



# Challenges in front of Biofuels



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# Introduction of Renewable Energy Sources(RES):

- ① **Renewable energy is a promising alternative solution because it is clean and environmentally safe.**
- ② **Biomass has been recognized as a major world RES to supplement declining fossil fuel resources.**
- ③ **Biomass can be used directly or indirectly by converting it into a liquid or gaseous fuel.**
- ④ **Biomass can be converted into biofuels such as bioethanol and biodiesel and thermochemical conversion products.**

# Biofuels

- **The term biofuel refers to liquid or gaseous fuels that are predominantly produced from biomass.**
- **It is considered relevant technology which include energy security, environmental concerns, foreign exchange savings and socioeconomic issues related to the rural sector.**
- **The advantage of biofuels are:-**
  - **Easily available from common biomass sources**
  - **Carbon dioxide cycle occurs in combustion**
  - **Environmentally friendly**
  - **Biodegradable and contribute to sustainability (Puppan,2002).**

# Biodiesel

- ⦿ **Biodiesel is the name for a variety of ester-based oxygenated fuels from renewable biological sources.**
- ⦿ **Chemically, biodiesel is defined as monoalkyl esters of long chain fatty acids derived from renewable biolipids.**
- ⦿ **Biodiesel is better than diesel fuel in terms of sulfur content, flash point, aromatic content and biodegradability (Bala,2005).**

# History of biodiesel

- In 1853 scientists E. Duffy and J. Patrick, conducted the transesterification of a vegetable.
- Life for the diesel engine began in 1893, when the famous German inventor Dr. Rudolph Diesel published a paper entitled “The theory and construction of a rational heat engine”.
- ⊙ Dr. Diesel used peanut oil to fuel one of his engines at the Paris Exposition of 1900 (Nitschke and Wilson, 1965).

# History of biodiesel

- **At the 1911 World's Fair in Paris, Dr. Diesel ran his engine on peanut oil and declared "the diesel engine can be fed with vegetable oils and will help considerably in the development of the agriculture of the countries which use it".**
- **In 1980s, biodiesel plants have opened in many European countries, and some cities have run buses on biodiesel, or blends of petro and biodiesels.**
- **The European Union accounted for nearly 89% of all biodiesel production worldwide in 2005.**

# Biofuel in India

- **India's total biodiesel requirement is projected to grow to 3.6 Million Metric Tons in 2011-12, with the positive performance of the domestic automobile industry.**
- **The Government is currently implementing an ethanol-blending program and considering initiatives in the form of mandates for biodiesel.**
- **On 12 September 2008, the Indian Government announced its 'National Biofuel Policy'.**
- **It aims to meet 20% of India's diesel demand with fuel derived from plants. That will mean setting aside 140,000 square kilometers of land. Presently fuel yielding plants cover less than 5,000 square kilometers.**

# Indian Scenario Revisited

- The Government of India approved the National Policy on Biofuels in December 2009.
- The biofuel policy encouraged the use of renewable energy resources as alternate fuels to supplement transport fuels (petrol and diesel for vehicles) and proposed a target of 20 percent biofuel blending (both bio-diesel and bio-ethanol) by 2017.
- The government launched the National Bio-diesel Mission (NBM) identifying *Jatropha curcas* as the most suitable tree-borne oilseed for bio-diesel production.
- .....contd.



# Indian Scenario Revisited

- The Planning Commission of India had set an ambitious target covering 11.2 to 13.4 million hectares of land under *Jatropha* cultivation by the end of the 11th Five-Year Plan.
- The central government and several state governments are providing fiscal incentives for supporting plantations of *Jatropha* and other non-edible oilseeds.
- Several public institutions, state biofuel boards, state agricultural universities and cooperative sectors are also supporting the biofuel mission in different capacities.
- The biodiesel industry in India is still in infancy despite the fact that demand for diesel is five times higher than that for petrol.

# Indian Scenario Revisited

- In 2003, India defined its policy for bioethanol production from sugarcane molasses, according to which the ministry of petroleum and natural gas made 5% ethanol blending in petrol mandatory across 9 states and 5 Union Territories (Wright & Aradhey, 2011). However, it was not implemented completely because of non-availability and insufficient production of sugarcane.
- Again in 2006, government mandated 5% ethanol blending in 20 states and 8 union territories with the collaboration of oil marketing companies (OMC) but they could supply only 540 million liter of ethanol in place of 1.4 million liters expected according to the contract.
- Again in 2008, the government mandated 5% blending in the whole country but due to non-availability of sugarcane it was implemented partially.

# Indian Scenario Revisited

- The National Biodiesel Mission, initiated development in biodiesel production in two main phase named demonstration phase (2003-2007) and self sustaining execution phase (2008-2012).
- In the first phase, the major focus was on jatropha cultivation, nursery development, seed procurement and installation of transesterification plants.
- The second phase was focused on large scale cultivation of jatropha as well as production of sufficient biodiesel for 20% blending by the end of the XIth plan (2008-2012). Both these phase were only partially successful due to some limitations in jatropha cultivation and availability.
- India targeted 20% blending by 2017.

- The government's ambitious plan of producing sufficient biodiesel to meet its mandate of 20 percent diesel blending by 2012 was not realized due to a lack of sufficient *Jatropha* seeds to produce biodiesel.
- Currently, *Jatropha* occupies only around 0.5 million hectares of low-quality wastelands across the country, of which 65-70 percent are new plantations of less than three years.
- The central government and several state governments provide fiscal incentives for supporting planting of *Jatropha* and other non-edible oilseeds.
- Several corporations, petroleum companies and private companies have entered into a memorandum of understanding with state governments to establish and promote *Jatropha* plantations on government-owned wastelands or contract farming with small and medium farmers.
- However, only a few states have been able to actively promote *Jatropha* plantations despite government incentives.



# GROWING UP HUNGRY

Around **800 million people** – one in nine across the globe – do not have enough food to eat every day.



INFANTS )



CHILDREN )



ADOLESCENTS )



ADULTS

An estimated **27% of adolescents** in developing countries are **iron-deficient.**





Severely malnourished girl Rajni, 2, is weighed by health workers in Madhya Pradesh, India, February 1.  
BY REUTERS



Adnan Abidi / Reuters

Four-month-old Vishakha, who weighs 2.3 kg (5 lbs) and suffers from severe malnutrition, rests on a bed next to her mother at the Nutritional Rehabilitation Centre, Shivpuri, Madhya Pradesh, India on February 1.



**1 in 10** older people\*  
are suffering from or are at risk of  
**malnutrition**



 MALNUTRITION  
TASK FORCE

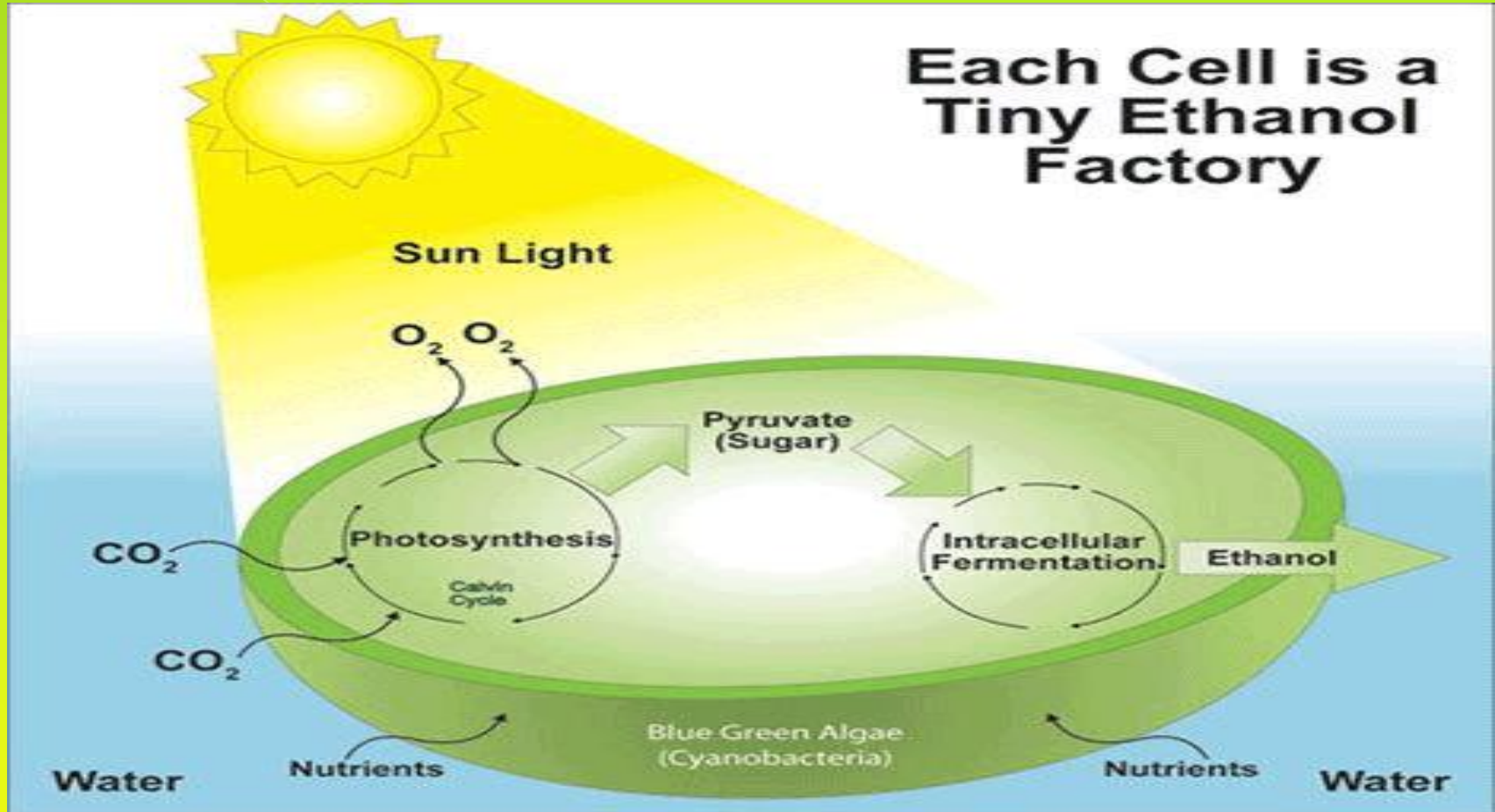
[www.smallappetite.org.uk](http://www.smallappetite.org.uk)  
\*over 65 in England and Wales (2007)



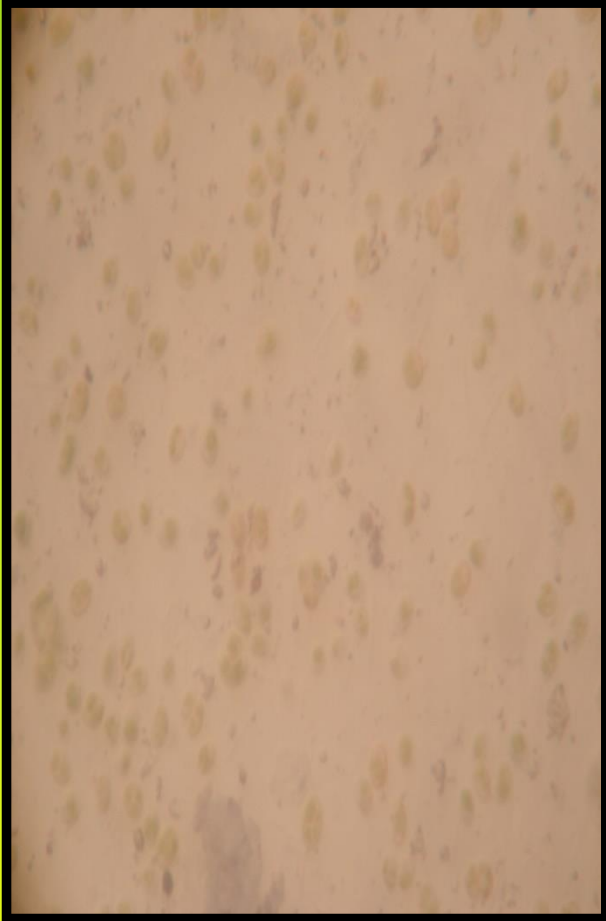
India is home to 194.6 million undernourished people, the highest in the world, according to the annual report by the Food and Agriculture Organization of the United Nations released on 28<sup>th</sup> May. This translates into over 15 per cent of India's population, exceeding China in both absolute numbers and proportion of malnourished people in the country's population.

# Microalgae as ethanol factory

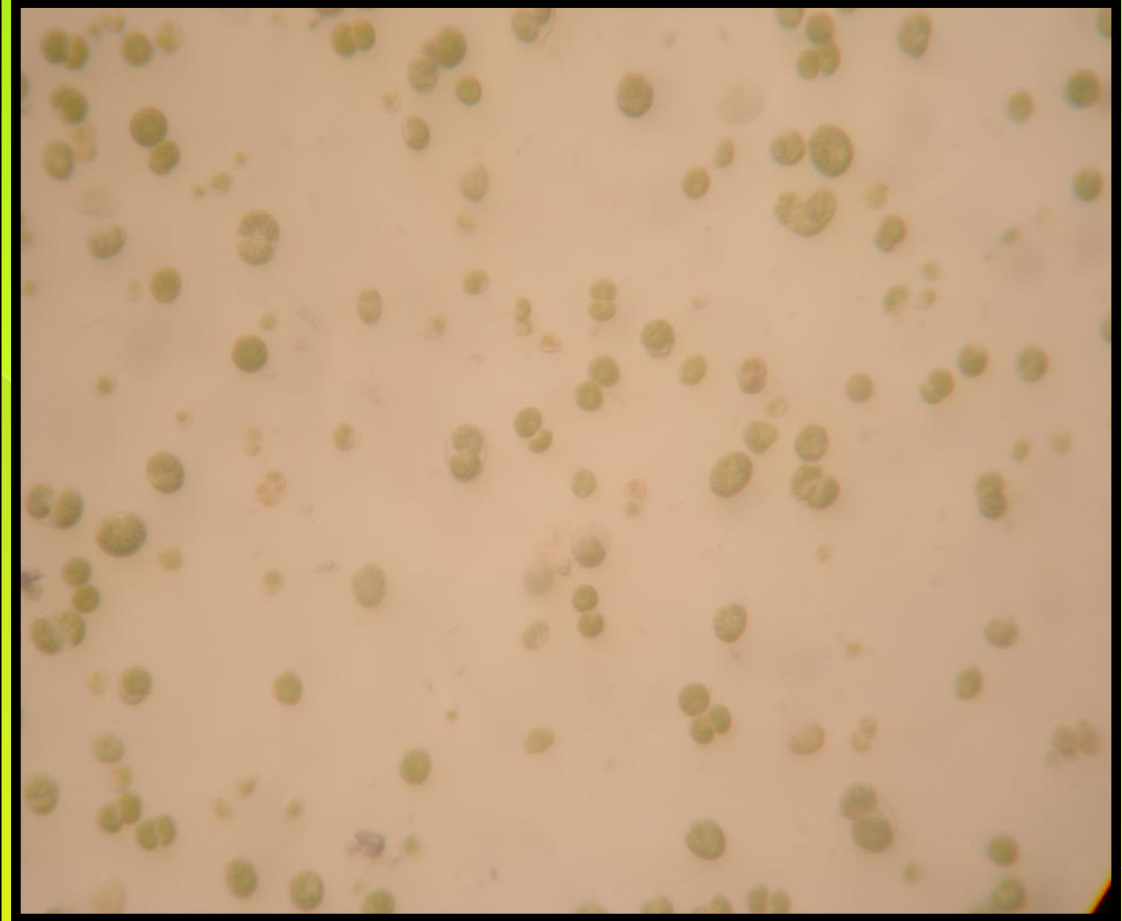
Algae-based bio-fuel is a promising energy source that is in the latter stages of development.



# *Chlorella pyrenoidosa*



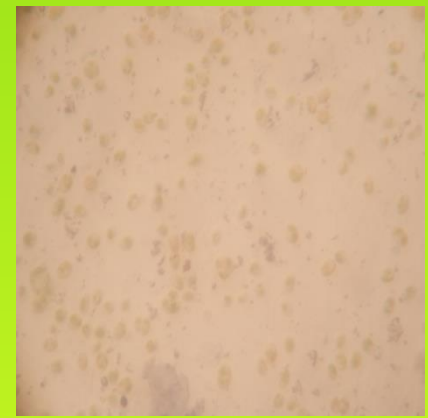
Under 45X



Under 100X

**Chlorella as seen under microscope**

# *Chlorella pyrenoidosa*



- *Chlorella pyrenoidosa* is a species of freshwater green algae genus Chlorella. It occurs worldwide.
- The species name pyrenoidosa refers to the presence of a prominent pyrenoid body within the Chlorella chloroplast
- The pyrenoidosa specie have been used in traditional Chinese medicine.
- This algae was used in a 1961 study by Boeing to see about feasibility for the use of algae providing oxygen on space missions.

# Objectives

- Sample collection from sewage treatment plant.
- Algal isolation by step dilution method.
- Identification and culturing of *Chlorella pyrenoidosa* sp.
- Maintenance of algal Culture.
- elucidate the simultaneous effect of different wavelength of light i.e. (red-650-680 nm and blue-420-470nm) and different conc. of  $\text{KNO}_3$  on cell growth and lipid content in *Chlorella pyrenoidosa*.

# Contd.

- ⊙ Extraction of oil by Bligh and Dyer(1959) method.
- ⊙ Further analysis of oil like
  - saponification value
  - iodine value,
  - acid value