Developments in Sustainable Ingredients for Aquaculture Feed

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EWOS®

The Backdrop:

- Global shortage of protein
- Higher food price trend
- Growing population, more ailments
- Employment in rural towns declining
- Increased demands from biofuel
- Canada/USA are rich nations blessed with resources
- Canadian Feeds Act from 1980s
- We want home-grown food
- Use of GMO grains/oilseeds
- Norway and UK : ABP
- Diversion of fishoil to capsules
- Fish are efficient converters
- Oil production: <1 MMT fish vs 100+MMT of vegetable
- Fishmeal production: 6-7 MMT

Sustainable Aquaculture

”Sustainable aquaculture needs sustainable feed. EWOS’ vision is to be the safest choice for high performance in aquaculture.”

Kjell Bjordal, CEO, EWOS.

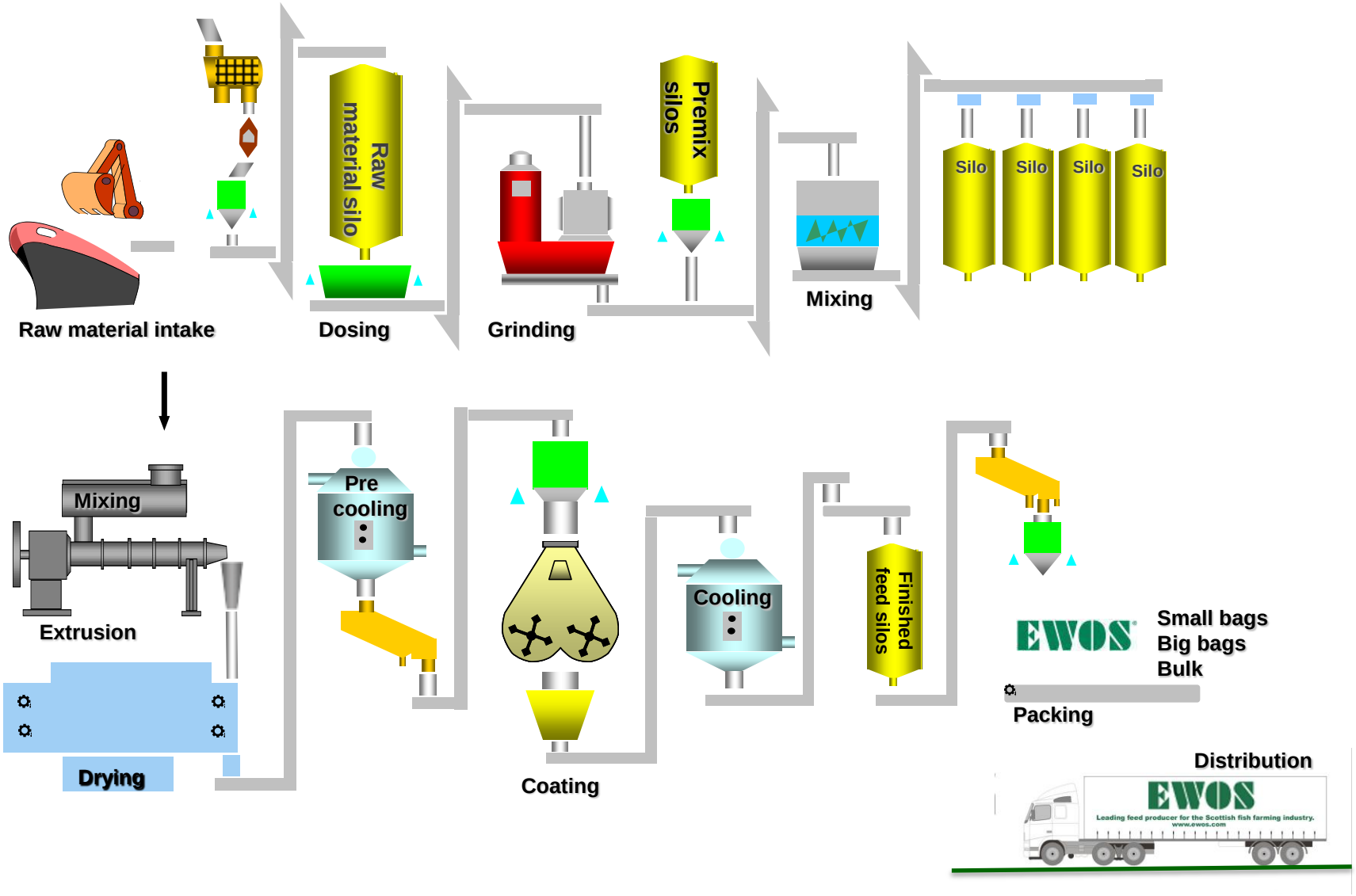
EWOS… sole focus on fish

A World Leader in Fish Nutrition

- EWOS started in Sweden in 1935.
- Today in Norway, UK, Chile, Canada and Vietnam
- R&D operations in Norway and Chile
- 897 employees of which ~10% in R&D
- 20 feed production lines
- ~1.1 million tonnes feed sold in 2011 (world salmon feed ~2.9 million tonnes)

EWOS feed operations

A sophisticated transformation process



Producing healthy seafood

Transforming basic ingredients into healthy food for people

Pelagic fishing fleet

Fish meal Fish oil factories

Terrestrial farming

Raw Material Processing

Salmon farmers

Harvesting

Processing

Non-edible Nutrients → Edible Nutrients

The safest choice …

EWOS Integrated Management Systems (EIMS)

EIMS

- ISO 9001 Quality
- ISO 14001 Environmental
- ISO 22000 Food Safety
  - HACCP
- OHSAS 18001
  - Health & Safety

What was in a BC fish feed pellet in 1986?

FISHOIL

WHEAT

FISHMEALS

MICRO INGREDIENTS

What may be in a pellet today?

OILSEED PRODUCTS

Canola, soybean, flax, sunflower meals, concentrates and oils

MARINE PRODUCTS

Fishmeals, oil, by-products

CEREALS & GRAINS

Wheat, barley, corn, potato, concentrates

TERRESTRIAL ANIMAL PRODUCTS

Poultry meal, oil, feathermeal, meat meal, bloodmeal, gelatin

LEGUMES & VEGETABLES

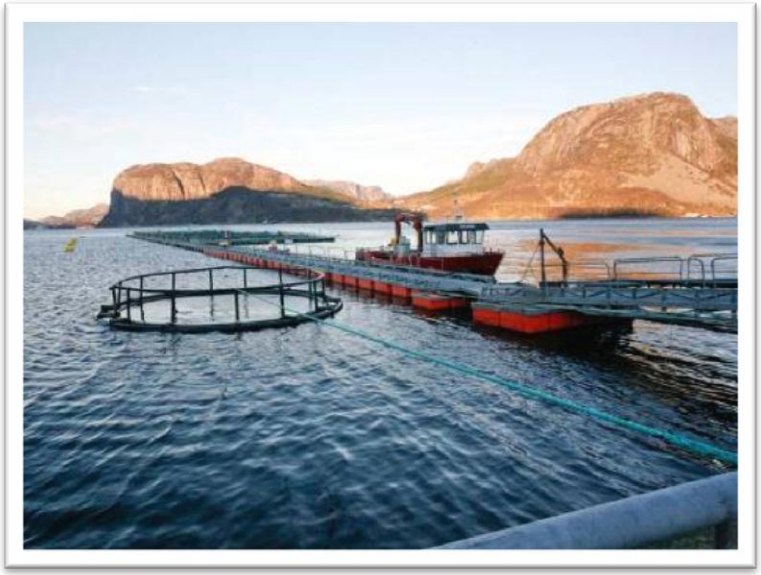
Peas, beans, native and concentrates

MICRO INGREDIENTS

Amino acids, vits, mins, functional nutrients

EWOS Innovation

Reinvesting >1% of revenue on feed-related R&D



Fish trials

(Dirdal, Lønningdal, Colaco)

- 40 sea cages (square 15m – circle 90m)
- 240 screening tanks (0.2-10g)
- 130 tanks (50-500g)
- 82 sea-on-land-tanks
- Laboratories (Dirdal, Colaco)
- Technology Centre (Dirdal)

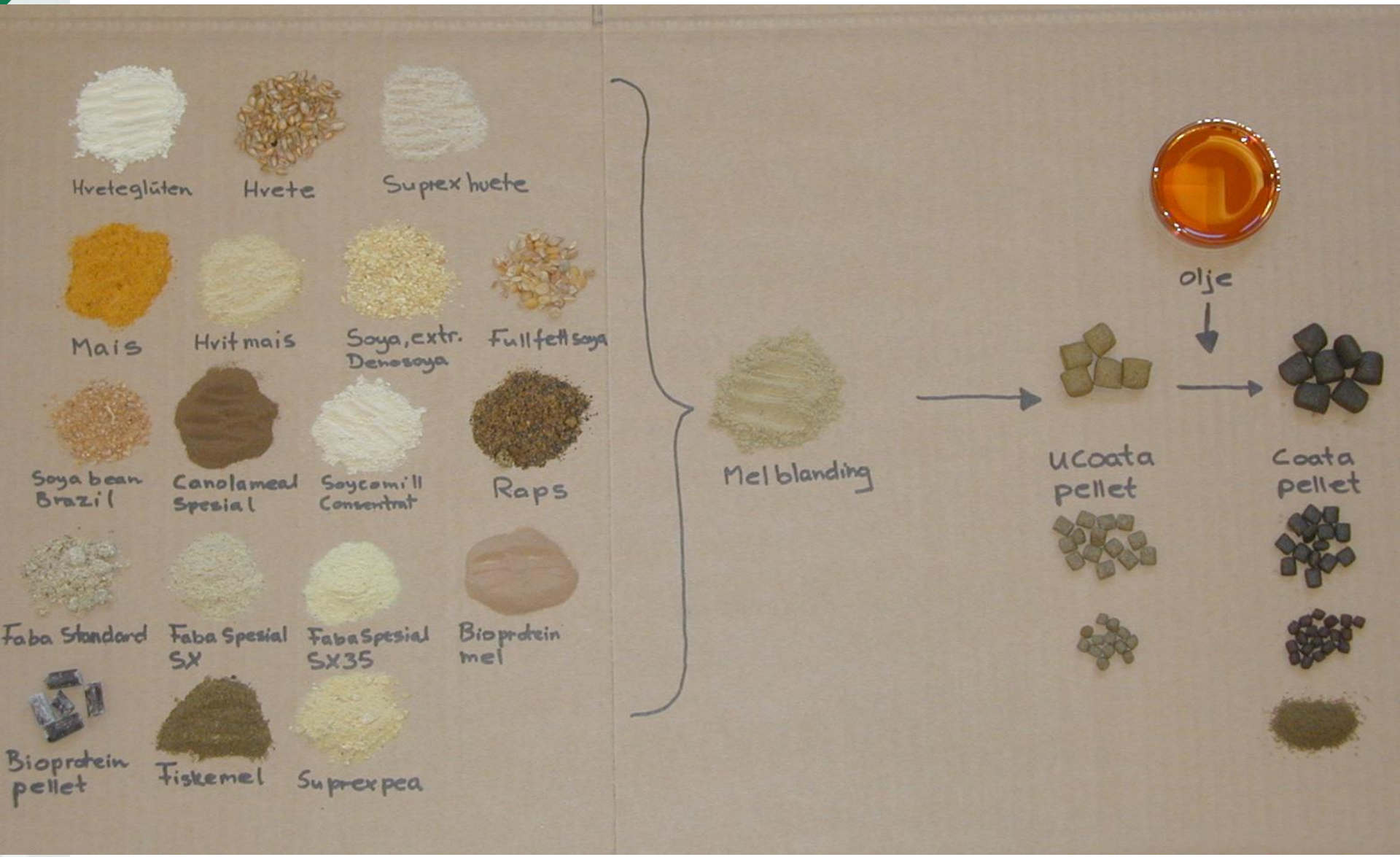
Budget

- NOK 85million from EWOS

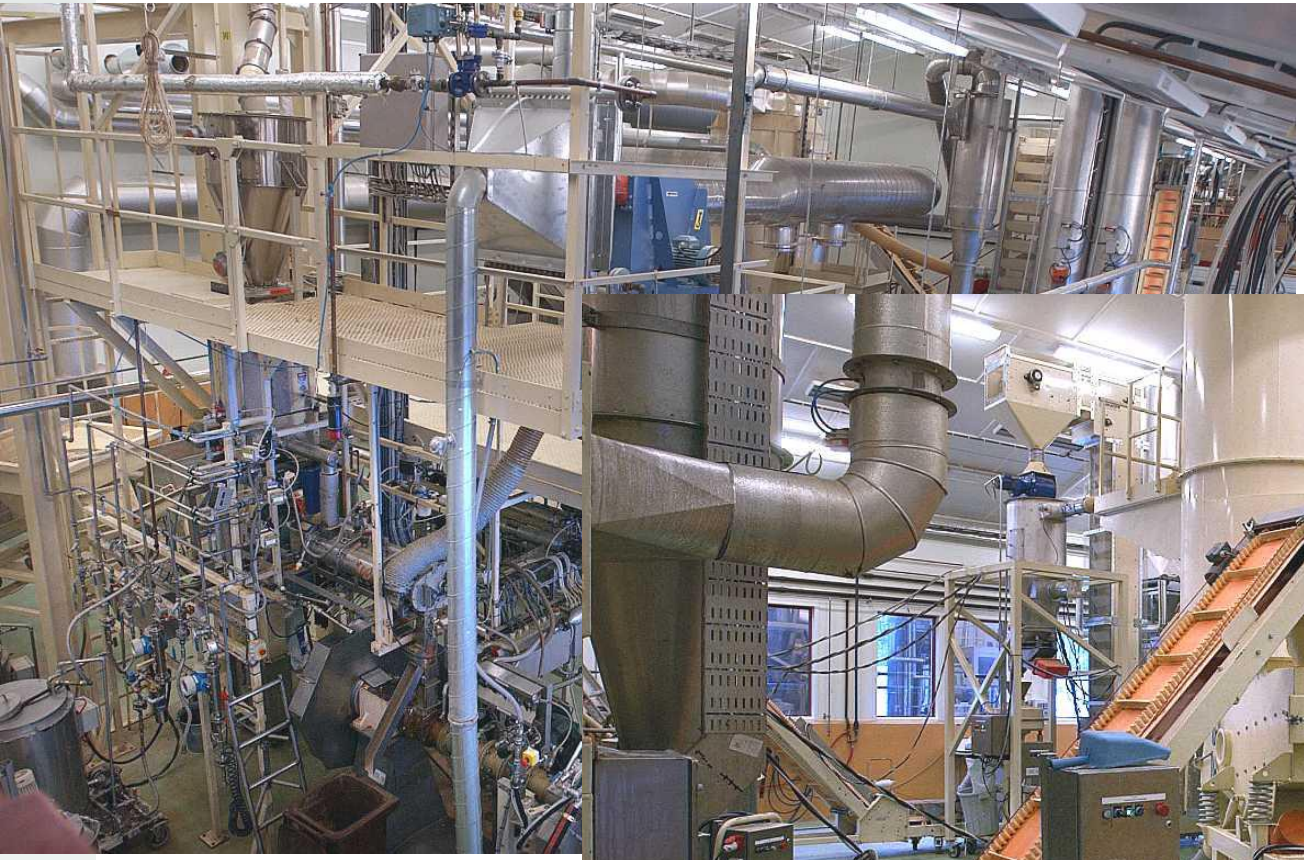
Staff

- Total 69 in Norway and 26 in Chile

Optimizing raw material blends…

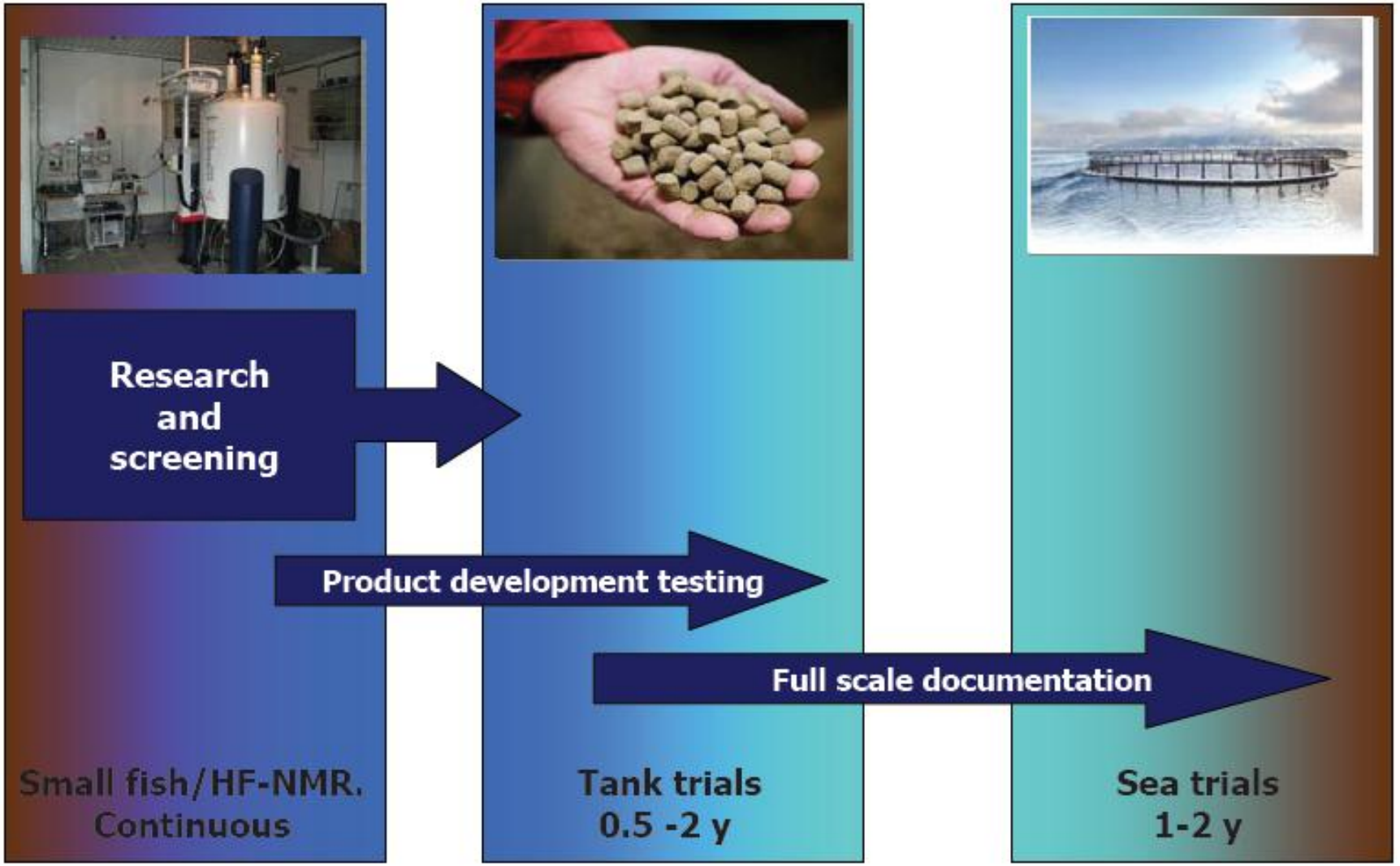


Technology Center



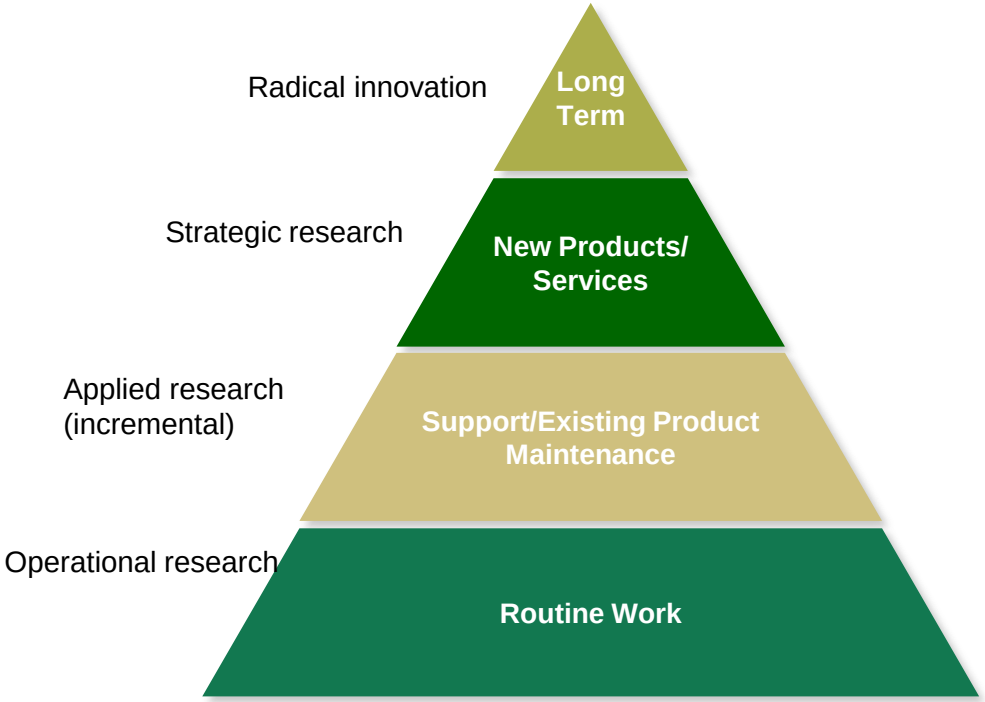
The Research Process

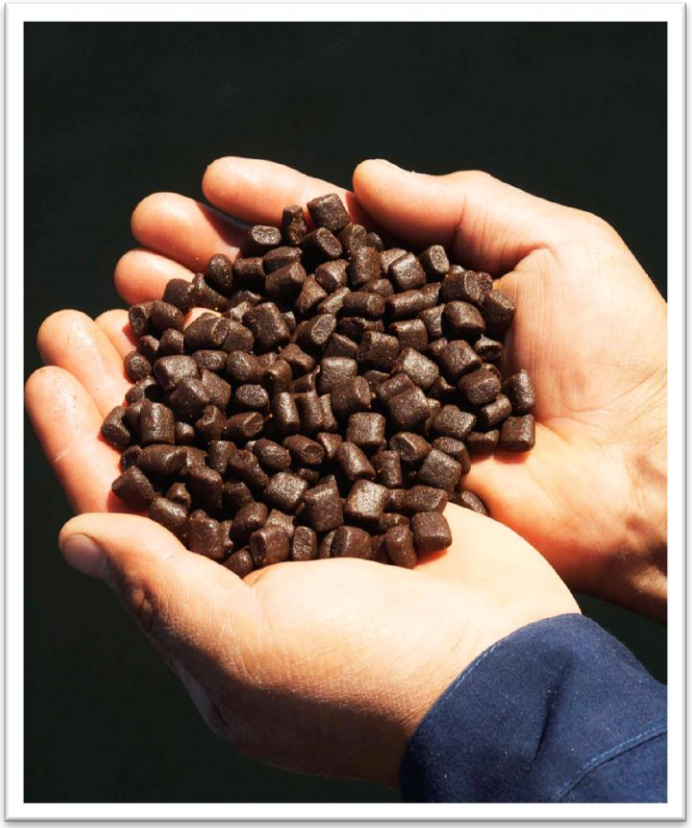
EWOS Innovation



EWOS Innovation

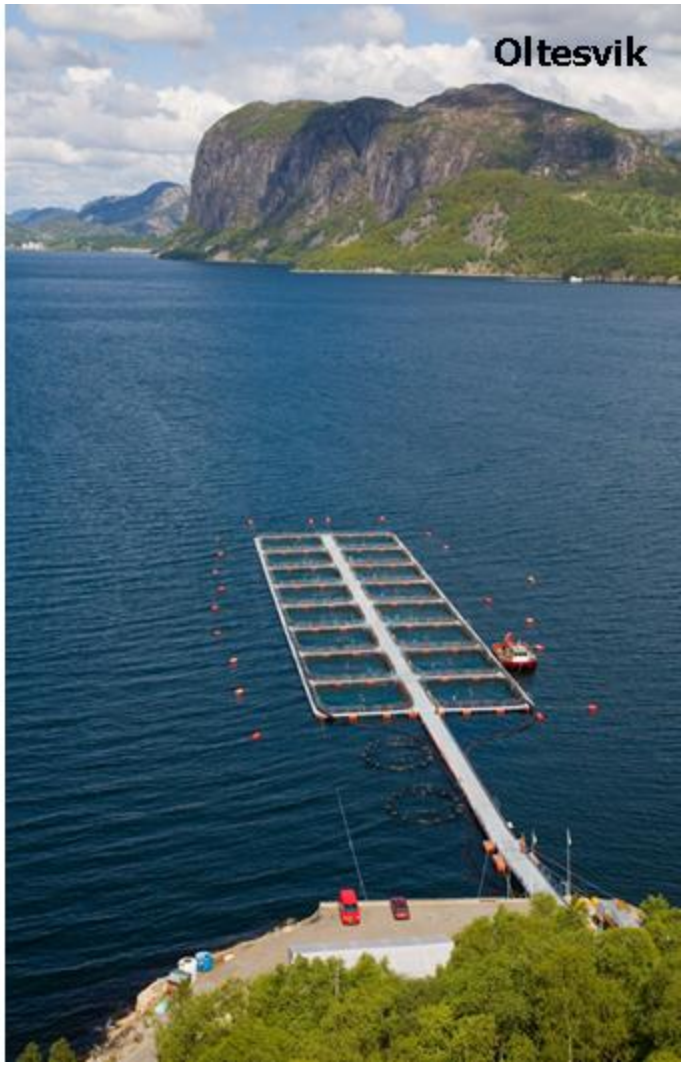
How we work with research and innovation



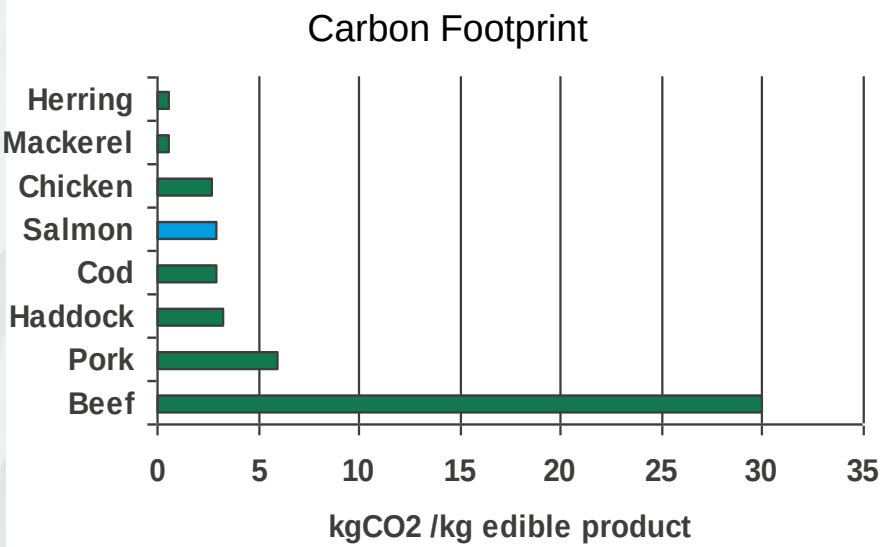


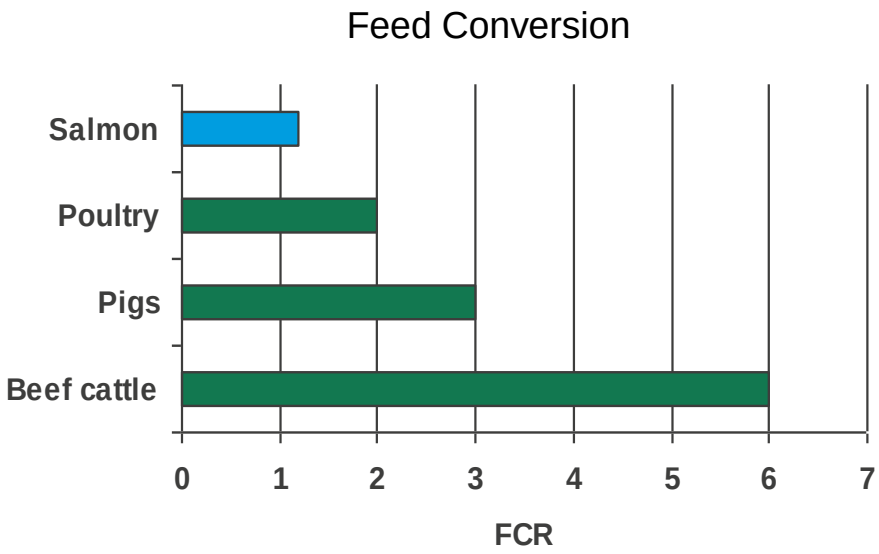
EWOS Innovation

DIRDAL



Farmed Salmon: Efficient food





- Our growing population is consuming more and more animal protein
- Farmed salmon is one of the most efficient types
  - Can eat similar raw materials as land animals
  - Convert the feed more effectively than land animals
  - Is healthier than meat

Sustainability Principles (environmental, biological and economic)…

- Develop/divert local food waste streams into good RMs
- Develop and utilize from a broad and diverse set of well-tested raw materials in the feed recipes.
- Focus on sourcing locally (less freight, fossil fuel).
- Combine feed ingredients in such a way to give complementary, consistent well-performing recipe.
- Encourage feed plant to be very flexible and willing to use a variety of RMs.
- Develop/Support/Purchase from local farming and food industries.
- Explain situation to fish farmers the long-term advantages of this holistic approach.

Sustainable Results…

- ~75% of raw materials sourced in North America
- ~ 14% of fishoil from seafood waste streams
- ~ 15% of fishmeal is from seafood waste streams
- > one-third of RMs from food by-products (recycled from human-destined foods)
- This diverse approach has allowed for a better shelter from volatile RM supplies and prices
- Nutrient cycling started

Nutrition and Purchasing are key…

- Know nutrient requirements of fish
- Diverse RMs
- Understand nutrient profile
- Account for nutrient availability
- Formulate diet as least cost
- Ensure safety
- Benchmark, validate

Trimmings …

- Factory vessel producing crude fish oil.
- Processes appx. 400MT of round fish per day,
  - producing appx. 120MT of frozen products in addition to by-product.
- EWOS Canada buys ~800 MT of fishoil per year .
- Previously, the fishoil used to be burned

Seafood trimmings…

Purchasing Sustainably…

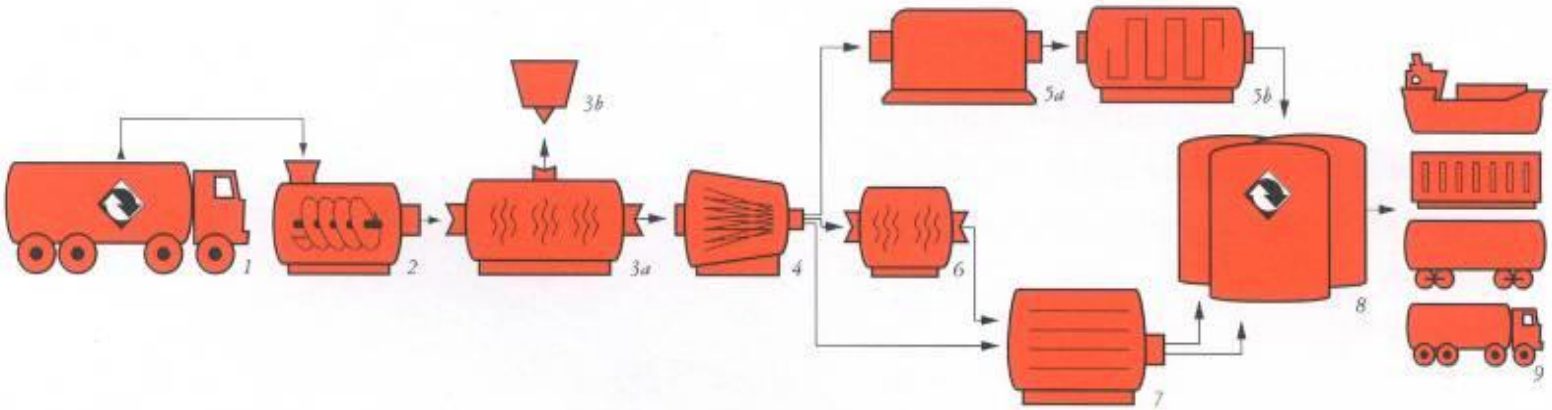
- Fishmeal and fishoil are sourced from sustainable, approved origins.
- Third-party agencies, ie:
  - IFFO-rs
  - MSC
  - Friends of the Sea
  - DFO
  - Imarpe
  - FAO
  - Government fisheries departments

Global Oilseed and Grain Industry

- This is the largest sector comprising salmon grower diets in Norway and UK.
- Global shortages have been seen in 2012 of soy protein concentrates from SA.
- There is a large dependence from Brazil and Argentina.
- In Canada and USA large production of canola and soy, resp. except supply was tight for corn and soy in 2012 crop.
- Corn Gluten Meal is used in Americas
- Concentrates from peas, beans may be used more if available
- Flaxseed has potential but requires processing

Canadian Rendering Industry

- Handles ~2.6 million MT of raw materials every year as a service to more than 100,000 suppliers
- Raw materials come mainly from the poultry, pork, beef and fish industries, as well as the restaurant business.
- Three major independent rendering companies in Canada
- Rendering is a service to the food industry
- Rendering plants in Canada must be Government certified to operate



The Rendering Process

1 **trucks:** plant cleanliness and product quality begin with prompt collection from suppliers

2 **grinder:** each type of raw material is processed separately, starting with crushing

3a **cooker:** releases natural proteins and oils of the animal by-products; feathers are hydrolyzed

3b **air purifier:** ensures the highest standard of air quality

4 **press:** all materials are pressed to separate solids from liquids

5a **centrifuge:** fats and oils are centrifuged to remove any remaining solids; blood is collected through coagulation and centrifuging

5b **polisher:** fats and oils are further refined, filtered and processed

6 **dryer:** fish solids and feathers are dried separately

7 **mill:** protein meals are milled separately

8 **storage:** all meals, fats and oils are stored in tanks until shipped

9 **transport:** meals, fats and oils are delivered worldwide via truck, rail, container or ship

Rendered Products

MEALS

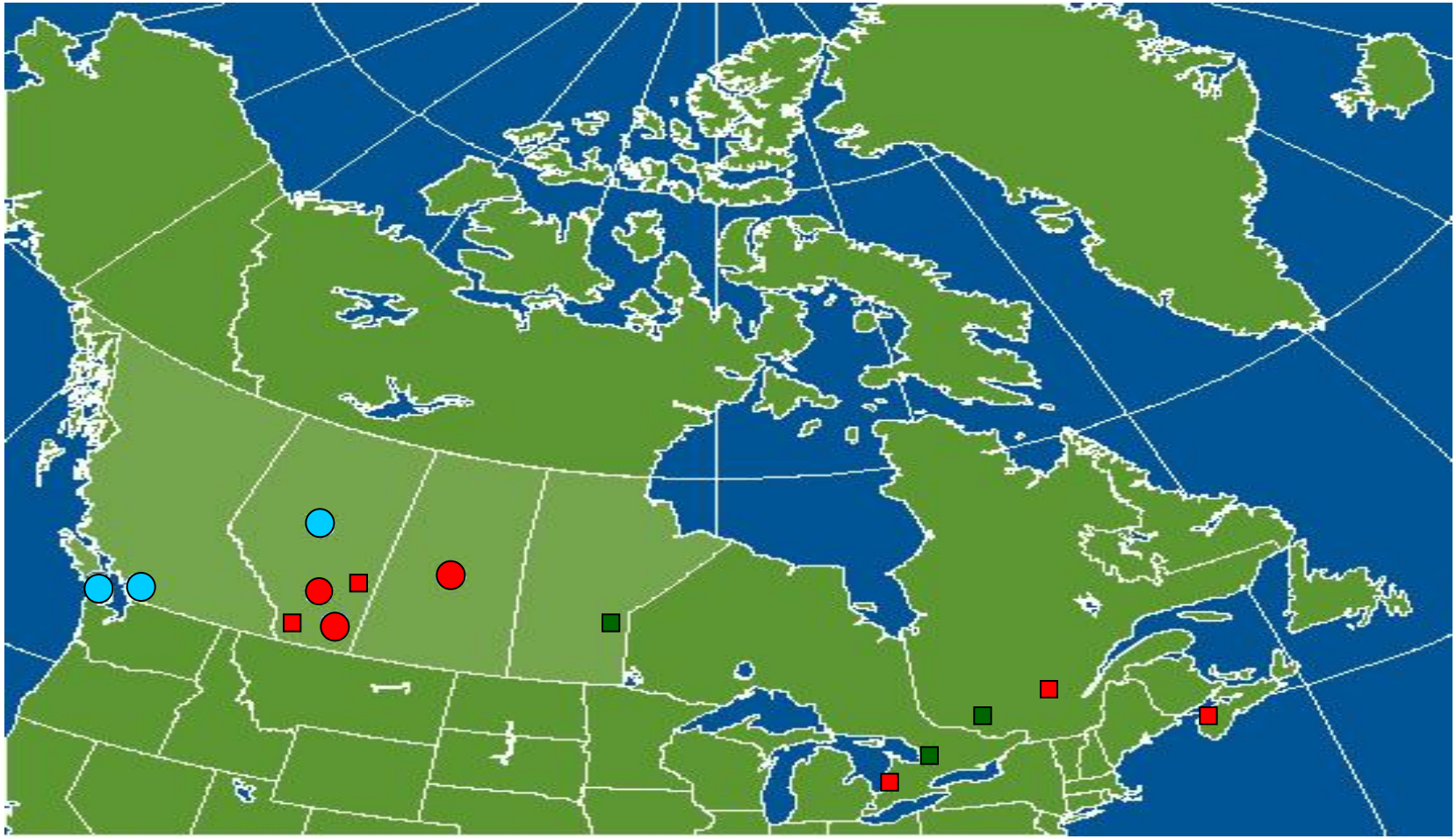
- Meat & Bone Meal
- Blood Meal
- Poultry Meal
- Feather Meal
- Porcine Meal
- Mixed Fish Meal
- Herring Meal
- Hake Meal

Rendered Products
FATS and OILS

- Feeding Fat
- Poultry Fat
- Bleachable Tallow
- Top White Tallow
- Extra Fancy Tallow
- Technical Tallow
- Yellow Grease
- Choice White Grease
- Herring Oil
- Fish Oil

Canada

Non Ruminant Plants Ruminant Plants



Challenges:

- Fishoil supply globally
- Reduced fishing quota in Peru
- High Feed and Food prices; predicted for 2013+ generally
- Economy of scale to attract RM suppliers to invest to make RMs
- Shortage of oil storage in BC vs demand
- A price firmness of ABPs price expected when less animals to slaughter in mid-2013
- Strong demand from Asia for ABPs
- Supply chain and logistical costs rising
- Low fish prices combined with high RM prices
- National Aquaculture Act for each of Canada and USA needed
- Alignment of regulations for feed and farming sectors in Canada vs other similar countries.
- Seafood imports fill North American demand

I am hopeful that…

- Canada updates Feeds Act and adopts a National Aquaculture Act
- We can harmonize CFIA ingredients permitted with other countries
- Invest in new RM processing capacity to produce ideal ingredients
- Maximize use of by-product marine RMs
- Attract investment to re-vitalize activity in Aquaculture industry
- Prioritize use of food by-products and RMs not competing with food
- We can educate each other so that we support growth
- We can feed more people in Canada and USA with healthy fish
- All seafood-related players may have one positive voice to the consumer about merits of eating seafood

Thank you.

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