

Inclusive Innovation



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Innovation for whom?

- ❑ Inclusive Innovation is to improve the quality of life of BOP.
- ❑ Even 70 years after independence almost 60% of rural population (~ 100 million rural households) have primitive lifestyle.
- ❑ Hardly any electricity, cook on biomass stoves, no clean drinking water, lack toilets and very few avenues of gainful employment.
- ❑ Rural poor in India are some of the most malnourished in the world. Need for innovative solutions to feed them.
- ❑ 30% of the world's poorest live in India. Modern technology has not touched their lives. There is another India with space ambitions.



What needs to be done?

- ❑ **Improve quality of life for rural poor**; one hut at a time. Need per household 1220 kWh/yr electricity for fans, lights, refrigerator and transport; and 260 kg/yr LPG. Can put them in the bracket of middle class.
- ❑ **Provide excellent rural livelihoods** via high-tech farming.
- ❑ **Get the best brains in the country to engage in rural development.**
- ❑ India Inc. survives because of rural areas. They help provide food. We cannot survive on nuts and bolts or software!
- ❑ India can only become a great nation when the 60% rural poor become middle class. **Roadmap for rural India.**

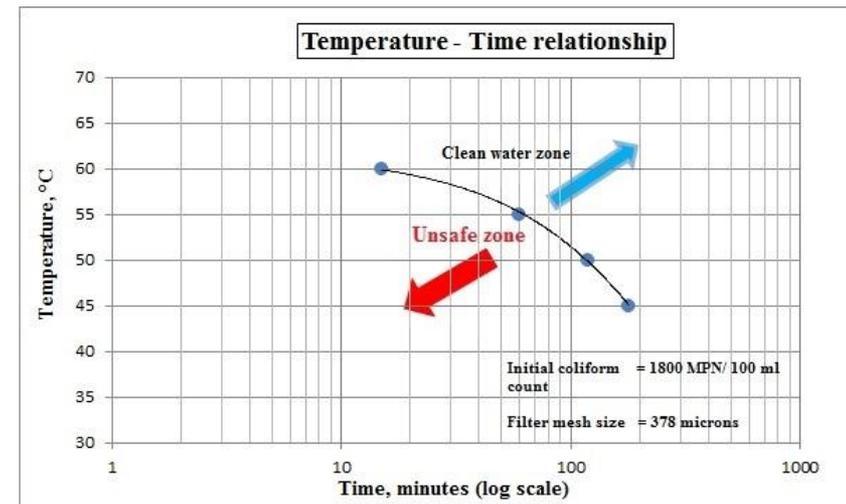
Lighting up lives - one hut at a time

- NARI's lanstove.
 - Provides excellent light ~ 2500-3000 lumens.
 - Cooks a complete meal for a family of 5. Produces 10 liters of potable water. Runs on kerosene and diesel.
 - No smoke, no smell, CO and particulates < WHO standards. Tested in 22 huts in 5 villages near Phaltan. As clean as LPG.
 - LCA on lanstove shows it is 5 times better than electric cooking and lighting.
 - Problems of kerosene availability; diesel as fuel ?
- **Challenges**
 - Heat-opaque glass needed
 - TE unit to charge cell phone; 5-7 W
 - Need an efficient fan. Max airflow/W
 - Renewable liquid fuel from agricultural residues



Potable water and refrigeration

- ❑ Filtering dirty water through 4 layers of cotton sari and heating it to 60°C for 10-15 minutes or 45°C for three hours inactivates all coliforms.
- ❑ Use of solar tubular water heaters. 99.5% times in a year water temp $> 50^{\circ}\text{C}$.
- ❑ Hot water can also be used to produce ice for refrigerators via absorption system.
- ❑ **Challenge**
 - Efficient abs/ref pairs needed.
 - Low cost ATM for water and ice.
 - Efficient ice box as refrigerator.

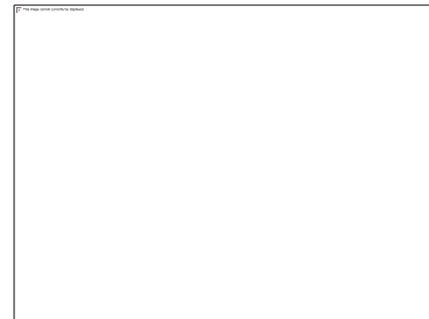
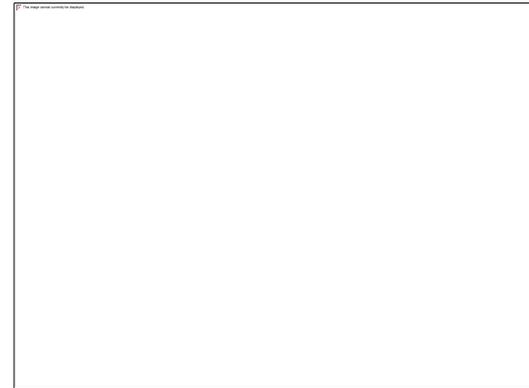
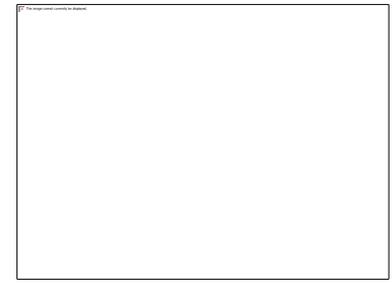
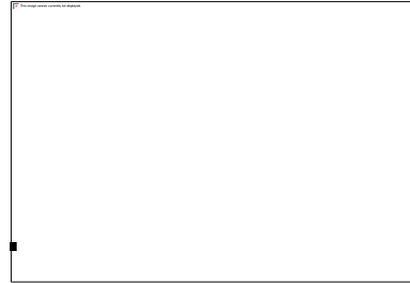


Wholesome food for rural poor

- ❑ After a hard day in the field the woman is in no shape or mood to cook. Very tiring and unpleasant chore.
- ❑ Tremendous pollution in rural households.
- ❑ Very poor nutrition. Daily rations are bought from PDS shops. If not available they tend to eat less.
- ❑ Poor eating and hence rapid aging and poor physical and mental health.
- ❑ Creation of rural restaurants. Regular ones but for BPL families subsidized meal at Rs.10 per person. Use of UID card for meal purchase.
www.nariphaltan.org/ruralrestaurants.pdf
- ❑ Good CSR activity.

Agriculture

- Safflower
 - 40% of total varieties from NARI. Our varieties grown in ~10,000 acres (2015-16).
 - Oil from seed and petals as herbal tea. Saffola oil.
- Sweet sorghum
 - Introduced in India in 1970s
 - Food (grain and syrup), fuel and fodder simultaneously
 - Madhura variety tested in 2 dozen countries
- Whole plant approach



Sheep breeding

- ❑ Isolation of FecB gene from Sundarban garole sheep
- ❑ Introduction in local Deccani sheep for twinning
- ❑ 200 Nari Suwarna rams given to Govt. of Karnataka. Also given in AP, TN and Maharashtra.
- ❑ AI center and sophisticated facilities at NARI for semen freezing and R&D
- ❑ Joint collaboration between NARI, UNE (Australia) and NCL



Rural livelihoods

- ❑ 80% of rural population involved in farming.
- ❑ 80% of farms in India < 2 ha size.
- ❑ Farm productivity in India lowest in the world and ~ 33% of the world's best.
- ❑ Farming is non-remunerative and farmers' children do not want to farm. Farmers' suicides.
- ❑ Large areas of farmland are being sold to builders.
- ❑ Poor support price by GOI and import of food.
- ❑ Proper farming policy can protect farmers and increase food production.
- ❑ Wealth of the country comes from its land. Inclusive innovation needed in farming.

Precision farming

- ❑ Precision farming(PF) for small farms can increase productivity and make farming glamorous.
- ❑ Precise and timely input to the crop. Robots-based. www.nariphaltan.org/precisionagriculture.pdf
- ❑ Container agriculture? Useful for vegetables and fodder.
- ❑ May also help to usher in Fourth Industrial revolution for rural areas. www.nariphaltan.org/FIR.pdf
- ❑ **Challenges:**
 - Cheap drones with camera for disease and stress identification.
 - Affordable and efficient drip irrigation systems.
 - Robots for planting, weeding and harvesting.
 - Farm machines to run on farm-derived fuel.
 - Venture funds needed for leasing farm machinery.

Precision farming.....

**My dream for
Indian farmer**

**Farmer should
become a breeder**



Best brains for rural development

- ❑ Excellent engineers, scientists and managers needed for inclusive innovation.
- ❑ Innovation ecosystem does not exist in Indian education system. Focused on passing exams.
- ❑ Students are bright but education system broken. Need to implant innovation bug in school and colleges. Innovative teaching methods needed.
- ❑ Precision agriculture, 3D printing, etc. for rural applications may spur bright students to be engaged.
- ❑ Need venture funds for rural startups.
- ❑ Good funding for rural internships in S&T NGOs. PM fellows?
- ❑ Social entrepreneurship provides excellent opportunity for young students to do something worthwhile with their lives.

Need to put our house in order

- ❑ Reduce our greed for resources and money. Preach what we practice.
- ❑ Spirituality helps in sustainable living.
- ❑ Need to approach inclusive innovation as higher calling. Money should be secondary.
- ❑ Giving back to society produces happiness.
- ❑ Rural poor do not have a single neuron less than us and aspire to improve their quality of life just as we do. Inclusive innovation is just that.
- ❑ Story

Thank you

- Useful sites
 - www.nariphaltan.org
 - www.nariphaltan.org/roi.pdf (Romance of Innovation book)
 - <http://www.nariphaltan.org/engeducation.pdf> (What ails engineering education in India)
 - www.nariphaltan.org/writings.htm
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