

# BOShA

## Biofiltration for Offshore Aquaculture

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# Our Golden Circle



## Why?

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To **improve** the **health** and **well-being** of coastal communities by improving **water quality**

## How?

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**Introduce** marine organisms to **biofilter** water in offshore **aquaculture** operations

## What?

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**Biodiverse** filtration solutions for Belizean seaweed farmers



# Background Information



# Seaweed Farming in Belize

*Eucheuma* and *Kappaphycus* currently farmed

- About 40% of global seaweed production is *Eucheuma* and *Kappaphycus*
- Used as food and to produce carrageenan, a compound used in food, beverage, and pharmaceutical industries
- Cultivation methods include fixed, **off-bottom monoline**, and floating methods
- Single step farming method through propagation





# Anthropogenic Greenhouse Effect Impacts **Water Quality**

## Storms

More **intense** and **frequent** tropical storms and hurricanes are projected

## Atmospheric Concentrations

Changes impact ocean **carbon dioxide** intake and pH levels

# Seaweed's Role in Climate Change Mitigation

## Direct

Carbon sequestration  
Mitigating  
eutrophication  
Bioenergy resource

## Indirect

Food source  
Cattle feed  
Habitat creation  
Ecosystem management

# Our Business Model





# Value Proposition

## Beneficiaries

- Belizean aquaculture farmers
- Local communities and cities in vicinity of aquaculture farms
- Consumers of aquacultural products
- Local contractors and installers
- Local marine life







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## Value

- Improve water quality
- Benefit community health
- Increase local biodiversity
- Improve product quality



# THIS IS OUR TEAM.

## Structural organisms

- Elkhorn coral (*Acropora palmata*)
- Finger Coral (*Porites porites*)

## Filtration organisms

- Caribbean Sea Whip (*Plexaura homomalla*)
- Purple sea fan (*Gorgonia ventalina*)
- Sun Anemone (*Stichodactyla helianthus*)

## Nutrient cycling organisms

- Fire Sponge (*Tedania ignis*)
- Scattered Pore Rope Sponge (*Aplysina fulva*)

## Detritus capturing organisms

- Christmas tree worm (*Spirobranchus giganteus*)
- Social feather duster (*Bispira brunnea*)

## Keystone species

- Black Sea Urchin (*Diadema antillarum*)
- Stoplight Parrotfish (*Sparisoma viride*)
- Spiny Lobster (*Panulirus argus*)





# Water Quality Impact on Seaweed

## Nutrient and Pollutant Levels

Nitrogen, phosphorus, etc.

## Carbon

Coral/sponges can reduce  
ocean acidification

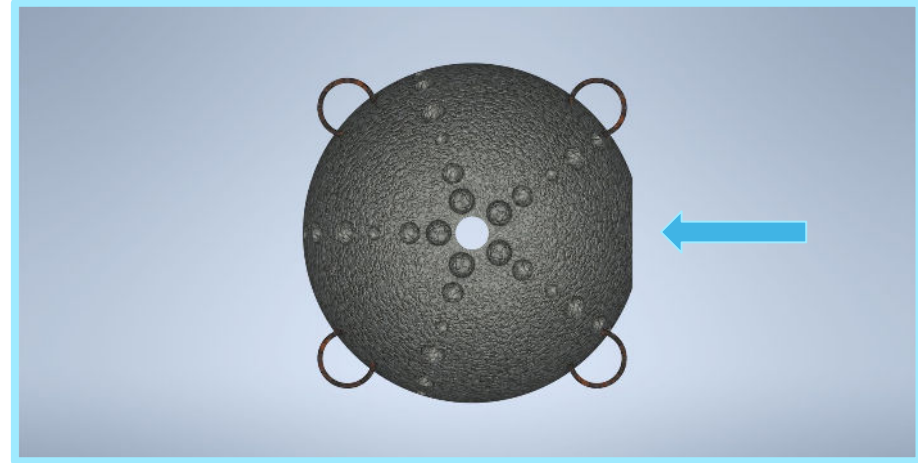


# Our Kappacrete

- Combining 3% *Kappaphycus* powder to concrete mix improves **yield stress** and **plastic viscosity**
- Pseudoplastic cement behavior is excellent for underwater applications

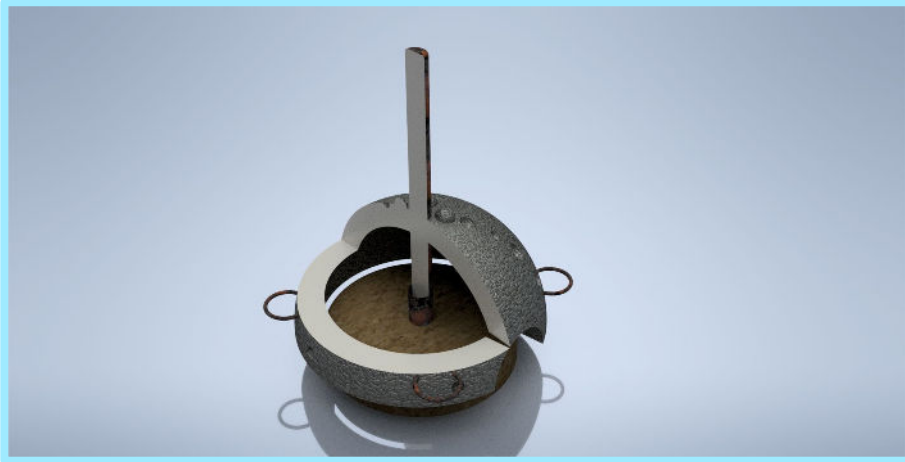


# Our “Kappacrete Seabiscuit” Design



*Providing additional attachment points for marine organisms to biofilter water in offshore aquacultural operations*

## Our Installed **Kappacrete Seabiscuits**



*Providing additional attachment points for marine organisms to biofilter water in offshore aquacultural operations*

# Partners and Stakeholders

## Partners

...

- Belize Women's Seaweed Farmers Association
- Fragments of Hope
- Local Contractors for Cement Casting

## Stakeholders

...

- Local community
- Seaweed farmers
- Investors
- Belizean government



# Activities, Resources, and People

What **resources** do we need to run our activities? • • •

- Design staff (Engineering, Marine Science, Support)
- Seaweed farmers and associated fishermen
- Permits from Belize Fisheries Department
- Suppliers of material and biological ingredients
- Company investors



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What program **activities** will we run? • • •

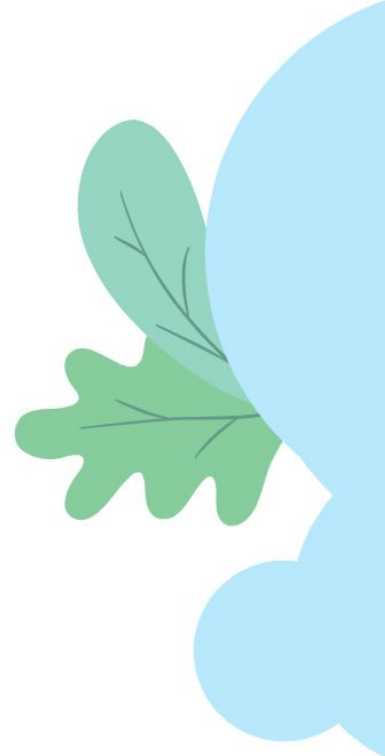
- Designing and installing biofiltration structures
- Pre- and post-installation water monitoring (5 years)
- Sustainable Kappacrete material development



# Activities, Resources, and People (2)

What non-program **activities** will we run? . . .

- Educational outreach about benefits of improved water quality
  - How does water quality change due to disturbances?
    - Human pollution and climate change
    - Harsh weather and storm runoff
- Complimentary evaluation of local farms (incentive)
- Assistance with grant applications for installations



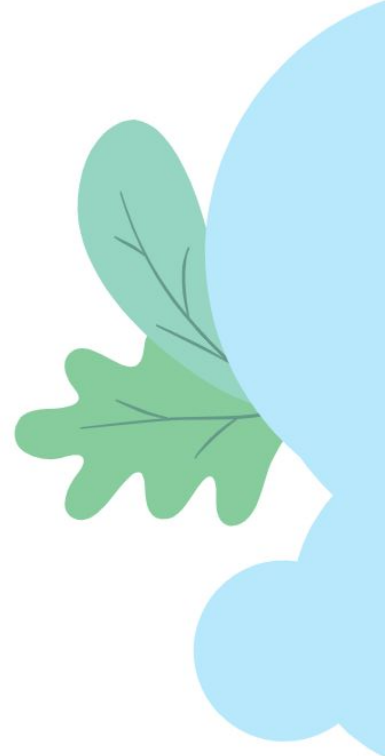
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**Channels:** How do we get in contact with our clients? . . .

- Outreach via associations with local aquaculture operations
- Community education events with partner organizations
- Active social media presence (for recruiting investors)



# Our Impact Measures

01



**Water quality** assessments  
at seaweed farms and  
surrounding waters

02



Increased local **biodiversity**  
gauged by surveys of marine  
life

03



**Nutrient content** analysis  
of seaweed products

04



Maintain **high market prices**  
of aquacultural products



## Analysis of Cost Structure: Largest Expenditures (USD)

<b>Biological Surveys and Environmental Impact (\$250)</b>	<b>Cost of Materials for Sea Biscuit Manufacture (\$500)</b>	<b>Employment (\$2,500)</b>
<b>Installation (\$1,000)</b>	<b>Continued Monitoring (\$5,000)</b>	<b>Warranty Repairs and Possible Externalities (\$1,000+)</b>

# Revenue Breakdown

Client Payment for  
Design, Install, and  
Warranty  
(+ \$2,300)

Investment  
Funds  
(+ \$8,000)

Small Business  
Grants  
(+ \$2,500)

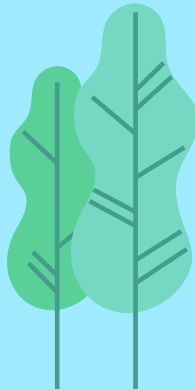
Total **profit** for one sample project: **\$1,300**

# How Profits Are Invested

Complimentary  
Assessments  
(- \$250)

Outreach to  
Investors and  
Possible Clients  
(- \$200)

Expansion  
Research Into  
Other Markets  
(~-\$850)



# Sample Project Timeline

Establish **contact** with local farmers and associations



**Locate** prospective seaweed plots



**Evaluate** the location for feasibility and cost estimate



Create **contract** with seaweed farmers for five-year duration





# Sample Project Timeline

**Finalize** designs and **assess** water quality



**Procure** inorganic and organic materials from partners



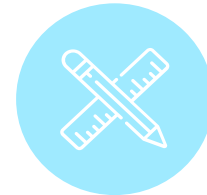
**Contact** our installers to cast our Kappacrete



**Install** and **seed** designs at the seaweed plot



**Monitor** and **evaluate** impact measures



# The Sustainable Development Goals

**3** GOOD HEALTH  
AND WELL-BEING



**6** CLEAN WATER  
AND SANITATION



**9** INDUSTRY, INNOVATION  
AND INFRASTRUCTURE



**12** RESPONSIBLE  
CONSUMPTION  
AND PRODUCTION



**13** CLIMATE  
ACTION



**14** LIFE  
BELOW WATER



# The Sustainability Complex

Global

National/State

Regional/Province

City

Community/Neighborhood

Household

Individual



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And Wilton!

# Questions?



The GREEN Program Belize 2024

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