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## Innovations for the poor by the poor

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**Abstract:** The concern for inclusive or harmonious development is being articulated worldwide. There is a belated realisation that for extreme affordability, there is no choice but to learn from green grassroots innovators and traditional knowledge holders. Honey Bee Network began scouting, spawning and sustaining innovations by knowledge rich-economically poor people more than 20 years ago. A database of more than 140,000 ideas, innovations and traditional knowledge practices has been pooled mainly from 500 districts of India and some other parts of the world. Blending formal and informal science has become imperative. Several new models have been proposed such as long tailored innovations, Kho Kho (relay) model, empathetic innovations, inverted innovations, and grassroots to global (g2G) to illustrate different dimension of innovations for the poor by the poor. The policy implications of these models have been drawn briefly besides explaining the conditions, which must be met for inclusive innovations.

**Keywords:** grassroots innovation; sustainable development; inclusive innovation.

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**Biographical notes:** Anil K. Gupta has been teaching at Indian Institute of Management, Ahmadabad for the last 30 years after serving in a bank for five years and institute of public administration for three years. He helped found Honey Bee Network, SRISTI, GIAN and National Innovation Foundation. In addition he is also a member of National Innovation Council which advises the Prime Minister of India and has served on several national and international advisory panels on innovations, biodiversity conservation and intellectual property right protection. He has received one of the highest civilian honour from President of India besides numerous other honours and awards. He teaches a course GRIT jointly with former President of India Dr. A.P.J. Abdul Kalam, besides several courses viz. shodhyatra, creativity, innovation, knowledge network, entrepreneurship (CINE), IPRs, institution building, technology management, etc.

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## 1 Introduction

Absurd as it may seem to a few, my argument mainly rests on the ability of economically disadvantaged people to trigger frugal, creative and ‘recombinable’ innovations that can stimulate creation of new pedagogies, products, and processes. Therefore, the model that I talk about is ‘sink’ to ‘source’ (Gupta, 2006). Such people are not ‘sink’ of our advice, or clients of corporate social responsibility (CSR), but given a chance, they can be a provider of solutions. These solutions may indeed need further value addition in some cases. But they provide models of extreme affordability and often nature friendliness. Why is it then that the designers of pedagogies and curricula, policies and programmes the world over neglect the need for learning from knowledge rich-economically poor people? Why are there so few papers on innovations by workers in organised and unorganised sector compared to managerial innovations (Macdonald, 1983; Gupta, 2007)? When even those countries which have suffered at the hands of colonial rulers, show disdain towards knowledge from below, I feel sad and a bit alarmed at the purpose of this persistent neglect. Is it that if we acknowledge the potential of such common people to solve local problems through their own genius in some cases, our policies and programs will have to be redesigned in a fundamentally different manner?

In India, the government will not be able to continue with its massive rural employment guarantee programme neglecting the *mental* work, stressing only on *menial* work. In Africa too, such neglect is rampant. Are we not the intellectuals and teachers who are mainly responsible for such biases in developmental thinking? After all, we create the legitimacy for such thinking. Recently, a survey supported by GE concluded, “The barometer, an independent survey of 1,000 business executives in 12 countries, found that the greatest innovations in the future will be those that help address human need, more so than those that simply create the most profit” (<http://www.stamfordadvocate.com/default/article/GE-s-innovation-barometer-shows-corporate-focus-984362.php#ixzz1CUboFLh2> downloaded on 29 January, 2011). At long last, it is being realised by the corporate world and announced at Davos that insular leadership will not work, the inclusive innovations are inevitable.

Lorentzen and Mohamed(2010) recently observed that “innovation research has acknowledged the importance of informal networks, including among non-firm actors. But this is, to date, a statement of faith and has not yet spawned much conceptual thinking or empirical analyses. Given the importance of actors other than firms who operate in contexts that cannot always and readily be described as markets, which emerges from the literature review, this may point to some problems researchers interested in innovation in LICs face”.

I hope I will be forgiven for saying that sensitive researchers like these also commit the same mistake, which they blame others of doing. They rightly bemoan that several anthologies of papers on innovations or handbook of innovations, ignore and neglect the innovation research in low-income countries. But have not they also failed to see the huge literature, which has emerged based on Honey Bee Network’s experience in the last two decades. Maybe the readers benefit by looking at few of the selected publications listed here on innovation and other aspects of survival under stress and local knowledge.<sup>1</sup> The work on grassroots to global (g2G) is also getting noted among those interested in fundamental change in society and I say that with full humility and consciousness about the contribution of thousands of my colleagues in the network

towards it (<http://www.utne.com/Politics/25-visionaries-changing-your-world-2010.aspx>, 17 December 2010, it is embarrassing to mention this list but still since it is lead by our hero Nelson Mandela, why not).

## 2 Inclusive development

If we use the transaction costs framework, we can recognise at least two kinds of costs, *ex-ante* and *ex-post*. The *ex-ante* transaction costs include the cost of searching information, finding suppliers, negotiating a contract and drawing up contract. The *ex-post* transaction costs include and monitoring and enforcement, in other words, compliance of the contract, side payments, costs of conflict resolution and if it does not work out, the cost of redrawing the contract. In the context of inclusive innovation model, we have to find out ways by which both these costs can be reduced so that barriers to entry and exit can go down and innovation partnerships can emerge between formal and informal sectors.

The *ex-ante* transaction costs include the cost of searching information, finding supplier, negotiation and drawing up a contract. The *ex-post* costs include enforcement of the contract and monitoring compliance, side payments or inducements, conflict resolution and if nothing works, the cost of redrawing the contract. If we look at the key stakeholders in the innovation value chain, i.e., innovators, investors, entrepreneurs, fabricators, regulators, certifiers, marketeers, designers and civil society groups monitoring the social, environmental and ethical impacts of the chain. It becomes obvious that an online database like that of Honey Bee does reduce the *ex-ante* transaction costs of several actors in the innovation chain. But, for many other actors, like designers and fabricators, much more precise information is required to forge connections and facilitate online or off line collaboration. Such a platform is still being developed. Besides the platform, one also needs the guidelines providing framework condition for collaboration among various actors. When we developed the concept of prior informed consent of the knowledge providers before taking up any further exercise, we kept a clause of the privilege of the innovator to change his mind at different stages of the value chain negotiation and development.

Thus, technically one can take consent in advance and then proceed with further actions. However, if we make allowance for learning over time, then we should accept that the consent given with limited information about the prospect of a technology may or may not be valid when a stakeholder has more information. Likewise, when National Innovation Foundation (NIF) helped in filing patents on behalf of the innovators, it did not automatically get stakes in the possible commercial returns from the future licensing. Filing patent in the name of grassroots innovators (often unaware of the technicalities of the intellectual property right regime) was a public policy support.

Later, a new concept of Technology Acquisition Fund has been set up to provide upfront compensation to the innovator before actual licensing or commercialisation has taken place. This enables the flexibility in pooling ideas, patents, and traditional knowledge to create new innovations and thus overcome the transaction costs involved in bringing about the convergence of interests in real time among actors located in different places. While the consent will still be required, it can only be at the final stage. The point is that transaction costs if not reduced, may be transferred to the weaker partner.

Despite the convention on biological diversity, the desert convention and many other international agreements, not many empowering instruments or institutions have emerged in the knowledge economy which strengthen the negotiation ability of the knowledge rich, economically poor people at different scales and in different geographies.

### **3 Models of innovations**

There is a general refrain in the literature on innovations that scale is a necessary condition for sustainability. By implication, some innovation which meets the needs of a small community and may not have large scale application has low ranking in the order of things. The ethics of exclusion of such segmented, scattered and small scale needs from the agenda of public policy or innovators is often ignored. Scale, I have argued should not become an enemy of sustainability (2009) ([http://www.ted.com/talks/anil\\_gupta\\_india\\_s\\_hidden\\_hotbeds\\_of\\_invention.html](http://www.ted.com/talks/anil_gupta_india_s_hidden_hotbeds_of_invention.html), 2009; also see my blog at HBR, [blogs.hbr.org/cs/2009/.../the\\_challenge\\_to\\_scaling\\_india.html](http://blogs.hbr.org/cs/2009/.../the_challenge_to_scaling_india.html), 11 May 2000). There are two concepts which have been developed to deal with different dimensions of such innovations. The first one is called the 'long tail of innovation' (Anderson, 2004). It implies that while few technologies will diffuse among a very large number of people, a large number of technologies will diffuse among very few people, sometimes one or two villages or individuals only. It is like an online portal of books where some books sell in large numbers but large amounts of books sell only a few copies of each. One would not go to a portal if it had only the best sellers. Aggregation of needs of large numbers of small communities can indeed generate a viable business model and a rich innovation eco-system. Honey Bee Network represents in many ways a long tail model of innovations. The 'long nose model' of innovation (Buxton, 2008) implies that an innovation developed much before time may take long before being accepted for mass application. In the long tail, the peak is on the left side of the curve, in the long nose, the peak is on the right side. To illustrate, the mouse was invented in the 1960's but became a mass consumption product when Windows 95 as a platform emerged offering a niche for large scale application of the mouse. Similarly, there are many grassroots innovations which are not being valued enough today but their value may be realised when the sustainability crisis becomes very severe. This is a pity because in the process, society loses an opportunity to improve the sustainability of life support systems for so long. The third model is when innovations themselves have little value unless blended with other innovations to meet emergent needs. Furthermore, these needs also may not be fixed.

The fuzziness of these needs would require a product which acquires its final shape in the hand of the users. In 1988, I argued for transfer of science for development and diffusion of technology (Gupta, 1989; Jaipur, 1994). The implication is that in conditions where users needs are highly variable and background conditions are also very heterogeneous such as in rainfed or dryland areas, developing a fixed technology for variable environment would not work. I call this a *long tailoring model*. The technology, unlike a readymade cloth, is not stitched according to the division of entire human community in six or seven categories of dimensions. While this division of entire humanity was useful to give birth to readymade garment industry, in the emerging era of

customisation, more and more people might like to have a higher fit between their needs and product design.

Another variation is an *autopoiesis model of innovation*, i.e., the ability of self-correction being embedded in the product design. In this model, an innovator develops a platform for technology on which various users in different conditions develop their own adaptations which have a flexible design to lend themselves for correction or refitting according to the user needs or usage pattern. A cushion on our chair often acquires a shape in which we sit and thus mimicks a peculiar angle at which we sit and distribute our load on it. If our posture is wrong and the cushion does not push us to correct it, then it is just an adaptive design. But, if it forces us to change our angle of incline and correct our posture despite variation in our body size and weight, then it becomes autopoiesis innovation.

While the above models have a bearing on different ways in which technologies evolve and diffuse, one could have similarly diverse models of motivation. Recently, in a study on motivations and triggers of innovations, Sinha (2009) identified several motivations which can lead an innovator to innovate. Apart from broad categories of extrinsic or intrinsic motivations, one can also explore the empathetic, competitive, collaborative and pioneering motivations for innovation. We also must appreciate the situation in which internalisation of the pain of third party can create internal stress leading to experimentation and innovation.

There are many innovators who did not suffer from a particular problem themselves but felt strongly about the suffering of others. Recognising others' pains and problems as one's own (*samvedana*), triggers what I call as *empathetic innovations* (Gupta, 2010). A very large number of grassroots innovations have been triggered by such empathetic interactions among the suffering community members and the trouble-shooter/s. The creation of eco-system for promoting such innovation has to build upon the compassionate human spirit. Just monetary incentives will not suffice, non monetary will have to be stressed and not just targeted at individuals but also groups (Gupta, 1995, 1999; Cottier et al., 1999). Various features may also be added in a technology to alleviate the pain of someone else. One can hypothesise that when empathetic motivations trigger innovations, the chances of it becoming a public good are higher. The research is underway as a part of IDRC supported project on Grassroots Innovations for Inclusive Development in India and China in which we are trying to map these motivations and incentives for diffusion.

In the absence of local language database, search cost of affordable solutions goes up for small farmers and pastoralists. If there is no database of engineering projects done by students, then small-scale entrepreneurs cannot find the potential applications they could use. Without distributed knowledge management platforms, originality like that of [www.Techpedia.in](http://www.Techpedia.in) cannot be promoted, collaboration cannot be forged. That's why Honey Bee Network (henceforth, The Network) database came up more than 20 years ago. It has helped National Innovation Foundation pool 140,000 ideas, innovations and traditional knowledge examples from 545 districts of India in the last decade (not all unique or distinctive of course) beginning with ten thousand such ideas a decade ago. Honourable President of India honour the outstanding innovators every two years. In fact, President Patil invited the Network to have an exhibition of grassroots innovations at President's Place during 11–14 March 2010, the first ever such invitation to creative common people by any head of the state. And this is not all. Former President of India, Dr. A.P.J. Abdul Kalam gives away the awards every year for student winners of ignite

competition organised by NIF (see [http://www.nif.org.in/ignite/ignite\\_announcement.php](http://www.nif.org.in/ignite/ignite_announcement.php) for awards given to creative children during last three years). A new model of *inverted innovation* is emerging through ignite, in which school children ideate, engineering students prototype and commercial companies and entrepreneurs take those products to market.

The website [www.techpdia.in](http://www.techpdia.in) has been created by SRISTI thanks to the voluntary contribution by young students like Hiranmay during the last year and a half to pool more than 100,000 projects of 350,000 technology students from 500 engineering colleges in India. Mapping the problems of micro and small industries, informal sector, grassroots innovators to the web of these institutions, we can generate a correspondence between unsolved problems and the potential solutions. This has spurred *Kho Kho (or relay) innovation model*. Ideas developed at one college by a team of students after they pass out and often abandon that idea, are picked up by another team at another or the same college. Then, through a few such cycles or relays, this may become product. Further the same idea may be taken in different directions and thus enabling simultaneous and independent innovation trajectories. In addition, the unsolved problems of the informal sector as well as micro, small and medium enterprises are put on the agenda of the students and faculty who are often not in great connect with real life problems of disadvantaged sections of society or industry.

Honey Bee Network provides not only a justification but also an operational framework for such a partnerships among young students, creative farmers, formal and informal sector to emerge. Similarly, SRISTI has been working towards recognition to cultural ([sristi.org/cultural](http://sristi.org/cultural)), culinary, educational and common property institutions ([www.sristi.org/cpri](http://www.sristi.org/cpri)) related innovations too.

National innovation Foundation now has become part of a Department of Science and Technology, Government of India, thus expanding the scope of national innovation systems beyond R&D in formal sector as conventionally defined. It has already entered into partnership with Indian Council of Medical Research, Council of Scientific and Industrial Research, in public sector and with Futures Group (owner of largest retail space in India) in private sector. Affordable and accessible technologies will be diffused through private retail chains in near future. But social diffusion of open source technologies is even more important contribution of NIF. Inclusion will not take place otherwise.

#### **4 Conditions for inclusion**

Inclusive or harmonious development is recognised as one of the most important goals of socio economic development in most of the developing countries in particular, India, China, Brazil and South Africa. Inclusion can take place by treating economically poor and disadvantaged people as

- a consumer of public policy of assistance and aid for basic needs
- b consumer of products at low cost made by large corporations [à la Prahalad] or state or other enterprises.

We do not advocate such approaches of inclusion.

Inclusion can also take place by building their capacity to produce what they already know and do; or enable them to convert their innovations and outstanding traditional knowledge either as such or by blending /bundling it with knowledge of others, into products marketed by them or other enterprises. In addition, linkage with modern institutions of R&D to receive technologies or products developed by the institutions or to add value to their knowledge, innovation or practices for developing value added products for eventual diffusion through commercial or non-commercial channels can also help inclusion. Institutional innovations for inclusive development will include interventions in several systems and domains of society. For instance, the pedagogy and curriculum in the educational institutions seldom require interaction among the students and the disadvantaged sections of society. Further, the innovation by common people almost never become part of the curriculum or textbooks at any level from primary education to the higher education level. Low self-expectations invariably follow. African innovations have only recently begun to be noted and acknowledged locally and internationally. However, the number of such innovations remains very small.

Various mediating organisations seem to have a kind of vested interest in suppressing the articulation of local genius. I remember when Global Research Alliance office took interest in showcasing grassroots innovations at the head of the state meeting a few years ago, they lost interest when the issue of people to people learning emerged as a organising principle of the session. The brokers did not want to become the bridge. This is not the only time when efforts to promote linkages between innovators in India and Africa have been thwarted by the powers that be. Former Science and Technology Minister, South Africa Dr. Ben Ngubane was a great fan of Honey Bee Network. He wrote a letter of the Science and Technology Ministers of Commonwealth countries recommending a Honey Bee Network kind of grassroots-up movement in various countries. A visit of grassroots innovators from India was arranged to Limpopo so as to share their experiences with local youth. A public grassroots innovation exhibition was organised to share tremendous scope that exists for such lateral learning among creative communities across continents. But durable linkages have not been forged so far, despite a genuine desire and willingness to engage on both the sides. Grassroots to global (g2G) is a model whose time has come so that one way thrust of conventional model of globalisation can be reversed (Gupta, 2008).

#### *4.1 Learning from grassroots: innovative heuristics*

Thousands of grassroots green innovations and traditional knowledge examples mobilised from all over India and different parts of the world provide useful heuristics for innovations in totally unrelated sectors. Let me illustrate.

Yusuf developed a groundnut digger in Rajasthan. This farm machinery works on the principle of lifting the pods mixed with the soil, stirring a sieve or a wire mesh and collecting the pods and leaving the soil on the ground. Another entrepreneur from down south read about it and thought of a creative application. He wanted to use the groundnut digger for sea beach cleaning. The problems were similar but creative leap of imagination took place when a potential user transformed the context of the solution from one sector to another. Farther the domain of application from the domain of origin, higher the value one could get from an innovation.

Late Mr. Savalya, a very creative small-scale entrepreneur tried to improve the thermal efficiency of a cooking plate made conventionally of iron by replacing it with an

aluminium hot plate having grooves or ridges on the bottom side. Studies at the Indian Institute of Petroleum, Dehradun and University Department of Chemical Technology, Mumbai demonstrated the gain of about 1.05% in the thermal efficiency because of the ridges. We are all aware about the heat tubes used in industrial boilers. If only the surface of these tubes could be redesigned to have ridges all around, the thermal efficiency can go up and at least 1% energy can be saved. Mansukh bhai Prajapati designed a one-dollar non-stick pan of clay, making even the poorest people aspire to get safer, affordable, and frugal energy saving cooking plate.

A traditional farmer in one part of Gujarat used a leaf and an insect, crushed together to repel the pest. Chemistry of such materials combined together has not been reported. Cell phones are used for communication around the world. But, applications of these phones as switching device attached to any appliance or tube well in the farm, were developed by a school dropout, a young boy, viz., Prem Singh. No big company gave such a choice to the consumers. One could switch on the microwave, geezer or any other such device while coming home from the office. A lot of comfort can be added to life. Enlarging the scope of existing technologies to new applications can bring new customers for business and in a few cases, even meet the unmet needs of disadvantaged consumers.

There is a worldwide diffusion of Bt Cotton – a genetically modified cotton variety – to reduce pesticide consumption. While chemical pesticides are indeed very harmful and must be controlled, they need not be the only alternative. Nature does not favour uniformity. Market and public extension agents will have no incentives to diffuse numerous non-chemical ways of pest control and increasing production (<http://www.sristi.org/hbnew/searchdatabase.php>). Why should they tell farmers that by growing lady's finger as a border crop, they can trap cotton pests? Or by spraying jaggery solution, they can attract black ants which can kill the larvae of harmful pests? The orphan green technological innovations will not diffuse on their own, they need public-spirited teachers, extension agents and policy makers and user networks.

Celebrating culinary traditions and innovations – Saatvik (2010) – was the eighth edition of tradition Food festival organised by SRISTI in collaboration in collaboration with National Innovation Foundation (NIF), Grassroots Innovation Augmentation Network (west) GIAN, and a large number of colleagues from IIMA. While there are variety of traditional and nutritional foods and other products from Karnataka, Kerala, Jammu and Kashmir, Uttrakhand, Haryana, Rajasthan, Orissa etc. (18–20 December 2010).

Dhanuk community, Ambala, Chhota Udaipur, Vadodara has brought non stick-clay pots completely natural. While Mansukh Bhai was the pioneer of non-stick clay pot (who also has a stall in Sattvik) but he still used food grade chemical to make the plate non-stick. The one by Dhanuk community is based clay polished by a lac which grows on a 'phoim' tree found in that region. The quality of this lac for cooking has been tested in SRISTI lab also. The community has been cooking on it for ages and Sadhana has been using it at my home for months. This is unique contribution from Gujarat to the world. A sustainable cooking pot which is affordable, safe, makes food tasteful, and of course energy efficient could become a *global signature* of sustainability in near future. Once that happens, it may be that that community will politely say no to NREGA (the Indian programme which considers 250 million economically poor but rich in knowledge and skills people like that of Dhanuk as *unskilled*) because they might earn more from these



sustainable non-stick pots. The case studies of such inclusive development will then be taught in not only IIMA but also elsewhere.

Let me share some other examples of community knowledge which are changing our perceptions of what is possible through platforms like Sattvik. Panchal Sajeev Kheti Manch has brought a large number of women and men farmers to the Sattvik festival. A community from Lalvadan Village, Jasdan, has developed a soap from cowdung, *panchgavya*, *multani mitti*, sesame oil, camphor etc., with extremely good sanitation properties. Likewise, they have made a facial (*ubtan*) having several similar ingredients including pulses, mustard, turmeric, chandan (sandalwood) etc. The new revolution in Indian and global markets might be triggered when unlike the strategy of selling things to rural people (a la fortune at the bottom of so called economic pyramid), we buy things from rural areas and expand their purchasing power. It will help the sellers of other goods as well. But today, most corporations are mindlessly targeted at only selling things to rural people without looking at what they can buy from them.

Hussian Ajhmeri from Shahpur has designed a gas iron for pressing clothes. While NIF had come across similar iron by Lingabrahma from Andhra Pradesh also, but this one seemed more tidy and customer friendly. We are testing both but this will expand the options of washer men community but also that of households which want to iron clothes at home. Dhramaveer from Haryana has made machine for processing various fruits and vegetables while Jaydeep and Abhishek from Suryansh group from Uttarakhand have made products based on aloe vera juice pith. Dharamveer does not feel that his products are getting competition by people whom he has sold machines, he feels happy that better quality products are coming to market. Collaborative, distributed and horizontal markets will change the polity of the nation as well.

## **5 Public policy for augmenting innovations**

It took ten years for Honey Bee Network to convince policy makers to establish National Innovation Foundation (NIF) and another ten years to institutionalise it as a part of the national innovation system. India is the only country where a complete eco system has been put in place though there is a tremendous scope for strengthening it further. Policy implications for strengthening national eco system for grassroots innovations are discussed in a separate paper (Gupta 2010 op. cit). It may suffice to state some of the key elements.

The scouting is far more important than just waiting for the innovators to turn up at your door. Most countries which have tried to develop some opportunities for grassroots innovators have failed to elicit much response mainly because of this reason. Given the historical distrust that many local communities have about outside agencies, particularly state agencies, not many people approach them for help. The passion which should persuade people to engage with the support system is a prior condition.

The prior art search to find uniqueness or important advantage requires not just recourse to patent or web enabled databases but also information from industrial clusters, informal markets and other innovators is also very important. A very small proportion of small entrepreneurs have web presence and thus determining novelty or distinctiveness based on web in at least third world countries or even emerging economies is every inadequate.

The value addition requires linkage with formal scientific institutions and till their mandate includes working with common people as a requirement, it is not easy to always persuade them. At the same time, we have been able to have agreements with Council of Scientific and Industrial Research (CSIR) and Indian Council of Medical Research (ICMR) in this regard.

For developing business development opportunities, NIF has set up a Micro Venture Innovation Fund (MVIF) assisted by Smallscale Industries Development Bank of India. In addition it provided support in market research and licensing for technology in collaboration with IPRs section. NIF has filed more than 260 patents for innovators who often have not received education beyond tenth class. Several have been granted in USA and India. About 60 technologies have been licensed to about 70 entrepreneurs. All this with the small budget of NIF remaining constant for a decade (only from this year, it has started receiving annual grant) and SRISTI not having any regular external funding except recently from IDRC for three years.

The Honey Bee Network model shows one way to build upon grassroots green innovations and traditional knowledge for generating employment and removing poverty. A great deal more remains to be done but scholars and practitioners have to recognise the huge potential this approach has to trigger self reliant Gandhian, distributed development process.

## **6 Summing up**

The time has come to go beyond the boundaries of the conventional organisations, disciplines, sectors and pedagogies. We have to look for platforms that link creative but economically disadvantaged people to learn from sustainable solutions developed at grassroots globally. The 'sink' has to become the 'source' and the *poor* have to become *providers*.

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## Notes

- 1 Also see, Gupta (2006), <http://www.mitpressjournals.org/doi/pdfplus/10.1162/itgg.2006.1.3.49>, also see <http://www.worldwatch.org/node/6110>; <http://online.wsj.com/article/SB125376926792036847.html>, The Wall Street Journal, September 24, 2009, see blog post at HBR, The Challenge of Scaling Innovations, [http://blogs.hbr.org/cs/2009/05/the\\_challenge\\_to\\_scaling\\_india.html](http://blogs.hbr.org/cs/2009/05/the_challenge_to_scaling_india.html), May 11, 2009, [http://www.pnyv.org/index.php?id=541&tx\\_ttnews\[tt\\_news\]=1564&tx\\_ttnews\[backPid\]=12&cHash=518ae64d60](http://www.pnyv.org/index.php?id=541&tx_ttnews[tt_news]=1564&tx_ttnews[backPid]=12&cHash=518ae64d60) on Innovations by Poor, 2008, Grassroots Green Innovations for Inclusive, Sustainable Development in 'The Innovation for Development Report 2009–2010, Strengthening Innovation for the Prosperity of the Nations, Augusto Lopez-Claros (Ed.), Palgrave Macmillan, New York, NY, pp.137–146; Is a just system also fair? Traversing the domain of knowledge, institutions, culture and ethics. Published in *Who Owns Knowledge? Knowledge and the Law*, Nico Stehr and Bernd Weiler (Eds.), London, Transaction Publishers, 2008, pp.87–97, presented at the *International Conference on Is Knowledge Justiciable?*, Essen, Germany, 21–23 March, 2005, IIMA W.P.No: 2006-04-05; (With R.A. Mashelkar) Women and Formal and Informal Science, IIMA Working Paper No.2005-05-02,

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