

Algae and Animal Feeds

A Part of the Solution!

Valerie Harmon, President



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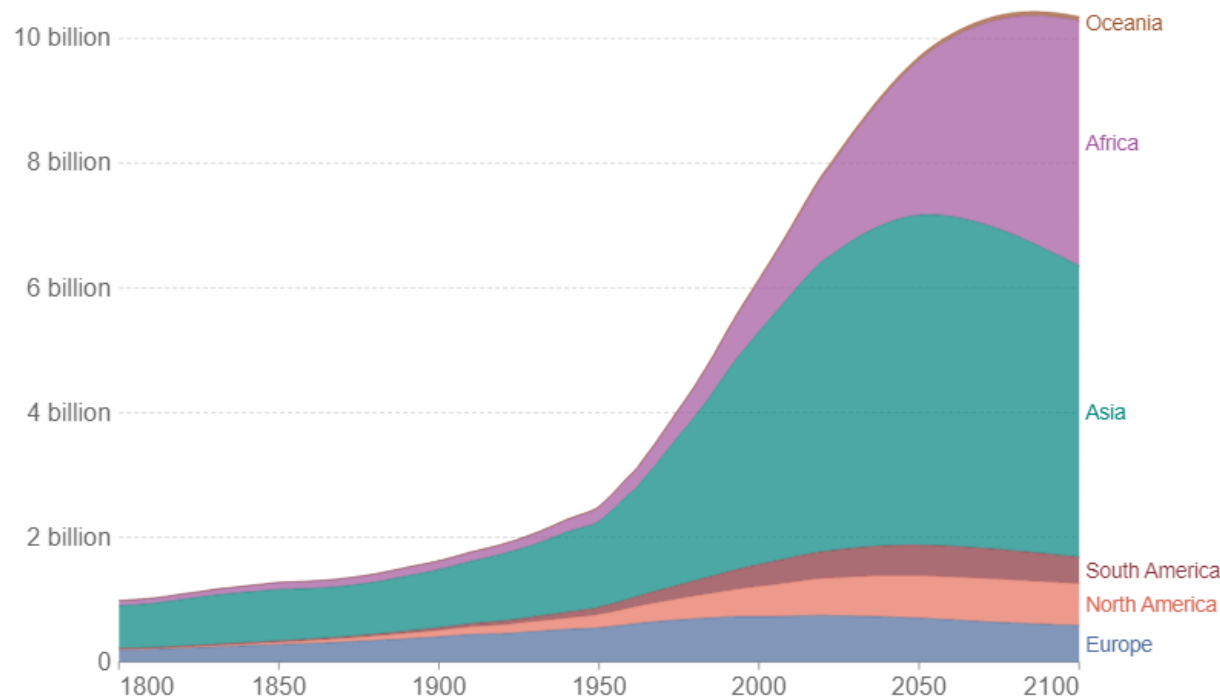


Today's Challenges

- World population is predicted to reach 9.7 billion by 2050
- Food production currently accounts for 25% of our greenhouse gas emissions worldwide
- We need to feed more people and make less of an environmental impact doing it

Population by world region

Historic estimates with future projections based on the UN medium-fertility scenario.

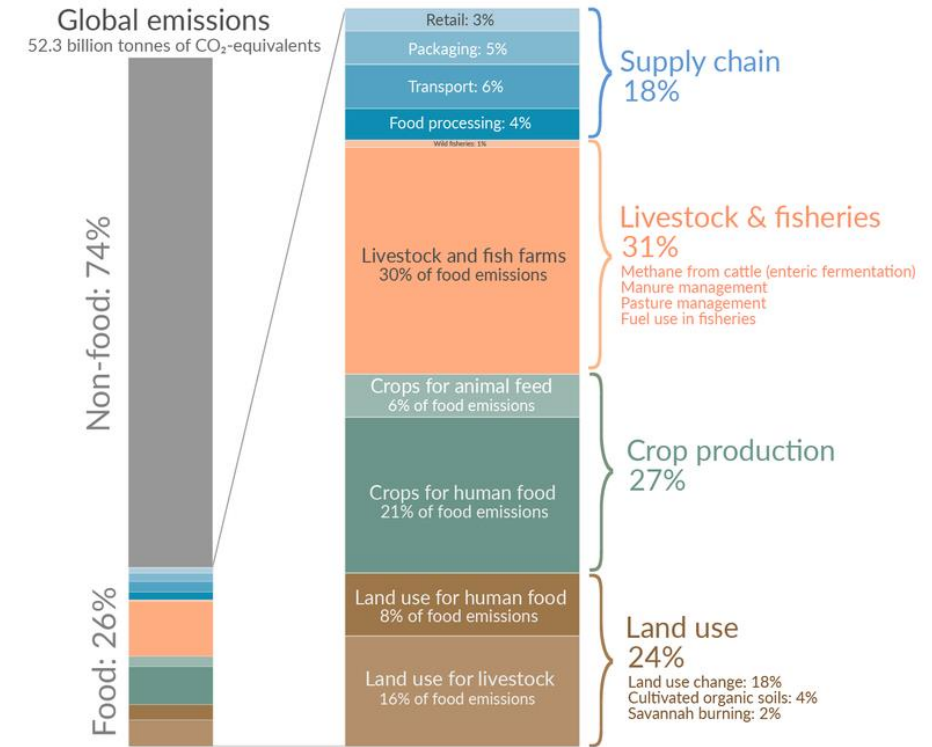


Data source: HYDE (2017); Gapminder (2023); UN (2022)

Note: Historical country data is shown based on today's geographical borders.

OurWorldInData.org/population-growth | CC BY

Global greenhouse gas emissions from food production



Data source: Joseph Poore & Thomas Nemecek (2018). Reducing food's environmental impacts through producers and consumers. Published in Science. Licensed under CC-BY by the author Hannah Ritchie (Nov 2022).



Food Production

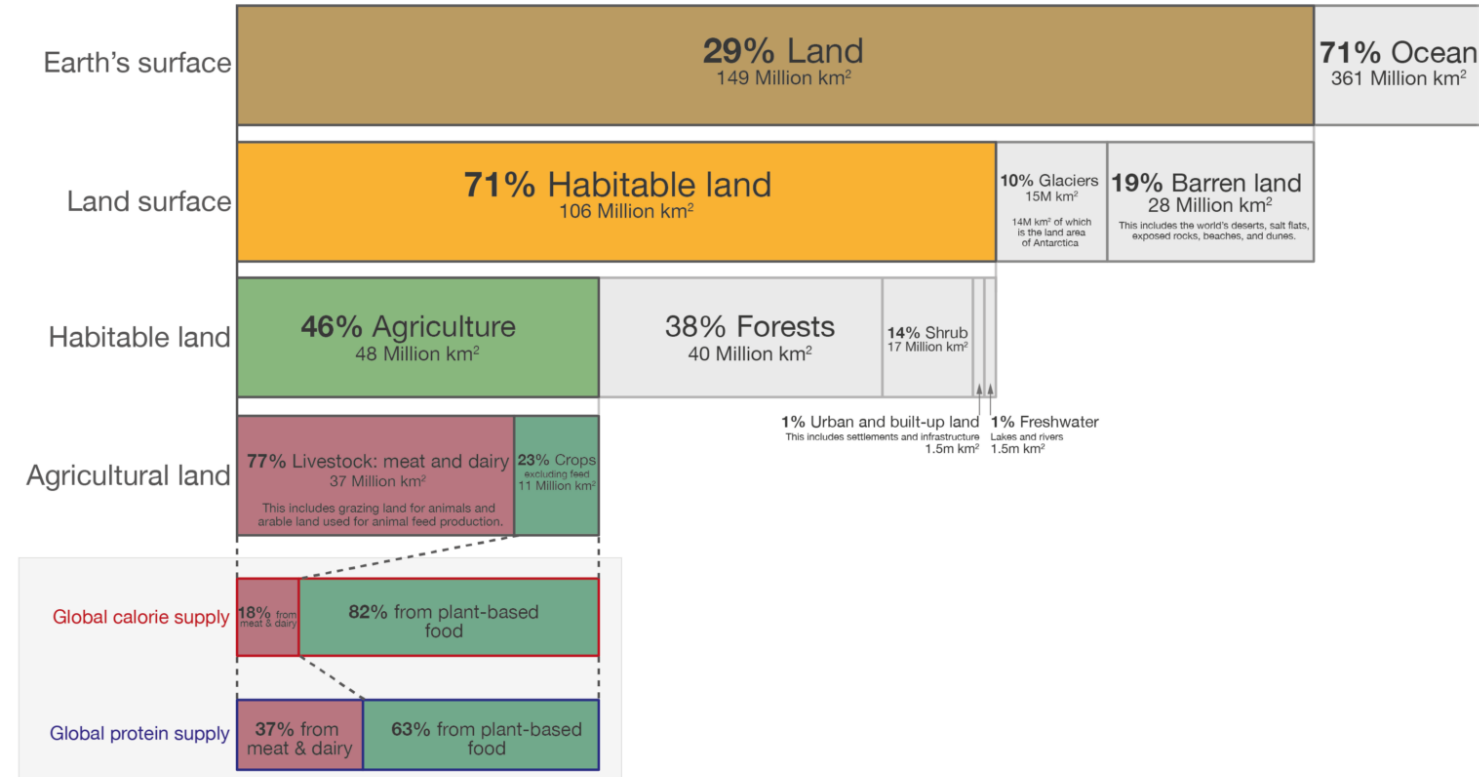
Land Use

Water Use

Global land use for food production

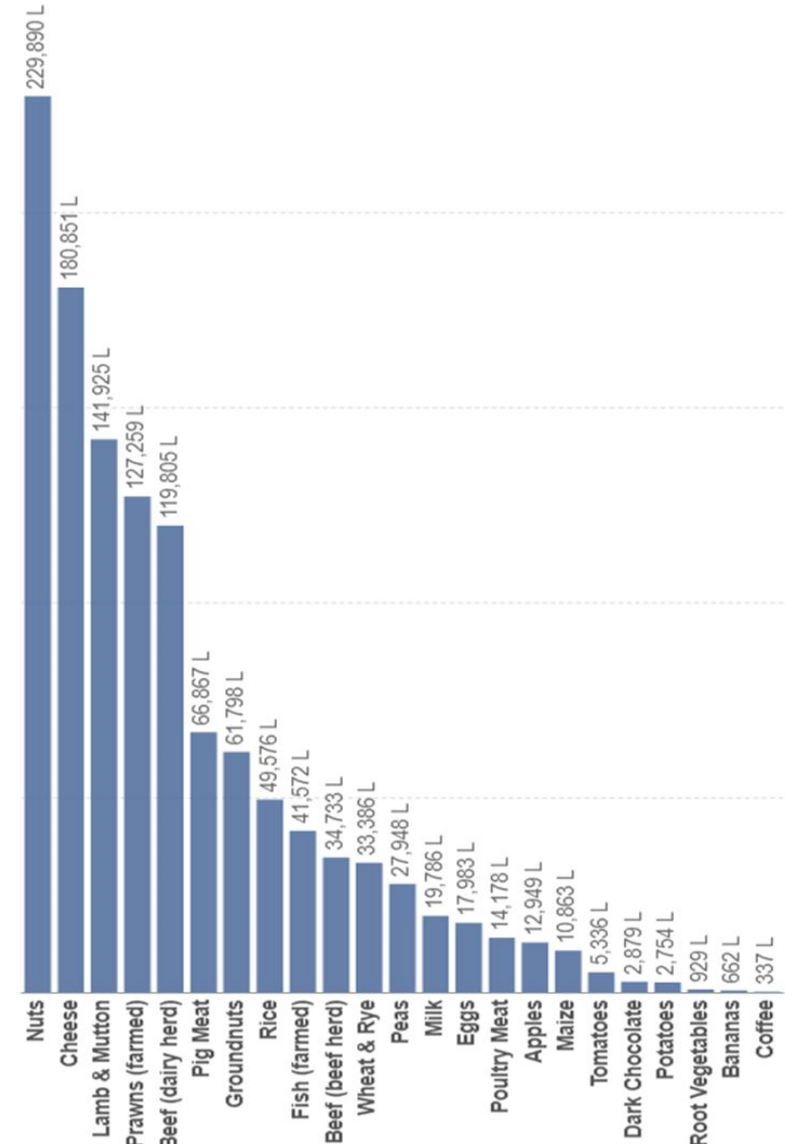
Our World in Data

Our World in Data



Scarcity-weighted water use per kilogram of food product

Scarcity-weighted water use represents freshwater use weighted by local water scarcity. This is measured in liters per kilogram of food product.



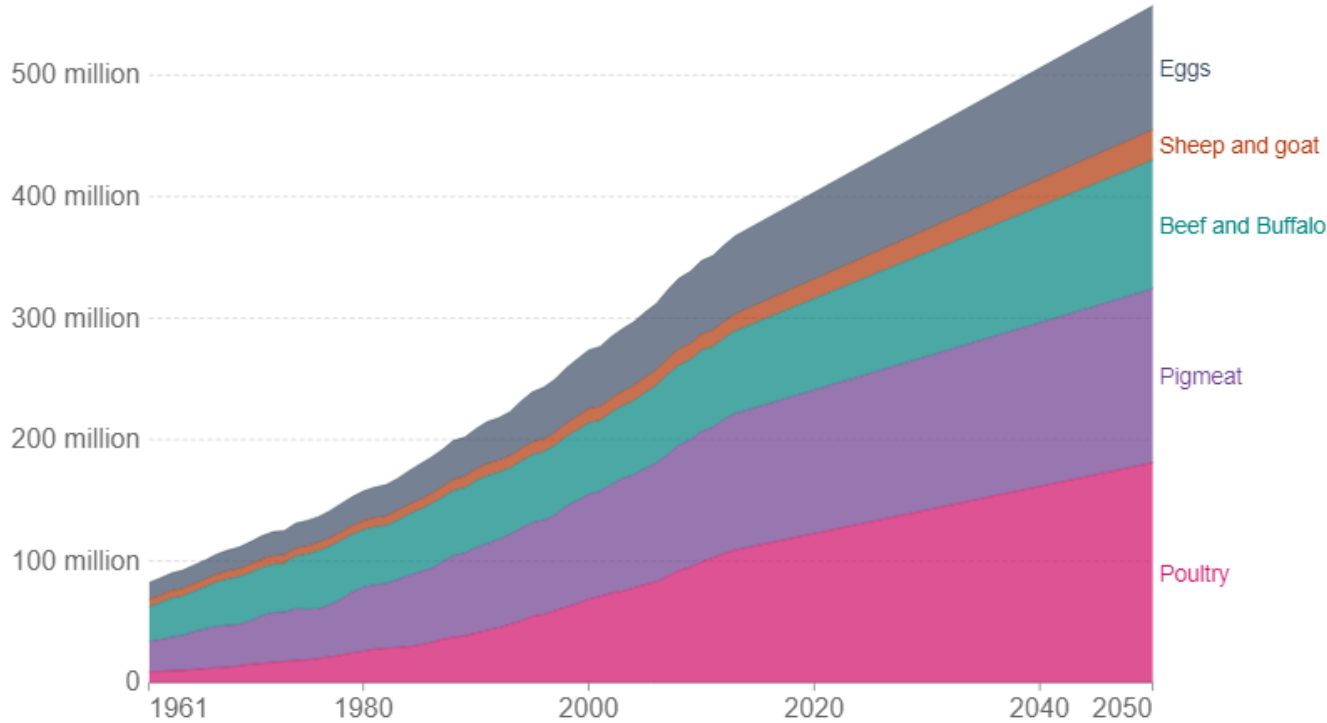
Data source: UN Food and Agriculture Organization (FAO)
OurWorldinData.org - Research and data to make progress against the world's largest problems.

Licensed under CC-BY by the authors Hannah Ritchie and Max Roser.
Date published: November 2019.

Meat Production: Protein

Global meat consumption, World, 1961 to 2050

Expressed in tonnes of meat. Data from 1961-2013 is based on published FAO estimates; from 2013-2050 based on FAO projections. Projections are based on future population projections and the expected impacts of regional and national economic growth trends on meat consumption.



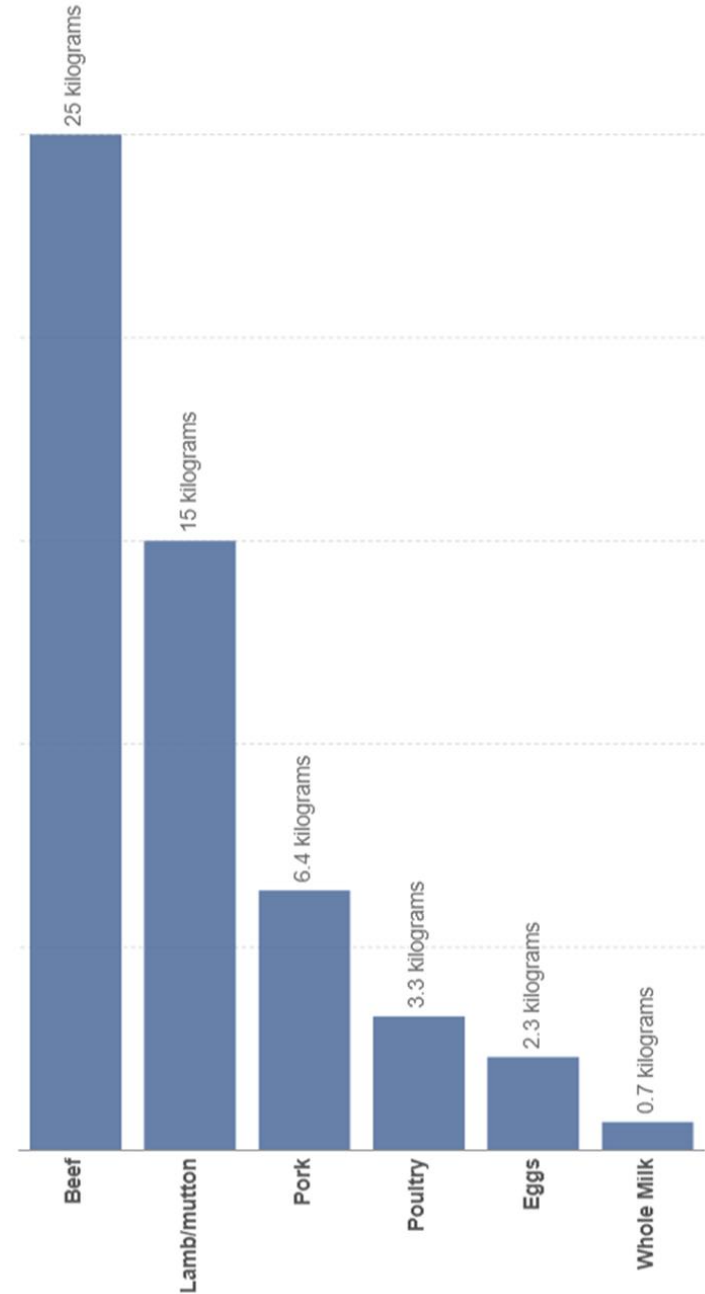
Data source: Food and Agriculture Organization of the United Nations

OurWorldInData.org/meat-production | CC BY

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Feed required to produce one kilogram of meat or dairy product

Quantity of animal feed required to produce one kilogram of meat, egg or milk product. This is measured as dry matter feed in kilograms per kilogram of edible weight output.



Data source: Alexander et al. (2016). Human appropriation of land for food: the role of diet. Global Environmental Change. OurWorldInData.org/meat-production | CC BY



Animal Feeds: Over 900 ingredients approved for use in USA

Ingredients

- Corn
- Soybean meal
- Dried and wet distillers' grains
- Amino acids
- Vitamins
- Minerals
- Probiotics
- Enzymes
- Fats and oils
- Etc.

Requirements

- Nutritious
- Safe
- Sustainable

Feed Pellets for
Different Animals



Soybean Meal



Corn Meal



Wheat Flour



Cake Meal



Bone Meal



Fish Meal



Meat Meal



Blood Meal

Algae as a feed ingredient

Is it nutritious, safe and sustainable?

Algae: Highly Nutritious!

- Proteins: up to 60%
 - Complete protein
 - Essential amino acids
- Lipids
 - Essential fatty acids
 - Omega 3s
 - Omega 6s
- Pigments
 - Chlorophylls
 - Carotenoids
 - Phycobiliproteins
- Immune Stimulating Compounds
 - Polysaccharides
 - Beta glucans

Species	Protein	Carbohydrates	Lipids
<i>Scenedesmus obliquus</i> (green alga)	50-56	10-17	12-14
<i>Scenedesmus quadricauda</i>	47	-	1.9
<i>Scenedesmus dimorphus</i>	8-18	21-52	16-40
<i>Chlamydomonas reinhardii</i> (green alga)	48	17	21
<i>Chlorella vulgaris</i> (green alga)	51-58	12-17	14-22
<i>Chlorella pyrenoidosa</i>	57	26	2
<i>Spirogyra sp.</i>	6-20	33-64	11-21
<i>Dunaliella bioculata</i>	49	4	8
<i>Dunaliella salina</i>	57	32	6
<i>Euglena gracilis</i>	39-61	14-18	14-20
<i>Prymnesium parvum</i>	28-45	25-33	22-38
<i>Tetraselmis maculata</i>	52	15	3
<i>Porphyridium cruentum</i> (red alga)	28-39	40-57	9-14<

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Credit: [B.R. Speer](#)



Algae: Sustainable

- Efficient land use
 - *19% of land is considered non-habitable*
 - We can grow microalgae on this land!
 - *70% of the world is ocean*
 - We can grow macroalgae in the ocean!
- Low water use
 - *Microalgae = 500 L/kg*
 - *Rice = 50,000 L/kg*
 - *Beef = 35,000 L/kg*
- Fast growing
 - *Crops in as little as 5 – 7 days*



Algae: More Nutrition per Acre!



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Examples of algae as a feed ingredient

We are doing it!

Algae: Part of the Solution!

- Kemin Expands into Global Immune Health Market with Algae-Sourced **Beta-Glucan** Ingredients
 - Aleta™ is a unique **beta-glucan** molecule derived from the specific algae *Euglena gracilis*
 - Aleta™ is highly bioavailable, offering a concentration greater than 50% of 1,3-beta glucans. Aleta provides a consistent response in situations of disease and stress — especially those typically addressed with antibiotics.



Aleta™



Algae: Part of the Solution!

- Corbion unleashes the power of algae fermentation to preserve the planet's limited resources. Our sustainable solutions help customers advance diets and reduce pressure on marine resources without impacting the carbon footprint.
 - Health Efficient - Higher levels of Omega-3s in feed support animal health. Find out more about further benefits of [AlgaPrime™ DHA](#) for your business: aquaculture, poultry, swine and cattle.

AlgaPrime[™] DHA

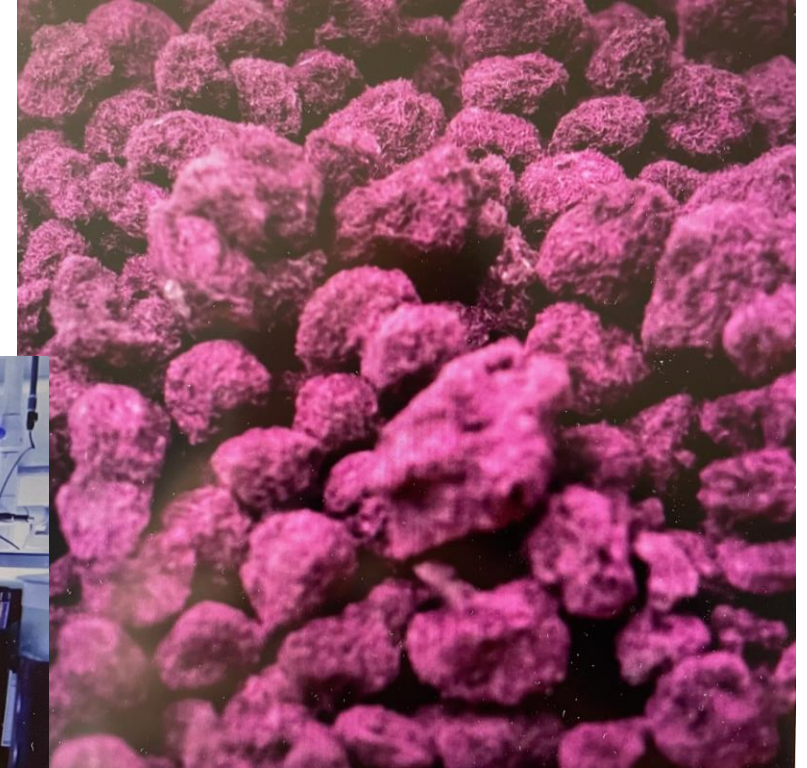


Algae: Part of the Solution!

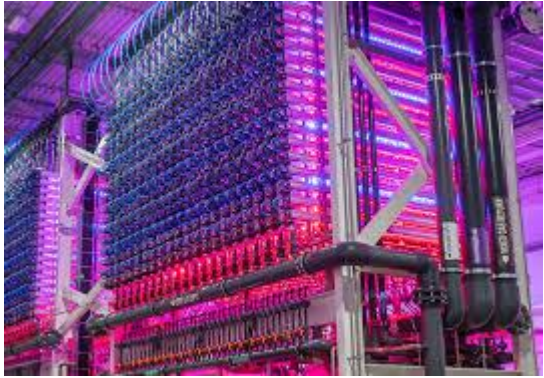
- Symbrosia
 - *SeaGraze™* feed reduces methane emissions from livestock burps.



- Blue Ocean Barns
 - *Brominata™*

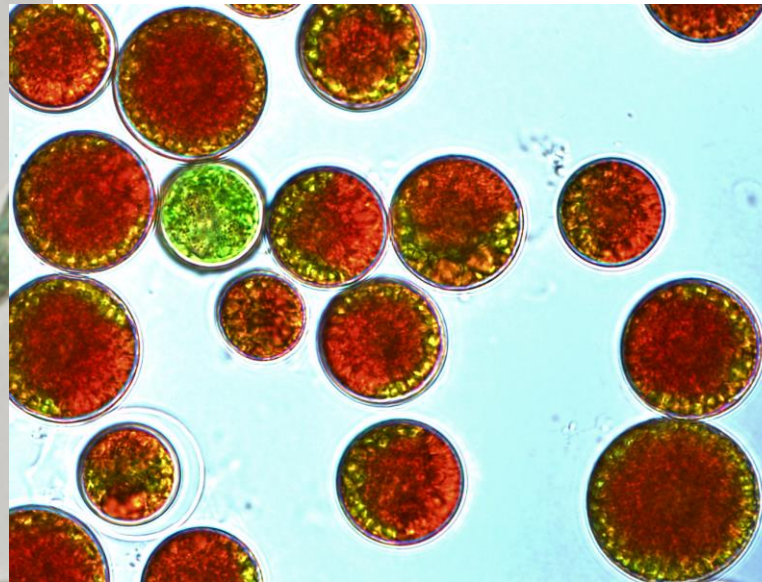


Algae: Part of the Solution!



Algae: What is the hold up?

- We need more large scale algae farms
- Capital intensive to build farms
 - *Longer return on investment than most investors are willing to tolerate*
- Time to invest in our future – Algae is going to be a part of the solutions we need



Mahalo! (Thank you)

***Bridging Gaps in Algae Technology
Development***



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