processing plant would require just under 50 employees.

- 1 Manager
- 6 Supervisors
- 36 Production Staff
- 3 Technicians
- 2 Administrative Staff

There would always be 2 supervisors and 12 production staff<sup>8</sup> as well as one technician troubleshooting repair issues. At the same time, a manager and an administrative employee would work a 7.5-hour shift during 'regular' business hours. The manager would supervise the ongoing business-related aspects of the decortication facility as well as being on call to handle any issues beyond the scope of the shift supervisors. The administrative employee will be on site to handle the regular administrative aspects of running a facility of this nature.

After raw commodities (yellow peas), labour is by far the most expensive operating cost for the facility. Using the above labour schedule, 48 employees cost the facility \$2 million per year.

#### 4.4.3 Utilities

Given that different dry fractionation equipment designs have different efficiency ratings, determining the exact variable electricity consumption is unclear at this time. As a placeholder in the model, we have used a value of 190 KW per Metric Ton of processing capacity.<sup>9</sup> We have used the above KW/hr rating and an electricity price of \$0.10/kWh. The Alberta Utilities Commission<sup>10</sup> provides the most up-to-date rate options, showing that residential regulated rates vary between \$0.68/kWh (\$0.8294/kWh actual) to \$0.68/kWh (\$0.9424/kWh actual). While industrial rates will

<sup>8</sup> Production staff includes all other staff operating the facility such as forklift operators, milling machine operators, those monitoring the unloading of peas into storage silos (trucking), and all other tasks associated with running the facility.

<sup>9</sup> Per 1 MT/hour of operation we have modelled the fractionation equipment consuming 190kW of power ((e.g. 12 MT/hour x 5475 hours/year x \$0.1 kWh x 190 kW=\$1,250,000). The chosen KW/hour consumption is taken from a hemp processing facility of a similar size, and we have used it as a placeholder value at this time.

<sup>10</sup> <http://www.auc.ab.ca/Pages/current-rates-electric.aspx>

vary from residential rates, this information is proprietary and not made available by energy providers. Natural Resources Canada (NRC) provides an overview of industrial electricity prices across Canada (\$0.078/kWh in Edmonton for industrial), however, they do not include line fees and other charges in this price. Therefore, we have used \$0.10/kWh in the model because it provides a realistic indication of the actual electricity costs in the BRAED region.

#### 4.4.4 Freight

Transportation costs have been analyzed by calculating the freight costs<sup>11</sup> to move the finished products to Edmonton, Alberta from each of the following counties:

- Camrose
- Beaver County
- Flagstaff County
- Paintearth County
- MD of Wainwright

We have selected an example town in each of the counties in order to provide the following freight estimates. The estimates are calculated using truck rather than rail, because at this time there is no certainty that the chosen location would have access to rail infrastructure. Based on an annual throughput of 65,700 MT/year with the assumption of 19% protein, 76% starch, and 5% fibre as well as a max truck load of 27.22 MT, a trucking cost of \$4/km, and 95% plant efficiency we get the annual freight costs associated with each location to ship their finished products to Edmonton:

- Camrose: \$900,000
- Beaver County \$1.2 million
- Flagstaff County \$1.7 million
- Paintearth County \$2.5 million
- MD of Wainwright \$2.0 million

It is oversimplifying to assume that all end products are being shipped to Edmonton, given that the fibre, for example, will likely be used as livestock feed. In addition, much of the commodity could also be shipped to Calgary or further to other markets. However, the above gives an indication of how distance from markets effects freight costs.

#### 4.4.5 Overhead & Other Operating Costs

Overhead costs refer to the ongoing expense of operating the pea processing facility. Unlike other operating expenses such as raw material and labor, overheads are not linked with any cost unit.

As this is an intermediate processing facility and not one producing finished goods, the marketing budget has been kept on the conservative side at \$10,000 per year. Accounting and bookkeeping services have been budgeted at \$500 per month or \$6,000 per year. The meals and entertainment budgeted in the model are \$2500. The meetings, convention and travel budget for this facility is \$3000. The annual office, computer, and telephone budget for the facility is \$3000. For some years (e.g. initial

<sup>11</sup> The specific locations chosen were Camrose, Viking, Sedgewick, Coronation, and Wainwright.

setup) the budget will likely be higher, but for subsequent years it will likely be lower, so an annual budget of \$3000 should cover office, computer and telephone costs.

Property tax for this model is calculated by multiplying a mill rate by the assessed industrial property value (land, buildings, and equipment). The mill rate is the amount of tax payable per dollar of the assessed value of a property. The tax information was collected from the Government of Alberta (Table 7).

**Table 7: Property Taxes<sup>12</sup>**

	Property Tax Rate
Camrose County	0.14168
Beaver County	0.21924
Flagstaff County	0.21676
Paintearth County	0.18237
MD of Wainwright	0.22430

Source: [Alberta Regional Dashboard](#)

Note that total tax rate is a combination of the non-residential mill rate and all other additional tax burdens. For our financial projections we used the tax rate for the city of Camrose, Alberta. However, in the model we have incorporate various different tax rates depending on the chosen location.

Property taxes are a significant fixed cost to consider when setting up a facility. Given the preliminary nature of the quotes we have received from equipment manufacturers, estimating the property taxes for the facility are very preliminary. However, given the assumption of \$45 million in capital expenditure requirements to set up a 12 MT/hr pea fractionation plant, the property tax burden ranges from \$570K to \$1.1 million depending on the chosen BRAED location.

4.5 Capital Costs

*There are significant capital costs associated with building a pea fractionation facility. This is a critical consideration as these costs are essentially sunk once assigned and virtually impossible to recover. As a result, a significant amount of due diligence was conducted on this cost category the relevant cost drivers.*

4.5.1 Capacity Considerations

A pea processing plant requires considerable feedstock from the surrounding region. This means that productive acreage within a 150 km radius is important for reducing transportation costs to source yellow peas. Under the assumption that yellow peas are going to be grown on a four-year rotation, ideally, the chosen site location for the yellow pea processing facility would have four times the acreage in the surrounding region than is required to supply the facility. The values displayed in Table 8 are modelled at a yellow pea yield rate of 1.1 MT/acre.<sup>13</sup>

**Table 8: Capacity Input Requirements**

Plant Size	MT/yr requirements	Acres of Peas	Acres in Rotation
12 MT/hr	65,7000	59,730 acres	240,000 acres

<sup>12</sup> The property tax rates used in this document are those provided by the Economic Development Officer for each county.

<sup>13</sup> [Canadian Grain Commission \(2018\)](#)

According to Statistics Canada, Alberta seeded 1.86 million acres of dry peas in 2016, accounting for 44% of total area seeded in Canada. The BRAED region has 5.2 million acres of farmland and seeded 188,000 acres to dry peas in 2016 (Table 9). Therefore, with the assumption that peas will be drawn from regions outside of BRAED, there is sufficient dry pea production for a 12 MT/hr facility. However, there may be supply constraints if other facilities are built in the surrounding area and competition for supply increases.

**Table 9: Dry Pea Seeded Acres (2016)**

Location	Acres Seeded 2016
Camrose County	43,284
Beaver County	32,289
Flagstaff County	59,772
Paintearth County	23,033
MD of Wainwright	29,415
Total	187,793

Source: [BRAED Region Agriculture by the Numbers](#)

If demand for yellow peas exceeds supply and prices increase it will affect revenue generation of the plant. In the model the price of yellow peas has been set at \$251/MT, however if through competition it were to grow to \$300/MT it would reduce cash flow and increase the payback period.

4.5.2 Construction Costs

Construction costs can be separated into various subcomponents that include all of the associated costs with putting in place a fractionation facility (Table 10). The costs shown in Table 10 do not include land purchases, which will vary by region. Commercial lots in the BRAED region with highway access will vary widely, from \$70,000 to upwards of \$300,000/acre. It is recommended that project proponents would need to contact target municipalities directly given this large variability. We have incorporated a 5 acre lots into the model. With regard to installation costs, each element for a 12 MT/hr dry fractionation facility is broken down as follows.<sup>14</sup>

**Table 10: Breakdown of Install Cost: 12 MT/hr Fractionation Plant**

Physical Plant	Estimated Cost
Equipment (delivered and installed)	\$10,000,000
Installation	\$4,000,000
Piping	\$1,500,000
Structural steel foundations, reinforced concrete	\$2,800,000
Electrical components	\$2,500,000
Instruments	\$500,000
Battery-limits building and service	\$5,000,000
Excavation and site preparation	\$1,050,000
Auxiliaries	\$3,000,000

<sup>14</sup> Footnote 3 describes how we have used the work of Peters, Timmerhaus & West (2003) and their factor of 4.55 to arrive at total plant costs from original equipment costs, i.e. \$10,000,000 \* 4.55 = \$45.5 million. Table 10 above uses a factor of 4.11 to arrive at the total fixed capital investment less land purchase costs, i.e. \$10,000,000 \* 4.11 = \$41.1 million. The costs in both instances are developed using general chemical engineering plant cost indexes, and the actual plant build costs will potentially vary.

Direct Plant costs	
Field expenses	\$1,100,000
Engineering	\$3,900,000
Contractor fees	\$3,150,000
Contingency (unforeseen costs)	\$2,600,000
<b>Total</b>	<b>\$41,100,000</b>

Source: Techfibre Industries

4.5.3 Land and Land Preparation

A piece of flat land with good ground-bearing capacity would be ideal. Site preparation includes site clearing and grading (if necessary), excavation and trenching for the building's concrete pad, water mains, sanitary sewer systems, storm sewer and retention systems, underground (if necessary) electrical and telecommunication systems, road and access parking, and pathways and sidewalks. All the site preparation costs have been factored into the initial capital expenditure and outlined in the Financial Assessment section of this document.

4.5.4 Summary

Estimated capital expenditure requirements for a 12 MT/hr dry pulse fractionation facility are roughly estimated at \$45 million dollars (CAD) including the land, site preparation, building and equipment (piping, electrical, compressed air, decortication machines, etc.).

A salvage value of 25 percent of the original value of the capital expenditure is assumed and applied at the end of the 20-year useful life of the facility. This is applied in every financial scenario modelled.



# 5.0 Financial Assessment

## 5.1 Overview

In this section we will present an overview of the financials for operating a yellow pea fractionation facility in the BRAED region. We have listed and provided context on each of the key assumptions made and provided sensitivity analysis on the impacts of each one.

Each of the critical assumptions made in the marketing and operating sections are assessed as part of the analysis. Different scenarios are used to ensure that the model and results are robust. Any critical success factors are discussed in detail in terms of how they might impact financial feasibility.

The costs associated with setting up of the fractionation facility include purchasing the land, building a steel structure, purchasing and installing decortication machinery, and all the other associated costs.

At this point the startup value is simply an estimate and would need to be re-priced based on detailed equipment quotes, and detailed engineering plans for the building. This detailed pricing can be completed once the business plan and rough plant layout have been decided upon.

### 5.1.1 Variable & Fixed Costs

The following tables outline the main cost elements associated with plant operations. These are further broken into fixed and variable costs. It is important to note that this information is reflective of what would be expected to pay for the specific cost element.

**Table 11: Fixed Costs**

Salaries	
Manager	\$105,000
Technician/Millwright	\$82,000
Administration	\$48,000
EI/ CPP/Benefits	15%
Insurance	\$90,000/year
Professional fees (accounting and legal)	\$25,000/year
Fixed Utilities	\$5,000/year
Finance and banking charges	\$1,500/year
Long term loan interest rate	5.19%
Phone, fax, internet, web page	\$6,000/year
Web page (design and maintenance)	
Year 1	\$20,000
Ongoing	\$5,000/year
Marketing	\$50,000/year
Meals and Travel	\$50,000/year
Licenses	\$1000/year
Recruiting (Advertising for other staff)	
Year 1	\$10,000

Ongoing	\$2,000/year
Software purchases	
Year 1	\$3,000
Ongoing	\$1,000/year
Photocopier Lease	\$4,800/year
Office Supplies	\$2,750/year
Vehicle lease	\$8,500/year
Fuel and oil	\$10,000/year

**Table 12: Variable Operating Costs**

Labour		
		12 MT/hr
Production Staff	\$15	12 people/hr
Supervisors	\$25	2 person/hr
Hours per shift		7.5

**Table 13: Variable Costs**

	Price	12 MT/hr
Yellow Peas	\$251/MT	65,700 MT/yr
Trucking	\$4/km	Varies by Region
Electricity <sup>15</sup>	\$0.10/kWh	1,900 kW per hr

5.1.2 Price Benchmarks

Yellow pea prices are roughly \$251/MT. Free on Board (FOB) prices for yellow pea protein, starch and fibre are show in

Table 14. Demand for yellow pea protein is expected to grow with increasing demand for plant-based proteins (e.g. Beyond Meat); however, supply is also growing at a considerable pace. Therefore, the future price of pea protein is uncertain. Therefore, we have modelled the current estimated price plus inflation going forward.

**Table 14: Pricing Schedule**

Product	Composition	Price
Protein	53% protein	\$2,640/MT <sup>16</sup>
Starch	73% starch	\$650/MT
Fibre	87% fibre	\$717/MT

5.2 Critical Assumptions Impacting Model

While all assumptions are critical to the evaluation of the model, there is more weight given to variables that have the most significant impact on the profitability of the business. The critical assumptions are described below.

<sup>15</sup> The Alberta Utilities Commission (AUC) provides details on regulated rate options by retailer. However, pricing is dependent on the exact land location, expected draw, and requirements for upgrading lines and transformers. The additional inclusion of line charges is also an undefined variable in the regulated prices provided by AUC. Therefore, in the model we have used \$0.10 kWh as the price in all regions.

<sup>16</sup> Consultation with AGT Food & Ingredients (2020-01-27) provided updated pea protein concentrate prices: \$2,000 USD/MT.

For the following critical cost assumptions, we have controlled by maintaining a 12 MT/hr yellow pea fractionation facility located in Camrose Alberta, shipping protein, starch and fibre to Edmonton by truck.

- Yellow peas cost \$251/MT FOB delivered to the facility. As yellow peas (raw inputs) are by far the largest cost element for a fractionation facility, changes in the price per tonne greatly impact the viability of the facility.
- Pea protein is sold for \$2,640/MT. Pea protein generates the most income for the fractionation facility, and the chosen market price greatly effects the viability of the plant.
- The total tax rate used for the city of Camrose is 14.17%. Mill Rates and additional tax burdens vary by region across BRAED and the impact on the model is important.
- Conventional 5-year mortgage rates (5.19%) from the Bank of Canada are used in the model to cover 30% of initial capital investment.
- Variable utilities (electricity) are amongst the highest costs in the model. We have used a rate of \$0.10/kWh for electricity.
- Finally, we make the assumption that 100% of the fractionations are being sold at our indicated price. While pea protein is currently in high demand, pea starch and fibre are currently not in as high of demand.

### 5.3 Financial Projections

A complete financial assessment was completed for a single location in order to test the sensitivity of the key cost elements (Camrose). All costs were held constant other than those specifically identified in the various options.

Projection 1: shows the financial projection resulting from the commercial loan to private equity ratio being 50/50.

Projection 2: shows how the financial projections change when the commercial loan to private equity ratio changes to 70/30.

Projection 3: shows how the projections change given a 70/30 capital split when the price of yellow peas drops from \$251/MT to \$225/MT and the price of pea protein increases from \$2,640/MT to \$3,000/MT. This potential scenario could result from producers in Alberta switching from canola production to pea production and continued growth in demand for protein fractionations.

Projection 4: shows how the projections change given a 70/30 capital split with a price of yellow peas increasing to \$300/MT and the price of pea protein dropping to \$2,000/MT from \$2,640/MT. This potential scenario could result from a sharp increase in demand for yellow peas and a slump in world demand for protein.

## Projection 1: 50/50

Camrose County	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
<b>REVENUE</b>										
Sales - Protein, Fibre, Starch	33,882,315	51,585,825	66,322,175	67,317,008	68,326,763	69,351,665	70,391,940	71,447,819	72,519,536	73,607,329
<b>TOTAL REVENUE</b>	<b>33,882,315</b>	<b>51,585,825</b>	<b>66,322,175</b>	<b>67,317,008</b>	<b>68,326,763</b>	<b>69,351,665</b>	<b>70,391,940</b>	<b>71,447,819</b>	<b>72,519,536</b>	<b>73,607,329</b>
<b>EXPENSES</b>										
<b>Cost of Goods Sold</b>										
Raw Material - Yellow Peas	8,245,350	12,553,545	16,139,675	16,381,770	16,627,497	16,876,909	17,130,063	17,387,014	17,647,819	17,912,536
Packaging	96,993	147,672	189,858	192,705	195,596	198,530	201,508	204,531	207,598	210,712
<b>Total COGS</b>	<b>8,342,343</b>	<b>12,701,218</b>	<b>16,329,532</b>	<b>16,574,475</b>	<b>16,823,093</b>	<b>17,075,439</b>	<b>17,331,570</b>	<b>17,591,544</b>	<b>17,855,417</b>	<b>18,123,248</b>
<b>Payroll Expenses</b>										
Wages and Benefits - Manager	104,938	106,512	108,109	109,731	111,377	113,047	114,743	116,464	118,211	119,984
Wages and Benefits - Supervisor	314,813	319,535	324,328	329,193	334,131	339,142	344,230	349,393	354,634	359,953
Wages and Benefits - Fractionation line	1,133,325	1,150,325	1,167,580	1,185,093	1,202,870	1,220,913	1,239,227	1,257,815	1,276,682	1,295,832
Wages and Benefits - Technician	245,554	249,237	252,976	256,770	260,622	264,531	268,499	272,527	276,614	280,764
Administration / Reception	96,543	97,991	99,460	100,952	102,467	104,004	105,564	107,147	108,754	110,386
<b>Total Payroll Expenses</b>	<b>1,895,171</b>	<b>1,923,599</b>	<b>1,952,453</b>	<b>1,981,740</b>	<b>2,011,466</b>	<b>2,041,638</b>	<b>2,072,262</b>	<b>2,103,346</b>	<b>2,134,896</b>	<b>2,166,920</b>
<b>General Expenses</b>										
Freight	458,672	698,328	897,817	911,284	924,953	938,827	952,910	967,204	981,712	996,437
Vehicle lease	8,500	8,628	8,757	8,888	9,022	9,157	9,294	9,434	9,575	9,719
Fuel and oil	10,000	10,150	10,302	10,457	10,614	10,773	10,934	11,098	11,265	11,434
Custodial	15,000	15,225	15,453	15,685	15,920	16,159	16,402	16,648	16,897	17,151
Variable Electricity Cost	1,248,300	1,267,025	1,286,030	1,305,320	1,324,900	1,344,774	1,364,945	1,385,419	1,406,201	1,427,294
Fixed Utilities Cost	5,000	5,075	5,151	5,228	5,307	5,386	5,467	5,549	5,632	5,717
Groundskeeping (Snow/Lands)	6,000	6,090	6,181	6,274	6,368	6,464	6,561	6,659	6,759	6,860
Repairs and maintenance	50,000	50,750	51,511	52,284	53,068	53,864	54,672	55,492	56,325	57,169
Insurance	90,000	91,350	92,720	94,111	95,523	96,956	98,410	99,886	101,384	102,905
Licenses	1,000	1,015	1,030	1,046	1,061	1,077	1,093	1,110	1,126	1,143
Marketing	50,000	50,750	51,511	52,284	53,068	53,864	54,672	55,492	56,325	57,169
Recruiting	10,000	2,030	2,060	2,091	2,123	2,155	2,187	2,220	2,253	2,287
Professional fees (accounting and legal)	25,000	25,375	25,756	26,142	26,534	26,932	27,336	27,746	28,162	28,585
Meals and Travel	50,000	50,750	51,511	52,284	53,068	53,864	54,672	55,492	56,325	57,169
Office furniture, computer, telephone	27,000	3,045	3,091	3,137	3,184	3,232	3,280	3,330	3,379	3,430
Finance and banking charges	1,500	1,523	1,545	1,569	1,592	1,616	1,640	1,665	1,690	1,715
Phone, fax, internet	6,000	6,090	6,181	6,274	6,368	6,464	6,561	6,659	6,759	6,860
Web Page	20,000	5,000	5,075	5,151	5,228	5,307	5,386	5,467	5,549	5,632
Software Purchases	3,000	1,015	1,030	1,046	1,061	1,077	1,093	1,110	1,126	1,143
Photocopier Lease	4,800	4,872	4,945	5,019	5,095	5,171	5,249	5,327	5,407	5,488
<b>Total General Expenses</b>	<b>2,089,772</b>	<b>2,304,084</b>	<b>2,527,660</b>	<b>2,565,574</b>	<b>2,604,058</b>	<b>2,643,119</b>	<b>2,682,766</b>	<b>2,723,007</b>	<b>2,763,852</b>	<b>2,805,310</b>
<b>EBITDA</b>	<b>21,555,029</b>	<b>34,656,924</b>	<b>45,512,531</b>	<b>46,195,219</b>	<b>46,888,147</b>	<b>47,591,469</b>	<b>48,305,341</b>	<b>49,029,921</b>	<b>49,765,370</b>	<b>50,511,851</b>
Taxes										
Income taxes	4,065,878	6,190,299	7,958,661	8,078,041	8,199,212	8,322,200	8,447,033	8,573,738	8,702,344	8,832,879
Property taxes	4,653,953	4,723,762	4,794,619	4,866,538	4,939,536	5,013,629	5,088,833	5,165,166	5,242,643	5,321,283
Interest Payment	1,137,895	1,114,671	1,090,241	1,064,544	1,037,513	1,009,079	979,170	947,708	914,614	879,801
Principle Payment	447,476	470,699	495,129	520,826	547,857	576,291	606,200	637,662	670,757	705,569
Amortization & Depreciation	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000
<b>TOTAL EXPENSES</b>	<b>23,865,487</b>	<b>30,661,332</b>	<b>36,381,294</b>	<b>36,884,738</b>	<b>37,395,734</b>	<b>37,914,394</b>	<b>38,440,835</b>	<b>38,975,172</b>	<b>39,517,524</b>	<b>40,068,011</b>
<b>NET INCOME</b>	<b>10,016,828</b>	<b>20,924,493</b>	<b>29,940,881</b>	<b>30,432,270</b>	<b>30,931,029</b>	<b>31,437,270</b>	<b>31,951,105</b>	<b>32,472,647</b>	<b>33,002,012</b>	<b>33,539,318</b>
Opening Balance	1,000,000	11,016,828	31,941,321	61,882,202	92,314,471	123,245,501	154,682,771	186,633,876	219,106,523	252,108,535
Closing Balance	11,016,828	31,941,321	61,882,202	92,314,471	123,245,501	154,682,771	186,633,876	219,106,523	252,108,535	285,647,853
Invested Capital	21,924,750									
Total Capital Expenditure	43,849,500									
NPV	200,523,511									

With a 50/50 private equity to commercial bank loan capital expenditure ratio, the payback period on the investment of \$21.92 million CAD is under two years and the accumulated cash flow is \$286 million after ten years. The Net Present Value (NPV) of the investment after ten years is \$200 million.

## Projection 2: 70/30

Camrose County	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
<b>REVENUE</b>										
Sales - Protein, Fibre, Starch	33,882,315	51,585,825	66,322,175	67,317,008	68,326,763	69,351,665	70,391,940	71,447,819	72,519,536	73,607,329
<b>TOTAL REVENUE</b>	<b>33,882,315</b>	<b>51,585,825</b>	<b>66,322,175</b>	<b>67,317,008</b>	<b>68,326,763</b>	<b>69,351,665</b>	<b>70,391,940</b>	<b>71,447,819</b>	<b>72,519,536</b>	<b>73,607,329</b>
<b>EXPENSES</b>										
<b>Cost of Goods Sold</b>										
Raw Material - Yellow Peas	8,245,350	12,553,545	16,139,675	16,381,770	16,627,497	16,876,909	17,130,063	17,387,014	17,647,819	17,912,536
Packaging	96,993	147,672	189,858	192,705	195,596	198,530	201,508	204,531	207,598	210,712
<b>Total COGS</b>	<b>8,342,343</b>	<b>12,701,218</b>	<b>16,329,532</b>	<b>16,574,475</b>	<b>16,823,093</b>	<b>17,075,439</b>	<b>17,331,570</b>	<b>17,591,544</b>	<b>17,855,417</b>	<b>18,123,248</b>
<b>Payroll Expenses</b>										
Wages and Benefits - Manager	104,938	106,512	108,109	109,731	111,377	113,047	114,743	116,464	118,211	119,984
Wages and Benefits - Supervisor	314,813	319,535	324,328	329,193	334,131	339,142	344,230	349,393	354,634	359,953
Wages and Benefits - Fractionation line	1,133,325	1,150,325	1,167,580	1,185,093	1,202,870	1,220,913	1,239,227	1,257,815	1,276,682	1,295,832
Wages and Benefits - Technician	245,554	249,237	252,976	256,770	260,622	264,531	268,499	272,527	276,614	280,764
Administration / Reception	96,543	97,991	99,460	100,952	102,467	104,004	105,564	107,147	108,754	110,386
<b>Total Payroll Expenses</b>	<b>1,895,171</b>	<b>1,923,599</b>	<b>1,952,453</b>	<b>1,981,740</b>	<b>2,011,466</b>	<b>2,041,638</b>	<b>2,072,262</b>	<b>2,103,346</b>	<b>2,134,896</b>	<b>2,166,920</b>
<b>General Expenses</b>										
Freight	458,672	698,328	897,817	911,284	924,953	938,827	952,910	967,204	981,712	996,437
Vehicle lease	8,500	8,628	8,757	8,888	9,022	9,157	9,294	9,434	9,575	9,719
Fuel and oil	10,000	10,150	10,302	10,457	10,614	10,773	10,934	11,098	11,265	11,434
Custodial	15,000	15,225	15,453	15,685	15,920	16,159	16,402	16,648	16,897	17,151
Variable Electricity Cost	1,248,300	1,267,025	1,286,030	1,305,320	1,324,900	1,344,774	1,364,945	1,385,419	1,406,201	1,427,294
Fixed Utilities Cost	5,000	5,075	5,151	5,228	5,307	5,386	5,467	5,549	5,632	5,717
Groundskeeping (Snow/Lands)	6,000	6,090	6,181	6,274	6,368	6,464	6,561	6,659	6,759	6,860
Repairs and maintenance	50,000	50,750	51,511	52,284	53,068	53,864	54,672	55,492	56,325	57,169
Insurance	90,000	91,350	92,720	94,111	95,523	96,956	98,410	99,886	101,384	102,905
Licenses	1,000	1,015	1,030	1,046	1,061	1,077	1,093	1,110	1,126	1,143
Marketing	50,000	50,750	51,511	52,284	53,068	53,864	54,672	55,492	56,325	57,169
Recruiting	10,000	2,030	2,060	2,091	2,123	2,155	2,187	2,220	2,253	2,287
Professional fees (accounting and legal)	25,000	25,375	25,756	26,142	26,534	26,932	27,336	27,746	28,162	28,585
Meals and Travel	50,000	50,750	51,511	52,284	53,068	53,864	54,672	55,492	56,325	57,169
Office furniture, computer, telephone	27,000	3,045	3,091	3,137	3,184	3,232	3,280	3,330	3,379	3,430
Finance and banking charges	1,500	1,523	1,545	1,569	1,592	1,616	1,640	1,665	1,690	1,715
Phone, fax, internet	6,000	6,090	6,181	6,274	6,368	6,464	6,561	6,659	6,759	6,860
Web Page	20,000	5,000	5,075	5,151	5,228	5,307	5,386	5,467	5,549	5,632
Software Purchases	3,000	1,015	1,030	1,046	1,061	1,077	1,093	1,110	1,126	1,143
Photocopier Lease	4,800	4,872	4,945	5,019	5,095	5,171	5,249	5,327	5,407	5,488
<b>Total General Expenses</b>	<b>2,089,772</b>	<b>2,304,084</b>	<b>2,527,660</b>	<b>2,565,574</b>	<b>2,604,058</b>	<b>2,643,119</b>	<b>2,682,766</b>	<b>2,723,007</b>	<b>2,763,852</b>	<b>2,805,310</b>
<b>EBITDA</b>	<b>21,555,029</b>	<b>34,656,924</b>	<b>45,512,531</b>	<b>46,195,219</b>	<b>46,888,147</b>	<b>47,591,469</b>	<b>48,305,341</b>	<b>49,029,921</b>	<b>49,765,370</b>	<b>50,511,851</b>
<b>Taxes</b>										
Income taxes	4,065,878	6,190,299	7,958,661	8,078,041	8,199,212	8,322,200	8,447,033	8,573,738	8,702,344	8,832,879
Property taxes	4,653,953	4,723,762	4,794,619	4,866,538	4,939,536	5,013,629	5,088,833	5,165,166	5,242,643	5,321,283
Interest Payment	682,737	668,802	654,145	638,726	622,508	605,448	587,502	568,625	548,768	527,881
Principle Payment	268,485	282,420	297,077	312,496	328,714	345,774	363,720	382,597	402,454	423,341
Amortization & Depreciation	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000
<b>TOTAL EXPENSES</b>	<b>23,231,339</b>	<b>30,027,184</b>	<b>35,747,146</b>	<b>36,250,590</b>	<b>36,761,586</b>	<b>37,280,246</b>	<b>37,806,687</b>	<b>38,341,024</b>	<b>38,883,376</b>	<b>39,433,863</b>
<b>NET INCOME</b>	<b>10,650,976</b>	<b>21,558,641</b>	<b>30,575,029</b>	<b>31,066,418</b>	<b>31,565,177</b>	<b>32,071,418</b>	<b>32,585,253</b>	<b>33,106,795</b>	<b>33,636,160</b>	<b>34,173,466</b>
<b>Opening Balance</b>	<b>1,000,000</b>	<b>11,650,976</b>	<b>33,209,617</b>	<b>63,784,646</b>	<b>94,851,063</b>	<b>126,416,241</b>	<b>158,487,659</b>	<b>191,072,912</b>	<b>224,179,707</b>	<b>257,815,867</b>
<b>Closing Balance</b>	<b>11,650,976</b>	<b>33,209,617</b>	<b>63,784,646</b>	<b>94,851,063</b>	<b>126,416,241</b>	<b>158,487,659</b>	<b>191,072,912</b>	<b>224,179,707</b>	<b>257,815,867</b>	<b>291,989,333</b>
<b>Invested Capital</b>	<b>30,694,650</b>									
<b>Total Capital Expenditure</b>	<b>43,849,500</b>									
<b>NPV</b>	<b>196,857,276</b>									

With a 70/30 private equity to commercial bank loan capital expenditure ratio, the payback period on the investment of \$30.39 million CAD is under two years and the accumulated cash flow after ten years is \$292 million. The NPV is \$197 million, calculated over a ten year period and discounted at the rate of borrowed capital.

### Projection 3: 70/30 with reduced input costs and higher protein prices

<i>Camrose County</i>	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
<b>REVENUE</b>										
Sales - Protein, Fibre, Starch	36,129,255	55,006,791	70,720,398	71,781,203	72,857,922	73,950,790	75,060,052	76,185,953	77,328,742	78,488,673
<b>TOTAL REVENUE</b>	<b>36,129,255</b>	<b>55,006,791</b>	<b>70,720,398</b>	<b>71,781,203</b>	<b>72,857,922</b>	<b>73,950,790</b>	<b>75,060,052</b>	<b>76,185,953</b>	<b>77,328,742</b>	<b>78,488,673</b>
<b>EXPENSES</b>										
<b>Cost of Goods Sold</b>										
Raw Material - Yellow Peas	7,391,250	11,253,178	14,467,836	14,684,854	14,905,126	15,128,703	15,355,634	15,585,968	15,819,758	16,057,054
Packaging	96,993	147,672	189,858	192,705	195,596	198,530	201,508	204,531	207,598	210,712
<b>Total COGS</b>	<b>7,488,243</b>	<b>11,400,851</b>	<b>14,657,694</b>	<b>14,877,559</b>	<b>15,100,722</b>	<b>15,327,233</b>	<b>15,557,142</b>	<b>15,790,499</b>	<b>16,027,356</b>	<b>16,267,767</b>
<b>Payroll Expenses</b>										
Wages and Benefits - Manager	104,938	106,512	108,109	109,731	111,377	113,047	114,743	116,464	118,211	119,984
Wages and Benefits - Supervisor	314,813	319,535	324,328	329,193	334,131	339,142	344,230	349,393	354,634	359,953
Wages and Benefits - Fractionation line	1,133,325	1,150,325	1,167,580	1,185,093	1,202,870	1,220,913	1,239,227	1,257,815	1,276,682	1,295,832
Wages and Benefits - Technician	245,554	249,237	252,976	256,770	260,622	264,531	268,499	272,527	276,614	280,764
Administration / Reception	96,543	97,991	99,460	100,952	102,467	104,004	105,564	107,147	108,754	110,386
<b>Total Payroll Expenses</b>	<b>1,895,171</b>	<b>1,923,599</b>	<b>1,952,453</b>	<b>1,981,740</b>	<b>2,011,466</b>	<b>2,041,638</b>	<b>2,072,262</b>	<b>2,103,346</b>	<b>2,134,896</b>	<b>2,166,920</b>
<b>General Expenses</b>										
Freight	458,672	698,328	897,817	911,284	924,953	938,827	952,910	967,204	981,712	996,437
Vehicle lease	8,500	8,628	8,757	8,888	9,022	9,157	9,294	9,434	9,575	9,719
Fuel and oil	10,000	10,150	10,302	10,457	10,614	10,773	10,934	11,098	11,265	11,434
Custodial	15,000	15,225	15,453	15,685	15,920	16,159	16,402	16,648	16,897	17,151
Variable Electricity Cost	1,248,300	1,267,025	1,286,030	1,305,320	1,324,900	1,344,774	1,364,945	1,385,419	1,406,201	1,427,294
Fixed Utilities Cost	5,000	5,075	5,151	5,228	5,307	5,386	5,467	5,549	5,632	5,717
Groundskeeping (Snow/Lands)	6,000	6,090	6,181	6,274	6,368	6,464	6,561	6,659	6,759	6,860
Repairs and maintenance	50,000	50,750	51,511	52,284	53,068	53,864	54,672	55,492	56,325	57,169
Insurance	90,000	91,350	92,720	94,111	95,523	96,956	98,410	99,886	101,384	102,905
Licenses	1,000	1,015	1,030	1,046	1,061	1,077	1,093	1,110	1,126	1,143
Marketing	50,000	50,750	51,511	52,284	53,068	53,864	54,672	55,492	56,325	57,169
Recruiting	10,000	2,030	2,060	2,091	2,123	2,155	2,187	2,220	2,253	2,287
Professional fees (accounting and legal)	25,000	25,375	25,756	26,142	26,534	26,932	27,336	27,746	28,162	28,585
Meals and Travel	50,000	50,750	51,511	52,284	53,068	53,864	54,672	55,492	56,325	57,169
Office furniture, computer, telephone	27,000	3,045	3,091	3,137	3,184	3,232	3,280	3,330	3,379	3,430
Finance and banking charges	1,500	1,523	1,545	1,569	1,592	1,616	1,640	1,665	1,690	1,715
Phone, fax, internet	6,000	6,090	6,181	6,274	6,368	6,464	6,561	6,659	6,759	6,860
Web Page	20,000	5,000	5,075	5,151	5,228	5,307	5,386	5,467	5,549	5,632
Software Purchases	3,000	1,015	1,030	1,046	1,061	1,077	1,093	1,110	1,126	1,143
Photocopier Lease	4,800	4,872	4,945	5,019	5,095	5,171	5,249	5,327	5,407	5,488
<b>Total General Expenses</b>	<b>2,089,772</b>	<b>2,304,084</b>	<b>2,527,660</b>	<b>2,565,574</b>	<b>2,604,058</b>	<b>2,643,119</b>	<b>2,682,766</b>	<b>2,723,007</b>	<b>2,763,852</b>	<b>2,805,310</b>
<b>EBITDA</b>	<b>24,656,069</b>	<b>39,378,257</b>	<b>51,582,592</b>	<b>52,356,331</b>	<b>53,141,675</b>	<b>53,938,801</b>	<b>54,747,883</b>	<b>55,569,101</b>	<b>56,402,637</b>	<b>57,248,677</b>
Taxes										
Income taxes	4,335,511	6,600,815	8,486,448	8,613,744	8,742,951	8,874,095	9,007,206	9,142,314	9,279,449	9,418,641
Property taxes	4,653,953	4,723,762	4,794,619	4,866,538	4,939,536	5,013,629	5,088,833	5,165,166	5,242,643	5,321,283
Interest Payment	682,737	668,802	654,145	638,726	622,508	605,448	587,502	568,625	548,768	527,881
Principle Payment	268,485	282,420	297,077	312,496	328,714	345,774	363,720	382,597	402,454	423,341
Amortization & Depreciation	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000
<b>TOTAL EXPENSES</b>	<b>22,646,872</b>	<b>29,137,333</b>	<b>34,603,094</b>	<b>35,089,377</b>	<b>35,582,955</b>	<b>36,083,936</b>	<b>36,592,431</b>	<b>37,108,554</b>	<b>37,632,419</b>	<b>38,164,142</b>
<b>NET INCOME</b>	<b>13,482,383</b>	<b>25,869,458</b>	<b>36,117,303</b>	<b>36,691,826</b>	<b>37,274,967</b>	<b>37,866,855</b>	<b>38,467,621</b>	<b>39,077,398</b>	<b>39,696,323</b>	<b>40,324,531</b>
<b>Opening Balance</b>	<b>1,000,000</b>	<b>14,482,383</b>	<b>40,351,841</b>	<b>76,469,145</b>	<b>113,160,971</b>	<b>150,435,938</b>	<b>188,302,792</b>	<b>226,770,413</b>	<b>265,847,812</b>	<b>305,544,134</b>
<b>Closing Balance</b>	<b>14,482,383</b>	<b>40,351,841</b>	<b>76,469,145</b>	<b>113,160,971</b>	<b>150,435,938</b>	<b>188,302,792</b>	<b>226,770,413</b>	<b>265,847,812</b>	<b>305,544,134</b>	<b>345,868,665</b>
<b>Invested Capital</b>	<b>30,694,650</b>									
<b>Total Capital Expenditure</b>	<b>43,849,500</b>									
<b>NPV</b>	<b>239,268,340</b>									

With a 70/30 private equity to commercial bank loan capital expenditure ratio, a reduced yellow pea cost per metric ton from \$251 to \$225 and the price of pea protein increases from \$2,640/MT to \$3,000/MT, the payback period on the investment of \$30.69 million CAD is a year and a half, and the accumulated cash balance after 5 years is \$150 million. The NPV is \$239 million.

### Projection 4: 70/30 with increase input costs and lower protein prices

<i>Camrose County</i>	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
<b>REVENUE</b>										
Sales - Protein, Fibre, Starch	29,887,755	45,504,107	58,503,114	59,380,660	60,271,370	61,175,441	62,093,073	63,024,469	63,969,836	64,929,383
<b>TOTAL REVENUE</b>	<b>29,887,755</b>	<b>45,504,107</b>	<b>58,503,114</b>	<b>59,380,660</b>	<b>60,271,370</b>	<b>61,175,441</b>	<b>62,093,073</b>	<b>63,024,469</b>	<b>63,969,836</b>	<b>64,929,383</b>
<b>EXPENSES</b>										
<b>Cost of Goods Sold</b>										
Raw Material - Yellow Peas	9,855,000	15,004,238	19,290,448	19,579,805	19,873,502	20,171,604	20,474,178	20,781,291	21,093,010	21,409,406
Packaging	96,993	147,672	189,858	192,705	195,596	198,530	201,508	204,531	207,598	210,712
<b>Total COGS</b>	<b>9,951,993</b>	<b>15,151,910</b>	<b>19,480,306</b>	<b>19,772,510</b>	<b>20,069,098</b>	<b>20,370,134</b>	<b>20,675,686</b>	<b>20,985,822</b>	<b>21,300,609</b>	<b>21,620,118</b>
<b>Payroll Expenses</b>										
Wages and Benefits - Manager	104,938	106,512	108,109	109,731	111,377	113,047	114,743	116,464	118,211	119,984
Wages and Benefits - Supervisor	314,813	319,535	324,328	329,193	334,131	339,142	344,230	349,393	354,634	359,953
Wages and Benefits - Fractionation line	1,133,325	1,150,325	1,167,580	1,185,093	1,202,870	1,220,913	1,239,227	1,257,815	1,276,682	1,295,832
Wages and Benefits - Technician	245,554	249,237	252,976	256,770	260,622	264,531	268,499	272,527	276,614	280,764
Administration / Reception	96,543	97,991	99,460	100,952	102,467	104,004	105,564	107,147	108,754	110,386
<b>Total Payroll Expenses</b>	<b>1,895,171</b>	<b>1,923,599</b>	<b>1,952,453</b>	<b>1,981,740</b>	<b>2,011,466</b>	<b>2,041,638</b>	<b>2,072,262</b>	<b>2,103,346</b>	<b>2,134,896</b>	<b>2,166,920</b>
<b>General Expenses</b>										
Freight	458,672	698,328	897,817	911,284	924,953	938,827	952,910	967,204	981,712	996,437
Vehicle lease	8,500	8,628	8,757	8,888	9,022	9,157	9,294	9,434	9,575	9,719
Fuel and oil	10,000	10,150	10,302	10,457	10,614	10,773	10,934	11,098	11,265	11,434
Custodial	15,000	15,225	15,453	15,685	15,920	16,159	16,402	16,648	16,897	17,151
Variable Electricity Cost	1,248,300	1,267,025	1,286,030	1,305,320	1,324,900	1,344,774	1,364,945	1,385,419	1,406,201	1,427,294
Fixed Utilities Cost	5,000	5,075	5,151	5,228	5,307	5,386	5,467	5,549	5,632	5,717
Groundskeeping (Snow/Lands)	6,000	6,090	6,181	6,274	6,368	6,464	6,561	6,659	6,759	6,860
Repairs and maintenance	50,000	50,750	51,511	52,284	53,068	53,864	54,672	55,492	56,325	57,169
Insurance	90,000	91,350	92,720	94,111	95,523	96,956	98,410	99,886	101,384	102,905
Licenses	1,000	1,015	1,030	1,046	1,061	1,077	1,093	1,110	1,126	1,143
Marketing	50,000	50,750	51,511	52,284	53,068	53,864	54,672	55,492	56,325	57,169
Recruiting	10,000	2,030	2,060	2,091	2,123	2,155	2,187	2,220	2,253	2,287
Professional fees (accounting and legal)	25,000	25,375	25,756	26,142	26,534	26,932	27,336	27,746	28,162	28,585
Meals and Travel	50,000	50,750	51,511	52,284	53,068	53,864	54,672	55,492	56,325	57,169
Office furniture, computer, telephone	27,000	3,045	3,091	3,137	3,184	3,232	3,280	3,330	3,379	3,430
Finance and banking charges	1,500	1,523	1,545	1,569	1,592	1,616	1,640	1,665	1,690	1,715
Phone, fax, internet	6,000	6,090	6,181	6,274	6,368	6,464	6,561	6,659	6,759	6,860
Web Page	20,000	5,000	5,075	5,151	5,228	5,307	5,386	5,467	5,549	5,632
Software Purchases	3,000	1,015	1,030	1,046	1,061	1,077	1,093	1,110	1,126	1,143
Photocopier Lease	4,800	4,872	4,945	5,019	5,095	5,171	5,249	5,327	5,407	5,488
<b>Total General Expenses</b>	<b>2,089,772</b>	<b>2,304,084</b>	<b>2,527,660</b>	<b>2,565,574</b>	<b>2,604,058</b>	<b>2,643,119</b>	<b>2,682,766</b>	<b>2,723,007</b>	<b>2,763,852</b>	<b>2,805,310</b>
<b>EBITDA</b>	<b>15,950,819</b>	<b>26,124,514</b>	<b>34,542,696</b>	<b>35,060,836</b>	<b>35,586,749</b>	<b>36,120,550</b>	<b>36,662,358</b>	<b>37,212,294</b>	<b>37,770,478</b>	<b>38,337,035</b>
Taxes										
Income taxes	3,586,531	5,460,493	7,020,374	7,125,679	7,232,564	7,341,053	7,451,169	7,562,936	7,676,380	7,791,526
Property taxes	4,653,953	4,723,762	4,794,619	4,866,538	4,939,536	5,013,629	5,088,833	5,165,166	5,242,643	5,321,283
Interest Payment	682,737	668,802	654,145	638,726	622,508	605,448	587,502	568,625	548,768	527,881
Principle Payment	268,485	282,420	297,077	312,496	328,714	345,774	363,720	382,597	402,454	423,341
Amortization & Depreciation	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000	1,233,000
<b>TOTAL EXPENSES</b>	<b>24,361,642</b>	<b>31,748,070</b>	<b>37,959,632</b>	<b>38,496,263</b>	<b>39,040,944</b>	<b>39,593,795</b>	<b>40,154,938</b>	<b>40,724,499</b>	<b>41,302,603</b>	<b>41,889,379</b>
<b>NET INCOME</b>	<b>5,526,113</b>	<b>13,756,037</b>	<b>20,543,482</b>	<b>20,884,397</b>	<b>21,230,426</b>	<b>21,581,646</b>	<b>21,938,134</b>	<b>22,299,970</b>	<b>22,667,232</b>	<b>23,040,004</b>
Opening Balance	1,000,000	6,526,113	20,282,150	40,825,632	61,710,029	82,940,455	104,522,102	126,460,236	148,760,205	171,427,438
Closing Balance	6,526,113	20,282,150	40,825,632	61,710,029	82,940,455	104,522,102	126,460,236	148,760,205	171,427,438	194,467,442
Invested Capital	30,694,650									
Total Capital Expenditure	43,849,500									
NPV	120,093,014									

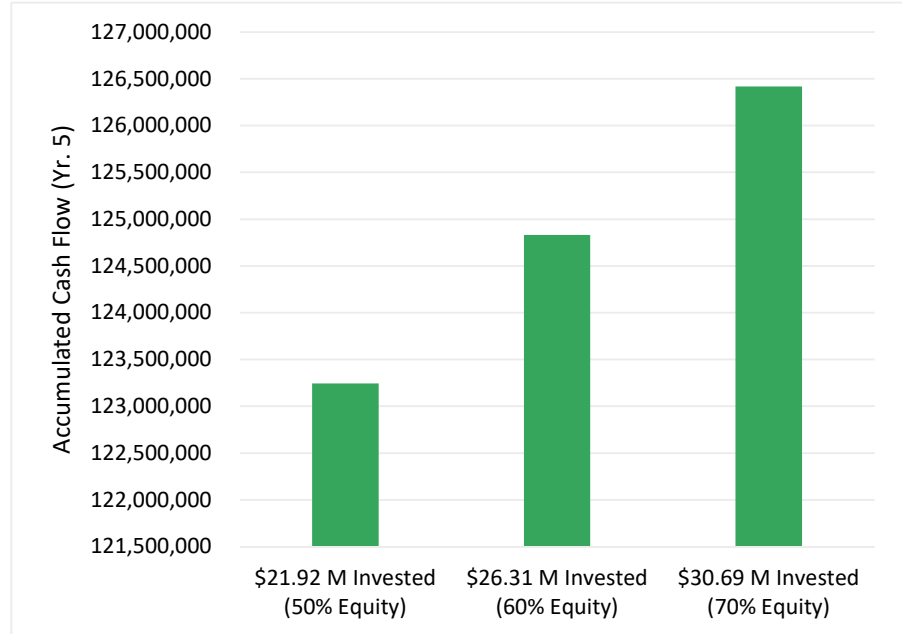
With a 70/30 private equity to commercial bank loan capital expenditure ratio, an increase in yellow pea cost per metric ton to \$300 and a reduced price for pea protein to \$2,000/MT, the payback period on the investment of \$30.69 million CAD is pushed out to two and a half years and the NPV drops to \$120 million.

## 5.4 Summary of Results

The following summarizes the findings from the financial analysis.

- In a base scenario, the 12 MT/hr yellow pea fractionation facility with 70% private equity, shipping protein, starch and fibre to Edmonton via truck pays back the initial \$31 million investment in 2.5 years and has an accumulated cash flow of over \$126 million by year 5 (Figure 5).

**Figure 5: Closing Cash Balance End of Year 5 Relative to Initial Investment**



- Projection 3 demonstrates the effect of the price of yellow peas reducing by \$25/MT and the price of protein fibre increasing to \$360/MT. The future price of yellow peas in the surrounding region (BRAED) will depend on supply and demand, but if considerable acres are converted from canola production it is feasible that the price could come down, thereby making a stronger case for pea fractionation. There is also potential for increasing pea protein prices in the years ahead, driven by demand for plant-based proteins. Projection 4 shows the opposite scenario, when yellow pea prices increase and pea protein prices slump. The results in both scenarios are as expected. With higher input prices for yellow peas and lower world market prices for protein, the payback period on the initial investment is pushed out, whereas the opposite is true for lower cost inputs and higher priced outputs.

The choice of the City of Camrose for the benchmark analysis in no way suggests that this location is the most favorable choice to locate a fractionation plant. The model requires that a given location be used in order to generate the results for comparison purposes. What it does illustrate is the relative importance of cost of goods sold and market pricing.