Algae Farming

Contemporary Problems in Urban Sustainability

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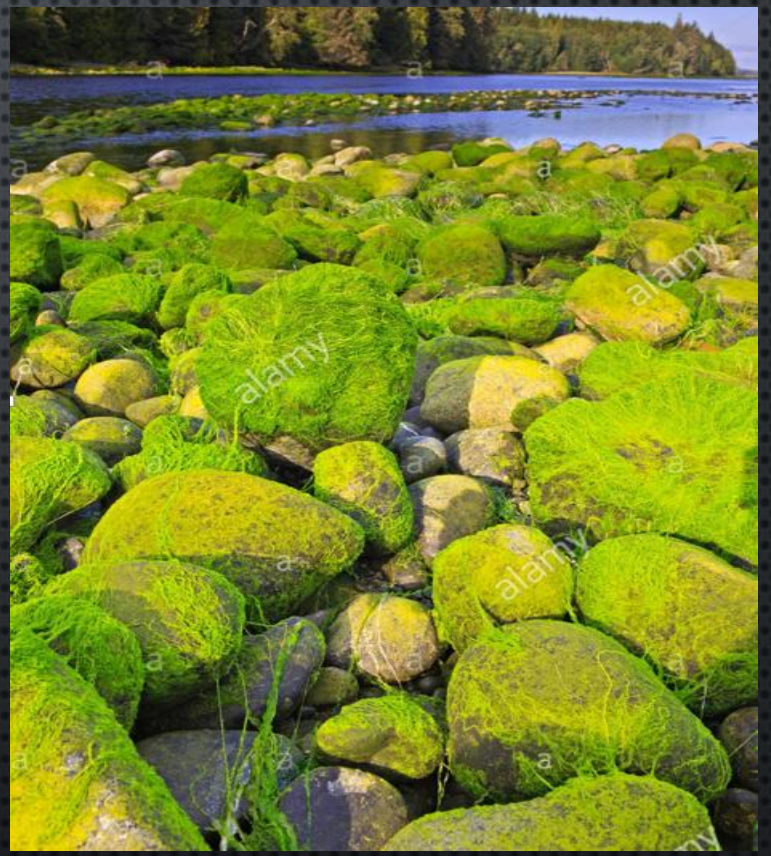
What Is Algae ?

- Algae are a diverse group of aquatic organisms that have the ability to conduct photosynthesis. Certain algae are familiar to most people; for instance, seaweeds (such as kelp or phytoplankton), pond scum or the algal blooms in lakes.



What Is Algae Farming ?

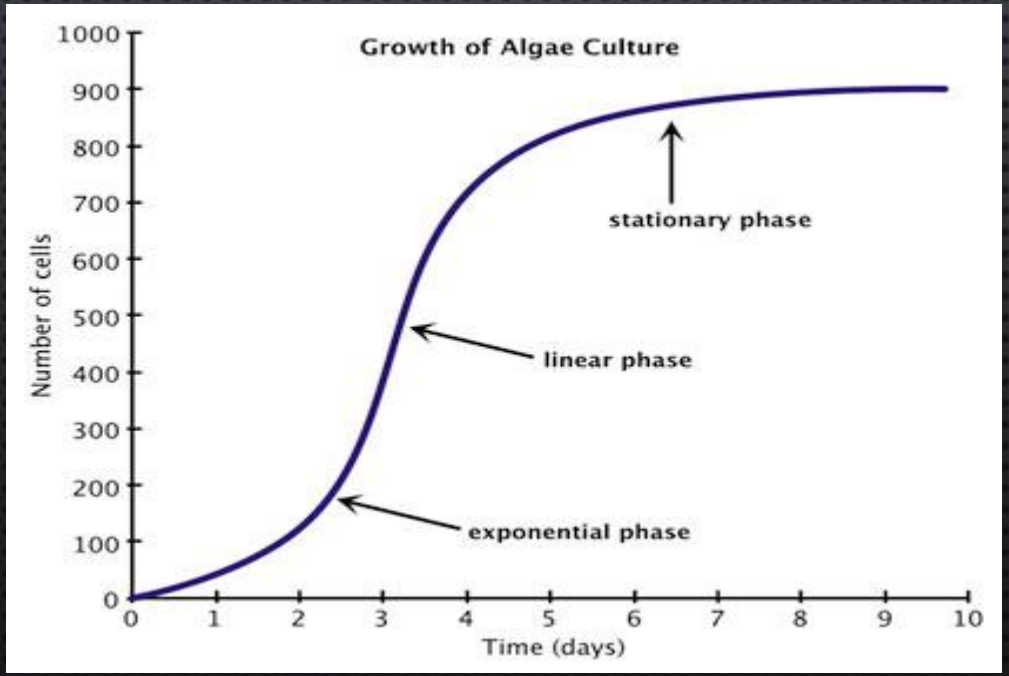
- Algae farms are places where algae is grown for commercial use. People engaged in algae farming are said to be involved in algaculture. Algaculture can involve growing many different species of algae.
- Most types of algae that are commercially grown are microalgae. These are sometimes referred to as phytoplankto, microphytes, and planktonic algae. Some of the larger algae species, also known as macroalgae, include seaweed and also have commercial uses.

- Today, algae cultivation is still carried out using traditional methods in some countries. Algae cultivation, in other words, algae farming is mostly carried out in Indonesia, Philippines and Tanzania in the world. The seaweed grown here is exported to many countries in Europe, especially the USA, and China. The biggest share of the market is these countries. This type of farming, which started in Japan in the 1600s for the first time in history, has gained its share in geographies suitable for growing.

Women who grow seaweed in their locally colored clothes in Zanzibar.

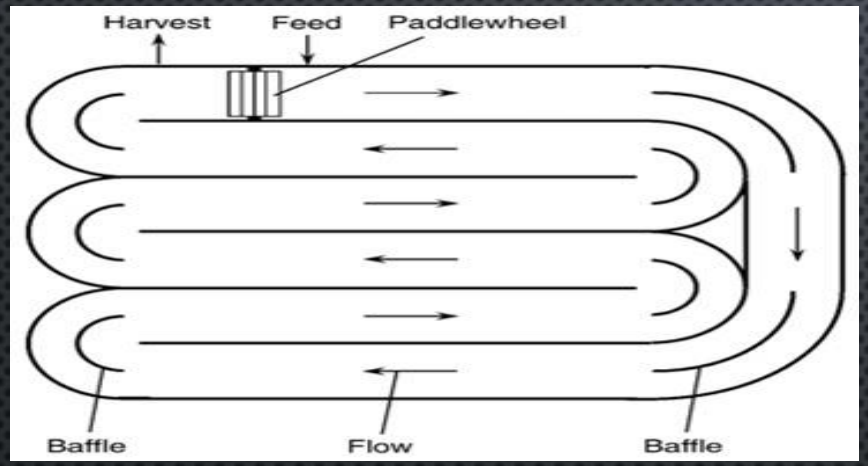
- Algae cultivation has started with modern methods in developed countries.
- Most algae farms grow only one type of algae. This is known as monoculture. Algae farmers choose the variety they are going to grow and take great care to keep their supply pure, as it is easy for other species to get into an algae culture and then come to dominate it.
- Pure cultures of one type of algae are the most valuable for commercial purposes and for research.
- When mixed algae species are grown together, it is usually as food for other sea creatures, such as larval mollusks.

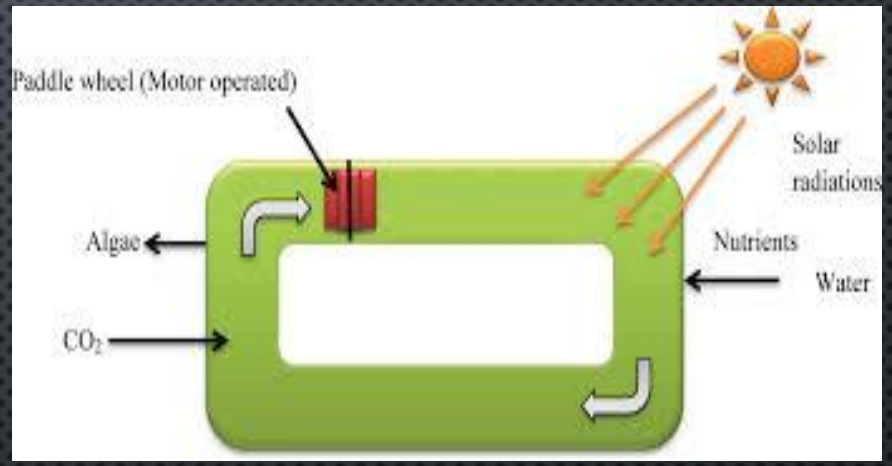
- When cultivating algae on algae farms, there are some basic requirements for producing a good stock, regardless of the species. Light, water, and minerals are all important ingredients in producing healthy algae. So is carbon dioxide. This combination produces the energy algae needs to grow.



Modern algae farming systems

Algae Open Ponds

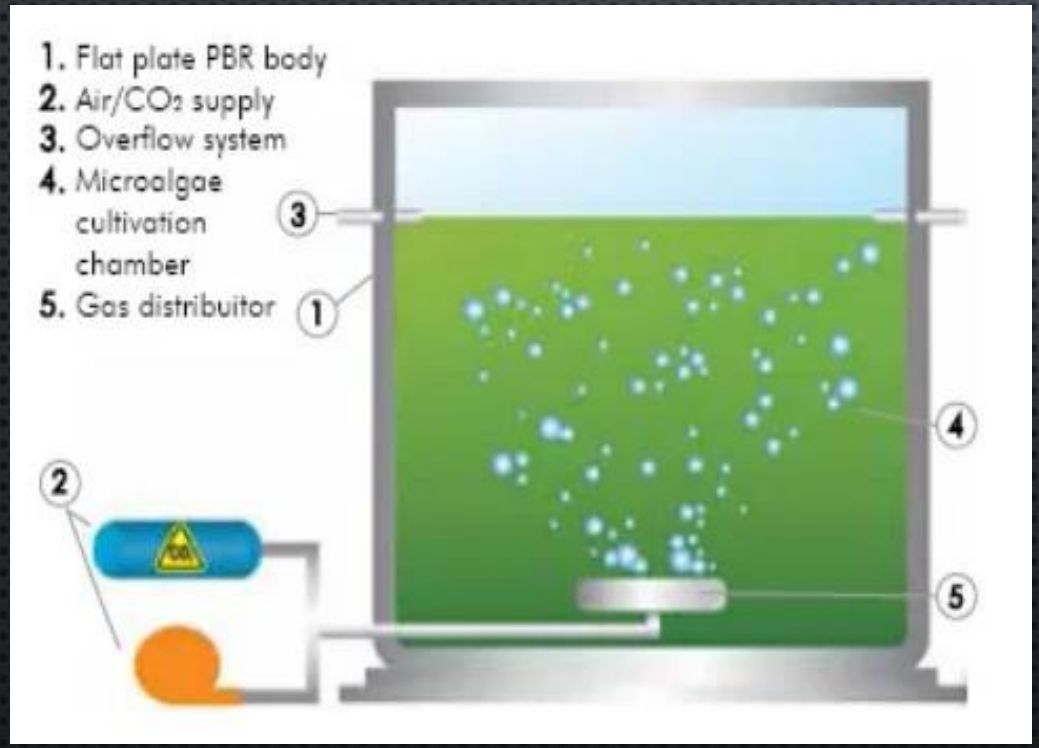




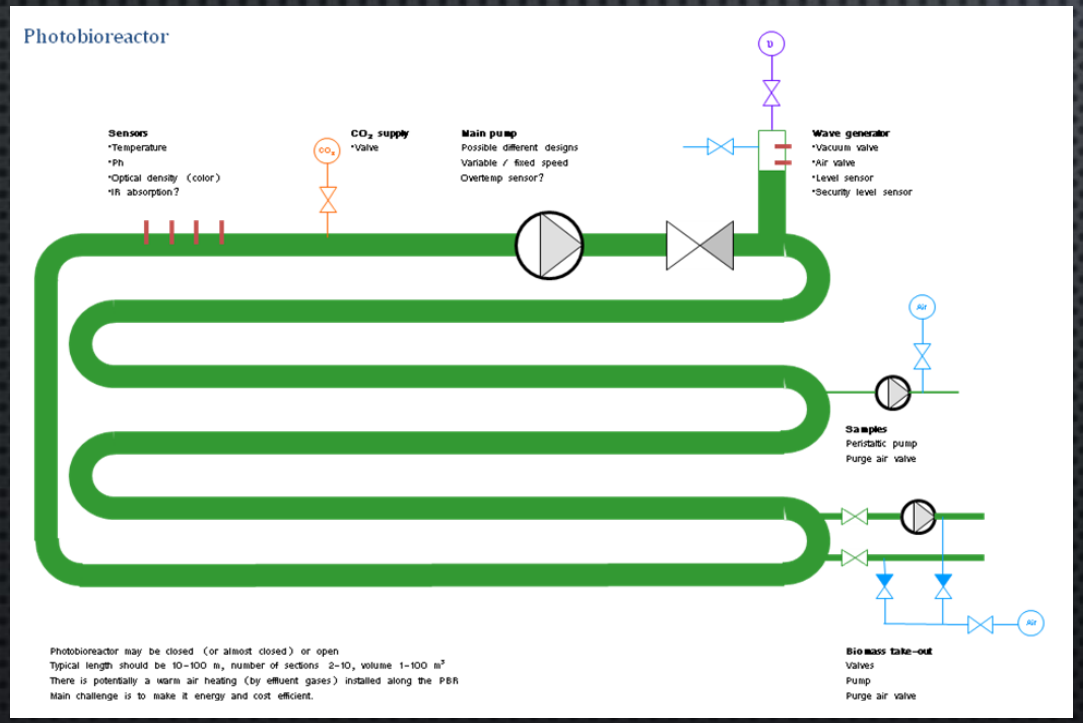
Photobioreactors (PBR)

- Photobioreactors (PBR) are bioreactors that use a light source to grow phototrophic microorganisms. There are 3 types of PBR (Flat Plate, Pyramidal, Tube)
- They are more practical and more productive than outdoor pools. However, they require higher capital.
- Phototrophs are organisms that capture photons to obtain energy. Microalgae are phototrophic.

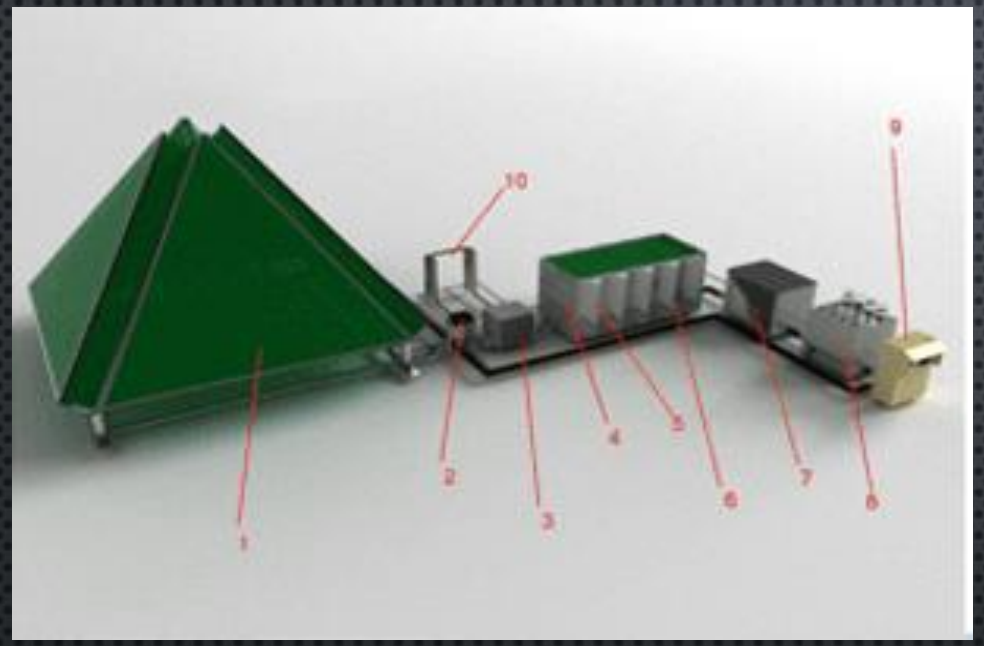
Photobioreactors (PBR) – Flat Plate



Photobioreactors (PBR) – Tubes



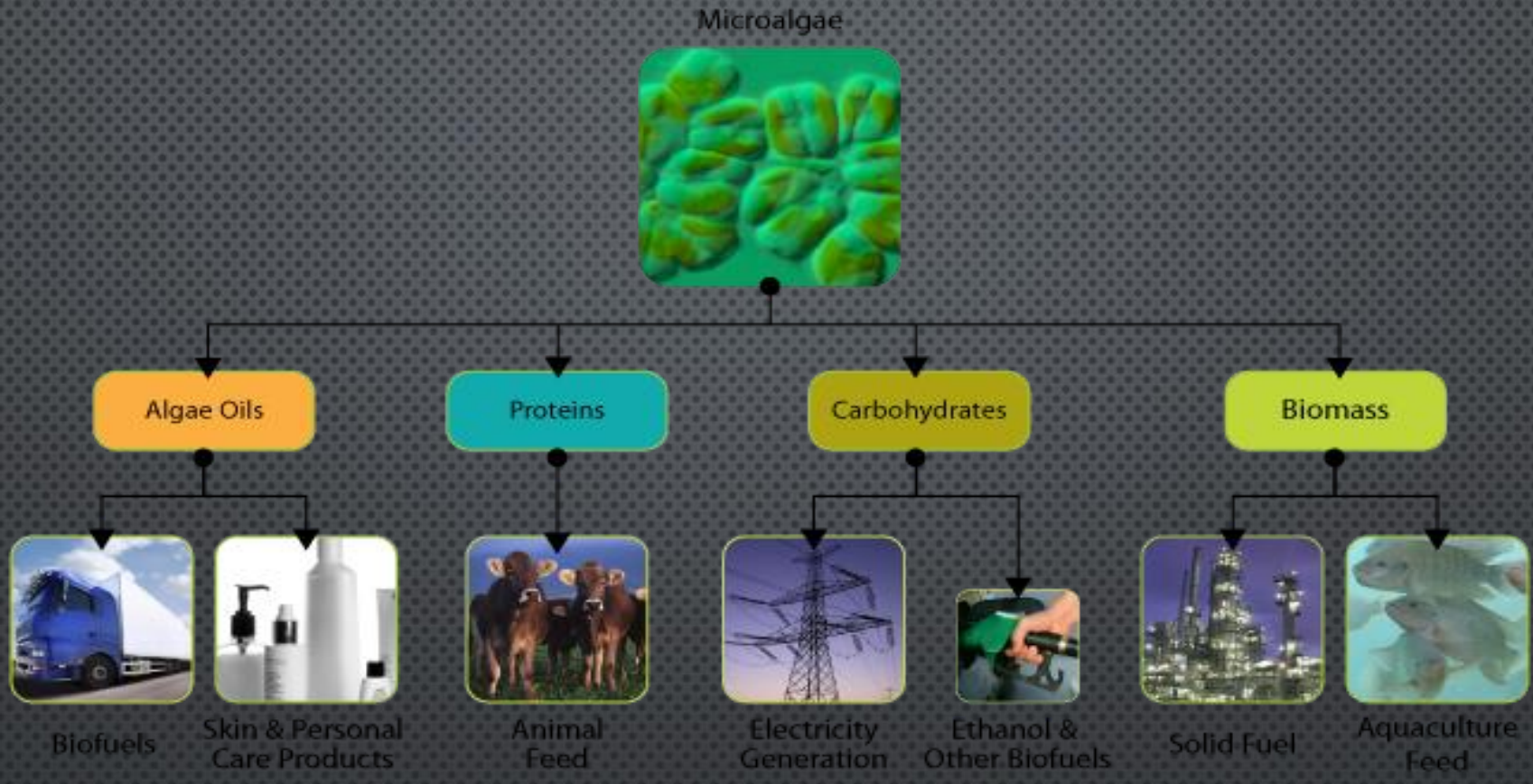
Photobioreactors (PBR) – Pyramidal



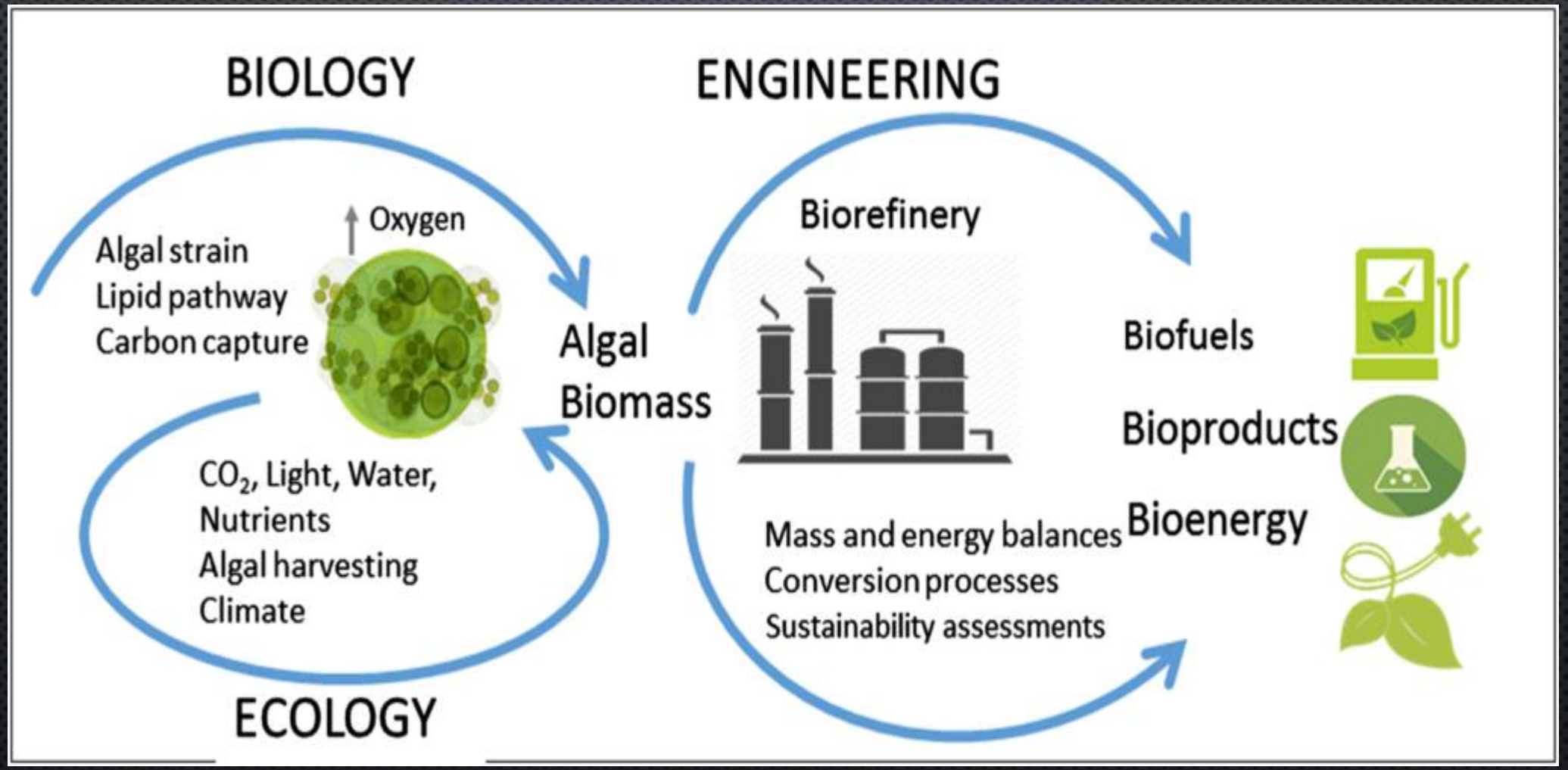
How Much Does An Algae Farm Cost?

- Michael Briggs who is expert on algae farm gave an estimate of **$80,000** per hectare for the construction costs to build the algae ponds. **$80,000** divided by 2.47 = 32,390 rounded. We will say **$32,500** per acre. **$32,500** times 250 acres = **$8,125,000** construction costs for a 250 acre algae farm.

PRODUCTS FROM ALGAE



- Some of the uses of commercial algae grown on algae farms includes **food coloring, fertilizer, bioplastics, chemical feed, medicines, pollution control, and fuel**. Some varieties are also grown as food for humans or as **nutritional supplements.**


BIOLOGY
ENGINEERING
Oxygen
Algal strain
Lipid pathway
Carbon capture
Algal Biomass
Biorefinery
Biofuels
Bioproducts
Bioenergy
CO_2, Light, Water, Nutrients
Algal harvesting
Climate
Mass and energy balances
Conversion processes
Sustainability assessments
ECOLOGY

Could Algae Be A Solution To Projected Food Shortages In The Future?

- Despite its reputation as pond scum, algae nevertheless represents a possible solution to the world hunger problem.
- In fact, you may already be ingesting the little green plant. Algae is found in "green smoothies," specialty chips, protein bars, protein powders and supplements including Omega-3 capsules. One type of algae, spirulina, has long been on the market as a nutrition-packed health food.
- Algae is also an ingredient in animal feed.

- Miguel Calatayud who runs a farm in Columbus, New Mexico, told CNN recently that "it is the foundation of the next generation of farming and food," It can provide lots of protein while using relatively little in the way of scarce resources.
- The algae grows very fast using sun, air and water and most of the water is recycled. It can be harvested year round.
- The algae is **40 percent protein**, and it isn't slimy and smelly, according to the company.
- Algae will most likely be used as a new protein ingredient in food products. "A lot of companies are testing it,«
- It's seen as filling the role that soybeans have filled. Soy is often added to meat products, cereals and bread and used in vegetarian products as a meat substitute.

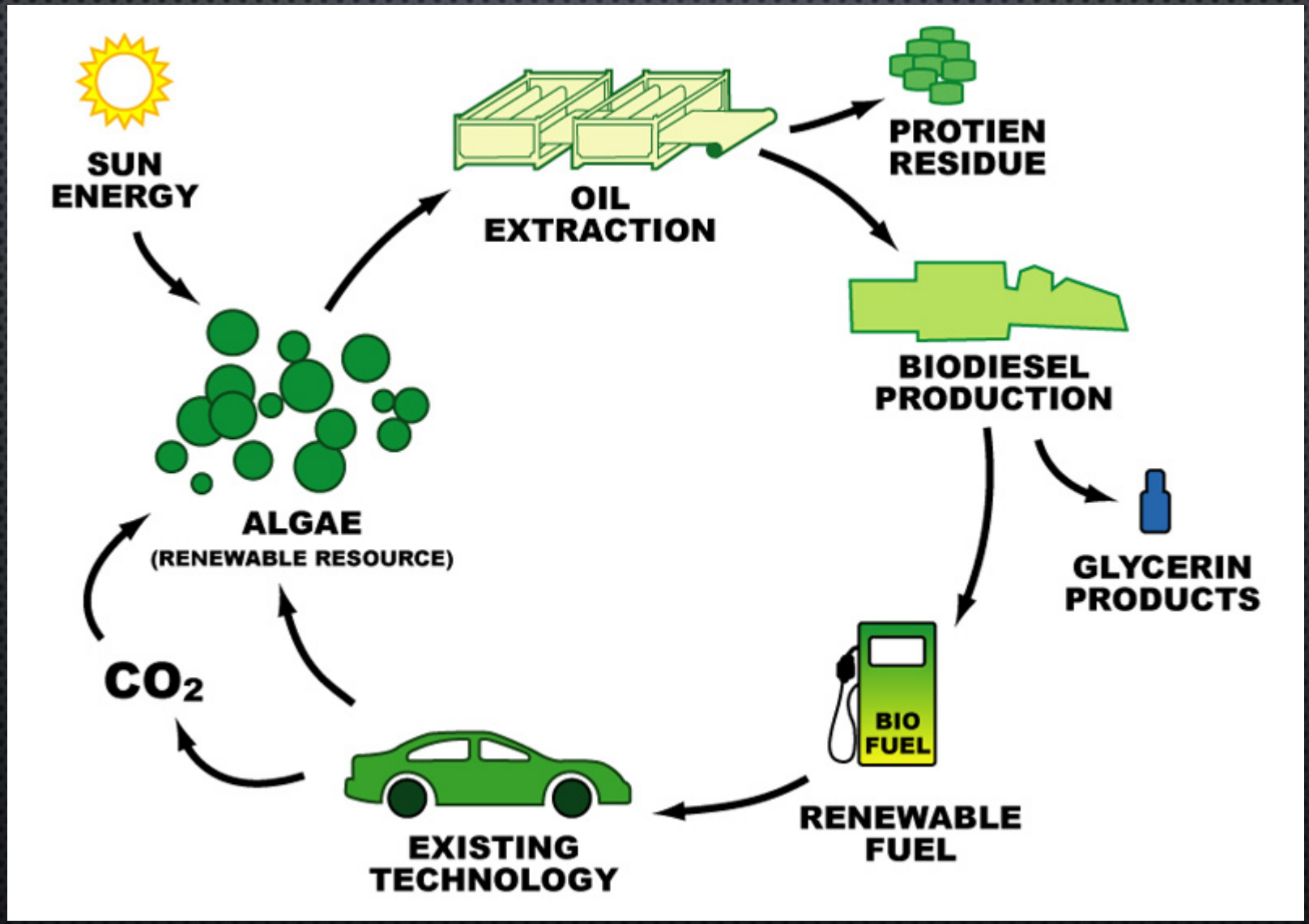
- Urban population growth around the world — particularly in Asia and North Africa — will put a strain on food resources, according to the United Nations, which expects an increase of 2.3 billion people by 2050.

- Algae can play an important role in decreasing hunger in the world. In addition to feeding a growing population, algae is seen as a way to address existing malnutrition. The Swiss Antenna Foundation cultivates spirulina in Tamil Nadu, India. The plant will be given as a supplement to children to combat malnutrition and the foundation will train people in local production as a way to encourage local sustainability.

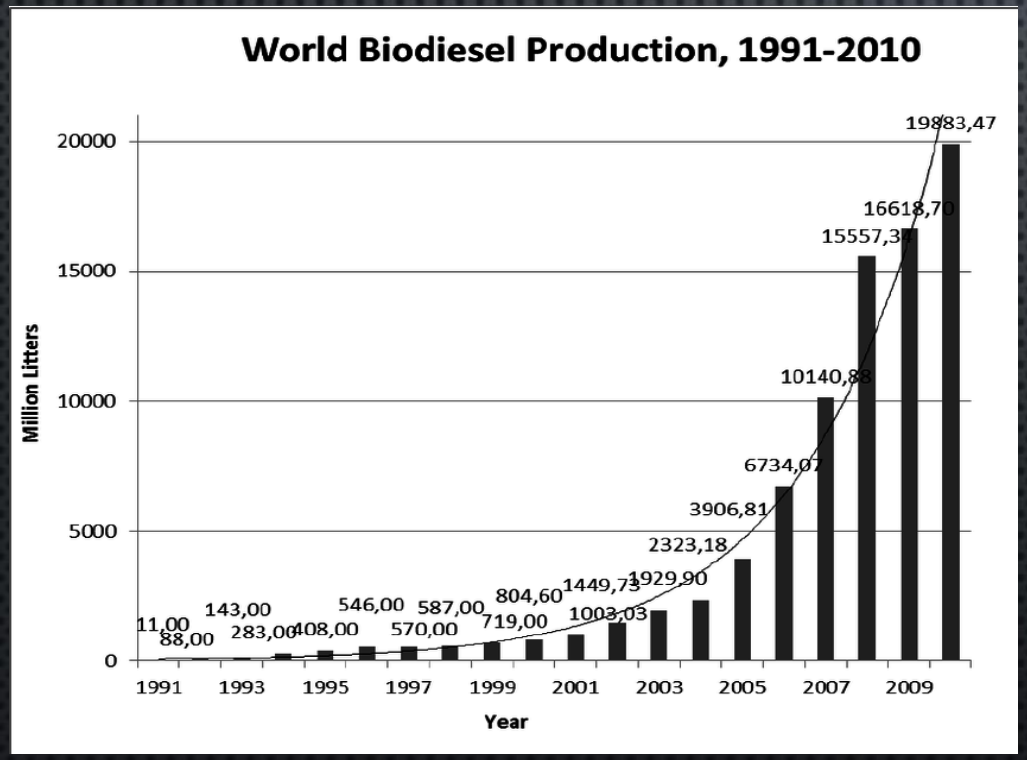
Biodiesel Fuel

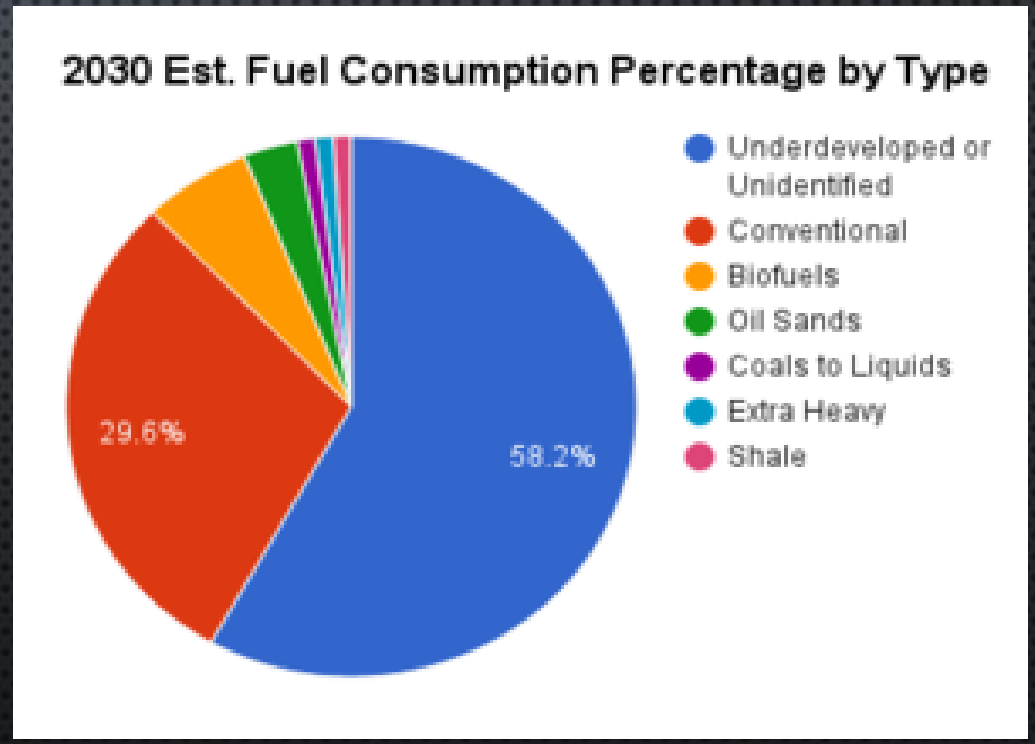
- The increase in the human population and technological developments show that the energy needs will increase by at least 50% by 2030.
- The current consumption rate is 105 times the oil provided by nature. Moreover, the use of fossil fuels is destroying the environment with greenhouse gases and global warming. That's why clean energy has come to the fore.
- There is a need to explore alternative energy sources to meet future energy demand in a sustainable way. Just like other animal feeds and chemicals, algae can be raw materials for biodiesel.

- According to the International Energy Agency's (IEA's) 2017 medium-term market report on renewable energy, world biofuel production is forecast to increase by approximately 16% to more than 2.7 MMbpd by 2023. Asia will be the leader in biofuels consumption growth due to increasing consumption in transportation fuels. Biofuels in the global transportation sector is the main driver for biofuels consumption.
- Biodiesel provides 93% more usable energy than the fossil energy needed for its production, reduces GHGs by 41% compared with diesel, reduces several major air pollutants, and has minimal impact on human and environmental health through N, P, and pesticide release.
- A study done by the Department of Energy and Agriculture found biodiesel reduces net carbon dioxide emissions by 78%.
- B20 with 20% **biodiesel** content will have 1% to 2% less energy per gallon than petroleum diesel, but many B20 users report no noticeable difference in performance.


SUN ENERGY
OIL EXTRACTION
PROTIEN RESIDUE
BIODIESEL PRODUCTION
GLYCERIN PRODUCTS
ALGAE
(RENEWABLE RESOURCE)
CO_2
BIO FUEL
RENEWABLE FUEL
EXISTING TECHNOLOGY

Biodiesel Production and Estimated Consumption





- Algae also have great benefits for human skin.
  - Hydrates dry skin.
  - Diminishes the appearance of hyperpigmentation.
  - Supplements can help manage Inflammation
  - Protects against sun damage.
  - Clears clogged pores.
  - Reduces the appearance of fine lines.

- Algae is used as one of important medical source due to its
  - Antioxidant
  - Anticancer
  - Antiviral properties.

  Therapeutic properties of algae is used for promotion of health.

- Algae are miraculous creatures that can be used in all areas of our lives.
- Algae has the power to finish fossil fuel, this is very important for future generations to reduce CO2 emissions and increase renewable energy.
- It will enable us to save a lot of money and have a healthier environment.
- It can also be consumed as food in case of food shortages thanks to the high protein in it.

➡ Therefore algae farming should be promoted all over the world and states should also give the necessary support to algae farming.


Thanks for listening me. Do you have any questions ?

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