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THE HONEY BEE NETWORK

Scholarly attention to the contribution of the Honey Bee Network (HBN) has evolved fairly rapidly both in India and abroad in response to growing interest in how to promote the diffusion of inclusive and environmentally friendly innovations in developing and emerging economies (Abrar and Nair, 2011; Bhaduri and Kumar, 2011; de Beer et al., 2013; De Keersmaecker et al., 2011; Pansera and Owen, 2014; Shivarajan and Srinivasan, 2013). A leading scholar of innovation studies has even suggested that the notion of grassroots innovation developed by Anil Gupta should be considered as the endogenous, intrinsic version of Prahalad's external, top-down version of bottom-of-the-pyramid (BoP) innovation (Soete, 2013).¹ Some already see this also as a pathway through which the incentive of intellectual property rights (IPRs) protection has been productively used to enhance the diffusion of alternative technology in respect of emerging economies and the developing world (Greenhalgh, 2014).

In the field of grassroots innovation the place of the HBN is seemingly distinct, since it focuses on the contributions of non-formal, uneducated innovators. For the HBN, grassroots innovation is the innovation of uneducated people (without a professional degree) who are self-employed outside the formal sector and develop their innovation without any outside help from formal institutions and organizations. The HBN considers the exclusion of these innovators from the formal sector to be the main characteristic of grassroots innovation.

The HBN displays a number of unique features in comparison to other grassroots innovation movements. In contrast with the People's Science Movements (see Chapter 5), a distinctive aspect of the HBN is its advocacy of the use of IPRs protection to promote grassroots innovation efforts. The HBN uses this protection strategy to recognize, respect, protect and financially reward non-formal grassroots innovators, and as an instrument to facilitate fair collaboration among non-formal innovators, formal sector science and technology (S&T) institutions and large private sector enterprises.

Focusing on this and other aspects of the case study, this chapter investigates the HBN from a historical and comparative perspective. We first outline the context and background of the network going back over thirty years to the mid-1980s. We then investigate the framings of grassroots innovation adopted by the network (as articulated by its key protagonists), the spaces and strategies adopted and occupied in order to further its goals and the ways in which the network's promotion of grassroots innovation has enabled the construction of pathways to sustainability and social justice. In order to do so, we draw on secondary documentation, textual and interview data and the personal experience of the primary author (Dinesh Abrol).

Context: origins and background of the HBN

The HBN was established in India by Professor Anil Kumar Gupta of the Indian Institute of Management Ahmedabad (IIM-A)² in 1988–89. At that time his key aim was to ensure the implementation of the idea that the documentation of any knowledge must refer to and acknowledge the knowledge holder. Anil Gupta was concerned that academics and consultants were becoming rich by writing about people's knowledge and that they were not sharing their wealth with the holders of traditional knowledge. In the words of Anil Gupta, the philosophy of the HBN has rested on four basic principles:

Cross pollination of ideas in local languages, acknowledgement of individual and common creativity without making them anonymous, protecting their knowledge rights, and sharing the benefits in a fair and just manner accrued from value addition in the innovations or traditional knowledge.

(Gupta, 2014a)

The social diffusion of grassroots innovation, encouraging grassroots innovators to practise knowledge sharing with people locally and globally through interaction with the scientific community, and the voluntary mobilization of people to use these innovations for community building were also the important aims of the HBN (Interview with Professor Kuldeep Mathur, Formerly Member of the Board of the National Innovation Foundation India, 11 February 2015).

In the case of the HBN the first formal step was taken when Anil Gupta started a newsletter at the IIM-A in 1990. To begin with he published it only in English and shared it with scientists, policymakers, conservationists and others. The newsletter set out the basic framework for a voluntary network where students, rural people, like-minded non-governmental organizations (NGOs) and others joined in to identify innovations and document them for publication. To date, the newsletter *Honey Bee* (in its English-language version) continues to be an important instrument for the volunteers of the HBN to publicize the innovative practices of rural people. In the first year, 1,613 innovations and traditional practices were identified and documented. Students and volunteers were initially asked to fan out individually in rural Gujarat, but from 1993 these individual efforts have been supplemented

by collective journeys, known as Shodh Yatras, taken on foot through villages in different states.

The efforts of the HBN gained momentum with the establishment of the Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI) in 1993. Innovations that were scouted required validation and verification. Initially SRISTI used only IIM-A facilities to set up a laboratory to perform the primary microbiological, entomological and chemical analysis of materials and products scouted by the HBN. The first model of cooperation with an educational institution was developed here. When more sophisticated equipment was needed for verification, SRISTI sent samples to the laboratories of other cooperating research agencies. For SRISTI, the first aim of the organization remains to help in the protection of the intellectual property of grassroots inventors and innovators. Scouted and patented grassroots innovations and grassroots innovation based on traditional knowledge have grown, in terms of the numbers of patents filed, from just two in 2001 to 557 in 2012 (Ustyuzhantseva, 2015).

The other important aim now is knowledge networking, and five main activities performed today by the HBN are: scouting and documentation; value addition and research and development; IPRs protection and licensing; information and communication technologies application and dissemination; and business development and micro-venture. The Grassroots Innovation Augmentation Network (GIAN) was set up by SRISTI in 1997. The GIAN helps to commercialize grassroots innovations. Innovators receive help from the GIAN to create its own companies to sell products. An innovator can create a joint company with an experienced entrepreneur and can also transfer technology for further commercialization by a third party.

The National Innovation Foundation (NIF) was set up in the year 2000. In 2006–7, the Department of Science and Technology (DST) scaled up its support to the NIF, which became an institution under the DST and has since then been receiving annual grants from the government of India. Today, the tasks of promoting and using the grassroots inventions identified by the volunteers of the HBN are implemented by the professional staff of the NIF and the GIAN. Currently the system of innovation includes the supporting organizations that have been established in the form of GIAN, NIF, the Micro Venture Innovation Fund (MVIF), the Grassroots Technological Innovation Acquisition Fund, Gandhian Young Technological Innovation Awards and Techpedia (connecting technology students with grassroots groups).

Anil Gupta characterizes innovations in three ways: *at*, *for* and *from* the grassroots. The HBN has collected from more than 500 districts throughout the country over 150,000 ideas and 10,000 examples of contemporary innovations and several outstanding examples of the use of traditional local knowledge in the sustainable management of natural resources. Information on these grassroots innovations is being shared with local communities and individuals in over seventy-five countries through the *Honey Bee* newsletter, which is now issued in eight languages (English, Spanish, Hindi, Gujarati, Tamil, Kannada, Pahari and Telugu) (Gupta, 2001a, 2014b; Ustyuzhantseva, 2015).

From its origins as a totally voluntary initiative, the HBN has become a distinct system of formal sector support for grassroots innovation via the NIF in India, an institution of the central government. The NIF is responsible for implementing the complete cycle of grassroots innovation augmentation and development and its professional staff are recruited with advice from the HBN. The HBN is free to choose partners from within both private and public sector organizations and to receive their help at all stages of the development of innovations. The NIF can decide on the nature of incentives for grassroots innovators to encourage them to participate in the process of innovation development.

In order to add value and disseminate grassroots innovations the HBN is making effective use of the facilities, recognition and public organization status of the NIF to collaborate with several public sector research organizations. The NIF also has an in-house innovation laboratory for developing grassroots innovations. The corporate sector is willing to collaborate with the HBN in the work of creating a marketplace for them.³ Because the HBN has been given full freedom to construct the mechanisms of support for grassroots innovation and to supplement the resources available to the NIF from the central government⁴ with those from private and public agencies, it seems to be free from the usual problem of bureaucratic hurdles preventing timely action.

The initiative that began in a small way in the state of Gujarat today has the recognition and support of central government for the organization of a separate mainstream system of innovation to promote grassroots innovators identified by the HBN from across all of India's states (Ustyuzhantseva, 2014). Initially, the institutional structure of SRISTI was motivated by the growing size of the database and an inability to handle it, and it was set up to provide an organizational base for the wider dissemination of traditional knowledge and uses of biodiversity in local languages, so as to allow the efforts of volunteers to spread as a social movement in all parts of the country (Gupta, 2000). Today, SRISTI's important emerging mission is knowledge networking for the benefit of grassroots innovators. Interestingly, its efforts also now contribute equally to the promotion of the grassroots innovations of students who are immersed in the sources of modern scientific and technological knowledge.

Shodh Yatras as the loci of voluntary mobilization

For a period of over two decades every summer and winter SRISTI has been organizing Shodh Yatras that celebrate creativity on its doorstep. These journeys are made to (a) explore creativity and knowledge systems at the grassroots; (b) honour innovators and traditional knowledge holders on their doorstep; (c) create awareness among both young and old of what others have done to solve problems without any external assistance, by sharing the multimedia, multi-language Honeybee database and initiating dialogue with innovators; (d) discover and elaborate the knowledge of women on local biodiversity and its rare uses; and (e) look for young geniuses who possess extraordinary sensitivity towards the environment. Shodh Yatras are also

used to honour knowledge experts in order to convey the message that outstanding traditional knowledge matters as much as contemporary innovations. Volunteers receive the blessings of centenarians on the way and try to learn from their lives.

The HBN's strength in voluntary mobilization

Even today the main strength in the HBN comes from the fact that informal and voluntary mobilization is thriving and has continued to do so through the gradual process of institutionalizing the network. The credit course that Anil Gupta developed at the IIM-A, whose students have been volunteers for the HBN, including in Shodh Yatra, has enabled the HBN to keep its voluntary character intact. Professor Kuldeep Mathur, a former member of the Board of NIF observes that Shodh Yatra and the credit course started at the IIM-A are the strengths of the HBN. Shodh Yatra provide the NIF with its close link to the voluntary character of the HBN. Even since the year 2000 and the constitution of the NIF, when the institutionalization phase of the HBN can be said to have taken off, neither the students nor the grassroots inventors are known to have faced any problems in working with Anil Gupta in this previously informal space. The leadership of the NIF has been developed by him and it mostly shares his values. The voluntary spirit continues to thrive under this leadership and the dedicated and committed voluntary system remains intact within the HBN and its affiliates (Interview with Professor Kuldeep Mathur, 11 February 2015).

HBN's framings

The motivations that initially moved Anil Gupta and the student volunteers of the HBN – namely, conservation of biodiversity and respect, recognition and reward for indigenous or traditional knowledge, wider social diffusion of traditional and local knowledge, redeeming the self-confidence of the local talent and community building through its use – received the attention of many other radical figures of the day. During the 1980s several governmental and non-governmental bodies were engaged in this field, telling policymakers how they should be using traditional knowledge in the process of development in India. Within civil society, also active in the field, with their own initiatives on traditional knowledge, were Suman Sahai of Gene Campaign, Vandana Shiva of Navdanya, Claude Alvares, Smitu Kothari, Ramchander Guha, Shiv Visvanathan and Ashis Nandy of Lokayan and the Centre for Developing Societies, and Ashish Kothari of Kalpavriksha and People's Science Movements.

All of them shared the broad framing that traditional knowledge was being undervalued and needed to be supported for its potential contribution to social and environmental goals. A number of these individuals and organizations actively engaged with the public on the issue of how the question of IPRs should be tackled by policymakers in order to achieve the objectives of conserving biodiversity and promoting traditional knowledge in India.⁵ But among them only the HBN chose

to use the institution of IPRs as a means to bring the contribution of grassroots innovators into the mainstream.

During the 1980s, advocacy of several environmental groups was framed in terms of the ideology of 'environmentalism of the poor' (Alier, 2002). This framing included a belief in traditional communities as the social carriers of environmentally relevant knowledge and innovation.⁶ The protection of biodiversity and traditional knowledge were an integral part of this framing. Although the efforts of the HBN were co-evolving amid the contestations that were ongoing in the sphere of where and how to use traditional knowledge, the HBN's emphasis on the contribution of individual grassroots innovators to traditional knowledge, the use of a competitive spirit and the element of market competition made an important difference. This emphasis gained for the HBN the influence that it received among the policymakers of the day. Anil Gupta clearly preferred to align with those policymakers who were supportive of market liberalization and IPRs protection for traditional knowledge. The idea of sourcing innovative solutions from the individual grassroots innovators for the benefit of the emerging market economy was a key move on the part of the HBN.

In the late 1980s, Anil Gupta was actively associated with the activities of the Patriotic and People-oriented Science and Technology Group (PPST), which advocated the development of the community dimension of traditional knowledge and saw it as the basis for the development of alternative sciences and technologies. During the 1980s, the PPST had emerged in India as a radical social movement in the area of cognitive justice for traditional knowledge, which was also aligned with the ideology of 'cultural nationalism', which is known to be embraced by both Hindu nationalists and secularists. When the first Traditional Science and Technology Congress at the Indian Institute of Technology (IIT) Mumbai was organized by the PPST in 1994, Anil Gupta was closely associated with the group. Discussions with Navjyoti Singh of the PPST suggest that the HBN deliberately chose to promote the strategy of making individual grassroots innovators competitive. It is notable that, in spite of his active association with the efforts of PPST, Anil Gupta chose not to frame the promotion of indigenous knowledge by the HBN as a challenge of developing local communities more broadly. The option to frame the challenge of promoting traditional knowledge mainly as a problem of strengthening individual innovators (rather than emphasizing the community origins of traditional/indigenous knowledge) was deliberately chosen to suit the changing times.⁷

Historically, at the beginning the core idea of the HBN had been to ensure the granting of respect, recognition and reward to grassroots inventors, and its framings revolved around the establishment of a mechanism of intellectual property protection for the conservation of biodiversity and traditional knowledge. The HBN supported the institution of stronger IPRs even though, according to many others, IPRs' adverse influence on access and innovation was an important concern in India.⁸ During the early 1990s the problem of IPRs was turned into a question of recognition of the rights of farmers and local communities in agriculture by Anil

Gupta, along with others such as Suman Sahai and Vandana Shiva.⁹ The National Working Group on Patent Laws (NWGPL) was also a key participant in the debate on IPRs, with a solution to the protection and promotion of traditional knowledge that was significantly different.¹⁰

At a time when the governments of the industrialized world and transnational corporations were describing the Indian inventors of process innovations as free riders and pirates (because the Indian Patent Act permitted patenting of process innovations in the pharmaceutical industry), a vast majority did not want the Indian government to accept the proposals of the TRIPS Agreement in the sphere of pharmaceuticals and agriculture. During the late 1980s and early 1990s most of the political and social movements in India were using the frame of neocolonialism to engage with the wider public on the question of IPRs. But Anil Gupta, in the case of traditional knowledge, chose to view the demand for stronger IPRs as an issue of cognitive justice for farmers and grassroots innovators.¹¹ He suggested that the Indian government should accept the principle that innovators (wherever and whoever they might be) must be protected and compensated through the institution of strong IPRs (Gupta, 1992). He argued that it was more important to allow the farmers and holders of traditional knowledge to gain from the IPR negotiations than to concentrate on the demands (from the governments of the industrialized world under TRIPS) for a stronger IPR system for medicines. Gupta argued that, by adopting his stance on the subject of IPRs in the *General Agreement on Tariffs and Trade* (GATT) and Convention on Biological Diversity negotiations, the developing world governments would be able to stake the right of their farmers to have a share in the global profits of multinational corporations.¹²

In September 2000, the World Intellectual Property Organization (WIPO) established the Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore to provide a forum for governments to discuss intellectual property matters with regard to access to genetic resources and benefit sharing and the protection of traditional knowledge, innovations and creativity and expressions of folklore. In India, the Biological Diversity Bill 2000, *vide* section 36 (IV) of chapter-IX, provides for the protection of the knowledge of local people relating to biodiversity through measures such as the registration of such knowledge and the development of a *sui generis* system. Sections 19 and 21 of chapter-V also stipulate prior approval of the National Biodiversity Authority before access and mutual benefit sharing. The HBN, through Anil Gupta, has been able to make a significant contribution to the issue of IPRs for traditional knowledge at both international and national levels.¹³ Meanwhile, SRISTI is advocating for the establishment of an International Network for Sustainable Technological Applications and Registration.

The HBN deliberately chose the idea of individual grassroots innovators as knowledge-rich, economically poor individuals who were deprived of recognition, respect and reward. The HBN's idea that strong IPRs would enrich rural areas rather than exploit them was new (Dutfield, 2006). It is important to underscore the point that, until that time, environmental activists had mostly preferred to advocate

for the ownership of biodiversity as resting at the level of local communities. The HBN chose to frame the challenge of knowledge networking as also providing for incubation and entrepreneurship support to individual grassroots innovators. Due to the efforts of the HBN, the institution of strong IPRs for traditional knowledge (whose carriers are now the individual grassroots innovators identified by the HBN) is the most important mechanism for the insertion of traditional knowledge into the mainstream development process in India.

The HBN has been able to provide legitimacy not only to the concept of individual innovators' ownership of traditional knowledge but also to the idea of how, by using the institution of IPRs, these individual innovators are now able to become competitive. More recently Anil Gupta has suggested the idea of creating a market for green grassroots frugal innovations, and that the innovations of poor people have substantial potential for green transformation. The frame of human survival in the age of climate change is also now added, so as to attract a contemporary motivating factor:

At the time of the HBN organized biodiversity competitions the people from outside try those recipes that have some uncultivated plants as ingredients. In the wake of climate change we might need new sources of food if the present one succumbs to new diseases or pests, and we have started preparations for any such catastrophe in the foreseeable future. Many of the so-called weeds are actually a rich source of nutrition. The inquisitiveness and the survival instincts of poor people might actually hold the key to the survival of humanity in the future. Thus, attention to their knowledge need not only be justified only on its own account and for potential help to the poor, but also because it will provide ways of survival for the more privileged ones who have lost such an instinct.

(Gupta, 2014a)

Another characteristic of the HBN's framing of grassroots innovation is the potential for (and importance of) blending different types of knowledge. Anil Gupta framed the issue of promoting traditional knowledge as a problem of ensuring access to the knowledge of other people, with institutions and knowledge systems in their own languages. Although traditional knowledge was cast by the HBN as an alternative and complementary knowledge, to be integrated into the process of 'modern development' in order to align this frame with the policy of economic liberalization (Gupta, 1990), it was conceived also as a problem of grassroots innovators not being given access to local or nearby scientific laboratories and workshops for validating and adding value to their knowledge of herbal healing (and other technological claims).

The HBN chose to actively access the institutions of modern S&T to provide hand-holding support on the doorstep to grassroots innovators who were pursuing creativity and innovation for survival, in order to convert their ideas into enterprises (see Gupta, 2009). The HBN focused on increasing its access to

local-language multimedia tools and databases of traditional knowledge or grassroots innovations held by other communities in the region (or around the world). The HBN did not reject modern S&T as ‘Western knowledge’. Like the People’s Science Movements, Anil Gupta is in favour of the active blending of people’s traditional or informal knowledge with modern scientific and technological knowledge. Vandana Shiva, Alvares, Nandy, Visvanathan and many others still promote the systems of traditional knowledge as alternative sciences and technologies. They have chosen not to accept the embrace of modern science and technology. The HBN, on the other hand, favours access to local or nearby labs and workshops so as to add value to such knowledge, to fabricate tools or to commercialize traditional knowledge-based innovation.

The HBN has been using the frame of celebrating cultural knowledge and creativity and has been linking the frame of cultural creativity and educational innovations so as to recognize the value of biodiversity during Shodh Yatras. Food recipes and ideas competitions in the villages have been used by the HBN in the course of Shodh Yatras to demonstrate the grassroots spirit in the spheres of the education of young children, the building of excellence and the development of collegiality (Gupta, 2014a).

The HBN has been able to address the challenge of simultaneously obtaining legitimacy both from the emerging policymaking apparatus and from the networks of activist groups who in the 1990s were aligning themselves with cultural nationalism and environmentalism of the poor. The HBN remains conscious that the framing of grassroots innovation combines its efforts only with the ideology of ‘secular cultural nationalism’. Its strategic use of post-Nehruvian environmental, cognitive and social justice movements for the cause of grassroots innovation is evident.

The HBN has been continuously adding new frames to motivate both grassroots innovators and the policymaking apparatus to provide support to and participate in its initiatives. After starting with the original frame of recognition, respect and reward, Anil Gupta today uses the frames of sustainable livelihoods to motivate people to support the initiatives of the HBN. The sustainable livelihoods frame includes equity considerations, conservation concerns, the preservation of traditional practices and culture, preventing the appropriation by unauthorized parties of components of traditional knowledge and the promotion of the latter’s use/importance in development.¹⁴ The HBN’s initiatives aim to foster creativity and upgrade the capabilities of people who lack a professional background. The HBN collaborates with them to commercialize solutions for sustainable development.

Promoting interactions between grassroots innovators and other regular entrepreneurs and supporting governmental institutions is today seen by the HBN as its key task. In the ongoing long evolutionary process of thinking on and learning from the role of people’s knowledge in development in India, the efforts of the HBN represents a discontinuity, as compared to earlier attempts to articulate people’s knowledge in development. Compared to these earlier approaches, the HBN’s main framing fits in with the pathway of market liberalization, but the

idea of scouting and documenting traditional knowledge, and of providing IPRs protection as an incentive to non-formal innovators, is still under test. Using the individual grassroots as social carriers of grassroots innovation is also a clever and risky step (see discussion on this issue in Dutfield, 2006).

Spaces and strategies of the HBN

The spaces and strategies of the HBN can be better understood when related to the outcomes of knowledge networking in practice in the form of encouraging student volunteering for the scouting and documentation of grassroots innovation, helping to build linkages between grassroots innovators and the publicly funded S&T institutions and private companies that are undertaking value addition, research and development, IPRs protection and licensing, and providing catalytic risk capital to grassroots innovators. In terms of the strategies used, the efforts of the HBN can be characterized as mainly informed by the frame of grassroots innovation movements using local ingenuity and their utilization in the process of mainstream development. Currently the spaces and strategies, in practice, largely reflect the desire of the HBN to help uneducated grassroots innovators to consolidate their monetary position. The HBN's frame of rewarding individual innovators so that they are able to compete in the market through their own strength is also firmly written into the spaces and strategies.

So far, altogether about 150,000 ideas, innovations and traditional knowledge practices (not all unique) have been mobilized from 545 districts of India through the efforts of the HBN. It is not a small achievement if one notes that more than 90 per cent have been collected by the volunteers of the HBN, while the remaining 10 per cent have come in response to advertisements issued by the NIF. It represents a significant contribution to the politics of innovation and intellectual property systems for the management of traditional knowledge.

The HBN has been using the faculty and students studying in engineering colleges, universities and national institutes of design as its collaborators. The HBN is implementing a strategy of providing recognition to university and college students through various award initiatives (IGNITE Awards, Techpedia and Gandhian Awards). While these efforts are seemingly still insufficient for the realization of effective collaborations between grassroots innovators and innovators from formal S&T institutions, the initiatives such as the various awards can help the HBN to tap from this pool a new generation of volunteers supporting grassroots innovation.

At a time when S&T institutions are being asked to adjust to the changing environment for research and technology development activities (due to the decline in public funding, market-led selection of research projects, greater collaboration with the private sector and generation of revenue from sponsored research, exclusive technology licensing and stronger IPRs), the HBN's strategies fit well with the developments taking place within the national innovation system. The NIF has become an apex institution of a system of grassroots innovation support in India. It has been able to involve organizations of the Indian Council of Medical

Research and the Council of Scientific and Industrial Research in its network that is under development to support the steps of innovation development from idea to product diffusion.

The use of micro-venture capital for the purpose of business development is an important HBN strategy. In 2003, the HBN was able to set up a Micro Venture Innovation Fund (MVIF) with the help of the Small Industries Development Bank of India (SIDBI). It has already invested more than Rs2.5 crores (Rs25 million) in the ideas and innovations of ordinary people without any collateral or guarantor.¹⁵ The national MVIF is the principal financial source for the GIAN. This fund is being effectively used to support innovations which have market potential at the national and global levels. The MVIF provides risk capital support to only those entrepreneurs and companies that are interested in commercializing grassroots innovations. The MVIF is not a grant but a loan.

Out of total four crore fund, till date, we have supported total 191 projects and the total sanctioned amount is Rs3,87,06,637 (Three Crores Eighty Seven Lakhs Six Thousand Six Hundred and Thirty Seven only), Disbursed Amount is Rs3,40,37,637 (Three Crores Fourty Lakhs Thirty Seven Thousand Six Hundred and Thirty Seven only) and the total repayment amount is Rs2,13,01,676 (Two Crore Thirteen Lakhs One Thousand Six Hundred and Seventy Six only).

(National Innovation Foundation, n.d.)

Using the MVIF, the HBN has been able to extend risk capital to many successful ventures that would otherwise normally be considered as too risky for the regular commercial financial institutions to fund. The NIF supports grassroots innovations in many ways, including support for converting market-ready prototypes to the stage of manufacturing in small quantities based on the orders received by the innovators, and support for certification by regulatory authorities, field trials, market research and benchmarking. An example is the motorbike-polycultivator, invented by Mansukhbhai Jagani in a small village in Gujarat. The NIF requested the National Institute of Design to develop a product design. The Sloan School of Management at MIT developed the business plan. In May 2008, NIF and GIAN took the initiative to test and improve Jagani's design. About thirty innovators and another twenty stakeholders met to discuss ways and possibilities for design and functional improvement (Ustyuzhantseva, 2015).

The Grassroots Technological Innovation Acquisition Fund, established as recently as 2011, acquires rights to technologies from the innovators for the purpose of generating public goods. It undertakes the acquisition of grassroots technologies by the HBN so as to share them with other grassroots entrepreneurs. In 2012, twenty-four farmers from eight states, who had developed over thirty-nine improved varieties of fifteen crops (such as paddy, wheat, mustard and beans) received Rs120,000. In total, the NIF has acquired rights to seventy technologies at a cost of Rs275,000 (National Innovation Foundation, 2013).

The GIAN also accesses small sources of funding from the Gujarat government and the Department of Scientific and Industrial Research. Unlike many other grassroots initiatives that are still struggling to mobilize innovation finance, the HBN is receiving generous help from the central and state governments.

The commercialization of grassroots innovations is carried out through the GIAN. More than sixty technological licences have been given, mainly to small companies and individual entrepreneurs, with the benefits going back to the innovators. Small entrepreneurs have chosen to license technologies from the innovators in about two dozen cases. Initiatives have included: (1) establishment of an innovator-based incubator with financial support from NIF – GIAN extended support of Rs1,583,000 to six innovators from Gujarat under this programme; (2) tie-in with Reuters for technology diffusion to farmers through mobile (SMS) phone. Each innovator received about twenty calls per day on average; (3) GIAN West's market research on herbal formulations developed from the knowledge of traditional healers, namely Herbaglow, Pain Relief, MosqHit, Herboheal and Zematic; (4) GIAN's development of brands for two innovative products, launched at the annual SATVIK traditional food festival. Herbal practices and traditional food items are being marketed under a common brand name by SRISTI.

Value addition, business development and technology transfer are very important to the HBN's strategy of ultimately making the individual innovator 'economically rich' and 'competitive' in the market. The HBN started by collaborating with the publicly funded R&D system; today, with the help of the corporate sector (another space for collaboration), the HBN is moving forward to provide support to individual grassroots innovators. Within the corporate space, GIAN West has been able to rope in automobile manufacturers. Sunil Parekh (Cadila Ltd), Rahul Bajaj (Chairman, Bajaj Auto Ltd) and Sunil Munjal (Chairman, Hero Honda Ltd) have taken an interest in the automobile technologies developed by grassroots innovators. In the private sector, the NIF has started working with the Futures Group (owner of the largest retail space in India).

More recently, in terms of the linking of grassroots innovators with the formal sector for business development, more spaces are opening up for the HBN's grassroots innovation activity, with the support of the corporate sector.

Progress in path construction

Our investigations indicate that the goal of the HBN is at present mainly restricted to developing the ability to mainstream, insert and include the innovations of socially excluded, non-formal grassroots innovators into mainstream developmental processes. Its achievements can be seen mainly in respect of the insertion of non-formal grassroots innovators into conventional markets. In selected cases (with the help of the NIF) the HBN has been able to help grassroots innovators to go global and to create business. These examples have encouraged many others to contribute grassroots innovations to the HBN registry, thinking that they too can improve their financial position by getting support from the NIF.

However, it is also important to recognize that the product and technology commercialization strategy of HBN relies basically on the individual producer to mobilize the resources for the introduction and diffusion of innovations into the market. Lack of success with the diffusion of a pedal-operated washing machine in Kerala and a hand-pump installation encouraging local water storage for human and animal consumption indicates that community building, social diffusion and group enterprise are necessary for a higher level of success.

Success is not forthcoming in many cases because the individual producer is not able to compete successfully in the market, particularly where medium- and large-scale firms are already active with similar or alternative products. Even when the individual producer has been able to obtain the collaboration of big business he or she is being encouraged to grow without changing the organization of production. The HBN does not have yet the arrangements in place for the growth of group entrepreneurship and to act as a co-producer to address the social diffusion of grassroots innovation within the space of locally evolving economies.

It is quite likely that the successful introduction of grassroots innovations of high commercial impact will largely come from collaboration and cooperation with big business. However, there are as yet not many cases of successful technological collaborations that are led by big business. Innovations that are being introduced with the help of big business have yet to bear significant fruit even for business development. Of course, this leads us to question the idea of the HBN as the endogenous, intrinsic version of Prahalad's external, top-down version of BoP innovation (Pralhad, 2009).

Further, our discussions with some of the grassroots innovators and state-level coordinators and collaborators from within the S&T institutions and government also indicate that (a) identification and acceptance by the NIF of grassroots innovations needs to be undertaken with more clarity about the expectations that grassroots innovators hold with regard to awards and financial and knowledge-related intermediation; and (b) patent filing and prior art searches need to be undertaken with far more responsibility because the payment of maintenance fees will make sense only for those patents where the NIF's public investment in patenting grassroots innovations can be suitably recovered by the state from the returns to the NIF (either from fees received as lump sums and royalties or from revenue from sales of the grassroots innovation).

The HBN faces the challenge of ensuring that the spaces created fulfil the aspirations of non-formal grassroots innovators as well as its own expectations for the wider diffusion of grassroots innovations. Investigations show that grassroots innovators have a mixed experience regarding their interactions with the NIF (see Bhaduri and Kumar, 2011 for further discussion on the mismatch between individuals' motivations and community expectations). As things stand today, the NIF has been quite flexible and liberal with regard to accepting the grassroots innovations identified and submitted during Shodh Yatras. But when they have developed expectations and the NIF has not been able to meet their aspirations, the response of grassroots innovators has at times been one of frustration and disappointment.

The NIF is generating a lot of expectations among grassroots innovators, and many of them have opined that the NIF needs to be democratized. One possibility would be to have representation on the governing body and executive from other such initiatives.

The HBN also faces the unanticipated challenge of mobilizing those grassroots innovators who are knowledge rich but who are not necessarily demanding economic benefits for their knowledge or innovations. Many among them feel that what they possess is a God-given gift that should be shared among the members of the community. More importantly, making the transition to being an entrepreneur is not easy, even for a person who strives for it. Our analysis suggests that the desire to share and to help each and every one remains strong among non-formal grassroots innovators, without such a great need for individualized financial gain. The NIF could possibly look into how the identified grassroots innovators could realize far more from the diffusion of their own innovations through open modes, which seems to be the desire of many grassroots innovators (as observed from the stories being put out by the NIF) (Abrol and Gupta, 2014).

As the diffusion of grassroots innovations is an important challenge at the local market level, the capacity to empower communities cannot come without augmenting the intermediation arrangements away from a focus on each one being competitive as an individual producer. The NIF needs to work out appropriate strategies in order to exploit the potential to develop interrelations between selected grassroots innovations, and to develop synergies among the enterprises under development in order to realize the wider possibilities of local economic and social development. While it is true that affordable and accessible technologies can also be diffused through private retail chains, the social diffusion of open source technologies is an even more important potential contribution of the HBN.

Efforts towards the mobilization of grassroots innovators that are needed so as to realize the potential of green grassroots frugal innovations at the level of the development of the local markets are receiving insufficient attention. The HBN has been far more successful in bringing about a change in the level of support for grassroots innovators to commercialize grassroots innovations at the national and international levels. In many examples, it has been able to assist innovators to improve their individual incomes in a significant way. But the impact of these innovations on the improvement of rural economies is as yet quite limited.

Future challenges for the Honey Bee Network

Drawing on the analysis above, we next set out some of the main challenges that the HBN faces in constructing pathways to inclusion and sustainable development in India, and offer some suggestions for how this might be done.

During the two and half decades since 1990 this idea of including non-formal grassroots innovators has made important strides as a result of the efforts of the HBN and its affiliates in India. An important strength of the HBN's strategy seems to lie in the programmes for mobilizing students and scientists from within the

formal sector S&T institutions. The HBN might achieve broader results if these voluntary S&T personnel were to support a model of group (rather than individual) entrepreneurship and promoted the social diffusion and use of grassroots innovations for community building.

Commercial organizations (which include large corporate organizations such as Tata Agrico, Hero Honda, Bajaj Auto, Kirloskar and Futures Group) and the formal sector institutions of S&T that retain their own culture and are joining hands for the promotion of innovation, incubation and entrepreneurship cannot be expected to change their own motivations in a spontaneous way in order to align with those of the innovators. Although the interaction of grassroots innovators with big business is giving traditional and local knowledge innovations much visibility, in the absence of strengthening rural communities and the local production and innovation capacity that communities need so as to upgrade their forward and backward linkages, the potential loss of creative spirit and autonomy is also a real possibility. Since interaction with big business is double-edged, with both advantages and challenges, the HBN also has a responsibility to safeguard the sources of local initiative and innovation for community building and social diffusion.

At the national level the HBN is clearly driven by a single leader. The leader, in the person of Anil Gupta, provides sustenance to the moral values of the network by recharging it through the personal example of thought and living. To some extent, in collaboration the team is also able to provide technocratic guidance and now possesses necessary capabilities in every component of professional activity. At the ground level, however, the grassroots innovator-turned-entrepreneur is still facing major problems and gaps.

The market demands the standardization and validation of products, the wherewithal to meet demand and the capacity to take risks. There are many professional activities that need to be undertaken before an innovation can enter the market as a commercial product. These activities take time and, in the process, a knowledge-rich person may lose patience and enthusiasm in pursuing the goal of becoming economically rich. At the level of business development, enterprise building and incubation, the gaps in state-level leadership are clearly evident. Furthermore, most grassroots innovators wish to obtain a reward for their contribution through the enhancement of livelihoods at the local level only. This is an important organizational challenge for the HBN.

Strategies devised for the recruitment of mainstream science, technology and innovation to the incubation of product and technology development efforts need to move away from the 'hand holding' of high-impact grassroots innovators. While a few have certainly found some success, the number of products introduced into the market by successful grassroots innovators is still not large enough to make an impact in the relevant market segment.

Further activities relating to the tasks of incubation and developing entrepreneurship also depend, in the case of the HBN, on the professionals who are being recruited on a formal basis by the leadership of the movement to pursue its goal of converting grassroots innovators into entrepreneurs. At the moment

these professionals are working largely out of platforms operating at the national level from within the NIF and at the regional level from within the GIAN. At the local or project level some professionals have also now set up not-for-profit organizations in a few cases. Aakar is one such organization which has been set up by Joydeep Mondal, who previously worked as an intern at the NIF and the GIAN.

The 'missing middle' level of leadership arrangements is an important issue to be tackled within the network as represented by the HBN, SRISTI, NIF and GIAN. The problem exists at the level of the organization of innovation and enterprise building, and for the collective diffusion of innovations identified even within the same district or state. It is readily apparent that while today a small network of volunteers dedicated to the ethical values of the movement does seek to undertake efforts in scouting and documentation, recognition, respect and reward, it is the professional staff recruited on a formal basis that are pursuing the goals of converting grassroots innovators into entrepreneurs. The professional staff are working largely from the platforms operating at the national level within the NIF or at the regional level within the GIANS.¹⁶ Although the interlocking relationship that the HBN has been able to develop among the units in place is the strength of the network, the management of such a relationship is not an ordinary challenge for the staff at the national and regional levels. In practical terms, the observations of Professor Kuldeep Mathur imply that there is also a huge challenge facing the network in terms of aligning the aspirations of the professionals who come to work in the areas of knowledge and finance at the formal sector institutions. Experience of the building of GIAN North and GIAN Northeast, which has its office IIT Guwahati, indicates that the development of middle-level leadership arrangements requires a concerted effort on the part of the HBN. Engineering design capabilities need strengthening and GIAN Northeast's experience needs to be reflected upon (Personal communication with Professor Kuldeep Mathur, 11 February 2015).

Many of the problems that are being encountered by grassroots innovators in the commercialization of products and technologies are in the field. Grassroots innovators face huge challenges in the marketplace, in their efforts at collaboration with the academic world and in the space of demand articulation for inclusive and green development. In the case of the students who are committed to scouting and documenting the innovative practices of rural people, they would like to see rural development as an outcome. Their attraction to the HBN relies on the assumption that the creative urges of individual grassroots inventors can be sustained and encouraged by them, and that these efforts will also ultimately help them to preserve biodiversity and traditional knowledge. The formal S&T institutions (which include non-governmental organizations) that support the grassroots innovators in the promotion and use of HBN-identified inventions have their own individual motivations. They would also like to take the collaboration with the NIF in directions that can contribute to their own S&T work and careers.

Related to motivations are expectations. The policymakers' expectations of wider economic development among grassroots inventors as a result of the implementation

of the stated vision of the HBN may also call for changes in vision and strategy and in organizational development repertoires over time. Further, the HBN may also need to put in more effort to create a culture of cooperation among individual producers, all of which are today embedded in the vision and ideology of developing individual producers who are competing with each other in the market. Arrangements that are geared to keeping grassroots inventors as individual producers face many handicaps in practice.

Furthermore, experience tells us that policymakers should not expect broad, transformative outcomes to emerge spontaneously for the benefit of inclusive and green development. The HBN will have to demonstrate that grassroots innovators and innovations are in a position to implement and diffuse innovations suited for resource-constrained settings, and contribute to the agenda of inclusive growth and sustainable development in a significant way. Since the HBN has achieved a fair degree of legitimization for the idea that grassroots innovators matter, and exist in large numbers, it now needs to demonstrate that the idea of individual innovators can work well for the development of micro enterprises; and, finally, that it also works for the achievement of goals of ecologically sustainable development.

Conclusions

Important policymaking advances in India, in the case of the HBN, include the widening of the scope and spread of its activity, successful institutionalization of the activities of documentation and recognition, dissemination after incubation and value addition, promotion of entrepreneurship and the use of grassroots inventions in the processes of development at the state and national levels. And this is an important gain for the HBN's pathway of inclusion of uneducated grassroots innovators. The challenge is now for the HBN and others to learn from the implementation of the spaces and strategies in place, and to go ahead with the task of innovation using the resources that the HBN has been able to accumulate during three decades since the mid-1980s.

For the first time, the HBN and the organizations around it (SRISTI, GIAN, etc.) represent a grassroots initiative that has been given significant governmental support (through the NIF) in India, but that also retains a level of autonomy. As such, it is a unique example from which scholars, social movements and policymakers can learn a great deal. However, from the discussion above it should also be clear that concerns exist with regard to the promotion of biodiversity contests and the practice of giving awards when these become a source of jealousy. Because the HBN's framings include the idea of promoting competition and introduce unfair expectations that are now recognized to be emerging within the community of grassroots innovators, the introduction of competition and profit is certainly a source of anxiety and concern.

Further, it should be clear that the challenge of promoting green and inclusive innovation goes far beyond the framing of introducing discrete products and placing

individual innovators who own them firmly in the marketplace. Social diffusion and community building, which were initially also key motivations, need to be given far more priority by the HBN. Anil Gupta has himself pointed out in his recent writings that, in order to achieve the objectives of frugal engineering, the HBN is faced with the challenge of how to promote place-based local economies as viable systems (Gupta, 2014b). However, it is also clear that the HBN cannot realize this goal without creating the necessary entrepreneurial leadership at the local level and the required intermediation arrangements. Such arrangements must link grassroots innovation to the design of local economic systems that are socially inclusive and sustainable.

Our analysis is that the HBN's framing of grassroots innovation can be characterized as a mixture of grassroots ingenuity and grassroots empowerment (Smith et al., 2014) for the inclusion of non-formal grassroots innovators into the mainstream of innovation. But inclusive innovation demands the development of new ways of producing and consuming resources by mixing up ideas or combining technologies, and – we would argue – some structural change.

Notes

- 1 Luc Soete (2013) suggests that the innovation process is now, in the true destructive creation sense, likely to be reversed, starting with the design phase that will be confronted directly with the need to find functional solutions to some of the particular BoP users' framework conditions. Spurring local reuse along the principles of cradle-to-cradle might well become a new form of sustainable grassroots innovation.
- 2 Dr Anil Kumar Gupta has been a professor at the Centre for Management in Agriculture, Indian Institute of Management, Ahmedabad, since 1981. Various positions held by him in IIM-A include Chairperson of Research and Publications, Chairperson of Ravi J. Matthai Centre for Educational Innovation and Kasturbhai Lalbhai Chair in Entrepreneurship. He is also now on the executive as a Vice Chair at the National Innovation Foundation.
- 3 In 2010 the Future Group, along with NIF and the DST, announced the formation of Khoj La, an innovation laboratory, to support grassroots innovations and create a marketplace. Future Group is an Indian privately held corporation that operates some of the most popular retail chains (such as Pantaloons, Big Bazaar, Food Bazaar, eZone and Home Town), in addition to other businesses.
- 4 Ustyuzhantseva suggests, on the basis of inputs from Anil Gupta, that these sums are definitely not enough for a country the size of India (Ustyuzhantseva, 2014).
- 5 During this period, policymakers were under pressure from big business and governments of the developed countries to accept a system of stronger intellectual property rights (exemplified by the World Trade Organization-administered Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) of 1994).
- 6 In the post-Nehruvian phase of economic development, local communities and the state had been the two main contending actors of choice for social activists in the development of new products, processes and practices in the domains of crop production, animal husbandry, food and health based on traditional or indigenous knowledge.
- 7 Discussions with Navjyoti Singh of PPST confirm that Anil Gupta deliberately did not conflate his decision with the PPST's overall understanding of the need to mobilize the holders of traditional knowledge as communities. This strategic move was important because many ideologues within the PPST were committed to the framing of

traditional knowledge as alternative sciences and technologies and were mobilizing communities of artisans and traditional practitioners (Telephone interview with Navjyoti Singh, July 2014).

- 8 While Anil Gupta differed at that time from many who opposed the demands for stronger IPRs, many of those who also wanted environmental and social justice to be respected did not think that stronger IPRs were a solution to the problem, in particular in the case of farmers' innovations. They were of the view that those who were promoting stronger IPRs would continue to erode and steal biodiversity from the developing world. They preferred open source-based approaches and more balanced IPRs to deal with the problem of knowledge misappropriation.
- 9 Anil Gupta argued that the technology gap in biotechnology was shorter to bridge, compared to most industrial technologies. He argued that, by compromising on the industrial front (read allowing stronger IPRs in pharmaceuticals), the country could gain a lot on the biotechnological front. He wrote (Gupta, 1992) that India should simultaneously refuse to accept the idea that biodiversity is the global heritage, and should document and patent various landraces and germplasm in the name of local communities.
- 10 The NWPGL considered the demand for stronger IPRs from transnational corporations to be causing much injury to the people as a whole and did not consider that the people's interest in Indian pharmaceuticals should be sacrificed. NWPGL also differed from Anil Gupta's arguments about the concerns of farmers in the debate on TRIPS. The NWPGL had prioritized the issue of farmers, access to seeds, and was opposed to the use of stronger IPRs for the protection of farmers' rights.
- 11 Anil Gupta (1992) wrote that the debate on protection of IPRs of the companies and scientific labs developing technologies through biotechnological means or otherwise had been highly surcharged with emotion, and got the policymakers to advocate farmers' rights and protection for traditional knowledge in the international negotiations on intellectual property.
- 12 The contrary view of the NWGPL was that the farmers would not gain much from the concept of farmers' rights. They wanted to strengthen the licensing regime within the legislation for the benefit of farmers as users of seeds from the private and public sector.
- 13 In a paper presented at a UNEP workshop in 2001, Anil Gupta (2001b) wrote that 'Intellectual property rights regimes used to be largely a domestic issue, but the forces of globalization have pushed it onto the world trade agenda, driven primarily by the rich developed nations whose companies hold the majority of the world's patents. This paper does not oppose a global patent regime as such, as one of the potential ways of dealing with rewards, but suggests it should be revised to fit more appropriately into the traditions and needs of developing countries, and operate alongside a portfolio approach to generating material and non-material incentives for individuals and communities for conservation.'
- 14 The contributions of Anil Gupta and the HBN made a distinct impact on the shaping of institutions of IPRs in respect of traditional knowledge. The operationalization of prior informed consent (see nifindia.org/pic.htm) in the NIF is a major effort which has never been tried on such a scale perhaps in any country. This has posed countless problems because people have never interacted with any institution that seeks their permission to decide how their knowledge should be shared with any third party and how it should be valorized or its benefits shared. This requires creating awareness about prior informed consent and it is a task that will take years.
- 15 Anil Gupta (2003) writes, 'On October 1, 2003, a small fund of about a million dollars has been set up at NIF with the help of SIDBI (Small Scale Industries Development Bank of India) for ten years to help convert innovations into enterprises. *An incubation fund to convert innovations to products remains to be set up.* With a corpus of about five million dollars, NIF has very limited degrees of freedom to operate with only interest income on the corpus. Declining interest rates and rising aspirations are bound to create problems of unmet expectations' (our italics).

- 16 The decision to keep only five professionals in the NIF besides a Chief Innovation Officer created a tremendous constraint on managing a national grassroots innovation movement. The need for networking was thus embedded in the structure of the organization, which would never have been able to achieve its goals without investing in strengthening the wider network. This is a lesson for designing lean organizations that draw their strength from networks of formal and informal volunteers, as well as professional mentors and other stakeholders (see indiainnovates.com).