

INNOVATION SYSTEMS APPROACHES

Where We Are Today

Professor Lynn K. Mytelka
UNU-MERIT

CTA 13 November 2013

INNOVATION

Innovation is the application of knowledge by firms and other actors to the production of goods and services that are new to them - irrespective of whether they are new to their competitors, their countries or the world.

INNOVATION TAKES MANY FORMS

- Radical Changes at the Frontier of Knowledge
- A wide range of small changes within a firm that collectively
 - Modify Products and Processes
 - Reduce Costs/Increase Efficiency
 - Ensure Environmental Sustainability
- Where new technologies are based on multiple knowledge bases, innovation frequently involves learning through collaboration in networks and consortia.

Innovation Systems Approaches

- Share an understanding of innovation as something more than simply the purchase of new machinery and equipment,
- View innovation as a **socially embedded process with habits, practices and norms that are acquired at one point in time and may no longer fit a period in which changes are taking place along many dimensions** -- production and consumption patterns, knowledge, skills and organizational forms,
- For policy to be effective, established **habits, practices and norms of the actors in the innovation system** eg. enterprises, governments, consumers, research organizations and others who stimulate & support innovation processes, must be taken into account.

Innovation and Development

Until recently developing countries were regarded as “Technology Users”, reliant on imports of technology from abroad, as opposed to being “Technology Producers” and “innovators” in their own right. As outsourcers they competed not on the basis of innovation but on low wages and thus continuously face competition from even lower wage countries.

For some this has changed, as the Korean **Auto & Electronics** industries, Cuban **Pharmaceutical** industry, Indian **Pharmaceuticals** and **Software**, **aeronautics & biofuels** in Brazil & other **natural resource industries** -wine in South Africa, Chile & Argentina & Flowers in Colombia illustrate.

Looking Ahead

We are now entering a period with the need for still newer types of knowledge and innovation –as we move towards an energy transition.

In the Global Energy Assessment (2012) we began the process of analyzing the many different pathways that could lead towards an energy transition and explored how developing countries could link this process to innovation & to sustainable and inclusive development.

Too often some of our critics saw these objectives as ‘either’/ ‘or’ propositions. This results from the short term perspectives that dominate contemporary policy making and create barriers to change processes.

Linking Energy Transitions, Innovation , Sustainable and Inclusive Development

1. New Thinking About the Process of Change
The Case of Agriculture
2. New Tools to aid in making choices
about change.

Creating New Linkages

One of the most important links between clean and sustainable energy, on the one hand, and transport systems and inclusive development on the other, is their link to agriculture.

From this perspective, agriculture becomes less part of the problem, as the earlier development literature would have us believe, and more a part of today's solution. The case of biofuels is illustrative.

RETHINKING BIOFUELS FROM A Multi-goal & Long Term Perspective

Biofuels have been praised as a means to provide energy and reduce greenhouse gas emissions, and criticized for contributing to the destruction of tropical forests & competing with food crops for the use of agricultural land. *Jatropha* is an important feedstock for biofuels because it can grow on marginal land and in arid environments unsuitable for food crops (UNEP,2009). It is also a good candidate for small holder production

The Case of Jatropha in Garalo, Mali

In 2007, rather than rely on imported diesel fuel for a future off grid generator, the villagers of Garalo chose to plant Jatropha on 440 hectares of their land as part of a multi-goal project to stimulate rural development

- By providing electricity for lighting, refrigeration, welding & agricultural processing machinery for use by businesses, workshops, health services, schools,
- reducing the cost of the village water pumping systems by replacing the diesel genset then in use with electricity from a local mini-grid they planed to build. **This grid now has over 300 paying clients.**

A Participatory Approach

Much of the success of this project lies with the farmers who played an important role in the decision to plant jatropha and in the design of the project.

They chose to intercrop Jatropha and local food crops such as maize, sorghum and beans – thus showing that it was not necessary to make either/or choices between food and fuel.

They also developed and sustained close links to research Institutes relatively nearby and this has led to considerable follow-up experimentation and local learning as well as improved methods of intercropping.

The Limits of Jatropha

The problem with using jatropha oil for fuel arises when it is reconceptualized as an export commodity. Up scaling the smallholder model for large-scale production of biodiesel fuel for the domestic market, and even more so for export can have unexpected impacts on inclusive development.

First, the assumption that jatropha is a low cost, low-input crop that grows virtually by itself is problematic in the context of upscaling. Research in India shows that the price of jatropha depends on increasing the yields, which in turn requires improved seeds, water and fertilizer. (Altenburg et.al.2008). Failure to reach anticipated yield levels has led to the abandonment of a number of joint ventures in India (Dogbevi,2009a:2006). Similar problems have emerged in Ghana.

Second, movement towards mass market and export activities requires a quite different management and often ownership, model that increases uncertainties associated with global pricing trends and limits the role Jatropha can play as a driver of local development, especially for small holders.

New Tools And New Habit & Practices

Overcoming Path Dependence

Metrics for Transitions

The Challenge of Path Dependence

Path dependence is the tendency for past practices and decisions to shape present choices.

It is reflected, in engineering beliefs about what is feasible, business perspectives on what is worth attempting, & government views on the choice of development trajectories to pursue.

It can emerge in contexts where earlier high sunk costs lead to habits and practices that are difficult to change .

The Tata Mundra project

- In 2008, the World Bank's International Finance Corporation approved a US\$450 million loan for the Tata Mundra project, designed to build five coal-fired power plants in the Indian state of Gujarat.
- The first of the Tata Mundra power plants was commissioned last year. It is expected to emit 40% less CO₂ than existing coal-fired power plants in India, but given the lifespan of these new plants, it will contribute “23.4 million tons of CO₂ per year” to the environment for the next 25–30 years (IFC, 2009).

Path Dependent Decision-Making

- Rashad Kaldany, then, IFC vice-president, justified this decision on the grounds that, in comparison with alternatives, such as wind or solar, which would require subsidies, this was by far the least expensive (Wroughton,2008).
- Taking traditional norms opposed to subsidies as the point of departure in making this choice, had the effect of eliminating many new or renewable energies from serious consideration, although India had already developed wind and solar industries.

NEW TOOLS FOR NEW TIMES

Traditional economic practices such as short-term static cost comparisons and a focus on the bottom line, then precluded taking into account longer term considerations, such as the future costs of retrofitting a plant with carbon capture and sequestration (CCS) technology, or the imposition of a carbon tax on coal-fired power plants, that might have altered the choice matrix.

From a development perspective, locating the new coal-fired plants on the coast & importing coal , when India has considerable reserves of coal, led, in 2012 to electricity shortages resulting from the rising costs of imported coal and inefficient domestic coal production & distribution practices.

Designing Policies in a Time of Transition

- Linking innovation system approaches to transition and inclusive development processes strengthens the relevance of both.
- Building capacity for research and supporting the uptake of research by users is a key step forward.
- Dialogues among all actors in the system are critical in effective policy making.
- Adopting a long term, multi-goal, systems perspective can build flexibility into policies and programs that are key to inclusive development and needed in times of transition.

THANK YOU