Policies and Strategies to Promote Grassroots Innovation

Workbook

UNITED NATIONS
ESCAP
Economic and Social Commission for Asia and the Pacific

gian

Honey Bee network
(1987-88)

A nameless, faceless innovator or traditional knowledge holder comes in contact with the Network and gets the identity

The shaded areas of the map indicate ESCAP Members and Associate Members.

The Economic and Social Commission for Asia and the Pacific (ESCAP) serves as the United Nations' regional hub promoting cooperation among countries to achieve inclusive and sustainable development. The largest regional intergovernmental platform with 53 Member States and 9 associate members, ESCAP has emerged as a strong regional think-tank offering countries sound analytical products that shed insight into the evolving economic, social and environmental dynamics of the region. The Commission's strategic focus is to deliver on the 2030 Agenda for Sustainable Development, which is reinforced and deepened by promoting regional cooperation and integration to advance responses to shared vulnerabilities, connectivity, financial cooperation and market integration. ESCAP's research and analysis coupled with its policy advisory services, capacity building and technical assistance to governments aims to support countries' sustainable and inclusive development ambitions.

The Grassroots Innovation Augmentation Network (GIAN) is a non-governmental organization that mobilises resources from public and private sources to support grassroots innovators and links innovation, investment and enterprises. GIAN is India's first technology business incubator focused on incubating and commercialising grassroots innovations and it is supported by the Government of Gujarat.

The Honey Bee Network is an informal association of volunteer farmers, mechanics, pastoralists, scientists, students, innovators, mentors, business people, entrepreneurs and policymakers around the world to scout, share and celebrate the inclusive, frugal grassroots innovations and senses the unmet social needs. The network has given voice, visibility and velocity to the ideas of creative communities and individuals for the last thirty years. It links grassroots with a global platform of policy, institutions and technologies.

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ABBREVIATIONS AND ACRONYMS

ASEAN	Association of Southeast Asian Nations
CSIR	Council of Scientific and Industrial Research
ESCAP	Economic and Social Commission for Asia and the Pacific
GI	Grassroots innovation
GIAN	Grassroots Innovations Augmentation Network
ICRISAT	International Crops Research Institute for the Semi-arid Tropics
ICT	Information and communications technology
IP	intellectual property
IPR	intellectual property rights
JKUAT	Jomo Kenyata University of Agricultural Technology
NABARD	National Bank for Agriculture and Rural Development
NIF	National Innovation Foundation - India
R&D	research and development
SRISTI	Society for Research and Initiatives for Sustainable Technologies and Institutions
STI	Science, technology and innovation
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
YIM	Yayasan Inovasi Malaysia (Malaysia Innovation Foundation)

INTRODUCTION

Grassroots innovation[1] is a modality of inclusive innovation that enables extremely affordable, niche-adapted solutions to local problems, often unaided by public sector or outsiders.

In a context of rising income disparity among the have and have-nots,[2] every effort should be made to convert the ideas and innovations of knowledge-rich but economically poor individuals and communities into viable means of raising income, addressing social needs, and conserving the environment. While grassroots innovation are typically bottom-up initiatives, public policies can also support the emergence, recognition and diffusion of grassroots innovations. The journey of developing a grassroots idea or invention into a viable product or service for commercial or social diffusion requires support from many actors at different stages and levels.

The Honey Bee Network has been leading the grassroots innovation movement in India. In the past three decades, it has strengthened the inclusive innovation ecosystem of the country and has become a global benchmark of frugal, friendly and flexible solutions for men and women farmers, pastoral and artisan households, mechanics, forest dwellers, fishermen etc. This workbook draws on the experience of the Honey Bee Network and discusses experiences, issues and strategies that could also be relevant for other countries.

Why this workbook?

The objectives of this workbook are to:

- Share an understanding of grassroots innovations, their relevance, how they emerge and diffuse, and the different types of grassroots innovations & traditional knowledge, based on the lessons learnt by the Honey Bee Network of India and other experiences in the Asia-Pacific region.
- Identify lessons learnt and policy options to provide a conducive environment for grassroots innovations to emerge and flourish. In particular to:
    - Discover and promote grassroots innovations
    - Recognize and protect them
    - Incubate and commercialize these innovations
    - Socially or commercially diffuse grassroots innovations and knowledge, and
    - Develop linkages among different actors of a grassroots innovation ecosystem.
- Enable stakeholders to identify the gaps as well as the strengths in their respective innovation ecosystems to support grassroots innovations.

How to use this workbook?

The workbook is designed to be used as a support tool for a workshop or training on grassroots innovation. It can also be used independently. Each chapter introduces an issue and provides examples, largely from India, on efforts to promote grassroots innovations. At the end of each section or chapter, a number of questions are provided for the reader to reflect on. By answering these questions, the reader will be able to identify the key characteristics, strengths and weaknesses of a specific grassroots innovation ecosystem.

Appendix 1 provides the definitions of key terms used throughout the workbook.
Appendix 2 provides a framework for assessing the status of a given innovation system for grassroots. The framework can help identify the strengths and weaknesses of your own grassroots innovation ecosystem.

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[1] For further definitions on the terms used in this report, please see Appendix 1.

[2] Niño-Zarazúa, Roope and Tarp (2016) find substantially differing trends in different regions of the world. Income inequality — both relative and absolute — increased between 1975 and 2010 in North America, Europe, Central Asia, South Asia, and sub-Saharan Africa.

Chapter 1. Emergence and diffusion of ideas and innovations

1. New ideas can emerge anywhere

A. When present solutions are either inefficient or completely absent

This can be true for many universal problems. For example, the walker with adjustable legs ideated by Shalini Kumar.

People around the world use, or have seen others using, walkers. However, the traditional design cannot be used for climbing stairs. Ms. Shalini Kumar, then a class 8 student, came up with the idea of making the front legs adjustable - so that while climbing up they become shorter and while climbing down they become longer (figure 1). The idea was then prototyped by in-house engineers of the National Innovation Foundation (NIF) and later licensed to a few small entrepreneurs and a public sector company Alimco (Artificial Limbs Manufacturing Corporation of India) on a non-exclusive basis. From another firm called Kaviraa solutions, Ms. Shalini got around $3,000 as license fee besides entitlement to a royalty fee of two dollars for the sale of each walker. She became one of the youngest entrepreneurs.

Figure 1. Walker for stairs

B. When present solutions are unaffordable

Drip irrigation, for example, is very costly and, without subsidies, unaffordable for small farmers. Mr. Harbhajan Singh, a farmer from Haryana, began with alternate row irrigation to reduce cost, water consumption and pest incidence in cotton. When too much water is given, it leads to leaching of nutrient, costs more energy and, since plants become more succulent, they also become more attractive for the pests. Later, he further modified his system to irrigate in between two rows of cotton so that the roots have to grow towards water and hence in the process they develop a strong root system and mobilize soil nutrients from a larger area. The topsoil has more nutrients than the deep soil.

C. When present solutions are inaccessible

Solutions may be available and affordable but inaccessible. Exclusion may happen over space, sector, skill, seasons and social segment. When people live in relatively inaccessible areas (spaces); or when they are engaged in neglected sectors and occupations; or when their skills have become obsolete in the current market/social scenario, or when the social class has been suppressed and neglected historically; or when they are displaced seasonally (like those living in the flood basins of major rivers) or specific opportunities or resources are only available in particular seasons. “It may not always be possible to have inclusivity in all functions and all services and yet such inclusion is desirable.” (Gupta, Dey & Singh 2017).[3]

D. When existing solutions are not commercialised

Solutions may be affordable and accessible but not available. For example, Tropicultor- a multipurpose tool bar developed by the International Crops Research Institute for the Semi-arid Tropics (ICRISAT)[4] was both

[3] Gupta, A., Dey, A. & Singh, G. J., 2017.
[4] http://oar.icrisat.org/801/1/RA_00062.pdf.

affordable and accessible but it was not available in the market. Whereas Santi (multipurpose tool bar attached to motorbike engine) became a popular choice in the Saurashtra region of Gujarat because it was more affordable, accessible and widely available).[5]

Innovations may be diffused through commercial means (e.g. selling a new tool) or through social means (e.g. sharing information about the innovation through social networks or open databases)

Questions for reflection:

- **Please identify an innovation from common people. Was it diffused?**
  - **If no, why has not been diffused?**
  - **If yes, through which commercial or social channels has the innovation diffused?**

2. Not all ideas need similar support for dissemination

Not all ideas need similar support for dissemination. Some ideas are commercially viable and enterprises are established to commercialise them or they are licensed out to other interested entrepreneurs. Other ideas are not commercially viable but are still socially relevant – particularly when they address enduring and widespread problems and may require support through public schemes and institutions. For instance, do-it-yourself solutions and low-cost solutions that can be made with locally available material may not be commercially viable but can be diffused through social channels and public extension services.

Questions for reflection:

- **Do extension agencies in your country (e.g. agricultural extension agencies or technical centres) currently include people-led solutions in their information and training activities?**
  - **If no, why do you think they do not include people-led solutions?**
  - **If yes, through which commercial or social channels has the innovation diffused?**
- **Please identify innovations diffused through commercial channels, social channels, and/or public extension services**

3. New ideas from the informal sector require support to graduate into major innovations

Most grassroots innovations are at the idea or proof-of-concept stage, and in a very crude shape. Support, expertise and resources are required to standardize and improve the prototype innovation. Grassroots innovators need access to tools and testing centres, and to manufacturers that can produce the first few pieces for testing. Most grassroots innovators reside in rural areas with very little access to modern tools

[5] Prinja, S., Bahuguna, P., Tripathy, J.P. and Kumar, R., 2015.

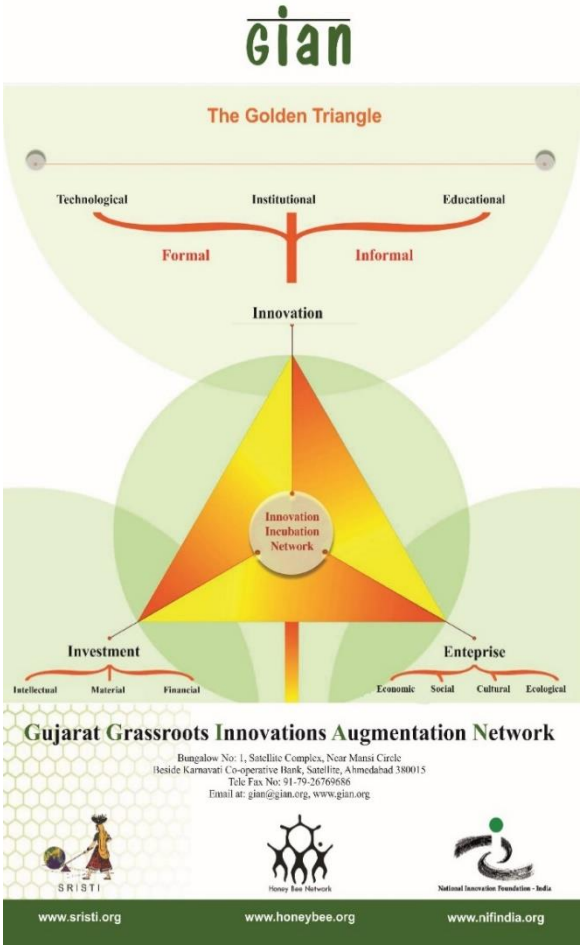
and machines. These innovations can be the precursor of micro and small enterprises, but inventors need the right kind of support systems to nurture their innovations. These inventors depend heavily on social networks and public systems. Intermediary organizations play also a crucial role in help them access to machines, equipment, finances, subsidies, etc.

In India, for example, the Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI) was set up by the Honey Bee Network in 1993 to provide back up support to the Network. SRISTI documented thousands of ideas, innovations and outstanding traditional knowledge, but many of them still had to be validated, added value and disseminated. And, even if the innovations were refined, they needed to be connect to entrepreneurs and investors to be diffused.

Hence, the Gujarat Grassroots Innovations Augmentation Network (GIAN)[6] was set up in 1997 to connect the golden triangle of innovators, enterprises and investors, as on their own they may not connect, and to reduce the costs for these to collaborate. The commercialisation of innovations involves ex ante costs (searching information, finding suppliers, negotiation and drawing up a contract for incubation or commercialization) and ex post costs (compliance of the contract, side payments, conflict resolution and rewriting contracts).

GIAN provides an interface mechanism to help rural grassroots innovators mobilize investments and either become entrepreneur or license the technology to an entrepreneur with suitable sharing of benefits (see figure 2).

Figure 2. The Golden triangle of innovators, enterprises and investors



Question for reflection:

- **How do formal institutions in your country select and sustain innovations from the informal sector? Identify specific programmes, services or funds supporting grassroots innovations**

[6] http://www.gian.org/

4. Innovations from grassroots are distinct from innovations for grassroots: frugality, inclusivity and the sustainability imperative

When people at grassroots solve their problems through their own creativity, know-how and heuristics, we call them grassroots innovations. Grassroots innovations, as they emerge in a resource constrained environment, are mostly frugal. They cater to the needs of the communities at the base of the economic pyramid, the ones whose problem remained neglected by the formal research and development (R&D) system. Hence, inclusivity is another aspect of grassroots innovations. Grassroots innovations are largely sustainable, as they are generally made from locally sourced materials, second hand parts and fewer materials.

On the other hand, frugal products made for the grassroots may not be always sustainable. For example, a typical frugal innovation made for grassroots is the commercialisation of smaller size products (such as the one rupee sachets in which shampoos, toothpaste, hair oils, are sold). The smaller size makes individual products more affordable. However, the actual cost is higher than buying a larger size. More importantly, these products are less environmentally friendly as the cost of collecting those plastic wrappers from 640,867 villages in India is not factored into the price of the sachet.

Question for reflection:

- **Innovations for grassroots tend to get more attention than innovations from grassroots. Do you have any specific measures to overcome this bias? Please identify programmes or activities to generate awareness about grassroots innovations**

5. Innovations from grassroots emerge in different ways: spontaneously, induced and through co-creation

Spontaneous innovations

Grassroots innovations often emerge in resource-constrained environments or where formal R&D activities, market and public policy have little reach or interest. They are generally need-based and cater to a niche problem. Here, innovation is a necessity to survive. Grassroots innovations spring up to address an unmet need of the community. These innovations may be called spontaneous grassroots innovations.

For example, Mr. Mansukhbhai Patel, the inventor of a cotton stripping machine, was himself a child labour. As a child, he felt the pain of stripping cotton and as he grew up, he conceptualized and made a cotton stripping machine. Mr. Patel initially failed in his design and was in great debt. With GIAN's financial and technical support, he was able to improve the machine. Today, after nearly two decades, Mr. Patel is one of the most successful grassroots innovators, the first supported and incubated by GIAN.

Induced innovations

When an external agency induces the community or individual to come up with a solution to a certain problem, innovations may emerge. Challenge awards are another way of inducing creative thinking among a broader public.

Co-creation

Innovations often emerge from opportunities to co-create. For example, the summer school and the children creativity camps promoted by the Honey Bee Network are opportunities to co-create. In the summer school, polytechnic and Industrial Training Institute (ITI) students learn theoretical and conceptual frameworks from Bachelor of Technology students, while Bachelor of Technology students learn about the practical uses and handling of equipment from the polytechnic and Industrial Training Institute students.

Questions for reflection:

- **Please give examples of grassroots innovation processes that you may have come across, including spontaneous, induced by external agencies, or emerging from co-creation processes**
- **How have/ can you help different types of grassroots innovations to emerge in your country? Identify which roles you may play to generate, induce, and/or support co-creation of grassroots innovations**

Chapter 2. Policies and strategies for supporting grassroots innovations

1. Why government officials must pay attention to promoting grassroots innovation

Grassroots innovations emerge when individuals and communities endeavour to experiment and devise solutions to their unmet needs. They evolve in sectors and spaces left void by market mechanisms, where market solutions may be unavailable or unaffordable to communities and individuals, and where public infrastructure and support is limited. Disadvantaged communities and individuals try to find technological and non-technological solutions to solve their problems, as innovation becomes an imperative for survival.

Why should government officials pay attention to promoting grassroots innovation?

A. To ensure that affordable and relevant solutions are available to disadvantaged communities

Grassroots Innovations address niche needs that have not been addressed by the market. Moreover, as grassroots innovations have evolved in a constrained environment, they are often frugal, locally relevant, and sustainable solutions.

Niche and location-specific solutions are critical for maintaining and addressing environmental and social diversity. For example, in Dhemaji, Assam, Northeast of India, water has a very high iron content. During a Shodhyatra, it was noticed that, despite the use of filters, filtered water turned brown in bottles after some movement. The implication was that the local filters had not completely succeeded in removing dissolved iron. No company manufacturing water filters is likely to design a special affordable filter for this niche market. In this context, a Do-it-yourself solution may be more relevant. Public institutions can engage the community of grassroots innovators to take this challenge and work on a solution.

Niche and location-specific solutions are also critical to support productive activities of tribal communities. For example, tribal communities in India often collect non-timber forest products such as seeds, pods, fruits, leaves, etc., used in medicine, dyes, agriculture and other industries. However, these communities could generate a greater income if they could add value to these raw materials. The use of small, affordable and appropriate machineries could help to process and add value to such products.

B. To empower communities to come up with their own solutions

By supporting these innovations, policy makers empower communities to solve their own problems without depending on the intervention of others. Gradually, a stronger innovative and problem-solving community will develop. Grassroots innovations have a learning value, along with utilitarian values, that may be applied in other contexts[7].

C. To prioritize those further behind

To leave no one behind, the needs of disadvantaged communities must be addressed. These needs have often not been identified or answered. Leaving needs unattended over time may lead to apathy and discontent. Supporting local innovations and addressing local needs is a mean to support more inclusive development.

[7] Gupta, A., 2013.

D. To enlarge the sourcing and sharing of ideas

In an era of crowdsourcing and open innovation, inclusivity can be achieved when the voices of creative and innovative people at grassroots are heard and appreciated. This will in turn broaden the canvas of ideas and innovations for inclusive development. Grassroots innovators may be able to come up with a solution to address their problem that may also have the potential to address the needs of others.

Public policies and initiatives are required to support grassroots innovations. The role of the public system in this context is not to come up with the solution, but to enable communities to come up with their own solutions. Public support is required to:

1. Generate awareness and promote innovation mindsets among disadvantaged communities and individuals.
2. Discover and promote grassroots innovations.
3. Recognize and protect grassroots innovations. Grassroots innovators make solutions in response to a need that they or their customers face. They may be unaware that they have made something new or they may claim to have something new. In both cases, they need support to validate, recognize and protect their rights as inventors.
4. Support the incubation of grassroots innovation. Grassroots innovations are often crude and need external formal actors to validate, add value and refine these inventions to become a product. Grassroots innovators may require specific incubation support, such as in-situ incubation. Most of grassroots innovators have other full-time job (e.g. they may be farmers, artisans, mechanics), and the provision of in-situ incubation is important for them.
5. Provide support and flexibility to meet compulsory standards, without compromising on the safety, security and functioning of the product, to legalize grassroots innovations at a faster rate. Grassroots innovations may find it difficult to follow established compulsory standards. And, though legitimate, they may not be legal. For example, many of the innovations are made from second-hand parts. While they contribute to a circular economy and are environmentally sustainable, the testing rules for new products in India requires all components to be new. A grassroots innovator may not have the resources to purchase all new components and, hence, test and register the new product.
6. Supporting the commercialisation of grassroots innovations. Many innovators are not entrepreneurs. The commercialisation of valuable grassroots innovations requires entrepreneurs and investors.
7. Support the social diffusion of grassroots innovations. Certain products and services are relevant for local conditions but may not be marketable or profitable and may not be protected through intellectual property rights (IPR). For example, the practice of alternate row irrigation devised by Mr. Harbhajan Singh of Haryana saves 50 per cent of water. This practice cannot be commercialized but is very beneficial for the farmers and environment, and it would be in the public interest to diffuse such knowledge.
8. Finance the promotion, incubation and diffusion of grassroots innovations.
9. Establish platforms and incentives that enable informal innovators and formal actors to interact – to, for instance, validate or add value to these innovations and to encourage the flow of knowledge from the lab to the field as well as from the field to the lab.

The following sections of this workbook explore in more detail each of these areas of public support.

Questions for reflection:

- **Does your government/agency support grassroots innovations? Why? In which ways?**
- **Are grassroots innovations (or should they become) part of the national innovation system? How do (could) they fit in the national innovation system?**

2. Policies, strategies, institutions and initiatives supporting grassroots innovations

Grassroots innovations emerge in different socio-ecological contexts. The social, economic, cultural and political contexts play an important role in the emergence, evolution, sustenance, dissemination and, at times, transformation of innovations.

While innovation policy is in place in many countries, only a few have a dedicated policy, strategy, institution or initiative to cater to grassroots innovations.

Support for grassroots innovations may come at the national or federal level; at the regional or state level; and at the local or district level.

2.1 National/ federal support

Policies, strategies, and institutions

National or federal policies and strategies help promote grassroots. Federal initiatives can provide broad support for grassroots innovations by, among others, legitimizing these innovations, encouraging state and district level bodies to take initiatives, and providing the means to help create an enabling ecosystem.

To further promote grassroots innovations, India established the National Innovation Foundation (NIF) in 2020. NIF scaled up to the federal level, the institutional support for scouting, spawning and scaling up grassroots innovations and outstanding traditional knowledge practices that SRISTI and GIAN (see box 1) provided at the regional level. The proposal for the establishment of the NIF came from the Honey Bee Network but the federal government provided the legitimacy and institutional structure. Initially, the NIF was managed through a corpus of 5 million dollars with roughly 250,000 dollars as annual expenses from the interest income. A decade later, NIF became an institution of the Department of Science and Technology.

In Malaysia, Yayasan Inovasi Malaysia (YIM), or the Malaysian Foundation for Innovation, was set up in 2008 by Ministry of Energy, Science, Technology, Environment and Climate Change, Malaysia to support grassroots innovations. YIM leads the implementation of several national programmes that support grassroots innovations, including the programme on Mainstreaming Grassroots Innovation (MaGRIs), that supports the development, diffusion and scaling up of grassroots innovations by collaborating with different partners and stakeholders like academia or industry. By the end of 2018, this programme had engaged about 13,000 people.[8] YIM supports the High Impact Project-6 programme, established under the small and medium-sized enterprises masterplan, to promote innovation-based micro-entrepreneurship, by

[8] https://www.yim.my/mainstreaming-grassroots-innovations/

providing handholding support and facilitating public-private partnerships. YIM also conducts since 2015 an annual Inclusive Innovation Challenge.[9]

In the Philippines, the Philippine Innovation Act No. 11293, approved in 2019, is a federal policy that will bring innovation at the centre of its development policies. It establishes a National Innovation Council under the leadership of the President, to develop Philippines's Innovation goals and national strategy. Section 11 of the Act promotes inclusive innovations and emphasizes that 'the NIC shall develop strategies for promoting social innovation [..] and enable the participation of communities in meeting their needs'.[10] Moreover, in 2019, in 2019, the Philippines adopted a "Grassroots Innovation for Inclusive Development (GRIND) Framework Plan. The GRIND Framework identifies grassroots innovation opportunities and sets-out a vision, targets, and strategies to support their development and an enabling ecosystem.[11]

Most countries do not have a dedicated national policies or institutions to support the creativity of grassroots. Yet, they may have one or several strategies encouraging citizens innovation, innovation in local communities, such as the one-village-one product policies, or innovation in specific sectors.

For instance, Cambodia established the One-Village-One-Product policy in 2000, where support is provided for individual villages to select and produce one competitive staple product which will generate economic returns and bring prosperity to the village (Samkol, 2008).[12] Similar strategies, all inspired by Japan's successful One Village One Product programme, have also been promoted in other countries, including Thailand[13], Myanmar, Kyrgyzstan, and most recently in Afghanistan and Tajikistan.[14]

In Sri Lanka, the Inventors Commission, a National Body established by the Sri Lanka Inventors Incentive Act NO 53 of 1979, supports Sri Lankan inventors and promotes innovativeness among its citizens. There are some very interesting programme to encourage creativity amongst children.

In India, several federal ministries have established funds to promote innovations in their respective sectors (e.g. rural development, urban affairs, railways, and micro, small, and medium-sized enterprises).

Grassroots innovations may also be indirectly promoted at the national level through representation in national science, technology and innovation institutions. For example, in India, when the National Innovation Council was set up in 2012, the grassroots movement was represented through the participation of the founder of the Honey Bee Network.

National programmes and initiatives

To support grassroots innovations, specific initiatives and organisations - such as awards, challenges, support for start-ups or incubation services - may be set up at the national level.

In India, there are multiple awards, including from President Awards, to recognize the achievements of grassroots innovators. The President of India provides Biennial Awards for grassroots innovations and outstanding traditional knowledge. The Dr. APJ Abdul Kalam Ignite Awards are given by NIF to school students that submit innovative ideas. The Gandhian Young Technology and Innovation Awards, given by SRISTI and supported by BIRAC, rewards technology students.

[9] https://iic.innomap.my/about_iic
[10] https://lawphil.net/statutes/repacts/ra2019/ra_11293_2019.html
[11] http://www.tapi.dost.gov.ph/news/165-dost-grinds-grassroots-innovation
[12] Samkol, L., 2008.
[13] https://www.thaiembassy.sg/friends-of-thailand/p/what-is-otop
[14] http://www.af.undp.org/content/afghanistan/en/home/ourwork/povertyreduction/successstories/one-village-one-product--how-a-japanese-idea-is-changing-lives-a.html

Start-up India, a national policy of the Government of India, supports innovators including grassroots innovators. The Atal Innovation Mission, under Niti Aayog (the policy think tank of the Government of India), has set up Atal Innovation Hubs and tinkering labs all over the country. This is being done centrally and has a clear line of command and monitoring system. It has developed a huge support infrastructure and is expected to deliver fruits in the coming years. Moreover, grassroots innovators may also have access to incubators set up by the Technology Business Incubator scheme of the Department of Science & Technology or by Bionest the incubation of biotech innovations set up by the Department of Biotechnology.

In India, the Ministry of Finance put forward a proposal during the thirteenth Finance commission (2010-15), to set up a District Innovation Fund[15] of about 150,000 dollars. District Innovation Funds were set up in several states including Rajasthan, Odisha, Tamil Nadu, and Karnataka. However, most state governments did not provide sufficient autonomy to the districts to select and support innovations or the necessary last mile investments.

The Government of India has established a national wide programme – INSPIRE-MANAK (www.inspireawards-dst.gov.in/)– under which a million ideas (two ideas from each school) are to be mobilized from half a million schools. Through a filtering mechanism, the best ideas will be selected, supported and taken to market. The objective of this programme is to spread a culture of creativity and innovation in every school.

2.2 Regional / State level support

Support initiatives may also be established at the regional or state level, but these depend upon each of Region or State's the fiscal position and the priority they attach to developing bottom-up innovation systems.

Regional/ State policies, strategies and institutions

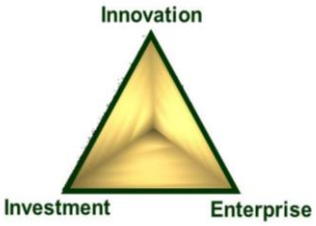
The Government of the State of Gujarat was the first government institution in India to set up an institution to commercialize and disseminate grassroots innovations. In 1997, as a follow up to first International Conference on Creativity and Innovation, GIAN was set up with the help of the Government of Gujarat, IIMA, and SRISTI. Later, as other States joined in, GIAN cells were set up in Rajasthan and Jammu & Kashmir. This system worked well in bridging the gap between federal and state levels structures. Later, other GIAN cells became NIF cells.

In India, there have been attempts to establish state innovation councils under the National Innovation Council, chaired by the Adviser to the Prime Minister. However, most of the State Innovation Councils did not work as actively as they were expected.

[15] https://doe.gov.in/sites/default/files/Guideline_District_Innovation_Fund.pdf

Box 1. Grassroots Innovations Augmentation Network (GIAN)

GIAN is a nodal agency under the start-up scheme of Industries Commissionerate, Government of Gujarat. GIAN has a patent facilitation cell that provides intellectual property rights (IPR) support to individuals and organizations hailing from the State of Gujarat. The purpose of GIAN is to support linkages between innovation, investment and enterprises (the golden triangle of innovation) to reward grassroots creativity.



The reduction in ex-ante and ex-post transaction cost of innovators, investors and entrepreneurs was to be achieved by several operating principles, including: a) to never to ask innovators to come to office, instead provide them support at their doorstep; and b) to organize financial, intellectual property, product and business development and dissemination support.

With a small team and limited funds, GIAN has made significant contributions. In 2003, GIAN shared the best incubator award with IIT Madras at the hands of the then President, Dr. A.P.J.Abdul Kalam by Department of Science and Technology. GIAN has worked in close collaboration with SRISTI to scout various innovations for incubation purposes. The model of GIAN was scaled up to the national level in 2000, with the establishment of the National Innovation Foundation (NIF).

GIAN has a small team of professionals experimenting with new models of incubation, innovation and inculcation of experimental ethic at different levels in society. As India's first grassroots innovation incubator, it found a viable pathway to reduce transaction cost of innovators, investors and entrepreneurs.

With passage of time, GIAN has expanded its scope work. It now works with women's groups, tribal communities, students of ITIs and polytechnics particularly women polytechnics besides farmers and workers.

It works in all sectors of human survival and adds value to people's knowledge in collaboration with other Honey Bee Network institutions such as SRISTI and NIF. It has an independent board having three additional chief secretaries of agriculture, Industry and rural development departments, independent industry representatives, faculty members from IIMA, Director, Entrepreneurship Development Institute and Director, IIMA and National Institute of Design are permanent invitees.

Other regional/State initiatives

Proactive participation and sustainable program for GIs at the state level are also necessary to support grassroots innovations. In Malaysia, for example, the Malaysia Innovation for Foundation (YIM) since its incorporation in 2008, works with State initiatives to synergize on scouting and discovery activities throughout Malaysia, covering 13 states and two Federal Territories.

In India, some States have established their own campaigns to map and screen innovations. For example, the State Agricultural Department of Odisha, supported by the Honey Bee Network and NIF, carried out a large mapping exercise of farm machinery innovations for farmers having a land of less 2.5 acres that covered almost every village of the state. The campaign started in 2018 and the awards were given in February 2019.

2.3 Local /district level initiatives

Supporting grassroots innovations at the last mile (the district level), both financially and non-financially, is critical to be as responsive as possible to the point of action.

Acknowledging grassroots innovators at their doorstep (i.e. at the local level) generates goodwill and support for these innovators. Often, even the closest kith and kin may not find merit in the innovation. This may generate stress or apathy for the innovator. A mechanism to identify, support and appreciate grassroots innovations at district level is needed. Public officials at the district level may appreciate the innovations better as they may be more aware of local conditions and the problems that the innovation is able to address. It is also easier for local public officials to coordinate with first-level public institutions such as the gram panchayats (village councils). Village councils and school teachers are the two key actors for conducting mass level scouting for grassroots problems and innovations.

Box 2. District level initiatives promoting grassroots innovations and traditional knowledge systems

Mr. O P Sharma, the district forest officer of Udaipur, Rajasthan, in a unique experiment bought two grassroots innovations to support the livelihoods of the tribal communities living near the forest. He bought the incense stick making machine of Mr. Paresh Panchal and the multipurpose food processing machine of Mr. Dharambir Kamboj. These innovations, together with marketing and packaging support, helped increase the income of the tribal communities (Gupta 2016).

To conserve the biodiversity of the region and encourage sustainable harvesting techniques, the Forest Department of Ghadchiroli, Maharashtra, documented local traditional knowledge of using local herbs for different traditional formulations. Leveraging this knowledge, they packaged and marketed local non-timber forest products, generating income for the tribal communities while conserving biodiversity.

2.4 Conclusion

In each country, the specific system to support grassroots innovations may differ. The experience of India indicates that:

- There is a need for a federal point of convergence to steer an inclusive innovation movement.
- Federal support may be translated further down either through regional offices at the state level or through supporting state governments to set up their own state-level innovation promotion platforms or even directly at grassroots level by federal agencies.
- There is a need for support at the local level, close to the grassroots innovators.
- Throughout each of these levels, support must be agile, transparent and relevant, to effectively support grassroots innovators.

Questions for reflection:

- **What mechanisms exist at the national/federal, regional/state and local/district level to promote innovations from the informal sector? And to promote innovations by children?**
- **What changes in the ecosystem are required to provide a more supportive environment for the emergence and sustenance of grassroots innovations? You may want to consider changes in terms of capacities (e.g. financial and human resources), specific programmes (e.g. information databases, support services, platforms), and incentives to support grassroots innovation (e.g. to encourage linkages between formal and informal innovation systems).**

Chapter 3. Discovering and promoting grassroots innovations

1. Discovering and promoting grassroots innovations

There are multiple ways to source or identify ideas that may potentially help addressing unmet needs. Different channels and networks can be used to reach out to grassroots innovators. Piggybacking on existing networks helps reaching out to the farthest corner with little or no extra cost. The following are mechanisms and channels that can be used for identifying and promoting innovations.

Shodhyatras

SRISTI, in collaboration with other Honey Bee Network institutions, conducts Shodhyatras (Shodh= exploration, research; Yatra= Journey) all across India. Shodhyatra is to undertake a journey on foot in the search of knowledge, creativity and innovations at the grassroots. Shodhyatra is an attempt to reach out to the most remote communities in search of innovations and outstanding traditional knowledge and to felicitate them at their doorsteps. It is also a walking journey of mutual exchange and open sharing of prior knowledge and innovations collected by the Honey Bee Network. The Honey Bee database has pooled knowledge over the last thirty years from villagers and has gathered old practices and contemporary innovations and knowledge. Cross pollination of ideas fuels curiosity and triggers further innovations.

Idea (and problem identification) competitions

The institutions of the Honey Bee Network conduct idea competitions amongst children, students and citizens to seek solutions that can address unmet social needs. GIAN is currently creating a database of unmet social needs. While children's ideas or solutions are often not viable or good, the problem the children chose to address is very relevant. It is thus important to recognize children who are very perceptive of the problems that they or others face.

Challenge awards

SRISTI, in collaboration with UNICEF-India Office, issued fifteen challenges across India in 2018 and invited innovators to come up with technological ideas to address those challenges. The outstanding solutions will be taken up by SRISTI and GIAN for further support. One of the challenges was to design for harvesting and processing of non-timber forest produce like nuts, leaves, bark of various tree species. One of the ideas submitted was the Mahua Nut cracking machine. After selecting this idea, students of Summer school made the proof of concept and the GIAN team is developing it further.

Summer school

Every year SRISTI invites engineering students and GIAN invites polytechnic and Industrial Training Institute students to collaboratively work to address a few unmet social needs. The participants work on a clearly defined problem of a disadvantaged community identified by them or the organisers. For three weeks, students ideate, take multiple feedbacks and are guided by experts and faculty from around the world. In one such workshop a student, Mr. Sanket Panchal noted that tea vendors serving tea in trains and buses carry a heavy kettle and spillage is a problem. With the help of mentors, he made an insulated backpack tea dispenser which can be carried like a backpack and is well insulated so it can maintain temperature for at least four hours (figure 3). GIAN is currently incubating this start-up.

Figure 3. Insulated backpack tea dispenser

Creativity workshops

Children are a great source of ideas. The Honey Bee Network works with children to develop ideas. During a two-day workshop, it brings together children from privileged and under privileged backgrounds to visit different places where workers, migrants and disadvantaged persons live. The first day is spent on a field visit, problem identification and brainstorming on multiple solutions to the same problem. On day two, children work in groups to develop one idea from a plethora of solutions and refine it. They make sketches, models and narratives and present their ideas to the communities and the jury, and receive feedback from them. Some of these ideas are later taken up for further development by the Honey Bee Network team or the summer school students.

Volunteers

The Honey Bee Network is not only a network of institutions but also a network of individuals who believe in the Honey Bee Network philosophy. The philosophy emulates the work of honeybees where bees collect nectar and, in turn, help pollinating the flowers. Flowers do not complain, they rather attract the bees. Similarly, when volunteers from the Honey Bee Network collect people's knowledge, they give due credit to the knowledge provider, like co-authorship in case of academic publications or benefit sharing when economic value is generated.[16] Knowledge collectors must acknowledge knowledge providers and protect the intellectual property rights of the providers. Likewise, the Honey Bee Network should cross-pollinate ideas, and help one community learn from the innovations and traditional knowledge practices of other communities. Whatever the Honey Bee Network learns is shared back with the knowledge providers in their language. Hundreds of volunteers have helped the Honey Bee Network to create its database. These volunteers come from different backgrounds like mechanics, students, scientists, teachers, etc. They reach the farthest areas which may not be even connected with the formal grids of communication channels.

Media partnerships

The Honey Bee Network has joined hands with UFO moviez (the largest digital cinema distribution network and in-cinema advertising platform in India) to run different campaigns throughout the year to promote grassroots innovations. The first campaign for the Honey Bee Network Creative and Inclusive Innovations awards is run over 3400 film screens across India.

Head of the State speech

Millions of people listen to speeches by the Head of the State. When statesmen mention grassroots innovations in their speech, attention is immediately drawn towards these innovations. In India, the grassroots innovation movement has been fortunate to have the support from the last four Presidents of India. It began when the late. Dr. APJ Abdul Kalam, Former Honourable President of India welcomed to his residence innovators at the grassroots and children. All the succeeding Presidents have supported various of the Honey Bee Network initiatives in favour of these innovators.

Celebrating success

Celebrating success through case studies, research, publications, and award functions bring accolades both to the grassroots innovators and ecosystems actors like scientists, scholars, etc. This in turn encourages others to participate.

School/ teachers networks

Schools and teachers, from primary to tertiary education, can be involved in the process of scouting and documenting grassroots innovations. As they get involved, students and teachers develop an eye for spotting oddity (i.e. anything that is disrupting the existing pattern). A register of innovations may be

[16] http://honeybee.org/genesis.php

maintained at a school or university and the best scout may be appreciated in the annual function. Involving teachers means that while students will graduate, teachers will remain available to encourage innovation in future student generations.

Extension outlets from the Ministries or Departments of agriculture, forestry, dairy, or industry

Extension workers are present in the field and have direct interaction with communities. Currently, they mostly disseminate information from the research and development activities carried out by the formal sector to users. As part of their activities, they may also gather knowledge about the experiments that people are doing in the area, but often do not have a mechanism to share and support these.

Marketing in postal and railway networks

Posters inviting entries put up in very post office and railway stations can be an excellent mean to both disseminating existing knowledge and scouting for new knowledge. In 2010, SRISTI sat innovation posters in more than 18,000 villages of Gujarat through the post offices.

Questions for reflection:

- **What mechanisms do you use for discovering and promoting innovations from low-income groups? Examples of mechanisms include learning walks, competitions, prizes and recognitions, media, education networks, extension services, marketing in public services**
- **Identify the networks available and relevant for discovering and promoting grassroots innovations in your country.**

2. Promoting innovation mindsets

To have an innovative society, it is imperative to promote innovation mindsets that, among others, encourage individuals to search for solutions and be creative. A basic principle of grassroots innovations is to not depend on external systems and incentives for solving local problems. Awards, innovation camps and innovation challenges –such as the children creativity camps or the Honey Bee Network Creativity and inclusive Innovation Awards (HBN CRIIA) and Ignite awards of India– are all measures to promote innovation mindsets. Grassroots innovators are experts in their domains and students can learn from them. In this endeavour, the Gujarat Technological University invited 11 grassroots innovators as visiting faculty in the university.[17]

Recognising innovation mindsets

The Lifelong Learning Program of YIM identifies the unique strengths of grassroots innovators of Malaysia and it accredits them through the Accreditation of Prior Experience platform. The accreditation officially recognizes an individual's expertise, skills and experience based on National Occupational Skills Standards into Malaysian Skills Certificate qualifications awarded by the Government (such as the Certificate of Competency, MSC levels 1 to 3, Diploma Malaysian Skills or Advanced Diploma Malaysian Skills).[18] This programme incentivizes and upskills grassroots innovators who have solved a societal problem.

[17] http://old.gtu.ac.in/circulars/13Apr/15042013_Report.pdf
[18] https://www.yim.my/lifelong-learning-initiative/

Focusing on particular groups

Particular groups may face greater socio-cultural barriers to see themselves as innovators. For example, women and girls often have to overcome social stereotypes to see themselves as innovators. In this context, specific programmes targeted to women, such as the promotion of female innovators as role models or innovation competitions only for girls and women, can be important to ensure more inclusive grassroots innovations.

The Women's Innovation Camp in Bangladesh, promoted by Bangladesh's Access to Information programme (A2i), is a programme to promote innovation among women. Bangladesh's A2i, a special programme of the Government of Bangladesh, runs several modules to encourage people to experiment and innovate for affordable and inclusive solutions. The information and communications technology (ICT) division along with the Ministry of Women and Children Affairs launched in 2016 the Women's Innovation Camp to identify significant and persistent problems in Bangladesh, increase the participation of innovative women, and celebrate the best ideas selected on the basis of novelty and feasibility.[19]

Technovation Cambodia was started in 2014 to encourage social innovation and technology entrepreneurship among girls. The participants submit projects wherein they identify local problems and learn coding to make apps that can address the challenges. In Cambodia, it is supported by the Institute of Technology of Cambodia, the United States Agency for International Development (USAID)'s Development Innovations and the Ministry of Education, Youth and Sport (MoEYS). The global program is run by Technovation Iridescent, which offers girls around the world to acquire skills required for emerging as leaders and tech-preneurs.

Starting from a young age

Innovation mindsets can be inculcated from a very young age. In Sri Lanka, for example, the Junior Inventor of the Year[20] competition, held by the Institute of Engineers, promotes creativity and innovation among school children. Competitions are first held at the provincial level and the winners graduate to the national level where they compete with the finalists of the Science Research Project Competition of the National Science fair and later compete at the Sri Lanka Science and Engineering Fair by the Ministry of Education and the Sri Lanka branch of Intel Corporation. The winners get a chance to participate at the Intel International Science and Engineering Fair held in the United States.

Showcasing innovations to promote an innovation culture

Sahasak Nimavum' is the national exhibition of inventions and innovations in Sri Lanka which is organized by the Sri Lanka Inventors Commission. The exhibition provides a platform for innovators and inventors to showcase their innovations and attract potential investors. It also helps promote an innovation culture.

Using mass media to promote innovation mindsets

The use of mass media can be very powerful to popularize innovation mindsets. INNOVA MINDS is a reality TV programme initiated by the Sri Lanka Inventors Commission in 2018 to promote socially, nationally and commercially important inventions among students. Selected participants were trained in different competencies including on presentation skills, pitching, etc. The alcohol detecting unit of Mr. Heshan Tharindu Kalubowila, Mahinda Rajapaksa College, Homagama won the first place, followed by the Pittu Making Machine of Mr. G. Gamitha Chamodha, Gurukula Vidyalaya, Kelaniya.

[19] http://challenge.gov.bd/wic?lan=en
[20] http://www.iesl.lk

Questions for reflection:

- **Which mechanisms are used in your country to promote innovation mindsets?**
- **Are there any mechanisms specifically targeting girls and women?**

3. Different models of innovation systems at and for grassroots

Policymakers may follow different strategies for scouting and spreading solutions depending on the attributes of the communities and innovators. In self-propelled systems, the autopoiesis model, communities do not require external aid to innovate and solve their problems. In induced autopoiesis models, the communities may need some incentives or triggers to start the process of innovation. In the case of contractual cooperatives, an external agency may trigger the process of innovation but the community takes over monitoring and sustaining the system. In the case of Heteropoiesis, the public system has to be the designer, executer and monitoring agent to be able to make the community come out of its inertia and start innovating for themselves.

Autopoiesis model

An Autopoiesis[21] model of innovation is when the communities and innovators identify the problems they want to address on their own and design solutions themselves. In this model, communities and innovators are like self-propelling engines that do not depend on external agencies or incentives to innovate and solve their own problems. They dwell on intrinsic motivations. These systems are self-designed, self-managed and also self-correcting (they manage contingencies as they arise).

The double decker tree root bridges built over local rivers in Meghalaya, north east of India, are a good example of autopoietic design. These bridges take about 50 years to make and last for about 500 years. There are very few modern solutions that last that long using only natural resources. These bridges have nearly zero entropy. Nothing is wasted out of them. Most of the grassroots innovations of the Honey Bee Network database fall in this category.

Induced Autopoiesis model

In this model, the incentives are designed by an external agency (e.g. formal innovation agencies) and the community takes care of their implementation and management. The community might lack the initial level of motivation or knowledge to start something new but after it starts, they perform well in carrying out the tasks and maintaining the system. Communities are responsive to new ideas, and are also a somewhat entrepreneurial. In this case, the incentives are often provided by the external agency.

An example of this model are watershed programmes funded by outside agencies but locally designed, adapted and sustained by local communities. Another example are idea competitions where children ideate and co-create solutions for problems they face or see. They may need to be challenged to think out of the box. The One-Village-One Product is another example of this model.

[21] The concept was originally developed by two biologists, Humberto Maturana and Francisco Varela .Autopoiesis (< Greek: autos = self, poiein = to produce) means self-(re)production. Luhmann (1986, http://www.oikos.org/mariotti.htm,) later adapted to social systems (Sedl 2004, http://www.zfog.bwl.uni-muenchen.de/files/mitarbeiter/paper2004_2.pdf. Gupta (2013) adapted it to grassroots innovation (Autopoiesis Model of Innovation: Frugal, Flexible, Friendly and Affordable Gupta, Anil K.International Economic Forum: Les Rencontres Economiquesd'Aix-en-Provence 2013, Aix-en-Provence, July 6, 2013

Contractual co-operatives

In many places, multi-market engagement is high and communities or individuals cannot engage in day to day management. Creative communities and individuals would design the system but hire external agencies for running the system. In this model, the incentive providers are endogenous, and the system is managed by an external agency, but the community members still remain the primary producers and decision makers.

The Amul model of a milk dairy cooperative is a model of a contractual cooperative. The cattle are reared by farmers, generally women. But the dairy plant and the whole logistics of collecting, chilling, processing and distributing milk and milk products is managed by a professional team of technical and marketing people. The board of directors include people's representatives but the management of the day to day operations is done by hired professionals.

Heteropoiesis [22] model

In this model, the problem identification, design and management is done by an external agency. An example of this model is the conventional lab to land extension system where problems are identified by formal institutions and technologies are also developed and delivered by these institutions. Vulnerability and dependence on formal institutions and markets, may make it difficult for communities to work for a common good. In such circumstances, incentives may be provided by the exogenous agency to address the needs of underprivileged communities. For example, during the summer school on inclusive innovations, SRISTI and GIAN invite students to address the problems of less privileged people through technological innovations.

Question for reflection:

- **Which models of innovation ecosystem for and by grassroots do you think can emerge and be sustained in your country/ specific context?**

[22] Heteropoiesis. Cybernetics & Human Knowing- Thesaurus pilot project. Edited by M&T Thellefsen. Accessed at http://www.imprint.co.uk/thesaurus/heteropoiesis.htm

Chapter 4. Recognizing and protecting grassroots innovation

1. Identifying local, regional and global innovations and traditional knowledge: prior art search

Prior art search is a pre-requisite for any idea to be established as novel (to have novel form, feature, or function beyond the prevailing technology or process) and qualify as an innovation. While internet has made it possible to search standard databases (patent databases, literature, online products, e-marketplaces, etc.), identifying prior traditional knowledge is more complicated. For instance, the Traditional Knowledge Digital Library, a medicinal herb digital repository, is not searchable yet.

The Traditional Knowledge Digital Library was developed collaboratively with Ministry of Science and Technology, the Department of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH), the Council of Scientific and Industrial Research (CSIR) and the Ministry of Health and Family Welfare. The database documents and digitalizes herbal traditional knowledge already available in the public domain and in codified literature, such as the ancient Indian medicinal systems of Ayurveda and Unani. At present, as per the approval of Cabinet Committee on Economic Affairs, access of the Traditional Knowledge Digital Library is available to nine International Patent Offices[23], under a Traditional Knowledge Digital Library Access (Non-disclosure) Agreement. As per the terms and conditions of the Access agreement, examiners of patent offices can utilize the Traditional Knowledge Digital Library for search and examination purposes only and cannot reveal the contents of Traditional Knowledge Digital Library to any third party unless it is necessary for the purpose of citation. The Traditional Knowledge Digital Library Access Agreement is unique in nature and has in-built safeguards of non-disclosure to protect India's interest against any possible misuse.[24]

Prior art search is important not only to conduct prior art for filing patents but also to help understand the current state of the art. Grassroots innovations and Outstanding Traditional Knowledge databases enrich community knowledge systems though cross pollination in local language. These databases provide information on potential collaborators, technologies or networks with complementary assets that can help making the innovation more efficient. The databases can help identify potential users or alternate uses of the technology or product. For example, the ground nut digger cum separator made by Mr. Yusuf Khan in arid Rajasthan found an alternate usage to clean debris on sea beaches in coastal Andhra Pradesh.[25]

In India, a large amount of knowledge is still within the communities in oral form. This knowledge is not documented or written and is passed from generation to generation orally in the form of traditional wisdom, folklores, tales, metaphors, home remedies, etc. The knowledge is often shared by the communities openly and in good faith. However, others try to claim intellectual property (IP) rights without even acknowledging them. To address this misappropriation, government can establish severe penalties

[23] European Patent Office, United State Patent & Trademark Office, Japan Patent Office, United Kingdom Patent Office, Canadian Intellectual Property Office, German Patent Office, Intellectual Property Australia, Indian Patent Office and Chile Patent Office. Negotiations are under way to conclude the Access Agreement with Intellectual Property Office of Russia and Malaysia.

[24] http://www.tkdl.res.in/tkdl/langdefault/common/Abouttkdl.asp]. It now reportedly has 34 million pages about 270,000 medicinal formulations from classical ayurvedic and ayush texts (United Nations Environment Programme [UNEP], Ad Hoc Open-Ended Inter-Sessional Working Group on Article 8(j) and Related Provisions of the Convention on Biological Diversity, 40, UNEP/CBD/WG8J/8/INF/5 (October 7, 2013) cited in Nadkarni and Rajan, 2016).

[25] http://www.gian.org

that serve as a deterrent and put in place campaigns to document and register traditional knowledge (Gupta 2004).[26]

Reciprocal and responsive systems

The Honey Bee Network was set up to address the disparities between the benefits and acknowledgements that knowledge providers and seekers used to get. Knowledge providers often remained anonymous as they were seldom adequately acknowledged or got a limited share of any benefit/award/accolade that their knowledge might have brought. Addressing the asymmetry in these exchanges is imperative to promote a trust-based Grassroots Innovation system (Gupta et al, 2016).

For developing a responsive and reciprocal innovation system, trust becomes imperative. Unless incentives for disclosure are provided, local communities have no reason to share their knowledge with outsiders. The Honey Bee Network has been privileged to have the trust and support of grassroots innovators and traditional knowledge holders. They trust the Honey Bee Network for its ability to safeguard their interests. A global trust-based system may help the collection and sharing of knowledge if it is transparent and requires the complete disclosure of intention/usage.

As any online or offline recorded data can confirm the date of publishing and thus may be referred as already present information (prior art), care should be taken to publish innovations only after a patent has been filed.

Question for reflection:

- **Please mention databases or websites that list the creativity of grassroots of your country**

2. Intellectual property rights protection and sharing

Intellectual Property Rights

While there is no universally accepted definition for the term 'intellectual property', it broadly refers to creations of the mind, such as inventions; literary and artistic works; designs; and symbols, names and images used in commerce.[27]

Intellectual property rights are exclusive rights vested on the creators of intellectual property. While some of those rights might be created under patent law, some of them might be created under other branches of law like copyright law or trademark law. Though many people tend to view the term 'intellectual property laws' as a homogenous body of law, it refers to distinct, but related legal doctrines, covering diverse subject matter in unique ways.[28]

Patents

While different branches of intellectual property laws can play significant role in promoting innovation and creativity, this workbook will focus on patents. Patents are exclusive rights granted for an invention. They

[26]https://www.wipo.int/edocs/pubdocs/en/tk/769/wipo_pub_769.pdf Ironically the database of codified traditional knowledge is not open and accessible to Indian scholars and traditional medicine practitioners as yet.

[27] https://www.wipo.int/about-ip/en/

[28] Bently and Sherman, 2014.

provide inventors a limited term monopoly for making, using and selling their invention, in return for the disclosure of that invention to the society.

To balance the interests of creators and society, many checks and balances have been built into the patent system. For example, not all inventions qualify for patent protection. Only inventions which meet the specific patentability requirements (novelty, non-obviousness and industrial application) and only those which are not specifically excluded from protection are granted patents. Secondly, patents are granted for a limited duration. They are not perpetual and at the end of the term of protection everyone is free to use and practice that invention. Moreover, anyone is free to make an improved version of an invention and some may get patent rights on improvements. But to use that improved version of the invention, s/he may have to take permission from the original inventor. Finally, if a patent owner refuses to use a patented invention, patent law provides mechanisms (such as compulsory licensing provisions) to make the invention accessible for the public.

Box 3. Patents granted to grassroots innovators. Three examples from India.

Organisations under the Honey Bee Network have actively helped grassroots innovators to file patent applications abroad, and to secure patent protection in India. SRISTI filed the first patent application in 2000 in the United States, in collaboration with GIAN and with the pro bono support of a lawyer named Tom Turano. In 2003, three grassroots innovators, who had not completed secondary education, were granted patents by the United States Patent Office.

Mr. Bhanji Bhai Mathukia, a farmer-mechanic from Visavadar, India, had developed a small tractor which could be converted into three wheel or four wheels. Despite a long history of inventions in this area, the additional flexibility provided by the innovation of Bhanji Bhai Mathukia helped him meet the patentability requirements under the US patent law and his invention was granted patent protection by the United States Patent Office.

Similarly, Mr. Mansukh Bhai Jagani, Amreli, was granted a US patent on a motorcycle-based multi-purpose plough (the invention was locally referred to as 'santi'). Santi is a low-cost, flexible and adaptive farm machinery particularly useful in light soil regions for weeding, breaking the crest of soil and earthing the crops. Over the last 25 years, Santi has been further developed in multiple directions by derivative innovators, who have for example, developed a model which could be used for spraying on the standing cotton crop.

Mr. Mansukh Bhai Patel, from Gujarat, Western India also received a US patent for developing a machine that can help in stripping the shells from dryland cotton varieties. Unlike hybrid cotton varieties, where cotton lint is loosely set and can be easily sucked; in dryland varieties, balls have to be plucked and then women and children used to strip shells and take seed cotton out of these shells. This cotton stripper succeeded in almost completely eliminating the child labour involved in this activity.

These are some of the many examples of grassroots innovations that can meet patentability tests in different jurisdictions across the world. In many ways, those patents are a recognition for their intellectual efforts.

These three inventors have also been recognised at the national level. They received awards from the President of India, were scholars in residence during the tenure of the former President of India, H.E. Shri Pranab Mukherjee, and stayed as the guest of the President of India at the President House for two weeks.

While most of the times patent applications are filed with the objective of commercializing an invention, patents are also used as a defensive mechanism for preventing others from monopolizing an invention. In other words, a public organization or public-spirited individual may file a patent application but may not

assert the exclusive rights. This would help in preventing others from taking patents on that invention and if they also publicly declare that they will not be enforcing their patent rights, it would turn the invention into an open source technology for all practical purposes.

Given this context, it may be useful to understand how patents can be utilized for incentivizing grassroots innovators without jeopardizing a culture of sharing at the community level. Without sharing and adaptation, many communities might not have sustained themselves during various historical socioecological and climatic fluctuations, risk and shocks. So, it is important to know how to obtain a patent but also to realize how they can be used in a socially beneficial manner. The Honey Bee Network has used patent protection in a creative manner to enable the promotion and diffusion of grassroots innovations, but also to ensure international recognition for these innovations (Box 3).

Technology Commons – A unique model for sharing knowledge

Sharing and learning amongst grassroots innovators is very important for advancing knowledge and social impact. While many people consider sharing of knowledge and protection of intellectual property rights as opposites, these need not to be opposites. For instance, the Honey Bee Network proposes a unique licensing approach, a 'Technology Commons', that makes this possible.

Technology commons is a licensing approach that attaches highest regard for both intellectual property generated at the grassroots as well as its sharing for the broader social good. What makes this license unique is the way it enables and encourages people-to-people sharing of knowledge (horizontal sharing model), while ensuring that any firm that wants to commercialize the innovation has to approach the innovator for a license. The roots of this model can be traced to the doctoral research of Dr. Riya Sinha, Former Chief Innovation Officer, NIF and a senior member of the Honey Bee Network.

If patents are asserted against fellow farmers who want to copy or improve upon innovations, then the very kernel of creativity at grassroots embedded in experimentation, sharing, taking feedback and further improving ideas will be inhibited. Technology Commons License agreements address this issue by allowing and encouraging self-employed farmers, mechanics and small-time fabricators to imitate and improve upon patented innovations. But if an industrial firm wants to commercially exploit such patents, they have to take a proper license through negotiations. This approach sustains sharing at the community level.

Open Innovation platforms

While about thousand patents have been filed by the National Innovation Foundation, the vast majority of grassroots innovations and outstanding traditional knowledge practices are available through open access databases (such as www.sristi.org and www.honeybee.org). SRISTI is one of the world's largest provider of open source database on farmers' and technology students' innovations in the world. GIAN is developing a similar database of innovations from polytechnic students, the majority of whom work at the shop floor level in small and medium industries.

Creative practices of about five thousand farmers and pastoralists are provided in four languages (Hindi, English, Gujarati and Tamil) in the Grassroots Indian Language Database. Multi-language and multi-media databases help expand the experimental and innovation ethic worldwide, by helping communities to experiment and learn from existing green, low cost, extremely frugal and sustainable innovations and by spurring other communities to try out their innovations.

For example, Santi, the motorcycle-based or adaptive agricultural machine was further developed into several derivative innovations. This includes a model which could be used for spraying on the standing cotton crop and another one wherein a multi-purpose tool bar has been incorporated.

Supporting technology transfer

Under a project supported by the United States Agency for International Development (USAID), three Indian grassroots technologies were transferred to Kenya in collaboration with Jomo Kenyata University of Agriculture and Technology (JKUAT), Nairobi. These technologies were: a multi-purpose food processing machine, a seed drill, and a small motorcycle-based tractor which was later adapted into Shuja, a locally customised small tractor design. The Kenya Bureau of Standards set up a joint committee comprising its own experts and JKUAT experts to develop new standards. Within five months, new standards were developed to enable the registration of these technologies. Registration enables access to bank loans for small farmers wishing to acquire such technology. This example illustrates how patents are only a small part of the value chain and several other regulatory steps also have to be fulfilled before a patented innovation reaches potential users. The development of crop varieties, herbal pesticides, and veterinary medicines also face different regulatory and institutional requirements.

Sharing the benefits while protecting the rights of innovators

When GIAN, SRISTI and NIF license the patented technologies to small and medium enterprises the benefits are shared with original innovators, and adequate steps are taken to ensure that the rights of the original innovators to practice the innovation and commercially distribute it in their own area of operation are adequately protected.

Open innovation framework and patents

Open innovation refers to organisations or firms looking beyond their internal sources of knowledge (such as their own staff or R&D) for fuelling innovations. External sources for innovation include customer feedback, published patents, competitors, external agencies and the public. In the private sector, open innovation was popularized by Chesbrough and Bogers (2014)[29]. One of the criticisms of open innovation in firms is that the rewards emanating from this process have not always been fairly shared with the originators of the ideas.

Socio-economic development of any society depends not only on receiving knowledge from outside, but also on sharing knowledge on a reciprocal and mutually respectful manner. The Honey Bee Network has pioneered a grassroots open innovation framework in which reciprocity, responsibility and respectfulness towards knowledge providers is non-negotiable (Gupta et al., 2016)[30]. Such a reciprocal and responsible open innovation framework, unfortunately, is not easily enforceable.

Open access databases with strong ethical norms are critical to encourage the sharing of knowledge on a reciprocal, responsible and respectful manner. Database users need to realize that knowledge is available because of the generosity of the knowledge-providing communities. Knowledge users should acknowledge the source of knowledge during any subsequent uses, and share the benefits from such exchanges. A sharing and caring society would thus become the criteria to judge how useful and effective the institutional designs and policies are.

Public policy can play a critical role in promoting fair exchange of knowledge, in particular between the formal and informal sectors. Legal and ethical frameworks can, among others, encourage corporations to enter into benefit sharing agreements while accessing external ideas, knowledge, practices and innovations, particularly when these come from the informal sector. Public policy can also encourage and

[29]Chesbrough, H., & Bogers, M. 2014. Explicating open innovation: Clarifying an emerging paradigm for understanding innovation. In H. Chesbrough, W. Vanhaverbeke, & J. West (Eds.), New Frontiers in Open Innovation: 3-28. Oxford: Oxford University Press. Page 17." [https://www.oxford-review.com/oxford-review-encyclopaedia-terms/encyclopaedia-open-innovation-definition-explanation/]

[30] Gupta et al., 2016.

support communities to develop knowledge registers or use existing knowledge registers[31] to create a record of their legitimate knowledge rights.

Protecting traditional knowledge and genetic resources

A challenging question for the international community is how to protect traditional knowledge. There has been a lot of debate on whether countries need a separate treaty/law or can use the current IP system to protect traditional knowledge and traditional cultural expressions[32] and whether traditional knowledge should be patentable or not. Traditional knowledge claims are often not documented and disclosed. Patent laws in some jurisdictions, including India, have explicitly excluded traditional knowledge from patent protection. However, if the patentability of traditional knowledge would be allowed, communities would be incentivized to disclose their knowledge in lieu of protection for their knowledge for a given period of time. This would provide more benefits for the traditional knowledge holders and enrich the knowledge available in the society.

Regarding genetic resources, the Convention on Biological Diversity reaffirms that States have sovereign rights over their own biological resources. Many countries have subsequently framed their own biodiversity related laws to assert and enforce this sovereign right. Some of these laws limit the open exchange of genetic materials and knowledge among countries to avoid the misappropriation of biodiversity. On the other hand, such limitation may affect genuine global research for creating robust plant varieties for different agro-climatic regions.

Matching how grassroots innovate with contemporary intellectual property systems

Grassroots innovations are often based on do-it-yourself processes and the bundling and blending of innovations.

Do-it-yourself refers to designing, creating or modifying an object or product by an individual rather than a professional. Do-it-yourself techniques enable general users to develop products or services without the aid of an expert and enjoy them at a more affordable rate. For example, disseminating herbal pesticides formulations may allow small farmers with limited purchasing power to make the pesticide themselves rather than buying the ready-made product from a company. Mr. Uplenchwar in Maharashtra, for instance, has shared herbal pesticide formulas on school walls, clearly mentioning that others could use the formula to make the pesticide or, alternatively, buy the ready-made solution from him (Gupta, 2004).[33]

While some grassroots innovations are stand-alone solutions, others need to be bundled or blended with other technologies/systems to become a solution or to become attractive for the consumers. Bundling refers to bringing different technologies together and providing them as a package to the end user. For example, Mr. Mansukhbhai Patel, innovator of the cotton stripping machine, collaborated with the ginning industry (which removes the seed from the lint) in his region. His machine is especially useful in separating the lint from the cotton bolls. The region mostly grows a rainfed cotton variety whose bolls do not split upon ripening unlike the Bt cotton. Until his innovation came to the market, the lint was separated manually by women and children. With this collaboration, most of the ginning factories adopted his machines and farmers now do not have to separate the lint manually. The process not only saved time, but also addressed the problem of child labour. Blending refers to blending grassroots innovations with other technologies to increase its efficacy. For example, Herbavate, a topical cream for giving relief from eczema was made by pooling and blending several practices that were reported in the Honey Bee Database.

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[31]Gupta, 2009, https://www.wsj.com/articles/SB125376926792036847, Gupta, 2009, Development of Village Knowledge Management Systems, https://nsdiindia.gov.in/nsdi/nsdiportal/meetings/aReportonAgriculture.pdf downloaded on Jan 25, 2019

[32] http://www.ip-watch.org/2018/12/17/wipo-members-agree-revision-draft-treaty-protection-tk-folklore/

[33] Gupta et al., 2004.

When blending or bundling knowledge, the concerned parties need adequate ex-ante clarity on the sharing of intellectual property rights arising from the value-added product.

Building a supportive eco-system for securing intellectual property rights

Protecting intellectual property rights, particularly patents, is often a costly and time-consuming process that requires the help of legal experts. Many grassroots innovators are unlikely to have the required resources or skills.

Financial support for innovators to file IPR-related applications (or for intermediary agencies to file them on behalf of the innovator) will often be required. In India, for example, the NIF covers fees related to patent application using funds provided by Department of Science and Technology, Government of India. SRISTI and GIAN provide patenting support from their own resources or through resources provided by the government of Gujarat (which reimburses such costs subject to certain conditions).

The Technology and Innovation Support Centers established by National Intellectual Property Office of Sri Lanka, in collaboration with the World Intellectual Property Organization, provide access to patent and non-patent technical information.[34] The National Science Foundation of Sri Lanka has set up a patent help desk to support people seeking information about various aspects of IPR.[35]

Pro-bono support has been critical to secure IP protection for grassroots innovations. Lawyers might be willing to provide pro-bono support for genuine grassroots innovators and organisations, as when the Honey Bee Network filed patents abroad. Pro-bono work of lawyers and law firms can be of substantial help in securing protection within and outside the country. Similarly, academics and students can also provide pro-bono support for doing extensive prior art searches and filing applications on behalf of the innovators.

Summary

Diverse intellectual property strategies can be used for diffusing and transferring grassroots innovations. As the experience of the Honey Bee Network suggests, IP protection is not always about protection, it can also be used for democratising access to knowledge through open access and open innovation approaches. The technology commons approach of the Honey Bee Network encourages more and equitable knowledge sharing among all stakeholders. The active promotion of horizontal sharing of knowledge can encourage more innovations.

[34]https://www.nipo.gov.lk

[35] http://www.nsf.ac.lk/index.php/industry-partners-/patent-help-desk.html

Question for reflection:

- **How are intellectual property rights used in your country to recognise, protect and disseminate grassroots innovations and traditional knowledge? For example:**
  - **Which resources (financial, expertise) are available to support the patenting of relevant grassroots innovations?**
  - **Are there provisions to encourage more and equitable knowledge sharing?**
  - **Are there open databases to provide access to grassroots innovations and outstanding traditional knowledge practices?**
  - **Is there a patent help desk to support people seeking information about various aspects of IPR?**
  - **What type of resources are available to support technology transfer?**

3. Database of grassroots innovations and traditional knowledge

There are not many databases, either online or offline, of innovative solutions developed by disadvantaged people themselves (Gupta, 2013)[36]. Strengthening scouting processes with documentation and creating a database of ideas and problems has limited use if proper systems for tapping existing and evolving knowledge are not put in place. Knowledge may be lost if it is not recorded in a legible and retrievable manner.

A database enables to:

1. Search for existing solutions for the problems one faces and that others may have solved. It decreases search costs and helps match demand and supply.
2. Mark the evolution of an idea into practice or innovation.
3. Track the iterative processes that helps refining an innovation.
4. Address changing social needs. When a social need is transformed, a new set of technology may be required to address it appropriately.
5. Tap into innovations or solutions that are ahead of time. For example, the computer mouse was invented ahead of the time, and it only became popular when the windows software arrived in the market.

These databases of grassroots innovations, ideas, traditional knowledge and unmet needs, have to be made available to the common public by rendering them in multi-language and multimedia formats.

Before dissemination, a number of steps need to be followed for due diligence and prevention of any unintended usage, including prior art research, verification and obtaining prior informed consent. Box 4 provides more details on how the databases of the Honey Bee Network are managed.

Innomap in Malaysia is another repository of innovations and ideas which is available online and is managed by YIM. Innomap integrates the data on grassroots innovations and innovations identified by

[36] https://ssir.org/articles/entry/tapping_the_entrepreneurial_potential_of_grassroots_innovation

different government agencies or submitted by community members. Multiple stakeholders can contribute and learn from each other.[37]

The Government of Indonesia is planning to establish a programme to identify and pool community best practices that solve local problems. Such practices will be published in a website, Development Channel, that will serve as a reference point for regional actors, policymakers, communities to learn about local solutions and situations.

Box 4. The Honey Bee Network Databases of grassroots innovations

The Honey Bee Network has several databases of grassroots innovations that are maintained by SRISTI (http://www.sristi.org/wsa/).

When an entry is received, a prior art search is conducted, based on which it can be categorised into public domain knowledge, novel or to be explored. Permission to share the information with third parties and the extent to which it can be shared is recorded in the Prior Informed Consent form which is a written in local language. In case the innovator is illiterate, recording is done on phone or camera. A verification team then visits the innovator to collect any information missing and also seek details from neighbours or villagers regarding the authenticity of their claims. Once prior art research is conducted, verification is done, and consent is received; the innovation can be uploaded on the database. However, if the practice or innovation is unique, it should not be published on the database until the IPR is filed.

Some of the practices and innovations are completely open source and anyone can use them. Other practices and innovations, when the innovator specifically asks or the network sees IP value, are partially shared or shared under Non-Disclosure agreement with the seeking party.

In order to promote a reciprocal, responsive and respectful system, where the contribution of knowledge providers is fully acknowledged, the Honey Bee Database provides the names of the knowledge providers as well as the names of the scouters.

The Ministry of Agriculture, Government of India has recognised the Honey Bee Network farmers' innovation and traditional knowledge practice database uploading it in its farmer's portal (https://farmer.gov.in/innovation/agricultureinnovation.aspx)

Questions for reflection:

- **Do you have any database registering grassroots innovations and/or traditional knowledge?**
- **Which actors are (could be) involved in the database?**
- **Which barriers (e.g. language, online access, skills) does the database design need to address to reach underprivileged communities?**

[37] https://www.yim.my/innomap/

Chapter 5. Incubating grassroots innovations

This section describes the process followed by GIAN for incubating grassroots technologies. Since 1997, GIAN has provided incubation support to more than 150 innovations, executed 30 technology transfers and established 40 grassroots innovation-based enterprises. GIAN has also facilitated the filing of 30 patents in India (15 awarded) and seven patents in the United States (four awarded). GIAN was adjudged Best Technology Business Incubator by NSTEDB along with IIT Madras in 2004 and received the award at the hands of the Honourable President of India.

Screening

The first step in the process is screening the ideas for novelty. For establishing novelty, several databases need to be search and referred. In addition, one needs to look at the online marketing sites, and contact experts in the field to find out about any enterprise that practices the claimed technology without having online presence. The solutions closest to the innovation available in prior art can be explained to the innovator, for clarity and knowledge. There is little chance that they would come to know otherwise. Educating the innovators about new tools and technologies is very important for a network to grow.

Other criteria, in addition to novelty, that may be considered for screening innovations are:

- Potential social impact and use among local communities especially women, handicapped, disadvantaged and marginal communities.
- Is the innovation commercially/ functionally superior to the current product alternative?
- Ability to generate sustained livelihoods.
- Level of time, money, effort, and passion invested by innovator.
- Willingness of the inventor to develop the idea into a product or, alternatively, availability of another innovator /entrepreneur willing to take it forward.
- Environmental sustainability and energy efficiency.
- Does the grassroots innovation require further development?
- Gender considerations. For instance, the ability of the innovation to reduce the workload of women.
- Animal welfare considerations.
- Compliance with laws and regulations.

Prototyping, value addition and validation

Many of the grassroots innovations are crude and need prototyping, refinement and validation.

Prototyping may be done in-house or outsourced. The Honey Bee Network carries out prototyping in-house (e.g. at the Fablabs of the NIF or at the SRISTI lab for herbal technologies) as well as outside (outsourced to private entrepreneurs/fabricators under a confidentiality agreement).

An in-house team skilled in various disciplines (e.g. engineering, agricultural or veterinary science, and business development) is helpful to protype. Ideally, a Fablab and biotech lab should available inhouse or in close vicinity of the innovators, to speed up the prototyping, make the first few pieces for lab and field testing, and even for manufacturing initial orders. The innovator may not have the workshop facility and the existing small and medium-sized enterprises/industries may not be interested in the economic returns of small orders. To cater to such needs, the NIF has a Fablab and has set up community workshop in the premises of some seasoned grassroots innovators. Both of them are open to innovators wishing to make prototypes of their innovative ideas or make small quantities for market testing or sale. SRISTI has an in-house natural products lab for validation of and adding value to community herbal practices. GIAN has a Community Innovation Lab for children and youth to experiment and make innovative contraptions.

The process of refining and adding value to the technologies developed by grassroots innovators requires convincing the innovators about the suggested changes. As grassroots innovators work under tremendous constraints, they are likely to be rigid about their ideas and may require persuasion to experiment further.

Prototypes need to be tested and validated in the labs and in the field. Trials have to be carried out with actual and potential customers of different sectors and geographies. Validating grassroots technologies in field conditions is critical to understand the variability in performance in different socio-ecological contexts.

SRISTI has a natural products laboratory which was originally set up with the help of the Sadbhav Trust (a private family trust) and later on expanded. The laboratory carries out all the basic phytochemical and microbial experiments to validate the herbal technologies in vivo. Then, GIAN carries out the field trials of these practices and innovations.

Multi-location trials under different agro-climatic conditions is important for agricultural technologies. This can be done in collaboration with the extension division of agricultural universities, private companies, and cooperatives to reduce the transaction cost. It may be difficult for a single institution to do all the trials, as access to different locations and to data collection at different time periods is required.

Both value addition and validation need the support of formal R&D institutions (e.g. scientists, designers, regulatory agencies). Grassroots innovations and useful traditional knowledge need to be validated by modern scientific tools and methods. Hence, linking informal science actors with formal science is key.

For example, GIAN collaborates with the National Institute of Design (Ahmedabad), the Industrial Design Centre at the IIM-Bombay; SRISTI, which has a natural product laboratory, collaborates with the Department of Biotechnology and the Institute of Microbial Technology; and the NIF has worked with more than 200 biotechnological, medical, Ayurvedic labs, and agricultural research centres for value addition in grassroots innovations. For example, it collaborates with various Council of Scientific and Industrial Research laboratories and with three major networks of public sector laboratories: the Indian Council of Medical Research, the Indian Council of Agricultural Research and the Council of Scientific and industrial Research. Private sector labs can also be roped in for the purpose. For example, the animal health monitoring system, developed by the students of the Shreemati Nathibai Damodar Thackersey Polytechnic college, has been prototyped in the laboratory of STM microelectronics, a leading semiconductors and microchips firm in India.

Not all the resources and skills may be available in individual labs. In this context, developing knowledge networks for value addition and validation is critical.

The Honey Bee Network, for example, brings in new skills and resources through volunteers, collaborations with formal research institutions, patent holders, universities and professional services at subsidized rates.

The volunteers of the Honey Bee Network play a significant role in each step of scouting and value addition of grassroots innovations and outstanding traditional knowledge. Volunteers come from different backgrounds (scientists, IP attorneys, farmers, entrepreneurs, designers, innovators, students, interns) and bring in a range of skill sets into the system.

Certain tasks may be done through collaboration with other institutions or by hiring professionals at subsized rates. For instance, through the Grassroots Innovations Design studio, set up by GIAN in collaboration with National Institute of Design-Ahmedabad, design students improve innovations. Some of the graphics/product designers, IP firms, manufacturers provide their professional services to the Honey Bee Network at subsidized rates.

Feedback and iterations

Feedback from customers and experts in the field is important. For example, for the modified wood-based crematorium made by Mr. Arjun Pagdar of Keshod, feedback was obtained from Mr. Palsikar, an entrepreneur in making kilns (a type of oven). Mr. Shrinand Palshikar suggested that the design needed to be changed for a drawer type crematorium. Previously, the lid was manoeuvred with the help of levels which was not very safe. He also connected the innovator to a market where he could get the firewool and bricks at a much lower price.

Filing intellectual property rights (IPR)

The Honey Bee Network has a team of dedicated IPR attorneys that provide pro bono advice. Several patent attorneys have provided services at highly subsidized rates. GIAN has a patent assistance cell, supported by the Government of Gujarat, where the patent filing fee is reimbursed by the state government to GIAN (and in turn to the innovator) in full for patents filed in India and in half for the patents filed in the US. Policy makers in different countries may consider whether financial support or facilitation centres should be set up to support the protection of grassroots innovations.

Making and testing the product

Owing to their small markets, many grassroots innovations require small production lines. Yet, small production lines still need to be streamlined to, for example, ensure that innovators procure standard, easily available components, instead of producing themselves such components. Procuring standard readily available components may help innovators deliver orders on time. For example, Mr. Raj Singh Dahiya, the innovator and now entrepreneur of the Biomass Gasifier, streamlined his production process to shorten the production cycle and timely cater to orders by relying on standard components wherever feasible.

In India, the legal framework for equipment testing requires all the components of the machine to be new. As many of the grassroots innovations use second-hand parts, this requirement is a major hindrance in testing and certification of the machines. GIAN, SRISTI and NIF seek help from different public sector testing facilities across the nation. As many of the innovations are agriculture based, dedicated labs for particular crops and machines are available. For example, Mr. Bharat Agrawat's weed remover was tested at the Junagadh Agricultural University facility. When Mr. Bhanji Bhai developed a small tractor, GIAN got the help of then Secretary Agriculture, Federal government to get it tested at a national farm equipment testing facility at concessional rates and in an expeditious manner. Funds to pay the testing fees may also be required for those innovators who cannot afford to do so.

Adjusting standards

Regulatory approval for grassroots innovations are often required. Product standards can be archaic and inflexible to make room for emergent innovation and amending or adding new standards takes a long time. Grassroots inventors may face additional difficulties to meet standards, particularly if they use do-it-yourself approaches, as they have fewer resources. Standards may have to be amended or established at a faster rate if grassroots innovations are to be mainstreamed.

More recently, SRISTI has transferred three technologies to Kenya in a project supported by the United States Agency for International Development (USAID)[38]. In this case, SRISTI transferred the technology and helped setting up the standards for a small tractor in collaboration with JKUAT and the Kenya Bureau of Standards.

[38]SRISTI USAID Technology Transfer Project Video Version 2 - https://www.youtube.com/watch?v=eUkK68vxCL4, 2018, http://www.sristi.org/usaid-2/).

Technology transfer, licensing and entrepreneurship

Innovators may not necessarily be entrepreneurs. They may not be interested, have the resources or the required skills. For example, a farmer that comes up with a solution, may not necessarily be interested in setting up a business. Designing a solution and being an entrepreneur require different sets of skills. While an innovator may be interested in constantly refining his or her inventions, an entrepreneur may need to focus on securing batch-to-batch consistency to be able to respond to market demands.

When the innovator is not able or interested in becoming an entrepreneur, the technology can be licenced or transferred to interested entrepreneurs that could commercialize it. The transfer may be under different clauses, exclusive or non-exclusive, as agreed mutually. Payments can be upfront, deferred, based on royalty fees or a combination of these.

The first technology transfer of a herbal veterinary formulation was done by SRISTI. Technology of an eczema drug called Herbavate was transferred to Troikaa pharmaceutical ensuring that all the seven communities whose knowledge was pooled received a fair share of the annual royalty.

Another example, in Kenya, several innovative farmers were identified by JKUAT, to pursue field testing of technology, generate feedback and then transfer the innovation to the university for eventual commercialization through a company set up by the university.

GIAN pursued the first district level technology transfer for Aaruni, a tilting bullock cart, developed by viz Amrut Bhai one of the oldest members of the Honey Bee Network in 1998-1999. Three small scale entrepreneurs licensed the technology for manufacturing and marketing the cart in three districts. The full licencing fees were given to the innovator. To date, GIAN has facilitated 30 technology transfers.

Financial skills

Grassroots innovators may have limited financial skills. For example, they may mix personal and business accounts. They may find it difficult to keep the relevant financial accounts (paying in cash and forget to make relevant entries in the book of accounts) and to understand the actual profit they are making. Another problem is the ratio of credit to cash sales. Giving products on credit without taking some advance, locks the capital available to the entrepreneur for long periods and may project false negatives in the book of accounts. Entrepreneurs also run the risk of not being able to recover their money.

Scaling up

After the enterprise is well established, suitable scaling up strategies may be devised. At this stage, the entrepreneur may decide to attract more investors or acquire a bigger manufacturing facility. Care has to be taken to ensure that any expansion is demand driven. The entrepreneur may also seek partnerships and opt for distributed manufacturing, assembling and markets.

Reaching customers: the role of markets, public institutions, and civil society

Markets, public institutions and civil society organisations can connect producers with consumers.

Markets are the natural mean for commercialising innovations. However, in the context of weak markets, where uncertainty is high or the customers are dispersed and unconnected, public institutions can play an important role in connecting producers with consumers. Public institutions can support the sharing of information on technologies, endorse specific technologies or adapt public procurement rules[39] to facilitate the dissemination of grassroots innovations.

[39] The Ministry of Micro Small and Medium Enterprises, Government of India relaxed the procurement norms for registered start-ups. The circular can be accessed at http://dcmsme.gov.in/Office%20memorandom_10316.pdf

For example, in 2016, the Public Procurement Division of the Ministry of Finance, India issued a memorandum to all central ministries and departments, for relaxing the conditions of turnover and experience for start-ups subject to meeting the required technical specifications and quality standards.[40] The Challenge for Change scheme of the Government of Rajasthan provides opportunities for digital technology start-ups to partner with the government.

The state may encourage grassroots innovators and entrepreneurs by:

- allocating free or concessional stall space in public exhibitions,
- advertising in newspapers and public media at an extremely concessional rates, or even at no cost,
- building capacity to learn about packaging, communication and marketing,
- support for selling products at e-marketing places including government e-marketplace for public procurement,
- supporting certification and accreditation,
- networking among innovators to make viable bundles and/or catalogues of products and services,
- supporting launchpads for rapid consumer feedback and testing the market.

Grassroots innovations are often niche based and hence defining the market and focussing on relevant geographies is important for optimal performance. For example, Bullet Santi, the motorcycle driven plough/ interculture equipment, performs best for the light sandy soils found in the Saurashtra region of Gujarat. The machine may not perform well in regions where the soil is deep, heavy and clayey. Advertising these innovations in appropriate areas with potential of finding customers is important.

Civil society organizations, working with grassroots, can help identifying needs as well as taking these technologies to the beneficiaries.

Questions for reflection:

- **Identify innovations that did not need any further value addition for diffusion and acceptance by others.**
- **List formal R&D actors that can help validate and add value to grassroots innovations and outstanding traditional knowledge.**

[40] https://www.startupindia.gov.in/content/dam/invest-india/Templates/public/notification/Relaxed_Norms_of_Public_Procurement_for_Startups/1.%20Relaxed_Norms_of_Public_Procurement_for_Startups.pdf

Chapter 6. Social diffusion of grassroots innovations

Not all grassroots innovations have the potential to be commercialized. When demand is scattered, small and uncertain or fluctuating, there is limited potential for commercialisation of specific grassroot innovations. Yet, the social diffusion of these grassroots innovations could help address the needs of disadvantaged communities.

The value of a given grassroots innovation for addressing the unmet need of a community engaged in agriculture, livestock, fisheries or in manual agricultural or food processing activities, has to be proven in local conditions. Their value may also have to be demonstrated through farm trials to prove their suitability for the local community. This process requires financial resources and expertise.

The first step to support the social diffusion of grassroots innovations is to generate awareness about existing solutions. Without knowing about grassroots innovations, it is unlikely that there will be demand for them even if these are available for free. Creating awareness, showing how the innovations can help people overcome their constraints and improve their productivity and income, can be done through several ways. For example, the Shodhyatras or learning walks is one major way in which the Honey Bee Network has created awareness in far flung areas. The annual Sattvik, a traditional food festival, has generated demand for traditional nutritious agro-biodiverse foods, organically produced products, crafts by women groups, herbs and other products. It has also made urban communities appreciate and support grassroots innovations.

Creating awareness among urban communities is also helping in building linkages among grassroots innovators, investment opportunities and entrepreneurs.

Social diffusion should be promoted in a way that encourages experimentation and a self-help spirit among individuals and communities rather than dependency.

Social diffusion of grassroots innovations and traditional knowledge can be done by sharing databases of verified and validated practices and innovations, online and offline through different media. As discussed in Chapter 3, different channels like extension services, post offices, etc., can be used to diffuse grassroots innovations and traditional knowledge.

There are several other approaches for social diffusion including the use of mobile phones (both feature and smart phones), radio, television, and print media.

Crowdsourcing investment and entrepreneurial support, where a third party bears the cost, can also help the social diffusion of existing grassroots innovations.

It should be noted, that some ideas that are not commercially viable are still socially relevant – particularly when they address enduring and widespread problems. In these cases, there is a case for providing support through public schemes and institutions to promote their diffusion.

Questions for reflection:

- **Which channels do you use to generate awareness about grassroots innovations?**

  Examples of channels to generate awareness include demonstration farms, innovation centres, collaboration spaces, TV and radio programmes, education programmes etc.

- **What mechanisms do you have for cross pollinating (diffusing) knowledge?**

  Examples of mechanisms to diffuse knowledge include channels include learning walks, innovation fairs, agricultural extension systems, innovation centres, collaboration spaces, etc.

- **What social channels do you use to diffuse grassroots innovations?** Examples of social channels include agricultural extension systems, demonstration farms, agricultural trials, innovation centres, collaboration spaces, open databases, TV and radio programmes, etc.

Chapter 7. Financing grassroots innovations

Supporting the incubation of grassroots innovations requires financial resources. The following are some of the financing mechanisms available in India to support grassroots innovations.

Value Addition Research and Development (VARD) Fund

The VARD Fund, financed by the Department of Science and Technology, provides grants to refine prototypes of innovations for which novelty can be established. The grant has no upper limit, is available throughout the full development circle of the innovation and is managed and monitored by the National Innovation Foundation. The funds are allocated and released based on the recommendation of a committee of experts. One recurrent problem faced by the managers of the Fund is that innovators change the design during the execution of the project and the fund may no longer be adequate. In that case, prior permission has to be taken from the Research Advisory committee for the viability of the new design and based on that recommendation the VARD committee may allocate additional resources.

Start-up schemes

The start-up scheme of the Government of Gujarat provides funding at the idea stage to make proof of concept or prototypes. The Industries Commissionerate of the Government of Gujarat finances and manages this scheme. The funding is available in two stages: for product development and for packaging, marketing and business development. In both cases, the upper limit of the grant is Rs 10 lakh (approx. 15,000 US dollars). A limitation of this scheme is that it only enables the development of one piece of prototype. To succeed in the market, products require testing in several places and among various user groups. Testing is costly and most grant schemes do not provide such support. Under certain state schemes, these funds are available only once and are not available for innovations for which the prototype has already been made.

There are other schemes, such as those by the Department of Biotechnology, that provide support across the whole cycle of development of an innovation from the concept stage and provide small and large grants and/or loans.

Micro Venture Innovation Fund

The Micro Venture Innovation Fund provides financial support to grassroots innovators under a single signature without any collaterals. It is a risk fund which, unlike micro finance, does not require third-party guarantee. It finances the development of products for which the market does not exist yet.

The fund was established at NIF in collaboration with the Small Industries Development Bank of India. Since its launch in 2003, 193 projects have been financed with more than 75 per cent recovery. Most of these investments were unsupervised because NIF then had few human resources to support this. In January 2016, another phase was launched to support innovators and entrepreneurs for three years.[41] The fund set up is currently under review.

Funds for labs to support grassroots innovations

The Government of India provided budgetary support to NIF for validation and value addition of grassroots innovations in-house and in cooperation with public sector labs. Institutions working in grassroots

[41] http://nif.org.in/bd

innovations can mobilize funds through Corporate Social Responsibility[42] for setting up labs, testing facilities and mobile fabrication labs, food and nutrition labs, children creativity and training labs. The government can also encourage public sector labs to assist grassroots innovators in value addition and validation (for example, the NIF has agreements with all the major public labs in India).

Financial institutions supporting Grassroots Innovations

The Small Industries Development Bank of India, finances and promotes the development of micro, small and medium enterprises in India. It also provides loans at concessional rates to small scale entrepreneurs registered as micro, small, and medium-sized enterprises.

The National Bank for Agriculture and Rural Development (NABARD) provides a number of finance and refinance schemes to support rural development in India. Until 2014, NABARD had a scheme of Rural Innovation Fund (RIF) to support innovative and unconventional on-farm and off-farm experiments to foster innovation and entrepreneurship in rural areas. Although the fund ceased to exist, NABARD still supports rural innovations through other windows.[43]

Under the Pradhan Mantri MUDRA Yojana scheme, a loan of up to 1 million Indian rupees (around 15,000 US dollars) may be given to "non-corporate, non-farm small/micro enterprises" through financing institutions. The loans can be accessed to set up grassroots innovation-based enterprises in India.[44]

Financing of outreach programmes

The Social Innovation Fund in Malaysia was created to reach to grassroots communities and support scaling up their innovative ideas. The programme receives submissions of proof-of-concepts or prototypes from the Ministry of Energy, Science, Technology, Environment and Climate Change, Malaysia. Selected prototypes are then connected to relevant agencies.

Question for reflection:

- **Please identify the different financial schemes and resources available in your country/ institution to support grassroots innovations**

[42] In India, firms of a certain size are obligated to contribute up 2 per cent of their average net profits of three years to corporate social responsibility. Government has identified themes and activities which can be funded by CSR. Incubation and entrepreneurship development activities are included in the list. See: https://www.india-briefing.com/news/corporate-social-responsibility-india-5511.html/

[43] https://www.nabard.org/content1.aspx?id=685&catid=683&mid=

[44] https://www.mudra.org.in/

Chapter 8. Building linkages between grassroots innovators, public institutions, firms, academia, and civil society organizations

Linkages between grassroots innovators, the public administration, industry, academia, and civil society organisations are essential for grassroots innovations to be identified, validated, recognized, developed and diffused.

Linkages enable the flow of information, knowledge and resources among different actors.

Grassroots innovators need access to expert knowledge and financial resources for technological validation, value addition, business development, intellectual property rights (IPR), and of course incubating their ideas and innovations. Generally, these sets of support and expertise are not available in any one institution.

The availability of efficient linkages helps bringing down the transaction cost of the different actors in both demand and supply side of the grassroots innovation ecosystem.

Building and developing linkages among different actors and institutions is therefore critical to enable grassroots innovations to emerge and thrive.

Linkages among grassroots innovators

Linkages among grassroots innovators are critical as they can then share resources for fabrication, design or on farm trial, and more experienced innovators may mentor others. These linkages can be through informal exchanges or under a formal set up. For example, Mr. Mansukhbhai Patel, the innovator of the cotton stripping machine gave the blowers to Mr. Natubhai Vadher, the innovator of the cotton-picking machine at a very subsidized rate under no formal agreement. However, in the case of the cow-dung pot making machine, a formal agreement was drawn between Mr. Gopalbhai Suratiya, the original innovator, and Mr. Pareshbhai Panchal, the innovator of incense stick making machine, to give manufacturing rights to the later.

The clustering of innovators by sector can help generate new innovations by pooling design features of several independent innovations or help pool related solutions to offer the consumer a comprehensive catalogue. The network of grassroots innovators may also provide multiple hubs for selling each other's products.

Intermediary organisations

The role of intermediary organisations is, as in any innovation ecosystem, critical to link actors and to match unmet needs with solutions. In the case of grassroots innovations, intermediary organisations are particularly important for facilitating interactions between formal and informal sectors. The knowledge systems of both sectors have evolved differently as they focus on optimizing different parameters. Collaboration between the two is essential for grassroots innovations to thrive, and the role of intermediary organisations is particularly important in areas, industries or regions neglected or unreached by the formal sector (Dey, 2015)[45].

[45] Presented in ICCIG, 2015[iccig.org].

Intermediary organisations play a crucial role in bringing partners from different sectors and segments to develop innovative solutions that address unmet social and technological needs. These organizations help to reduce transaction costs and bring them on a common platform. They can help translating and transcending language and trust barriers. When scientists started working on grassroots technologies, the Honey Bee Network institutions like SRISTI and NIF indemnified them against any legal or institutional conflict that could have arisen. However, no such conflict has been reported till now. One of the strongest evidences for trust building comes from having a system requiring Prior Informed Consent. Grassroots innovators have the option to work directly with partners, companies, and R&D labs but almost all of them have opted to work via SRISTI, GIAN or NIF.

Intermediary organisations –variously referred as brokers, third parties, bridges or intermediary firms– facilitate the diffusion of knowledge and resources between different actors. Intermediary organisations may include marketing agencies, technology partners, design or legal consultancy firms, service organizations, and play different roles from innovation management and protecting property rights of innovators (Howells, 2006)[46].

GIAN is a clear example of an intermediary organisation supporting grassroots innovations. Box 5 describes some of the functions taken by GIAN to support a specific grassroot innovation.

Key innovation actors (e.g. universities, public sector agencies and entrepreneurs) may have taken intermediary functions, but as innovations systems become more open, distributed, and complex these functions are increasingly carried out by independent organizations.

There are not many intermediary organizations specifically supporting grassroots innovations. In India, the Honey Bee Network has spawned three such institutions. They are different in structure and governance but cater to the cause of grassroots innovators and outstanding traditional knowledge holders. SRISTI is a non-governmental organization, GIAN is also a non-governmental organisation but supported by the Government of Gujarat, and NIF is an autonomous institution under the Department of Science and Technology, Government of India.

SRISTI facilitates the scouting, documentation and cross pollination of innovations and supports the open dissemination of ideas, innovations and traditional knowledge practices for sustainable agriculture, livestock, agroforestry, water management, food and nutrition. SRISTI facilitates the dissemination of knowledge by providing open access to databases on farmers innovations, indigenous common property resource institutions, and medicinal plants; engineering student projects (techpedia.sristi.org) and abandoned US patents. SRISTI facilitates learning through the organisation of Shodhyatras (learning walks) in different parts of the country. The SRISTI helps recognize and encourage grassroots innovations through awards such as SRISTI Samman and the Gandhian Young technological Innovation Award and the organisation of festivals such as Sattvik, a traditional food festival. SRISTI also supports grassroots innovators by adding value to their knowledge and creativity through a natural product biotechnological laboratory.

GIAN, the world's first incubator of grassroots innovations, mobilizes resources from public and private sources to support grassroots innovators. As an intermediary organisation, it connects creative communities and individual innovators with sources of information about emerging technologies, investments, and markets, academics. It also supports the patenting of grassroots innovations in India and abroad. GIAN supports the dissemination of knowledge and linkages of different actors through the organisation of international conferences and summer schools, and the establishment of platforms (e.g. for organic farmers to reach urban consumers). GIAN has also supported market access for traditional

[46] Howells, J., 2006.

products of tribal communities and, vice versa, disseminated knowledge and frugal and sustainable technologies for tribal communities.

Box 5. Organisations supporting grassroots innovations – the case of GIAN and Arjunbhai Paghdar

Mr. Arjunbhai Paghdar, a Grassroots Innovator of Gujarat developed a more efficient and culturally acceptable wood-based cremation system. The system is designed with an innovative approach to minimize fuel wood consumption and reduce air and water pollution. Its ritual enabling design makes it a user-acceptable alternative. Initial trial results indicate that this system reduces fuel wood consumption by 60 to 65 per cent.

The innovator designed the inner part of the cremation system to minimize the space for wood and maximize the utilization of the heat to burn the human body. The inner part of the cremation system is made up with fire bricks in a closed mummy shape. It has a two-way door (on the side of the head and of the feet). The air circulates with the help of forced draft nozzle pipes placed from head to feet at the bottom of the body, helping to release oxygen to inflame the body. Trays are provided for placing wood, cow dung logs and body. Ash content is collected through a tray at the bottom.

The advantage of this new design is that it contains heat within the controlled volume and the insulated walls prevents heat from dissipating. Air went has been designed to accelerate the combustion process. The uniqueness of the mould is that it has a human body shape to accommodate wood as per the proportion of the body. The design has reduced considerably the wood and biomass requirements and has reduced drastically the time required for cremation.

GIAN supported the development of this innovation.

- It mobilised funds for making the prototype through the VARD fund.
- Its in-house engineers helped to refine the design and material. The network volunteers made the models and autocad designs.
- GIAN connected the innovator to suppliers who gave him highly discounted rates.
- The Honey Bee Network mobilised industry experts to mentor and advise the innovator.
- GIAN facilitated the testing of the prototype. Testing the prototype required a corpse and villagers were not open to cremate a deceased relative in a prototype. GIAN connected the innovator to Junagarh Municipal Corporation, which agreed to do a trial if an unclaimed body arrived. On the day of the testing, a women's body arrived. The relatives agreed to use the modified crematorium as they knew the work of the Honey Bee Network.
- After the trials, the drawbacks were addressed by changing the design. The innovator was helped by industry experts and in-house engineers.
- GIAN mobilised investments, through Gujarat Energy Development agency scheme and the Forest Department of Gujarat, for scaling up the production of the cremation system.

The National Innovation Foundation (NIF), as an institution of the Government of India, mobilizes public resources for supporting grassroots innovators and provides them with high-level recognition, including from the Honourable President of India. The foundation has provided support in filling patents and licensing technologies. It organizes the annual Festival of innovation and entrepreneurship, with the support by the office of the President of India, to connect policymakers, scientists, corporations and other stakeholders with grassroots innovators and traditional knowledge communities. It intermediates between formal and informal system of science and technology to support value addition and validation. It also supports the Indo-ASEAN platform for innovation dissemination across the region.

Several incubators in technology or management institutions like the IIT Madras incubation cell or IIT-Bombay provide relevant services such as value addition, mentoring or IP support to grassroots innovators, although they are not solely working for grassroots innovations.

The organisation of innovation festivals featuring grassroots innovations is one way of promoting the diffusion of these innovations, providing recognition and fostering linkages among different actors of the ecosystem. The Malaysian Innovation Foundation and Indonesia's Puspiptek National Science and Technology Park have organized international innovation festivals that have featured grassroots innovations.

GIAN often takes intermediary functions as it acts as a connector among different actors in the grassroots innovation ecosystem. For instance, in a recent initiative, capacity building training was provided to potters of the Rathwa community. The community makes non-stick earthen pots using a naturally available materials in the nearby forests. These low-cost non-stick cooking vessels allow to cook using less oil, the most expensive ingredient in the diet of this community. Non-stick cookware is also popular amongst urban population adopting healthier lifestyles. However, when these pots were introduced in the urban market they were not accepted as the pots were bigger, heavier and unsuitable for cooking on gas stoves. GIAN facilitated access expertise to develop the the appropriate product. First, it facilitated discussions with the team and the community, which decided to develop iron moulds. The iron moulds turned out to be inappropriate, as the soil mixture was not sticking on the mould and hence could not be shaped. Then, GIAN team started inquiring and searching for solutions in the area and an old lady (who was not a potter herself) suggested to make wooden moulds and the problem was solved.

Mentoring platforms

Mentoring platforms provide resources, knowledge and guidance for grassroots innovators to develop their initial ideas into products. India's Grassroots Innovation Augmentation Network [GIAN] is one example of a mentoring platform.

Techpedia and GIAN-nidhi are two endeavours trying to link students and industry actors. Techpedia is a database (techpedia.sristi.org) collecting the final projects of engineering students. It has nearly 200,000 student projects from all over India. The platform forges linkages among small scale industries and students through the Industrial Defined Problems' Programme (http://techpedia.in/problems/idp). Students in the third- or fourth-year of their degree course identify the unmet needs of small enterprises, grassroots innovators, communities or public agencies and pursue final year projects to address these needs. GIAN-nidhi is a national repository of projects carried out by Industrial Training Institute and Polytechnic students. The database provides visibility to students efforts.

During the inclusive innovation summer school (https://www.ss.sristi.org/), technology students from polytechnics and degree colleges are encouraged to learn from, and collaborate with, local disadvantaged communities (such as salt farmers and tribal communities living in forests) to ideate solutions for their problems.

Supporting women grassroots innovators

The problems of women may be neglected by male grassroots innovators. For example, women have been constrained culturally in many countries and have not been allowed to use blacksmith and carpentry tools. This prevented them to convert their ideas into real solutions. In domains in which their autonomy matched their agency, they have produced brilliant knowledge and practices for childcare, community health, livestock care, biodiversity conservation, seed selection for new varieties of crop etc.

In this context, it is critical to put in place targeted mechanisms to support female grassroots innovators. For example, the community Food and Nutrition Lab GIAN is promoting women's knowledge of low-cost nutritional recipes. Some of the recipes use discarded ingredients, like the skin of vegetables, edible weeds

and roadside plants. The lab also spreads awareness about cooking methods and utensils to help communities maximize nutrition while minimising costs.

Funding for formal science, technology and innovation (STI) institutions to support grassroots innovations

Linkages between formal science, technology and innovation institutions and informal grassroots innovators can be encouraged by providing funding to relevant formal institutions to support grassroots innovations.

Given the constrained budgets of most labs, unless dedicated funds are provided, the scientists working at the labs hesitate in taking extra load of working with grassroots innovators. The availability of funds specifically directed to support grassroots innovation can help address this limitation. For example, the Council of Scientific and Industrial Research (CSIR) had set up a joint implementation committee, chaired by an eminent scientist and comprising senior scientists from the CSIR labs and representatives of National Innovation Foundation. About a million-dollar grant was allocated to different CSIR labs to work with grassroots innovators through NIF on May 5th 2005 for five years. The collaboration is continuing and has entered its third cycle.

Incentives to encourage linkages for grassroots innovations to emerge and diffuse

Linkages between research and training institutions and grassroots innovators are critical. A portfolio of incentives (material or non-material, individual or collective) may help building and sustaining these linkages.

Academics have the opportunity to conduct research or action research related to the validation of or value addition to grassroots knowledge, innovations or practices. Academics can be encouraged to publish papers with grassroots innovators as co-authors and there are several researchers that have done so. Unlike patents, which do not recognize the scientists or staff of intermediary organizations; research papers can acknowledge all collaborators as authors or in the content of the papers.

For some academics, the opportunity to have face to face interaction with innovators is very rewarding. Such meetings can be arranged so that mutual expectations and insights are clear to all parties. It is part of the protocol to take prior informed consent.

Questions for reflection:

- **How do you promote linkages to support grassroots innovations in your country? List platforms, programmes, intermediary organisations, funding and incentives that enable grassroots innovators to link up with one another, and to link with formal science, technology and innovation institutions.**
- **Please identify the actors with whom you collaborate to support grassroots innovations**

Appendix 1. Key definitions used throughout this workbook

A new idea: A thought that makes it possible to imagine the forms, features or functions of a product or service that is not yet a reality.

Invention: New or novel practical application of knowledge, technology and ideas that come from experience, scientific enquiry or research and development.

Innovation: The application or introduction of a new idea (a new product, method, organisation, application/use or system of delivery). Innovations, depending on their novelty, can be incremental, radical, disruptive or even transformative. Innovation is broader than invention, it requires the introduction or use of an invention or novel idea to improve performance of a function, product, service or system.

Grassroots innovation: Strictly speaking, grassroots innovations are developed by members of informal sector at community level, like farmers, artisans, workers, mechanics, children etc., to address an unmet need without outside help [*innovations from grassroots*]. These must be distinguished from *innovations for grassroots* developed by actors in the formal sector, including firms, science and technological institutions, and non-governmental organisations.

Commercialization of innovations: the diffusion of an innovation through commercial channels either by the innovator or through licensing of the technological innovation to another party.

Social diffusion of innovations: the diffusion of innovations through social channels, but not commercial ones. Many grassroots innovations are shared openly by the innovators with their communities. Social diffusion may also take place through intermediary agencies (like the Honey Bee Network, SRISTI, GIAN or NIF), through extension agencies, cultural fairs, mass media, government public information channels, and social media.

Innovation ecosystem: Innovations occur in specific contexts and through the interaction of different actors (grassroots innovators, firms, scientific and technological agencies, civil society organisations, marketing, branding, funding, certifying or regulatory agencies, users and consumers). A thriving grassroots innovation ecosystem depends on the technological, institutional and innovative *capabilities* of the different actors, and on the *linkages* among them (for instance, between innovators and mentors, investors, marketing, IPR experts, public support systems, educational institutions, public research organisations, and extension systems).

Traditional knowledge: the knowledge, know-how, skills and practices that are developed, sustained and passed on from generation to generation within a community, often forming part of its cultural or spiritual identity[47]. Local communities have been solving local problems through experimentation, testing and sharing of knowledge and practices over generations. Where each generation may add their own insights. Traditional knowledge practices may be shared intact over space and time and may be simultaneously discovered or developed by different communities independently. Traditional knowledge is often intertwined with the community cultural and spiritual belief system. Traditional knowledge may not necessarily be scientifically valid.

[47] https://www.wipo.int/tk/en/tk/

Appendix 2. Self-assessment grassroots innovation ecosystem

Complete this self-assessment to identify the strengths and weaknesses of your own grassroots innovation ecosystem

Grassroots innovations (GI)		**ASSESMENT** of your ecosystem for grassroots innovation					**NEED** I would need support for ..
		1 Weak	**2**	**3**	**4**	**5 Strong**	
Awareness	Among policy makers						
	Among grassroots communities						
Public support for GI	Public policy explicitly supports GI						
	Public initiatives at federal						
	Public initiatives at state level						
	Public initiatives at district level						
Discovering & promoting GI	Scouting: diversity of channels used						
	Promoting innovation minds						
Recognising and protecting GI	Prior art research						
	Use of intellectual property (IP) to protect GI						
	Use of patent information to innovate						
	Use of open access modalities						
Developing & incubating GI	Validation and value addition						
	Incubation (facilities, entrepreneurial skills, technical skills, mentoring)						
Social Diffusion	Database of GI and Traditional Knowledge available						
	Adoption in extension services						
Financing	Research and development (R&D)						
	Incubation						
	Infrastructure (labs)						
Linkages	Platforms						
	Intermediary organisations						
	Incentives (recognition, financial) to link						

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