An Economic Feasibility Analysis of Food Fish Aquaculture in Minnesota

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Abstract

Food security is increasingly at risk due to overfishing, pollution, and climate-related disruptions. Therefore, it is essential to implement sustainable solutions to meet the rising global demand for seafood. This thesis examines the economic feasibility of using recirculating aquaculture systems (RAS) to achieve year-round food-fish production in Minnesota. RAS are indoor fish-rearing systems that filter and recirculate water to tanks through a combination of mechanical and biological processes. While Minnesota's aquaculture industry has historically focused on raising fish for bait and stocking, there is a growing interest in farming native species, such as walleye and yellow perch, for human consumption. To evaluate commercial viability, enterprise budgets were developed for food fish operations of walleye, yellow perch, and pacific white shrimp at two different production scales. These budgets were refined based on feedback from regional producers. Breakeven costs and net present value (NPV) estimates were calculated for each enterprise. The NPV estimates were then subjected to sensitivity analysis. The analysis revealed that smaller-scale operations were not commercially viable under the proposed or altered market conditions. In contrast, larger-scale enterprises showed potential for profitability when key variables were adjusted. Key variables driving positive NPV estimates include higher sale prices, greater production volumes, and reduced capital investment, feed, and labor costs. The findings help establish realistic expectations for commercial-scale aquaculture in Minnesota.

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I. Introduction

Demand for seafood is rising. In 2019, aquatic organisms accounted for 17 percent of all animal proteins consumed worldwide (FAO, 2022). Worldwide demand for seafood continues to rise at an average annual rate of 3 percent, outpacing the average population growth of 1.6 percent (FAO, 2022). In 2020, the average per capita seafood consumption was 20.2 kg. By 2030, consumption is projected to increase to 21.4 kg (FAO, 2022). Rising incomes, urbanization, advancements in post-harvest practices, and shifting dietary trends collectively drive up the demand for seafood (FAO, 2022).

The seafood industry is a major player in the global economy, with the majority of its activities concentrated in Asia. Asian countries operate the largest offshore fishing fleets, accounting for about 66 percent of the world's fishing vessels (FAO, 2022). However, overfishing affects 35.4% of ocean fish stocks, while 72% of global inland bodies of water are subject to moderate to high levels of fishing pressure (FAO, 2022).

The global trade of aquatic organisms has steadily grown over the past decades, driven by increasing demand for high-value species and shifting consumer preferences. The average annual growth rate for traded aquatic organisms was 3.9 percent in real terms from 1976 to 2020 (FAO, 2022). This growth in value relative to quantity shows an increase in the proportion of high-value species traded. The United States is the world's largest importer of aquatic food (FAO, 2022). Imported seafood accounts for about 65 percent of seafood consumed in the United States (Gephart et al., 2019). However, food fish consumers are increasingly emphasizing the purchase

of locally grown and sustainably raised fish, as food security becomes a greater concern due to natural disasters and climate change (FAO, 2022).

The seafood industry also includes aquaculture. The Food and Agriculture Organization (FAO) defines aquaculture as the farming of aquatic organisms with interventions in the rearing process to enhance production (FAO, 2025). Aquaculture has the potential to overcome the challenges that threaten wild fish stocks and meet the growing demand for seafood (NOAA, 2022). Aquatic organisms are farmed for various reasons, including for use as baitfish, food fish, fishing, stocking, and ornamental purposes. Fish can be raised in various types of systems, including raceways, ponds, net pens, and recirculating aquaculture systems. In 2020, approximately 20.5 million people were employed in aquaculture worldwide (FAO, 2022). Grass carp and Atlantic salmon are the most commonly farmed species globally (FAO, 2022). With China as the leading exporter, Asia dominates the industry, contributing 90 percent of the global aquaculture food fish supply.

Increasing competition for land, water, and energy, along with overfishing, poses challenges for meeting the rising demand for seafood. Therefore, sustainable intensification is needed to maximize food fish production while minimizing resource depletion and environmental impact (Godfray et al., 2010). Advancements in recirculating aquaculture system (RAS) technology have made indoor fish farming an attractive option to accomplish this goal. RAS are indoor fish-rearing systems that utilize mechanical and biological filtration to continuously recycle water through fish tanks.

Aquaculture is a relatively new and emerging industry in the Great Lakes region. As of 2018, the Midwest was home to only 308 commercial aquaculture farms (NASS Census of

Aquaculture, 2018). Historically, aquaculture in Minnesota has focused on raising fish for bait or stocking purposes (NASS Census of Aquaculture, 2013). However, interest in food-fish aquaculture is increasing in the region. Particularly, there is growing interest in raising walleye, yellow perch, and pacific white shrimp using RAS. Regional consumers favor these fish species, which are native to the Great Lakes region. Pacific white shrimp are not native to the Great Lakes region and are a saltwater species. RAS makes expanding aquaculture in the Midwest more feasible by extending the growing season beyond outdoor seasonal limits. RAS also meets the consumer preference for locally grown and sustainably raised protein.

This thesis will explore the feasibility of starting a new aquaculture farm in the Great Lakes region, with a focus on raising walleye, yellow perch, and pacific white shrimp in RAS in Minnesota. Enterprise budgets were developed for each species at differing production scales and compared to market prices to determine their profit potential. The budgeted costs are based on existing literature, listed sale prices, and discussions with regional producers about their experiences. Net present value (NPV) calculations were also performed for each enterprise and analyzed for their sensitivity to various components. The NPV represents the current dollar value of all a project's cash flow over time.

II. Literature Review

Seafood farmed in the United States is consistently ranked as the "best choice" by the Monterey Bay Aquarium Seafood Watch Consumer Guide, which judges seafood based on food safety and sustainability criteria (Monterey Bay Aquarium, 2025). The United States contributes only 1.5% of farmed seafood worldwide despite having adequate resources to produce more

(Moen et al., 2017). Not producing to its full potential in aquaculture contributes to the United States' $70 billion trade deficit (Bureau of Economic Analysis, 2024). Advances in recirculating aquaculture system (RAS) technology may make this rearing method a viable solution for closing the gap in domestic supply and demand. According to the most recent Aquaculture Census, RAS accounts for 452 aquaculture farms in the United States, which is about 13% of total aquaculture farms (NASS Aquaculture Census, 2018).

Aquaculture faces many challenges, with one notable challenge being the regulatory burden on farms. Aquaculture is one of the most highly regulated industries in the United States (Duff et al., 2003). For example, 30% of surveyed aquaculture farmers in the United States reported regulatory burden as their number one or two challenge (Van Senten and Engle, 2017). Wisconsin farmers reported needing to comply with 14 regulations and carry 17 permits. However, across the United States, on average, farms must obtain six permits and comply with eight regulations to operate legally. These regulations impact many aspects of the business, including the care of commercially raised seafood, interstate transportation, and environmental management (Van Senten and Engle, 2017). The actual cost of permits accounts for a small percentage of overall regulatory expenses. Intense regulation requires more labor hours to manage compliance and track permit renewals (Van Senten and Engle, 2017). Most regulations apply to farms of all sizes. Therefore, large-scale farms benefit from economies of scale, enabling them to distribute costs across higher production levels (Van Senten and Engle, 2017). Furthermore, most other aquaculture-producing countries require farms to adhere to less stringent regulations, making these countries more competitive in the global marketplace.

Limited access to fingerlings is another challenge the aquaculture industry faces. Many species, including yellow perch and walleye, spawn only once a year, making continuous growth and harvest difficult. Cold banking is a management strategy that can be used to offset this challenge and smooth production throughout the year (Shewmon, 2005). Cold banking slows the growth rate of fingerlings by exposing them to cold water for a period of time. High costs of equipment, feed, and processing are also challenges. Fish feed is typically composed of soy, corn, and fishmeal. These ingredients are used in many other industries, making it hard for aquaculture to compete for them (Moen et al., 2017). Acquiring capital to build aquaculture facilities is also difficult. Lenders are cautious about lending to aquaculture farms due to their low success rate (Moen et al., 2017). Finally, limited knowledge of local markets and pricing further hinders the success of producers (Moen et al., 2017).

Consumer demand and preferences are factors shaping the growth of Minnesota's aquaculture industry. In states surrounding the Great Lakes, consumers are willing to pay a premium of $4.00 per pound for yellow perch and $3.49 per pound for walleye (Athnos et al.,2022). Similarly, the study showed that, on average, domestic consumers are willing to pay a $1.64 per pound premium for fish sourced from the North Central Region of the United States. This demand presents a significant opportunity for Minnesota's aquaculture industry, which consists of 12 USDA-recognized food fish farms that contribute $1,716,000 annually to the state's economy (NASS Census of Aquaculture, 2018). Minnesota Sea Grant Aquaculture Workshop attendees identified yellow perch and walleye as the species of regional interest for aquaculture (Moen et al., 2017). Similarly, a review of Minnesota restaurants revealed that

shrimp was the most frequently listed seafood on menus, making it a species of interest as well (Moen et al., 2017).

Aquaculture Workshop participants highlighted RAS as the production system of interest (Moen et al., 2017). Compared to other fish-rearing methods, RAS offers several advantages. Fully recirculating systems recycle over 90 percent of the water in the system with loss due only to evaporation or sludge deposits (Timmons and Vinci, 2022). In comparison, raceways discharge large volumes of water, requiring 4,200 times more water per kilogram of production than RAS. As a result, raceways are subject to more wastewater regulations. Similarly, ponds use 80 to 420 times more water per kilogram of production than RAS (Timmons and Vinci, 2022). RAS also offers the potential to conserve energy. RAS minimizes the energy needed to maintain optimal growth temperatures by continuously recycling water. In contrast, flow-through systems discard used water, so they often use more energy to heat replacement water from the ground temperature to the desired temperature for grow-out. Finally, outdoor systems, such as ponds, expose fish to natural disasters, predators, and diseases. In contrast, indoor recirculating systems better control biosecurity by using well-supplied water that is sterilized by a UV filter (Brengballe, 2022). RAS also has disadvantages compared to other systems. RAS requires a lot of equipment and technology, so it has a higher upfront cost than other systems. It also requires a large amount of energy to operate the filtration system.

Although several enterprise budgets exist in aquaculture literature, few focus on RAS. Most budgets focus on bass, trout, tilapia, or catfish grown in ponds. Additionally, many of these budgets are modeled in southern states with long growing seasons. Several budgets are also outdated, with publication dates ranging from 1990 to 2008. The North Central Regional

Aquaculture Center developed a series of enterprise budgets for yellow perch grown in ponds in Wisconsin and Indiana (Malison and Held, 2008). Purdue University created an interactive budgeting tool to estimate the cost of producing yellow perch and other species in RAS (Quagrainie and Malekar, 2012). This tool creates future cash flow projections, rather than focusing on the breakeven cost of production. Purdue also created a series of shrimp production budgets that highlight cash flow over time for growing shrimp to various market sizes, to understand the financial impacts of harvest size. In 2023, the Northern Aquaculture Demonstration Facility created an enterprise budget for raising walleye in a recirculating aquaculture system (Held, 2023). This budget examines the production costs associated with raising 6,292 pounds of fish, assuming the farmer starts with an existing building and utilities. In 2024, the University of Missouri Extension released an indoor grow-out budget for shrimp in a recirculating aquaculture system (Kientzy et al., 2024 and Honer et al., 2023). This budget assumes the farm starts from scratch and builds a new facility. It focuses on the breakeven cost of producing 15,000 pounds of shrimp in Missouri, each weighing 22 grams.

This thesis will develop enterprise budget data for three species and various production scales to identify economic barriers specific to Minnesota's aquaculture industry. Few budget studies focus on yellow perch or walleye raised in RAS (Athnos et al., 2022). The budgets presented here each focus on two different production scales and aim to inform potential aquaculture farmers in Minnesota, which has a small but expanding aquaculture industry. The budgets analyzed in this thesis assume the farmer starts from scratch. The breakeven cost of production and NPV will provide insight into whether Minnesota can sustain a profitable aquaculture industry based on market value and consumer willingness to pay for locally grown,

farm-raised fish. This information can also provide data to guide financing decisions for new aquaculture farms. This analysis aims to clarify the economic viability of expanding Minnesota's aquaculture industry, particularly for species underrepresented in existing research.

III. Methods

1. Enterprise Budgets and Profit Analysis

Enterprise budgets demonstrate the revenues and expenses associated with producing a single unit of product (Kay et al., 2020). In aquaculture, enterprise budgets estimate the cost of producing each pound of fish fillets or shrimp. By using a consistent per-unit measurement, values can be compared across different scales and species. Calculating the expected production costs in the Great Lakes region allows potential farmers to evaluate the profitability of farming various species by comparing costs to market prices. Likewise, existing farmers can use these budgets to benchmark their expenses and profitability against regional averages.

The profit an enterprise generates is the difference between revenue and expenses. We assumed that the farmer sells all the fish upon harvest and receives payment at the time of product transfer. Thus, all revenue is cash revenue. Selling sludge and fish waste from the system is another potential revenue stream that can help lower the breakeven cost per pound of fillets. However, this thesis does not explore the profit potential of fish waste and ignores it as a revenue variable. The profit equation includes cash and non-cash expenses. This thesis classifies cash expenses into operating and overhead expenses, while treating depreciation as a non-cash

expense. Taxes are excluded from the profit equation because they are calculated as a percentage of profit.

Businesses use either accounting or economic profit models to measure profit. Accounting profit results from subtracting all explicit expenses from total revenue. Economic profit accounts for explicit and implicit expenses, such as opportunity costs, subtracted from total revenue. Economic profits reveal whether a business benefits or suffers as a result of its resource allocation. In this model, opportunity cost includes owner labor and land value. Most agricultural producers do not pay themselves a consistent salary as employees of the business. Many of them instead make withdrawals from the business to cover necessary expenses. However, their labor must be accounted for as an opportunity cost because they could earn income elsewhere through employment. Land use is also considered an opportunity cost. If a farmer owns land, it could be sold instead of being used for an aquaculture farm. To reflect the opportunity cost of land, this model assumes that land is purchased to build an aquaculture farm. This thesis, therefore, focuses on economic costs. However, if the land is purchased and owner labor is compensated as an employee expense, then economic and accounting costs would be equal.

2. Overview of the Enterprises

Enterprise budgets were developed for different scales and species raised in RAS in Minnesota. Yellow perch and walleye were selected based on strong interest from Minnesota producers (Moen et al., 2017) and validated by consumer preference (Athnos et al., 2022). Pacific white shrimp was included based on strong producer interest and broad market appeal. It is also the most commonly featured seafood on restaurant menus in Minnesota (Moen et al.,

2017). Small and large-scale production was explored for each species to understand the magnitude of economies of scale in RAS. Table 1 provides information about the scale of each enterprise. Industry experts provided production scale estimates for each species' smaller and larger-scale enterprises. These estimates determined the approximate water volume needed for the system based on stocking density. The approximate system water volume was divided by the number of harvests per year to get the volume needed per tank to support the target level of production. The tank with the closest volume was then selected, and the calculation was done in reverse to obtain the annual production level for each species and scale. The pounds of fillets sold per year are rounded to assume that only whole fillets are packaged and sold. The average fillet yield was determined for each species in the model. One pound was divided by the fillet yield in grams of one fish to determine how many fish are needed to produce one pound of fillets. The total production level was then divided by the number of fish (rounded to the nearest half or whole) required to yield one pound of fillets. A similar process was used for pacific white shrimp.

All the enterprises assume the farm starts from scratch. Each farmer is assumed to purchase one acre of land, build a shed, drill a well, and purchase new RAS equipment. All the farms are grow-out operations that raise purchased fingerlings or post-larvae (PLs) to market size. The smaller-scale farms harvest one tank of fish once a month, while the larger-scale farms harvest one tank each week. All the fish are processed for sale off-site.

A complete list of enterprise assumptions is summarized in the appendices. The assumptions used to create the walleye enterprise budgets are detailed in tables A1-A3. Assumptions for the yellow perch enterprise budgets are presented in tables B1-B3. The

assumptions used to create the pacific white shrimp enterprise budgets are found in tables C1-C4.

Table 1. Enterprise Overviews

Species and Scale	Fingerlings/PLs Purchased Annually	Number Harvested Annually	Appx yield (g)	Harvests per Year	Pound of Fillets/Shrimp Sold Annually	Tanks
Smaller walleye	11,136	10,584	102	12	5,292	13 Tanks: (10x3ft) (1,765 gal)
Larger walleye	52,676	50,024	102	52	25,012	58 Tanks: (10x3.5ft) (2,056 gal)
Smaller yellow perch	14,844	14,100	35.25	12	2,169	10 Tanks: (10x2ft) (1,175 gal)
Larger yellow perch	70,616	67,080	35.25	52	10,320	43 Tanks: (8x3.5ft) (1,290 gal)
Smaller pacific white shrimp	137,352	109,872	14	12	3,434	6 Tanks: (14x3ft) (3,455 gal)
Larger pacific white shrimp	573,820	459,056	14	52	14,346	13 Tanks: (18x3.5ft) (6,662 gal)

Given the variability in input costs across the aquaculture industry, a total of eight individuals with aquaculture experience were interviewed from August to October 2024, meaning each budget was reviewed by two to three experienced producers. The producers were asked to help identify a range of cost inputs that best represented the experiences of farmers in the Great Lakes region. Since the costs are averaged across various experiences and based on calculations using standardized variables, these budgets provide a good starting point for estimating the costs of raising fish in RAS in Minnesota. However, they are not a perfect reflection of the costs experienced by producers. Table 2 provides a list of interviewed industry experts.

Table 2. Interviewed Aquaculture Experts	
Pseudonym	Aquaculture Experience
Alex	For three years, Alex has farmed walleye in RAS as part of an aquaponics system in Wisconsin.
Avery	Avery is a yellow perch farmer in Wisconsin who uses RAS. Avery also has experience raising walleye in RAS.
Brooke	Brooke works in RAS equipment sales and design.
Cameron	Cameron has farmed shrimp in Minnesota for nearly 10 years. Cameron raises PLs for sale and uses RAS for growout.
Casey	Casey is a researcher who has researched fisheries for nearly 10 years. In recent years, Casey's research has focused on raising walleye in RAS.
Jordan	Jordan spent many years researching how to raise walleye in RAS. Jordan now works as a consultant.
Logan	Logan is a yellow perch researcher working on spawning yellow perch year-round in RAS.
Payton	Payton has raised shrimp in RAS in Ohio for 10 years. Payton owns a restaurant in conjunction with the shrimp farm.
Riley	For the past 15 years, Riley has farmed yellow perch in RAS in Minnesota. Riley focuses on selling fillets to restaurants.
Taylor	Taylor is a yellow perch farmer in Minnesota who uses a combination of RAS and ponds for growout.

3. Operating and Overhead Expenses

Operating expenses result from production activities and vary with production level. If a farm stopped producing fish, these costs would decrease to zero. These costs are also known as variable costs. This category of costs includes the purchase of fingerlings, feed, hired labor, owner labor, electricity for pumps and filters, sales and marketing, repairs and maintenance, and fish processing.

The standard practice in fish farming is to purchase feed-trained fingerlings for grow-out, since few farms maintain their own broodstock and hatch eggs. Industry experts agree that this model will likely continue for the foreseeable future. Researchers are working to create artificial

environments that allow fish to spawn year-round, providing continuous access to fingerlings. Currently, walleye spawn 3-4 times yearly in a research facility (Alex), and captive yellow perch spawn once yearly (Riley). Pacific white shrimp naturally spawn year-round (Cameron). There is a push to add hatcheries for all three species in the Midwest and across the United States. Too few walleye and yellow perch hatchers exist in the United States to meet the growing demand for feed-trained fingerlings. Denmark provides one of the most reliable sources for walleye fingerlings (Alex). However, these fish belong to a different strain than those naturally found in the Great Lakes region and must endure a lengthy journey to reach the Midwest. Pacific white shrimp post-larvae (PL) producers primarily operate along the southern coast of the United States. Concentrated production in this region concerns pacific white shrimp producers because this region is prone to hurricane damage, which can disrupt the supply chain for post-larvae pacific white shrimp (Cameron). Cold banking is a management tool that can smooth the production of walleye and yellow perch fillets throughout the year by delaying the growth of fingerlings. This practice can be costly, as it may require additional equipment to control fingerling growth rates. The cost of equipment for cold-banking fingerlings is included in the miscellaneous equipment and tools category on the enterprise budgets.

To calculate the number of fingerlings purchased within a year for each model, the number of fish per tank was divided by the survival rate and then multiplied by the total number of tanks. The number of fish per tank was calculated by multiplying the tank volume by the target stocking density. The target stocking density is the maximum biomass that each tank can sustain without compromising growth efficiency. This calculation for each enterprise is shown in Table 3. The price per fingerling varies by species. The lowest price for two-inch walleye

fingerlings was calculated by multiplying the fingerling length by $0.25 per inch (Held, 2023). However, some producers reported significantly higher prices. The consensus was that a mid-value would provide the best estimate for the cost of walleye fingerlings. For yellow perch fingerlings, the formula used by the Northern Aquaculture Demonstration Facility for walleye fingerlings accurately represents the midrange cost, which is calculated by multiplying the fingerling length by $0.25 per inch. A feed-trained yellow perch fingerling is also expected to be two inches long (Quagrainie & Malekar, 2012). For pacific white shrimp, the high end of the price range was used for the smaller-scale farm budget, while the low end was used for the larger-scale budget, reflecting farmers' experiences. Price information for PLs and fingerlings is in Table 4.

Table 3. Annual Quantity of Fingerlings Purchased

Species and Scale	Target Density (kg/m^3)	Mortality Rate	Fish Per Tank	Tanks Harvested Annually	Annual Quantity of Fingerlings
Smaller walleye	60	5%	882	12	11,136
Larger walleye	60	5%	962	52	52,676
Smaller yellow perch	40	5%	1175	12	14,844
Larger yellow perch	40	5%	1290	52	70,616
Smaller shrimp	7	20%	4578	12	137,352
Larger shrimp	7	20%	8828	52	573,820

Table 4. Annual Cost of Fingerlings Purchased

Species and Scale	Fingerling Price Range	Price	Quantity	Annual Cost
Smaller walleye	$0.50 - $1.50	$ 1.00	11,136	$ 11,136
Larger walleye	$0.50 - $1.50	$ 1.00	52,676	$ 52,676
Smaller yellow perch	$0.05 - $1.00	$ 0.50	14,844	$ 7,422
Larger yellow perch	$0.05 - $1.00	$ 0.50	70,616	$ 35,308
Smaller shrimp	$0.02 - $0.04	$ 0.04	137,352	$ 5,494
Larger shrimp	$0.02 - $0.04	$ 0.02	573,820	$ 11,476

Feed quantity in kilograms per day was calculated for each species and scale. The quantity of feed per tank was calculated based on the specific life stage of the fish, with fish of similar weights grouped together in each tank. The initial and final weights of the fish in each tank were estimated and matched to the number of days post-hatch based on research from the Northern Aquaculture Demonstration Facility (Hauser et al., 2023) and the experiences of interviewed experts. The mortality rate was spread evenly across each life stage, although realistically, the mortality rate will decrease as the fish grow. As the fish increase in size, the number of fish per tank decreases proportionally to the mortality rate. Tank biomass over time was calculated by multiplying the final weight of fish at each stage by the number of fish in the tank. Each life stage in the smaller enterprises lasts approximately 30 days, reflecting the fact that one tank is harvested each month. Likewise, each life stage in the larger enterprises lasts 7 days, reflecting that one tank is harvested each week. The final tank biomass for each stage is multiplied by the corresponding feed rate to determine the daily amount of feed fed in kilograms per tank. The feed rate estimates were determined using research from the Northern Aquaculture Demonstration Facility (Hauser et al., 2023) and the experiences of interviewed farmers. Since the number of life stages corresponds to the number of tanks, the total daily feed amount, measured in kilograms, is the sum of the feed provided to all tanks. Kilograms of feed were converted to pounds per day and multiplied by 365 to determine the pounds of feed needed per year. Since, in reality, the mortality rate exponentially decreases throughout the life cycle, marginally less feed is needed per year than calculated. The average feed cost per pound across life stages was determined through interviews with farmers. The cost per pound of feed typically decreases as the amount purchased increases. Therefore, the lower cost in the price range was

applied to the larger-scale farm, and the higher cost in the price range was applied to the smaller-scale farm, reflecting economies of scale. Feed cost and quantity information are summarized in Table 5. The calculations for feed cost and quantity can be found in the appendices. Table A4-A7 show information regarding walleye, Table B4-B7 show yellow perch information, and Table C5-C6 show feed cost and quantity calculations for pacific white shrimp.

Table 3. Feed Cost and Quantity

Species and Scale	Feed Price Range	Price	Quantity (lbs)	Annual Cost
Smaller walleye	$1.00 - $1.50	$ 1.50	42,535	$ 63,803
Larger walleye	$1.00 - $1.50	$ 1.00	152,353	$ 152,353
Smaller yellow perch	$1.00 - $1.50	$ 1.50	17,135	$ 25,702
Larger yellow perch	$1.00 - $1.50	$ 1.00	63,807	$ 63,807
Smaller pacific white shrimp	$1.65 - $2.25	$ 2.25	7,372	$ 16,587
Larger pacific white shrimp	$1.65 - $2.25	$ 1.65	27,501	$ 45,376

All budgets include owner labor as an expense, assuming the owner works full-time on the aquaculture farm, equivalent to 2,080 hours per year. Most of this labor is directly dedicated to caring for the fish, making owner labor a direct expense. Following Prager et al. (2018), the owner draws a $55,000 yearly salary from the business. In larger-scale budgets, hired labor is included as a variable expense. It is assumed that the owner can solely care for all the fish in the small-scale enterprise but needs part-time help once the farm expands to a larger size. Hired labor is assumed to work 1040 hours per year and perform tasks directly related to fish production. Interviewed farmers agreed that $20 per hour was a reasonable wage for hired labor and that $18 per hour was generally too low.

In RAS, most electricity costs are generated by operating pumps and filtration systems. Therefore, the cost of electricity is considered a direct variable cost of production. The cost of electricity per kilowatt-hour (kWh) was calculated as the average between rural producer

experiences and the average cost in Minneapolis (Bureau of Labor Statistics, 2024). A rate of $0.14/kWh was applied to all enterprise budgets. The amount of electricity used was determined based on research estimates. For small-scale enterprise budgets, 29.4 kWh/kg (Badiola et al., 2017) was used, while 20 kWh/kg (Badiola et al., 2017) was used for large-scale budgets to account for economies of scale in electricity consumption. The main drivers of electrical use are water heaters and water pumps (Badiola et al., 2017). Electrical usage and cost information for each enterprise can be found in Table 6.

Table 4. Electricity Usage and Cost

Species and Scale	Price per kWh	kWh/kg	Quantity of kWh	Annual Cost
Smaller walleye	$0.14	29.4	4,800	$19,757
Larger walleye	$0.14	20.0	22,687	$63,523
Smaller yellow perch	$0.14	29.4	2,132	$8,773
Larger yellow perch	$0.14	20.0	10,141	$28,394
Smaller pacific white shrimp	$0.14	29.4	2,197	$9,042
Larger pacific white shrimp	$0.14	20.0	9,180	$25,703

The interview participants agreed that spending $50 to $100 per month on sales and marketing was reasonable. Sales and marketing expenses encompass the labor and direct costs associated with advertisements, marketing materials, brand development, and customer communications. A budget of $50 per month was allocated for small-scale enterprises, while $100 per month was allocated for large-scale enterprises. This reflects the assumption that large-scale farms have more money to allocate toward sales and marketing and have a greater need to spend on marketing to sell all their fillets. These monthly estimates were multiplied by 12 to calculate the annual expenditure on sales and marketing.

Repairs and maintenance are calculated as a percentage of operating costs. Aquaculture farms typically spend about 10% of their operating cost on annual repairs and maintenance

(Business Plan Templates, 2024). This percentage remains consistent across all species and scales. Annual repair and maintenance calculations can be found in Table 7.

Table 5. Annual Cost of Repairs

Species and Scale	Op. Cost pre-repairs	Repairs Constant (Business Plan Templates, 2024)	Annual Cost
Smaller walleye	$167,245	10%	$16,725
Larger walleye	$425,607	10%	$42,561
Smaller yellow perch	$111,614	10%	$11,161
Larger yellow perch	$271,605	10%	$27,160
Smaller pacific white shrimp	$101,240	10%	$10,124
Larger pacific white shrimp	$184,495	10%	$18,450

The range of processing costs per species was determined through interviews with producers. For yellow perch and walleye, processing costs ranged from $0.50 to $2.00 per fish. A fee of $1.00 per fish was selected for yellow perch, while $1.60 per fish was chosen for walleye, based on producer recommendations. Since yellow perch is smaller than walleye and is likely filleted in larger batches, it is reasonable to assume that per-fish processing costs are higher for walleye than for yellow perch. Pacific white shrimp processing follows a different pricing structure. According to producers, a monthly fee is charged up to a certain number of pacific white shrimp, followed by a per-pacific white shrimp fee for any amount above that threshold. This analysis assumes the processor charges $1,100 per month for up to 9,000 pacific white shrimp and $0.03 per pacific white shrimp above 9,000. This pricing model applies to both small and large-scale pacific white shrimp budgets. Annual processing cost calculations can be found in Table 8.

Table 6. Annual Processing Cost				
Species and Scale	Processing Price Range	Price	Quantity	Annual Cost
Smaller walleye	$0.50 - $2.00	$ 1.60	10,584	$ 16,934
Larger walleye	$0.50 - $2.00	$ 1.60	50,024	$ 80,038
Smaller yellow perch	$0.50 - $2.00	$ 1.00	14,100	$ 14,100
Larger yellow perch	$0.50 - $2.00	$ 1.00	67,080	$ 67,080
Smaller pacific white shrimp	Effective price:	$ 0.12	109,872	$ 13,256
Larger pacific white shrimp	Effective price:	$ 0.05	459,056	$ 22,672

Pacific white shrimp need to be raised in saltwater. Since salt is required for pacific white shrimp production, it is a direct input. To achieve the desired salinity, salt is required in a quantity of 0.2 pounds per gallon of water (Cameron). The cost of salt ranges from $0.13 to $0.30 per pound, depending on the quantity purchased. It is assumed that the smaller-scale producer pays closer to $0.30 per pound, while the larger-scale producer pays closer to $0.13 per pound, because the large-scale producer purchases salt in larger quantities. The price and quantity calculation for salt is shown in Table 9.

Table 7. Annual Cost of Salt					
Species and Scale	Salt Price Range	Price	Pounds of salt/gal	Gallons of Water	Annual Cost
Smaller pacific white shrimp	$0.13 -$0.30	$0.30	0.20	20,730	$1,244
Larger pacific white shrimp	$0.02 - $0.04	$0.13	0.20	86,606	$2,252

The farmer must pay overhead expenses regardless of the production level, as these costs remain independent of production intensity. Overhead expenses include internet service, licensing and permit fees, insurance, and depreciation. The cost of internet service represents the average monthly cost for internet service in Minnesota. Licenses and permits are estimated to cost $300 annually for all production levels. Minnesota aquaculture farms are required to obtain

a fish import permit and an aquatic farm license (MN DNR, 2025). The annual insurance cost is estimated to equal 5% of the operating costs. Although this cost varies across production budgets, it is assumed to remain constant each year and must be paid regardless of whether the farm produces fish. Using a percentage rather than a constant value across budgets helps account for the higher insurance premiums paid by larger farms for coverage of larger buildings and more equipment. The insurance cost calculation for each enterprise is shown in Table 10.

Table 8. Annual Cost of Insurance

Species and Scale	Operating Cost	Insurance Constant (Business Plan Templates, 2024)	Annual Cost
Smaller walleye	$183,970	5%	$9,199
Larger walleye	$468,167	5%	$23,408
Smaller yellow perch	$122,775	5%	$6,139
Larger yellow perch	$298,765	5%	$14,938
Smaller pacific white shrimp	$111,364	5%	$5,568
Larger pacific white shrimp	$202,945	5%	$10,147

Depreciation is calculated using the straight-line depreciation method. This method subtracts salvage value from the purchase price and divides the difference by the asset's useful life. For simplicity, the salvage value of all depreciable assets is assumed to be zero. The building and well are expected to depreciate over a period of 40 years (Collins, 2005; Kientzy et al., 2024; Honer et al., 2023), and costs related to new construction are also expected to depreciate over the same period (PWC, 2024; Collins, 2005). The building plumbing, heating, ventilation, and air conditioning (HVAC), electrical, generator, and water heater are estimated to depreciate over a useful life of 20 years (Kientzy et al., 2024; Honer et al., 2023; Held, 2023). The tanks and RAS equipment are expected to have a useful life of 10 years (Kientzy et al., 2024; Honer et al., 2023; Quagrainie & Malekar, 2012). Lab equipment and tools are anticipated

to have a useful life of 5 years (Kientzy et al., 2024; Honer et al., 2023; Held, 2023). A breakdown of annual depreciation cost is provided in Table 11.

Table 9. Annual Depreciation

Species and Scale	Building Deprec.	HVAC/Plumbing/ Electrical Deprec.	Tanks and RAS Deprec.	Total Annual Deprec.
Smaller walleye	$11,863	$4,650	$41,207	$57,720
Larger walleye	$45,107	$9,525	$137,025	$191,657
Smaller yellow perch	$10,755	$4,488	$34,179	$49,421
Larger yellow perch	$27,155	$6,893	$87,557	$121,604
Smaller pacific white shrimp	$10,755	$5,488	$36,602	$52,844
Larger pacific white shrimp	$29,150	$8,185	$74,439	$111,774

4. Capital Investment

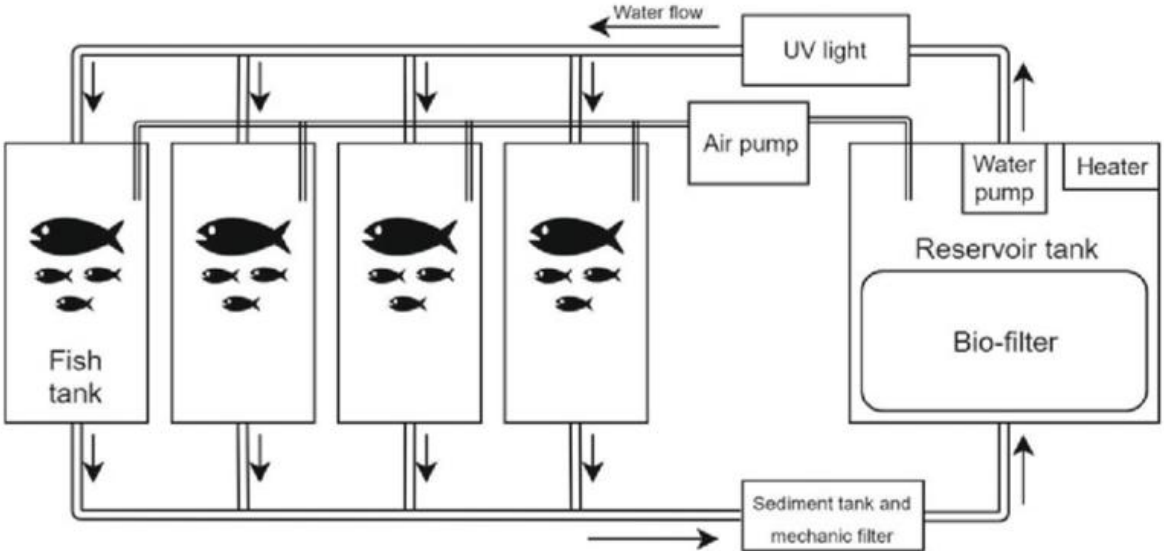
Each budget assumes the aquaculture farm purchases land, constructs a new building, and acquires all new aquaculture equipment, essentially starting from scratch. Each site is built on one acre of land. The average cost for agricultural land in Minnesota in 2024 was $6,745 per acre (UMN Extension, 2024). Site preparation is estimated to cost the same for each project, despite variations in building sizes. Site preparation and excavation typically range from $200 to $2,000 per acre (Graham, 2025), with a median cost of $1,100 per acre. Additionally, drilling a 20-gallon-per-minute well is estimated to cost around $20,000 (Hoidal and Sharma, 2022). Building permits add another expense, averaging $2,000, though they can range from $1,000 to $3,000 (Cameron). General contracting costs range from 5% to 15% of total facility costs, excluding permit fees and land acquisition (BuildBook, 2024), with a median value of 10% applied in this analysis. The building and concrete costs are estimated at $80 per square foot (Cameron), though industry observations range from $20 to $250 per square foot. Given this wide variation, it is

assumed that the lower end of $20 per square foot likely covers only materials, while the upper end of $250 per square foot includes everything from construction to equipment purchases necessary to start farm operations. The installation of septic and plumbing is estimated at $20,000 (Jordan, Cameron). The building size was determined by calculating the space required to house all fish tanks, with a 5-foot walking path around each tank. Additionally, approximately 25 feet were added to the length of buildings in smaller budgets to accommodate office space and RAS equipment storage, while about 45 feet were added to larger buildings. Building size information can be found in Table 12. Capital investment costs for each enterprise are outlined in Table 13. The estimated cost of installing HVAC is $10,000 (Schipper et al., 2022). Similarly, connecting the facility to electrical service is projected at $12,000, which represents the median value within the $4,000 to $20,000 range of estimates (Kellam, 2025). The cost to install electrical wiring in the building is calculated using a cost per square foot, ranging from $4 to $9 (Cramer and Farmer, 2024), with a median value of $5 per square foot selected. A backup generator typically costs between $9,000 and $20,000 (Weimert et al., 2022; Cameron), with a median estimate of $14,500 used in this analysis. Additionally, the estimated cost of purchasing a water heater is $4,000 (The Home Depot, 2025). A saltwater containment system is required for pacific white shrimp production in case of a system failure, costing approximately $20,000 (Cameron). The cost range for facility line items were specified assuming a 20% margin for costs between $0 and $20,000 and a 10% margin for costs over $20,000 (Jordan).

Table 10. Building Information				
Species and Scale	Tank Specs	Calculated Dimensions for Tank Space (ft)	Additional length for Equipment (ft)	Total Building Dimensions(ft)
Smaller walleye	13 tanks; 10ft diameter	50 x 75	25	50 x 100
Larger walleye	58 tanks; 10ft diameter	95 x 155	45	100 x 200
Smaller yellow perch	10 tanks; 10ft diameter	50 x 65	25	50 x 90
Larger yellow perch	43 tanks; 8ft diameter	70 x 122	47	70 x 170
Smaller pacific white shrimp	6 tanks; 14ft diameter	43 x 62	28	50 x 90
Larger pacific white shrimp	13 tanks; 18ft diameter	74 x 120	40	80 x 160

Table 11. Capital Investment				
Species and Scale	Building & Land Cost	HVAC/Plumbing/ Electrical Cost	Tanks and RAS Cost	Total Capital Investment
Smaller walleye	$481,255	$93,000	$348,838	$923,093
Larger walleye	$1,811,005	$190,500	$1,185,238	$3,186,743
Smaller yellow perch	$436,930	$89,750	$285,239	$811,919
Larger yellow perch	$1,092,940	$137,850	$746,109	$1,976,899
Smaller pacific white shrimp	$436,930	$109,750	$309,252	$855,932
Larger pacific white shrimp	$1,172,725	$163,700	$608,945	$1,945,370

Figure 1. RAS Diagram



The cost of purchasing recirculating aquaculture system equipment was also calculated for each species and scale. A diagram of RAS equipment is provided in Figure 1. The tank size requirements were determined by dividing the total production by the stocking density for each species to obtain the total system volume. The total system volume was then divided by the number of harvests per year to determine the volume needed per tank. To ensure good sludge drainage, the tanks should be 3-6 times wider than they are tall (Timmons & Vinci, 2022). The number of tanks for each species and scale was determined by dividing the number of days in the grow-out by the number of days between harvests (7 or 30 days). Note that based on this calculation, the smaller Pacific white shrimp budget only needs three tanks; however, considering the layout, tank size, and overall cost, using six tanks and harvesting them in pairs is more practical. The cost per tank was found online at Hydro Composites' website (Hydro Composites, 2025). Tank volume calculations are shown in Table 14, while tank cost calculations are presented in Table 15.

Table 12. Tank Volume

Species and Scale	Live weight production (kg)	Target Stocking Density (kg/m^3)	Total Tank Volume Required (m^3)	Harvests per Year	Volume Required per Tank (m^3)
Smaller walleye	4,800	60	80.00	12	6.67
Larger walleye	22,687	60	378.11	52	7.27
Smaller yellow perch	2,132	40	53.29	12	4.44
Larger yellow perch	10,141	40	253.51	52	4.88
Smaller pacific white shrimp	2,197	7	313.83	12	26.15
Larger pacific white shrimp	9,180	7	1311.37	52	25.22

Table 13. Total Tank Cost						
Species and Scale	Number of Days in Grow-Out	Number of Days Between Harvests	Number of Tanks Required	Cost per Tank (Hydro Composites, 2025)	Fittings and Installation Cost/Tank (Jordan)	Total Cost
Smaller walleye	405	31	13	$6,225	$1,556	$101,156
Larger walleye	405	7	58	$6,812	$1,703	$493,870
Smaller yellow perch	300	30	10	$5,277	$1,319	$65,963
Larger yellow perch	300	7	43	$4,859	$1,215	$261,171
Smaller pacific white shrimp	90	30	6	$11,168	$2,792	$83,760
Larger pacific white shrimp	90	7	13	$8,000	$2,000	$130,000

The drum filter size for each species and production scale was determined by calculating 25% of the system's water flow rate, which represents the portion of water diverted through the drum filter via the tank's bottom drain (Timmons & Vinci, 2022). The water flow rate was calculated by multiplying the daily feed amount by the protein percentage in the feed to determine the amount of protein fed daily. This protein amount was then multiplied by the total ammonia nitrogen (TAN) conversion factor of 0.092 (Timmons & Vinci, 2022), representing the kilograms of ammonia produced from the protein fed. The calculation for ammonia production in each system is included in Table 16. Passive nitrification by bacteria converts 30% of this ammonia into nitrate (Losordo & Hobbs, 2000). The remaining ammonia passes through a biofilter to be converted into nitrate. Biofilters have an ammonia removal efficiency rate of about 35% (Timmons & Vinci, 2022). Since the target ammonia concentration in RAS is less than or equal to 1 milligram per liter of water, the water leaving the biofilter should have a concentration of 0.65 milligrams of ammonia or less per liter (Timmons & Vinci, 2022). Based on this, the water flow rate was calculated by dividing the amount of ammonia available for biofiltration by the biofilter’s efficiency rate (Timmons & Vinci, 2022). The water flow rate calculations are included in Table 17. The target hydraulic retention time is typically 30 minutes, with a

maximum acceptable limit of one hour (Timmons & Vinci, 2022). The calculated hydraulic retention time for pacific white shrimp exceeded the generally accepted range. Therefore, the water flow rate for a hydraulic retention time of 45 minutes was used. An aquaculture equipment company estimated the cost of a drum filter for each enterprise based on the calculated water flow rates (Brooke). Drum filter sizing calculations are included in Table 18. Sump and pump cost calculations are included in Table 19. The cost of a sump and pump station was found online by matching the gallon-per-minute flow rate to the appropriate pump model (Pentair AES, 2025). If the gallons per minute flow rate was more than one pump could handle, then the cost of the pump was multiplied by the number of pumps needed to move the water. Instead of purchasing multiple small pumps, the farmer would likely purchase one large pump; however, due to limited pricing data, the cost of a larger pump was estimated using multiplication.

Table 14. Ammonia Production

Species and Scale	Daily Feed (kg)	Feed Protein Percentage	Daily Protein Fed (kg)	TAN Conversion Factor (Timmons and Vinci, 2022)	Ammonia Produced (kg)
Smaller walleye	53	50%	26	0.092	2.43
Larger walleye	189	50%	95	0.092	8.71
Smaller yellow perch	21	48%	10	0.092	0.94
Larger yellow perch	79	48%	38	0.092	3.50
Smaller pacific white shrimp	9	35%	3		
Larger pacific white shrimp	34	35%	12		

Table 15. Water Flow Rates						
Species and Scale	Ammonia Produced (kg)	Passive Nitrification Constant (Losordo & Hobbs, 2000)	Ammonia Remaining for Biofiltration (kg)	TAN Removal Constant (mg TAN/L) (Timmons & Vinci, 2022)	Flow Rate (L/day)	Flow Rate (gpm)
Smaller walleye	2.43	30%	1.70	0.35	4,862,200	892
Larger walleye	8.71	30%	6.10	0.35	17,415,600	3,195
Smaller yellow perch	0.94	30%	0.66	0.35	1,880,333	345
Larger yellow perch	3.50	30%	2.45	0.35	7,002,010	1,285
Smaller pacific white shrimp		Flow Rate at a 45-minute Hydraulic Retention Time:				461
Larger pacific white shrimp		Flow Rate at a 45-minute Hydraulic Retention Time:				1,925

Table 16. Drum Filter Cost				
Species and Scale	Water Flow Rate (gpm)	Center Drain Flow Constant (Timmons & Vinci, 2022)	Flow Rate to Drum Filter (gpm)	Cost
Smaller walleye	892	25%	223	$18,000.00
Larger walleye	3,195	25%	799	$27,000.00
Smaller yellow perch	345	25%	86	$11,000.00
Larger yellow perch	1,285	25%	321	$23,000.00
Smaller pacific white shrimp	461	25%	115	$19,000.00
Larger pacific white shrimp	1,925	25%	481	$23,000.00

Table 17. Sump and Pump Cost					
Species and Scale	System Flow Rate (gpm)	Max Pump Flow Rate (gpm) (Pentair AES, 2025)	Number of pumps to reach desired flow rate	Cost per Pump (Pentair AES, 2025)	Cost
Smaller walleye	892	600	2	$2,726.00	$5,452.00
Larger walleye	3195	600	6	$2,726.00	$16,356.00
Smaller yellow perch	345	600	1	$2,726.00	$2,726.00
Larger yellow perch	1285	600	3	$2,726.00	$8,178.00
Smaller pacific white shrimp	461	600	1	$2,726.00	$2,726.00
Larger pacific white shrimp	1925	600	4	$2,726.00	$10,904.00

Calculations for biofilter media are provided in Table 20, while cost information is provided in Table 21. To reasonably represent producer experiences, the cost of biofilters for small-scale budgets was determined by averaging online prices with the highest cost reported by survey respondents. The lowest cost was identified by matching the calculated cubic feet per minute (CFM) air requirements to model specifications and requesting price quotes from the manufacturer (Brooke). CFM air requirements were determined through a multi-step calculation. First, the volume of biofilter media needed was calculated by dividing the total ammonia available to the biofilter by the nitrification rate constant. The nitrification rate constant for moving bed bioreactors is 0.8 kg TAN/m^3/day (Timmons & Vinci, 2022). The required biofilter volume was determined using a media fill constant of 60% (Timmons & Vinci, 2022). The biofilter volume was then multiplied by a mixing aeration constant of five times the reactor volume per hour (Timmons & Vinci, 2022) to estimate the total airflow needed.

For the large-scale walleye and yellow perch budgets, the biofilter cost was scaled by multiplying it to meet the required CFM, approximating the expense of a larger biofilter. This estimation resulted in a biofilter cost of $30,000 for the large-scale walleye budget and $20,000 for the large-scale yellow perch budget, which aligned with producer-reported costs. Since the pacific white shrimp and yellow perch budgets are similar in scale, the biofilter cost for the yellow perch budget was also applied to the pacific white shrimp budget. This estimation seemed more realistic to producers than the calculated biofilter cost of $5,500.

Table 18. Volume of Biofilter Media				
Species and Scale	System Flow Rate (gpm)	Total Ammonia Available to Biofilter (kg)	Nitrification Rate Constant (TAN/m^3/day) (Timmons & Vinci, 2022)	Volume of Biofilter Media (m^3)
Smaller walleye	892	1.70	0.8	2.13
Larger walleye	3195	6.10	0.8	7.62
Smaller yellow perch	345	0.66	0.8	0.82
Larger yellow perch	1285	2.45	0.8	3.06
Smaller pacific white shrimp	461	0.21	0.8	0.26
Larger pacific white shrimp	1925	0.77	0.8	0.96

Table 19. Biofilter Cost						
Species and Scale	Media Fill Percentage (Timmons & Vinci, 2022)	Volume of Biofilter (m^3)	Aeration & Mixing Constant (vol/hr) (Timmons & Vinci, 2022)	Air Req. (m^3/hr)	Air Req. (CFM)	Cost
Smaller walleye	60%	3.55	5	18	10	$15,000.00
Larger walleye	60%	12.70	5	63	37	$30,000.00
Smaller yellow perch	60%	1.37	5	7	4	$12,500.00
Larger yellow perch	60%	5.11	5	26	15	$20,000.00
Smaller pacific white shrimp	60%	0.43	5	2	1	$12,500.00
Larger pacific white shrimp	60%	1.60	5	8	5	$20,000.00

The cost of a degassing column is estimated to be similar to that of a biofilter. Based on the expert's feedback, the degassing column is projected to cost $20,000 for the small-scale and $30,000 for the large-scale walleye operation. For the yellow perch budgets, the cost range aligned with the large-scale biofilter estimates, with the higher value of $24,000 chosen as the larger-scale estimate and the lower value of $16,000 applied to the smaller-scale budget. A new cost range was then developed around these estimates. Since the pacific white shrimp and yellow perch budgets are similar in size, the same degassing column cost was used in the pacific white

shrimp budget. Price information for degassing columns is included in Table 22. An equipment company estimated the cost of UV disinfection systems based on provided water flow rates, which are found in Table 23.

Table 20. Degassing Column Cost

Species and Scale	Degassing Column Price Range	Price
Smaller walleye	$16,000 - $24,000	$20,000
Larger walleye	$27,000 - $30,000	$30,000
Smaller yellow perch	$12,800 - $19,200	$16,000
Larger yellow perch	$21,600 - $26,400	$24,000
Smaller pacific white shrimp	$12,800 - $19,200	$16,000
Larger pacific white shrimp	$21,600 - $26,400	$24,000

Table 21. UV Disinfection Cost

Species and Scale	UV Filtration Price Range	Price
Smaller walleye	$14,400 - $21,600	$18,000
Larger walleye	$40,500 - $49,500	$45,000
Smaller yellow perch	$12,800 - $19,200	$16,000
Larger yellow perch	$31,500 - $38,500	$35,000
Smaller pacific white shrimp	$14,400 - $21,600	$18,000
Larger pacific white shrimp	$31,500 - $38,500	$35,000

The aeration system is designed to oxygenate each tank to enhance water quality for optimal growth. The aeration system cost was calculated per square foot for the entire building, with an estimated range of $15–$23 per square foot. This range was created using a 20% margin around the median value of $19.00. To account for economies of scale, the cost per square foot was adjusted incrementally by $2 for each species and scale. The large-scale walleye budget is the largest of the production scales, so it was assigned the lowest cost per square foot at $15. The small-scale yellow perch and pacific white shrimp budgets received a rate of $21 per square foot. The small-scale walleye budget was assigned a mid-range cost of $19 per square foot. Note that

$23 per square foot was not used since only four values were needed, and the lower range was more realistic. Table 24 contains cost data for aeration systems.

Table 22. Aeration Cost

Species and Scale	Aeration Price Range	Price per Sq. Ft	Square Footage	Price
Smaller walleye	$15 - $23	$19.00	5,000	$95,000
Larger walleye	$15 - $23	$15.00	20,000	$300,000
Smaller yellow perch	$15 - $23	$21.00	4,500	$94,500
Larger yellow perch	$15 - $23	$17.00	11,900	$202,300
Smaller pacific white shrimp	$15 - $23	$21.00	4,500	$94,500
Larger pacific white shrimp	$15 - $23	$17.00	12,800	$217,600

The cost of feeders for each enterprise can be found in Table 25. The survey respondents agreed that $1,000 per feeder was a reasonable cost estimate, although some feeders have a lower price point. Since each tank requires one feeder, the total feeder cost was calculated by multiplying the number of tanks in each budget by $1,000.

Table 23. Feeder Cost

Species and Scale	Price per Feeder	Number of Feeders	Price
Smaller walleye	$1,000.00	13	$13,000
Larger walleye	$1,000.00	58	$58,000
Smaller yellow perch	$1,000.00	10	$10,000
Larger yellow perch	$1,000.00	43	$43,000
Smaller pacific white shrimp	$1,000.00	6	$6,000
Larger pacific white shrimp	$1,000.00	13	$13,000

Water quality and monitoring equipment are estimated to range from $8 - $12 per square foot of building space. To reflect economies of scale and avoid linearity, the cost per square foot was adjusted incrementally by $1 for each species and scale. The small-scale walleye budget was assigned a median value of $10 per square foot. The large-scale walleye budget is the largest of the production scales, so it was assigned the lowest cost per square foot at $8. The small-scale

yellow perch and pacific white shrimp budgets were assigned the highest cost of $11 per square foot. Table 26 contains cost data for water quality and monitoring equipment.

Table 24. Water Quality Monitoring Equipment Cost

Species and Scale	Monitoring Price Range	Price per Sq. Ft	Square Footage	Price
Smaller walleye	$8 - $12	$10.00	5,000	$50,000
Larger walleye	$8 - $12	$8.00	20,000	$160,000
Smaller yellow perch	$8 - $12	$11.00	4,500	$49,500
Larger yellow perch	$8 - $12	$9.00	11,900	$107,100
Smaller pacific white shrimp	$8 - $12	$11.00	4,500	$49,500
Larger pacific white shrimp	$8 - $12	$9.00	12,800	$115,200

Miscellaneous equipment and tools include cold banking equipment, nets, buckets, waders, maintenance tools, scales, and office supplies. The estimated cost for these items ranges from $0.50 to $1.50 per pound of live-weight production (Table 27). These items are included as start-up costs but need to be replaced over time. Like other equipment purchases, a gradient approach was applied, with costs increasing by $0.25 per pound across species and scales. The large-scale walleye budget, the largest production scale, was assigned the lowest cost at $0.50 per pound. The large-scale yellow perch and pacific white shrimp budgets were set at $1.00 per pound, the small-scale walleye budget at $1.25, and the small-scale yellow perch and pacific white shrimp budgets at $1.50 per pound. Since the pacific white shrimp and yellow perch budgets are comparable in scale, the same cost structure was applied to both species for the small-scale and large-scale budgets.

Table 25. Miscellaneous Equipment Cost					
Species and Scale	Scale (lbs live weight)	Misc. Equipment Price Range	Price per lb Live Weight Production	lb Live Weight Production	Price
Smaller walleye	Smaller (10584)	$0.50 - $1.50	$1.25	10,584	$13,230
Larger walleye	Larger (50024)	$0.50 - $1.50	$0.50	50,024	$25,012
Smaller yellow perch	Smaller (4700)	$0.50 - $1.50	$1.50	4,700	$7,050
Larger yellow perch	Larger (22360)	$0.50 - $1.50	$1.00	22,360	$22,360
Smaller pacific white shrimp	Smaller (4844)	$0.50 - $1.50	$1.50	4,844	$7,266
Larger pacific white shrimp	Larger (20241)	$0.50 - $1.50	$1.00	20,241	$20,241

A complete budget for each enterprise, outlining the capital investment, operating, and overhead expenses, can be found in the appendices. The enterprise budget for the smaller-scale walleye farm is in Table A8. The enterprise budget for the larger-scale walleye farm is in Table A9. Table B8 shows the enterprise budget for the smaller-scale yellow perch farm. Table B9 shows the enterprise budget for the larger-scale yellow perch farm. The enterprise budget for the smaller-scale pacific white shrimp farm is in Table C7. The enterprise budget for the larger-scale pacific white shrimp farm is in Table C8.

5. NPV and Sensitivity Analyses

The costs from the enterprise budgets were used to estimate NPV, which assesses a project's expected cash benefits over time. Unlike enterprise budgets, NPV accounts for tax expenses and changes in working capital throughout the project's lifespan. Cash flows over the period are discounted to the present using a set rate to reflect the time value of money.

Each of the proposed aquaculture farms was evaluated over a 30-year period. This timeframe aligns with the typical length of a mortgage loan, and it is a reasonable period to assume a starting farmer would operate an aquaculture farm if the starting farmer were between

30 and 40 years old. Annual sales revenue was calculated by multiplying the pounds of fillet sold per year by the sale price per pound. The sale price was increased by 2% annually to align with the Federal Reserve's target inflation rate and account for potential price increases driven by the rising demand for seafood. Meanwhile, expenses are held constant from year to year. As the aquaculture industry continues to grow and innovate, efficiencies and technological advancements are expected to reduce the cost per pound of fish produced relative to their sale price. Variable cost per pound was calculated by dividing the total annual variable cost by the pounds of fillets produced. This calculation assumes the facility operates at full capacity starting in year one and all the fillets are sold. Fixed costs per pound were calculated by dividing the total annual fixed costs by the pounds of fillets sold.

Depreciation serves as a tax shield and is deducted from the gross margin before calculating tax expense, which is expected to be 16.8% of taxable income according to the United States Department of Agriculture Economic Research Service (McDonald, 2025). Since depreciation is a non-cash expense, it is added back after taxes to determine operating cash flow. Working capital requirements are estimated at 30% of annual cash expenses. Since cash expenses were assumed to remain constant, annual changes in working capital were set at $0. The initial working capital investment will be recovered at the end of the 30-year project. The change in working capital is added to the operating cash flow to calculate the free cash flow each year. Capital investments are assumed to be made upfront, with revenue and expenses beginning in the first year. Annual cash flows were discounted back to the present using a 4.99% discount rate, based on a weighted average cost of capital (WACC) calculated using a 6% average mortgage rate and a 16.8% tax rate. The sum of discounted cash flows equals the project's NPV.

For larger-scale enterprises, the internal rate of return (IRR) and payback period were calculated. The IRR represents the expected rate of return on an investment over its lifetime. It is the discount rate at which a project's NPV equals zero and was calculated using the Excel function (=irr). The payback period measures the time it takes to recover a project's initial cash investment. It is calculated by adding annual cash flows from consecutive years until the sum equals the initial investment cost.

The NPV calculation for the smaller-scale walleye farm is in Table A10. The payback period, NPV, and IRR calculations for the larger-scale walleye farm are summarized in Table A18. Table B10 shows the NPV calculation for the smaller-scale yellow perch farm. Table B18 shows the payback period, NPV, and IRR calculations for the larger-scale yellow perch farm. The NPV calculation for the smaller-scale pacific white shrimp farm is in Table C9. The payback period, NPV, and IRR calculations for the larger-scale pacific white shrimp farm are summarized in Table C17.

Several sensitivity analyses were conducted using the NPV calculations. Tables were created to compare percentage increases and decreases in key variable estimates. Price and quantity fluctuations ranged from a 10% decrease to a 25% increase in the original estimates. Capital investment, feed, and labor costs were analyzed from a 25% decrease to a 10% increase in price. The Excel "What-If Analysis" function was used to populate the sensitivity tables. In total, seven tables were generated for each proposed aquaculture plan, assessing the impact of changes in (1) price and quantity produced, (2) price and capital investment, (3) capital investment and quantity produced, (4) feed cost and selling price, (5) feed cost and quantity sold, (6) labor cost and selling price, and (7) labor cost and quantity sold.

IV. Results

1. Walleye Budgets

The results for the small-scale walleye enterprise are presented in Table 28. The smaller-scale walleye enterprise plans to raise 10,584 pounds of live fish in a newly constructed facility costing $923,093. Annual depreciation for the facility and equipment amounts to $57,720. Yearly operating costs are projected to be $183,970. Meanwhile, producing a single cohort of walleye over a 405-day cycle is estimated to cost $202,876. It takes 405 days to grow a walleye fingerling to market size. Overhead expenses amount to $68,046 annually and $75,503 for a 405-day cycle. The total production cost is $252,016 per year and $278,379 per growth cycle. Therefore, the break-even operating cost for one pound of fillets is $34.76 annually and $35.39 per cycle. Including overhead expenses, the total break-even cost per pound rises to $47.62 annually and $48.56 per cycle. Based on the assumed values in the enterprise budget, the proposed walleye enterprise has a NPV of -$1,938,106.

Table 26. Smaller Walleye Results

	Annual Cost	Cycle Cost
Capital Investment	$923,093	
Depreciation	$57,720	
Operating Cost	$183,970	$202,876
Ownership Cost	$68,046	$75,503
Total Production Cost	$252,016	$278,379
Operating Breakeven ($/lb)	$34.76	$35.39
Total Breakeven ($/lb)	$47.62	$48.56
NPV	-$1,938,106	

The results for the larger-scale walleye enterprise are found in Table 29. The larger-scale walleye enterprise plans to raise 50,024 pounds of live fish in a newly constructed facility, projected to cost $3,186,743. The facility and equipment will depreciate by $191,657 annually. Yearly operating costs are projected to be $468,167. Meanwhile, producing a single cohort of fish over a 405-day cycle will cost $520,610. Overhead expenses amount to $216,193 annually and $239,885 for a 405-day cycle. The total production cost is $684,360 per year and $760,495 per growth cycle. The break-even operating cost for one pound of fillets is $18.72 annually and $18.66 per cycle. Including overhead expenses, the total break-even cost per pound is $27.36 annually and $27.26 per cycle. Based on the assumed values in the enterprise budget, the proposed larger walleye enterprise has a NPV of -$1,596,914. The IRR is 1.82%, and the project's payback period is 26 years.

Table 27. Larger Walleye Results

	Annual Cost	Cycle Cost
Capital Investment	$3,186,743	
Depreciation	$191,657	
Operating Cost	$468,167	$520,610
Ownership Cost	$216,193	$239,885
Total Production Cost	$684,360	$760,495
Operating Breakeven ($/lb)	$18.72	$18.66
Total Breakeven ($/lb)	$27.36	$27.26
NPV	-$1,596,914	
IRR	1.82%	
Payback Period	26 years	

2. Yellow Perch Budgets

The results for the smaller-scale yellow perch enterprise are outlined in Table 30. The smaller-scale yellow perch enterprise raises 4,700 pounds of live fish in a newly constructed

facility costing $811,919. The facility and equipment will depreciate by $49,421 annually. Yearly operating costs are projected to be $122,775. Meanwhile, producing a single cohort of fish over a 300-day cycle will cost $101,257. Overhead expenses amount to $56,688 annually and $46,593 for a 300-day cycle. The total production cost is $179,462 per year and $147,849 per growth cycle. Therefore, the break-even operating cost for one pound of fillets is $56.60 annually and $56.01 per cycle. Including overhead expenses, the total break-even cost per pound rises to $82.73 annually and $81.79 per cycle. Based on the assumed values in the enterprise budget, the proposed yellow perch enterprise has a NPV of -$1,698,039.

Table 28. Smaller Yellow Perch Results

	Annual Cost	Cycle Cost
Capital Investment	$811,919	
Depreciation	$49,421	
Operating Cost	$122,775	$101,257
Ownership Cost	$56,688	$46,593
Total Production Cost	$179,462	$147,849
Operating Breakeven ($/lb)	$56.60	$56.01
Total Breakeven ($/lb)	$82.73	$81.79
NPV	-$1,698,039	

The results for the larger-scale yellow perch enterprise are presented in Table 31. The larger-scale yellow perch enterprise aims to raise 22,360 pounds of live fish in a newly constructed facility, projected to cost $1,976,899. The facility and equipment will depreciate by $121,604 annually. Yearly operating costs are projected to be $298,765. Meanwhile, producing a single cohort of fish over a 300-day cycle is estimated to cost $245,980. Overhead expenses amount to $137,671 annually and $113,154 for a 300-day cycle. The total production cost is $436,435 per year and $359,134 per growth cycle. The break-even operating cost for one pound of fillets is $28.95 annually and $28.82 per cycle. Including overhead expenses, the total break-

even cost per pound is $42.29 annually and $42.08 per cycle. Based on the assumed values in the enterprise budget, the proposed larger yellow perch enterprise has a NPV of -$1,053,077. The IRR is 1.63%, and the project's payback period is 27 years.

Table 29. Larger Yellow Perch Results

	Annual Cost	Cycle Cost
Capital Investment	$1,976,899	
Depreciation	$121,604	
Operating Cost	$298,765	$245,980
Ownership Cost	$137,671	$113,154
Total Production Cost	$436,435	$359,134
Operating Breakeven ($/lb)	$28.95	$28.82
Total Breakeven ($/lb)	$42.29	$42.08
NPV	-$1,053,077	
IRR	1.63%	
Payback Period	27 years	

3. Pacific White Shrimp Budgets

The results for the smaller-scale pacific white shrimp enterprise are found in Table 32. The smaller-scale pacific white shrimp enterprise plans to raise 4,844 pounds of live pacific white shrimp in a newly constructed facility costing $855,932. The facility and equipment will depreciate by $52,844 annually. Yearly operating costs are projected to be $111,364. Meanwhile, producing a single cohort of pacific white shrimp over a 90-day cycle will cost $36,310. Overhead expenses amount to $59,540 annually and $14,681 for a 90-day cycle. The total production cost is $170,904 per year and $50,991 per growth cycle. Therefore, the break-even operating cost for one pound of pacific white shrimp is $32.43 annually and $42.30 per cycle. Including overhead expenses, the total break-even cost per pound rises to $49.78 annually and

$59.40 per cycle. Based on the assumed values in the enterprise budget, the proposed pacific white shrimp enterprise has a NPV of -$1,948,000.

Table 30. Smaller Pacific white shrimp Results		
	Annual Cost	Cycle Cost
Capital Investment	$855,932	
Depreciation	$52,844	
Operating Cost	$111,364	$36,310
Ownership Cost	$59,540	$14,681
Total Production Cost	$170,904	$50,991
Operating Breakeven ($/lb)	$32.43	$42.30
Total Breakeven ($/lb)	$49.78	$59.40
NPV	-$1,948,000	

The results for the larger-scale pacific white shrimp enterprise are outlined in Table 33. The larger-scale pacific white shrimp enterprise aims to raise 20,241 pounds of live pacific white shrimp in a newly constructed facility, projected to cost $1,945,370. The facility and equipment will depreciate by $111,773 annually. Yearly operating costs are projected to be $202,945. Meanwhile, producing a single cohort of pacific white shrimp over a 90-day cycle will cost $50,298. Overhead expenses amount to $123,048 annually and $30,341 for a 90-day cycle. The total production cost is $325,994 per year and $80,638 per growth cycle. The break-even operating cost for one pound of pacific white shrimp is $14.15 annually and $14.02 per cycle. Including overhead expenses, the total break-even cost per pound is $22.72 annually and $22.48 per cycle. Based on the assumed values in the enterprise budget, the proposed larger pacific white shrimp enterprise has a NPV of -$1,738,290. The IRR is 0.21%, and the project's payback period is 36 years.

Table 31. Larger Pacific White Shrimp Results		
	Annual Cost	Cycle Cost
Capital Investment	$1,945,370	
Depreciation	$111,773	
Operating Cost	$202,945	$50,298
Ownership Cost	$123,048	$30,341
Total Production Cost	$325,994	$80,638
Operating Breakeven ($/lb)	$14.15	$14.02
Total Breakeven ($/lb)	$22.72	$22.48
NPV	-$1,738,290	
IRR	0.21%	
Payback Period	36 years	

4. Sensitivity Analyses

Several sensitivity analyses were conducted to better understand which factors most significantly impact the NPV of the proposed aquaculture projects. Seven tables were created for each aquaculture plan, evaluating the effects of simultaneous changes in key variables. The sensitivity analysis tables for each species can be found in the appendices.

The sensitivity tables included the following combinations of variables:

- Price and quantity produced
- Price and capital investment
- Capital investment and quantity produced
- Feed cost and selling price
- Feed cost and quantity sold
- Labor cost and selling price
- Labor cost and quantity sold

Each table shows the impact of two variables changing concurrently. Both variables are adjusted by increments of five percentage points in either direction. The cell where the two changes intersect displays the resulting NPV if both modifications occur simultaneously. By comparing the new NPVs to the original estimate, the tables reveal the sensitivity of the project's profitability to combined changes in key parameters.

The full set of sensitivity analyses can be found in the appendices. The sensitivity analyses for the smaller-scale walleye farm are shown in Tables A11-A17. The sensitivity analyses for the larger-scale walleye farm are included in Tables A19-A25. Tables B11-B17 show sensitivity analyses for the smaller-scale yellow perch farm. Tables B19-B25 show the sensitivity analyses for the larger-scale yellow perch farm. The sensitivity analyses for the smaller-scale pacific white shrimp farm are summarized in Tables C10-C16. The sensitivity analyses for the larger-scale pacific white shrimp farm are shown in Tables C18-C24.

a. Walleye

The NPV calculation inputs are outlined in Table 34 for the smaller-scale enterprise and Table 35 for the larger-scale enterprise. In the spring of 2025, the retail market price for one pound of walleye fillets is $24.80 (Walleye Direct, 2025), which falls below the calculated annual breakeven variable cost per pound of $34.76 and the total breakeven cost per pound of $47.62 for the smaller walleye enterprise. However, for the larger walleye enterprise, it remains above the annual variable breakeven cost per pound of $18.72 but below the total breakeven cost per pound of $27.36. At the market price of $24.80, neither the smaller nor the larger walleye enterprise is expected to be profitable based on the NPV analysis. The smaller enterprise has an NPV of −$1,938,106 while the larger enterprise shows an NPV of −$1,596,914. No

combinations of changes to the parameters in the sensitivity analyses made the small walleye enterprise NPV positive. However, several combinations of parameter changes resulted in a positive NPV estimate for the larger walleye enterprise. These combinations are outlined in Table 36.

NPV turned positive when the quantity sold ranged from 23,761 pounds to 31,265 pounds of fillets, and the price fluctuated between $23.56 and $31.00. These changes resulted in an NPV ranging from $278,688 to $4,029,892. The original NPV estimate assumed 25,012 pounds at a price of $24.80 per lb. NPV also turned positive when capital investment fluctuated between $2,390,057 and $3,505,417, and prices ranged from $27.28 to $31.00. Under this range, the NPV is expected to be $40,756 to $1,700,574. The original estimates were $3,186,743 in capital investment and a selling price of $24.80 per pound. Similarly, NPV turned positive when capital investment ranged between $2,390,057 and $3,505,417, and quantity sold fluctuated between 27,513 and 31,265 pounds. Within this range, the NPV ranged from $40,756 to $1,700574. The original assumption was that 25,012 pounds of fillets would be sold and $3,186,743 would be spent on capital investment. When feed costs decreased by 25% to a variable cost per pound of $17.19 and quantity sold increased by 25% to 31,265 pounds of fillets, the expected NPV rose to $52. However, when feed costs vary from 25% less to 10% above the original estimate, and the sale price ranges between $28.52 and $31.00, NPV becomes positive, ranging from $2,732 to $1,399,712. In this range, variable costs are $17.19 at 25% less and $19.33 at 10% more than the original estimate. The original variable cost estimate was $18.72 per pound, and the original sale price was $24.80 per pound. Similarly, when labor costs fluctuate between 25% less and 10% more than the original estimate, and the sale price ranges

between $28.52 and $31.00, NPV ranges from $10,995 to $1,082,934. In this scenario, variable costs are $18.17 at 25% less and $18.94 at 10% more than the original estimate of $18.72.

Table 32. Smaller Walleye NPV Inputs

NPV Input	Value
Current Market Price ($/lb)	$24.80
Annual Breakeven Variable Cost ($/lb)	$34.76
Annual Breakeven Total Cost ($/lb)	$47.62
Pounds of Fillets Sold	5,292
Capital Expenditure	$923,093
Variable Cost	$34.76
NPV	-$1,938,106

Table 33. Larger Walleye NPV Inputs

NPV Input	Value
Current Market Price ($/lb)	$24.80
Annual Breakeven Variable Cost ($/lb)	$18.72
Annual Breakeven Total Cost ($/lb)	$27.36
Pounds of Fillets Sold	25,012
Capital Expenditure	$3,186,743
Variable Cost	$18.72
NPV	-$1,596,914

Table 34. Larger Walleye Positive NPV Scenarios

Inputs Changed	Positive NPV Range
Price and Quantity	$278,688 - 4,029,892
Price and Capital Investment	$40,756 - 1,700,574
Quantity and Capital Investment	$40,756 - 1,700,574
Price and Feed Cost	$2,732 - 1,399,712
Quantity and Feed Cost	$52
Price and Labor Cost	$10,995 - 1,082,934

b. Yellow Perch

The NPV calculation inputs are presented in Table 37 for the smaller-scale enterprise and Table 38 for the larger-scale enterprise. In the spring of 2025, the retail market price for one pound of yellow perch fillets is $37.80 (Walleye Direct, 2025), which is below the annual breakeven variable cost of $56.60 per pound and the total breakeven cost of $82.73 per pound for the smaller yellow perch enterprise. However, it remains above the annual variable cost per pound of $28.95 but below the total breakeven cost per pound of $42.29 for the larger yellow perch enterprise. At the market price of $37.80, neither the smaller nor the larger yellow perch enterprise is expected to be profitable based on NPV analysis. The smaller enterprise has an NPV of- $1,698,039, while the larger enterprise shows an NPV of- $1,053,077. Sensitivity analysis revealed that no combination of parameter changes made the smaller enterprise's expected NPV positive. However, five scenarios resulted in a positive NPV estimate for the larger enterprise. These combinations are outlined in Table 39.

First, NPV turned positive when the quantity sold ranged from 9,804 to 12,900 pounds, and the sale price fluctuated between $35.91 and $47.25. These estimates resulted in an NPV range of $126,461 to $2,485,538. The original NPV estimate assumed 10,320 pounds of fillets at $37.80 per pound. NPV also turned positive when capital investment ranged between $1,482,674 and $2,174,589, and the sale price increased by 10% to 25%. Within this range, the prices are $41.58 to $47.25. Under these assumptions, NPV ranged from $7,407 to $1,013,866. The original estimates were $1,976,899 in capital investment and a sale price of $37.80 per pound. Similarly, when capital investment ranges between $1,482,674 and $2,174,589 and the quantity sold ranges between 11,352 pounds and 12,900 pounds, NPV ranges from $7,407 to $1,013,866.

The original estimates were $1,976,899 spent on capital investment and 10,320 pounds of fillets sold. When feed costs vary between 25% less and 10% above the original estimate, and the sale price ranges between $43.47 and $47.25 per pound, NPV becomes positive, ranging from $15,146 to $727,295. In this range, variable costs are $27.40 at 25% less and $29.57 at 10% more than the original variable cost estimate of $28.95. The original sale price was $37.80 per pound. When labor costs fluctuate between 25% less and 10% more than the original estimate, and the sale price ranges between $43.47 and $47.25, NPV ranges from $38,596 to $766,379. In this scenario, variable costs are $27.11 at 25% less and $29.68 at 10% more than the original estimate of $28.95.

Table 35. Smaller Yellow Perch NPV Inputs

NPV Input	Value
Current Market Price ($/lb)	$37.80
Annual Breakeven Variable Cost ($/lb)	$56.60
Annual Breakeven Total Cost ($/lb)	$82.73
Pounds of Fillets Sold	2,169
Capital Expenditure	$811,919
Variable Cost	$56.60
NPV	-$1,698,039

Table 36. Larger Yellow Perch NPV Inputs

NPV Input	Value
Current Market Price ($/lb)	$37.80
Annual Breakeven Variable Cost ($/lb)	$28.95
Annual Breakeven Total Cost ($/lb)	$42.29
Pounds of Fillets Sold	10,320
Capital Expenditure	$1,976,899
Variable Cost	$28.95
NPV	-$1,053,077

Table 37. Larger Yellow Perch Positive NPV Scenarios	
Inputs Changed	Positive NPV Range
Price and Quantity	$126,461 - 2,485,538
Price and Capital Investment	$7,402 - 1,013,866
Quantity and Capital Investment	$7,402 - 1,013,866
Price and Feed Cost	$15,146 - 727,295
Price and Labor Cost	$38,596 - 766,379

c. Pacific White Shrimp

The NPV calculation inputs are found in Table 40 for the smaller-scale enterprise and Table 41 for the larger-scale enterprise. In the spring of 2025, the retail market price for one pound of headless Pacific white shrimp is $17.99 (Coastal Seafoods, 2025), which is below the annual breakeven variable cost of $32.43 per pound and the total annual breakeven cost of $49.78 per pound for the smaller pacific white shrimp enterprise. However, for the larger pacific white shrimp enterprise, it remains above the annual variable cost per pound of $14.15 but below the total annual breakeven cost per pound of $22.72. At the market price of $17.99, neither the smaller nor the larger pacific white shrimp enterprise is expected to be profitable based on the NPV analyses. The smaller enterprise has an NPV of −$1,948,000, while the larger enterprise shows an NPV of −$1,738,290. Sensitivity analysis revealed that no combination of parameter changes made the smaller enterprise's NPV turn positive. However, one combination of adjustments allowed the larger enterprise to achieve a positive NPV. These combinations are outlined in Table 42.

A positive NPV was reached when the quantity sold ranged between 16,497 and 17,932 pounds, and the price fluctuated between $20.69 and $22.49 per pound, resulting in an NPV

range of $82,518 to $602,749. The original NPV estimate assumed 14,346 pounds of fillets sold at $17.99 per pound.

Table 38. Smaller Pacific White Shrimp NPV Inputs

NPV Input	Value
Current Market Price ($/lb)	$17.99
Annual Breakeven Variable Cost ($/lb)	$32.43
Annual Breakeven Total Cost ($/lb)	$49.78
Pounds of Fillets Sold	3,434
Capital Expenditure	$855,932
Variable Cost	$32.43
NPV	-$1,948,000

Table 39. Larger Pacific White Shrimp NPV Inputs

NPV Input	Value
Current Market Price ($/lb)	$17.99
Annual Breakeven Variable Cost ($/lb)	$14.15
Annual Breakeven Total Cost ($/lb)	$22.72
Pounds of Fillets Sold	14,346
Capital Expenditure	$1,945,370
Variable Cost	$14.15
NPV	-$1,738,290

Table 40. Larger Pacific White Shrimp Positive NPV Scenarios

Inputs Changed	Positive NPV Range
Price and Quantity	$82,518 - 602,749

V. Discussion

Overall, the smaller enterprise budgets for each species are not economically feasible and should be regarded as hobby-level farms rather than viable commercial operations. The larger-scale enterprises considered in the study represent the smallest feasible starting point for

commercial production. However, none of the larger operations achieve a positive NPV under the original parameters. Despite this, a marginal increase in both the sale price and quantity sold would turn the NPV positive, assuming variable costs remain constant under the original assumptions. According to economic theory, a business should continue operating as long as variable costs are covered. However, starting a new business under the current parameters is not recommended because the market price does not cover the total cost of production for the small- or large-scale farms.

Strategic adjustments in pricing, production, and cost management lead to positive NPV estimates for the proposed larger-scale enterprises. Key factors that increase NPV include higher selling prices, increased sales volume, and reductions in capital and variable costs. Of these factors, sale price stands out as the most impactful. In the walleye and yellow perch sensitivity analyses, a 20% increase in sale price alone is enough to turn many of the NPV estimates positive. Boosting production levels is the next most influential factor. Across all three large-scale operations, the combination of higher prices and increased sales volumes yields the strongest improvement in NPV.

It is important to note that stocking density and equipment capacity may not fully support the 25% increase in production modeled in the sensitivity analyses. However, some farms operate at a higher stocking density than assumed in this thesis, and the equipment can support increased production if the required flow rate remains within its filtration capacity. Given that the production costs in these enterprise budgets are higher than those found in existing literature, it is reasonable to assume the total cost of production could be spread over 25% more fish, particularly if the farmer identifies ways to reduce the investment cost per fish. Applying a 25%

change in value effectively illustrates the magnitude of change in production required to establish a profitable enterprise relative to its cost. Sensitivity analyses are valuable for identifying which inputs have the greatest impact on profitability.

1. Walleye

At the market price of $24.80, the proposed walleye enterprises are not expected to be profitable. However, the larger enterprise can achieve profitability through strategic adjustments. Increasing the sale price to $28.52 per pound, while reducing capital and variable costs, or scaling up production, significantly raises the calculated NPV (Tables A19-A24). The sale price and quantity sold exhibit a stair-step style relationship, where positive NPV estimates lie between a -5% and 25% change in price and volume. A 5% decrease in capital investment combined with a 10% increase in selling price or sales volume can push the larger enterprise to achieve a positive NPV. Increases in selling price and decreases in variable costs, including feed and labor, had a greater positive impact on NPV than increases in quantity sold, combined with decreases in variable costs. The IRR on the larger-scale walleye enterprise was 1.82%. This indicates that at a discount rate of 1.82%, the NPV estimate would equal zero. Therefore, under the initial enterprise assumptions, the NPV is positive for any discount rate less than 1.82%, and negative for any discount rate above 1.82%. If the enterprise assumptions change, then the IRR also changes. Additionally, the payback period for the larger-scale enterprise is 26 years, meaning it will take 26 years to recover the initial project investment cost.

2. Yellow Perch

Although the yellow perch enterprises are not profitable at a market price of $37.80, the larger enterprise can achieve a positive NPV through targeted adjustments. Increasing the sale price to $43.47 per pound, reducing capital and variable costs, and scaling up production significantly enhance profitability (Tables B19-B22 and B24). Similar to the walleye case, the sale price and quantity sold exhibit a stair-step style relationship, where positive NPV estimates lie between a -5% and 25% change in price and volume. A 5% decrease in capital investment combined with a 10% increase in selling price or sales volume can push the larger enterprise to achieve a positive NPV. Increases in selling price and decreases in variable costs, including feed and labor, had a greater positive impact on NPV than increases in quantity sold, combined with decreases in variable costs. Even at a 25% change in both parameters, an increase in sales volume combined with lower variable costs per pound did not result in a positive NPV estimate. The IRR on the larger-scale yellow perch enterprise was 1.63%. This means the project's NPV estimate would equal zero when discounted at 1.63%. Under the initial enterprise assumptions, the NPV is positive for any discount rate less than 1.63%, and negative for any discount rate above 1.63%. The IRR will change if the enterprise assumptions change. Additionally, the payback period for the larger-scale enterprise is 27 years, meaning it will take 27 years to recover the initial project investment cost.

3. Pacific White Shrimp

For the larger pacific white shrimp enterprise, NPV turns positive only when both price and quantity increase by at least 15% (Table C18). Although the pacific white shrimp enterprises

are not profitable at the market price of $17.99, the larger enterprise can achieve a positive NPV by raising the sale price to at least $20.69 per pound and increasing production volume to 16,497 pounds. The IRR on the larger-scale pacific white shrimp enterprise was 0.21%. This means that at a discount rate of 0.21%, the NPV estimate would be zero. Under the initial enterprise assumptions, the NPV is positive for any discount rate less than 0.21%, and negative for any discount rate above 0.21%. IRR is sensitive to changes in assumptions, so changes to enterprise inputs will change the IRR estimate. Additionally, the payback period for the larger-scale enterprise is 36 years, meaning it will take 36 years to recover the initial project investment cost.

4. Enterprise Budget Comparisons

In 2023, the Northern Aquaculture Demonstration Facility released a budget for walleye raised in RAS (Held, 2023). This budget analyzes the cost of producing 6,000 pounds of walleye annually and reveals a breakeven cost of $7.70 per pound. The smaller-scale enterprise budget in this thesis raises 10,584 pounds of walleye per year at a breakeven cost of $47.62 per pound. These cost differences are attributed to higher depreciation, feed, and labor expense. The larger-scale enterprise budget raises 50,024 pounds of walleye annually at $27.36 per pound. The breakeven cost of production decreases to $18.72 per pound if depreciation and other fixed expenses are excluded from the calculation.

The North Central Regional Aquaculture Center developed aquaculture budgets for yellow perch pond production in Wisconsin and Indiana (Malison & Held, 2008). These budgets model 17,000 pounds of production per year at a breakeven price of $3.00 per pound. In comparison, the yellow perch budgets presented in this thesis include 4,700 pounds of annual

production at a $56.60 operating breakeven cost per pound and 22,360 pounds of production at a breakeven operating cost of $28.95. The significantly higher breakeven cost in the thesis models is primarily due to differences in production scale and system.

Purdue University created an interactive budgeting tool for yellow perch raised in RAS (Quagrainie & Malekar, 2012). This model projects that at 3,796 pounds of annual production, cash flows will remain negative for at least ten years. Reflecting this trend, the 4,700-pound production model in this thesis revealed prolonged negative cash flows, lasting 29 years. Meanwhile, the 22,360-pound production model projected negative project cash flows for only three years. The variation in expected financial performance is attributed mainly to differences in production scale.

Purdue University developed an interactive budgeting tool for shrimp (Quagrainie & Malekar, 2012). This model projects that a farm raising 899 pounds of shrimp will produce $12,400 after only one year of operation. In contrast, the thesis model for 4,844 pounds of shrimp annually projected negative cash flows for at least 30 years. This difference can be attributed to higher capital investment, insurance, maintenance, feed, and labor costs in the thesis budget. The thesis model for 20,241 pounds of production projected negative cash flows for 9 years.

Purdue University also created shrimp aquaculture budgets to evaluate the financial impact of harvest size. The budgets evaluated harvest weights ranging from 14 to 20 grams. The 20-gram budget assumed annual production of 6,222 pounds and had a breakeven cost of production at $13.76 per pound. The University of Missouri Extension published a RAS grow-out budget for shrimp (Kientzy et al., 2024; Horner et al., 2023). This budget analyzes the

economic impact of raising shrimp to 22 grams each, totaling 15,000 pounds of annual production. The model has a breakeven cost of $14.97. Similarly, the thesis budget for 4,844 pounds of shrimp at a harvest size of 20 grams had a breakeven cost of production of $49.78 per pound. The difference in breakeven price was influenced by higher depreciation, feed, and labor costs. The thesis budget for 20,241 pounds of shrimp harvested at 20 grams had a breakeven price of 22.72 per pound, and a variable breakeven cost of production of $14.15 per pound. Excluding depreciation expense and other fixed costs brought the calculated cost of production per pound for the larger-scale enterprise in line with these existing findings.

Compared to other budgets in the literature, the thesis budgets allocated more operating expenses toward feed and labor costs. Industry experts who were interviewed noted that the cost of these line items is often underestimated and should be increased from the amount budgeted for in the existing literature.

5. Study Limitations

This thesis has some limitations. The initial cost estimates were reviewed by only two to three experts per species. More feedback would have provided a more accurate representation of average industry costs. Similarly, the price estimates for RAS equipment were sourced from a single manufacturer. Including quotes from multiple suppliers would have offered a broader and more reliable cost range. Additionally, an aquaculture engineer was not involved in the facility design process. Collaborating with an engineer could have improved the technical accuracy and feasibility of the proposed aquaculture facilities. Many building costs were estimated using

residential values instead of commercial values. However, even with this variation, interviewed participants generally considered the facility cost estimates to be reasonable.

VI. Conclusion

Aquatic food security is becoming an increasing concern due to natural disasters, pollution, and overfishing. At the same time, rising incomes and shifting dietary preferences drive up the demand for seafood. RAS support year-round production in controlled indoor environments. In Minnesota, interest in food-fish aquaculture using RAS is growing, particularly in raising walleye, yellow perch, and pacific white shrimp. Walleye and yellow perch are both native to the Great Lakes and are highly valued in local markets. However, the expansion of U.S. aquaculture faces significant challenges, including heavy regulatory burden, high input costs, and limited availability of fingerlings. Management strategies such as cold banking can help smooth production over time. While many enterprise budgets exist for bass, trout, tilapia, and catfish, they are typically modeled for pond systems in southern states.

In this thesis, enterprise budgets were developed for walleye, yellow perch, and pacific white shrimp to determine the variable and total breakeven costs of production. These estimates were then compared to the market price to determine profitability. Aquaculture farmers in the Great Lakes region, with a focus on Minnesota, were contacted to review the budgets and provide feedback. The feedback was used to refine the initial budget estimates before analysis. Data from the final enterprise budgets were then used to generate NPV estimates for each enterprise. Sensitivity analyses were conducted on the NPV calculations to assess the impact of changes in key variables on the overall value.

The smaller enterprises for each species are too small to be commercially viable. These enterprises generated negative NPV estimates, with no sensitivity analyses resulting in a positive NPV. Additionally, their variable and total breakeven costs of production exceed the current market prices. Therefore, the smaller-scale enterprises explored in this thesis should be considered hobby-sized rather than commercially viable. Budgets for larger enterprises showed more economic potential than those for smaller enterprises. Although the initial NPV estimates were negative, sensitivity analyses revealed that the NPV turned positive under certain conditions. Furthermore, the current market price covers the variable production costs for larger enterprises, though it remains below the breakeven prices needed to cover total production costs under the original assumptions. The sensitivity analyses revealed that changes in sale price and production quantity had the most significant impact on NPV estimates. Reductions in capital investments greatly improved NPV for the larger-scale walleye and yellow perch enterprises. Farmers could explore retrofitting RAS equipment into an existing building, using pools instead of fish tanks, and purchasing used equipment to reduce start-up investment costs. Reductions in feed and labor costs also had a positive impact on NPV. Securing funding for aquaculture farms can be challenging due to the limited data available on production costs and the relatively small number of successful operations. The enterprise budgets, NPV, and sensitivity analyses presented in this thesis provide valuable data to help inform financing decisions and support industry growth.

VII. References

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Appendix A - Walleye

Table A 1. Walleye Budget Assumptions					
Operating Assumptions	Input	Source (low)	Source (high)	Value Used	Source of Value Used
Water Temperature (C)	23	Hauser et al., 2023	Hauser et al., 2023	23	Hauser et al., 2023
Fingerling Price ($/2" fingerling)	$0.50 - 1.50	Held, 2023	Alex and Casey	$1.00	Median
Stocking Density at Harvest (kg/m^3)	60	Hauser et al., 2023	Hauser et al., 2023	60 kg/m^3	Hauser et al., 2023
Days per Cycle	365 - 405	Jordan	Held, 2023; Alex	405 days	Held, 2023; Alex
Growout Mortality Rate	2 - 10%	Alex	Jordan	5%	Held, 2023
Final Market Size (g)	454 - 680	Held, 2023	Jordan	454 g	Held, 2023
Fillet Yield	40 - 45%	Summerfelt, 1996	Jordan	45%	Jordan
Size of each fillet (g)	91 - 153	Calculated (yield*market size)	Calculated	102 g	yield*market size
Expense Categories	Input	Source (low)	Source (high)	Value Used	Source of Value Used
Feed ($/lb)	$1.00 - 1.50	Jordan	Alex	$1.50 small; $1.00 large	Alex; Jordan
Labor ($/hr)	$20 - 26.45	Avery	Prager et al., 2018	$26.45 full time; $20 part time	Prager et al., 2018; Avery
Processing Costs ($/fish)	$0.50 - 2.00	Riley	Riley	$1.60	Homerfishprocessing, 2025
Electricity ($/kWh)	$0.09 - 0.18	Jordan	BLS, 2024	$0.14	Median
Electricity use (kWh/kg)	20 - 29.4	Badiola et al., 2017	Badiola et al., 2017	29.4 small; 20 large	Badiola et al., 2017
Permits/Licensing ($/year)	$300	MN DNR, 2025	MN DNR, 2025	$300	MN DNR, 2025
Sales & Marketing ($/month)	$50 - 100	Payton	Payton	$50 small; $100 large	Payton
Maintenance & Repair (% of operating cost)	10%	BPT Team, 2024	BPT Team, 2024	10%	BPT Team, 2024
Insurance (% of operating cost)	5%	BPT Team, 2024	BPT Team, 2024	5%	BPT Team, 2024
Internet ($/month)	$50 - 80	Payton	Payton	$69	Highspeedinternet, 2025

Table A 2. Smaller Scale Walleye Enterprise Operating Assumptions			
Operating Assumptions	**Input**	**Source**	**Formula/Notes**
Final Market Size (g)	454 g	Held, 2023	
Days per Cycle	405 days	Held, 2024	
Stocking Density at Harvest (kg/m^3)	60 kg/m^3	Hauser et al., 2023	Equals 0.5 lbs/gal
Fish/tank	882		Tank volume (gal)*0.5 lb/gal
Fingerlings/tank	928		Fish per tank/survival rate
Number of tanks	13		3x10ft, 1765 gal
System volume (m^3)	86.85		
Harvests/yr	12		
Hydrilic retention time (min)	26		System volume (gal)/flow rate
Flow Rate (gpm)	892		

Table A 3. Larger Scale Walleye Enterprise Operating Assumptions			
Operating Assumptions	**Input**	**Source**	**Formula/Notes**
Final Market Size (g)	454 g	Held, 2023	
Days per Cycle	405 days	Held, 2024	
Stocking Density at Harvest (kg/m^3)	60 kg/m^3	Hauser et al., 2023	Equals 0.5 lbs/gal
Fish/tank	962		Tank volume (gal)*0.5 lb/gal
Fingerlings/tank	1013		Fish per tank/survival rate
Number of tanks	58		10x3.5 ft, 2056 gal
System volume (m^3)	451.36		
Harvests/yr	52		
Hydrilic retention time (min)	37		System volume (gal)/flow rate
Flow Rate (gpm)	3195		

Table A 4. Smaller Scale Walleye Enterprise Feed Calculations									
Days post hatch Initial fingerlings per tank (928)	**Initial weight (g)**	**Final weight (g)**	**Final tank biomass (kg)**	**Feed rate/day**	**Final feed rate (kg/day)**	**Life Stage**	**Fish mortality rate**	**Fish per tank (period ending)**	**Source**
40-51	1	2	1.86	20.0%	0.39	1	0.2941%	926	Hauser et al., 2023
51-61	2	3	2.78	15.0%			0.2941%	923	Hauser et al., 2023
61-71	3	4	3.69	10.0%			0.2941%	920	Hauser et al., 2023
71-85	4	9	8.28	7.5%	0.89	2	0.2941%	918	Hauser et al., 2023
85-102	9	18	16.52	7.0%			0.2941%	915	Hauser et al., 2023
102-115	18	30	27.45	6.0%	1.19	3	0.2941%	912	Hauser et al., 2023
115-133	30	40	36.49	2.0%			0.2941%	909	Hauser et al., 2023
133-164	40	84	76.40	2.0%	1.53	4	0.2941%	907	Hauser et al., 2023
164-195	84	120	108.82	2.0%	2.18	5	0.2941%	904	Hauser et al., 2023
195-226	120	172	155.51	2.0%	3.11	6	0.2941%	901	Hauser et al., 2023
226-257	172	216	194.72	2.0%	3.89	7	0.2941%	899	Hauser et al., 2023
257-288	216	260	233.69	2.0%	4.67	8	0.2941%	896	Hauser et al., 2023
288-319	260	304	272.44	2.0%	5.45	9	0.2941%	894	Hauser et al., 2023
319-350	304	348	310.95	2.0%	6.22	10	0.2941%	891	Hauser et al., 2023
350-381	348	393	350.13	2.0%	7.00	11	0.2941%	888	Hauser et al., 2023
381-413	393	438	389.07	2.0%	7.78	12	0.2941%	886	Hauser et al., 2023
413-445	438	483	427.78	2.0%	8.56	13	0.2941%	883	Hauser et al., 2023
Each life stage is about 31 days	**Total Biomass**	**2,566.65**	**kg**	**Total Feed / Day**	**52.85**	**kg**	**5%**	**Mortlity Rate**	

Table A 5. Larger Scale Walleye Enterprise Feed Calculation									
Days post hatch Initial fingerlings per tank (1,013)	**Initial weight (g)**	**Final weight (g)**	**Final tank biomass (kg)**	**Feed rate/day**	**Final feed rate (kg/day)**	**Life Stage**	**Fish mortality rate**	**Fish per tank (period ending)**	**Source**
40-47	1	2	2.03	20.0%	0.41	1	0.0862%	1012	Hauser et al., 2023
47-54	2	3	3.04	15.0%	0.46	2	0.0862%	1011	Hauser et al., 2023
54-61	3	4	4.04	10.0%	0.40	3	0.0862%	1010	Hauser et al., 2023
61-68	4	5	5.05	7.5%	0.38	4	0.0862%	1009	Hauser et al., 2023
68-75	5	7	7.06	7.5%	0.53	5	0.0862%	1008	Hauser et al., 2023
75-82	7	9	9.07	7.0%	0.64	6	0.0862%	1007	Hauser et al., 2023
82-89	9	12	12.09	7.0%	0.85	7	0.0862%	1007	Hauser et al., 2023
89-96	12	15	15.10	6.0%	0.91	8	0.0862%	1006	Hauser et al., 2023
96-103	15	18	18.10	6.0%	1.09	9	0.0862%	1005	Hauser et al., 2023
103-110	18	24	24.12	6.0%	1.45	10	0.0862%	1004	Hauser et al., 2023
110-117	24	30	30.12	6.0%	1.81	11	0.0862%	1003	Hauser et al., 2023
117-124	30	35	35.11	2.0%	0.70	12	0.0862%	1002	Hauser et al., 2023
124-131	35	40	40.09	2.0%	0.80	13	0.0862%	1001	Hauser et al., 2023
131-138	40	49	49.07	1.8%	0.88	14	0.0862%	1000	Hauser et al., 2023
138-145	49	58	58.03	1.8%	1.04	15	0.0862%	1000	Hauser et al., 2023
145-152	58	67	66.97	1.8%	1.21	16	0.0862%	999	Hauser et al., 2023
152-159	67	76	75.91	1.8%	1.37	17	0.0862%	998	Hauser et al., 2023
159-166	76	85	84.82	1.8%	1.53	18	0.0862%	997	Hauser et al., 2023
166-173	85	94	93.72	1.8%	1.69	19	0.0862%	996	Hauser et al., 2023
173-180	94	103	102.61	1.8%	1.85	20	0.0862%	995	Hauser et al., 2023
180-187	103	113	112.47	1.8%	2.02	21	0.0862%	994	Hauser et al., 2023
187-194	113	123	122.32	1.8%	2.20	22	0.0862%	994	Hauser et al., 2023
194-201	123	133	132.15	1.8%	2.38	23	0.0862%	993	Hauser et al., 2023
201-208	133	143	141.96	1.8%	2.56	24	0.0862%	992	Hauser et al., 2023
208-215	143	153	151.76	1.8%	2.73	25	0.0862%	991	Hauser et al., 2023
215-222	153	163	161.54	1.8%	2.91	26	0.0862%	990	Hauser et al., 2023

Table A 6. Larger Scale Walleye Enterprise Feed Calculation Cont.									
Days post hatch Initial fingerlings per tank (1,013)	**Initial weight (g)**	**Final weight (g)**	**Final tank biomass (kg)**	**Feed rate/day**	**Final feed rate (kg/day)**	**Life Stage**	**Fish mortality rate**	**Fish per tank (period ending)**	**Source**
222-229	163	173	171.30	1.8%	3.08	27	0.0862%	989	Hauser et al., 2023
229-236	173	183	181.05	1.8%	3.26	28	0.0862%	988	Hauser et al., 2023
236-243	183	193	190.77	1.5%	2.86	29	0.0862%	988	Hauser et al., 2023; Ronyai & Csengeri, 2008
243-250	193	203	200.49	1.5%	3.01	30	0.0862%	987	Hauser et al., 2023; Ronyai & Csengeri, 2008
250-257	203	213	210.18	1.5%	3.15	31	0.0862%	986	Hauser et al., 2023; Ronyai & Csengeri, 2008
257-264	213	223	219.86	1.5%	3.30	32	0.0862%	985	Hauser et al., 2023; Ronyai & Csengeri, 2008
264-271	223	233	229.52	1.5%	3.44	33	0.0862%	984	Hauser et al., 2023; Ronyai & Csengeri, 2008
271-279	233	243	239.16	1.5%	3.59	34	0.0862%	983	Hauser et al., 2023; Ronyai & Csengeri, 2008
279-286	243	253	248.79	1.5%	3.73	35	0.0862%	983	Hauser et al., 2023; Ronyai & Csengeri, 2008
286-293	253	263	258.40	1.5%	3.88	36	0.0862%	982	Hauser et al., 2023; Ronyai & Csengeri, 2008
293-300	263	273	268.00	1.5%	4.02	37	0.0862%	981	Hauser et al., 2023; Ronyai & Csengeri, 2008
300-307	273	283	277.57	1.5%	4.16	38	0.0862%	980	Hauser et al., 2023; Ronyai & Csengeri, 2008
307-314	283	293	287.13	1.5%	4.31	39	0.0862%	979	Hauser et al., 2023; Ronyai & Csengeri, 2008
314-321	293	303	296.68	1.5%	4.45	40	0.0862%	978	Hauser et al., 2023; Ronyai & Csengeri, 2008
321-328	303	313	306.21	1.5%	4.59	41	0.0862%	977	Hauser et al., 2023; Ronyai & Csengeri, 2008
328-335	313	323	315.72	1.5%	4.74	42	0.0862%	977	Hauser et al., 2023; Ronyai & Csengeri, 2008
335-342	323	333	325.21	1.5%	4.88	43	0.0862%	976	Hauser et al., 2023; Ronyai & Csengeri, 2008
342-349	333	343	334.69	1.5%	5.02	44	0.0862%	975	Hauser et al., 2023; Ronyai & Csengeri, 2008
349-356	343	353	344.15	1.5%	5.16	45	0.0862%	974	Hauser et al., 2023; Ronyai & Csengeri, 2008
356-363	353	363	353.59	1.5%	5.30	46	0.0862%	973	Hauser et al., 2023; Ronyai & Csengeri, 2008
363-370	363	373	363.02	1.5%	5.45	47	0.0862%	972	Hauser et al., 2023; Ronyai & Csengeri, 2008
370-377	373	383	372.43	1.5%	5.59	48	0.0862%	972	Hauser et al., 2023; Ronyai & Csengeri, 2008
377-384	383	393	381.83	1.5%	5.73	49	0.0862%	971	Hauser et al., 2023; Ronyai & Csengeri, 2008
384-391	393	403	391.20	1.5%	5.87	50	0.0862%	970	Hauser et al., 2023; Ronyai & Csengeri, 2008

Table A 7. Larger Scale Walleye Enterprise Feed Calculation Cont.									
Days post hatch Initial fingerlings per tank (1,013)	**Initial weight (g)**	**Final weight (g)**	**Final tank biomass (kg)**	**Feed rate/day**	**Final feed rate (kg/day)**	**Life Stage**	**Fish mortality rate**	**Fish per tank (period ending)**	**Source**
391-398	403	413	400.57	1.5%	6.01	51	0.0862%	969	Hauser et al., 2023; Ronyai & Csengeri, 2008
398-405	413	423	409.91	1.5%	6.15	52	0.0862%	968	Hauser et al., 2023; Ronyai & Csengeri, 2008
405-412	423	433	419.24	1.5%	6.29	53	0.0862%	967	Hauser et al., 2023; Ronyai & Csengeri, 2008
412-419	433	443	428.55	1.5%	6.43	54	0.0862%	967	Hauser et al., 2023; Ronyai and Csengeri, 2008
419-426	443	453	437.85	1.5%	6.57	55	0.0862%	966	Hauser et al., 2023; Ronyai and Csengeri, 2008
426-433	453	463	447.13	1.5%	6.71	56	0.0862%	965	Hauser et al., 2023; Ronyai and Csengeri, 2008
433-439	463	473	456.39	1.5%	6.85	57	0.0862%	964	Hauser et al., 2023; Ronyai and Csengeri, 2008
439-445	473	483	465.64	1.5%	6.98	58	0.0862%	963	Hauser et al., 2023; Ronyai and Csengeri, 2008
Each life stage is about 7 days	**Total Biomass**	**11,790.56**	**kg**	**Total Feed / Day**	**189.30**	**kg**	**5%**	**Mortality Rate**	

Table A8. Smaller Scale Walleye Enterprise Budget (10,584 lbs live)											
Capital Expediture	**Item**	**Cost range**	**Source (low)**	**Source (high)**	**Source (Used)**	**Cost/unit (used)**	**Number of units**	**Total cost**	**Useful life**	**Depreciation/year**	**Source**
Facilities	Land cost ($/acre)	$2,000 - 15,000	Taylor	Cameron	UMN Extension, 2024	$6,745	1	$6,745			
	Site Prep ($/acre)	$200 - 2,000	Graham, 2025	Graham, 2025	Median	$1,100	1	$1,100	40	$28	PWC, 2024; Collins, 2005
	Well (20 gpm)	$16,000 - 30,000	Payton	Cameron	UMN Extension, 2022	$20,000	1	$20,000	40	$500	Kientzy et al., 2024; Horner et al., 2023
	Building Permits	$1,000 - 3,000	Cameron	Cameron	Median	$2,000	1	$2,000	40	$50	PWC, 2024; Collins, 2005
	General Contractor (% of building cost)	5% - 15%	BuildBook, 2024	BuildBook, 2024	Median	10%	$514,100	$51,410	40	$1,285	PWC, 2024; Collins, 2005
	Building (50x100ft) and concrete ($/sq. ft)	$20 - 250	Payton	Jordan	Cameron	$80	5,000	$400,000	40	$10,000	Collins, 2005
	Septic and plumbing	$16,000 - 24,000	Minus 20%	Plus 20%	Jordan; Cameron	$20,000	1	$20,000	20	$1,000	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	HVAC	$8,000 - 12,000	Minus 20%	Plus 20%	Schipper et al., 2024	$10,000	1	$10,000	20	$500	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Electrical service	$4,000 - 20,000	Kellam, 2025	Kellam, 2025	Median	$12,000	1	$12,000	20	$600	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Electrical wiring ($/sq. ft)	$4 - 9	Farmer et al., 2024	Farmer et al., 2024	Median	$6.50	5,000	$32,500	20	$1,625	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Generator	$9,000 - 20,000	Weimert et al., 2024	Cameron	Median	$14,500	1	$14,500	20	$725	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Water heater	$3,200 - 4,800	Minus 20%	Plus 20%	Home Depot, 2025	$4,000	1	$4,000	20	$200	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Subtotal							$574,255			
RAS Equipment	Tanks (10x3ft), (1765 gal)	$4,800 - 7,200	Minus 20%	Plus 20%	Hydro Composites, 2025	$6,225	13	$101,156	10	$10,116	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Drum filter	$14,400 - 21,600	Minus 20%	Plus 20%	Brooke	$18,000	1	$18,000	10	$1,800	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Sump and pump station	$4,400 - 6,600	Minus 20%	Plus 20%	Pentair AES, 2025	$5,452	1	$5,452	10	$545	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Biofilter	$10,000 - 20,000	Brooke	Jordan	Median	$15,000	1	$15,000	10	$1,500	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Degassing column	$16,000 - 24,000	Minus 20%	Plus 20%	Jordan	$20,000	1	$20,000	10	$2,000	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	UV disinfection	$14,400 - 21,600	Minus 20%	Plus 20%	Brooke	$18,000	1	$18,000	10	$1,800	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Aeration system ($/sq. ft)	$15 - 23	Minus 20%	Plus 20%	Cameron	$19	5,000	$95,000	10	$9,500	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Feeders	$800 - 1200	Minus 20%	Plus 20%	Jordan; Cameron	$1,000	13	$13,000	10	$1,300	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Water quality and monitoring equipment ($/sq. ft)	$8 - 12	Minus 20%	Plus 20%	Cameron	$10	5,000	$50,000	5	$10,000	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Misc Equip/Tools ($/lb producrion)	$0.50 - 1.50	Minus 20%	Plus 20%	Held, 2023	$1.25	10,584	$13,230	5	$2,646	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Subtotal							$348,838	Depreciation/year	$57,720	
Total Facilities Investment								$923,093			

Cost category	**Item**	**Cost range**	**Source (low)**	**Source (high)**	**Source (Used)**	**Cost/unit (used)**	**Number of units**	**365 day Annual cost**	**405 day Cycle cost**
Operating Costs	Fingerlings ($/fingerlings)	$0.50 - 1.50	Held, 2023	Alex and Casey	Median	$1.00	11,136	$11,136	$12,064
	Feed ($/lb)	$1.00 - 1.50	Jordan	Alex	Alex	$1.50	42,535	$63,803	$70,795
	Owner Labor ($/hr)	$20 - 26.45	Avery	Prager et al., 2018	Prager et al., 2018	$26.45	2,080	$55,016	$61,045
	Electricity ($/kWh)	$0.09 - 0.18	Jordan	BLS, 2024	Median	$0.14	141,120	$19,757	$21,403
	Sales & Marketing ($/month)	$50 - 100	Payton	Payton	Payton	$50.00	12	$600	$666
	Repairs and Maintenance (% of op. cost)	10%	BPT Team, 2024	BPT Team, 2024	BPT Team, 2025	10%	$167,246	$16,725	$18,557
	Processing ($/fish)	$0.50 - 2.00	Riley	Riley	Homerfishprocessing, 2025	$1.60	10,584	$16,934	$18,346
	Total variable cost							$183,970	$202,876
Overhead Costs	Internet Service ($/month)	$50 - 80	Payton	Payton	Highspeedinternet, 2025	$69.00	12	$828	$919
	Permits and Licensing ($/year)	$300	MN DNR, 2025	MN DNR, 2025	MN DNR, 2025	$300.00	1	$300	$333
	Insurance (% of op. cost)	5%	BPT Team, 2024	BPT Team, 2024	BPT Team, 2024	5%	$183,970	$9,199	$10,207
	Depreciation ($/year)	$57,720				$57,720	1	$57,720	$64,045
	Total ownership cost							$68,046	$75,503
Total Cost of Production								$252,016	$278,379
Breakeven operating cost per 1 lb filets (4 filets)								$34.76	$35.39
Breakeven total cost per 1 lb filets (4 filets)								$47.62	$48.56

Table A9. Larger Scale Walleye Enterprise Budget (50,024 lbs live)											
Capital Expediture	**Item**	**Cost range**	**Source (low)**	**Source (high)**	**Source (Used)**	**Cost/unit (used)**	**Number of units**	**Total cost**	**Useful life**	**Depreciation/year**	**Source**
Facilities	Land cost ($/acre)	$2,000 - 15,000	Taylor	Cameron	UMN Extension, 2024	$6,745	1	$6,745			
	Site Prep ($/acre)	$200 - 2,000	Graham, 2025	Graham, 2025	Median	$1,100	1	$1,100	40	$28	PWC, 2024; Collins, 2005
	Well (20 gpm)	$16,000 - 30,000	Payton	Cameron	UMN Extension, 2022	$20,000	1	$20,000	40	$500	Kientzy et al., 2024; Horner et al., 2023
	Building Permits	$1,000 - 3,000	Cameron	Cameron	Median	$2,000	1	$2,000	40	$50	PWC, 2024; Collins, 2005
	General Contractor (% of building cost)	5% - 15%	BuildBook, 2024	BuildBook, 2024	Median	10%	$1,811,600	$181,160	40	$4,529	PWC, 2024; Collins, 2005
	Building (100x200ft) and concrete ($/sq. ft)	$20 - 250	Payton	Jordan	Cameron	$80	20,000	$1,600,000	40	$40,000	Collins, 2005
	Septic and plumbing	$16,000 - 24,000	Minus 20%	Plus 20%	Jordan; Cameron	$20,000	1	$20,000	20	$1,000	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	HVAC	$8,000 - 12,000	Minus 20%	Plus 20%	Schipper et al., 2024	$10,000	1	$10,000	20	$500	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Electrical service	$4,000 - 20,000	Kellam, 2025	Kellam, 2025	Median	$12,000	1	$12,000	20	$600	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Electrical wiring ($/sq. ft)	$4 - 9	Farmer et al., 2024	Farmer et al., 2024	Median	$6.50	20,000	$130,000	20	$6,500	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Generator	$9,000 - 20,000	Weimert et al., 2024	Cameron	Median	$14,500	1	$14,500	20	$725	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Water heater	$3,200 - 4,800	Minus 20%	Plus 20%	Home Depot, 2025	$4,000	1	$4,000	20	$200	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Subtotal							$2,001,505			
RAS Equipment	Tanks (10x3.5ft), (2056 gal)	$5,600 - 8,400	Minus 20%	Plus 20%	Hydro Composites, 2025	$6,812	58	$493,870	10	$49,387	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Drum filter	$24,300 - 29,700	Minus 10%	Plus 10%	Brooke	$27,000	1	$27,000	10	$2,700	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Sump and pump station	$12,800 - 19,200	Minus 20%	Plus 20%	Pentair AES, 2025	$16,356	1	$16,356	10	$1,636	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Biofilter	$27,000 - 33,000	Minus 10%	Plus 10%	Brooke	$30,000	1	$30,000	10	$3,000	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Degassing column	$27,000 - 33,000	Minus 10%	Plus 10%	Jordan	$30,000	1	$30,000	10	$3,000	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	UV disinfection	$40,500 - 49,500	Minus 10%	Plus 10%	Brooke	$45,000	1	$45,000	10	$4,500	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Aeration system ($/sq. ft)	$15 - 23	Minus 20%	Plus 20%	Cameron	$15	20,000	$300,000	10	$30,000	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Feeders	$800 - 1200	Minus 20%	Plus 20%	Jordan; Cameron	$1,000	58	$58,000	10	$5,800	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Water quality and monitoring equipment ($/sq. ft)	$8 - 12	Minus 20%	Plus 20%	Cameron	$8	20,000	$160,000	5	$32,000	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Misc Equip/Tools ($/lb producrion)	$0.5 - 1.50	Minus 20%	Plus 20%	Held, 2023	$0.50	50,024	$25,012	5	$5,002	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Subtotal							$1,185,238	Depreciation/year	$191,657	
Total Facilities Investment								$3,186,743			

Cost category	**Item**	**Cost range**	**Source (low)**	**Source (high)**	**Source (Used)**	**Cost/unit (used)**	**Number of units**	**365 day Annual cost**	**405 day Cycle cost**
Operating Costs	Fingerlings ($/fingerlings)	$0.50 - 1.50	Held, 2023	Alex and Casey	Median	$1.00	52,676	$52,676	$58,754
	Feed ($/lb)	$1.00 - 1.50	Jordan	Alex	Jordan	$1.00	152,353	$152,353	$169,050
	Hired Labor ($/hr)	$20 - 26.45	Avery	Prager et al., 2018	Avery	$20.00	1,040	$20,800	$23,079
	Owner Labor ($/hr)	$20 - 26.45	Avery	Prager et al., 2018	Prager et al., 2019	$26.45	2,080	$55,016	$61,045
	Electricity ($/kWh)	$0.09 - 0.18	Jordan	BLS, 2024	Median	$0.14	453,732	$63,523	$70,852
	Sales & Marketing ($/month)	$50 - 100	Payton	Payton	Payton	$100.00	12	$1,200	$1,332
	Repairs and Maintenance (% of op. cost)	10%	BPT Team, 2024	BPT Team, 2024	BPT Team, 2025	10%	$425,606	$42,561	$47,225
	Processing ($/fish)	$0.50 - 2.00	Riley	Riley	Homerfishprocessing, 2025	$1.60	50,024	$80,038	$89,274
	Total variable cost							$468,167	$520,610
Overhead Costs	Internet Service ($/month)	$50 - 80	Payton	Payton	Highspeedinternet, 2025	$69.00	12	$828	$919
	Permits and Licensing ($/year)	$300	MN DNR, 2025	MN DNR, 2025	MN DNR, 2025	$300.00	1	$300	$333
	Insurance (% of op. cost)	5%	BPT Team, 2024	BPT Team, 2024	BPT Team, 2024	5%	$468,167	$23,408	$25,974
	Depreciation ($/year)	$191,657				$191,657	1	$191,657	$212,660
	Total overhead cost							$216,193	$239,885
Total Cost of Production								$684,360	$760,495
Breakeven operating cost per 1 lb filets (4 filets)								$18.72	$18.66
Breakeven total cost per 1 lb filets (4 filets)								$27.36	$27.26

Table A10. Smaller Scale Walleye Enterprise (10,584 lbs live) Net Present Value Calculation

Input	Value	Source	Input	Formula
Depreciation/year	$57,720		Income from s	lbs of fillets*sale price
Pounds of filles/year	5,292	Number of fish/fish per lb of fillets	Variable costs	(variable cost/lb)*lbs of fillets sold
Sale price/lb	24.80	Walleye Direct, 2025	Fixed costs	(ownership cost/lb)*lbs of fillets sold
Variable costs/lb	$34.76	Variable cost/lbs of fillets	Tax (shield)	EBIT*tax rate
Ownership costs/lb	$12.86	Ownership cost/lbs of fillets	Working Capit	30%*(variable+ownership coosts)
Tax rate	16.80%	McDonald, 2025	Feed cost	((Variable cost - feed cost) + (feed cost *(1 + % change)))/lbs of fillets sold
Interest rate	6.00%	Giovanetti, 2025	Labor cost	((Variable cost - labor cost) + (labor cost *(1 + % change)))/lbs of fillets sold
Discount rate	4.99%	Interest*(1-tax rate)		
Inflation	2.00%	FED, 2025		
Working capital	30.00%	Boehlje and Langemeier, 2020		

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Income from sales		$131,241.60	$133,866.43	$136,543.76	$139,274.64	$142,060.13	$144,901.33	$147,799.36	$150,755.34	$153,770.45	$156,845.86	$159,982.78	$163,182.43	$166,446.08	$169,775.00
Variable costs		-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30
Gross Margin		-$52,728.70	-$50,103.87	-$47,426.54	-$44,695.67	-$41,910.17	-$39,068.97	-$36,170.94	-$33,214.96	-$30,199.85	-$27,124.44	-$23,987.52	-$20,787.87	-$17,524.22	-$14,195.30
Ownership costs		-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09
Depreciation		-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58
Earnings before Interest and Tax		-$178,494.37	-$175,869.53	-$173,192.21	-$170,461.33	-$167,675.84	-$164,834.64	-$161,936.61	-$158,980.62	-$155,965.52	-$152,890.11	-$149,753.19	-$146,553.53	-$143,289.88	-$139,960.96
Tax (shield)		$29,987.05	$29,546.08	$29,096.29	$28,637.50	$28,169.54	$27,692.22	$27,205.35	$26,708.74	$26,202.21	$25,685.54	$25,158.54	$24,620.99	$24,072.70	$23,513.44
Net operating profit after tax		-$148,507.31	-$146,323.45	-$144,095.92	-$141,823.83	-$139,506.30	-$137,142.42	-$134,731.26	-$132,271.88	-$129,763.31	-$127,204.57	-$124,594.65	-$121,932.54	-$119,217.18	-$116,447.52
Add depreciation		$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58
Operating cash flow		-$90,787.74	-$88,603.88	-$86,376.34	-$84,104.25	-$81,786.72	-$79,422.84	-$77,011.68	-$74,552.30	-$72,043.73	-$69,484.99	-$66,875.08	-$64,212.96	-$61,497.61	-$58,727.95
Working Capital		$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92
Annual Change		-$75,604.92	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Capital expenditure	-$923,093														
Total Cash Flow	-$923,093	-$166,392.66	-$88,603.88	-$86,376.34	-$84,104.25	-$81,786.72	-$79,422.84	-$77,011.68	-$74,552.30	-$72,043.73	-$69,484.99	-$66,875.08	-$64,212.96	-$61,497.61	-$58,727.95

Year	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Income from sales	$173,170.50	$176,633.91	$180,166.59	$183,769.92	$187,445.32	$191,194.23	$195,018.11	$198,918.48	$202,896.85	$206,954.78	$211,093.88	$215,315.76	$219,622.07	$224,014.51	$228,494.80	$233,064.70
Variable costs	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30	-$183,970.30
Gross Margin	-$10,799.80	-$7,336.39	-$3,803.71	-$200.38	$3,475.02	$7,223.93	$11,047.81	$14,948.17	$18,926.54	$22,984.48	$27,123.58	$31,345.45	$35,651.77	$40,044.21	$44,524.50	$49,094.40
Ownership costs	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09	-$68,046.09
Depreciation	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58	-$57,719.58
Earnings before Interest and Tax	-$136,565.46	-$133,102.05	-$129,569.37	-$125,966.04	-$122,290.64	-$118,541.74	-$114,717.85	-$110,817.49	-$106,839.12	-$102,781.18	-$98,642.09	-$94,420.21	-$90,113.90	-$85,721.45	-$81,241.16	-$76,671.27
Tax (shield)	$22,943.00	$22,361.14	$21,767.65	$21,162.30	$20,544.83	$19,915.01	$19,272.60	$18,617.34	$17,948.97	$17,267.24	$16,571.87	$15,862.60	$15,139.13	$14,401.20	$13,648.52	$12,880.77
Net operating profit after tax	-$113,622.47	-$110,740.91	-$107,801.72	-$104,803.75	-$101,745.82	-$98,626.73	-$95,445.25	-$92,200.15	-$88,890.15	-$85,513.95	-$82,070.22	-$78,557.62	-$74,974.76	-$71,320.25	-$67,592.65	-$63,790.50
Add depreciation	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58	$57,719.58
Operating cash flow	-$55,902.89	-$53,021.33	-$50,082.14	-$47,084.17	-$44,026.24	-$40,907.15	-$37,725.68	-$34,480.58	-$31,170.57	-$27,794.37	-$24,350.64	-$20,838.04	-$17,255.19	-$13,600.68	-$9,873.07	-$6,070.92
Working Capital	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$75,604.92	$0.00
Annual Change	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$75,604.92
Total Cash Flow	-$55,902.89	-$53,021.33	-$50,082.14	-$47,084.17	-$44,026.24	-$40,907.15	-$37,725.68	-$34,480.58	-$31,170.57	-$27,794.37	-$24,350.64	-$20,838.04	-$17,255.19	-$13,600.68	-$9,873.07	$69,534.00

Net present value	**-$1,938,106.07**

Table A11. Smaller Scale Walleye Enterprise (10,584 lbs live)

			Quanity Sold							
			-10%	**-5%**	**original**	**5%**	**10%**	**15%**	**20%**	**25%**
	Initial NPV	-$1,938,106	4,763	5,027	5,292	5,557	5,821	6,086	6,350	6,615
Price	**-10%**	$22.32	-$2,340,234	-$2,244,993	-$2,149,752	-$2,054,512	-$1,959,271	-$1,864,030	-$1,768,789	-$1,673,548
	-5%	$23.56	-$2,244,993	-$2,144,461	-$2,043,929	-$1,943,397	-$1,842,865	-$1,742,333	-$1,641,801	-$1,541,269
	original	$24.80	-$2,149,752	-$2,043,929	**-$1,938,106**	-$1,832,283	-$1,726,460	-$1,620,637	-$1,514,813	-$1,408,990
	5%	$26.04	-$2,054,512	-$1,943,397	-$1,832,283	-$1,721,169	-$1,610,054	-$1,498,940	-$1,387,825	-$1,276,711
	10%	$27.28	-$1,959,271	-$1,842,865	-$1,726,460	-$1,610,054	-$1,493,649	-$1,377,243	-$1,260,838	-$1,144,432
	15%	$28.52	-$1,864,030	-$1,742,333	-$1,620,637	-$1,498,940	-$1,377,243	-$1,255,547	-$1,133,850	-$1,012,153
	20%	$29.76	-$1,768,789	-$1,641,801	-$1,514,813	-$1,387,825	-$1,260,838	-$1,133,850	-$1,006,862	-$879,874
	25%	$31.00	-$1,673,548	-$1,541,269	-$1,408,990	-$1,276,711	-$1,144,432	-$1,012,153	-$879,874	-$747,595

Table A12. Smaller Scale Walleye Enterprise (10,584 lbs live)

			Capital Investment							
			-25%	**-20%**	**-15%**	**-10%**	**-5%**	**original**	**5%**	**10%**
	Initial NPV	-$1,938,106	-$692,320	-$738,475	-$784,629	-$830,784	-$876,939	-$923,093	-$969,248	-$1,015,403
Price	**-10%**	$22.32	-$1,918,979	-$1,965,134	-$2,011,288	-$2,057,443	-$2,103,598	-$2,149,752	-$2,195,907	-$2,242,062
	-5%	$23.56	-$1,813,156	-$1,859,311	-$1,905,465	-$1,951,620	-$1,997,775	-$2,043,929	-$2,090,084	-$2,136,239
	original	$24.80	-$1,707,333	-$1,753,487	-$1,799,642	-$1,845,797	-$1,891,951	**-$1,938,106**	-$1,984,261	-$2,030,415
	5%	$26.04	-$1,601,510	-$1,647,664	-$1,693,819	-$1,739,974	-$1,786,128	-$1,832,283	-$1,878,438	-$1,924,592
	10%	$27.28	-$1,495,686	-$1,541,841	-$1,587,996	-$1,634,150	-$1,680,305	-$1,726,460	-$1,772,614	-$1,818,769
	15%	$28.52	-$1,389,863	-$1,436,018	-$1,482,173	-$1,528,327	-$1,574,482	-$1,620,637	-$1,666,791	-$1,712,946
	20%	$29.76	-$1,284,040	-$1,330,195	-$1,376,349	-$1,422,504	-$1,468,659	-$1,514,813	-$1,560,968	-$1,607,123
	25%	$31.00	-$1,178,217	-$1,224,371	-$1,270,526	-$1,316,681	-$1,362,835	-$1,408,990	-$1,455,145	-$1,501,299

Table A13. Smaller Scale Walleye Enterprise (10,584 lbs live)

			Capital Investment							
			-25%	**-20%**	**-15%**	**-10%**	**-5%**	**original**	**5%**	**10%**
	Initial NPV	-$1,938,106	-$692,320	-$738,475	-$784,629	-$830,784	-$876,939	-$923,093	-$969,248	-$1,015,403
Quantity	**-10%**	4,763	-$1,918,979	-$1,965,134	-$2,011,288	-$2,057,443	-$2,103,598	-$2,149,752	-$2,195,907	-$2,242,062
	-5%	5,027	-$1,813,156	-$1,859,311	-$1,905,465	-$1,951,620	-$1,997,775	-$2,043,929	-$2,090,084	-$2,136,239
	original	5,292	-$1,707,333	-$1,753,487	-$1,799,642	-$1,845,797	-$1,891,951	**-$1,938,106**	-$1,984,261	-$2,030,415
	5%	5,557	-$1,601,510	-$1,647,664	-$1,693,819	-$1,739,974	-$1,786,128	-$1,832,283	-$1,878,438	-$1,924,592
	10%	5,821	-$1,495,686	-$1,541,841	-$1,587,996	-$1,634,150	-$1,680,305	-$1,726,460	-$1,772,614	-$1,818,769
	15%	6,086	-$1,389,863	-$1,436,018	-$1,482,173	-$1,528,327	-$1,574,482	-$1,620,637	-$1,666,791	-$1,712,946
	20%	6,350	-$1,284,040	-$1,330,195	-$1,376,349	-$1,422,504	-$1,468,659	-$1,514,813	-$1,560,968	-$1,607,123
	25%	6,615	-$1,178,217	-$1,224,371	-$1,270,526	-$1,316,681	-$1,362,835	-$1,408,990	-$1,455,145	-$1,501,299

Table A14. Smaller Scale Walleye Enterprise (10,584 lbs live)

			Feed Cost							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,938,106	$31.75	$32.35	$32.96	$33.56	$34.16	$34.76	$35.37	$35.97
Price	-10%	$22.32	-$1,942,112	-$1,983,640	-$2,025,168	-$2,066,696	-$2,108,224	-$2,149,752	-$2,191,281	-$2,232,809
	-5%	$23.56	-$1,836,289	-$1,877,817	-$1,919,345	-$1,960,873	-$2,002,401	-$2,043,929	-$2,085,457	-$2,126,986
	original	$24.80	-$1,730,465	-$1,771,994	-$1,813,522	-$1,855,050	-$1,896,578	**-$1,938,106**	-$1,979,634	-$2,021,162
	5%	$26.04	-$1,624,642	-$1,666,170	-$1,707,698	-$1,749,227	-$1,790,755	-$1,832,283	-$1,873,811	-$1,915,339
	10%	$27.28	-$1,518,819	-$1,560,347	-$1,601,875	-$1,643,403	-$1,684,932	-$1,726,460	-$1,767,988	-$1,809,516
	15%	$28.52	-$1,412,996	-$1,454,524	-$1,496,052	-$1,537,580	-$1,579,108	-$1,620,637	-$1,662,165	-$1,703,693
	20%	$29.76	-$1,307,173	-$1,348,701	-$1,390,229	-$1,431,757	-$1,473,285	-$1,514,813	-$1,556,341	-$1,597,870
	25%	$31.00	-$1,201,349	-$1,242,878	-$1,284,406	-$1,325,934	-$1,367,462	-$1,408,990	-$1,450,518	-$1,492,046

Table A15. Smaller Scale Walleye Enterprise (10,584 lbs live)

			Feed Cost							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,938,106	$31.75	$32.35	$32.96	$33.56	$34.16	$34.76	$35.37	$35.97
Quantity	-10%	4,763	-$1,723,389	-$1,760,764	-$1,798,139	-$1,835,515	-$1,872,890	-$1,910,265	-$1,947,640	-$1,985,016
	-5%	5,027	-$1,726,927	-$1,766,379	-$1,805,830	-$1,845,282	-$1,884,734	-$1,924,186	-$1,963,637	-$2,003,089
	original	5,292	-$1,730,465	-$1,771,994	-$1,813,522	-$1,855,050	-$1,896,578	**-$1,938,106**	-$1,979,634	-$2,021,162
	5%	5,557	-$1,734,004	-$1,777,608	-$1,821,213	-$1,864,817	-$1,908,422	-$1,952,027	-$1,995,631	-$2,039,236
	10%	5,821	-$1,737,542	-$1,783,223	-$1,828,904	-$1,874,585	-$1,920,266	-$1,965,947	-$2,011,628	-$2,057,309
	15%	6,086	-$1,741,081	-$1,788,838	-$1,836,595	-$1,884,353	-$1,932,110	-$1,979,867	-$2,027,625	-$2,075,382
	20%	6,350	-$1,744,619	-$1,794,453	-$1,844,287	-$1,894,120	-$1,943,954	-$1,993,788	-$2,043,622	-$2,093,455
	25%	6,615	-$1,748,157	-$1,800,068	-$1,851,978	-$1,903,888	-$1,955,798	-$2,007,708	-$2,059,619	-$2,111,529

Table A16. Smaller Scale Walleye Enterprise (10,584 lbs live)

			Labor Cost							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,938,106	$32.16	$32.68	$33.20	$33.72	$34.24	$34.76	$35.28	$35.80
Price	-10%	$22.32	-$1,970,707	-$2,006,516	-$2,042,325	-$2,078,134	-$2,113,943	-$2,149,752	-$2,185,562	-$2,221,371
	-5%	$23.56	-$1,864,884	-$1,900,693	-$1,936,502	-$1,972,311	-$2,008,120	-$2,043,929	-$2,079,738	-$2,115,548
	original	$24.80	-$1,759,060	-$1,794,870	-$1,830,679	-$1,866,488	-$1,902,297	**-$1,938,106**	-$1,973,915	-$2,009,724
	5%	$26.04	-$1,653,237	-$1,689,046	-$1,724,855	-$1,760,665	-$1,796,474	-$1,832,283	-$1,868,092	-$1,903,901
	10%	$27.28	-$1,547,414	-$1,583,223	-$1,619,032	-$1,654,841	-$1,690,651	-$1,726,460	-$1,762,269	-$1,798,078
	15%	$28.52	-$1,441,591	-$1,477,400	-$1,513,209	-$1,549,018	-$1,584,827	-$1,620,637	-$1,656,446	-$1,692,255
	20%	$29.76	-$1,335,768	-$1,371,577	-$1,407,386	-$1,443,195	-$1,479,004	-$1,514,813	-$1,550,622	-$1,586,432
	25%	$31.00	-$1,229,944	-$1,265,754	-$1,301,563	-$1,337,372	-$1,373,181	-$1,408,990	-$1,444,799	-$1,480,608

Table A17. Smaller Scale Walleye Enterprise (10,584 lbs live)

			Labor Cost							
			-25%	**-20%**	**-15%**	**-10%**	**-5%**	**original**	**5%**	**10%**
	Initial NPV	-$1,938,106	$32.16	$32.68	$33.20	$33.72	$34.24	$34.76	$35.28	$35.80
Quantity	**-10%**	4,763	-$1,749,124	-$1,781,352	-$1,813,581	-$1,845,809	-$1,878,037	-$1,910,265	-$1,942,493	-$1,974,722
	-5%	5,027	-$1,754,092	-$1,788,111	-$1,822,130	-$1,856,148	-$1,890,167	-$1,924,186	-$1,958,204	-$1,992,223
	original	5,292	-$1,759,060	-$1,794,870	-$1,830,679	-$1,866,488	-$1,902,297	**-$1,938,106**	-$1,973,915	-$2,009,724
	5%	5,557	-$1,764,029	-$1,801,628	-$1,839,228	-$1,876,827	-$1,914,427	-$1,952,027	-$1,989,626	-$2,027,226
	10%	5,821	-$1,768,997	-$1,808,387	-$1,847,777	-$1,887,167	-$1,926,557	-$1,965,947	-$2,005,337	-$2,044,727
	15%	6,086	-$1,773,965	-$1,815,145	-$1,856,326	-$1,897,506	-$1,938,687	-$1,979,867	-$2,021,048	-$2,062,228
	20%	6,350	-$1,778,933	-$1,821,904	-$1,864,875	-$1,907,846	-$1,950,817	-$1,993,788	-$2,036,759	-$2,079,730
	25%	6,615	-$1,783,901	-$1,828,663	-$1,873,424	-$1,918,186	-$1,962,947	-$2,007,708	-$2,052,470	-$2,097,231

Table A18. Larger Scale Walleye Enterprise (50,024 lbs live) Net Present Value, IRR, and Payback Period Calculations

Input	Value	Source	Input	Formula
Depreciation/year	$191,657		Income from s	lbs of fillets*sale price
Pounds of filles/year	25,012	Number of fish/fish per lb of fillets	Variable costs	(variable cost/lb)*lbs of fillets sold
Sale price/lb	$24.80	Walleye Direct, 2025	Fixed costs	(ownership cost/lb)*lbs of fillets sold
Variable costs/lb	$18.72	Variable cost/lbs of fillets	Tax (shield)	EBIT*tax rate
Ownership costs/lb	$8.64	Ownership cost/lbs of fillets	Working Capit	30%*(variable+ownership coosts)
Tax rate	16.80%	McDonald, 2025	Feed cost	((Variable cost - feed cost) + (feed cost *(1 + % change)))/lbs of fillets sold
Interest rate	6.00%	Giovanetti, 2025	Labor cost	((Variable cost - labor cost) + (labor cost *(1 + % change)))/lbs of fillets sold
Discount rate	4.99%	Interest*(1-tax rate)		
Inflation	2.00%	FED, 2025		
Working capital	30.00%	Boehlje and Langemeier, 2020		

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Income from sales		$620,297.60	$632,703.55	$645,357.62	$658,264.78	$671,430.07	$684,858.67	$698,555.85	$712,526.96	$726,777.50	$741,313.05	$756,139.31	$771,262.10	$786,687.34	$802,421.09
Variable costs		-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91
Gross Margin		$152,130.69	$164,536.64	$177,190.71	$190,097.86	$203,263.16	$216,691.76	$230,388.93	$244,360.05	$258,610.59	$273,146.14	$287,972.40	$303,095.19	$318,520.43	$334,254.18
Ownership costs		-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85
Depreciation		-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50
Earnings before Interest and Tax		-$255,718.66	-$243,312.71	-$230,658.63	-$217,751.48	-$204,586.19	-$191,157.59	-$177,460.41	-$163,489.29	-$149,238.76	-$134,703.21	-$119,876.94	-$104,754.16	-$89,328.92	-$73,595.17
Tax (shield)		$42,960.73	$40,876.53	$38,750.65	$36,582.25	$34,370.48	$32,114.47	$29,813.35	$27,466.20	$25,072.11	$22,630.14	$20,139.33	$17,598.70	$15,007.26	$12,363.99
Net operating profit after tax		-$212,757.92	-$202,436.17	-$191,907.98	-$181,169.23	-$170,215.71	-$159,043.11	-$147,647.06	-$136,023.09	-$124,166.64	-$112,073.07	-$99,737.62	-$87,155.46	-$74,321.66	-$61,231.18
Add depreciation		$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50
Operating cash flow		-$21,101.42	-$10,779.67	-$251.48	$10,487.27	$21,440.79	$32,613.39	$44,009.44	$55,633.41	$67,489.86	$79,583.43	$91,918.88	$104,501.04	$117,334.84	$130,425.32
Working Capital		$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93
Annual Change		-$205,307.93	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Capital expenditure	-$3,186,743														
Total Cash Flow	-$3,186,743	-$226,409.35	-$10,779.67	-$251.48	$10,487.27	$21,440.79	$32,613.39	$44,009.44	$55,633.41	$67,489.86	$79,583.43	$91,918.88	$104,501.04	$117,334.84	$130,425.32

Year	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Income from sales	$818,469.51	$834,838.90	$851,535.68	$868,566.39	$885,937.72	$903,656.47	$921,729.60	$940,164.20	$958,967.48	$978,146.83	$997,709.77	##########	##########	##########	##########	##########
Variable costs	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91	-$468,166.91
Gross Margin	$350,302.60	$366,671.99	$383,368.77	$400,399.48	$417,770.81	$435,489.56	$453,562.69	$471,997.28	$490,800.57	$509,979.92	$529,542.85	$549,497.05	$569,850.33	$590,610.67	$611,786.22	$633,385.29
Ownership costs	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85	-$216,192.85
Depreciation	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50	-$191,656.50
Earnings before Interest and Tax	-$57,546.75	-$41,177.36	-$24,480.58	-$7,449.87	$9,921.46	$27,640.22	$45,713.35	$64,147.94	$82,951.22	$102,130.57	$121,693.51	$141,647.70	$162,000.98	$182,761.33	$203,936.88	$225,535.94
Tax (shield)	$9,667.85	$6,917.80	$4,112.74	$1,251.58	-$1,666.81	-$4,643.56	-$7,679.84	-$10,776.85	-$13,935.81	-$17,157.94	-$20,444.51	-$23,796.81	-$27,216.17	-$30,703.90	-$34,261.40	-$37,890.04
Net operating profit after tax	-$47,878.89	-$34,259.56	-$20,367.84	-$6,198.29	$8,254.66	$22,996.66	$38,033.50	$53,371.08	$69,015.42	$84,972.64	$101,249.00	$117,850.89	$134,784.82	$152,057.42	$169,675.48	$187,645.90
Add depreciation	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50	$191,656.50
Operating cash flow	$143,777.61	$157,396.94	$171,288.66	$185,458.21	$199,911.16	$214,653.16	$229,690.00	$245,027.58	$260,671.92	$276,629.14	$292,905.50	$309,507.39	$326,441.32	$343,713.92	$361,331.98	$379,302.40
Working Capital	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$205,307.93	$0.00
Annual Change	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$205,307.93
Total Cash Flow	$143,777.61	$157,396.94	$171,288.66	$185,458.21	$199,911.16	$214,653.16	$229,690.00	$245,027.58	$260,671.92	$276,629.14	$292,905.50	$309,507.39	$326,441.32	$343,713.92	$361,331.98	$584,610.33

Net present value	**-$1,596,914.08**
Internal Rate of Return	**1.82%**
Payback Peiod	**26 Years**

Table A19. Larger Scale Walleye Enterprise (50,024 lbs live)

Price			Quanity Sold							
			-10%	-5%	original	5%	10%	15%	20%	25%
	Initial NPV	-$1,596,914	22,511	23,761	25,012	26,263	27,513	28,764	30,014	31,265
	-10%	$22.32	-$3,497,524	-$3,047,380	-$2,597,235	-$2,147,091	-$1,696,946	-$1,246,802	-$796,657	-$346,513
	-5%	$23.56	-$3,047,380	-$2,572,227	-$2,097,075	-$1,621,922	-$1,146,770	-$671,617	-$196,465	$278,688
	original	$24.80	-$2,597,235	-$2,097,075	**-$1,596,914**	-$1,096,754	-$596,593	-$96,432	$403,728	$903,889
	5%	$26.04	-$2,147,091	-$1,621,922	-$1,096,754	-$571,585	-$46,416	$478,752	$1,003,921	$1,529,089
	10%	$27.28	-$1,696,946	-$1,146,770	-$596,593	-$46,416	$503,760	$1,053,937	$1,604,113	$2,154,290
	15%	$28.52	-$1,246,802	-$671,617	-$96,432	$478,752	$1,053,937	$1,629,121	$2,204,306	$2,779,491
	20%	$29.76	-$796,657	-$196,465	$403,728	$1,003,921	$1,604,113	$2,204,306	$2,804,499	$3,404,691
	25%	$31.00	-$346,513	$278,688	$903,889	$1,529,089	$2,154,290	$2,779,491	$3,404,691	$4,029,892

Table A20. Larger Scale Walleye Enterprise (50,024 lbs live)

Price			Capital Investment							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,596,914	-$2,390,057	-$2,549,394	-$2,708,732	-$2,868,069	-$3,027,406	-$3,186,743	-$3,346,080	-$3,505,417
	-10%	$22.32	-$1,800,549	-$1,959,887	-$2,119,224	-$2,278,561	-$2,437,898	-$2,597,235	-$2,756,572	-$2,915,909
	-5%	$23.56	-$1,300,389	-$1,459,726	-$1,619,063	-$1,778,400	-$1,937,737	-$2,097,075	-$2,256,412	-$2,415,749
	original	$24.80	-$800,228	-$959,565	-$1,118,903	-$1,278,240	-$1,437,577	**-$1,596,914**	-$1,756,251	-$1,915,588
	5%	$26.04	-$300,068	-$459,405	-$618,742	-$778,079	-$937,416	-$1,096,754	-$1,256,091	-$1,415,428
	10%	$27.28	$200,093	$40,756	-$118,582	-$277,919	-$437,256	-$596,593	-$755,930	-$915,267
	15%	$28.52	$700,253	$540,916	$381,579	$222,242	$62,905	-$96,432	-$255,770	-$415,107
	20%	$29.76	$1,200,414	$1,041,077	$881,740	$722,402	$563,065	$403,728	$244,391	$85,054
	25%	$31.00	$1,700,574	$1,541,237	$1,381,900	$1,222,563	$1,063,226	$903,889	$744,551	$585,214

Table A 21. Larger Scale Walleye Enterprise (50,024 lbs live)

Quantity			Capital Investment							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,596,914	-$2,390,057	-$2,549,394	-$2,708,732	-$2,868,069	-$3,027,406	-$3,186,743	-$3,346,080	-$3,505,417
	-10%	22,511	-$1,800,549	-$1,959,887	-$2,119,224	-$2,278,561	-$2,437,898	-$2,597,235	-$2,756,572	-$2,915,909
	-5%	23,761	-$1,300,389	-$1,459,726	-$1,619,063	-$1,778,400	-$1,937,737	-$2,097,075	-$2,256,412	-$2,415,749
	original	25,012	-$800,228	-$959,565	-$1,118,903	-$1,278,240	-$1,437,577	**-$1,596,914**	-$1,756,251	-$1,915,588
	5%	26,263	-$300,068	-$459,405	-$618,742	-$778,079	-$937,416	-$1,096,754	-$1,256,091	-$1,415,428
	10%	27,513	$200,093	$40,756	-$118,582	-$277,919	-$437,256	-$596,593	-$755,930	-$915,267
	15%	28,764	$700,253	$540,916	$381,579	$222,242	$62,905	-$96,432	-$255,770	-$415,107
	20%	30,014	$1,200,414	$1,041,077	$881,740	$722,402	$563,065	$403,728	$244,391	$85,054
	25%	31,265	$1,700,574	$1,541,237	$1,381,900	$1,222,563	$1,063,226	$903,889	$744,551	$585,214

Table A22. Larger Scale Walleye Enterprise (50,024 lbs live)

			Feed Cost							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,596,914	$17.19	$17.50	$17.80	$18.11	$18.41	$18.72	$19.02	$19.33
Price	-10%	$22.32	-$2,101,412	-$2,200,577	-$2,299,741	-$2,398,906	-$2,498,071	-$2,597,235	-$2,696,400	-$2,795,564
	-5%	$23.56	-$1,601,251	-$1,700,416	-$1,799,581	-$1,898,745	-$1,997,910	-$2,097,075	-$2,196,239	-$2,295,404
	original	$24.80	-$1,101,091	-$1,200,256	-$1,299,420	-$1,398,585	-$1,497,749	**-$1,596,914**	-$1,696,079	-$1,795,243
	5%	$26.04	-$600,930	-$700,095	-$799,260	-$898,424	-$997,589	-$1,096,754	-$1,195,918	-$1,295,083
	10%	$27.28	-$100,770	-$199,934	-$299,099	-$398,264	-$497,428	-$596,593	-$695,758	-$794,922
	15%	$28.52	$399,391	$300,226	$201,061	$101,897	$2,732	-$96,432	-$195,597	-$294,762
	20%	$29.76	$899,551	$800,387	$701,222	$602,057	$502,893	$403,728	$304,563	$205,399
	25%	$31.00	$1,399,712	$1,300,547	$1,201,383	$1,102,218	$1,003,053	$903,889	$804,724	$705,559

Table A23. Larger Scale Walleye Enterprise (50,024 lbs live)

			Feed Cost							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,596,914	$17.19	$17.50	$17.80	$18.11	$18.41	$18.72	$19.02	$19.33
Quantity	-10%	22,511	-$1,541,548	-$1,630,796	-$1,720,044	-$1,809,292	-$1,898,541	-$1,987,789	-$2,077,037	-$2,166,285
	-5%	23,761	-$1,321,319	-$1,415,526	-$1,509,732	-$1,603,939	-$1,698,145	-$1,792,351	-$1,886,558	-$1,980,764
	original	25,012	-$1,101,091	-$1,200,256	-$1,299,420	-$1,398,585	-$1,497,749	**-$1,596,914**	-$1,696,079	-$1,795,243
	5%	26,263	-$880,862	-$984,985	-$1,089,108	-$1,193,231	-$1,297,354	-$1,401,477	-$1,505,600	-$1,609,722
	10%	27,513	-$660,634	-$769,715	-$878,796	-$987,877	-$1,096,958	-$1,206,039	-$1,315,120	-$1,424,202
	15%	28,764	-$440,405	-$554,445	-$668,484	-$782,523	-$896,563	-$1,010,602	-$1,124,641	-$1,238,681
	20%	30,014	-$220,177	-$339,174	-$458,172	-$577,169	-$696,167	-$815,165	-$934,162	-$1,053,160
	25%	31,265	$52	-$123,904	-$247,860	-$371,816	-$495,771	-$619,727	-$743,683	-$867,639

Table A24. Larger Scale Walleye Enterprise (50,024 lbs live)

			Labor Cost							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,596,914	$18.17	$18.28	$18.39	$18.50	$18.61	$18.72	$18.83	$18.94
Price	-10%	$22.32	-$2,418,190	-$2,453,999	-$2,489,808	-$2,525,617	-$2,561,426	-$2,597,235	-$2,633,044	-$2,668,853
	-5%	$23.56	-$1,918,029	-$1,953,838	-$1,989,647	-$2,025,456	-$2,061,265	-$2,097,075	-$2,132,884	-$2,168,693
	original	$24.80	-$1,417,868	-$1,453,678	-$1,489,487	-$1,525,296	-$1,561,105	**-$1,596,914**	-$1,632,723	-$1,668,532
	5%	$26.04	-$917,708	-$953,517	-$989,326	-$1,025,135	-$1,060,944	-$1,096,754	-$1,132,563	-$1,168,372
	10%	$27.28	-$417,547	-$453,356	-$489,166	-$524,975	-$560,784	-$596,593	-$632,402	-$668,211
	15%	$28.52	$82,613	$46,804	$10,995	-$24,814	-$60,623	-$96,432	-$132,242	-$168,051
	20%	$29.76	$582,774	$546,965	$511,155	$475,346	$439,537	$403,728	$367,919	$332,110
	25%	$31.00	$1,082,934	$1,047,125	$1,011,316	$975,507	$939,698	$903,889	$868,080	$832,270

Table A25. Larger Scale Walleye Enterprise (50,024 lbs live)										
			Labor Cost							
			-25%	**-20%**	**-15%**	**-10%**	**-5%**	**original**	**5%**	**10%**
	Initial NPV	-$1,596,914	$18.17	$18.28	$18.39	$18.50	$18.61	$18.72	$18.83	$18.94
Quantity	**-10%**	22,511	-$1,826,648	-$1,858,876	-$1,891,104	-$1,923,332	-$1,955,561	-$1,987,789	-$2,020,017	-$2,052,245
	-5%	23,761	-$1,622,258	-$1,656,277	-$1,690,295	-$1,724,314	-$1,758,333	-$1,792,351	-$1,826,370	-$1,860,389
	original	25,012	-$1,417,868	-$1,453,678	-$1,489,487	-$1,525,296	-$1,561,105	**-$1,596,914**	-$1,632,723	-$1,668,532
	5%	26,263	-$1,213,479	-$1,251,078	-$1,288,678	-$1,326,278	-$1,363,877	-$1,401,477	-$1,439,076	-$1,476,676
	10%	27,513	-$1,009,089	-$1,048,479	-$1,087,869	-$1,127,259	-$1,166,649	-$1,206,039	-$1,245,429	-$1,284,819
	15%	28,764	-$804,699	-$845,880	-$887,060	-$928,241	-$969,421	-$1,010,602	-$1,051,782	-$1,092,963
	20%	30,014	-$600,310	-$643,281	-$686,252	-$729,223	-$772,194	-$815,165	-$858,136	-$901,107
	25%	31,265	-$395,920	-$440,682	-$485,443	-$530,204	-$574,966	-$619,727	-$664,489	-$709,250

Appendix B – Yellow Perch

Table B 1. Yellow Perch Budget Assumptions					
Operating Assumptions	Input	Source (low)	Source (high)	Value Used	Source of Value Used
Water Temperature (C)	20	Hart et al., 2006	Hart et al., 2006	20	Hart et al., 2006
Fingerling Price ($/2" fingerling)	$0.05 - 1.00	Quagrainie and Malekar, 2012	Fenders Fish Hatchery, 2024	$0.50	Median
Stocking Density at Harvest (kg/m^3)	40	Riley	Riley	40 kg/m^3	Riley
Days per Cycle	300	Riley	Riley	300 days	Riley
Growout Mortality Rate	2 - 10%	Riley	Avery	5%	Median
Final Market Size (g)	150	Manci, 2000	Manci, 2000	150 g	Manci, 2000
Fillet Yield	0.47	Manci, 2000	Manci, 2000	47%	Manci, 2000
Size of each fillet (g)	35.25	Calculated (yield*market size)	Calculated	35.25 g	yield*market size
Expense Categories	Input	Source (low)	Source (high)	Value Used	Source of Value Used
Feed ($/lb)	$1.00 - 1.50	Jordan	Alex	$1.50 small; $1.00 large	Alex; Jordan
Labor ($/hr)	$20 - 26.45	Avery	Prager et al., 2018	$26.45 full time; $20 part time	Prager et al., 2018; Avery
Processing Costs ($/fish)	$0.50 - 2.00	Riley	Riley	$1.00	Riley
Electricity ($/kWh)	$0.09 - 0.18	Jordan	BLS, 2024	$0.14	Median
Electricity use (kWh/kg)	20 - 29.4	Badiola et al., 2017	Badiola et al., 2017	29.4; small 20 large	Badiola et al., 2017
Permits/Licensing ($/year)	$300	MN DNR, 2025	MN DNR, 2025	$300	MN DNR, 2025
Sales & Marketing ($/month)	$50 - 100	Payton	Payton	$50 small; $100 large	Payton
Maintenance & Repair (% of operating cost)	10%	BPT Team, 2024	BPT Team, 2024	10%	BPT Team, 2024
Insurance (% of operating cost)	5%	BPT Team, 2024	BPT Team, 2024	5%	BPT Team, 2024
Internet ($/month)	$50 - 80	Payton	Payton	$69	Highspeedinternet, 2025

Table B 2. Smaller Yellow Perch Enterprise Operating Assumptions			
Operating Assumptions	**Input**	**Source**	**Formula/Notes**
Final Market Size (g)	150 g	Manci, 2000	
Days per Cycle	300 days	Riley	
Stocking Density at Harvest (kg/m^3)	40 kg/m^3	Riley	Equals 0.33 lbs/gal
Fish/tank	1175		Tank volume (gal)*0.33 lb/gal
Fingerlings/tank	1237		Fish per tank/survival rate
Number of tanks	10		2x10ft, 1175 gal
System volume (m^3)	44.47		
Harvests/yr	12		
Hydrilic retention time (min)	34		System volume (gal)/flow rate
Flow Rate (gpm)	345		

Table B 3. Larger Scale Yellow Perch Enterprise Operating Assumptions			
Operating Assumptions	**Input**	**Source**	**Formula/Notes**
Final Market Size (g)	150 g	Manci, 2000	
Days per Cycle	300 days	Riley	
Stocking Density at Harvest (kg/m^3)	40 kg/m^3	Riley	Equals 0.33 lbs/gal
Fish/tank	1290		Tank volume (gal)*0.33 lb/gal
Fingerlings/tank	1358		Fish per tank/survival rate
Number of tanks	43		8x3.5ft, 1290 gal
System volume (m^3)	209.95		
Harvests/yr	52		
Hydrilic retention time (min)	43		System volume (gal)/flow rate
Flow Rate (gpm)	1285		

Table B 4. Smaller Scale Yellow Perch Enterprise Feed Calculations									
Days post hatch Initial fingerlings per tank (1,237)	**Initial weight (g)**	**Final weight (g)**	**Final tank biomass (kg)**	**Feed rate/day**	**Final feed rate (kg/day)**	**Life Stage**	**Fish mortality rate**	**Fish per tank (period ending)**	**Source**
30-60	2	15	18.55	6%	1.11	1	0.5%	1231	Hauser et al., 2023; Logan
60-90	15	30	36.92	4%	1.48	2	0.5%	1225	Hauser et al., 2023; Logan
90-120	30	45	55.10	2%	1.10	3	0.5%	1218	Hauser et al., 2023; Logan
120-150	45	60	73.10	2%	1.46	4	0.5%	1212	Hauser et al., 2023; Logan
150-180	60	75	90.92	2%	1.82	5	0.5%	1206	Hauser et al., 2023; Logan
180-210	75	90	108.56	2%	2.17	6	0.5%	1200	Hauser et al., 2023; Logan
210-240	90	105	126.02	2%	2.52	7	0.5%	1194	Hauser et al., 2023; Logan
240-270	105	120	143.30	2%	2.87	8	0.5%	1188	Hauser et al., 2023; Logan
270-300	120	135	160.41	2%	3.21	9	0.5%	1182	Hauser et al., 2023; Logan
300-330	135	150	177.34	2%	3.55	10	0.5%	1176	Hauser et al., 2023; Logan
Each life stage is about 30 days	**Total Biomass**	**990.24**	**kg**	**Total Feed / Day**	**21.29**	**kg**	**5%**	**Mortality Rate**	

Table B 5. Larger Scale Yellow Perch Enterprise Feed Calculations									
Days post hatch Initial fingerlings per tank (1,358)	**Initial weight (g)**	**Final weight (g)**	**Final tank biomass (kg)**	**Feed rate/day**	**Final feed rate (kg/day)**	**Tank Stage**	**Fish mortality rate**	**Fish per tank (period ending)**	**Source**
30-37	0.05	3	4.07	6%	0.24	1	0.1163%	1356	Hauser et al., 2023; Logan
37-44	3	6.5	8.82	6%	0.53	2	0.1163%	1355	Hauser et al., 2023; Logan
44-51	6.5	10	13.55	6%	0.81	3	0.1163%	1353	Hauser et al., 2023; Logan
51-58	10	13.5	18.27	6%	1.10	4	0.1163%	1352	Hauser et al., 2023; Logan
58-65	13.5	17	22.98	4%	0.92	5	0.1163%	1350	Hauser et al., 2023; Logan
65-72	17	20.5	27.68	4%	1.11	6	0.1163%	1348	Hauser et al., 2023; Logan
72-79	20.5	24	32.36	4%	1.29	7	0.1163%	1347	Hauser et al., 2023; Logan
79-86	24	27.5	37.04	4%	1.48	8	0.1163%	1345	Hauser et al., 2023; Logan
86-93	27.5	31	41.70	2%	0.83	9	0.1163%	1344	Hauser et al., 2023; Logan
93-100	31	34.5	46.36	2%	0.93	10	0.1163%	1342	Hauser et al., 2023; Logan
100-107	34.5	38	51.00	2%	1.02	11	0.1163%	1341	Hauser et al., 2023; Logan
107-114	38	41.5	55.64	2%	1.11	12	0.1163%	1339	Hauser et al., 2023; Logan
114-121	41.5	45	60.26	2%	1.21	13	0.1163%	1338	Hauser et al., 2023; Logan
121-128	45	48.5	64.87	2%	1.30	14	0.1163%	1336	Hauser et al., 2023; Logan
128-135	48.5	52	69.47	2%	1.39	15	0.1163%	1334	Hauser et al., 2023; Logan
135-142	52	55.5	74.06	2%	1.48	16	0.1163%	1333	Hauser et al., 2023; Logan
142-149	55.5	59	78.64	2%	1.57	17	0.1163%	1331	Hauser et al., 2023; Logan
149-156	59	62.5	83.21	2%	1.66	18	0.1163%	1330	Hauser et al., 2023; Logan
156-163	62.5	66	87.76	2%	1.76	19	0.1163%	1328	Hauser et al., 2023; Logan
163-170	66	69.5	92.31	2%	1.85	20	0.1163%	1327	Hauser et al., 2023; Logan
170-177	69.5	73	96.85	2%	1.94	21	0.1163%	1325	Hauser et al., 2023; Logan
177-184	73	76.5	101.37	2%	2.03	22	0.1163%	1324	Hauser et al., 2023; Logan

Table B 6. Larger Scale Yellow Perch Enterprise Feed Calculations Cont.									
Days post hatch Initial fingerlings per tank (1,358)	**Initial weight (g)**	**Final weight (g)**	**Final tank biomass (kg)**	**Feed rate/day**	**Final feed rate (kg/day)**	**Tank Stage**	**Fish mortality rate**	**Fish per tank (period ending)**	**Source**
184-191	76.5	80	105.89	2%	2.12	23	0.1163%	1322	Hauser et al., 2023; Logan
191-198	80	83.5	110.39	2%	2.21	24	0.1163%	1321	Hauser et al., 2023; Logan
198-205	83.5	87	114.88	2%	2.30	25	0.1163%	1319	Hauser et al., 2023; Logan
205-212	87	90.5	119.37	2%	2.39	26	0.1163%	1317	Hauser et al., 2023; Logan
212-219	90.5	94	123.84	2%	2.48	27	0.1163%	1316	Hauser et al., 2023; Logan
219-226	94	97.5	128.30	2%	2.57	28	0.1163%	1314	Hauser et al., 2023; Logan
226-233	97.5	101	132.75	2%	2.66	29	0.1163%	1313	Hauser et al., 2023; Logan
233-240	101	104.5	137.19	1.6%	2.13	30	0.1163%	1311	Ronyai & Csengeri, 2008; Logan
240-247	104.5	108	141.62	1.6%	2.20	31	0.1163%	1310	Ronyai & Csengeri, 2008; Logan
247-254	108	111.5	146.04	1.6%	2.26	32	0.1163%	1308	Ronyai & Csengeri, 2008; Logan
254-261	111.5	115	150.45	1.5%	2.26	33	0.1163%	1307	Ronyai & Csengeri, 2008; Logan
261-268	115	118.5	154.85	1.5%	2.32	34	0.1163%	1305	Ronyai & Csengeri, 2008; Logan
268-275	118.5	122	159.24	1.5%	2.39	35	0.1163%	1304	Ronyai & Csengeri, 2008; Logan
275-282	122	125.5	163.62	1.5%	2.45	36	0.1163%	1302	Ronyai & Csengeri, 2008; Logan

Table B 7. Larger Scale Yellow Perch Enterprise Feed Calculations Cont.									
Days post hatch Initial fingerlings per tank (1,358)	**Initial weight (g)**	**Final weight (g)**	**Final tank biomass (kg)**	**Feed rate/day**	**Final feed rate (kg/day)**	**Tank Stage**	**Fish mortality rate**	**Fish per tank (period ending)**	**Source**
282-289	125.5	129	167.98	1.5%	2.52	37	0.1163%	1301	Ronyai & Csengeri, 2008; Logan
289-296	129	132.5	172.34	1.5%	2.59	38	0.1163%	1299	Ronyai & Csengeri, 2008; Logan
296-303	132.5	136	176.69	1.5%	2.65	39	0.1163%	1298	Ronyai & Csengeri, 2008; Logan
303-310	136	139.5	181.02	1.5%	2.72	40	0.1163%	1296	Ronyai & Csengeri, 2008; Logan
310-317	139.5	143	185.35	1.5%	2.78	41	0.1163%	1295	Ronyai & Csengeri, 2008; Logan
317-324	143	146.5	189.66	1.5%	2.84	42	0.1163%	1293	Ronyai & Csengeri, 2008; Logan
324-330	146.5	150	193.97	1.5%	2.91	43	0.1163%	1292	Ronyai & Csengeri, 2008; Logan
Each life stage is about 7 days	**Total Biomass**	**4,323.70**	**kg**	**Total Feed / Day**	**79.28**	**kg**	**5%**	**Mortality Rate**	

Table B8. Smaller Scale Yellow Perch Enterprise Budget (4,700 lbs live)											
Capital Expediture	**Item**	**Cost range**	**Source (low)**	**Source (high)**	**Source (Used)**	**Cost/unit (used)**	**Number of units**	**Total cost**	**Useful life**	**Depreciation/year**	**Source**
Facilities	Land cost ($/acre)	$2,000 - 15,000	Taylor	Cameron	UMN Extension, 2024	$6,745	1	$6,745			
	Site Prep ($/acre)	$200 - 2,000	Graham, 2025	Graham, 2025	Median	$1,100	1	$1,100	40	$28	PWC, 2024; Collins, 2005
	Well (20 gpm)	$16,000 - 30,000	Payton	Cameron	UMN Extension, 2022	$20,000	1	$20,000	40	$500	Kientzy et al., 2024; Horner et al., 2023
	Building Permits	$1,000 - 3,000	Cameron	Cameron	Median	$2,000	1	$2,000	40	$50	PWC, 2024; Collins, 2005
	General Contractor (% of building cost)	5% - 15%	BuildBook, 2024	BuildBook, 2024	Median	10%	$470,850	$47,085	40	$1,177	PWC, 2024; Collins, 2005
	Building (50x90) and concrete ($/sq. ft)	$20 - 250	Payton	Jordan	Cameron	$80	4,500	$360,000	40	$9,000	Collins, 2005
	Septic and plumbing	$16,000 - 24,000	Minus 20%	Plus 20%	Jordan; Cameron	$20,000	1	$20,000	20	$1,000	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	HVAC	$8,000 - 12,000	Minus 20%	Plus 20%	Schipper et al., 2024	$10,000	1	$10,000	20	$500	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Electrical service	$4,000 - 20,000	Kellam, 2025	Kellam, 2025	Median	$12,000	1	$12,000	20	$600	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Electrical wiring ($/sq. ft)	$4 - 9	Farmer et al., 2024	Farmer et al., 2024	Median	$6.50	4,500	$29,250	20	$1,463	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Generator	$9,000 - 20,000	Weimert et al., 2024	Cameron	Median	$14,500	1	$14,500	20	$725	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Water heater	$3,200 - 4,800	Minus 20%	Plus 20%	Home Depot, 2025	$4,000	1	$4,000	20	$200	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Subtotal							$526,680			
RAS Equipment	Tanks (10x2ft), (1175 gal)	$4,000 - $6,000	Minus 20%	Plus 20%	Hydro Composites, 202	$5,277	10	$65,963	10	$6,596	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Drum filter	$8,800 - 13,200	Minus 20%	Plus 20%	Brooke	$11,000	1	$11,000	10	$1,100	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Sump and pump station	$2,400 - $3,600	Minus 20%	Plus 20%	Pentair AES, 2025	$2,726	1	$2,726	10	$273	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Biofilter	$5,500 - 20,000	Brooke	Jordan	Median	$12,500	1	$12,500	10	$1,250	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Degassing column	$12,800 - 19,200	Minus 20%	Plus 20%	Jordan	$16,000	1	$16,000	10	$1,600	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	UV disinfection	$12,800 - 19,200	Minus 20%	Plus 20%	Brooke	$16,000	1	$16,000	10	$1,600	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Aeration system ($/sq. ft)	$15 - 23	Minus 20%	Plus 20%	Cameron	$21	4,500	$94,500	10	$9,450	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Feeders	$800 - 1200	Minus 20%	Plus 20%	Jordan; Cameron	$1,000	10	$10,000	10	$1,000	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Water quality and monitoring equipment ($/sq. ft)	$8 - 12	Minus 20%	Plus 20%	Cameron	$11	4,500	$49,500	5	$9,900	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Misc Equip/Tools ($/lb producrion)	$0.50 - 1.50	Minus 20%	Plus 20%	Held, 2023	$1.50	4,700	$7,050	5	$1,410	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Subtotal							$285,239	Depreciation/year	$49,421	
Total Facilities Investment								$811,919			

Cost category	**Item**	**Cost range**	**Source (low)**	**Source (high)**	**Source (Used)**	**Cost/unit (used)**	**Number of units**	**365 day Annual cost**	**300 day Cycle cost**
Operating Costs	Fingerlings ($/fingerlings)	$0.05 - 1.00	Quagrainie and Maleka	Fenders Fish Hatcher	Median	$0.50	14,844	$7,422	$6,185
	Feed ($/lb)	$1.00 - 1.50	Jordan	Alex	Alex	$1.50	17,135	$25,702	$21,125
	Owner Labor ($/hr)	$20 - 26.45	Avery	Prager et al., 2018	Prager et al., 2018	$26.45	2,080	$55,016	$45,219
	Electricity ($/kWh)	$0.09 - 0.18	Jordan	BLS, 2024	Median	$0.14	62,667	$8,773	$7,311
	Sales & Marketing ($/month)	$50 - 100	Payton	Payton	Payton	$50.00	12	$600	$493
	Repairs and Maintenance (% of op. cost)	10%	BPT Team, 2024	BPT Team, 2024	BPT Team, 2025	10%	$111,613	$11,161	$9,174
	Processing ($/fish)	$0.50 - 2.00	Riley	Riley	Riley	$1.00	14,100	$14,100	$11,750
	Total variable cost							$122,775	$101,257
Overhead Costs	Internet Service ($/month)	$50 - 80	Payton	Payton	Highspeedinternet, 2025	$69.00	12	$828	$681
	Permits and Licensing ($/year)	$300	MN DNR, 2025	MN DNR, 2025	MN DNR, 2025	$300.00	1	$300	$247
	Insurance (% of op. cost)	5%	BPT Team, 2024	BPT Team, 2024	BPT Team, 2024	5%	$122,775	$6,139	$5,046
	Depreciation ($/year)	$49,421				$49,421	1	$49,421	$40,620
	Total ownership cost							$56,688	$46,593
Total Cost of Production								$179,462	$147,849
Breakeven operating cost per 1 lb filets (13 filets)								$56.60	$56.01
Breakeven total cost per 1 lb filets (13 filets)								$82.73	$81.79

Table B9. Larger Scale Yellow Perch Enterprise Budget (22,360 lbs live)

Capital Expenditure	Item	Cost range	Source (low)	Source (high)	Source (Used)	Cost/unit (used)	Number of units	Total cost	Useful life	Depreciation/year	Source
Facilities	Land cost ($/acre)	$2,000 - 15,000	Taylor	Cameron	UMN Extension, 2024	$6,745	1	$6,745			
	Site Prep ($/acre)	$200 - 2,000	Graham, 2025	Graham, 2025	Median	$1,100	1	$1,100	40	$28	PWC, 2024; Collins, 2005
	Well (20 gpm)	$16,000 - 30,000	Payton	Cameron	UMN Extension, 2022	$20,000	1	$20,000	40	$500	Kientzy et al., 2024; Horner et al., 2023
	Building Permits	$1,000 - 3,000	Cameron	Cameron	Median	$2,000	1	$2,000	40	$50	PWC, 2024; Collins, 2005
	General Contractor (% of building cost)	5% - 15%	BuildBook, 2024	BuildBook, 2024	Median	10%	$1,110,950	$111,095	40	$2,777	PWC, 2024; Collins, 2005
	Building (70x170) and concrete ($/sq. ft)	$20 - 250	Payton	Jordan	Cameron	$80	11,900	$952,000	40	$23,800	Collins, 2005
	Septic and plumbing	$16,000 - 24,000	Minus 20%	Plus 20%	Jordan; Cameron	$20,000	1	$20,000	20	$1,000	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	HVAC	$8,000 - 12,000	Minus 20%	Plus 20%	Schipper et al., 2024	$10,000	1	$10,000	20	$500	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Electrical service	$4,000 - 20,000	Kellam, 2025	Kellam, 2025	Median	$12,000	1	$12,000	20	$600	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Electrical wiring ($/sq. ft)	$4 - 9	Farmer et al., 2024	Farmer et al., 2024	Median	$6.50	11,900	$77,350	20	$3,868	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Generator	$9,000 - 20,000	Weimert et al., 2024	Cameron	Median	$14,500	1	$14,500	20	$725	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Water heater	$3,200 - 4,800	Minus 20%	Plus 20%	Home Depot, 2025	$4,000	1	$4,000	20	$200	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Subtotal							$1,230,790			
RAS Equipment	Tanks (8x3.5ft), (1290 gal)	$4,000 - 6,000	Minus 20%	Plus 20%	Hydro Composites, 2025	$4,859	43	$261,171	10	$26,117	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Drum filter	$20,700 - 25,300	Minus 10%	Plus 10%	Brooke	$23,000	1	$23,000	10	$2,300	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Sump and pump station	$8,800 - 13,200	Minus 20%	Plus 20%	Pentair AES, 2025	$8,178	1	$8,178	10	$818	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Biofilter	$16,000 - 24,000	Minus 20%	Plus 20%	Brooke	$20,000	1	$20,000	10	$2,000	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Degassing column	$21,600 - $26,400	Minus 10%	Plus 10%	Jordan	$24,000	1	$24,000	10	$2,400	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	UV disinfection	$31,500 - 38,500	Minus 10%	Plus 10%	Brooke	$35,000	1	$35,000	10	$3,500	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Aeration system ($/sq. ft)	$15 - 23	Minus 20%	Plus 20%	Cameron	$17	11,900	$202,300	10	$20,230	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Feeders	$800 - 1200	Minus 20%	Plus 20%	Jordan; Cameron	$1,000	43	$43,000	10	$4,300	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Water quality and monitoring equipment ($/sq. ft)	$8 - 12	Minus 20%	Plus 20%	Cameron	$9	11,900	$107,100	5	$21,420	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Misc Equip/Tools ($/lb producrion)	$0.50 - 1.50	Minus 20%	Plus 20%	Held, 2023	$1	22,360	$22,360	5	$4,472	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Subtotal							$746,109	Depreciation/year	$121,604	
Total Facilities Investment								$1,976,899			

Cost category	Item	Cost range	Source (low)	Source (high)	Source (Used)	Cost/unit (used)	Number of units	365 day Annual cost	300 day Cycle cost
Operating Costs	Fingerlings ($/fingerlings)	$0.05 - $1.00	Quagrainie and Maleka	Fenders Fish Hatcher	Median	$0.50	70,616	$35,308	$29,197
	Feed ($/lb)	$1.00 - $1.50	Jordan	Alex	Jordan	$1.00	63,807	$63,807	$52,444
	Hired Labor ($/hr)	$20 - 26.45	Avery	Prager et al., 2018	Avery	$20.00	1,040	$20,800	$17,096
	Owner Labor ($/hr)	$20 - 26.45	Avery	Prager et al., 2018	Prager et al., 2019	$26.45	2,080	$55,016	$45,219
	Electricity ($/kWh)	$0.09 - $0.18	Jordan	BLS, 2024	Median	$0.14	202,812	$28,394	$23,245
	Sales & Marketing ($/month)	$50 - 100	Payton	Payton	Payton	$100.00	12	$1,200	$986
	Repairs and Maintenance (% of op. cost)	10%	BPT Team, 2024	BPT Team, 2024	BPT Team, 2025	10%	$271,604	$27,160	$22,324
	Processing ($/fish)	$0.50 - $2.00	Riley	Riley	Riley	$1.00	67,080	$67,080	$55,470
	Total Variable Cost							$298,765	$245,980
Overhead Costs	Internet Service ($/month)	$50 - 80	Payton	Payton	Highspeedinternet, 2025	$69.00	12	$828	$681
	Permits and Licensing ($/year)	$300	MN DNR, 2025	MN DNR, 2025	MN DNR, 2025	$300.00	1	$300	$247
	Insurance (% of op. cost)	5%	BPT Team, 2024	BPT Team, 2024	BPT Team, 2024	5%	$298,765	$14,938	$12,278
	Depreciation ($/year)	$121,604				$121,604	1	$121,604	$99,949
	Total ownership cost							$137,671	$113,154
Total Cost of Production								$436,435	$359,134
Breakeven operating cost per 1 lb filets (13 filets)								$28.95	$28.82
Breakeven total cost per 1 lb filets (13 filets)								$42.29	$42.08

Table B10. Smaller Scale Yellow Perch Enterprise (4,700 lbs live) Net Present Value Calculation

Input	Value	Source	Input	Formula
Depreciation/year	$49,421		Income from s	lbs of fillets*sale price
Pounds of filles/year	2,169	Number of fish/fish per lb of fillets	Variable costs	(variable cost/lb)*lbs of fillets sold
Sale price/lb	37.80	Walleye Direc rise with inflation	Fixed costs	(ownership cost/lb)*lbs of fillets sold
Variable costs/lb	$56.60	Variable cost/lbs of fillets	Tax (shield)	EBIT*tax rate
Ownership costs/lb	$26.13	Ownership cost/lbs of fillets	Working Capit	30%*(variable+ownership coosts)
Tax rate	16.80%	McDonald, 2025	Feed cost	((Variable cost - feed cost) + (feed cost *(1 + % change)))/lbs of fillets sold
Interest rate	6.00%	Giovanetti, 2025	Labor cost	((Variable cost - labor cost) + (labor cost *(1 + % change)))/lbs of fillets sold
Discount rate	4.99%	Interest*(1-tax rate)		
Inflation	2.00%	FED, 2025		
Working capital	30.00%	Boehlje and Langemeier, 2020		

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Income from sales		$81,996.92	$83,636.86	$85,309.60	$87,015.79	$88,756.11	$90,531.23	$92,341.85	$94,188.69	$96,072.46	$97,993.91	$99,953.79	$101,952.87	$103,991.92	$106,071.76
Variable costs		-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72
Gross Margin		-$40,777.80	-$39,137.86	-$37,465.12	-$35,758.93	-$34,018.61	-$32,243.49	-$30,432.87	-$28,586.03	-$26,702.26	-$24,780.81	-$22,820.93	-$20,821.85	-$18,782.79	-$16,702.96
Ownership costs		-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71
Depreciation		-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98
Earnings before Interest and Tax		-$146,886.48	-$145,246.54	-$143,573.81	-$141,867.61	-$140,127.30	-$138,352.18	-$136,541.55	-$134,694.72	-$132,810.94	-$130,889.49	-$128,929.61	-$126,930.54	-$124,891.48	-$122,811.64
Tax (shield)		$24,676.93	$24,401.42	$24,120.40	$23,833.76	$23,541.39	$23,243.17	$22,938.98	$22,628.71	$22,312.24	$21,989.43	$21,660.18	$21,324.33	$20,981.77	$20,632.36
Net operating profit after tax		-$122,209.55	-$120,845.12	-$119,453.41	-$118,033.86	-$116,585.91	-$115,109.01	-$113,602.57	-$112,066.00	-$110,498.70	-$108,900.06	-$107,269.44	-$105,606.21	-$103,909.71	-$102,179.29
Add depreciation		$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98
Operating cash flow		-$72,788.58	-$71,424.15	-$70,032.43	-$68,612.88	-$67,164.94	-$65,688.04	-$64,181.60	-$62,645.03	-$61,077.73	-$59,479.08	-$57,848.46	-$56,185.23	-$54,488.74	-$52,758.31
Working Capital		$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73
Annual Change		-$53,838.73	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Capital expenditure	-$811,919														
Total Cash Flow	-$811,919	-$126,627.31	-$71,424.15	-$70,032.43	-$68,612.88	-$67,164.94	-$65,688.04	-$64,181.60	-$62,645.03	-$61,077.73	-$59,479.08	-$57,848.46	-$56,185.23	-$54,488.74	-$52,758.31

Year	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Income from sales	$108,193.20	$110,357.06	$112,564.20	$114,815.49	$117,111.80	$119,454.03	$121,843.11	$124,279.98	$126,765.58	$129,300.89	$131,886.91	$134,524.64	$137,215.14	$139,959.44	$142,758.63	$145,613.80
Variable costs	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72	-$122,774.72
Gross Margin	-$14,581.52	-$12,417.66	-$10,210.52	-$7,959.23	-$5,662.92	-$3,320.69	-$931.61	$1,505.26	$3,990.86	$6,526.17	$9,112.19	$11,749.92	$14,440.42	$17,184.72	$19,983.91	$22,839.08
Ownership costs	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71	-$56,687.71
Depreciation	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98	-$49,420.98
Earnings before Interest and Tax	-$120,690.21	-$118,526.34	-$116,319.20	-$114,067.92	-$111,771.61	-$109,429.37	-$107,040.29	-$104,603.43	-$102,117.83	-$99,582.52	-$96,996.50	-$94,358.76	-$91,668.27	-$88,923.97	-$86,124.78	-$83,269.61
Tax (shield)	$20,275.95	$19,912.43	$19,541.63	$19,163.41	$18,777.63	$18,384.13	$17,982.77	$17,573.38	$17,155.80	$16,729.86	$16,295.41	$15,852.27	$15,400.27	$14,939.23	$14,468.96	$13,989.29
Net operating profit after tax	-$100,414.25	-$98,613.92	-$96,777.58	-$94,904.51	-$92,993.98	-$91,045.24	-$89,057.52	-$87,030.05	-$84,962.03	-$82,852.65	-$80,701.09	-$78,506.49	-$76,268.00	-$73,984.74	-$71,655.82	-$69,280.31
Add depreciation	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98	$49,420.98
Operating cash flow	-$50,993.28	-$49,192.94	-$47,356.60	-$45,483.53	-$43,573.00	-$41,624.26	-$39,636.55	-$37,609.08	-$35,541.06	-$33,431.68	-$31,280.11	-$29,085.52	-$26,847.03	-$24,563.77	-$22,234.84	-$19,859.34
Working Capital	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$53,838.73	$0.00
Annual Change	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$53,838.73
Total Cash Flow	-$50,993.28	-$49,192.94	-$47,356.60	-$45,483.53	-$43,573.00	-$41,624.26	-$39,636.55	-$37,609.08	-$35,541.06	-$33,431.68	-$31,280.11	-$29,085.52	-$26,847.03	-$24,563.77	-$22,234.84	$33,979.39

Net present value	**-$1,698,038.64**

Table B11. Smaller Scale Yellow Perch Enterprise (4,700 lbs live)

Price			Quanity Sold							
			-10%	-5%	original	5%	10%	15%	20%	25%
	Initial NPV	-$1,698,039	1,952	2,061	2,169	2,278	2,386	2,495	2,603	2,712
	-10%	$34.02	-$1,949,280	-$1,889,775	-$1,830,271	-$1,770,766	-$1,711,262	-$1,651,757	-$1,592,253	-$1,532,749
	-5%	$35.91	-$1,889,775	-$1,826,965	-$1,764,155	-$1,701,344	-$1,638,534	-$1,575,724	-$1,512,914	-$1,450,103
	original	$37.80	-$1,830,271	-$1,764,155	**-$1,698,039**	-$1,631,923	-$1,565,807	-$1,499,690	-$1,433,574	-$1,367,458
	5%	$39.69	-$1,770,766	-$1,701,344	-$1,631,923	-$1,562,501	-$1,493,079	-$1,423,657	-$1,354,235	-$1,284,813
	10%	$41.58	-$1,711,262	-$1,638,534	-$1,565,807	-$1,493,079	-$1,420,351	-$1,347,624	-$1,274,896	-$1,202,168
	15%	$43.47	-$1,651,757	-$1,575,724	-$1,499,690	-$1,423,657	-$1,347,624	-$1,271,590	-$1,195,557	-$1,119,523
	20%	$45.36	-$1,592,253	-$1,512,914	-$1,433,574	-$1,354,235	-$1,274,896	-$1,195,557	-$1,116,217	-$1,036,878
	25%	$47.25	-$1,532,749	-$1,450,103	-$1,367,458	-$1,284,813	-$1,202,168	-$1,119,523	-$1,036,878	-$954,233

Table B12. Smaller Scale Yellow Perch Enterprise (4,700 lbs live)

Price			Capital Investment							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,698,039	-$608,939	-$649,535	-$690,131	-$730,727	-$771,323	-$811,919	-$852,514	-$893,110
	-10%	$34.02	-$1,627,291	-$1,667,887	-$1,708,483	-$1,749,079	-$1,789,675	-$1,830,271	-$1,870,867	-$1,911,463
	-5%	$35.91	-$1,561,175	-$1,601,771	-$1,642,367	-$1,682,963	-$1,723,559	-$1,764,155	-$1,804,751	-$1,845,347
	original	$37.80	-$1,495,059	-$1,535,655	-$1,576,251	-$1,616,847	-$1,657,443	**-$1,698,039**	-$1,738,635	-$1,779,230
	5%	$39.69	-$1,428,943	-$1,469,539	-$1,510,135	-$1,550,731	-$1,591,327	-$1,631,923	-$1,672,519	-$1,713,114
	10%	$41.58	-$1,362,827	-$1,403,423	-$1,444,019	-$1,484,615	-$1,525,211	-$1,565,807	-$1,606,402	-$1,646,998
	15%	$43.47	-$1,296,711	-$1,337,307	-$1,377,903	-$1,418,499	-$1,459,095	-$1,499,690	-$1,540,286	-$1,580,882
	20%	$45.36	-$1,230,595	-$1,271,191	-$1,311,787	-$1,352,383	-$1,392,979	-$1,433,574	-$1,474,170	-$1,514,766
	25%	$47.25	-$1,164,479	-$1,205,075	-$1,245,671	-$1,286,267	-$1,326,862	-$1,367,458	-$1,408,054	-$1,448,650

Table B13. Smaller Scale Yellow Perch Enterprise (4,700 lbs live)

Quantity			Capital Investment							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,698,039	-$608,939	-$649,535	-$690,131	-$730,727	-$771,323	-$811,919	-$852,514	-$893,110
	-10%	1,952	-$1,627,291	-$1,667,887	-$1,708,483	-$1,749,079	-$1,789,675	-$1,830,271	-$1,870,867	-$1,911,463
	-5%	2,061	-$1,561,175	-$1,601,771	-$1,642,367	-$1,682,963	-$1,723,559	-$1,764,155	-$1,804,751	-$1,845,347
	original	2,169	-$1,495,059	-$1,535,655	-$1,576,251	-$1,616,847	-$1,657,443	**-$1,698,039**	-$1,738,635	-$1,779,230
	5%	2,278	-$1,428,943	-$1,469,539	-$1,510,135	-$1,550,731	-$1,591,327	-$1,631,923	-$1,672,519	-$1,713,114
	10%	2,386	-$1,362,827	-$1,403,423	-$1,444,019	-$1,484,615	-$1,525,211	-$1,565,807	-$1,606,402	-$1,646,998
	15%	2,495	-$1,296,711	-$1,337,307	-$1,377,903	-$1,418,499	-$1,459,095	-$1,499,690	-$1,540,286	-$1,580,882
	20%	2,603	-$1,230,595	-$1,271,191	-$1,311,787	-$1,352,383	-$1,392,979	-$1,433,574	-$1,474,170	-$1,514,766
	25%	2,712	-$1,164,479	-$1,205,075	-$1,245,671	-$1,286,267	-$1,326,862	-$1,367,458	-$1,408,054	-$1,448,650

Table B14. Smaller Scale Yellow Perch Enterprise (4,700 lbs live)

			Feed Cost							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,698,039	$53.64	$54.23	$54.82	$55.41	$56.01	$56.60	$57.19	$57.78
Price	-10%	$34.02	-$1,746,625	-$1,763,354	-$1,780,083	-$1,796,812	-$1,813,542	-$1,830,271	-$1,847,000	-$1,863,729
	-5%	$35.91	-$1,680,509	-$1,697,238	-$1,713,967	-$1,730,696	-$1,747,426	-$1,764,155	-$1,780,884	-$1,797,613
	original	$37.80	-$1,614,393	-$1,631,122	-$1,647,851	-$1,664,580	-$1,681,310	**-$1,698,039**	-$1,714,768	-$1,731,497
	5%	$39.69	-$1,548,277	-$1,565,006	-$1,581,735	-$1,598,464	-$1,615,193	-$1,631,923	-$1,648,652	-$1,665,381
	10%	$41.58	-$1,482,161	-$1,498,890	-$1,515,619	-$1,532,348	-$1,549,077	-$1,565,807	-$1,582,536	-$1,599,265
	15%	$43.47	-$1,416,045	-$1,432,774	-$1,449,503	-$1,466,232	-$1,482,961	-$1,499,690	-$1,516,420	-$1,533,149
	20%	$45.36	-$1,349,929	-$1,366,658	-$1,383,387	-$1,400,116	-$1,416,845	-$1,433,574	-$1,450,304	-$1,467,033
	25%	$47.25	-$1,283,813	-$1,300,542	-$1,317,271	-$1,334,000	-$1,350,729	-$1,367,458	-$1,384,188	-$1,400,917

Table B15. Smaller Scale Yellow Perch Enterprise (4,700 lbs live)

			Feed Cost							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,698,039	$53.64	$54.23	$54.82	$55.41	$56.01	$56.60	$57.19	$57.78
Quantity	-10%	1,952	-$1,595,165	-$1,610,221	-$1,625,277	-$1,640,334	-$1,655,390	-$1,670,446	-$1,685,502	-$1,700,559
	-5%	2,061	-$1,604,779	-$1,620,672	-$1,636,564	-$1,652,457	-$1,668,350	-$1,684,242	-$1,700,135	-$1,716,028
	original	2,169	-$1,614,393	-$1,631,122	-$1,647,851	-$1,664,580	-$1,681,310	**-$1,698,039**	-$1,714,768	-$1,731,497
	5%	2,278	-$1,624,007	-$1,641,573	-$1,659,138	-$1,676,704	-$1,694,269	-$1,711,835	-$1,729,400	-$1,746,966
	10%	2,386	-$1,633,621	-$1,652,023	-$1,670,425	-$1,688,827	-$1,707,229	-$1,725,631	-$1,744,033	-$1,762,435
	15%	2,495	-$1,643,235	-$1,662,473	-$1,681,712	-$1,700,950	-$1,720,189	-$1,739,427	-$1,758,666	-$1,777,904
	20%	2,603	-$1,652,849	-$1,672,924	-$1,692,999	-$1,713,074	-$1,733,149	-$1,753,224	-$1,773,299	-$1,793,374
	25%	2,712	-$1,662,463	-$1,683,374	-$1,704,286	-$1,725,197	-$1,746,109	-$1,767,020	-$1,787,931	-$1,808,843

Table B16. Smaller Scale Yellow Perch Enterprise (4,700 lbs live)

			Labor Cost							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,698,039	$50.26	$51.53	$52.79	$54.06	$55.33	$56.60	$57.87	$59.13
Price	-10%	$34.02	-$1,651,225	-$1,687,034	-$1,722,843	-$1,758,652	-$1,794,462	-$1,830,271	-$1,866,080	-$1,901,889
	-5%	$35.91	-$1,585,109	-$1,620,918	-$1,656,727	-$1,692,536	-$1,728,346	-$1,764,155	-$1,799,964	-$1,835,773
	original	$37.80	-$1,518,993	-$1,554,802	-$1,590,611	-$1,626,420	-$1,662,230	**-$1,698,039**	-$1,733,848	-$1,769,657
	5%	$39.69	-$1,452,877	-$1,488,686	-$1,524,495	-$1,560,304	-$1,596,113	-$1,631,923	-$1,667,732	-$1,703,541
	10%	$41.58	-$1,386,761	-$1,422,570	-$1,458,379	-$1,494,188	-$1,529,997	-$1,565,807	-$1,601,616	-$1,637,425
	15%	$43.47	-$1,320,645	-$1,356,454	-$1,392,263	-$1,428,072	-$1,463,881	-$1,499,690	-$1,535,500	-$1,571,309
	20%	$45.36	-$1,254,529	-$1,290,338	-$1,326,147	-$1,361,956	-$1,397,765	-$1,433,574	-$1,469,384	-$1,505,193
	25%	$47.25	-$1,188,413	-$1,224,222	-$1,260,031	-$1,295,840	-$1,331,649	-$1,367,458	-$1,403,268	-$1,439,077

Table B17. Smaller Scale Yellow Perch Enterprise (4,700 lbs live)										
			Labor Cost							
			-25%	**-20%**	**-15%**	**-10%**	**-5%**	**original**	**5%**	**10%**
	Initial NPV	-$1,698,039	$50.26	$51.53	$52.79	$54.06	$55.33	$56.60	$57.87	$59.13
Quantity	**-10%**	1,952	-$1,509,305	-$1,541,533	-$1,573,761	-$1,605,990	-$1,638,218	-$1,670,446	-$1,702,674	-$1,734,903
	-5%	2,061	-$1,514,149	-$1,548,168	-$1,582,186	-$1,616,205	-$1,650,224	-$1,684,242	-$1,718,261	-$1,752,280
	original	2,169	-$1,518,993	-$1,554,802	-$1,590,611	-$1,626,420	-$1,662,230	**-$1,698,039**	-$1,733,848	-$1,769,657
	5%	2,278	-$1,523,837	-$1,561,437	-$1,599,036	-$1,636,636	-$1,674,235	-$1,711,835	-$1,749,434	-$1,787,034
	10%	2,386	-$1,528,681	-$1,568,071	-$1,607,461	-$1,646,851	-$1,686,241	-$1,725,631	-$1,765,021	-$1,804,411
	15%	2,495	-$1,533,525	-$1,574,705	-$1,615,886	-$1,657,066	-$1,698,247	-$1,739,427	-$1,780,608	-$1,821,788
	20%	2,603	-$1,538,369	-$1,581,340	-$1,624,311	-$1,667,282	-$1,710,253	-$1,753,224	-$1,796,195	-$1,839,166
	25%	2,712	-$1,543,213	-$1,587,974	-$1,632,736	-$1,677,497	-$1,722,259	-$1,767,020	-$1,811,781	-$1,856,543

Table B18. Larger Scale Yellow Perch Enterprise (22,360 lbs live) Net Present Value, IRR, and Payback Period Calculations

Input	Value	Source	Input	Formula
Depreciation/year	$121,604		Income from s	lbs of fillets*sale price
Pounds of filles/year	10,320	Number of fish/fish per lb of fillets	Variable costs	(variable cost/lb)*lbs of fillets sold
Sale price/lb	$37.80	Walleye Direct, 2025	Fixed costs	(ownership cost/lb)*lbs of fillets sold
Variable costs/lb	$28.95	Variable cost/lbs of fillets	Tax (shield)	EBIT*tax rate
Ownership costs/lb	$13.34	Ownership cost/lbs of fillets	Working Capit	30%*(variable+ownership coosts)
Tax rate	16.80%	McDonald, 2025	Feed cost	((Variable cost - feed cost) + (feed cost *(1 + % change)))/lbs of fillets sold
Interest rate	6.00%	Giovanetti, 2025	Labor cost	((Variable cost - labor cost) + (labor cost *(1 + % change)))/lbs of fillets sold
Discount rate	4.99%	Interest*(1-tax rate)		
Inflation	2.00%	FED, 2025		
Working capital	30.00%	Boehlje and Langemeier, 2020		

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Income from sales		$390,096.00	$397,897.92	$405,855.88	$413,973.00	$422,252.46	$430,697.51	$439,311.46	$448,097.68	$457,059.64	$466,200.83	$475,524.85	$485,035.34	$494,736.05	$504,630.77
Variable costs		-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58
Gross Margin		$91,331.42	$99,133.34	$107,091.30	$115,208.42	$123,487.88	$131,932.93	$140,546.88	$149,333.11	$158,295.06	$167,436.25	$176,760.27	$186,270.77	$195,971.47	$205,866.20
Ownership costs		-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53
Depreciation		-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30
Earnings before Interest and Tax		-$167,943.41	-$160,141.49	-$152,183.53	-$144,066.41	-$135,786.95	-$127,341.90	-$118,727.95	-$109,941.72	-$100,979.77	-$91,838.57	-$82,514.56	-$73,004.06	-$63,303.35	-$53,408.63
Tax (shield)		$28,214.49	$26,903.77	$25,566.83	$24,203.16	$22,812.21	$21,393.44	$19,946.30	$18,470.21	$16,964.60	$15,428.88	$13,862.45	$12,264.68	$10,634.96	$8,972.65
Net operating profit after tax		-$139,728.91	-$133,237.72	-$126,616.69	-$119,863.25	-$112,974.74	-$105,948.46	-$98,781.65	-$91,471.51	-$84,015.17	-$76,409.69	-$68,652.11	-$60,739.38	-$52,668.39	-$44,435.98
Add depreciation		$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30
Operating cash flow		-$18,124.61	-$11,633.42	-$5,012.39	$1,741.05	$8,629.56	$15,655.84	$22,822.65	$30,132.79	$37,589.13	$45,194.61	$52,952.19	$60,864.92	$68,935.91	$77,168.32
Working Capital		$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53
Annual Change		-$130,930.53	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Capital expenditure	-$1,976,899														
Total Cash Flow	-$1,976,899	-$149,055.15	-$11,633.42	-$5,012.39	$1,741.05	$8,629.56	$15,655.84	$22,822.65	$30,132.79	$37,589.13	$45,194.61	$52,952.19	$60,864.92	$68,935.91	$77,168.32

Year	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Income from sales	$514,723.39	$525,017.86	$535,518.21	$546,228.58	$557,153.15	$568,296.21	$579,662.14	$591,255.38	$603,080.49	$615,142.10	$627,444.94	$639,993.84	$652,793.71	$665,849.59	$679,166.58	$692,749.91
Variable costs	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58	-$298,764.58
Gross Margin	$215,958.81	$226,253.28	$236,753.64	$247,464.00	$258,388.57	$269,531.63	$280,897.56	$292,490.80	$304,315.91	$316,377.52	$328,680.36	$341,229.26	$354,029.14	$367,085.01	$380,402.00	$393,985.33
Ownership costs	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53	-$137,670.53
Depreciation	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30	-$121,604.30
Earnings before Interest and Tax	-$43,316.02	-$33,021.55	-$22,521.19	-$11,810.83	-$886.26	$10,256.81	$21,622.73	$33,215.97	$45,041.08	$57,102.69	$69,405.53	$81,954.43	$94,754.31	$107,810.18	$121,127.17	$134,710.50
Tax (shield)	$7,277.09	$5,547.62	$3,783.56	$1,984.22	$148.89	-$1,723.14	-$3,632.62	-$5,580.28	-$7,566.90	-$9,593.25	-$11,660.13	-$13,768.34	-$15,918.72	-$18,112.11	-$20,349.37	-$22,631.36
Net operating profit after tax	-$36,038.93	-$27,473.93	-$18,737.63	-$9,826.61	-$737.37	$8,533.66	$17,990.11	$27,635.69	$37,474.18	$47,509.44	$57,745.40	$68,186.09	$78,835.58	$89,698.07	$100,777.81	$112,079.14
Add depreciation	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30	$121,604.30
Operating cash flow	$85,565.37	$94,130.37	$102,866.67	$111,777.69	$120,866.93	$130,137.96	$139,594.41	$149,239.99	$159,078.48	$169,113.74	$179,349.70	$189,790.39	$200,439.88	$211,302.37	$222,382.11	$233,683.44
Working Capital	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$130,930.53	$0.00
Annual Change	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$130,930.53
Total Cash Flow	$85,565.37	$94,130.37	$102,866.67	$111,777.69	$120,866.93	$130,137.96	$139,594.41	$149,239.99	$159,078.48	$169,113.74	$179,349.70	$189,790.39	$200,439.88	$211,302.37	$222,382.11	$364,613.97

Net present value	**-$1,053,077.07**
Internal Rate of Return	**1.63%**
Payback Period	**27 Years**

Table B19. Yellow Perch Larger Scale (22,360 lbs live weight)

			Quanity Sold							
			-10%	-5%	original	5%	10%	15%	20%	25%
	Initial NPV	-$1,053,077	9,288	9,804	10,320	10,836	11,352	11,868	12,384	12,900
Price	-10%	$34.02	-$2,248,343	-$1,965,253	-$1,682,164	-$1,399,075	-$1,115,986	-$832,897	-$549,807	-$266,718
	-5%	$35.91	-$1,965,253	-$1,666,437	-$1,367,621	-$1,068,804	-$769,988	-$471,171	-$172,355	$126,461
	original	$37.80	-$1,682,164	-$1,367,621	**-$1,053,077**	-$738,533	-$423,990	-$109,446	$205,097	$519,641
	5%	$39.69	-$1,399,075	-$1,068,804	-$738,533	-$408,263	-$77,992	$252,279	$582,550	$912,820
	10%	$41.58	-$1,115,986	-$769,988	-$423,990	-$77,992	$268,006	$614,004	$960,002	$1,306,000
	15%	$43.47	-$832,897	-$471,171	-$109,446	$252,279	$614,004	$975,729	$1,337,454	$1,699,179
	20%	$45.36	-$549,807	-$172,355	$205,097	$582,550	$960,002	$1,337,454	$1,714,906	$2,092,359
	25%	$47.25	-$266,718	$126,461	$519,641	$912,820	$1,306,000	$1,699,179	$2,092,359	$2,485,538

Table B20. Yellow Perch Larger Scale (22,360 lbs live weight)

			Capital Investment							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,053,077	-$1,482,674	-$1,581,519	-$1,680,364	-$1,779,209	-$1,878,054	-$1,976,899	-$2,075,744	-$2,174,589
Price	-10%	$34.02	-$1,187,939	-$1,286,784	-$1,385,629	-$1,484,474	-$1,583,319	-$1,682,164	-$1,781,009	-$1,879,854
	-5%	$35.91	-$873,396	-$972,241	-$1,071,086	-$1,169,931	-$1,268,776	-$1,367,621	-$1,466,466	-$1,565,311
	original	$37.80	-$558,852	-$657,697	-$756,542	-$855,387	-$954,232	**-$1,053,077**	-$1,151,922	-$1,250,767
	5%	$39.69	-$244,309	-$343,154	-$441,999	-$540,844	-$639,689	-$738,533	-$837,378	-$936,223
	10%	$41.58	$70,235	-$28,610	-$127,455	-$226,300	-$325,145	-$423,990	-$522,835	-$621,680
	15%	$43.47	$384,778	$285,934	$187,089	$88,244	-$10,601	-$109,446	-$208,291	-$307,136
	20%	$45.36	$699,322	$600,477	$501,632	$402,787	$303,942	$205,097	$106,252	$7,407
	25%	$47.25	$1,013,866	$915,021	$816,176	$717,331	$618,486	$519,641	$420,796	$321,951

Table B21. Yellow Perch Larger Scale (22,360 lbs live weight)

			Capital Investment							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,053,077	-$1,482,674	-$1,581,519	-$1,680,364	-$1,779,209	-$1,878,054	-$1,976,899	-$2,075,744	-$2,174,589
Quantity	-10%	9,288	-$1,187,939	-$1,286,784	-$1,385,629	-$1,484,474	-$1,583,319	-$1,682,164	-$1,781,009	-$1,879,854
	-5%	9,804	-$873,396	-$972,241	-$1,071,086	-$1,169,931	-$1,268,776	-$1,367,621	-$1,466,466	-$1,565,311
	original	10,320	-$558,852	-$657,697	-$756,542	-$855,387	-$954,232	**-$1,053,077**	-$1,151,922	-$1,250,767
	5%	10,836	-$244,309	-$343,154	-$441,999	-$540,844	-$639,689	-$738,533	-$837,378	-$936,223
	10%	11,352	$70,235	-$28,610	-$127,455	-$226,300	-$325,145	-$423,990	-$522,835	-$621,680
	15%	11,868	$384,778	$285,934	$187,089	$88,244	-$10,601	-$109,446	-$208,291	-$307,136
	20%	12,384	$699,322	$600,477	$501,632	$402,787	$303,942	$205,097	$106,252	$7,407
	25%	12,900	$1,013,866	$915,021	$816,176	$717,331	$618,486	$519,641	$420,796	$321,951

Table B22. Yellow Perch Larger Scale (22,360 lbs live weight)

			Feed Cost							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,053,077	$27.40	$27.71	$28.02	$28.33	$28.64	$28.95	$29.26	$29.57
Price	-10%	$34.02	-$1,474,510	-$1,516,041	-$1,557,572	-$1,599,103	-$1,640,633	-$1,682,164	-$1,723,695	-$1,765,226
	-5%	$35.91	-$1,159,967	-$1,201,498	-$1,243,028	-$1,284,559	-$1,326,090	-$1,367,621	-$1,409,151	-$1,450,682
	original	$37.80	-$845,423	-$886,954	-$928,485	-$970,016	-$1,011,546	**-$1,053,077**	-$1,094,608	-$1,136,139
	5%	$39.69	-$530,880	-$572,410	-$613,941	-$655,472	-$697,003	-$738,533	-$780,064	-$821,595
	10%	$41.58	-$216,336	-$257,867	-$299,398	-$340,928	-$382,459	-$423,990	-$465,521	-$507,051
	15%	$43.47	$98,207	$56,677	$15,146	-$26,385	-$67,916	-$109,446	-$150,977	-$192,508
	20%	$45.36	$412,751	$371,220	$329,690	$288,159	$246,628	$205,097	$163,566	$122,036
	25%	$47.25	$727,295	$685,764	$644,233	$602,702	$561,172	$519,641	$478,110	$436,579

Table B23. Yellow Perch Larger Scale (22,360 lbs live weight)

			Feed Cost							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,053,077	$27.40	$27.71	$28.02	$28.33	$28.64	$28.95	$29.26	$29.57
Quantity	-10%	9,288	-$1,106,353	-$1,143,730	-$1,181,108	-$1,218,486	-$1,255,863	-$1,293,241	-$1,330,619	-$1,367,996
	-5%	9,804	-$975,888	-$1,015,342	-$1,054,796	-$1,094,251	-$1,133,705	-$1,173,159	-$1,212,613	-$1,252,067
	original	10,320	-$845,423	-$886,954	-$928,485	-$970,016	-$1,011,546	**-$1,053,077**	-$1,094,608	-$1,136,139
	5%	10,836	-$714,959	-$758,566	-$802,173	-$845,781	-$889,388	-$932,995	-$976,602	-$1,020,210
	10%	11,352	-$584,494	-$630,178	-$675,862	-$721,545	-$767,229	-$812,913	-$858,597	-$904,281
	15%	11,868	-$454,029	-$501,790	-$549,550	-$597,310	-$645,071	-$692,831	-$740,592	-$788,352
	20%	12,384	-$323,565	-$373,402	-$423,238	-$473,075	-$522,912	-$572,749	-$622,586	-$672,423
	25%	12,900	-$193,100	-$245,013	-$296,927	-$348,840	-$400,754	-$452,667	-$504,581	-$556,494

Table B24. Yellow Perch Larger Scale (22,360 lbs live weight)

			Labor Cost							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,053,077	$27.11	$27.48	$27.85	$28.22	$28.58	$28.95	$29.32	$29.68
Price	-10%	$34.02	-$1,435,426	-$1,484,774	-$1,534,122	-$1,583,469	-$1,632,817	-$1,682,164	-$1,731,512	-$1,780,859
	-5%	$35.91	-$1,120,883	-$1,170,230	-$1,219,578	-$1,268,926	-$1,318,273	-$1,367,621	-$1,416,968	-$1,466,316
	original	$37.80	-$806,339	-$855,687	-$905,034	-$954,382	-$1,003,730	**-$1,053,077**	-$1,102,425	-$1,151,772
	5%	$39.69	-$491,796	-$541,143	-$590,491	-$639,838	-$689,186	-$738,533	-$787,881	-$837,229
	10%	$41.58	-$177,252	-$226,600	-$275,947	-$325,295	-$374,642	-$423,990	-$473,337	-$522,685
	15%	$43.47	$137,291	$87,944	$38,596	-$10,751	-$60,099	-$109,446	-$158,794	-$208,141
	20%	$45.36	$451,835	$402,487	$353,140	$303,792	$254,445	$205,097	$155,750	$106,402
	25%	$47.25	$766,379	$717,031	$667,683	$618,336	$568,988	$519,641	$470,293	$420,946

Tabe B25. Yellow Perch Larger Scale (22,360 lbs live weight)										
			Labor Cost							
			-25%	**-20%**	**-15%**	**-10%**	**-5%**	**original**	**5%**	**10%**
	Initial NPV	-$1,053,077	$27.11	$27.48	$27.85	$28.22	$28.58	$28.95	$29.32	$29.68
Quantity	**-10%**	9,288	-$1,071,177	-$1,115,590	-$1,160,003	-$1,204,415	-$1,248,828	-$1,293,241	-$1,337,654	-$1,382,067
	-5%	9,804	-$938,758	-$985,638	-$1,032,519	-$1,079,399	-$1,126,279	-$1,173,159	-$1,220,039	-$1,266,919
	original	10,320	-$806,339	-$855,687	-$905,034	-$954,382	-$1,003,730	**-$1,053,077**	-$1,102,425	-$1,151,772
	5%	10,836	-$673,920	-$725,735	-$777,550	-$829,365	-$881,180	-$932,995	-$984,810	-$1,036,625
	10%	11,352	-$541,502	-$595,784	-$650,066	-$704,349	-$758,631	-$812,913	-$867,195	-$921,478
	15%	11,868	-$409,083	-$465,832	-$522,582	-$579,332	-$636,081	-$692,831	-$749,581	-$806,331
	20%	12,384	-$276,664	-$335,881	-$395,098	-$454,315	-$513,532	-$572,749	-$631,966	-$691,183
	25%	12,900	-$144,245	-$205,929	-$267,614	-$329,298	-$390,983	-$452,667	-$514,352	-$576,036

Appendix C - Pacific White Shrimp

Table C 1. Shrimp Budget Assumptions					
Water Temperature (C)	28	Cameron	Cameron	28	Cameron
Post Larvae ($/each)	$0.02 - 0.04	Payton	Cameron	$0.04 small; $0.02 large	Cameron; Payton
Stocking Density at Harvest (kg/m^3)	$7.00	Cameron	Cameron	7 kg/m^3	Cameron
Days per Cycle	90 - 120	Cameron	Payton	90 days	Cameron
Growout Mortality Rate	10 - 50%	Payton	Cameron	0.2	Payton
Final Market Size (g)	20 - 24	Cameron	Payton	20 g	Cameron
Fillet Yield	58 - 70%	Payton	Cameron	0.64	Median
Meat Weight per Shrimp (g)	11.6 - 16.8	Calculated (yield*market size)	Calculated	14 g	yield*market size

Table C 2. Shrimp Budget Assumptions Cont.					
Expense Categories	Input	Source (low)	Source (high)	Value Used	Source of Value Used
Feed ($/lb)	$1.65 - 2.25	Payton	Payton	$2.25 small; $1.65 large	Payton
Labor ($/hr)	$20 - 26.45	Avery	Prager et al., 2018	$26.45 full time; $20 part time	Prager et al., 2018; Avery
Processing Costs ($/shrimp)	$1100/month for up to 9000 shrimp then $0.03/shrimp	Payton	Payton	$1100/month for up to 9000 shrimp then $0.03/shrimp	Payton
Salt ($/lb)	$0.13 - 0.30	Cameron	Cameron	$0.30 small; $0.13 large	Cameron
Salt (lb/gal)	$0.20	Cameron	Cameron	$0.20	Cameron
Electricity ($/kWh)	$0.09 - 0.18	Jordan	BLS, 2024	0.14	Median
Electricity use (kWh/kg)	20 - 29.4	Badiola et al., 2017	Badiola et al., 2017	29.4; small 20 large	Badiola et al., 2017
Permits/Licensing ($/year)	$300	MN DNR, 2025	MN DNR, 2025	$300	MN DNR, 2025
Sales & Marketing ($/month)	$50 - 100	Payton	Payton	$100.00	Payton
Maintenance & Repair (% of operating cost)	3%	BPT Team, 2024	BPT Team, 2024	3%	BPT Team, 2024
Insurance (% of operating cost)	5%	BPT Team, 2024	BPT Team, 2024	5%	BPT Team, 2024
Internet ($/month)	$50 - 80	Payton	Payton	$69	Highspeedinternet, 2025

Table C 3. Smaller Scale Shrimp Enterprise Operating Assumptions			
Operating Assumptions	**Input**	**Source**	**Formula/Notes**
Final Market Size (g)	20 g	Cameron	
Days per Cycle	90 days	Cameron	
Stocking Density at Harvest (kg/m^3)	7 kg/m^3	Cameron	Equals 26.5 g/gal
Pacific white shrimp/tank	4578		Tank volume (gal)*26.5 g/gal
PLs/tank	5723		Fish per tank/survival rate
Number of tanks	6		3455 gal (14 ftx3 ft)
System volume (m^3)	78.46		
Harvests/yr	12		
Hydraulic retention time (min)	192	45	System volume (gal)/flow rate
Flow Rate (gpm)	108	461	

Table C 4. Larger Scale Shrimp Enterprise Operating Assumptions			
Operating Assumptions	**Input**	**Source**	**Formula/Notes**
Final Market Size (g)	20 g	Cameron	
Days per Cycle	90 days	Cameron	
Stocking Density at Harvest (kg/m^3)	7 kg/m^3	Cameron	Equals 26.5 g/gal
Pacific white shrimp/tank	8828		Tank volume (gal)*26.5 g/gal
PLs/tank	11035		Fish per tank/survival rate
Number of tanks	13		(18ftx3.5ft), (6662 gal)
System volume (m^3)	327.80		
Harvests/yr	52		
Hydraulic retention time (min)	215	45	System volume (gal)/flow rate
Flow Rate (gpm)	404	1925	

Table C 5. Smaller Scale Shrimp Enterprise Feed Calculations									
Days post hatch Initial PL count per tank (5,723)	**Initial weight (g)**	**Final weight (g)**	**Final tank biomass (kg)**	**Feed rate/day**	**Final feed rate (kg/day)**	**Life Stage**	**Pacific white shrimp mortality rate**	**Pacific white shrimp per tank (period ending)**	**Source**
21-36	0.0002	0.5	2.86	10%	0.29	1	3.333%	5532	Cameron
36-51	0.5	1.2	6.64	10%	0.66	2	3.333%	5347	Cameron
51-66	1.2	3	16.04	8%	1.28	3	3.333%	5169	Cameron
66-81	3	6.5	33.60	5%	1.68	4	3.333%	4997	Cameron
81-96	6.5	13.25	66.21	5%	3.31	5	3.333%	4830	Cameron
96-111	13.25	20	96.60	2%	1.93	6	3.333%	4669	Cameron
Each Life stage is about 15 days	**Total Biomass**	**221.95**	**kg**		**Total Feed / Day**	**9.16**	**kg**	**20%**	**Mortality Rate**

Table C 6. Larger Scale Shrimp Enterprise Feed Calculations									
Days post hatch Initial PL count per tank (11,035)	**Initial weight (g)**	**Final weight (g)**	**Final tank biomass (kg)**	**Feed rate/day**	**Final feed rate (kg/day)**	**Life Stage**	**Shrimp mortality rate**	**Shrimp per tank (period ending)**	**Source**
21-28	0.0002	0.3	3.31	10%	0.33	1	1.538%	10865	Cameron
28-35	0.3	0.5	5.43	10%	0.54	2	1.538%	10698	Cameron
35-42	0.5	0.8	8.56	10%	0.86	3	1.538%	10533	Cameron
42-49	0.8	1.2	12.64	10%	1.26	4	1.538%	10371	Cameron
49-56	1.2	2.2	22.82	8%	1.83	5	1.538%	10212	Cameron
56-63	2.2	3.2	32.68	8%	2.61	6	1.538%	10055	Cameron
63-70	3.2	4.3	43.24	8%	3.46	7	1.538%	9900	Cameron
70-77	4.3	5.4	53.46	5%	2.67	8	1.538%	9748	Cameron
77-84	5.4	6.5	63.36	5%	3.17	9	1.538%	9598	Cameron
84-91	6.5	9.5	91.18	5%	4.56	10	1.538%	9450	Cameron
91-98	9.5	13	122.85	5%	6.14	11	1.538%	9305	Cameron
98-105	13	16.5	153.53	2%	3.07	12	1.538%	9162	Cameron
105-11	16.5	20	183.23	2%	3.66	13	1.538%	9021	Cameron
Each life stage is about 7 days	**Total Biomass**	**796.29**	**kg**		**Total Feed / Day**	**34.17**	**kg**	**20%**	**Mortality Rate**

Table C7. Smaller Scale Shrimp Enterprise Budget (4,844 lbs live)											
Capital Expediture	**Item**	**Cost range**	**Source (low)**	**Source (high)**	**Source (Used)**	**Cost/unit (used)**	**Number of units**	**Total cost**	**Useful life**	**Depreciation/year**	**Source**
Facilities	Land cost ($/acre)	$2,000 - 15,000	Taylor	Cameron	UMN Extension, 2024	$6,745	1	$6,745			
	Site Prep ($/acre)	$200 - 2,000	Graham, 2025	Graham, 2025	Median	$1,100	1	$1,100	40	$28	PWC, 2024; Collins, 2005
	Well (20 gpm)	$16,000 - 30,000	Payton	Cameron	UMN Extension, 2022	$20,000	1	$20,000	40	$500	Kientzy et al., 2024; Horner et al., 2023
	Building Permits	$1,000 - 3,000	Cameron	Cameron	Median	$2,000	1	$2,000	40	$50	PWC, 2024; Collins, 2005
	General Contractor (% of building cost)	5% - 15%	BuildBook, 2024	BuildBook, 2024	Median	10%	$470,850	$47,085	40	$1,177	PWC, 2024; Collins, 2005
	Building (50x90ft) and concrete ($/sq. ft)	$20 - 250	Payton	Jordan	Cameron	$80	4,500	$360,000	40	$9,000	Collins, 2005
	Septic and plumbing	$16,000 - 24,000	Minus 20%	Plus 20%	Jordan; Cameron	$20,000	1	$20,000	20	$1,000	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	HVAC	$8,000 - 12,000	Minus 20%	Plus 20%	Schipper et al., 2024	$10,000	1	$10,000	20	$500	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Electrical service	$4,000 - 20,000	Kellam, 2025	Kellam, 2025	Median	$12,000	1	$12,000	20	$600	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Electrical wiring ($/sq. ft)	$4 - 9	Farmer et al., 2024	Farmer et al., 2024	Median	$6.50	4,500	$29,250	20	$1,463	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Generator	$9,000 - 20,000	Weimert et al., 2024	Cameron	Median	$14,500	1	$14,500	20	$725	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Water heater	$3,200 - 4,800	Minus 20%	Plus 20%	Home Depot, 2025	$4,000	1	$4,000	20	$200	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Saltwater containment	$16,000 - 24,000	Minus 20%	Plus 20%	Cameron	$20,000	1	$20,000	20	$1,000	Kientzy et al., 2024; Horner et al., 2023
	Subtotal							$546,680			
RAS Equipment	Tanks (14x3ft), (3455 gal)	$8,800 - 13,200	Minus 20%	Plus 20%	Hydro Composites, 2025	$11,168	6	$83,760	10	$8,376	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Drum filter	$15,200 - 22,800	Minus 20%	Plus 20%	Brooke	$19,000	1	$19,000	10	$1,900	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Sump and pump station	$2,400 - 3,600	Minus 20%	Plus 20%	Pentair AES, 2025	$2,726	1	$2,726	10	$273	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Biofilter	$5,500 - 20,000	Brooke	Jordan	Median	$12,500	1	$12,500	10	$1,250	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Degassing column	$12,800 - 19,200	Minus 20%	Plus 20%	Jordan	$16,000	1	$16,000	10	$1,600	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	UV disinfection	$14,400 - 21,600	Minus 20%	Plus 20%	Brooke	$18,000	1	$18,000	10	$1,800	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Aeration system ($/sq. ft)	$15 - 23	Minus 20%	Plus 20%	Cameron	$21	4,500	$94,500	10	$9,450	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Feeders	$800 - 1200	Minus 20%	Plus 20%	Jordan; Cameron	$1,000	6	$6,000	10	$600	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Water quality and monitoring equipment ($/sq. ft)	$8 - 12	Minus 20%	Plus 20%	Cameron	$11	4,500	$49,500	5	$9,900	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Misc Equip/Tools ($/lb producrion)	$0.50 - 1.50	Minus 20%	Plus 20%	Held, 2023	$7,266	1	$7,266	5	$1,453	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Subtotal							$309,252	Depreciation/year	$52,844	
Total Facilities Investment							$855,932				

Cost category	**Item**	**Cost range**	**Source (low)**	**Source (high)**	**Source (Used)**	**Cost/unit (used)**	**Number of units**	**365 day Annual cost**	**90 day Cycle cost**
Production costs	Post larvae ($/PL)	$0.02 - 0.04	Payton	Cameron	Cameron	$0.04	137,352	$5,494	$1,374
	Feed ($/lb)	$1.65 - 2.25	Payton	Payton	Payton	$2.25	7,372	$16,587	$4,090
	Owner Labor ($/hr)	$20 - 26.45	Avery	Prager et al., 2018	Prager et al., 2019	$26.45	2,080	$55,016	$13,566
	Electricity ($/kWh)	$0.09 - 0.18	Jordan	BLS, 2024	Median	$0.14	64,587	$9,042	$2,279
	Sales & Marketing ($/month)	$50 - 100	Payton	Payton	Payton	$50.00	12	$600	$148
	Repairs and Maintenance (% of op. cost)	10%	BPT Team, 2024	BPT Team, 2024	BPT Team, 2025	10%	$101,240	$10,124	$11,233
	Salt ($/lb)	$0.13 - 0.30	Cameron	Cameron	Cameron	$0.30	4,146	$1,244	$307
	Processing ($/shrimp)	$1100/month for up	Payton	Payton	Calculated from formula	$0.12	109,872	$13,256	$3,314
	Total Variable Cost							$111,364	$36,310
Overhead costs	Internet Service ($/month)	$50 - 80	Payton	Payton		$69.00	12	$828	$204
	Permits and Licensing ($/year)	$300	MN DNR, 2025	MN DNR, 2025		$300.00	1	$300	$74
	Insurance (% of op. cost)	5%	BPT Team, 2024	BPT Team, 2024		5%	$111,364	$5,568	$1,373
	Depreciation ($/year)	$52,844				$52,844	1	$52,844	$13,030
	Total ownership cost							$59,540	$14,681
Total Cost of Production								$170,904	$50,991
Breakeven operating cost per 1 lb shrimp (32)								$32.43	$42.30
Breakeven total cost per 1 lb shrimp (32)								$49.78	$59.40

Table C8. Larger Scale Shrimp Enterprise Budget (20,241 lbs live)

Capital Expediture	Item	Cost range	Source (low)	Source (high)	Source (Used)	Cost/unit (used)	Number of units	Total cost	Useful life	Depreciation/year	Source
Facilities	Land cost ($/acre)	$2,000 - 15,000	Taylor	Cameron	UMN Extension, 2024	$6,745	1	$6,745			
	Site Prep ($/acre)	$200 - 2,000	Graham, 2025	Graham, 2025	Median	$1,100	1	$1,100	40	$28	PWC, 2024; Collins, 2005
	Well (20 gpm)	$16,000 - 30,000	Payton	Cameron	UMN Extension, 2022	$20,000	1	$20,000	40	$500	Kientzy et al., 2024; Horner et al., 2023
	Building Permits	$1,000 - 3,000	Cameron	Cameron	Median	$2,000	1	$2,000	40	$50	PWC, 2024; Collins, 2005
	General Contractor (% of building cost)	5% - 15%	BuildBook, 2024	BuildBook, 2024	Median	0.1	$1,188,800	$118,880	40	$2,972	PWC, 2024; Collins, 2005
	Building (80x160ft) and concrete ($/sq. ft)	$20 - 250	Payton	Jordan	Cameron	$80	12,800	$1,024,000	40	$25,600	Collins, 2005
	Septic and plumbing	$16,000 - 24,000	Minus 20%	Plus 20%	Jordan; Cameron	$20,000	1	$20,000	20	$1,000	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	HVAC	$8,000 - 12,000	Minus 20%	Plus 20%	Schipper et al., 2024	$10,000	1	$10,000	20	$500	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Electrical service	$4,000 - 20,000	Kellam, 2025	Kellam, 2025	Median	$12,000	1	$12,000	20	$600	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Electrical wiring ($/sq. ft)	$4 - 9	Farmer et al., 2024	Farmer et al., 2024	Median	$6.50	12,800	$83,200	20	$4,160	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Generator	$9,000 - 20,000	Weimert et al., 2024	Cameron	Median	$14,500	1	$14,500	20	$725	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Water heater	$3,200 - 4,800	Minus 20%	Plus 20%	Home Depot, 2025	$4,000	1	$4,000	20	$200	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Saltwater containment	$16,000 - 24,000	Minus 20%	Plus 20%	Cameron	$20,000	1	$20,000	20	$1,000	
	Subtotal							$1,336,425			
											Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
RAS Equipment	Tanks (18x3.5ft), (6662 gal)	$6,400 - 9,600	Minus 20%	Plus 20%	Hydro Composites, 2025	$8,000	13	$130,000	10	$13,000	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Drum filter	$20,700 - 25,300	Minus 10%	Plus 10%	Brooke	$23,000	1	$23,000	10	$2,300	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Sump and pump station	$6,400 - 9,600	Minus 20%	Plus 20%	Pentair AES, 2025	$10,904	1	$10,904	10	$1,090	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Biofilter	$16,000 - 24,000	Minus 20%	Plus 20%	Brooke	$20,000	1	$20,000	10	$2,000	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Degassing column	$21,600 - 26,400	Minus 10%	Plus 10%	Jordan	$24,000	1	$24,000	10	$2,400	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	UV disinfection	$31,500 - 38,500	Minus 10%	Plus 10%	Brooke	$35,000	1	$35,000	10	$3,500	Kientzy et al., 2024; Horner et al., 2023; Quagrainie and Malekar, 2012
	Aeration system ($/sq. ft)	$15 - 23	Minus 20%	Plus 20%	Cameron	$17	12,800	$217,600	10	$21,760	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Feeders	$800 - 1200	Minus 20%	Plus 20%	Jordan; Cameron	$1,000	13	$13,000	10	$1,300	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Water quality and monitoring equipment ($/sq. ft)	$8 - 12	Minus 20%	Plus 20%	Cameron	$9	12,800	$115,200	5	$23,040	Kientzy et al., 2024; Horner et al., 2023; Held, 2023
	Misc Equip/Tools ($/lb producrion)	$0.50 - 1.50	Minus 20%	Plus 20%	Held, 2023	$20,241	1	$20,241	5	$4,048	Kientzy et al., 2024; Horner et al., 2023; Held, 2024
	subtotal							$608,945	Depreciation/year	$111,773	
Total Facilities Investment								$1,945,370			

Cost category	Item	Cost range	Source (low)	Source (high)	Source (Used)	Cost/unit (used)	Number of units	365 day Annual cost	90 day Cycle cost
Production costs	Post larvae ($/PL)	$0.02 - 0.04	Payton	Cameron	Payton	$0.02	573,820	$11,476	$2,869
	Feed ($/lb)	$1.65 - 2.25	Payton	Payton	Payton	$1.65	27,501	$45,376	$11,189
	Hired Labor ($/hr)	$20 - 26.45	Avery	Prager et al., 2018	Avery	$20.00	1,040	$20,800	$5,129
	Owner Labor ($/hr)	$20 - 26.45	Avery	Prager et al., 2018	Prager et al., 2018	$26.45	2,080	$55,016	$13,566
	Electricity ($/kWh)	$0.09 - 0.18	Jordan	BLS, 2024	Median	$0.14	183,592	$25,703	$6,477
	Sales & Marketing ($/month)	$50 - 100	Payton	Payton	Payton	$100.00	12	$1,200	$296
	Repairs and Maintenance (% of op. cost)	10%	BPT Team, 2024	BPT Team, 2024	BPT Team, 2025	10%	$184,496	$18,450	$4,549
	Salt ($/lb)	$0.13 - 0.30	Cameron	Cameron	Cameron	$0.13	17,321	$2,252	$555
	Processing ($/shrimp)	$1100/month for up	Payton	Payton	Payton	$0.05	459,056	$22,672.32	$5,668.08
	Total Variable Cost							$202,945	$50,298
Overhead Costs	Internet Service ($/month)	$50 - 80	Payton	Payton	Highspeedinternet, 2025	$69.00	12	$828	$204
	Permits and Licensing ($/year)	$300	MN DNR, 2025	MN DNR, 2025	MN DNR, 2025	$300.00	1	$300	$74
	Insurance (% of op. cost)	5%	BPT Team, 2024	BPT Team, 2024	BPT Team, 2024	5%	$202,945	$10,147	$2,502
	Depreciation ($/year)	$111,773				$111,773	1	$111,773	$27,560
	Total ownership cost							$123,048	$30,341
Total Cost of Production								$325,994	$80,638
Breakeven operating cost per 1 lb shrimp (32)								$14.15	$14.02
Breakeven total cost per 1 lb shrimp (32)								$22.72	$22.48

Table C9. Smaller Scale Shrimp Enterprise (4,844 lbs live) Net Present Value Calculation

Input	Value	Source	Input	Formula
Depreciation/year	$52,844		Income from s	lbs of fillets*sale price
Pounds of filles/year	3,434	Number of fish/fish per lb of fillets	Variable costs	(variable cost/lb)*lbs of fillets sold
Sale price/lb	17.99	Coastal Seafoc rise with inflation	Fixed costs	(ownership cost/lb)*lbs of fillets sold
Variable costs/lb	$32.43	Variable cost/lbs of fillets	Tax (shield)	EBIT*tax rate
Ownership costs/lb	$17.34	Ownership cost/lbs of fillets	Working Capit	30%*(variable+ownership coosts)
Tax rate	16.80%	McDonald, 2025	Feed cost	((Variable cost - feed cost) + (feed cost *(1 + % change)))/lbs of fillets sold
Interest rate	6.00%	Giovanetti, 2025	Labor cost	((Variable cost - labor cost) + (labor cost *(1 + % change)))/lbs of fillets sold
Discount rate	4.99%	Interest*(1-tax rate)		
Inflation	2.00%	FED, 2025		
Working capital	30.00%	Boehlje and Langemeier, 2020		

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Income from sales		$61,768.67	$63,004.04	$64,264.12	$65,549.40	$66,860.39	$68,197.60	$69,561.55	$70,952.78	$72,371.84	$73,819.27	$75,295.66	$76,801.57	$78,337.60	$79,904.35
Variable costs		-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62
Gross Margin		-$49,594.95	-$48,359.58	-$47,099.50	-$45,814.22	-$44,503.23	-$43,166.02	-$41,802.07	-$40,410.84	-$38,991.78	-$37,544.34	-$36,067.96	-$34,562.05	-$33,026.01	-$31,459.26
Ownership costs		-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11
Depreciation		-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93
Earnings before Interest and Tax		-$161,978.98	-$160,743.61	-$159,483.53	-$158,198.25	-$156,887.26	-$155,550.05	-$154,186.10	-$152,794.87	-$151,375.81	-$149,928.37	-$148,451.99	-$146,946.08	-$145,410.04	-$143,843.29
Tax (shield)		$27,212.47	$27,004.93	$26,793.23	$26,577.31	$26,357.06	$26,132.41	$25,903.26	$25,669.54	$25,431.14	$25,187.97	$24,939.93	$24,686.94	$24,428.89	$24,165.67
Net operating profit after tax		-$134,766.51	-$133,738.68	-$132,690.30	-$131,620.94	-$130,530.20	-$129,417.64	-$128,282.83	-$127,125.33	-$125,944.68	-$124,740.41	-$123,512.06	-$122,259.14	-$120,981.16	-$119,677.62
Add depreciation		$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93
Operating cash flow		-$81,922.59	-$80,894.76	-$79,846.37	-$78,777.02	-$77,686.27	-$76,573.72	-$75,438.91	-$74,281.40	-$73,100.75	-$71,896.48	-$70,668.13	-$69,415.21	-$68,137.23	-$66,833.69
Working Capital		$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12
Annual Change		-$51,271.12	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Capital expenditure	-$855,932														
Total Cash Flow	-$855,932	-$133,193.71	-$80,894.76	-$79,846.37	-$78,777.02	-$77,686.27	-$76,573.72	-$75,438.91	-$74,281.40	-$73,100.75	-$71,896.48	-$70,668.13	-$69,415.21	-$68,137.23	-$66,833.69

Year	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Income from sales	$81,502.44	$83,132.49	$84,795.14	$86,491.04	$88,220.86	$89,985.28	$91,784.99	$93,620.69	$95,493.10	$97,402.96	$99,351.02	$101,338.04	$103,364.80	$105,432.10	$107,540.74	$109,691.56
Variable costs	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62	-$111,363.62
Gross Margin	-$29,861.17	-$28,231.13	-$26,568.48	-$24,872.57	-$23,142.75	-$21,378.34	-$19,578.63	-$17,742.93	-$15,870.52	-$13,960.65	-$12,012.59	-$10,025.57	-$7,998.81	-$5,931.52	-$3,822.88	-$1,672.06
Ownership costs	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11	-$59,540.11
Depreciation	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93	-$52,843.93
Earnings before Interest and Tax	-$142,245.21	-$140,615.16	-$138,952.51	-$137,256.60	-$135,526.78	-$133,762.37	-$131,962.66	-$130,126.96	-$128,254.55	-$126,344.69	-$124,396.63	-$122,409.61	-$120,382.84	-$118,315.55	-$116,206.91	-$114,056.09
Tax (shield)	$23,897.19	$23,623.35	$23,344.02	$23,059.11	$22,768.50	$22,472.08	$22,169.73	$21,861.33	$21,546.76	$21,225.91	$20,898.63	$20,564.81	$20,224.32	$19,877.01	$19,522.76	$19,161.42
Net operating profit after tax	-$118,348.01	-$116,991.81	-$115,608.49	-$114,197.49	-$112,758.28	-$111,290.29	-$109,792.93	-$108,265.63	-$106,707.78	-$105,118.78	-$103,497.99	-$101,844.79	-$100,158.53	-$98,438.54	-$96,684.15	-$94,894.67
Add depreciation	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93	$52,843.93
Operating cash flow	-$65,504.09	-$64,147.89	-$62,764.56	-$61,353.57	-$59,914.36	-$58,446.36	-$56,949.01	-$55,421.71	-$53,863.86	-$52,274.85	-$50,654.07	-$49,000.87	-$47,314.60	-$45,594.61	-$43,840.22	-$42,050.74
Working Capital	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$51,271.12	$0.00
Annual Change	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$51,271.12
Total Cash Flow	-$65,504.09	-$64,147.89	-$62,764.56	-$61,353.57	-$59,914.36	-$58,446.36	-$56,949.01	-$55,421.71	-$53,863.86	-$52,274.85	-$50,654.07	-$49,000.87	-$47,314.60	-$45,594.61	-$43,840.22	$9,220.37

Net present value	**-$1,947,999.64**

Table C10. Smaller Scale Shrimp Enterprise (4,844 lbs live)

			Quanity Sold							
			-10%	-5%	original	5%	10%	15%	20%	25%
	Initial NPV	-$1,948,000	3,090	3,262	3,434	3,605	3,777	3,949	4,120	4,292
Price	-10%	$16.19	-$2,137,261	-$2,092,436	-$2,047,611	-$2,002,786	-$1,957,961	-$1,913,136	-$1,868,311	-$1,823,486
	-5%	$17.09	-$2,092,436	-$2,045,120	-$1,997,805	-$1,950,490	-$1,903,175	-$1,855,859	-$1,808,544	-$1,761,229
	original	$17.99	-$2,047,611	-$1,997,805	**-$1,948,000**	-$1,898,194	-$1,848,389	-$1,798,583	-$1,748,778	-$1,698,972
	5%	$18.89	-$2,002,786	-$1,950,490	-$1,898,194	-$1,845,898	-$1,793,603	-$1,741,307	-$1,689,011	-$1,636,715
	10%	$19.79	-$1,957,961	-$1,903,175	-$1,848,389	-$1,793,603	-$1,738,816	-$1,684,030	-$1,629,244	-$1,574,458
	15%	$20.69	-$1,913,136	-$1,855,859	-$1,798,583	-$1,741,307	-$1,684,030	-$1,626,754	-$1,569,478	-$1,512,201
	20%	$21.59	-$1,868,311	-$1,808,544	-$1,748,778	-$1,689,011	-$1,629,244	-$1,569,478	-$1,509,711	-$1,449,944
	25%	$22.49	-$1,823,486	-$1,761,229	-$1,698,972	-$1,636,715	-$1,574,458	-$1,512,201	-$1,449,944	-$1,387,687

Table C11. Smaller Scale Shrimp Enterprise (4,844 lbs live)

			Capital Investment							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,948,000	-$641,949	-$684,746	-$727,542	-$770,339	-$813,135	-$855,932	-$898,729	-$941,525
Price	-10%	$16.19	-$1,833,628	-$1,876,424	-$1,919,221	-$1,962,017	-$2,004,814	-$2,047,611	-$2,090,407	-$2,133,204
	-5%	$17.09	-$1,783,822	-$1,826,619	-$1,869,415	-$1,912,212	-$1,955,009	-$1,997,805	-$2,040,602	-$2,083,398
	original	$17.99	-$1,734,017	-$1,776,813	-$1,819,610	-$1,862,406	-$1,905,203	**-$1,948,000**	-$1,990,796	-$2,033,593
	5%	$18.89	-$1,684,211	-$1,727,008	-$1,769,804	-$1,812,601	-$1,855,398	-$1,898,194	-$1,940,991	-$1,983,787
	10%	$19.79	-$1,634,406	-$1,677,202	-$1,719,999	-$1,762,795	-$1,805,592	-$1,848,389	-$1,891,185	-$1,933,982
	15%	$20.69	-$1,584,600	-$1,627,397	-$1,670,193	-$1,712,990	-$1,755,786	-$1,798,583	-$1,841,380	-$1,884,176
	20%	$21.59	-$1,534,795	-$1,577,591	-$1,620,388	-$1,663,184	-$1,705,981	-$1,748,778	-$1,791,574	-$1,834,371
	25%	$22.49	-$1,484,989	-$1,527,786	-$1,570,582	-$1,613,379	-$1,656,175	-$1,698,972	-$1,741,769	-$1,784,565

Table C12. Smaller Scale Shrimp Enterprise (4,844 lbs live)

			Capital Investment							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,948,000	-$641,949	-$684,746	-$727,542	-$770,339	-$813,135	-$855,932	-$898,729	-$941,525
Quantity	-10%	3,090	-$1,833,628	-$1,876,424	-$1,919,221	-$1,962,017	-$2,004,814	-$2,047,611	-$2,090,407	-$2,133,204
	-5%	3,262	-$1,783,822	-$1,826,619	-$1,869,415	-$1,912,212	-$1,955,009	-$1,997,805	-$2,040,602	-$2,083,398
	original	3,434	-$1,734,017	-$1,776,813	-$1,819,610	-$1,862,406	-$1,905,203	**-$1,948,000**	-$1,990,796	-$2,033,593
	5%	3,605	-$1,684,211	-$1,727,008	-$1,769,804	-$1,812,601	-$1,855,398	-$1,898,194	-$1,940,991	-$1,983,787
	10%	3,777	-$1,634,406	-$1,677,202	-$1,719,999	-$1,762,795	-$1,805,592	-$1,848,389	-$1,891,185	-$1,933,982
	15%	3,949	-$1,584,600	-$1,627,397	-$1,670,193	-$1,712,990	-$1,755,786	-$1,798,583	-$1,841,380	-$1,884,176
	20%	4,120	-$1,534,795	-$1,577,591	-$1,620,388	-$1,663,184	-$1,705,981	-$1,748,778	-$1,791,574	-$1,834,371
	25%	4,292	-$1,484,989	-$1,527,786	-$1,570,582	-$1,613,379	-$1,656,175	-$1,698,972	-$1,741,769	-$1,784,565

Table C13. Smaller Scale Shrimp Enterprise (4,844 lbs live)

			Feed Cost							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,948,000	$31.23	$31.47	$31.71	$31.95	$32.19	$32.43	$32.68	$32.92
Price	-10%	$16.19	-$1,993,628	-$2,004,425	-$2,015,221	-$2,026,018	-$2,036,814	-$2,047,611	-$2,058,407	-$2,069,204
	-5%	$17.09	-$1,943,823	-$1,954,619	-$1,965,416	-$1,976,212	-$1,987,009	-$1,997,805	-$2,008,602	-$2,019,398
	original	$17.99	-$1,894,017	-$1,904,814	-$1,915,610	-$1,926,407	-$1,937,203	**-$1,948,000**	-$1,958,796	-$1,969,593
	5%	$18.89	-$1,844,211	-$1,855,008	-$1,865,805	-$1,876,601	-$1,887,398	-$1,898,194	-$1,908,991	-$1,919,787
	10%	$19.79	-$1,794,406	-$1,805,202	-$1,815,999	-$1,826,796	-$1,837,592	-$1,848,389	-$1,859,185	-$1,869,982
	15%	$20.69	-$1,744,600	-$1,755,397	-$1,766,193	-$1,776,990	-$1,787,787	-$1,798,583	-$1,809,380	-$1,820,176
	20%	$21.59	-$1,694,795	-$1,705,591	-$1,716,388	-$1,727,184	-$1,737,981	-$1,748,778	-$1,759,574	-$1,770,371
	25%	$22.49	-$1,644,989	-$1,655,786	-$1,666,582	-$1,677,379	-$1,688,175	-$1,698,972	-$1,709,769	-$1,720,565

Table C14. Smaller Scale Shrimp Enterprise (4,844 lbs live)

			Feed Cost							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,948,000	$31.23	$31.47	$31.71	$31.95	$32.19	$32.43	$32.68	$32.92
Quantity	-10%	3,090	-$1,854,056	-$1,863,773	-$1,873,490	-$1,883,207	-$1,892,924	-$1,902,641	-$1,912,358	-$1,922,074
	-5%	3,262	-$1,874,037	-$1,884,293	-$1,894,550	-$1,904,807	-$1,915,063	-$1,925,320	-$1,935,577	-$1,945,834
	original	3,434	-$1,894,017	-$1,904,814	-$1,915,610	-$1,926,407	-$1,937,203	**-$1,948,000**	-$1,958,796	-$1,969,593
	5%	3,605	-$1,913,997	-$1,925,334	-$1,936,670	-$1,948,006	-$1,959,343	-$1,970,679	-$1,982,015	-$1,993,352
	10%	3,777	-$1,933,978	-$1,945,854	-$1,957,730	-$1,969,606	-$1,981,482	-$1,993,359	-$2,005,235	-$2,017,111
	15%	3,949	-$1,953,958	-$1,966,374	-$1,978,790	-$1,991,206	-$2,003,622	-$2,016,038	-$2,028,454	-$2,040,870
	20%	4,120	-$1,973,938	-$1,986,894	-$1,999,850	-$2,012,806	-$2,025,762	-$2,038,717	-$2,051,673	-$2,064,629
	25%	4,292	-$1,993,919	-$2,007,414	-$2,020,910	-$2,034,406	-$2,047,901	-$2,061,397	-$2,074,893	-$2,088,388

Table C15. Smaller Scale Shrimp Enterprise (4,844 lbs live)

			Labor Cost							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,948,000	$28.43	$29.23	$30.03	$30.83	$31.63	$32.43	$33.24	$34.04
Price	-10%	$16.19	-$1,868,565	-$1,904,374	-$1,940,183	-$1,975,992	-$2,011,802	-$2,047,611	-$2,083,420	-$2,119,229
	-5%	$17.09	-$1,818,760	-$1,854,569	-$1,890,378	-$1,926,187	-$1,961,996	-$1,997,805	-$2,033,614	-$2,069,423
	original	$17.99	-$1,768,954	-$1,804,763	-$1,840,572	-$1,876,381	-$1,912,191	**-$1,948,000**	-$1,983,809	-$2,019,618
	5%	$18.89	-$1,719,148	-$1,754,958	-$1,790,767	-$1,826,576	-$1,862,385	-$1,898,194	-$1,934,003	-$1,969,812
	10%	$19.79	-$1,669,343	-$1,705,152	-$1,740,961	-$1,776,770	-$1,812,579	-$1,848,389	-$1,884,198	-$1,920,007
	15%	$20.69	-$1,619,537	-$1,655,347	-$1,691,156	-$1,726,965	-$1,762,774	-$1,798,583	-$1,834,392	-$1,870,201
	20%	$21.59	-$1,569,732	-$1,605,541	-$1,641,350	-$1,677,159	-$1,712,968	-$1,748,778	-$1,784,587	-$1,820,396
	25%	$22.49	-$1,519,926	-$1,555,735	-$1,591,545	-$1,627,354	-$1,663,163	-$1,698,972	-$1,734,781	-$1,770,590

Table C16. Smaller Scale Shrimp Enterprise (4,844 lbs live)

Quantity			Labor Cost							
			-25%	**-20%**	**-15%**	**-10%**	**-5%**	**original**	**5%**	**10%**
	Initial NPV	-$1,948,000	$28.43	$29.23	$30.03	$30.83	$31.63	$32.43	$33.24	$34.04
	-10%	3,090	-$1,741,500	-$1,773,728	-$1,805,956	-$1,838,184	-$1,870,412	-$1,902,641	-$1,934,869	-$1,967,097
	-5%	3,262	-$1,755,227	-$1,789,245	-$1,823,264	-$1,857,283	-$1,891,302	-$1,925,320	-$1,959,339	-$1,993,358
	original	3,434	-$1,768,954	-$1,804,763	-$1,840,572	-$1,876,381	-$1,912,191	**-$1,948,000**	-$1,983,809	-$2,019,618
	5%	3,605	-$1,782,681	-$1,820,281	-$1,857,880	-$1,895,480	-$1,933,080	-$1,970,679	-$2,008,279	-$2,045,878
	10%	3,777	-$1,796,408	-$1,835,798	-$1,875,188	-$1,914,578	-$1,953,969	-$1,993,359	-$2,032,749	-$2,072,139
	15%	3,949	-$1,810,136	-$1,851,316	-$1,892,497	-$1,933,677	-$1,974,858	-$2,016,038	-$2,057,219	-$2,098,399
	20%	4,120	-$1,823,863	-$1,866,834	-$1,909,805	-$1,952,776	-$1,995,747	-$2,038,717	-$2,081,688	-$2,124,659
	25%	4,292	-$1,837,590	-$1,882,351	-$1,927,113	-$1,971,874	-$2,016,636	-$2,061,397	-$2,106,158	-$2,150,920

Table C17. Larger Scale Shrimp Enterprise (20,241 lbs live) Net Present Value, IRR, and Payback Period Calculations

Input	Value	Source	Input	Formula
Depreciation/year	$111,773		Income from s	lbs of fillets*sale price
Pounds of filles/year	14,346	Number of fish/fish per lb of fillets	Variable costs	(variable cost/lb)*lbs of fillets sold
Sale price/lb	17.99	Coastal Seafoods, 2025	Fixed costs	(ownership cost/lb)*lbs of fillets sold
Variable costs/lb	$14.15	Variable cost/lbs of fillets	Tax (shield)	EBIT*tax rate
Ownership costs/lb	$8.58	Ownership cost/lbs of fillets	Working Capit	30%*(variable+ownership coosts)
Tax rate	16.80%	McDonald, 2025	Feed cost	((Variable cost - feed cost) + (feed cost *(1 + % change)))/lbs of fillets sold
Interest rate	6.00%	Giovanetti, 2025	Labor cost	((Variable cost - labor cost) + (labor cost *(1 + % change)))/lbs of fillets sold
Discount rate	4.99%	Interest*(1-tax rate)		
Inflation	2.00%	FED, 2025		
Working capital	30.00%	Boehlje and Langemeier, 2020		

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Income from sales		$258,075.55	$263,237.06	$268,501.80	$273,871.83	$279,349.27	$284,936.26	$290,634.98	$296,447.68	$302,376.63	$308,424.17	$314,592.65	$320,884.50	$327,302.19	$333,848.24
Variable costs		-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37
Gross Margin		$55,130.18	$60,291.69	$65,556.43	$70,926.46	$76,403.90	$81,990.89	$87,689.61	$93,502.31	$99,431.26	$105,478.80	$111,647.28	$117,939.13	$124,356.82	$130,902.87
Ownership costs		-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37
Depreciation		-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10
Earnings before Interest and Tax		-$179,691.29	-$174,529.78	-$169,265.04	-$163,895.00	-$158,417.57	-$152,830.58	-$147,131.86	-$141,319.16	-$135,390.20	-$129,342.67	-$123,174.19	-$116,882.34	-$110,464.65	-$103,918.60
Tax (shield)		$30,188.14	$29,321.00	$28,436.53	$27,534.36	$26,614.15	$25,675.54	$24,718.15	$23,741.62	$22,745.55	$21,729.57	$20,693.26	$19,636.23	$18,558.06	$17,458.33
Net operating profit after tax		-$149,503.16	-$145,208.78	-$140,828.51	-$136,360.64	-$131,803.42	-$127,155.04	-$122,413.71	-$117,577.54	-$112,644.65	-$107,613.10	-$102,480.92	-$97,246.10	-$91,906.58	-$86,460.28
Add depreciation		$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10
Operating cash flow		-$37,730.06	-$33,435.68	-$29,055.41	-$24,587.54	-$20,030.32	-$15,381.94	-$10,640.61	-$5,804.44	-$871.55	$4,160.00	$9,292.18	$14,527.00	$19,866.52	$25,312.82
Working Capital		$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12
Annual Change		-$97,798.12	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Capital expenditure	-$1,945,370														
Total Cash Flow	-$1,945,370	-$135,528.18	-$33,435.68	-$29,055.41	-$24,587.54	-$20,030.32	-$15,381.94	-$10,640.61	-$5,804.44	-$871.55	$4,160.00	$9,292.18	$14,527.00	$19,866.52	$25,312.82

Year	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Income from sales	$340,525.20	$347,335.70	$354,282.42	$361,368.07	$368,595.43	$375,967.34	$383,486.68	$391,156.42	$398,979.55	$406,959.14	$415,098.32	$423,400.29	$431,868.29	$440,505.66	$449,315.77	$458,302.09
Variable costs	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37	-$202,945.37
Gross Margin	$137,579.83	$144,390.34	$151,337.05	$158,422.70	$165,650.06	$173,021.97	$180,541.32	$188,211.05	$196,034.18	$204,013.77	$212,152.95	$220,454.92	$228,922.92	$237,560.29	$246,370.40	$255,356.72
Ownership costs	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37	-$123,048.37
Depreciation	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10	-$111,773.10
Earnings before Interest and Tax	-$97,241.64	-$90,431.13	-$83,484.42	-$76,398.77	-$69,171.41	-$61,799.50	-$54,280.15	-$46,610.42	-$38,787.29	-$30,807.70	-$22,668.52	-$14,366.55	-$5,898.55	$2,738.82	$11,548.93	$20,535.25
Tax (shield)	$16,336.59	$15,192.43	$14,025.38	$12,834.99	$11,620.80	$10,382.32	$9,119.07	$7,830.55	$6,516.26	$5,175.69	$3,808.31	$2,413.58	$990.96	-$460.12	-$1,940.22	-$3,449.92
Net operating profit after tax	-$80,905.04	-$75,238.70	-$69,459.04	-$63,563.78	-$57,550.61	-$51,417.18	-$45,161.09	-$38,779.87	-$32,271.03	-$25,632.01	-$18,860.21	-$11,952.97	-$4,907.59	$2,278.70	$9,608.71	$17,085.33
Add depreciation	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10	$111,773.10
Operating cash flow	$30,868.06	$36,534.40	$42,314.06	$48,209.32	$54,222.49	$60,355.92	$66,612.01	$72,993.23	$79,502.07	$86,141.09	$92,912.89	$99,820.13	$106,865.51	$114,051.80	$121,381.81	$128,858.43
Working Capital	$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12	$97,798.12	0
Annual Change	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$97,798.12
Total Cash Flow	$30,868.06	$36,534.40	$42,314.06	$48,209.32	$54,222.49	$60,355.92	$66,612.01	$72,993.23	$79,502.07	$86,141.09	$92,912.89	$99,820.13	$106,865.51	$114,051.80	$121,381.81	$226,656.55

Net present value	**-$1,738,290.47**
Internal Rate of Return (37 year	**0.21%**
Payback Perriod	**36 years**

Table C18. Larger Scale Shrimp Enterprise (4,844 lbs live)

			Quanity Sold							
			-10%	-5%	original	5%	10%	15%	20%	25%
	Initial NPV	-$1,738,290	12,911	13,628	14,346	15,063	15,780	16,497	17,215	17,932
Price	-10%	$16.19	-$2,529,042	-$2,341,758	-$2,154,475	-$1,967,192	-$1,779,909	-$1,592,626	-$1,405,343	-$1,218,060
	-5%	$17.09	-$2,341,758	-$2,144,071	-$1,946,383	-$1,748,695	-$1,551,007	-$1,353,320	-$1,155,632	-$957,944
	original	$17.99	-$2,154,475	-$1,946,383	**-$1,738,290**	-$1,530,198	-$1,322,106	-$1,114,013	-$905,921	-$697,829
	5%	$18.89	-$1,967,192	-$1,748,695	-$1,530,198	-$1,311,701	-$1,093,204	-$874,707	-$656,210	-$437,713
	10%	$19.79	-$1,779,909	-$1,551,007	-$1,322,106	-$1,093,204	-$864,302	-$635,401	-$406,499	-$177,598
	15%	$20.69	-$1,592,626	-$1,353,320	-$1,114,013	-$874,707	-$635,401	-$396,095	-$156,788	$82,518
	20%	$21.59	-$1,405,343	-$1,155,632	-$905,921	-$656,210	-$406,499	-$156,788	$92,922	$342,633
	25%	$22.49	-$1,218,060	-$957,944	-$697,829	-$437,713	-$177,598	$82,518	$342,633	$602,749

Table C19. Larger Scale Shrimp Enterprise (4,844 lbs live)

			Capital Investment							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,738,290	-$1,459,028	-$1,556,296	-$1,653,565	-$1,750,833	-$1,848,102	-$1,945,370	-$2,042,639	-$2,139,907
	-10%	$16.19	-$1,668,133	-$1,765,401	-$1,862,670	-$1,959,938	-$2,057,207	-$2,154,475	-$2,251,744	-$2,349,012
	-5%	$17.09	-$1,460,040	-$1,557,309	-$1,654,577	-$1,751,846	-$1,849,114	-$1,946,383	-$2,043,651	-$2,140,920
Price	original	$17.99	-$1,251,948	-$1,349,216	-$1,446,485	-$1,543,753	-$1,641,022	**-$1,738,290**	-$1,835,559	-$1,932,827
	5%	$18.89	-$1,043,856	-$1,141,124	-$1,238,393	-$1,335,661	-$1,432,930	-$1,530,198	-$1,627,467	-$1,724,735
	10%	$19.79	-$835,763	-$933,032	-$1,030,300	-$1,127,569	-$1,224,837	-$1,322,106	-$1,419,374	-$1,516,643
	15%	$20.69	-$627,671	-$724,939	-$822,208	-$919,476	-$1,016,745	-$1,114,013	-$1,211,282	-$1,308,550
	20%	$21.59	-$419,578	-$516,847	-$614,115	-$711,384	-$808,652	-$905,921	-$1,003,189	-$1,100,458
	25%	$22.49	-$211,486	-$308,755	-$406,023	-$503,292	-$600,560	-$697,829	-$795,097	-$892,366

Table C20. Larger Scale Shrimp Enterprise (4,844 lbs live)

			Capital Investment							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,738,290	-$1,459,028	-$1,556,296	-$1,653,565	-$1,750,833	-$1,848,102	-$1,945,370	-$2,042,639	-$2,139,907
	-10%	12,911	-$1,668,133	-$1,765,401	-$1,862,670	-$1,959,938	-$2,057,207	-$2,154,475	-$2,251,744	-$2,349,012
	-5%	13,628	-$1,460,040	-$1,557,309	-$1,654,577	-$1,751,846	-$1,849,114	-$1,946,383	-$2,043,651	-$2,140,920
Quantity	original	14,346	-$1,251,948	-$1,349,216	-$1,446,485	-$1,543,753	-$1,641,022	**-$1,738,290**	-$1,835,559	-$1,932,827
	5%	15,063	-$1,043,856	-$1,141,124	-$1,238,393	-$1,335,661	-$1,432,930	-$1,530,198	-$1,627,467	-$1,724,735
	10%	15,780	-$835,763	-$933,032	-$1,030,300	-$1,127,569	-$1,224,837	-$1,322,106	-$1,419,374	-$1,516,643
	15%	16,497	-$627,671	-$724,939	-$822,208	-$919,476	-$1,016,745	-$1,114,013	-$1,211,282	-$1,308,550
	20%	17,215	-$419,578	-$516,847	-$614,115	-$711,384	-$808,652	-$905,921	-$1,003,189	-$1,100,458
	25%	17,932	-$211,486	-$308,755	-$406,023	-$503,292	-$600,560	-$697,829	-$795,097	-$892,366

Table C21. Larger Scale Shrimp Enterprise (4,844 lbs live)

			Feed Cost							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,738,290	$13.36	$13.51	$13.67	$13.83	$13.99	$14.15	$14.31	$14.46
	-10%	$16.19	-$2,006,801	-$2,036,336	-$2,065,871	-$2,095,405	-$2,124,940	-$2,154,475	-$2,184,010	-$2,213,545
	-5%	$17.09	-$1,798,708	-$1,828,243	-$1,857,778	-$1,887,313	-$1,916,848	-$1,946,383	-$1,975,918	-$2,005,453
Price	original	$17.99	-$1,590,616	-$1,620,151	-$1,649,686	-$1,679,221	-$1,708,756	**-$1,738,290**	-$1,767,825	-$1,797,360
	5%	$18.89	-$1,382,524	-$1,412,059	-$1,441,593	-$1,471,128	-$1,500,663	-$1,530,198	-$1,559,733	-$1,589,268
	10%	$19.79	-$1,174,431	-$1,203,966	-$1,233,501	-$1,263,036	-$1,292,571	-$1,322,106	-$1,351,641	-$1,381,175
	15%	$20.69	-$966,339	-$995,874	-$1,025,409	-$1,054,944	-$1,084,478	-$1,114,013	-$1,143,548	-$1,173,083
	20%	$21.59	-$758,247	-$787,781	-$817,316	-$846,851	-$876,386	-$905,921	-$935,456	-$964,991
	25%	$22.49	-$550,154	-$579,689	-$609,224	-$638,759	-$668,294	-$697,829	-$727,363	-$756,898

Table C22. Larger Scale Shrimp Enterprise (4,844 lbs live)

			Feed Cost							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,738,290	$13.36	$13.51	$13.67	$13.83	$13.99	$14.15	$14.31	$14.46
Quantity	-10%	12,911	-$1,757,380	-$1,783,961	-$1,810,543	-$1,837,124	-$1,863,705	-$1,890,287	-$1,916,868	-$1,943,450
	-5%	13,628	-$1,673,998	-$1,702,056	-$1,730,114	-$1,758,172	-$1,786,230	-$1,814,289	-$1,842,347	-$1,870,405
	original	14,346	-$1,590,616	-$1,620,151	-$1,649,686	-$1,679,221	-$1,708,756	**-$1,738,290**	-$1,767,825	-$1,797,360
	5%	15,063	-$1,507,234	-$1,538,246	-$1,569,257	-$1,600,269	-$1,631,281	-$1,662,292	-$1,693,304	-$1,724,316
	10%	15,780	-$1,423,852	-$1,456,341	-$1,488,829	-$1,521,317	-$1,553,806	-$1,586,294	-$1,618,783	-$1,651,271
	15%	16,497	-$1,340,471	-$1,374,436	-$1,408,401	-$1,442,366	-$1,476,331	-$1,510,296	-$1,544,261	-$1,578,226
	20%	17,215	-$1,257,089	-$1,292,531	-$1,327,972	-$1,363,414	-$1,398,856	-$1,434,298	-$1,469,740	-$1,505,182
	25%	17,932	-$1,173,707	-$1,210,625	-$1,247,544	-$1,284,463	-$1,321,381	-$1,358,300	-$1,395,218	-$1,432,137

Table C23. Larger Scale Shrimp Enterprise (4,844 lbs live)

			Labor Cost							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,738,290	$12.83	$13.09	$13.35	$13.62	$13.88	$14.15	$14.41	$14.68
Price	-10%	$16.19	-$1,907,737	-$1,957,085	-$2,006,433	-$2,055,780	-$2,105,128	-$2,154,475	-$2,203,823	-$2,253,170
	-5%	$17.09	-$1,699,645	-$1,748,993	-$1,798,340	-$1,847,688	-$1,897,035	-$1,946,383	-$1,995,730	-$2,045,078
	original	$17.99	-$1,491,553	-$1,540,900	-$1,590,248	-$1,639,595	-$1,688,943	**-$1,738,290**	-$1,787,638	-$1,836,986
	5%	$18.89	-$1,283,460	-$1,332,808	-$1,382,155	-$1,431,503	-$1,480,851	-$1,530,198	-$1,579,546	-$1,628,893
	10%	$19.79	-$1,075,368	-$1,124,715	-$1,174,063	-$1,223,411	-$1,272,758	-$1,322,106	-$1,371,453	-$1,420,801
	15%	$20.69	-$867,276	-$916,623	-$965,971	-$1,015,318	-$1,064,666	-$1,114,013	-$1,163,361	-$1,212,708
	20%	$21.59	-$659,183	-$708,531	-$757,878	-$807,226	-$856,573	-$905,921	-$955,268	-$1,004,616
	25%	$22.49	-$451,091	-$500,438	-$549,786	-$599,133	-$648,481	-$697,829	-$747,176	-$796,524

Table C24. Larger Scale Shrimp Enterprise (4,844 lbs live)

			Labor Cost							
			-25%	-20%	-15%	-10%	-5%	original	5%	10%
	Initial NPV	-$1,738,290	$12.83	$13.09	$13.35	$13.62	$13.88	$14.15	$14.41	$14.68
Quantity	-10%	12,911	-$1,668,223	-$1,712,636	-$1,757,048	-$1,801,461	-$1,845,874	-$1,890,287	-$1,934,700	-$1,979,112
	-5%	13,628	-$1,579,888	-$1,626,768	-$1,673,648	-$1,720,528	-$1,767,408	-$1,814,289	-$1,861,169	-$1,908,049
	original	14,346	-$1,491,553	-$1,540,900	-$1,590,248	-$1,639,595	-$1,688,943	**-$1,738,290**	-$1,787,638	-$1,836,986
	5%	15,063	-$1,403,218	-$1,455,033	-$1,506,848	-$1,558,662	-$1,610,477	-$1,662,292	-$1,714,107	-$1,765,922
	10%	15,780	-$1,314,883	-$1,369,165	-$1,423,447	-$1,477,730	-$1,532,012	-$1,586,294	-$1,640,577	-$1,694,859
	15%	16,497	-$1,226,548	-$1,283,297	-$1,340,047	-$1,396,797	-$1,453,546	-$1,510,296	-$1,567,046	-$1,623,795
	20%	17,215	-$1,138,213	-$1,197,430	-$1,256,647	-$1,315,864	-$1,375,081	-$1,434,298	-$1,493,515	-$1,552,732
	25%	17,932	-$1,049,878	-$1,111,562	-$1,173,246	-$1,234,931	-$1,296,615	-$1,358,300	-$1,419,984	-$1,481,669