



BIORETUR

– TURNING PROBLEMS INTO RESOURCES –

Fish Sludge & Circular Economy

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BIORETUR PRESENTS - A CIRCULAR ECONOMIC MEAL



BIORETUR
IN COOPERATION WITH HOUST ASIA
ARABICA BOURBON & CATIMOR
PRODUCED WITH FERTILIZER DELIVERED FROM
NORWEGIAN FISH SLUDGE
GIFT EDITION
250 g
PRODUCT OF VIETNAM COFFEE - 14 TRAN QUANG DIEP DAM VIETNAM

COFFEE from Vietnam
Grown with fish sludge
from Bioretur's customers

RICE from Vietnam
Grown with fish sludge
from Bioretur's customers

SMOKED SALMON
Farm raised

SALAD from Norway
Grown with fish sludge
in aquaponics

CORIANDER from Norway
Grown with fish sludge
in aquaponics

CHIVES from Norway
Grown with fish sludge
in aquaponics

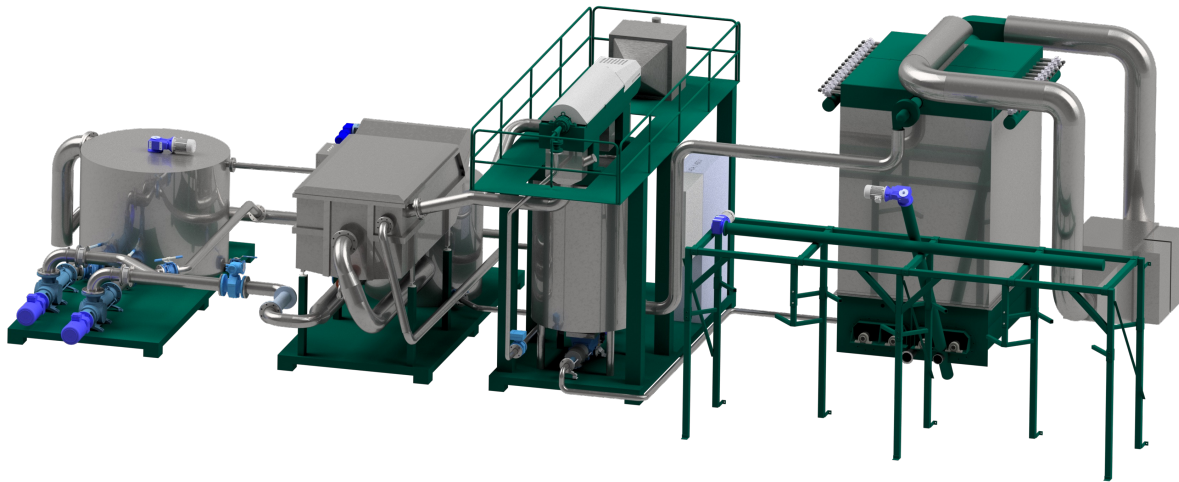


BIORETUR TECHNOLOGY & SERVICES

FOR COLLECTING & HANDLING FISH SLUDGE

The physical product

Bioretur sludge handling system



- Processes flushing water directly from drum filter. (*0,1% dry matter*)
- Hygienized and storage-stable sludge. (*>90% dry matter*)
- Step by step process using:
 - Belt filter
 - Decanter
 - Bioretur SHS-Dryer



The service

Bioretur agreement – one monthly fixed fee

TECHNOLOGY & EQUIPMENT



When you choose Bioretur you avoid the risk of investing in your own facility, all necessary equipment is covered in the agreement.

LOGISTICS & HANDLING



We ensure that sludge from the plant is handled in a responsible, rational and sustainable manner. Transport is challenging and requires prudent and well planned solutions.

OPERATION & MAINTENANCE



Daily operation and regular maintenance of the facility is carried out by our specialised personnel and ensures quality of service, stable operation and longevity of the equipment.

SUSTAINABILITY



Sustainable utilization of fish sludge that meets both fertilizer regulations and cleaning requirements as well as environmental concerns. The products benefit consumers, society and the environment.

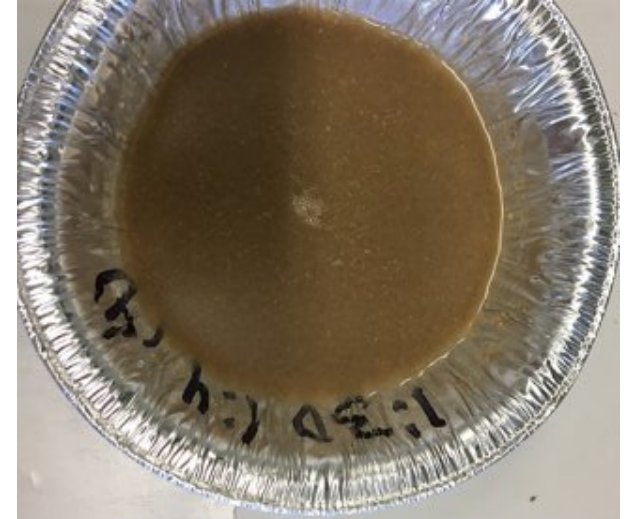
What is Fish Sludge?

Fish sludge

- Feaces and excess feed from the fish

Fish silage:

- Dead fish and parts of the fish that are liquefied in acid



What do we know about Fish Sludge?

Bioretur have collected data from many fish farms over many years. Data on **nutrients** and on **heavy metals** in the inlet water, in the outlet water and in the treated sludge.

Specific requirements for both **fertilizer regulations** and **discharge permits** is the main reason why we do this regularly. But it also makes Bioretur experts on sludge, and our data can potentially give value to many.

What does the data say?

Dry treated sludge (powder)




Some nutrients (typical data)

Nitrogen (N)	Phosphorus (P)	Potassium (K)
40 kg/ton Ts	28 kg/ton Ts	1,7 kg/ton Ts

Some heavy metals (typical data)

Zink (Zn)	Cadmium (Cd)	Nickel (Ni)
420 mg/kg DM	0,70 mg/kg DM	15 mg/kg DM

Fertilizer classification (Heavy metals - Maximum values)

-  Category 0: Zink (150), Cadmium (0,4), Nickel (20)
-  Category 1: Zink (400), Cadmium (0,8), Nickel (30)
-  Category 2: Zink (800), Cadmium (2), Nickel (50)

Expansions in fish farming

- Also means expansion in sludge

+150 000

TONS OF EXTRA YEARLY BIOMASS
FROM LANDBASED AQUACULTURE

+22 000 000

TONS OF SLUDGEWATER TO BE
TREATED EVERY YEAR (0,1 % DM)

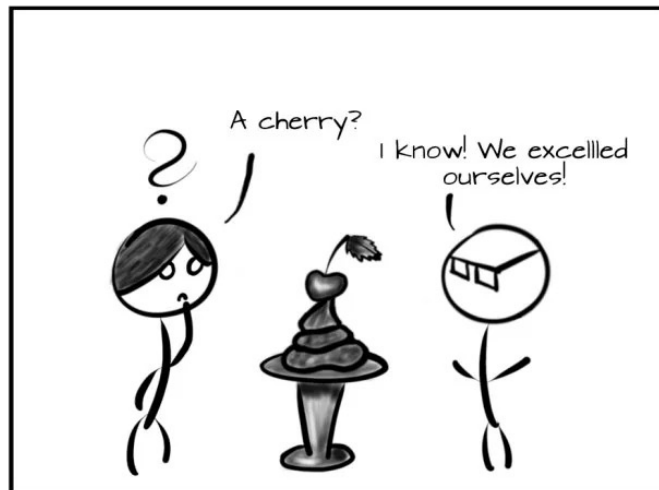
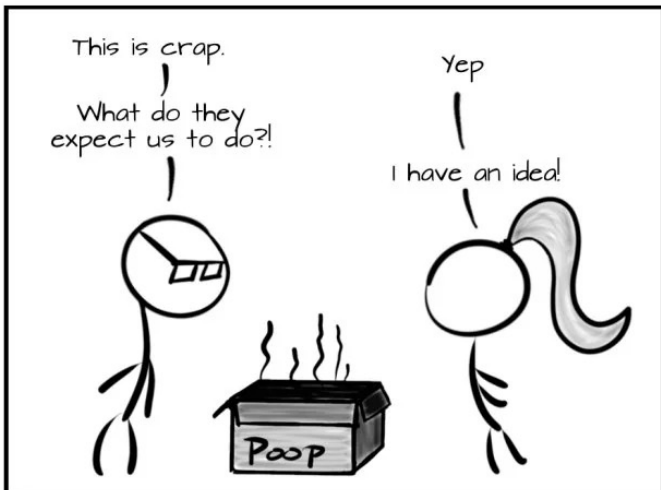
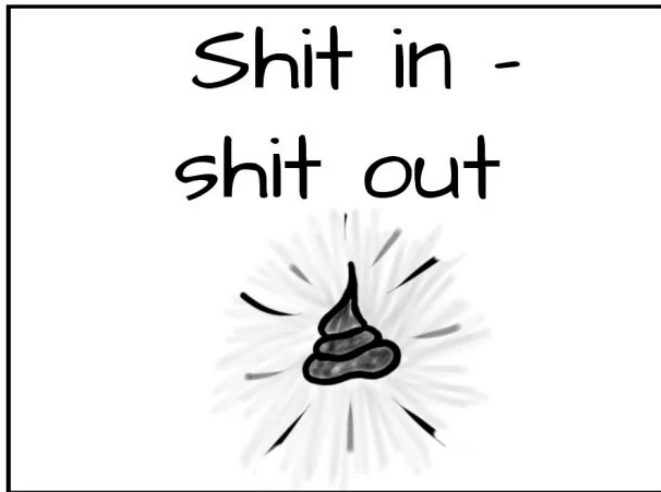
+220 000

TONS OF WET SLUDGE TO BE
HANDLED EVERY YEAR (10 % DM)

+24 000

TONS OF DRY SLUDGE TO BE UTILIZED
IN FERTILIZER EVERY YEAR (90 % DM)

The future of fish sludge?



- What you feed the fish reflects what comes out at the end of the value chain. Also, it affects the side stream of fish sludge.
- A proactive dialog with stake holders within the whole value chain is essential, if we want a circular use of rest materials, and a green deal at the end of the day.

“Producers of feed, farmers, Bioretur and fertilizer producers need to work together on this.”

How can we use fish sludge?

- Fish sludge in its raw form is not a fertilizer. Correct treatment and product development is necessary. The levels of heavy metals and risk of pathogens are too high to spread directly onto agricultural land.
- Fish sludge as **substrate in Biogas** is not automatically circular economy, it is a side stream. Use of sludge in production of biogas process still results in high volumes of excess bio rest material.
- Fish sludge as a **source in bio char** doesn't utilize the valuable nutrients the sludge contains, and the biochar product will also have concentrated values of Zinc and Cadmium. Thus, it will have a very limited value as fertilizer.

Reserchers at the Norwegian Institute of Bioeconomy (NIBIO):

«We believe it is best to utilize dried fish sludge as fertilizer. Dried fish sludge should be combined with other nitrogen and potassium sources to balance the nutrient ratio in the sludge, for example, with mineral NK fertilizers. Dried fish sludge should be transported to areas where there is a need for phosphorus.»

TERRAMARINE & BIORETUR

FERTILIZER PRODUCTION BASED ON RAW MATERIAL FROM
THE FISH FARMING INDUSTRY
ICELAND



TERRAMARINE

Terramarine & Bioretur offer

Terramarine AS is a Norwegian company, specialized in producing organic fertilizer from the fish farming industry, with an international sales network. Terramarine is owned by Hima Seafood – a large producer of rainbowtrout at landbased plants. Terramarine & Bioretur has been co-operating for many years.

FERTILIZER PRODUCTION



Terramarine can use fish sludge from Bioretur's processing facility at X location as an ingredient in a mineral organic fertilizer.

MARKET ACCESS



Terramarine have built substantial markets for export and sales of our mineral organic fertilizers.

PROCESSING PLANT



We have vast experience in designing processing plants, and create business opportunities and economics of scale.

CIRCULAR ECONOMY



We use valuable nutrients that otherwise would go to waste in production of fertilizer used in food production.

From sludge to Fertilizer



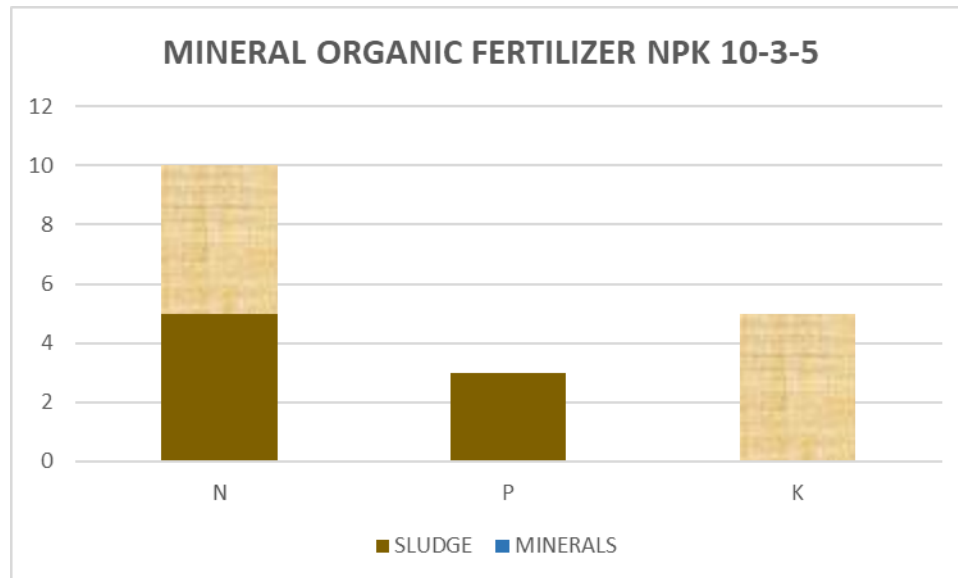
Fish sludge can be converted by to a mineral-organic fertilizer that can replace chemical fertilizer.

The product must be comparabel with ordinary chemical fertilizers in the market when it comes to:

- Particle size
- Smell
- Technical characteristics
- Storage stability
- Nutrient value
- Easy to use by farmers

Nutrient Value

- ✓ Sludge from smolt production will typically have 4-5% Nitrogen and 3-4% Phosphorus. The product lack Potassium. The organic content is high (>70%).
- ✓ We can upgrade the sludge and make an mineral-organic fertilizer that is fully compatible with mineral fertilizers.



Processing Plant

The design of the processing plant depends mostly on the available volume of dried fish sludge. Terramarine are designing several fertilizer factories – all between 4.000 – 30.000 tons of organic /mineral organic fertilizer. There are definitely some economies of scale.



Market Access

- There might well be a good local market for organic and mineral organic fertilizers in Iceland. Market research need to be done.
- If not, Terramarine have built a substantial market also in South East Asia, with a daughter company in Vietnam, giving possibilities of export or using Vietnam as a clearing market in low seasons in Iceland.



Circular Economy

- Our soil is worldwide threatened by overuse of chemical fertilizers, pesticides and insecticides
- We are saving valuable nutrients and organic material when we collect the sludge from the fish farming industry – and use it in new production of fertilizer and food.
- Organic fertilizers improve soil quality and stimulate the microbial life that is necessary for plant growth.
- By using organic fertilizers, its possible to reduce the use of pesticides and increase the farmers yields.



An award winning concept

CHAMBER OF COMMERCE AND INDUSTRY



BERGEN CHAMBER & FANA SPAREBANK
SUSTAINABILITY AWARD 2021



SUSTAINABILITY INTERNATIONAL



ENVIRONMENT AWARD



HONORARY AWARD





BIORETUR

Thank you for your attention!