



# INNOVATION SYSTEM APPROACHES IN A TIME OF TRANSITION

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# 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.
- Clustering is also believed to offer unique opportunities for SMEs to engage in a wide range of linkages that stimulate and support innovation.

# Innovation System 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** that involves changes along many dimensions -- production and consumptions patterns, knowledge, skills and organizational forms,
- Recognize the need to take account of the **established habits, practices and norms of the actors involved** – enterprises, governments at all levels, consumers, research organizations and many others whose participation stimulates and supports innovation processes.

# Building Innovation Capacity

In the last quarter of the 20<sup>th</sup> century, changes in the global pattern of production and competition had important consequences for competitiveness around the world. Three changes stood out.

1. Production became more knowledge-intensive in high-tech sectors such as ITCs and the bio-economy.
2. Gradually the growing knowledge-intensity of production extended to reshape a broad spectrum of traditional industries.
3. Trade liberalization and the globalization of industry made it difficult for **earlier entrants** to compete with low wage newcomers unless they engaged in a process of innovation.

# **TEXTILES AND CLOTHING**

## **A CLASSIC EXAMPLE**



# Sustaining Innovation Capacity

- Surprisingly some of the 'old timers' are still among the major exporters in this Industry. This involved a continuous process of innovation.
- In Italy the boundaries of the knowledge system were reconfigured by establishing linkages to a wider set of knowledge inputs (dyes, new materials ) and traditional practices of collaboration among companies, transformed textile production domestically.
- Germany built upon its core strength in high-volume machinery and also continues to export textiles.
- France focuses on fashion and led the development of new markets by multiplying the 'seasons'

# 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.



## Bringing the Rest on Board

Transitions have been extensively discussed in the Innovation literature - in the past with regard to mobility, the advent of trains and cars, or the changes brought about by ICTs-- more recently to Energy Transitions,

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 commentators and critics saw these objectives in 'either' / 'or' terms. 'You can't have both' or as Margaret Thatcher would have said "TINA". I do not believe that this is the case.

# 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.
3. New Capacities for Carrying out change processes more effectively

# Creating New Linkages

One of the most important links between clean and sustainable energy and transport systems and inclusive development 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.

# RETHINKING BIOFUELS FROM A Multi-goal 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 250 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 dealing with the assumed need to choose 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

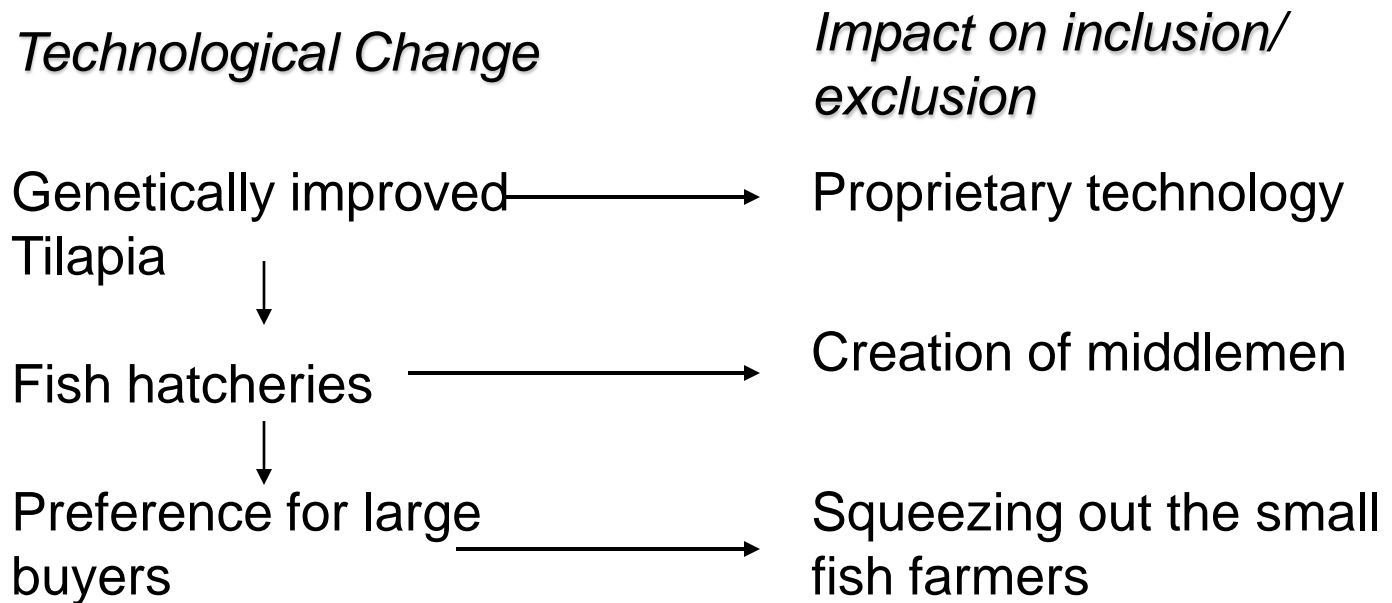
The problem with using jatropha oil for fuel arises when it is reconceptualized as an export commodity. Up scaling the smallholder model for large-scale production of biodiesel fuel for the domestic market, and even more so for export can have unexpected impacts on inclusive development.

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.

Unlike the Garalo project, many others have not been designed in a participatory manner nor do they take a long term perspective on change . Their negative impact on small holders could have been avoided.

### The gift fish project



What might have been done?



# New Tools

Overcoming Path Dependence

Metrics for Transitions

# **The Challenge of Path Dependence**

## **New Metrics for Clean Energy Solutions**

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

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

can emerge in contexts where earlier investments result in high sunk costs and lead to entrenched 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 CO<sub>2</sub> than existing coal-fired power plants in India, but given the lifespan of these new plants, it will contribute “23.4 million tons of CO<sub>2</sub> 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.

# A Repeat Performance: South Africa

➤ In 2010 the World Bank approved yet another loan for the construction of a coal-fired power plant - this time in South Africa. Once fully operational in 2015, the Medupi power station will emit 26 million tonnes of CO<sub>2</sub> per year (Duffy, 2010: 11). South Africa's Sasol is one of the world's major developers of Fischer-Tropsch based Syngas and Coal-to-Liquids processes.

➤ **As in India, path dependent decision-making in South Africa reduces opportunities for local innovation & the stimulus to move towards an energy transition.**

# NEW CAPACITIES

Research

Dialogues

Policy Learning

# Building Capacities For Dialogue

- Until recently, dialogues did not feature centrally in policymaking or project planning. Although they relate to the broader set of habits, practices and norms that affect innovation and transition process, they were not well established practices.
- Instead, the common approach involved a top-down, linear process in which the flows of knowledge and information were driven by governments, research or, business. These were of two sorts: Communication and Consultation.



# Communication, Consultation and Dialogues

- **Communication** is the transfer of information through the distribution of material, awareness- raising campaigns and formal training programs. There is little interaction.
- **Consultation** involves focus groups and stakeholder meetings that give the impression of being dialogues but in fact, they have pre-established boundaries that provide little opportunity for those consulted to express interests, needs or preferences not already on the agenda.
- **Dialogues**, in contrast, are interactive processes that offer room for the articulation of a broad range of views, interests, preferences and needs that are essential for confidence and consensus building. While dialogues do not solve problems, they do open channels for innovative ways to deal with them as case studies in Chapter 25 of the Global Energy Assessment illustrate.

# Designing Policies in a Time of Transition

- Linking innovation system approaches to transition and inclusive development processes adds to the current value and strengthens the relevance of both.
- Understanding the habits and practices of actors in the system is essential for advancement along both trajectories. Dialogues among all actors are critical here.
- Adopting a long term, multi-goal, systems perspective & the new metrics this will need, can build flexibility into policies and programs that are key to inclusive development and needed in times of transition.

THANK YOU