

# Utilization of Contaminated Substrates for Boosting Bioeconomy, A Cascading Approach

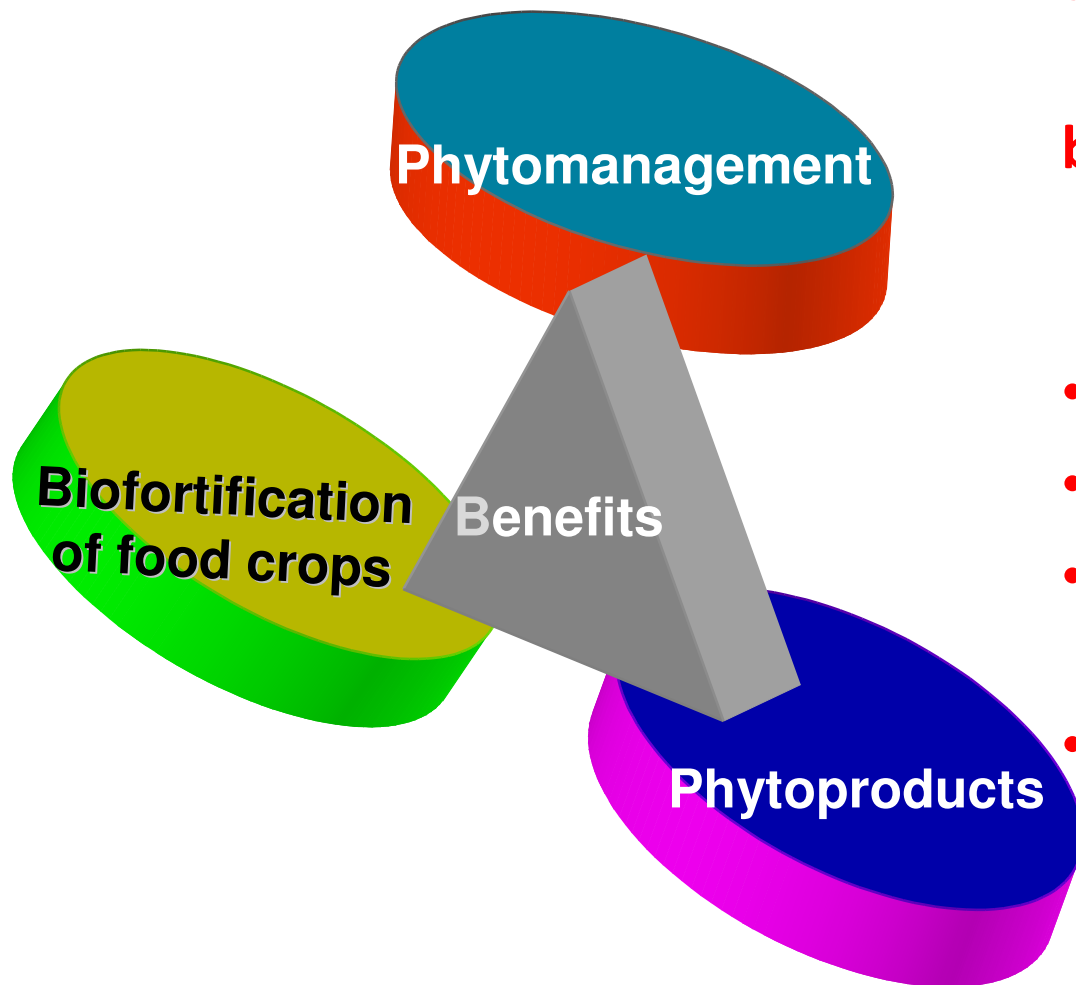


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# Benefits of plants used in phytomanagement, provided fast growing with high bioproductivity

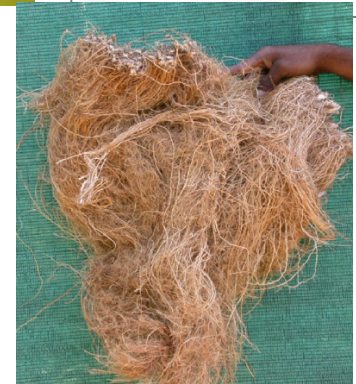
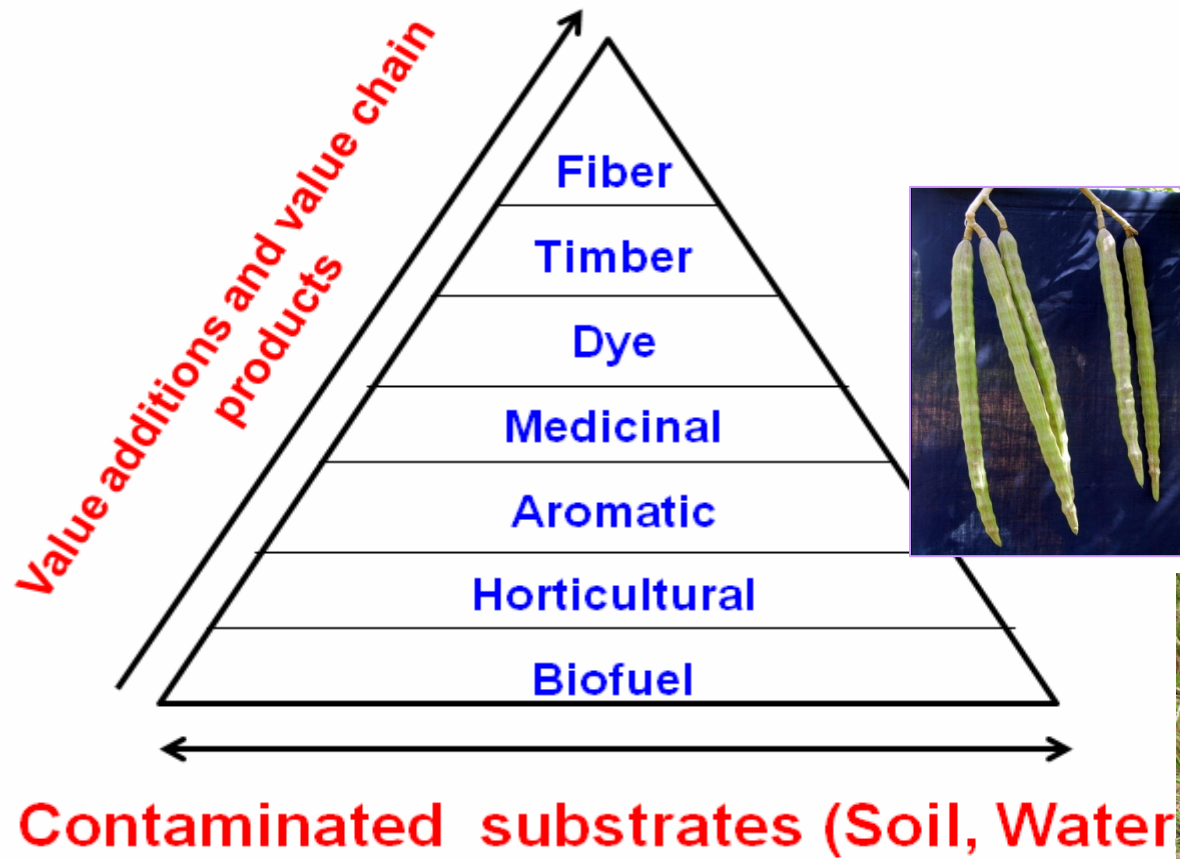


- a) Globally Land Resources are under immense pressure
- b) The pressure on available land resources is also increasing because:
  - Land degradation
  - Population explosion
  - Global Economic Development
  - Urbanization

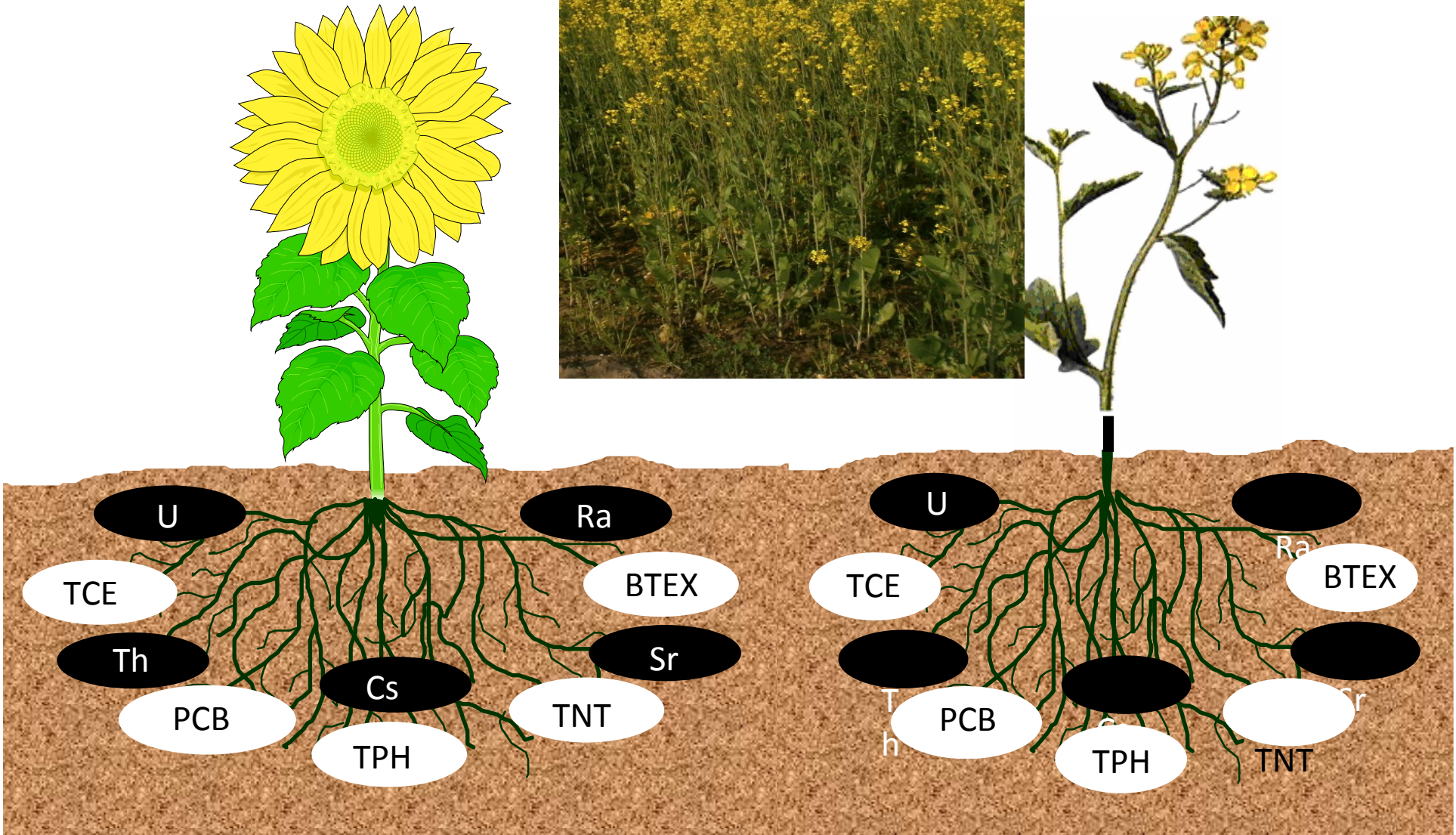
**This presentation will focus on usage of contaminated land and waste water for economically important products**



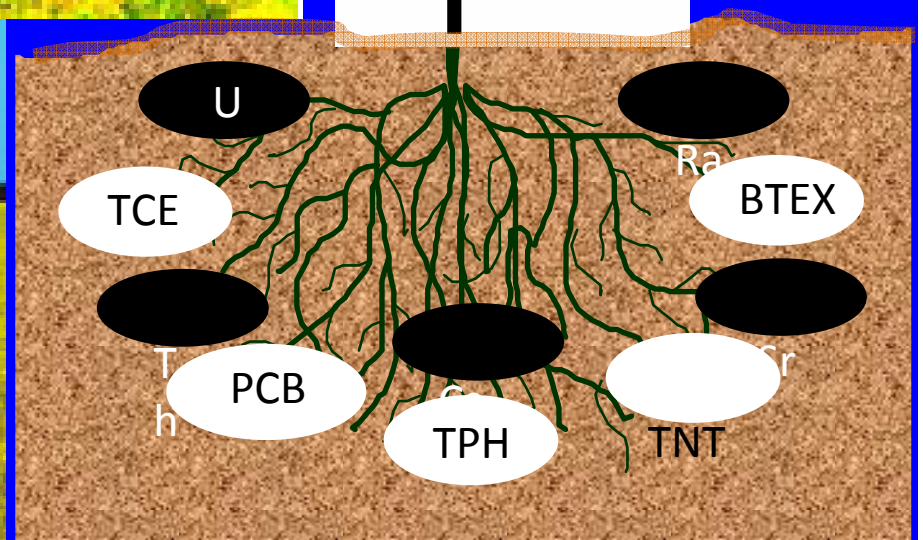
# The New Innovation Wave

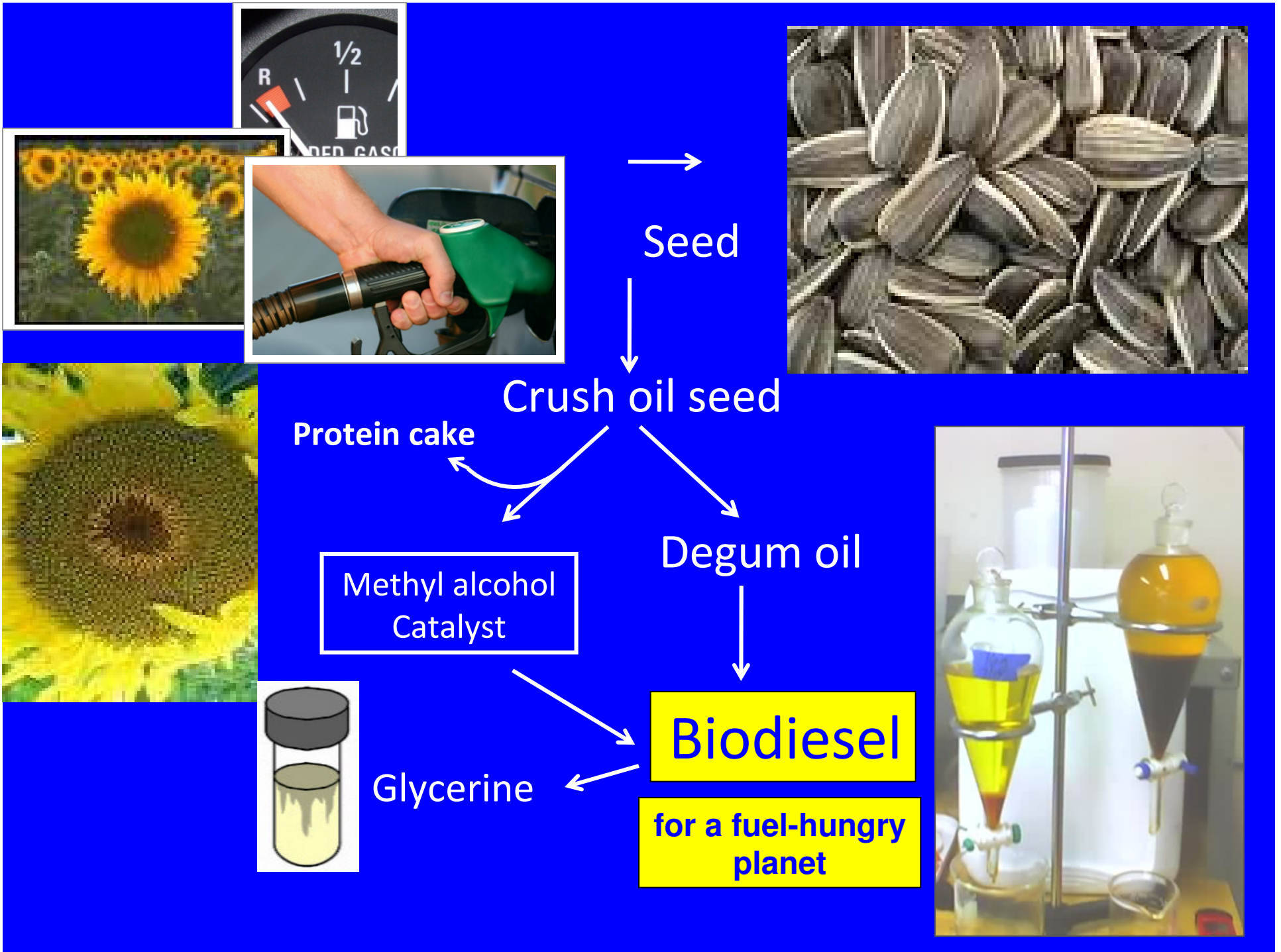
























*Vetiveria zizanioides*







*Perfumes*



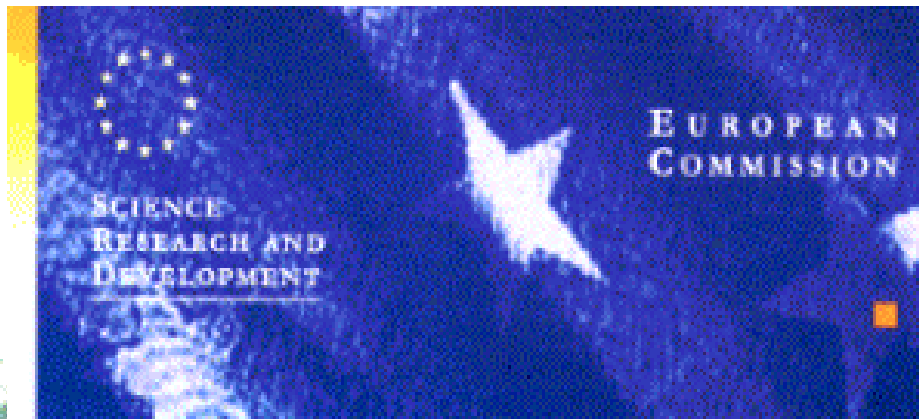




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## Environmental Crops

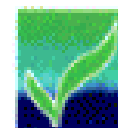
**Kenaf**



General Information

*Crops for  
industry and energy  
in Europe*

## Environmental Crops



Env. Chair (EBC) (EBC) (EBC)



***Morus alba* on coal mine over burden**







***Prosopis juliflora* accelerates nature cure of contaminated sites**















# Charcoal increased soil microbes (PGPR) in the fields







**Gumgaon, Manganese Mine in Central India – Vegetative Capping by Bamboo**





## Bamboo Charcoal powder for removal of heavy metals

☞ The use of activated charcoal is considered to be the best currently available technology for removing low-solubility contaminants in water treatment.

☞ Operational cost is low.

☞ Therefore, *Melocana baccifera* raw charcoal (MBRC) and *Melocana baccifera* activated charcoal (MBAC) were evaluated as adsorbents for the removal of heavy metals such as Pb, Cd, Ni, Zn and Cu from aqueous solutions through biosorption.



Charcoal kiln



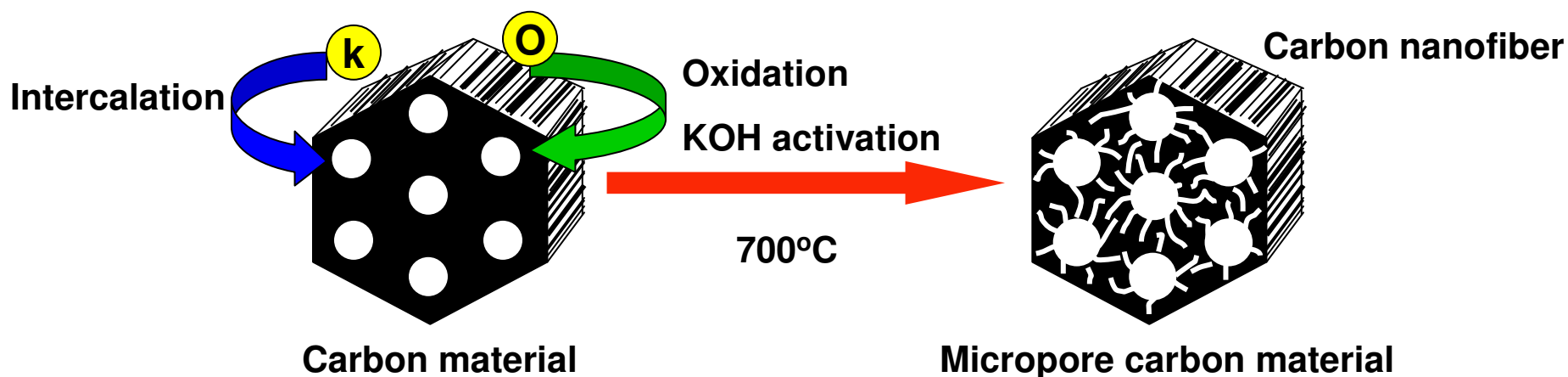
Bamboo charcoal





H. Lalhruaitluanga, M.N.V. Prasad, K. Radha, (2011)  
Potential of chemically activated and raw charcoals  
of *Melocanna baccifera* for removal of Ni(II) and  
Zn(II) from aqueous solutions. *Desalination* 271  
301-308.

H. Lalhruaitluanga, K. Jayaram, M.N.V. Prasad,  
(2010) Comparative study of raw and activated  
charcoals of *Melocanna baccifera* Roxburgh  
(bamboo) as an adsorbent for the removal of  
lead(II) from aqueous solution. *Journal of  
Hazardous Materials* 175 311-318.



**Pictorial representation of the formation of micropores in the carbon  
upon activation with KOH**





***Trapa natans* profuse growth**



**Water chestnut fruits**



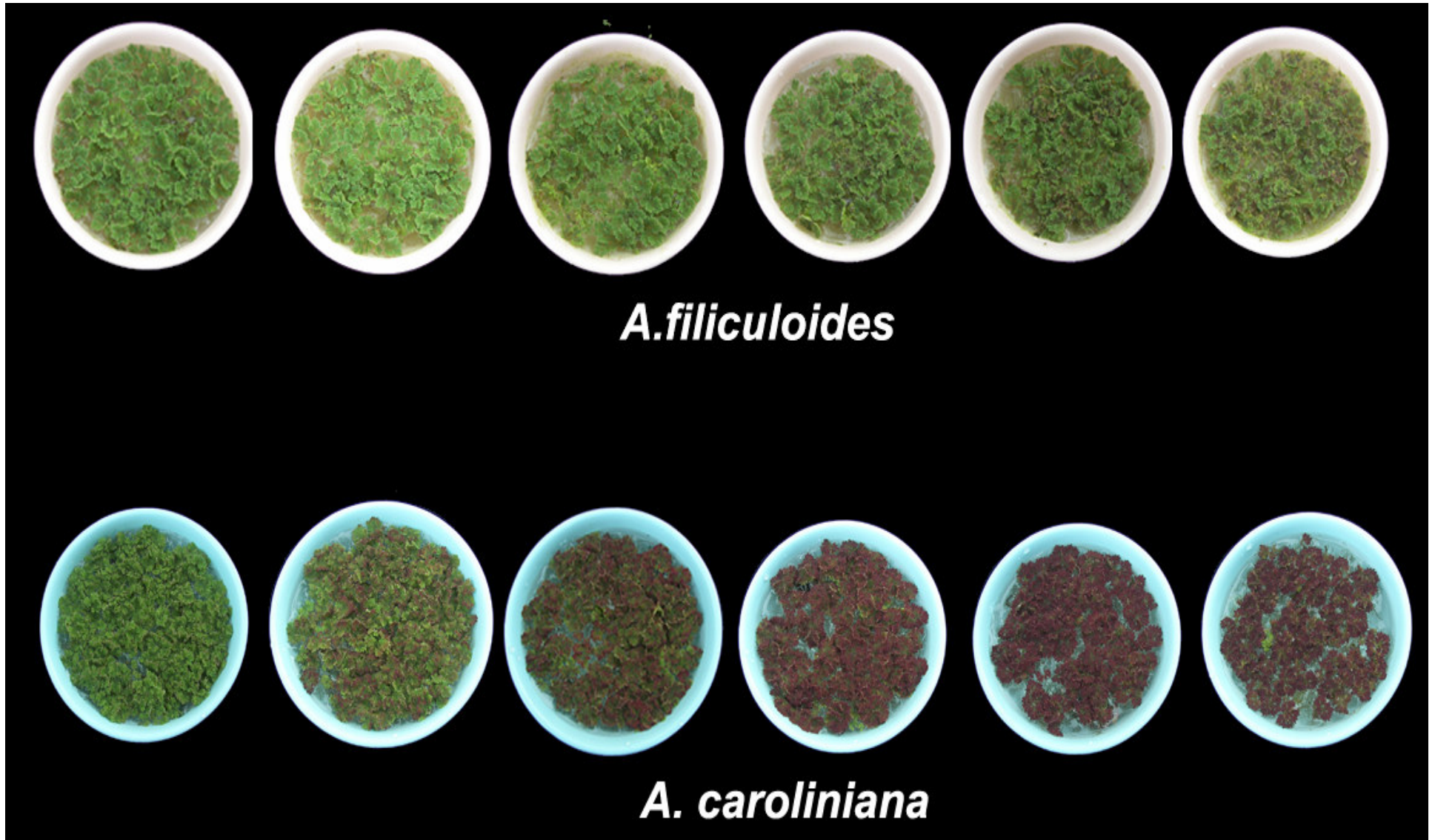
**Floating water chestnut**



**Mature fruit**

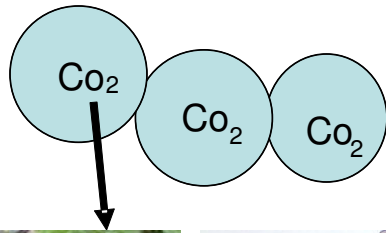


# **Azolla**

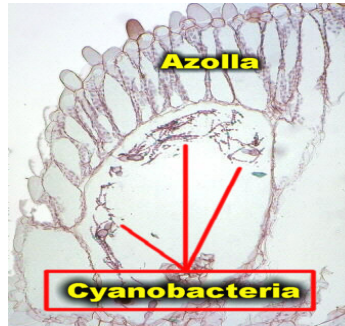


**These two strains differ greatly in biomass and anthocyanins**





## Duckweeds, “tiny titans”, highly nutritious food stuff



Combating global warming

Reducing As and Cd uptake in rice ??



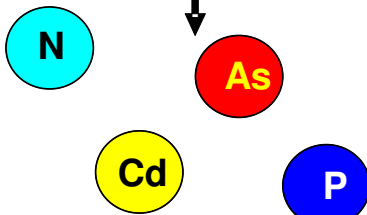
Animal Feed

Fast growth

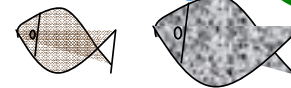
High protein



Water Purification

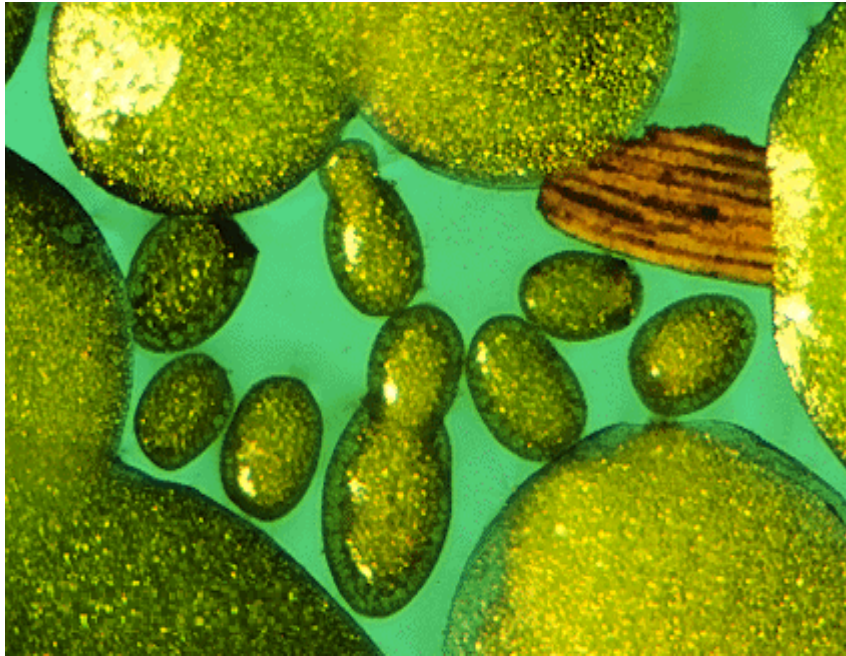


Curtailing eutrophication





## Duckweeds, “tiny titans”, highly nutritious food stuff













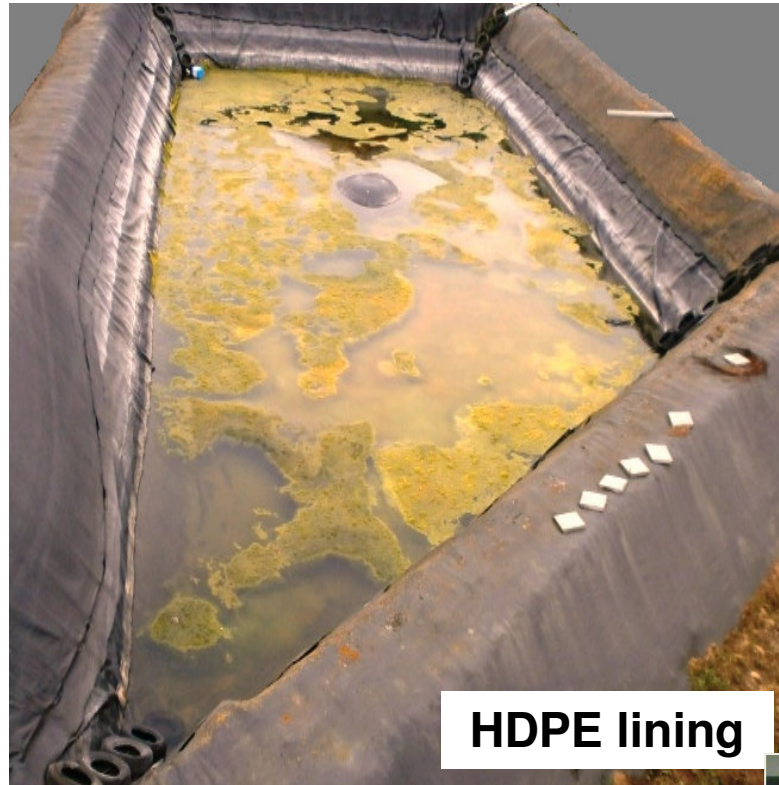
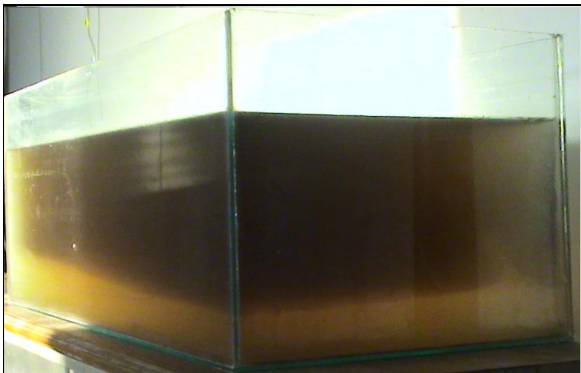
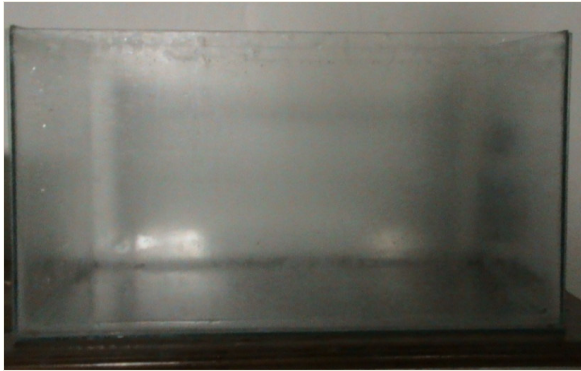






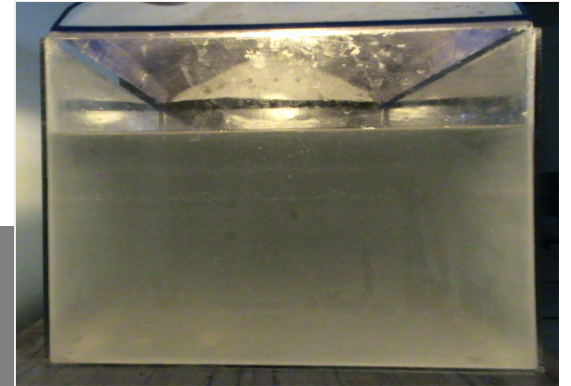
**Aquatic weed waste into biogas**





**HDPE lining**

**Wastewater  
High Rate Algal Pond [HRAP]**



**Biodiesel  
from Algae**





MSW dump site Jawaharnagar  
in Greater Hyderabad





