

# Rural Innovations for Sustainable development

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# Introduction

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- Innovations for creating wealth
- Innovations in farming and rural employment
- Both possible through energy from agriculture
- Energy and food security to be maximized
- Energy is the basis of life. Lack of it produces economic stagnation and social upheavals
- Energy from agriculture will provide rural wealth and create employment. Can bring 60% marginalized people into mainstream India, without which India cannot become an economic superpower

# Energy from Agriculture

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- India produces ~ 600 million tons of agri. residues per year. Waste disposal problem and hence mostly burned in fields . Creates environmental pollution and loss of energy.
- From special crops and residues we can produce three types of fuel
  - Liquid fuels like ethanol, biodiesel or pyrolysis oil.
  - Gaseous fuel like methane (biogas).
  - Electricity via biomass-based power plants.
- Can take care of major fuel requirements of India.
- In any agriculture 25-40% of produce is food and rest are residues. No remunerations from residues, hence farming is uneconomical. No industry can survive on such norms.
- Residues for energy can give an extra income of Rs. 2000-4000/acre/season to the farmers. Insurance against distress sale.

# Energy production (cont..)

- Residues can produce 156 b l/yr of ethanol which is 42% of India's oil demand in 2012; or 80% of oil demand via pyrolysis oil; or 80,000 MW of electric power (50% of installed capacity).
- Can provide 120 million jobs.
- With increased industrial demand for fuel and electricity large tracts of farmlands may come under fuel crops only.
- Food vs. fuel debate. Need to do R&D on multipurpose crops.
- NARI's pioneering work on sweet sorghum.
- Farms and farmers are the backbone of any nation since they can produce food, fuel and wealth from the land. Innovations needed for them.



# Innovations in cooking and lighting

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- Increased wealth through energy production from agriculture is the engine of development.
- High technology needed to provide energy devices in rural areas.
- High technology provides increased efficiency of devices so useful outputs are obtained from dilute forms of energy.
- Around 75% of total energy is used in rural cooking and lighting. Innovations in these areas can improve the quality of life.

# Cooking/lighting on ethanol

- Only renewable liquid and gaseous fuels can provide clean household energy.
- 50% ethanol/water mixture. Easy to distill and very safe household fuel.
- Stoves and lanterns developed.
- Stove 2.5-3 kW capacity. Like LPG stove with high and simmer settings.
- Lantern output = 100 W bulb light.
- Need to change draconian excise laws.
- [www.nariphaltan.org/ethstove.pdf](http://www.nariphaltan.org/ethstove.pdf)



# Biomass Gasification

- Loose leafy biomass gasifier.
- 500-800 kW (thermal) capacity. Controllable flame.
- Cleaning of gas still a problem.
- <http://nariphaltan.virtualave.net/Gasifier.pdf>



# Environmentally sound transport

- Electric cycle rickshaws
- Trikes for handicapped
- Electric auto rickshaw.
- <http://nariphaltan.virtualave.net/MAPRA.pdf>



# Availability of devices in rural areas

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- “Cell phone model” to be used. Provides an important function for communication in rural areas. Is robust, very high tech, low cost and good after sales service. So are human beings!
- Biomimicry should be the mantra for rural R&D.
- Need for corporate world, civil society (S&T NGOs) and rural population to work together.
- Innovations are needed in corporate/NGO partnership. NARI/NFCL example.

# Role of Corporate World

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- Corporate World should be directly involved in rural development. Have managerial and other resources.
- In energy production via renewables:
  - Power production
  - Utilities for liquid and gaseous fuels. Fuel production either with dedicated crops or residues
- Water utilities in a village using rain water harvesting and supply for both irrigation and household uses. Need for water Act similar to Electricity Act.
- Need to look beyond business and financial gains only. Rural energy industry could be Rs.50 K cr/yr.
- Need to reduce profit margins for rural work.

# Corporate World (cont..)

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- In this era of enhanced communication, creation of rural wealth is in the interest of corporate India.
- The captains of corporate world need to reduce their consumptive lifestyle. It is unsustainable.
- A decent lifestyle is possible with energy consumption of 50-70 GJ/person/yr. In India avg. consumption is 18 GJ/person/yr. In US it is 350 GJ/person/yr.
- If every citizen of the India follows US lifestyle we will need all the resources of the world to sustain it.
- Spirituality can help in curbing the greed and making us sustainable.
- Becoming sustainable in our personal lives and giving something back to the society will help India become a holistic and sustainable country.

# Thank You

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## Useful sites

- [www.nariphaltan.org](http://www.nariphaltan.org)
- [www.nariphaltan.org/writings.htm](http://www.nariphaltan.org/writings.htm)  
(articles on spirituality, technology and sustainability)
- [www.nariphaltan.org/langmuirrural.pdf](http://www.nariphaltan.org/langmuirrural.pdf)  
(an article on use of high technology for rural areas)