Chapter 4

Promoting Inclusive Innovation

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A cross-cutting, multipronged strategy is needed to make India's innovation system better meet the needs of the common people. Most discussion on India's innovation system focuses on formal research and development (R&D) efforts and the formal part of the economy. However, India is an extremely heterogeneous economy, and most of its population operates in the informal sector. Given the rising divergence between productivity in agriculture and in knowledge-intensive professional sectors such as information and communication technology (ICT) and finance, and the economy's inability to sufficiently absorb migrants from the agricultural sector and new entrants to the labor force, income inequality will likely increase. This has been the trend in most other economies—especially fast-growing ones. Inequality is also likely to worsen unless special efforts are made to address the needs of the poor.

This chapter outlines some mechanisms to support innovation efforts that can help improve the productivity and livelihoods of people in India's vast informal economy. Much of the knowledge and technology needed to achieve the Millennium Development Goals (MDGs) already exists. Much is known about basic nutrition, sanitation, preventive medicine, environmentally friendly technologies, cheap mobile phones, and the like. But poor people's needs are broader than the few listed and monitored as part of the MDGs, and further innovation is required to improve delivery of a wide range of public services. Far more needs to be done on preventive medicine, clean water, education, and other public services that can benefit from harnessing collaborative efforts of formal creation efforts for the poor. What is needed is not only to reduce the costs and increase the availability of goods and services needed by the poor, but more important, to open up sustainable livelihood and productive income-generating opportunities for the poor.

Poor people's innovative ability is constrained by, among other things, insufficiently developed skills, inadequate public services, and an inability to access markets and assets on fair terms and handle associated risks. Enhancing skills through better

delivery of basic training for the informal sector is discussed in chapter 5. How innovation through access to new and existing technology can help create more and better-paying jobs for enterprises that the poor work in or run has not received enough attention, and is a major focus of this chapter. In addition to strengthening poor people's capabilities, solutions will involve strengthening incentives, policies, and institutions. Part of the solution will be in stronger institutional infrastructure. In addition to closer collaboration between public R&D entities, industry, universities, nongovernmental organizations (NGOs), and global networks to better meet the needs of the poor, the poor could gain by organizing themselves in groups. In Andhra Pradesh, community-based development initiatives have led self-help groups to develop mutual insurance schemes, lending and savings operations, and marketing strategies for new agricultural products. Although this chapter illustrates the potential of new and existing technologies in opening up some of these opportunities, a lot more needs to be done.

Harnessing Formal Creation Efforts for the Poor

A first approach to promoting inclusive innovation is for India to harness, increase, and redirect formal creation efforts to better meet the needs of the economically weaker sections of Indian society. The main recommendation of this section is to create incentives for pro-poor early-stage technology development (ESTD) and commercialization by the formal sector, possibly by providing more preferential matching grants to collaborations among public R&D entities, industry, universities, NGOs, and global poverty alleviation networks.

Agricultural R&D as Inspiration

India's green revolution is the foremost example of harnessing formal creation efforts for achieving national self-sufficiency in food grains. Over the past four decades, the green revolution has significantly improved India's food security and reduced rural poverty. It has included investments in technology, largely comprising high-yielding seed varieties (initially of wheat and later rice), chemical fertilizers, and agricultural research and extension—aided by public investments in supporting infrastructure (irrigation, roads, market institutions) and price incentives that have encouraged wheat and rice production.

Although India's agriculture faces many challenges, it also has great technological opportunities. There is huge untapped potential for augmenting value chains in agriculture through crop diversification and forward and backward linkages, including post-harvest handling and processing. First, the rich diversity of agro-ecosystems is a source of sustainable growth for the sector. Second, joint ventures between public research institutes and the private sector are seen more favorably today. Such partnerships could considerably augment R&D efforts. Third, agriculture can develop value chain processing activities in rural areas to meet the changing pattern of food demand in the country and to tap international markets. Fourth, crop diversification

has become a potential source of agricultural growth, creating new export and employment opportunities. Fifth, livestock, fishery, and horticulture are emerging as important sunrise sectors. Because most livestock is owned by small and marginal farmers and landless households in rural areas, the rapid growth of these sectors benefits poor households.

Agricultural R&D is crucial to generating additional income and employment for the poor. Given the limited scope for expanding agricultural areas, increases in productivity, profitability, and competitiveness will be the main sources of agricultural growth—led or triggered by innovations and applications of science in agriculture. In other words, Indian agriculture will shift from resource- and input-based growth to knowledge- and science-based growth. Flows of knowledge and innovations play a critical role in this paradigm shift. R&D assumes more importance because it is a cost-effective way of promoting sustainability and increasing competitiveness. To attain global competitiveness, more attention should be given to harnessing advances in frontier sciences in priority areas. Thus, support for basic and strategic research is critical. The consortia emerging between research entities and the private sector being promoted by the National Agricultural Innovation Project are a direction worth pursuing.

Building on Public R&D and University-Enabled Initiatives

India's large, diverse public R&D infrastructure has the potential to address more of the problems of the poor. As noted in chapter 2, the bulk of India's public R&D infrastructure is mission oriented to defense, space, and energy, with much less applied to problems of agriculture, industry, and health. Much more can be done to orient the considerable capabilities of this large public research system to address the needs and problems of the poor. Some of this harnessing is occurring in mission-oriented programs such as space, and a number of initiatives are under way in biotechnology, medicine, and industrial R&D (box 4.1).

The Council of Scientific and Industrial Research's (CSIR's) development of technology applications for rural India is a candidate for expansion, with the need for greater emphasis on commercialization (CSIR 2004). CSIR has been increasingly concentrating on a people-oriented development and delivery approach. CSIR labs, for example, have been instrumental in reviving India's world-famous handmade blue pottery, with research leading to product and quality improvements and product diversification—enabling this ailing traditional industry to find new life and extended markets outside India. Another example is technology to desalinate water using reverse osmosis. CSIR labs have also been designing multichannel ceramic membrane with optimum channel configuration to upgrade technology for purifying arsenic contamination in groundwater. CSIR has also been working on herbal products, mint oil (from the Central Institute of Medicinal and Aromatic Plants, Lucknow), food processing technologies, leather processing technology, and more. Although it has developed many pro-poor products and technologies, its transfer and commercialization have been weak.

Box 4.1 Public Research for Development

Using space technology for development. Advances in space-based Earth observation technology and its applications have the potential to integrate diverse sciences to provide economic security and better living standards. For example, Sujala, a watershed development project in Karnataka, has created hope for 1,270 villages across five districts, relying on high levels of community participation and scientific planning tools like satellite remote sensing, geographic information systems, and information technology (Muniyappa, Ranganath, and Diwakar 2004). Similarly, under the Rajiv Gandhi National Drinking Water Mission, more than 2,000 groundwater maps covering about 45 percent of the country (mainly problem zones) have been prepared, and more than 24,000 wells drilled (Mohandas and Reddy 2004).

Preventive medicine. The new antituberculosis molecule (LL-4858 Subotern) by Lupin is an example of network innovation through a public-private partnership. The Council of Scientific and Industrial Research supported this project through the New Millennium Indian Technology Leadership Initiative (NMITLI). The molecule has the potential to not only treat tuberculosis but also significantly reduce treatment time, and is compatible with combination therapy. The molecule has been tested on mice and guinea pigs and has been proven very effective. An investigational new drug application has been made. Once cleared, the molecule will go through clinical trials (Bowonder and others 2006).

Source: Authors.

India's extensive university system can also do more. Except for the Indian Institute of Science and Indian Institutes of Technology (IITs), most Indian universities do little R&D. But they have the bulk of scientists and engineering PhDs, so have considerable intellectual capital that can be deployed to work on the technological problems of the poor. Some good initiatives in this area can be built on (box 4.2).

Stronger incentives and funding are needed to harness the potential of public R&D and university-enabled initiatives. Available mechanisms to increase the focus on inclusive innovation include institutional mandates, prizes and public awards, and targeted funding. As a policy thrust, the government should encourage research institutes, universities, and other publicly funded learning institutes to do more to address the needs of the poor—for example, through competitive research grants. Prizes and public awards could be given to research teams and institutes that produce relevant innovations. Mechanisms—including widespread dissemination and funding—should be offered to scale up, demonstrate, and disseminate these innovations to people in the informal sector. The precise nature of transfer and dissemination mechanisms will depend on the nature of the innovations and their potential applicability. Those with the nature of public goods should be widely demonstrated and disseminated among the target population. One possible mechanism would be to create a professional body entrusted with in-field trial and demonstration for diffusion, adaptation, and assimilation of formal sector technologies for the poor. Such

Box 4.2 University-Enabled Initiatives

n-Logue. Incubated at IIT Chennai, n-Logue (www.n-logue.com) can best be described as an Internet service provider for rural areas (Manzar 2005). It was launched to fill the need for Internet and voice services in underserved small towns and villages; the company does not operate in any of India's top 150 population centers. n-Logue has established 2,500 village information kiosks with dedicated broadband connectivity, offering agricultural, health consultation, education, and insurance services. The kiosks have been set up by village entrepreneurs, who take bank loans to finance the initial costs. The kiosks must generate revenues to repay the loans. The aim is to replicate the Public Call Office model throughout rural India so that it can help double rural per capita income (Das Gupta 2006). The International Finance Corporation's Grassroots Business Initiative is providing a grant to scale up n-Logue's telemedicine technology for districts in Tamil Nadu and Gujarat; it is also exploring e-pharmaceutical distribution. Jhunjhunwala, Ramachandran, and Ramachander (2006) find—in joint research conducted by n-Logue and Microsoft on 150 kiosks—that while only a few are profitable within 6 months, 60–70 percent report profitability within 6–24 months. Because most kiosks are reluctant to report their incomes and generally grossly underreport, having 60–70 percent report themselves profitable is significant.

Baluchari IIT Kharagpur computer-aided design (CAD) program. Baluchari is a sari design style from West Bengal. Previously only rich people could own such saris, because the handloom-based weaving took an average of six months of design. A new adaptation using CAD simplified the design by replacing the handloom with the Jacquard loom. The spread of the Jacquard loom was affected primarily through a cooperative, while the idea and initiation were those of the master weaver. A public research organization and IIT Kharagpur joined with the cooperative and secured ministry funding. The CAD program was user friendly, and the cooperative adopted and diffused the process very successfully within Bengal. The program has retained the original design style, and varieties are immense. CAD-designed Balucharis are in the market at low prices, and the size of the market and earnings of weavers have increased. More important, the production process remains household-based, and marketing—including sourcing of input materials and financing—remains based on master trader networks (Banerjee 2006).

Source: Authors.

an entity would hire professionals trained in market research and media planning, offering competitive compensation.[1] Innovations that can be commercialized should be licensed to qualified producers and organizations.

Encouraging Private Sector and Global Network Initiatives

There is even greater potential to harness the research capacity of the private sector to address the needs of the poor—as shown by the growing number of Fortune at the Bottom of the Pyramid initiatives. Efforts to develop products that meet the needs of

Box 4.3 Fortune at the Bottom of the Pyramid Initiatives

Solar energy for the poor. The Solar Home Systems program, launched as a three-year energy pilot in Karnataka by the United Nations Environment Programme and the Shell Foundation, works with two major Indian banks and nine agricultural subsidiaries to make loans to rural households seeking to buy solar lighting. By September 2005, the program had provided more than 100,000 people with reliable, affordable electricity for the first time.

Mobile telephones. Ultra low-cost handsets are being produced by Nokia and LG, reflecting the 5 million new mobile phone connections being added each month in India.

Simputer. Amida's Simputer is designed to enable word processing and e-mail, regardless of language. Prices for the computer range from $240–480. It was developed for use in rural areas and for applications such as microfinance and e-governance.

Microlending. The SKS smart cards project is a microfinance project catering to marginal farmers and agricultural workers. SKS Microfinance is an innovative nonbanking financial company that has a variety of loan products, encourages membership of women, and provides loans of $100 or less. So far it has loaned about $57 million to more than 200,000 people. ICICI Bank has lent more than $10 million to SKS and led multiple initiatives to provide affordable banking services to the poor. The bank has partnered with SKS, n-Logue (see box 4.2), and others to co-locate automated teller machines with rural Internet kiosks. It has also created a network of 8,000 self-help groups, each with 20 female members, to create microfinanced businesses.

Hypermarkets and access to cold storage supply chains for poor farmers. Over the 2007–10 period**,** Reliance Industries—India's largest private sector company, an oil, petrochemicals, and textile group—intends to build a nationwide retail network of 2,000 supermarkets and 1,000 larger hypermarkets based on a distribution supply system, an integrated "farm to fork" logistics supply chain. Reliance will not enter the farming business. Instead it will be the "off-taker of last resort," relieving farmers of risk. It plans to revolutionize both farming and retail by investing $5.7 billion by 2011 to modernize both farms and stores, connect them through a distribution system guided by the latest logistics technology, and create enough surplus to generate $20 billion in annual agricultural exports.

Direct-to-home distribution network. Consumer goods firms such as Hindustan Lever are seeking new ways of doing business among the rural poor. Its Project Shakti recruits women to self-help groups that offer tiny loans—microcredit—to support a direct-to-home distribution network. The project already reaches 80,000 villages, and by 2010 expects to employ 100,000 "Shakti entrepreneurs," covering 500,000 villages.

Low-cost Internet connectivity for poor villages. Indian Tobacco Company's e-Choupal initiative has equipped more than 6,000 villages with computers and satellite connections to the Internet—part of its agribusiness procurement network. Farmers can use the computers to check prices for their products and sell online, freeing them from middlemen who take a big cut of farm earnings. Once a commercially viable way has been found to provide a village with an Internet connection, it has many other potential uses, including for e-government, sales, education, and entertainment.

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Box 4.3 continued

Drishtee.com. This initiative delivers fee-based e-governance, education, commerce, and insurance services to rural populations in northern and northeastern India. These services are delivered through more than 700 kiosks owned and operated by local entrepreneurs. The International Finance Corporation's Grassroots Business Initiative is providing Drishtee with a grant to establish 50 new kiosks in Meerut, Uttar Pradesh.

Sources: Usher 2003; Shell Foundation 2003; Tata 2007; *Economist* 2005a, 2005b, 2005c, 2006; Sharma 2004; Bellman 2006; Prahalad 2004; Moreau and Mazumdar 2006.

the poor and underserved—while also creating viable business propositions—need to be pursued more systematically. As argued by Prahalad (2004), large companies can use their considerable technological, organizational, and marketing capabilities to create and deliver products and services for people at the bottom of the economic pyramid—those with incomes of less than $2 a day—and make a profit doing so (box 4.3).[2]

Global networks provide another source of formal R&D to meet the needs of the poor. The best known of international public goods R&D efforts is the Consultative Group for International Agricultural Research (CGIAR), which was behind the green revolution. There are also major initiatives in medicine and pharmaceuticals, environment, and other areas in which India should continue to participate, such as in the Global Research Alliance (box 4.4).

The government should consider allocating more funds to encourage formal creation and commercialization efforts that focus on the challenges facing the poor. It could establish a pilot Inclusive Innovation Fund to support formal R&D by public R&D entities, the private sector, universities, and NGOs aimed at the needs of the informal sector, on a matching grant basis. These initiatives should be subject to continuous monitoring and evaluation. If successful, in the long term the government should earmark a small percentage of the federal public R&D budget to support an Inclusive Innovation Fund on a recurring basis—the funding should cover scaling up, piloting, testing, and taking to the market. Competition for scarce funds would be driven by transparent eligibility and evaluation criteria.

Initiatives should focus on the underserved community—the more than 800 million Indians living on less than $2 a day. An additional incentive is that many solutions developed for poor Indians would also be applicable for the 4–5 billion poor people worldwide. Thus, firms can develop and pilot in India products and services that then may be marketed globally. In addition, the government could provide financial incentives and awards to research teams, institutes, and universities that produce relevant innovations, as well as dissemination and funding mechanisms to scale up, demonstrate, and disseminate innovations to people in the informal sector.

Box 4.4 International Public Good–Type Innovation Efforts

Agriculture. The Consultative Group for International Agricultural Research (CGIAR) is a strategic alliance of members, partners, and international agricultural centers that mobilizes science to benefit the poor. The hope of extending the productivity gains of the green revolution in India to other parts of the developing world was in large measure the impetus for the CGIAR. Recent achievements include releasing quality protein maize varieties in 25 countries on more than 600,000 hectares, breeding a selective strain of tilapia, adopting low-till farming practices on 1.2 million hectares across the Indo-Gangetic plains, and training more than 75,000 developing country scientists and researchers.

Medicine and pharmaceuticals. According to Grace (2005), at $10 billion, India's pharmaceutical industry ranks 4th in the world in volume of production and 13th in value. India supplies 22 percent of the world's generic drugs and a significant proportion of the vaccines made for the developing world. India can take advantage of recent commercial opportunities, such as the U.S. President's Emergency Plan for HIV/AIDS Relief (PEPFAR). Now that the risk to generic companies of being sued by originators is gone, companies such as Ranbaxy, Matrix, and Aurobindo have taken up the offer to get generic antiretrovirals approved by the U.S. Food and Drug Administration under the expedited review process set up to support PEPFAR. India is also participating in global initiatives such as the International AIDS Vaccine Initiative (IAVI) and the Global Fund to Fight AIDS, Tuberculosis, and Malaria (GFATM). More funding will enable it to work on solutions that would benefit not only itself but also the world.

Global networks. India, through CSIR, is a member of the Global Research Alliance (GRA)—a global knowledge pool for global good committed to undertaking large-impact projects for the benefit of society.

Sources: CGIAR (www.cgiar.org), IAVI (www.iavi.org.in/overview.html); GFATM (www.theglobalfund.org/Programs/Portfolio.aspx?countryID=IDA&lang=en and www.usaid.gov/our_work/global_health/aids/Countries/ane/india_05.pdf); GRA (www.research-alliance.net/index.html).

Promoting and Diffusing Grassroots Innovations

A second approach to promoting inclusive innovation is for India to better promote and diffuse innovations by grassroots entrepreneurs. A main recommendation of this section is for grassroots innovation networks to be formally evaluated and supported.

Grassroots Innovation Networks

Grassroots innovation networks support efforts where traditional knowledge and innovative products emerge at the individual or collective level.[3] Grassroots innovation programs focus on poverty alleviation programs based on local people's knowledge, innovations, and practices, largely produced and maintained at the grassroots level. In some cases value may be added by the formal science and technology sector, but the lead ideas or traditional knowledge emerge at the local level. The programs

Table 4.1 Grassroots Innovations: Activities and Actors

Activities	Government	Nongovernment	Private
Documenting and disseminating information	• National Innovation Foundation (NIF) • Department of Science and Technology (DST) • CSIR's Traditional Knowledge Digital Library (TKDL) • Ayurveda Yoga Naturopathy Unani Siddha and Homeopathy (AYUSH) • Grassroots Innovation Augmentation Network (GIAN)	• Honey Bee Network (HBN) • Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI) • Foundation for Revitalization of Local Health Traditions (FRLHT) Community Biodiversity Registers (CBRs) • Kalpavriksh • Gene Campaign • Beej Bachao Andolan • Anthra	• Publications ○ Eenadu's Annadata ○ Adike Patrike; Malayalam Panorama ○ Baliraja ○ Prakurthi
Resource conservation		• FRLHT CBRs • Beej Bachao Andolan	
Value addition and experimentation	• DST's Technology Information, Forecasting, and Assessment Council (TIFAC) • CSIR • NIF • GIAN	• SRISTI • Rural Innovation Network (RIN) • Magan Sangrahalaya • Centre for Innovation, Incubation and Entrepreneurship (CIIE) at IIM-Ahmadabad	
Commercialization	• CSIR • NIF • GIAN	• SRISTI • GIAN	• Aavishkaar
Dissemination	• NIF	• HBN and network collaborators • SRISTI • Centre of Science for Villages (CSV)	
Finance	• DSIR Techno-entrepreneurs Promotion Program (TePP) • DST Science and Society Program	• SRISTI • RIN • NIF • GIAN	• Aavishkaar
Intellectual property rights protection programs and services	• NIF	• SRISTI	

Source: Mathur and Sinha 2006.

include a broad range of actors—government, NGOs, and the private sector—involved in a host of activities (table 4.1). The largest, best-known nongovernment programs are the Honey Bee Network (HBN) and the Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI). The two largest government programs are the Grassroots Innovation Augmentation Network (GIAN) and the National Innovation Foundation (box 4.5). The government has also set up the Traditional Knowledge Digital Library (TKDL) to prepare a computerized database of indigenous knowledge on medicinal plants.

Box 4.5 Grassroots Innovation Networks: HBN, SRISTI, GIAN, and NIF

Honey Bee Network (HBN) and Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI). The HBN consists of innovators (individuals, farmers, and entrepreneurs), policy makers, academics, and NGOs committed to recognizing and rewarding innovative ideas and traditional knowledge produced at the grassroots level (by individuals and communities) through local language interfaces. It seeks to protect the intellectual property rights of knowledge holders and follow the conditions they may advise under the concept of prior informed consent (PIC). SRISTI (www.sristi.org) was created in 1993 as a voluntary organization to provide financial and institutional backing to the HBN. SRISTI has organized 17 Shodh Yatras (journeys of exploration) and developed a multimedia, multilanguage database using graphics, photographs, and other audiovisuals. It manages KnowNet Grin—an electronic knowledge network of grassroots innovators, and GILD (Grassroots Green Innovations local language database). It has developed a multimedia kiosk node at the IIM-Ahmadabad: Gyan Manthan Kendra (GMK), village knowledge churning center to connect innovators across language and cultural barriers. At the international level, SRISTI has organized scouting contests, with awards given to grassroots innovators from China, India, and Vietnam. SRISTI has also focused on women's knowledge systems through the Sadbhav-SRISTI Sansodhan Lab—the Natural Product Lab. The major products that have been successful in the scheme of value addition include development of botanical pesticides and growth promoters and health healing formulations.

Grassroots Innovation Augmentation Network (GIAN). GIAN (www.gian.org) was developed in 1997 with seed money from the Gujarat government to link innovations, investment, and enterprises so that benefits could be shared widely among the community. GIAN provides small amounts of funding for prototype development, facilitates links between innovators and scientific and technological institutions, and identifies commercial enterprises interested in licensing product technologies from grassroots innovators. GIAN has established the Grassroots Innovations Design Studio (GRIDS) at the National Institute of Design, Ahmadabad, and has been recognized as a Scientific and Industrial Research Organization (SIRO) R&D institution by the DSIR. About 18 technologies have been licensed and benefits shared with innovators under the PIC framework. GIAN has facilitated the development of more than 61 enterprise efforts to manufacture and market innovations, and has filed 67 patents and 3 design registrations; 2 patents and 1 design registration have been granted. It has filed seven patents in the United States—three have been granted. A Patent Assistance Cell at GIAN West has been established to assist small and medium innovators. GIAN has arranged for micro venture finance and incubation support for more than 60 innovations. GIAN West was the joint winner of the National Award for Technology Business Incubator in 2003, and one of the technologies it incubated—the cotton stripper machine—received an award.

National Innovation Foundation (NIF). The work of the HBN and SRISTI has been the model for the NIF (www.nifindia.org), set up by DST with an initial grant of about $5 million. It is a formal effort to document grassroots innovations and traditional knowledge, and has a repository

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Box 4.5 continued

of more than 50,000 practices. It received a Micro Venture Innovation Fund (MVIF) of about $1 million with the help of SIDBI (Small Industries Development Bank of India), but so far it has disbursed only about $54,000. The MVIF has made availability of risk capital a bit easier, but there remains a gap with the lack of the establishment of a dedicated fund for product development. Of the tens of thousands of grassroots innovations and traditional knowledge products scouted by NIF, few have been incubated. Ideally, NIF should plan to incubate at least 2,000 projects to obtain 20–30 major products—of which 2 or 3 may achieve major success.

Source: Mathur and Sinha 2006.

Although there has been a lot of activity on grassroots innovations, there has not been much assessment or quantification of how they have contributed to improving the livelihoods of people in the informal sector. What little evaluation has been done mostly lists activities and number of innovations. There is virtually no information on costs or impacts of the innovations, though there have been many and some have even been licensed in India and abroad. Conceptually there are some models for promoting inclusive innovations (box 4.6).

Grassroots innovations face five main challenges: high transaction costs of scouting and documentation, need for value addition, need for commercialization, need for finance, and unclear intellectual property rights (IPR). High transaction costs

Box 4.6 Models for Promoting Inclusive Innovations

- Grants can be provided for technical assistance to support scouting and documentation, value addition, prototype development, and diffusion.
- For commercialization, government could provide matching grants. This could be part of the window of the fund of funds (see chapter 7), where the government can require certain activities (such as investing in pro-poor innovations, spin-offs from R&D labs, and so on) in exchange for the funding.
- The government could also use procurement to promote inclusive innovations—for example, by specifying goods and services for the poor and encouraging competitive bidding to produce them, thereby generating a market.
- Finally, Bottom of the Pyramid initiatives already under way should be encouraged to achieve the right scale.

Source: Authors.

are inevitable in programs that support a large number of widely scattered informal innovators who have accumulated knowledge from years of trial and error, or incremental innovations in existing tools or agricultural practices. What is needed is good monitoring and evaluation to support grassroots innovations considered to be making positive contributions by a new pilot-inclusive innovation fund.

High Transaction Costs of Scouting and Documentation

Possible remedies, relying mainly on existing networks, include the following:

- Developing special campaigns through microcredit associations, innovator associations, and GIAN to scout traditional knowledge, pool best practices, and take products to the market
- Using radio and other media to expand the reach of the HBN and institutionalizing Village Knowledge Registers (such as plant breeders' rights) that would not be restricted to biodiversity knowledge
- Replicating the Shodh Yatras, Shodh Sankals, and Prayog Pariwar networks throughout the country
- Building more multimedia, multilanguage databases (like that developed by SRISTI; see box 4.5) on innovations and traditional knowledge in local languages.

Need for Value Addition

Most grassroots innovations are still at an early stage of indicating that something might work (such as in herbal medicine) or a minor improvement might emerge—both of which require much more analysis and testing to improve the value of the innovations. However, there are few facilities or labs to do such analysis, validation, and testing.[4] Even where available, they are most likely beyond the financial means of grassroots innovators. Furthermore, as with most innovations, there is a need not only to make technical improvements, but also to do demonstrations and test marketing to evaluate the market potential of the innovations, which requires additional steps and resources and can be expensive. What is needed is the following:

- Develop a nationwide strategic plan to add value in local knowledge, innovations, and practices through contractual arrangements with public and private R&D institutions. This includes support for SRISTI's think tank—the Academy for Augmenting Sustainable Technological Inventions, Innovations, and Traditional Knowledge.
- Establish community farms where traditional knowledge holders can do experiments and demonstrate their technologies.
- Build national and regional technology networks for specific problems. Investments are needed to identify experts willing to offer their services at different terms (ranging from voluntary to deferred or upfront payments). Incentives must be created for their time-bound availability at the sites of innovators.

- Use ICT to facilitate communication among network members. A revamped portal like www.Indiainnovates.com can provide an online value addition and incubation platform.
- Develop common fabrication laboratories and testing centers for faster validation.
- Link up with the 100,000 Internet-enabled Common Services Centers being set up by the Department of Information Technology to extend the reach of grassroots innovations.

Need for More Effective Commercialization

Two types of diffusion and dissemination efforts are required for commercialization. Most innovations are simple and low cost (such as a pulley that locks a rope in place so that the object does not slide back, or a simple agricultural tool), and take the drudgery out of some work. The cost of diffusing such products is often higher than the cost of the product itself. But because they are simple, low cost, and easy to replicate, such products can have large social impacts on the livelihoods and quality of life of marginalized sections of society. Diffusion of these types of innovations requires the following:

- Creating awareness of them through the media, and publicizing results of trials and demonstrations
- Networking with NGOs and other actors with outreach to communities, building feedback loops for adoption
- Creating a national fund to acquire rights to such technologies
- Contributing resources to support diffusion of open source public domain technologies (social technologies), governed by the prior informed consent (PIC) of the knowledge holders, communities, and individuals.

Other types of innovations are more complex and expensive, but they can raise productivity and increase competitiveness (such as a cotton-stripping motorcycle, cycle-based plow, or bamboo-splitting machine). Diffusing these will require explicit efforts to scale up for industrial production and significant marketing and commercialization efforts. Such efforts will require developing technology clearinghouses and exchanges to link grassroots innovators, investors, and entrepreneurs, as well as incubators such as GIAN to do market research, develop business plans, and source micro venture capital or risk capital to support innovators in becoming entrepreneurs. This could lead to a global GIAN that provides incubation support to people across the world.

Need for Financing Commercialization

Finally, even for innovations sufficiently developed to be commercialized, their industrial production and distribution need financing. This can be more expensive than the earlier stages, and it is difficult for grassroots innovators to get financing for this step (see chapter 7). Recommendations include establishing a fund for new

grassroots products and processes ready for commercialization, the terms of which could be softer than regular commercial financing. It is important that grassroots innovators learn about commercial principles. It is also important to learn from e-Choupal, Drishtee.com, and other initiatives on sharing information among potential private investors to set up venture funds or extend credit facilities for such commercialization (see box 4.3).

Pro-Poor Intellectual Property Rights

How can India deliver the benefits of IPR to poor citizens living traditional lifestyles? Any attempt to craft a traditional knowledge IPR framework that rewards functional knowledge from traditional communities will require revolutionary thinking and bold experimentation in both legislation and administration. Advocates of traditional knowledge are often split between their desire to protect secret knowledge in ways that preserve traditional communities and their desire to leverage that knowledge in ways that increase the resources and opportunities available to those communities. These goals, while both arguably worthy, are mutually exclusive. A pragmatic consideration suggests that preservation is unlikely to succeed. Commercially valuable secrets are notoriously difficult to preserve. Corporations that have done so successfully have developed complex, often expensive, procedures. Nothing comparable is possible at the level of traditional knowledge. If India wants to lead the world in addressing the intellectual property inherent in traditional knowledge, it must begin by explicitly adopting the goal of compensation.

IPR for traditional knowledge could offer solutions—and challenges. Professor Anil Gupta, the Executive Vice Chairperson of India's National Innovation Foundation (NIF), has clearly articulated the challenge of protecting functional IPR for traditional knowledge (Gupta 2002). Introducing new IPR for traditional knowledge will both impose immediate administrative costs and increase restrictions on the use of such knowledge. Thus, a proper analysis of such IPR must justify the system as generating internal benefits that exceed its costs. Neither India nor the world should reward possessors of functional traditional knowledge merely for possessing it—but they should reward those possessors for sharing their knowledge. The basis for the proposed IPR system for traditional knowledge must thus parallel the basis of the patent system: possessors of traditional knowledge must put their knowledge into full public view in exchange for temporary rights, revenues, or both. When that temporary period ends, the traditional knowledge will become part of the global knowledge base, freely appropriable by anyone who grasps it—and no longer subject to anyone's IPR. Box 4.7 examines possible system structures for traditional knowledge IPR.

Consideration should be given to creating an IPR policy think tank. The government of India should charge the proposed policy-oriented think tank with assessing the costs and benefits associated with individual IPR for traditional knowledge, a blanket TKDL license, and a voluntary fund. Adoption of any of these approaches, concurrent with or shortly after the launch of the TKDL, will establish India's leadership on this issue, and reinforce its image as a country taking bold, novel approaches to developing its innovation system, and its burgeoning role as a leading

Box 4.7 Approaches to Designing Intellectual Property Rights for Traditional Knowledge

Possibility 1. Develop a direct national traditional knowledge analog to the patent system. This "equitable" proposal places possessors of traditional and nontraditional knowledge on footings as equal as possible. This proposal raises many challenges, including establishing rules for publishing traditional knowledge to share knowledge with the world, circumscribing classes of ideas that qualify as traditional knowledge, defining "items" of traditional knowledge, determining an appropriate length for IPR for traditional knowledge (beyond which the published knowledge enters the public domain), identifying "owners" for each item of traditional knowledge, setting and publishing "reasonable and nondiscriminatory" licensing terms (including both prices and rights), designating conservators, specifying appropriate outlays for moneys collected, designating enforcers, and defining penalties for noncompliance or infringement, and drafting international cooperation treaties in the likely event of noncompliant multinational corporations (MNCs). A variant is an international direct traditional knowledge analog to the patent system. This proposal eases many coordination problems, but risks holding the entire venture hostage to international intransigence.

Possibility 2. Institute a blanket license for traditional knowledge IPR. This reduces the complexity of systemic administration and eliminates many direct incentives for innovation, but it may leave enough to spur volunteer or NGO efforts on collection and cataloging. However, it does not really address challenges in international coordination, enforcement, and distribution.

Possibility 3. Establish a voluntary fund and encourage MNCs to contribute funds related to the value that they extract from the TKDL. This raises standard problems of free-ridership and the general limitations of applying moral suasion to business decisions. It is easier to establish and begin quickly, and could lead to larger short-term pools of disbursable money than the other alternatives. It is likely to present the fewest problems of international coordination and participation.

Source: Abramson 2007.

player in the global knowledge economy. Recommendations here include completing work on the library to prevent international patenting of traditional knowledge, and soliciting further analyses of various approaches toward leveraging traditional knowledge into revenue streams.

Helping the Informal Sector Better Absorb Knowledge

A third approach to promoting inclusive innovation is for India to help informal enterprises better absorb existing knowledge. A main recommendation of this section is for government programs to more effectively promote knowledge absorption in the productive sector and extend the reach of markets to the common man.

Agricultural and Rural Extension Reforms Offer Examples

Traditional, supply-driven public extension systems in agriculture have been replaced by more flexible, market-sensitive support mechanisms. The green revolution in India was successful in increasing agricultural output, but by the 1990s the increased supply of wheat and rice had reduced commodity prices and farm incomes, and India's supply-driven extension system could no longer respond effectively to new challenges in agriculture. India's traditional training and visitation extension system stopped being effective at roughly the time the country achieved food security. The system worked well when relatively uniform technological packages had to be diffused rapidly to large numbers of producers in a short time, as with improved rice production technologies for irrigation farming. But the approach was abandoned with changing needs, given its inadequate interaction with the agricultural research system, inability to attribute benefits, weak accountability, and lack of fiscal sustainability (see Anderson, Feder, and Ganguly 2005). There is a growing realization that a rural development strategy is needed to focus on increasing farm incomes and rural nonfarm employment. China's successful program for developing rural nonfarm opportunities is premised on providing a flexible, demand-driven package of services—not just technology, but also information, technical assistance, marketing, and developing supply networks and supply chains (box 4.8).

The recent National Agricultural Technology Project has piloted a more market-oriented extension approach built around demand-driven market assessments, farmer organizations, and bottom-up governance. In particular, the extension component has successfully piloted farmer-centered, market-driven extension services with close links to researchers and farmers known as Agriculture Technology Management Agencies (ATMAs). ATMAs improve coordination among line departments, encourage public-private partnerships for technology testing and extension, and strengthen institutions for monitoring and evaluation at the state and national levels (box 4.9).

Extending Support to Markets and Networks at the Cluster Level

Support networks can help low-income workers raise productivity and incomes by teaching more efficient production methods. Informal enterprise, formal micro enterprise, and SME production chains of goods and services suffer from low-quality inputs, stock seasonality and accumulation, weak capital machinery, unavailability of prototyping and facilities for experimentation, lack of information on and exchange with markets—including for exports—and poor knowledge of how to manufacture goods. An illustration is provided by the plethora of roadside motor mechanic shops all over India. Millions of mechanics do all kinds of repairing, and their problem-solving abilities and novel solutions show that their talents can be harnessed to increase productivity and achieve business ends. However, most mechanics lack basic education and have no access to formal engineering or science training.

Box 4.8 China's Spark Program

With the emergence of rapidly growing, dynamic rural nonstate enterprises in the early 1980s, and with the Chinese government's determination to be more active in using science and technology developed in China in the real sector, in 1986 the Ministry of Science and Technology initiated the nationwide Spark Program. (Its name came from the Chinese proverb "A single spark can start a prairie fire," meaning that the spark of science and technology will extend over the vast rural areas of China.) Its overall objective was to help transfer technological and managerial knowledge from more advanced sectors to rural enterprises to support continued growth and development in nonstate rural enterprises—mostly town and village enterprises (TVEs)—and to help increase output and employment.

The program has spread to virtually every province in the country and has helped develop 66,700 projects and many more individual enterprises within them. As a result, some 20 million people have found employment in rural areas. Due to a TVE in Jingyang County in Shaanxi, per capita income in the county has almost tripled in five years. The Spark Program has achieved one of the primary objectives of China's agricultural policy: to stimulate and modernize the rural economy and improve the living standards of farmers and their families. Many factors have contributed to the program's success, such as the following:

- *Flexibility*. Farmers can select from a wide range of well-developed technologies (projects) to suit their districts.
- *Demand driven*. Participants choose from the projects within the program.
- *Income driven*. Joining the program provides the prospect of higher income.
- *Diffusion of known knowledge*. Technologies used in the program are generally already proven.
- *Local accountability*. Selection of the leader of a Spark Program project is in the hands of participants (subject to approval).
- *Support from local institutes*. The state provides financial support for training participants and for technical advice.
- *Sustainability*. Enterprises are funded almost entirely from bank loans and from capital raised by participants, not from government grants.
- *Market responsiveness*. Considerable effort is made to ensure that market outlets are available for the products of participating enterprises, with the program linked to local agricultural and industrial market systems.

One of Spark's main lessons is that successful execution of technical assistance requires full commitment and participation by all stakeholders. National ownership is important, and sound organizational setup and dynamic leadership for implementation are essential to project success.

Sources: World Bank 1998; Huang and others 2004; IDRC (www.idrc.ca/en/ev-55213-201-1-DO_TOPIC.html).

Box 4.9 The Experiences of Agriculture Technology Management Agencies

India's ATMAs provide for decentralized, participatory, farmer-driven extension services and have institutionalized bottom-up planning processes through the preparation of Strategic Research and Extension Plans—based on participatory rural appraisals and Block Action Plans. The program relies on a group approach based on village groups, as well as training of volunteer farmers. ATMAs support private extension initiatives by contracting NGOs to conduct extension responsibilities in selected areas, using farmer-to-farmer extension services provided by individuals or through farmer organizations, and forming partnerships with input providers (of seeds, fertilizers, crop protection chemicals) for demonstrations and farmer training. In most districts, farmers and other stakeholders have a sense of program ownership.

ATMA successes include diversification of production systems for higher income (for example, cultivation of high-value crops including flowers, fruits, vegetables, and medicinal plants), better natural resource management, integrated pest management, organic farming, well recharging, integrated plant nutrient management, resource conservation technologies, and development of new enterprises such as cashew processing, beekeeping, dairying, value addition through processing, and group marketing. Farmer interest groups have mobilized men, women, and young people to join common interest groups, such as producer groups for flowers, fruit, milk, and other products, as well as marketing groups for seed.

Training farm leaders in technology and leadership skills is important. Strong farmer organizations can be a positive link in the cost-effective provision of extension support to small and marginal farming communities, as well as an alternative to privatization of extension service. Farmer Advisory Committees are operational in most project blocks and are recognized by government line departments. However, internal conflicts between ATMA priorities and departmental responsibilities persist, and extension staff require considerable motivation to work in a farm advisory role with multiple funding sources.

Source: Janssen 2006.

Creating a network of such entrepreneurs and giving them better access to modern training, knowledge, quality assurance, and quality control training and finance could lead to them providing high value to customers—increasing productivity as well as incomes (Banerjee 2006).

A broad range of support networks have unrealized synergies, including research firms, enterprises, trade-entrepreneur networks, and NGOs. Formal researcher-academic networks typically do not have enough incentives to provide knowledge inputs to this bottom layer of producers. However, CSIR is building new innovation models by forging local partnerships, reaching out to the remote corners of India. A village called Athaoni, on the border of Maharashtra and Karnataka, is where Kolhapuri chappals (sandals) were until recently made using traditional techniques. Scientists from the Central Leather Research Institute helped reduce the processing time of producing the sandals—the stamping process was standardized and certain innovative changes were made in the design, based on

computer-aided techniques. But this was not a top-down process. The oldest man in the village was consulted, and today the institute has trained several hundred artisans—not only enhancing family incomes but also changing their perceptions of science and development.

Large enterprises may be encouraged to act as mentors for SMEs. The Tata Group may be interested in leveraging value addition through maintenance clinics. Upgrading roadside mechanic shops through access to more modern knowledge and practices could help them become part of this chain. Trader-entrepreneur networks are also important, including traders and wholesalers up to exporters, master-craftsperson traders, and guild masters. Recognition is needed for their roles in minimizing transaction costs, channeling market information, enabling informal contracting and close monitoring of least costs, providing finance, and providing designs and inputs, and sometimes even skilled staff. Among the clear advantages of producer cooperatives, professional organizations, and other NGOs is that they have lower direct personnel and infrastructure costs than do formal organizations carrying out similar functions. More important, they often have or can create or access informal networks that can facilitate their work—and their impact can be significant (box 4.10). The government as well as the private sector would do well to learn from their experience.

Box 4.10 NGO Initiatives and Rural Networks

Self-Employed Women's Association (SEWA). The association is engaged in manufacturing, crafts, and services, and has more than 420,000 members at the grassroots level. Export markets explored include Australia, Belgium, France, Germany, Italy, Japan, Spain, the United Kingdom, and the United States. SEWA's Trade Facilitation Center researches markets, improves communications between micro enterprises and their federations, carries out capacity-building and product development, and develops information and training software in local languages. It has commercialized the rural handicrafts industry, which sells women's goods through shops, trade fairs, and exports—in some cases adding $175 to an embroiderer's annual income. Key results for the Trade Facilitation Center include $307,000 in sales in 2006, a reduction in rejection rates from 30 percent to less than 9 percent, a state-of-the-art mainline production facility, and income generation for over 1,100 craftswomen in 2005 and 2006.

Krishi Gram Vikas Kendra (KGVK). The organization has pioneered the concept of "total village management" by providing sustainable income-generating opportunities and access to health care for the rural poor of Jharkhand, where 60 percent of the population lives below the poverty line. One example is its AGIVIKA (livelihood) research and training center, which builds skills and production capacity among the rural poor by training them to deliver services in primary health care, education, and water management for a small fee. In the past 33 years, KGVK has helped increase incomes of more than 10,000 people, and created over 3,000 self-help

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Box 4.10 continued

groups in 352 villages of rural Jharkhand. Key results include the formation of 78 farmer clubs that provide training and extension services to over 600 farmers, and two retail shops that have had over $12,000 in sales.

Magan Sanghralaya and Centre of Science for Villages (CSV), Wardha, Maharashtra. Magan Sanghralaya is the apex body of the CSV. CSV's objective is to identify technological problems in rural areas, find suitable interventions to mitigate them, and develop the mitigations in ways that can be adapted locally. It trains rural women in simple scientific skills and techniques, teaching marketing skills on how to sell, display, and store finished products. The center has helped develop 300 technologies for women, benefiting some 2 million women.

Prayog Pariwar. The essence of the Prayog Pariwar movement is regular meetings of farmers' groups to discuss practical problems and provide them with information on scientific practices. A key accomplishment is its efforts in carrying out the Scientific Grape Revolution in Maharashtra, involving thousands of farmers. Within 20 years, farmers with little experience in scientific farming are now believed to be India's leading grape cultivators, with annual turnover of nearly Rs 500 crore (about $122 million).

Sources: SEWA: www.sewa.org, Treacy 2003, and www.ifc.org/gbi; KGVK: www.ifc.org/gbi; Magan Sanghralaya and CSV, Wardha, Maharashtra: Dabholkar at www.prayogpariwar.net.

The government should consider providing additional programmatic support to markets and networks at the cluster level—with a focus on helping informal enterprises better absorb knowledge. The development of linkages calls for the emergence of new partnerships among traditional knowledge systems, NGOs, user ministries, associations of village industries, panchayat raj institutions, and rural Indians. A number of initiatives have elements of such partnerships. For example, it would be important to monitor ATMAs in agriculture and, if effective, expand them by providing increased funding. There is also a need to enhance absorptive capacity and extend the reach of markets to the poor through enhanced information, education, training, skills development, and finance. It is also important to strengthen indigenous clusters supported by trader-entrepreneurs, corporate parenting, and NGO networks. In the long run, developing a more formal programmatic approach would be helpful to serve as a focal point, provide funding as a stimulus, and ensure rigorous monitoring and evaluation of results.

Socially driven pro-poor innovations should also be encouraged. This is where companies go beyond the pure profit motive to develop goods or services to help deal with the needs of the poor, such as basic literacy, preventive medicine, and health-related issues, in the spirit of corporate social responsibility (box 4.11).

Box 4.11 Indian Initiatives for Corporate Social Responsibility

Education. The Computer-Based Functional Literacy (CBFL) Program (www.tataliteracy.com) tries to overcome illiteracy through the innovative use of information technology. It uses a mix of teaching software, multimedia presentations, and printed materials to teach uneducated people to read in a fraction of the time it takes to do so using conventional means. The project focuses exclusively on reading; people in the program can acquire a 300–500 word vocabulary in their own language within 30–45 hours spread over 10–12 weeks. The Infosys Foundation (www.infosys.com/infosys_foundation/learning.htm) has set up more than 10,150 libraries in rural schools, as well as well-equipped libraries in Hubli and Bangalore with the latest books in high-tech streams—such as medicine and engineering—that can be accessed by underprivileged students. It has also collaborated with the Center for Environment Education, Bangalore, to train teachers in science and the environment; 15 camps have been held in the 2004–06 period, and 1,000 teachers trained. The Azim Premji Foundation (www.azimpremjifoundation.org) is dedicated to universalizing primary education in India. It works under a Learning Guarantee Program, building a voluntary spirit of accountability among schools, communities, and government functionaries, and studies factors that influence learning. The Byrraju Foundation of Satyam Computer Service broadcasts English and math classes through satellite links and radio towers to more than 200 government-run schools (Corcoran 2006). With IBM's help, it has put computers in 54 rural primary schools and supports vocational programs for plumbers, electricians, and dressmakers. NIIT's Hole in the Wall experiment started in 1999 by introducing a kiosk housing a high-speed, touch-screen computer in a wall in a New Delhi slum, and showed that children can master navigating the Internet within hours (Orvis 2006). Since then, more than 150 computers have been installed in some 50 locations in New Delhi slums and rural India. TARAhaat (www.tarahaat.com) is a franchise network of 37 ICT centers that provide e-education, communication, and governance services to the poor. They also sell innovative products such as fuel-efficient cook stoves, lighting systems, and solar power devices.

Health and preventive medicine. Distance Healthcare Advancement is an initiative of Philips India to deliver high-quality, low-cost diagnostic distance health care for the underserved (www.philips.com/Assets/Downloadablefile/05-DISHA-15354.pdf). It partners with Apollo hospitals, which provides doctors and specialists for free consultations; the Electronics Corporation of India (a government organization that supplies the satellite dish); and with ISRO (Indian Space Research Organization), which places the satellite in orbit.

Linking farmers and the rural population through information technology. Indian Tobacco Company's e-Choupal (www.echoupal.com) is the largest infrastructure network serving villages, farmers, and rural markets, reaching more than 3.5 million farmers in over 31,000 villages through 6,000 kiosks in at least six states. Village Internet kiosks managed by farmers enable the agricultural community to access information in their local languages on the weather and market prices, disseminate knowledge on scientific farm practices and risk management, facilitate the sale of farm inputs, and sell farm produce from the farmers' doorsteps. Real-time information enhances

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Box 4.11 continued

farmers' ability to make decisions and aligns their farm output with market demand and secure quality and productivity. Aggregation of demand for farm inputs gives them access to high-quality inputs from established manufacturers at fair prices. As a direct marketing channel, e-Choupal eliminates wasteful intermediation, significantly reducing transaction costs (Das Gupta 2006). Microsoft's Rural IT Initiative, Saksham (http://www.mission2007.org/saksham_tm.pdf), is aimed at delivering the benefits of IT to rural India. It will partner with Drishtee, Jai Kisan, and n-Logue to roll out kiosks across the country: 50,000 are planned over the next three years. And the Byrraju Foundation has created two IT centers (known as GramIT), with 100 kiosks each in Andhra Pradesh. The foundation covered the initial costs: $110,000 for computers, wireless networks, and worker training. GramIT withholds some wages for the 1 percent equity that each worker will hold in the local business in two years. It is estimated that each job generates as much revenue as five acres of good land (Corcoran 2006).

Creating opportunities by starting new businesses (www.ifc.org/gbi). The Bharatiya Yuva Shakti Trust (BYST) identifies underprivileged young entrepreneurs and provides them with collateral-free financing over three years. Funding is supplemented by targeted mentoring, monitoring, and networking. BYST has engaged with the Indian corporate sector. Its Mentor Development Program will expand its mentor network to 30,000 over the next five years, affecting 90,000 enterprises run by young entrepreneurs in India.[5]

Source: Authors, based on cited Web sites.

Notes

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1. Such a foundation, the Foundation for Innovation, Research, Support Trial, and Diffusion (FirstD), was discussed during the preparation of the 11th Five-Year Plan for CSIR, according to a communication by Professor Anil Gupta (personal communication July 2006).
2. Karnani (2006) presents a complementary view on how the private sector can help alleviate poverty. Rather than focusing on the poor as consumers, they should be viewed as producers—thereby emphasizing buying from rather than only selling to the poor.
3. Much of the discussion in this section draws on Mathur and Sinha (2006).
4. CSIR is encouraging links between scientists and indigenous knowledge holders. An example is a medicine based on the active ingredient in a plant, Trichopus zeylanicus, found in the tropical forests of southwest India and collected by the Kani tribe. Scientists at the Tropical Botanic Garden and Research Institute (TBGRI) collected plant samples, tested the ingredients, and incorporated them into a compound christened Jeevani—giver of life. The tonic is being manufactured by an Ayurvedic drug company. In 1995 an agreement was signed between TBGRI and the tribe to share a license fee and assign 2 percent of net profits to the tribe. This process was perhaps the first time that cash benefits have gone to the source of knowledge of traditional medicines—the original innovators (Mashelkar 2001).

5. Since its inception, BYST has established a network of 3,000 volunteer business mentors and developed more than 1,100 enterprises. Key results over the past 13 years include creation of 10,000 new jobs, 10-fold wealth generation (Rs 10 in enterprise revenue for every Rs 1 invested), counseling of 55,000 young entrepreneurs, 1,000 new jobs a year created by overseas organizations mentored by BYST, and a loan recovery rate of 95 percent (on total loans of $750,000). Information is from www.ifc.org/gbi.

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