

GreenFeed

Sustainable, High Quality Fish Feed at Reasonable Prices

Summary

At GreenFeed, we utilize scientific and engineering innovations to convert retail food waste into a sustainable, scientifically formulated fish feed for the aquaculture industry.

The Problems

Retail Food Waste

- Each year, **133 billion lbs. (31%) of retail food are wasted** in the US, with 95% of it ending up in landfills.
- Wasted produce alone costs the supermarket industry **\$15 billion/year in losses**.
- Landfill food contributes **23% of methane emissions** in the US.

Feeding Fish with Fish

The production of feed for the aquaculture industry presents another environmental problem: The primary ingredients in fish feed—fish meal and fish oil—are largely made from small species of fish such as anchovies, herring, and sardines. The **overfishing of these feed fish** has negative impacts on other marine life that depend on them as a food source.

For this reason, NOAA and the USDA have partnered to create an Alternative Feeds Initiative that aims to “identify alternative dietary ingredients that will reduce the amount of fishmeal and fish oil contained in aquaculture feeds while maintaining the human benefits of farmed seafood.” GreenFeed fits within this framework.

The GreenFeed Solution

At GreenFeed, we use our engineering expertise to convert food waste into scientifically formulated fish feed for the aquaculture industry. We have developed a database that compares nutritional profiles of received food waste to that required for fish feed formulations so that we can ensure our feed will meet industry nutritional standards regardless of the specific food waste we receive. Our database computes formulations for salmon, trout, and catfish feed that scale with fish size.

Fish weight (g)	Pellet diameter/length (mm)
<10	1
10-20	2
20-50	3
50-100	4
100-200	5
200-300	6
300-500	7
500-1000	9
1000-1250	11
1250-2000	13
2000-2500	15

Pellet size is a function of fish size

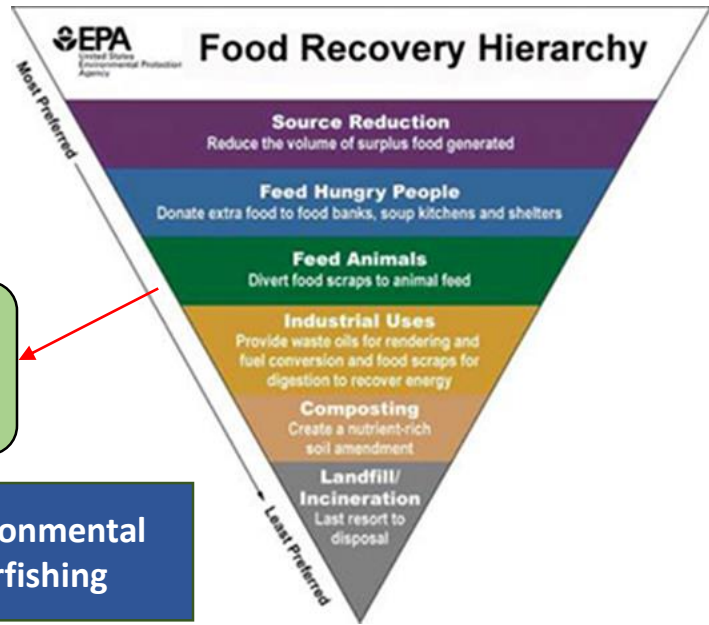
A More Sustainable Solution for Food Waste

According to EPA guidelines, converting human food waste into animal feed is a better solution than those more commonly in place at the food retail level: making fertilizer and biofuel.

Furthermore, **fish feed is a higher value product** than fertilizer and biofuel.

The EPA's Food Recovery Hierarchy places animal feed above industrial uses like fuel conversion and composting

GreenFeed mitigates the negative environmental impacts of retail food waste and overfishing



Market Opportunity

The production of aquaculture feeds is the **most rapidly expanding market in the animal feed production sector**, increasing at a rate of 6-8% each year.

Fish feed is the single largest expenditure for fish farms. Fishmeal, the primary ingredient in fish feed, has been steadily increasing in price since 2000.

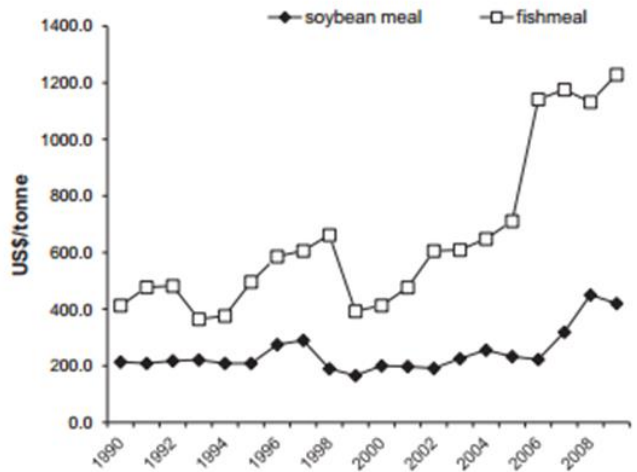


Fig. 1. Price of soybean meal and fishmeal during the last 20 years (pers.com. H. Josupeit, Globefish/FAO).

Market Scope

Our target markets are the US and Canada aquaculture industries.

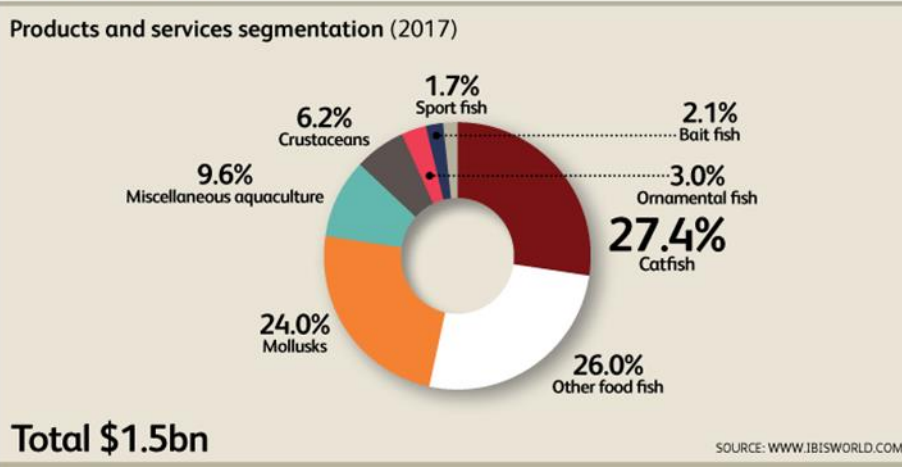
GreenFeed's formulations include salmon, trout, and catfish feed to enter these markets.

In the US, **catfish is a \$411 million industry**, with feed cost taking up 35% of catfish sales revenue. After catfish, trout and salmon are the second most extensively farmed food fish, accounting for an estimated 8.0% and 4.0% of the total industry revenue respectively.

Market Scope

US Fish and Seafood Aquaculture Industry

Products and Services



Catfish, salmon, and trout are the largest segments of the US fish aquaculture industry

Canadian Market:

Salmon is \$60 million industry in the US, while in Canada it is a **\$668 million industry** accounting for approximately 70% of the total aquaculture revenue of the country. 76% of Canadian salmon is farmed in British Columbia.

2015 Canadian Aquaculture Production Statistics (\$000)											
	Nfld	PEI	NS	NB	Que	Ont	Man	Sask	Alta	BC	CANADA ⁽¹⁾
Finfish											
Salmon	..	..	x	x	0	0	x	x	x	470,098	668,655
Trout	..	..	x	..	7,95	23,20	x	x	x	0	40,264
Steelhead	..	..	0	0	0	0	x	x	x	2,495	2,495
Other	..	..	8,349	0	213	2,200	x	x	x	1,862	14,406
Total Finfish	148,536	x	53,580	x	8,170	25,400	x	x	x	474,455	877,856
Total Shellfish	12,847	40,690	2,395	x	1,689	0	x	x	x	x	89,586
Total Aquaculture	161,383	x	55,975	162,580	9,859	25,400	x	x	x	x	967,441

Potential Customers

BC Salmon Farms:

- Marine Harvest Canada - the world's largest aquaculture company and producer of farmed salmon.
- Creative Salmon
- Grieg Seafood BC Ltd.
- Cermaq Canada Ltd.
- Cooke Aquaculture

US Catfish Farms (located in MS, LA, and AL):

- America's catch
- Heartland Catfish
- Pride of the Pond
- Guidry's
- Country select
- Freshwater Farms Products, LLC

Potential Customers

US salmon and trout farms and hatcheries:

- Icicle Seafoods
- The Washington Department of Fish and Wildlife (WDFW). The WDFW operates 83 hatchery facilities, of which 75-80% are dedicated to producing salmon and/or steelhead and another 20-25% rear trout and other gamefish. Fifty-one tribal hatcheries (45 NWIFC facilities, three Colville Confederated Tribes and three Yakama Nation) and 12 federal hatcheries also contribute to the statewide salmon harvest.

Methods we'll employ to reach our customers

- Ads and Promotions to Industry Associations such as:
 - National Aquaculture Association
 - Catfish Farmers of America
 - BC Salmon Farmer's Association
- Direct mail and samples to aquaculture companies
- Discount promotions to aquaculture companies
- Tradeshows such as Aquaculture America

Competitors

GreenFeed is well positioned sell in the price range of our primary competitors (**\$400-700/tonne**).

BC-based salmon feed competition:

- Cargill Aqua-Nutrition Canada/EWOS Feeds
- Skretting
- Taplow Feeds

US-based fish feed competition:

- BioMar
- Aller Aqua

Incentive for supermarkets to give us their waste food:

GreenFeed will pick up waste food from our suppliers on site, which will mitigate costs incumbent upon supermarkets to have their waste shipped to composting and garbage facilities

Financial Projections

Our Cost:

We incur a one-time cost of capital investment in setting up our factory. However, our operational expenses are low as manufacturing fish food is not a labor-intensive process. Additionally, our product cost is zero since we are using waste as our input product. Our COGS includes the nutrient enrichment additives that we would be purchasing and adding to fortify our feed.

Fixed Cost = Investment in setting up a factory = \$200,000

Cost of packaging and producing each unit (tonne) of the fish food = \$150

Our Price:

Average sale price per unit of feed (tonne) = **\$400**

This is **very competitive pricing** in an industry where average salmon fish feed is sold for \$500 per tonne.

Our Profit Margin:

= ((Price - Variable Cost)/Price) %

= (400-150)/400

= **63%**

Financial Projections

Our Breakeven quantity:

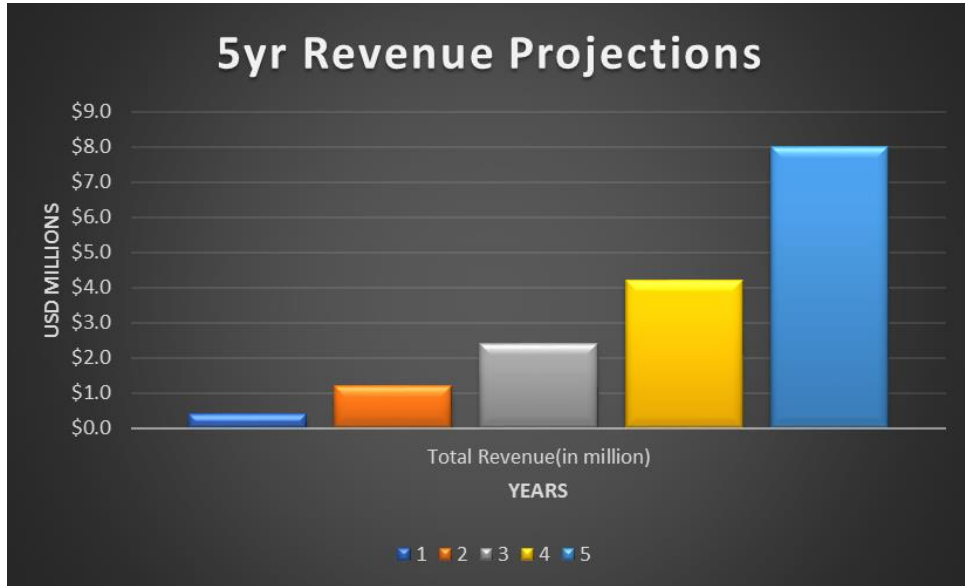
= Fixed Cost/(Price – Variable Cost)

= \$200,000/(400-150)

= 800 tonnes

Based on our projections, we will break even in our first year of operation.

Our Revenue Projection:



Year	Customers Served	Revenue per customer	# of units sold per customer (in tonnes)	Total amount of feed sold (in tonnes)	Total Revenue (in USD millions)
1	10	\$40,000	100	1000	\$0.4
2	20	\$60,000	150	3000	\$1.2
3	30	\$80,000	200	6000	\$2.4
4	35	\$120,000	300	10,500	\$4.2
5	40	\$200,000	500	20,000	\$8.0

Customer Lifetime Value for 5yrs of operation:

Average customer lifetime = 5 yrs

LTV: Revenue per customer over 5yr lifetime = **\$500,000**

Financial Projections

Customer Acquisition Cost (CAC):

We project our **Customer Acquisition Cost (CAC)** to be about \$4,000 per customer

- Booth rental at a conference/trade show: \$2,000
- Travel cost and promotion material cost for each conference: \$3,000
- Conferences/Tradeshows in next year: 4
- Tradeshow costs = \$20,000
- Direct mail brochures + samples to potential customers = \$2000
- Initial order discount promotions total budget = \$18,000
- Total Customer Acquisition spend for 1 year = \$20k+\$2K+\$18k = \$40k
- Number of customers acquired in yr1 = 10

Customer Acquisition Cost CAC per customer = \$40k/10 = \$4k

Hence, LTV = 500k and CAC = 4k. Revenue LTV vs. CAC = 11.5x

Our projected **Customer Lifetime Value (LTV)** is 11.5 times our CAC.

Therefore, GreenFeed is a very healthy business to invest in

Our Team

GreenFeed consists of five seniors in the chemical engineering department with a wide variety of independent research experience:

- **Mihyun Kim**
- **Katherine Schultz**
- **Jiachun Shi**
- **Leyan Wang**
- **Mengjia Zhu**

and

- **Pallavi Sharma**, an MBA candidate and Electrical Engineer with prior business development and high-tech experience at Intel Corp.

Advisor: **Prof. Lilo Pozzo**, UW Chemical Engineering