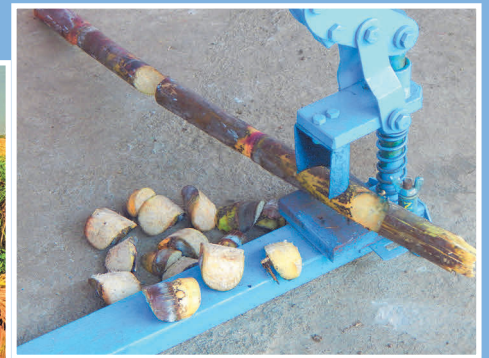


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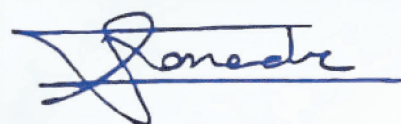
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Development vis-à-vis Grassroots & Student
Innovations from India - Shri Tushar Garg**

As National Innovation Foundation-India (NIF) commemorate 25 years of relentless pursuit to democratize innovation in our country, we are honored to present the inaugural edition of our bi-monthly magazine on this momentous occasion. This new chapter in NIF's publication's history heralds the beginning of a dedicated platform where NIF's progression, visionary ideas, critical dialogues, local success stories, and the diverse tapestry of indigenous knowledge converge. At its core, this magazine aims to represent the myriad voices of innovators and inspire readers through analytical discourse on grassroots innovation ecosystem of India. With this initiative, NIF aspires to assume even greater participation in the march of national development to Viksit Bharat by 2047 which is the centenary of India's independence.

Through National Biennial Competitions and Innovation Yatras, NIF's Scouting, Documentation, and Database Management (SDDM) Division has meticulously created a vast repository of over 345,000 innovative technological ideas from around 625 districts across the country. Our Value Addition, Research, and Development, and Intellectual Property Management (VARD&IPM) Division have ensured the transition of grassroots innovations into scalable solutions through R&D interventions and safeguarded the intellectual property of innovators through filing over 1400 patents, 95 plant variety registrations under PPVFRA, 24 Design registrations, and 11 trade-mark applications. Through mentoring and capacity building, product development, market linkage, and widespread diffusion, NIF facilitates large scale application of grassroots technologies at the ground level and thus contributing to the national aspiration of improved healthcare, sustainable agriculture, environmental conservation, livelihood and entrepreneurship promotion. Moreover, NIF is nurturing creativity in young minds through INSPIRE MANAK scheme of Department of Science and Technology. By gathering innovative ideas from middle and high school students and blending such ideas with technology for addressing societal challenges, NIF is instilling the spirit of problem solving and self-reliance in the young generation.

The critical significance of grassroots innovations has been nationally recognized. Over a dozen of our grassroots innovators have been conferred with Padma Shri, the 4th highest civilian award, and over a thousand such innovators have been conferred national honors at Festival of innovation and exhibition (FINE). This reflects the potential of sustainable and affordable rural technologies in contemporary times. Moreover, India's grassroots innovation ecosystem is gaining global traction with NIF showcasing its technologies at international platforms like the ASEAN-India Grassroots Innovation Forum (AIGIF).

The Viksit Bharat@2047 vision and NIF's roadmap are symbiotic. In this journey, NIF is not merely a facilitator but a co-author of India's development trajectory. As NIF commemorates 25 years, its legacy lies not merely in promoting innovations and entrepreneurship but in fostering a mindset that development is not confined only in sophisticated laboratories and corporate boardrooms but also expressed in the quiet resilience of everyday ingenuity. While we launch the maiden issue of our magazine, we stand united in our belief that the future of India lies in the hands of its innovators who dare to dream, experiment, and push the boundaries of what is possible. This magazine will serve as a pulsating tribute to every stakeholder whose creative spark has contributed to the mosaic of progress, and a call to action for continued collaboration between communities, policymakers, educators, entrepreneurs, academia, and industry. Let us celebrate the ingenuity that has brought us this far and remain steadfast in our commitment to fostering an environment where innovation is not just encouraged but celebrated at every level of society.



The journey of National Innovation Foundation (NIF) – India

Dr. Vipin Kumar

The vision encompassing a journey of an inclusive and innovative India could not have been realized unless the knowledge, innovations and practices of people at grassroots were seen as building blocks of a new developmental paradigm. To realize it, while delivering the Union Budget speech of the FY 1999-2000, the then Finance Minister of the country had announced establishing of National Innovation Foundation (NIF) - India with an aim of strengthening grassroots technological innovations and outstanding tradi-

tional knowledge. The underlying mission was to help India become a creative and knowledge-based society by expanding policy and institutional space for grassroots technological innovators. Building upon the philosophy of Honey Bee Network (HBN) and witnessing unwavering commitment and support from all the network partners, NIF in its initial years have demonstrated both potential and impact.

Since inception, the entrepreneurial model that NIF has adopted and propagated in different parts

of country, ensured that these innovations, either in their original form or after being pooled with other similar innovations, traditional knowledge, or practices, were valorized, tested, and used as the basis for new enterprises. It becomes India's contribution to global thinking on the subject and it offered the country an early mover advantage.

True to its objectives at the time of inception, NIF scouts, supports and spawns' grassroots innovations developed by individuals and local communities in any technological field, helping in human survival without any help from formal sector. NIF emerged as support system to nurture grassroots innovations across India and became a complete value chain i.e. from an idea to a commercial product. It has successfully put in place all segments of an innovation incubation chain viz. Scouting and Documentation, Value Addition and Validation, IPR protection and Social/Commercial diffusion. NIF also supports the outstanding traditional knowledge based technologies sourced from their holders, both individuals and communities, irrespective of their locations even at the last mile and deepest



Inclusivity at its best: Hon'ble President of India conferred an award to women grassroots innovator Smt Arkhiben Mithabhai Vanakar during 6th Biennial National Grassroots Innovation and Outstanding Traditional Knowledge Awards (2012)



Hon'ble former President of India Dr APJ Abdul Kalam inspiring creative and innovative children with his presence during IGNITE Awards

pockets of the country, and carry out their scientific validation with the support of various partner Institutions in the Public sector and expert organizations in the Private sector. Consequently, the indigenous practices maintained over generations which had proven useful to common people and generated significant social impact locally, get an opportunity to be preserved, professionally and scientifically evaluated as per standards and protocols, scaled up and benefit the entire country and world at large through their inherent merit. Enhancing citizen welfare, social wealth, improving people's lifestyles and facilitating sustainable alternatives for development were successfully accomplished.

NIF has pooled a database of over 3,45,000 technological ideas, innovations and traditional knowl-

edge practices (not all unique, not all distinct) from over 625 districts of the country. NIF has till date recognised 1145 grassroots innovators and school students at the national level in its various National Biennial Grassroots Innovation Award Functions (latest edition in 2023) and annual Dr A P J Abdul Kalam Ignite Children Award functions (last observed in 2019). Aligned with Start-up India movement, NIF and DST together started implementing the annual INSPIRE MANAK competition wherein close to 5 million ideas and innovations have already been scouted since the year 2016.

Until the year 2023, NIF and DST under the aegis of Rashtrapati Bhawan organized the annual Festival of Innovation and Entrepreneurship (FINE), erstwhile known as FOIN (Festival of Innovations) which was more than a hope for

all innovators and warmly reciprocating it, the initiative consistently provided an excellent platform to innovators for exhibiting the merit of their innovative technologies and respected, rewarded and recognized the creativity of the common people of the country. Other initiatives like the Innovation Scholar In-Residence Program further cemented this hope for innovators of the country.

In the year 2017, NIF has invited Director General, World Intellectual Property Organization (WIPO) Dr Francis Gurry to FINE at Rashtrapati Bhawan and it was a welcome visit in terms of his team's exposure to India's

'NIF has pooled a database of over 3,45,000 technological ideas, innovations and traditional knowledge practices from over 625 districts of the country.'

unique frugal, demand driven, social and grassroots innovations and innovators behind them. Such interactions are one of its kind and lead to improved perceptions and groundbreaking developments which benefit the country and its people.

NIF has established community workshops in different rural areas of the country at the premises of seasoned innovators so that other

grassroots innovators of the region can have access to fabrication facilities and also learn from the

‘NIF has established community workshops in different rural areas of the country at the premises of seasoned innovators so that other grassroots innovators of the region can have access to fabrication facilities and also learn from the experiences of such innovators.’

experiences of such innovators. 71 such workshops have been established in 24 states of the country. NIF has filed a total of 1416 patents, including 8 filed in the USA and 28 Patent Cooperation Treaty (PCT) applications, on behalf of the innovators and outstanding traditional knowledge holders. A total of 24 Design registrations and 11 trademark applications have also been filed. Applications for 95 plant varieties developed by farmers at the Protection of Plant Varieties & Farmers’ Rights Authority (PPV&FRA) have been filed. The Micro Venture Innovation Fund (MVIF) which was announced in the Union budget speech of finan-

cial year 2002-03 by then Finance Minister of the country, so as to facilitate the transition of innovations into enterprises jointly by NIF and SIDBI, has provided risk capital to 238 innovation based enterprise projects. NIF has succeeded in commercialising several products across countries in six continents, apart from being successful in materialising more than 130 cases of technology licensing.

NIF has also developed an innovation portal (www.innovation.nif.org.in) which was launched on 14th January 2021 by Dr Harsh Vardhan, then Hon’ble Union Minister of Science and Technology. Today, the portal is home to about 1.39 lakh grassroots innovations and traditional knowledge practices, scouted from common people of the country, covering

engineering, agriculture, veterinary and human health. In terms of domain areas, presently the innovations cover energy, mechanical, automobile, electrical, electronics, household, chemical, civil, textiles, farm/ cultivation practice, storage practice, plant variety, plant protection, poultry, livestock management, nutraceuticals etc.

NIF has also operationalized Grassroots Technological Innovations Acquisition Fund (GTIAF) wherein it acquired rights of useful grassroots technologies from innovators after paying an upfront fee and disseminated/diffused it at low cost or no cost to other innovators, fabricators, farmers or entrepreneurs across the country for societal good.



Respecting, Rewarding and recognizing creative spirit - Second National Grassroots Technological Innovation and Outstanding Traditional Knowledge award of NIF (2002)



NIF Incubation and Entrepreneurship Council (NIFentreC), a Technology Business Incubator (TBI) hosted by NIF which contributes towards strengthening of commercialization aspects of innovations

When we take a step back and review the journey of two and a half decades, we realise that NIF was perhaps the only Institution in the country at the time of its inception which provided a truly an end to end service to its supported innovators. This is evident in diversity of metrics that NIF represents, as stated above and also in other contemporary indicators, be it the count of start-ups nurtured or the count of patents it managed to get granted or count of innovators recognized or count of those which were successfully value added in terms of Science and Technology. Conventionally, these metrics used to be one dimensional for specialized institutes which provided only one and not all of these services simultaneously. However, NIF managed to challenge the conventional approaches and gradually, this uniqueness of NIF to serve end to end was adopted by few Institu-

tions in the country over a period of time which contributed towards coining of popular phrases like “single window” or “one-stop solution” or “Ease of Doing Business”. Grassroots Innovators by virtue of support from NIF had the privilege of being incubated in an era when the term “Technology Business Incubator (TBI)” was yet to be coined. Three top Research Councils of the country, CSIR, ICAR and ICMR and many others have consistently partnered with NIF to help it deliver superior public service.

In many ways, NIF was ahead of its times and it addressed needs of those whose need was by far unattended and those who couldn't find their way on their own. Cinema is a cultural force which mirrors society and often become a vehicle for social change. The adaptation of Grassroots Innovators Life for celluloid in India bears

testimony to a fact that audience was waiting to be inspired. Films like Padman (Hindi) and Mallesh-am (Telugu) were biographies of Shri Arunachalam Muruganatham & Shri C H Mallesham respectively - Grassroots innovators supported by NIF. Another film, 3 idiots inspired our generation to think differently also deployed a couple of grassroots innovations in the film namely Scooter Mill by Sheikh Jahangir Sheikh Usman & Sheep shearer by Mohammad Idris Chidda thereby enhancing the effectiveness of message. Films like Ship of Theseus had reference to a NIF supported grassroots innovator too.

NIF's approach has always been to discover the inclusive dimensions of innovations at hand which is an important step towards inclusive growth of the country. The impact on weaker sections have been two fold - Not only did the innovations originating from the weaker sections of society made conclusive by virtue of activities of NIF, but also weaker sections in general had a greater access to innovative technologies which would bring convenience to their lives. So as to measure the true benefit of NIF to the people, two dimensions are to be looked into – (a) The success of NIF per se (b) The success of innovators supported by it. This is because, with a humble beginning in the year 2000, NIF has travelled a journey of twenty five years in the service of innovators of the country, and their success is as important and a contributor to true assessment of NIF's success.

Following are amongst key impacts of NIF delivered in a small but meaningful journey so far -

- Discovering affordable technologies by way of bringing forward several rural innovations / practices to market acceptable levels which were otherwise never attended institutionally
- Knowledge of common people was leveraged to arrive at innovative solutions for the larger benefit of the society
- Overcame barriers by sharing knowledge in local languages so that the knowledge of one community could be transferred to other communities
- Enhanced confidence of grassroots innovators by investing in their abilities
- Diffused open source technologies to generate social impact
- Created the spirit of entrepreneurship and a new model of knowledge based employment generation among rural communities
- Evolving role models in the form of innovators and stakeholders who can inspire others to experiment and solve local problems through their own efforts even if they are formally not trained or educated enough
- Successful innovation enhanced aspirational value among the citizens
- Nobody in the world had expected Intellectual property to be used in defense of poor. Today every major debate in the world on the subject refers to the contribution of the NIF (though we reiterate that Intellectual property constitute a very small part of the total efforts in building value chain)
- Spread of the grassroots innovation movement is also increasing impatience with inertia and challenging inefficiency in all walks of the life, and rightly so
- Generating new heuristics for learning helps in making society more creative and innovative
- Making children innovate and solve problems in creative way builds capacity among the future leaders of our society

As a result of above, today a number of countries learn and replicate the NIF incubation model in their own countries, which is a success indicator that can't be quantified but significantly important for reputation of our country at global levels.

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In-situ incubation – a unique way of Augmenting grassroots innovators

Shri Mahesh Patel

It is a historic moment for me to be a part of the Silver Jubilee celebration of NIF's foundation day. I have the privilege of witnessing the institution's development from its inception to its current stature. Looking back at my involvement in various activities and steps that led to the development of NIF, today is a proud moment to write this article in the organisation's first official newsletter.

At every stage of its evolution, right from the corpus fund support from DST (till 2010) and later change from corpus to regular funding from DST, the priority remained clear: to foster grassroots innovation and provide individuals and communities with the support needed to transform their ideas into tangible solutions. Over the years, NIF-India has not only recognized the potential of innovators but has also played a critical role in nurturing their contributions to address pressing societal challenges.

The establishment of NIF-India under the aegis of the Department of Science and Technology was a pivotal initiative by the Government of India, marking a significant milestone in mainstreaming and institutionalising the support to the grassroots innovators (GRI). At the time of its inception, terms like innovation and incubation

were relatively unfamiliar, especially in the context of the informal sector. The formation of NIF-India created a vital platform for individuals who struggled to find a place within formal structures, demonstrating the sector's potential and proving that it deserved recognition.

and private. These incubators provide innovators with space for a predefined period, offering continuous mentorship and facilitating financial and venture support to help commercialize their innovations.

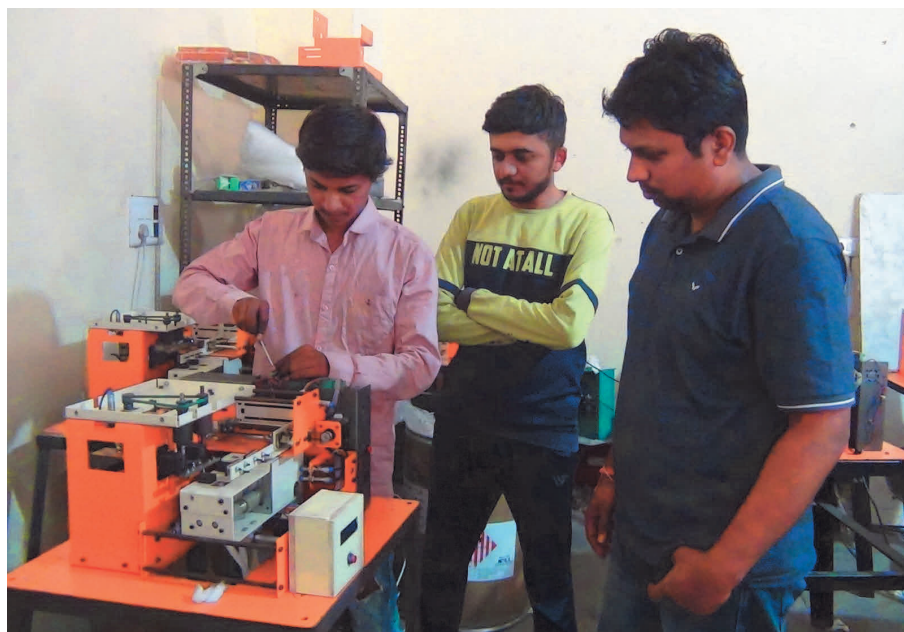
Over the past 25 years, NIF-India has introduced and successfully



Innovator explaining technology to experts at site

Soon after, incubation activities gained traction within the mainstream, attracting the attention of innovators, technocrats, and funding agencies from both the public and private sectors. Numerous incubators have since been established in academic institutions, both public

implemented numerous pioneering concepts in the entire value chain of incubating grassroots innovations. The uniqueness of NIF-India's approach lies in providing in-situ support to many innovators simultaneously. Some of these are a) visiting innovators to



NIF Engineer at Inovator's Site

extend services at their doorstep
b) arranging experts visit at the site for an exchange of ideas, c) extending direct financial support for value addition by innovators d) arranging innovators' visits for prototype development or pilot scale production at fabrication lab at NIF-India e) establishment of community workshops at innovator's place, f) arranging exposure visit of innovator at public and private R&D Labs g) arranging interaction of top experts and policymakers under one roof in Innovation Scholar's In-residence programme h) continuous engagement with a diverse range of stakeholders, including innovators, fabricators, entrepreneurs, and end-users of innovations h) regional offices of NIF-India across different parts of the country - Jammu and

Kashmir, Noida, Bhubaneswar and Guwahati has enabled the team to visit innovators and Traditional Knowledge holders at their doorstep to understand the context of innovations.

This in-situ approach helps understand the context of each innovation which in turn, results in valuable insights, significantly reducing the incubation period and enabling the transformation of innovations into viable enterprises and the diffusion of technologies among the end users. The in-situ incubation support that is extended by NIF-India is beyond mere funding. Combining intellectual expertise, recognition, business development and technology diffusion support has enabled innovators to accelerate the innovation lifecycle and transform local solutions into

successful enterprises.

More than two decades of NIF-India's efforts proved to be useful. A lot of progress has been made in grassroots innovations. Handholding and mentoring innovators will further strengthen the innovation ecosystem of our country. NIF-India is all set to fulfil the expectations of innovators. Now we must look into and address some of the following questions while defining the strategy of NIF-India for at least the next 25 years:

- How can NIF-India's services reach the farthest corner of the country?
- To be a first choice of innovators, how can NIF-India develop new ethics and values so as to attract and keep pace with other institutions already existing in the ecosystem offering these services to innovators?
- Given the pace of change in technology, can NIF-India still satisfy the innovator's expectations within the institutional framework and use the latest technology?
- How can we collaborate and harness the support from other institutes working in the area of emerging technologies for blending formal science with innovations from informal sector?
- How NIF-India can contribute in achieving Sustainable Development Goals for India?
- Does NIF-India need drastic/major changes in the process to fulfil its mandate?

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Scouting and Documentation: In Search of Unsung Heroes

Dr. Vivek Kumar

The combination of Socio-economic, cultural, and environmental factors in different niches propel individuals to evolve localized solutions/practices/innovations to their problems and needs. Science underlying many of these practices remains to be properly understood. In some cases, even without such articulation of scientific basis, the functional efficiency of some of the innovative practices has considerable potential for solving local problems in the regional and global markets. Their limitation in terms of higher local fit becomes their strength in providing effective solutions to variable needs.

Scouting is the first step towards the fulfilment of the mission of the National Innovation Foundation-India (NIF), i.e. to help various local communities and societies to build upon the genius of knowledge rich-economically poor people. Scouting is done to discover and recognize grassroots innovations and traditional knowledge in communities which may have been alienated in some cases from the mainstream. NIF has established itself as a pioneer in recognizing these grassroots innovators through methodical scouting and documentation processes.

It is true, however, that while the proportion of local innovations may be higher in economically disadvantaged regions, such innovations do occur even in the developed regions. The nature of problems is different and so also the focus of innovations. But what is worthy of underlining is that even in most developed regions, urban fringe areas, slums, and other places, viable and functional innovations / traditional knowledge can always be found. There are always problems, which remain unsolved by modern technologies and institutions in an affordable manner even in urban

‘Scouting involves extensive fieldwork to search for experimenters and knowledge experts in local communities.’

areas. Local knowledge systems help in seeking solutions to such problems in a spontaneous manner individually or collectively.



Interaction with herbal healer in village meeting at Bijapur district, Chhattisgarh

Thousands of examples from India and elsewhere have shown that the people at the grassroots, farmers, artisans, mechanics and the like have been relying on their own ingenuity to solve their local problems. In the absence of an external aid, the only option left with them is to come up with their own solutions, which, in many cases, may be able to solve similar problems elsewhere.

Scouting involves extensive fieldwork to search for experimenters and knowledge experts in local communities. The process of scouting and documenting such innovators and their technical works is a crucial step toward recognizing, preserving, and disseminating their contributions for the greater good. NIF implements a multi-faceted approach for scouting. Through its biennial national campaigns, NIF reaches out to every corner of the country, inviting innovators to share their technological creativity. Field

understanding not just their innovations but the context in which they emerged.

NIF has also established a network of research/ academic institutions, and nongovernmental organizations (ngo) across the country, who also believes that

innovators to wider audiences.

Young minds play a crucial role in this scouting process. Through student internships and survey programs, NIF engages college students in scouting innovations in their own villages. This not only helps uncover hidden talents but



Sensitisation program at mulgi parisar, Nandubar district, Maharashtra for village youth for scouting and documentation of Grassroots innovations

**‘The innovative
“Shodh Camps”
serve as vibrant
platforms where
community
knowledge and
modern science
intersect.’**

researchers and scouts, deeply embedded in local communities, serve as the institution’s eyes and ears on the ground. They build trust with local innovators,

the innovations at the grassroots play a very important role and are helping NIF in identifying the grassroots innovations from their areas.

The innovative “Shodh Camps” serve as vibrant platforms where community knowledge and modern science intersect. These camps create spaces where traditional wisdom is recognized, documented, and celebrated. Media partnerships amplify these efforts, with journalists helping to tell the stories of these remarkable

also creates a new generation of scouts who appreciate the value of grassroots creativity.

NIF in association with state governments has initiated a regional campaign for identifying the grassroots innovations from their state so that the due credit can be given to the grassroots innovators. Awarding the innovators is not only the goal of these competition, in deserving cases state govt. and NIF will take forward them for value addition and patent filing so that the



Workshop of herbal Healer at Bhamti village, Udaipur

‘NIF in association with state governments has initiated a regional campaign for identifying the grassroots innovations from their state so that the due credit can be given to the grassroots innovators.’

technology can reach the masses. Farm fairs, cultural festivals, and exhibitions serve as natural meeting points where innovations are shared and documented. These traditional gathering spaces become platforms for knowledge exchange, where farmers and artisans can showcase their innovations and learn from others. What makes NIF’s approach particularly noteworthy is its emphasis on ethical documentation. The institution places great importance on obtaining Prior Informed Consent (PIC) from knowledge providers, ensuring that innovators maintain control over how their knowledge

is used and shared. This respect for innovators’ rights has helped build trust and create sustainable partnerships between formal institutions and grassroots innovators.

The documentation process follows a careful three-tier system. It begins with preliminary documentation capturing basic information, moves to detailed verification through field visits, and culminates in tertiary documentation that tracks how innovations evolve over time. This systematic approach ensures that valuable knowledge is preserved accurately for future generations. Perhaps most importantly, NIF’s

efforts help preserve rapidly eroding traditional knowledge about optimal use of bio-resources and contemporary technological innovations. In an era of rapid modernization, this work ensures that valuable indigenous knowledge isn’t lost to time.

Through these comprehensive scouting and documentation efforts, NIF has helped create a movement that recognizes and celebrates India’s grassroots innovators. These unsung heroes, working with limited resources but unlimited creativity, represent the true spirit of innovation that springs from necessity and is nurtured by ingenuity.

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Information and Communication Technology: Transforming Innovation

Dr. Rintu Nath

In the rapidly evolving world of science and technology, Information and Communication Technology (ICT) has emerged as a crucial enabler of progress, driving innovation and development across sectors. For National Innovation Foundation - India (NIF), ICT plays a transformative role in identifying, documenting, supporting, and scaling grassroots innovations across the country. With its vision to strengthen India's innovation ecosystem, NIF leverages ICT to bridge gaps, connect innovators, and promote sustainable development. ICT encompasses various digital tools, communication networks, and computing technologies that facilitate information storage, retrieval, transmission, and processing. The key aspects of ICT

that are crucial for NIF include: **Digital Documentation and Knowledge Management:** ICT enables the systematic collection and preservation of grassroots innovations, creating accessible databases and digital archives.

Communication and Networking: With ICT-driven communication tools, innovators, researchers, and policymakers can collaborate efficiently across geographical barriers.

Data Analytics: Advanced data processing tools help in analyzing innovation trends, identifying potential opportunities, and predicting future needs.

Cloud Computing and Storage: ICT supports seamless data sharing and accessibility, ensuring

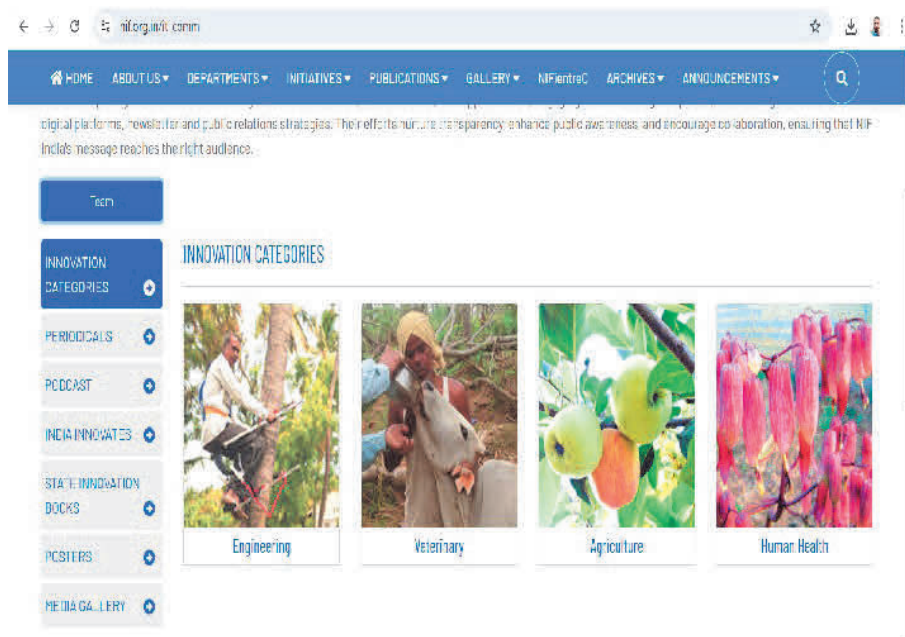
that knowledge reaches relevant stakeholders.

Social Media and Digital Outreach: Digital platforms help in amplifying the impact of grassroots innovations, connecting them with investors, businesses, and consumers.

Since its establishment, NIF has been at the forefront of leveraging ICT to identify and promote innovations. Several key areas highlight how ICT has been integrated into NIF's operational framework. Grassroots Innovation Database is created with thousands of innovative ideas. The digital platform is accessible to researchers, policymakers, and entrepreneurs. NIF has launched web portals where grassroots innovators can submit their ideas for evaluation. This eliminates geographical constraints, allowing widespread participation from remote villages to urban centers. With the help of ICT, NIF assists grassroots innovators in obtaining patents for their ideas. Patent management systems streamline the process, ensuring timely protection of intellectual property rights. NIF organizes online workshops, webinars, and e-learning programs to train grassroots innovators on entrepreneurship, business development, and technical



The road ahead



integration of Information and Communication Technology (ICT) has significantly enhanced its impact. By leveraging ICT for digital documentation, outreach, market linkages, and policy support, NIF – India continues to create an inclusive and dynamic innovation ecosystem. Looking ahead, emerging technologies like AI, IoT, and Big Data will further strengthen NIF-India's role in driving innovation-led development. Green computing and sustainable ICT initiatives will ensure that digital transformation

advancements. ICT enables interactive learning modules that reach a broader audience. Through social media campaigns, video documentaries, and podcasts, NIF brings grassroots innovation stories to a global audience. This digital outreach enhances visibility and encourages collaborative partnerships.

As technology continues to evolve, the integration of ICT at NIF-India presents exciting possibilities for the future. Artificial Intelligence based ICT tools can help analyze innovation trends, risk analysis, cost estimation, and assess the potential impact of various grassroots technologies. AI algorithms can also be used to match grassroots innovations with investors, researchers, and industry partners based on relevance and potential impact. By leveraging big data analytics, policymakers can identify innovation trends, measure impact, and formulate data-driven

policies that support grassroots innovators effectively. Internet of Things (IoT) - enabled devices can help in monitoring and enhancing innovations in fields like agriculture, water conservation, and renewable energy. Improved digital connectivity will enable real-time collaboration, remote mentoring, and faster access to knowledge resources. Augmented Reality/ Virtual Reality (AR/VR) technology can be used to create immersive prototyping experiences, allowing innovators to visualize and test their ideas before implementation. NIF-India is already using 3D printing technology for prototype making. Cost-effective scaling-up with 3D printer will be possible with advancement of technology.

Conclusion

The National Innovation Foundation - India has been instrumental in nurturing grassroots innovations, and the

'Internet of Things (IoT) - enabled devices can help in monitoring and enhancing innovations in fields like agriculture, water conservation, and renewable energy.'

at NIF aligns with environmental sustainability goals.

As we move into a future driven by digital transformation, the synergy between ICT and grassroots innovation will be key to unlocking India's vast creative potential, fostering sustainability, and empowering communities across the nation. The journey has just begun, and with continuous advancements, NIF-India is set to redefine the landscape of innovation in India.

Integrating knowledge systems: Sustaining societal knowledge & Knowledge holders

Dr. R K Ravikumar

Several policy interventions have been introduced to protect natural resources, occupational diversification and to reduce income disparity. Technological intervention need to be sustainable and to strengthen income generating livelihood opportunities in rural areas of India. Evolving technological framework by reinforcing inherent

‘Medicinal ingredients comprising neem (*Azadirachta indica* A Juss or limbada) and monks pepper (*Vitex negundo* L. or nagod) were found effective in control of tick infestation avoiding chemical acaricide.’

capabilities of society is essential. Development perspective in search for non-agriculture activities are visible hence there is need to demonstrate evidences

aimed at overcoming such constraints including providing cost effective health care. National Innovation Foundation-India have been pivoting technological intervention(s) to supplement dairy farmer’s efforts for farm animal productivity, welfare as well as public health. These activities are nurtured by strengthening inherent societal wisdom (indigenous knowledge system). Observations reflected

that technological advancement through their local resources created condition to minimize seeking support from external resources. This offers new development opportunity which had strengthened the link with custodian of indigenous knowledge holders and society.

Understanding knowledge link is essential in changing economic reality and quality living standard.



Fig Method of application on external parasite-infected animal, Pune district, Maharashtra [Source; <https://pib.gov.in/PressReleasePage.aspx?PRID=1810576>]

These functional knowledge system can reduce farming distress and acknowledging outstanding knowledge holders, societal wisdom is desirable. A special emphasis is shared in undertaking in-situ value addition in galvanising technologies from pooling of common practices. Medicinal ingredients comprising

‘In public health perspective, early preventive measures and therapeutic interventions are necessary to minimize health issues and associated multi-organ complications.’

neem (*Azadirachta indica* A Juss or *limbada*) and monks pepper (*Vitex negundo* L. or *nagod*) were found effective in control of tick infestation avoiding chemical acaricide. This had led to reinforcement of technical know-how among farmers, based their own knowledge and experimental spirit. The institutional support helped to incubate outstanding traditional healer's practices scientifically, enhanced maturity of technology so as to develop

unique innovative products. These efforts led to development of products based on indigenous knowledge system sustained by community/individuals [<https://pib.gov.in/PressReleasePage.aspx?PRID=1765163>].

In public health perspective, early preventive measures and therapeutic interventions are necessary to minimize health issues and associated multi-organ complications. Value added indigenous herbal technologies can address specific ailment as well as post therapeutic improvement of general health among patients. Scientific validation of outstanding knowledge holder's claims had confirmed functional efficacy in addressing ailments affecting human health. For example, clinical assessment of a blood pressure formulation demonstrated regulation of blood pressure within an acceptable range and serves to protect vital organs, promote general well-being of patients. Assessment of technical knowhow through standardized research protocol help to strengthen the link between formal and societal knowledge system for addressing health care.

The innovation capabilities which are endogenous nature need to be protected in development of new technologies and to nurture local entrepreneurship

activities. This calls for protection of their unique knowledge system through national intellectual Property rights

‘NIF-India postulates ways in recognizing, respecting inherent knowledge system for enhancing utilization of local resources for sustainable public health care.’

system. NIF facilitates this patent protection that are associated with technological adoption and industry interface [<https://pib.gov.in/PressReleasePage.aspx?PRID=2068785>].

The respectful dialogue between knowledge holders/societal wisdom and ability to utilize the knowledge is pre-requisite to address current challenges. NIF-India postulates ways in recognizing, respecting inherent knowledge system for enhancing utilization of local resources for sustainable public health care. These scientific validation helps in pharmaceutical development, protect custodian knowledge through intellectual property rights and technological maturity towards commercial or social spheres.

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Empowering Communities: NIF's efforts towards the diffusion of grassroots Innovations

Dr. Nitin Maurya

The dissemination and social diffusion-related activities at the National Innovation Foundation - India (NIF) serve as the crucial link between grassroots innovators and the wider community, facilitating the flow of invaluable knowledge and grassroots technologies. The focus is on making these resources accessible through a variety of channels. This work encompasses the broad dissemination of useful information available with the NIF and the targeted social diffusion of specific innovations to improve livelihoods and promote sustainable development. It strives to ensure that the ingenuity of grassroots innovators translates into tangible benefits for society.

NIF realizes that to reach people across the vast geography of the country, crossing occupational, linguistic and cultural barriers, its dissemination and diffusion strategies have to be multi-pronged. NIF's dissemination strategy is multifaceted, aiming to broadly share information about the organization, its initiatives, and the wealth of grassroots innovations it champions. This includes disseminating verified knowledge on herbal practices for agriculture, veterinary care, and nutraceuticals. To achieve this, NIF employs a diverse range of media. Print media is utilized through publications like annual reports, award books, and informational/

technical brochures. At the same time, electronic media plays a vital role via websites[i], online databases[ii], social media platforms[iii], and partnerships with online portals and national/international news outlets[iv]. Personal interaction is fostered through presentations, workshops, field visits, and Shodh Camps. Furthermore, NIF leverages strategic partnerships to amplify its reach. Notable collaborations in the past have included working with the Indian Postal Department to display informational posters in Gujarat villages, partnering with IFFCO Kisan Sanchar Limited to deliver voice-based agricultural



Dissemination of low chilling apple variety at Kakching, Bishnupur, Senapati, Churachandpur, Imphal East and Tengnoupal districts of Manipur

information in regional languages, and collaborating with Gujarat Livelihood Promotion Company to diffuse open-source technologies. Other partnerships involve disseminating information through SMS services with Reuters Market Light (Thomson Reuters), showcasing innovator stories on Doordarshan/Kisan Channel, collaborating with Vigyan Prasar and All India Radio for broadcast series on grassroots innovations and the India Science Portal, and displaying innovation videos on Gujarat State Road Transport Corporation buses.

To enhance its dissemination efforts, NIF has been focussing on several strategic initiatives. Firstly, it prioritizes the creation and verification of standardized content, ensuring easy access to diverse dissemination tools. NIF has been trying to utilize social media platforms for broader information sharing and interactive engagement. NIF recognizes the importance of local languages and actively develops content in regional languages to enhance community outreach. Social diffusion focuses on the physical spread of innovations (machinery, herbal products, improved plant varieties) in relevant areas among identified beneficiaries. The innovations targeted for social diffusion may not have widespread commercial potential, but they enhance social wealth, improve livelihoods, and offer sustainable alternatives for development; or, even if commercially viable, they may require initial introduction through non-commercial channels. The social diffusion

process involves careful planning, including resource mapping, beneficiary identification, training, financial management, and monitoring. NIF may also need to facilitate the acquisition of necessary licenses and certifications for beneficiaries. NIF's strategy for social diffusion centres on empowering local communities and ensuring the sustainable adoption of grassroots innovations. To achieve this, NIF plans to leverage its network of community workshops, providing platforms for visibility, local

manufacturing, and incremental innovation. NIF also promotes co-creation, offering core innovative components and empowering users to adapt and build products based on local resources. Emphasis is placed on designing easily serviceable products, utilizing readily available materials, and standardizing training modules for operation, maintenance, and product development. To further facilitate adoption, NIF has developed several DIY manuals of grassroots innovations with detailed technical instructions for



Demonstration trials of farmers rice varieties (DRK and Kudrat-5) in Durg, Dhamtari and Raigarh districts of Chhattisgarh

local fabricators and manufacturers. Recognizing the crucial role of collaboration, NIF actively engages with various partners, including Panchayati Raj institutions, government departments, State Science and Technology councils, and research institutions, to ensure effective diffusion and widespread impact. To illustrate the scope of NIF's social diffusion efforts, dozens of grassroots innovations have been deployed across the country.

These include the natural water cooler, manure-making machine, maize shellers, coconut tree climber, multi-tree climber, hand-operated pump, paddy husk stove, multipurpose tool, head load reducing device, mileage enhancer, bicycle hoe cum spade, fruit nipper, cow dung pot making machine, cow dung log making machine, seed cum fertilizer dibbler, egg incubator, and multi-purpose drier, have been diffused across diverse states and Union

Dissemination and Social Diffusion

Territories. This extensive reach includes Jammu and Kashmir, Chhattisgarh, Odisha, Meghalaya, Assam, Nagaland, Tripura, Manipur, Uttar Pradesh, Andhra Pradesh, Telangana, Bihar, Jharkhand, Uttarakhand, Sikkim, Arunachal Pradesh, and Mizoram. To ensure adaptability, many

‘NIF aims to effectively disseminate and socially diffuse grassroots innovations’



Training to women belonging to SHGs by NIF for producing sanitary napkins

innovations are fabricated locally, allowing for improvisation to suit specific regional needs. Notably, innovations like the sanitary napkin-making machine, multi-purpose processing machine, sal leaf-making machine, banana-based product development, cow dung product-making machines, incense stick making machine, and incense stick rolling machine, which provide vital livelihood opportunities, were diffused across Uttar Pradesh, Bihar, Jharkhand, Chhattisgarh, Odisha, Rajasthan, Sikkim, West Bengal, Assam, Nagaland, Manipur, and Meghalaya. These innovations have resulted in improved livelihoods and sustainable practices in these regions.

The success of NIF's dissemination and diffusion strategies is

gauged through several key parameters, including heightened public awareness of NIF and its initiatives, increased participation in its competitions and schemes, and the widespread adoption and adaptation of grassroots innovations by individuals and communities. Ultimately, the impact is measured by enhanced livelihoods, increased social wealth, and strengthened collaborative partnerships. However, NIF confronts various challenges in achieving these goals. These challenges include ensuring the availability of verified, updated, and easily retrievable content in both English and local languages, effectively tracking the number of innovations, diffusion sites, and beneficiaries, and developing backwards-forward

linkages for livelihood related innovations. NIF also focuses on improving training experience on innovations, after-sales support by innovators directly or through a local intermediary, ensure accountability both on account of innovator and beneficiary, and create better videos to explain the value of grassroots innovations.

By continuously refining its strategies and addressing the challenges, NIF aims to effectively disseminate and socially diffuse grassroots innovations to create a positive impact on the lives of people and contribute to sustainable development.

[i] www.nif.org.in

[ii] www.innovation.nif.org.in

[iii] Facebook, Twitter, Instagram, YouTube, LinkedIn

[iv] NDTV, Discovery, ZeeQ, BBC, among many others.

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Drudgery reduction through Agricultural Mechanisation and Innovation

Er. Rakesh Maheshwari

Drudgery in agriculture, rural livelihoods, and traditional occupations involves laborious, repetitive, and physically demanding tasks. These tasks often lead to fatigue, health issues, and reduced productivity, particularly affecting marginalized groups such as small and marginal farmers, rural women, and artisans. The persistent drudgery hampers their efficiency and overall quality of life, necessitating strategies for effective intervention.

In India high power, low control operations such as tillage, transport, water pumping, milling, and threshing were mechanized first. Medium power and control needs such as seeding, spraying, and intercultural operations were the next to see mechanisation while the high control, low power tasks, such as transplanting, vegetable planting, and harvesting of fruits and vegetables were mechanized last.

However, the current agricultural landscape is experiencing a labour shortage due to several factors including Shift to the service sector for better working conditions, impact of MGREGA (Mahatma Gandhi National Rural Employment Guarantee Act) which provides 35-40% of annual employment, Increasing urbanization and the search for better opportu-

nities and Rise of rural entrepreneurs

These changes have led farmers to recognize the need for mechanisation with minimal human intervention to maintain productivity. Proposed strategies for enhanced mechanisation

1. Participatory research approach: Research and development (R&D) institutes and farm machinery industries often treat farmers merely as feedback providers. Instead, involving farmers from the start of technology development can improve acceptance, reduce research costs, and increase success rates. Farmers can contribute valuable insights to make technologies more practical and cost-effective.

2. Strengthening extension activities: It is crucial to guide farmers in local languages about the benefits and impacts of mechanisation. Extension services should help them in selecting appropriate machinery based on land size, crop type, and usage mode (individual or custom hiring). Large-scale demonstrations, interviews with early adopters, and practical insights can also boost adoption rates.

3. End-to-end mechanisation solutions: Farmers need access to a complete package of practices for specific crops, covering all stages of the value chain. For example, sugarcane growers could benefit from tools for tillage,



Sugarcane bud chipper

seed preparation, planting, crop care, irrigation, harvesting, residue management, and processing equipment.

4. Diverse research and development: The design and development of machinery should accommodate different soil types, farm sizes, and crop varieties. With over 67% of Indian farmers owning less than 1 hectare of land, it is vital to address their needs. When small machinery development is not feasible, cooperative farming and custom hiring models should be promoted.

5. Supporting local artisans and informal sector innovators: The demand for agricultural machinery cannot be met by the formal sector alone. Local artisans /grass-roots innovators and small-scale industries play a significant role in manufacturing and marketing efficient tools, particularly in remote areas. These innovators need training, certification support, access to affordable components, and opportunities to develop small tools/manual machines for specific tasks.

6. Precision agriculture (PA): PA involves the precise application of inputs like water, fertilizers, and pesticides to maximize crop yields. The approach needs to be adapted for small Indian farms, focusing on the optimal use of resources, minimal chemical inputs, and the adoption of smart technologies like drones and robots.

7. Development of smart agricultural machinery: Prototypes of smart machinery have been devel-



Silk worm net folding device

oped in laboratories but have yet to be widely adopted in farming. Smart machines can address challenges such as maintaining seed depth, ensuring proper spacing, and providing quality feedback during processing, identifying affected plants to reduce pesticide use, managing farm machinery logs, and enabling affordable soil micronutrient analysis.

8. Embedded Electronic Systems: There is a need to create robust, embedded electronic systems tailored to Indian agricultural environments. These systems can support precision farming by helping farmers make informed decisions and automatically regulate performance parameters.

The National Innovation Foundation India (NIF) focuses on creating affordable, user-friendly technologies that alleviate drudgery and enhance rural livelihoods.

Through its innovative approach to agricultural mechanisation, NIF plays a vital role in reshaping the agricultural sector. By facilitating the development and dissemination of efficient farm machinery, in-situ processing technologies and environmentally friendly technologies NIF empowers farmers to improve their yield and profitability. Through initiatives like training, capacity building, and connecting innovators with markets and policymakers, NIF ensures that innovative solutions reach small and marginal farmers. This approach not only enhances agricultural productivity but also reduces input costs, improves resource management, and promotes rural entrepreneurship—contributing significantly to the goal of doubling farmers' income in a sustainable and inclusive manner.

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Farmers Agro-Innovations and Sustainability

Dr. Satya Singh and Shri Hardev Choudhary

The world is grappling with challenges such as rapid population growth, food security concerns, biodiversity loss, and the escalating impact of climate change. These issues jeopardize livelihoods on a global scale, emphasizing the need for sustainable agricultural solutions. One of the most effective ways to address these concerns is through grassroots innovation, where local communities devise creative solutions tailored to their specific challenges and environments by offering cost-effective and sustainable solutions. However, expanding these innovations to a broader audience requires significant collaboration between government bodies, research institutions, industries, non-governmental organizations and social players.

Value Addition Research and Development – Agriculture (VARD-Agriculture) department has been instrumental in

supporting, incubating and promoting agricultural innovations from all across the country. Farmers' unique crop varieties, novel farming techniques, pest and postharvest management technologies have significantly contributed to food security, climate resilience, and resource sustainability. More than 5,000 agricultural innovations have been identified and several hundred supported for their scientific assessments, including biochemical profiling and molecular characterization, laboratory and field evaluations. These farmers' technologies include diverse crop varieties with medicinal benefits, climate-resilient strains, and farming methods along with pest and disease control formulations, postharvest management technologies that enhance productivity, resilience and sustainability. The scientific evaluations

and claim characterizations have demonstrated that many farmer-developed varieties and technologies are at par or even outperform conventional crops in both yield and quality.

A significant proportion of grassroots farmers' innovations are vegetables and cereal crops, constituting around 60% of supported varieties. Other key crop group include spices, fruits, medicinal plants, and cash crops. However, there remains a need to integrate fiber crops, tree plantations, medicinal and aromatic crop varieties into the innovation pipeline to ensure their conservation and sustainable use. Safeguarding the intellectual property rights of grassroots innovators is crucial in ensuring they receive due credit, financial benefits, and market opportunities. Through the Protection of Plant Varieties and Farmers' Rights (PPV&FR) Act 2001, 95 varieties applications



Agriculture innovation

were supported for registration, of which 52 farmers' varieties were granted registration. This not only acknowledges the contributions of these innovators but also motivates them to continue developing sustainable agricultural solutions. Traditional knowledge plays an essential role in sustainable agriculture, particularly in the development of botanical formulations for crop protection and soil health improvement. Herbal-based pest management solutions, natural soil enhancers, and eco-friendly post-harvest treatments are gaining traction as viable alternatives to synthetic agrochemicals. By supporting validation of traditional wisdom of farmers and grassroots innovators with scientific methodologies, plant-based solutions that enhance soil health, increase crop yields, and reduce reliance on chemical fertilizers and pesticides have been created. The recognition of herbal agricultural innovations continues to grow, with 26 patents granted by the Indian Patent office for formulations addressing pest control, disease management, growth enhancement, and post-harvest preservation. These developments not only contribute to food security but also promote environmental sustainability by reducing chemical residues in soil and water.

Despite their potential, grassroots innovations often face significant barriers to commercialization. To address these issues, business



development support by mentoring innovators in business planning, marketing strategies, and distribution networks is provided. Through financial assistance and strategic partnerships, farmers are connected with experts, investors, engineers, designers, and entrepreneurs who help bring their innovations to the mainstream market. Many grassroots innovators and farmers have successfully established micro-enterprises, driving regional economic growth and sustainable agricultural transformation.

Beyond financial and commercialization support, national and international platforms, exhibitions, and competitions play a crucial role in promoting grassroots innovations. These events offer exposure and recognition, allowing innovators to scale their solutions while attracting potential collaborators

and investors. Several grassroots innovators have been honored with prestigious National awards, including the Padma Shri, for their significant contributions to Indian agriculture and rural development.

Agro-innovations driven by grassroots efforts hold immense potential to transform Indian agriculture and rural economies. By integrating traditional knowledge with scientific advancements, empowering local innovators, and ensuring market access, we can create a sustainable agricultural ecosystem that benefits farmers, consumers, and the environment alike. As we move forward, it is imperative to strengthen institutional support, expand funding opportunities, and enhance awareness of farmers' grassroots innovations to build a resilient and sustainable agricultural future.

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International co-operation and Business Development vis-à-vis Grassroots & Student Innovations from India

Shri Tushar Garg

India is perhaps the only country in the world which has institutionalized the process of supporting grassroots innovations as early as the year 2000. This was a remarkable initiative considering the fact that at that time, India's independence and republic status was a little more than 50 years only. The initiative delivered multidimensionally as while on one side the supply side of technologies got strengthened for the country and on the other a very challenging task i.e. innovation adoption by virtue of NIF's dissemination through social and commercial channels experienced

a major push in the right direction for the future. In the twenty five years of existence, NIF has always ensured that innovations and innovator deserve and secure a very high level of respect, reward and recognition. Nothing could have been better, than the respect, reward and recognition getting magnified and setting new benchmarks. To accomplish it, NIF have adopted an approach to create visibility for good work that our innovators were and continue to do in both domestic and international markets, and at the same time also saw this as an opportunity to inspire the world

and at the same time be inspired by experiences of creative citizens from other countries.

Over a period of two and a half decades, NIF had scouted a variety of Science and Technology based innovations covering a variety of domains viz. energy, mechanical, automobile, electrical, electronics, household, chemical, civil, textiles, farm/ cultivation practice, storage practice, plant variety, plant protection, poultry, livestock management, human health, nutraceuticals etc. Upon scouting, the innovation life cycle demands value addition and Intellectual



The grassroots innovators and student innovators from 10 ASEAN Member States (AMS) and India came together in Cambodia to celebrate the spirit of innovation during 3rd ASEAN India Grassroots Innovation Forum

Property Rights (IPR) protection and in this regard NIF has filed 8 patents in USA as well, thereby maintaining a global perspective of things right from initial years. The next step entails business development of the technologies and to accomplish it, there are certain bespoke scenarios demanding bespoke solutions. In a given situation, where innovator expresses an interest in also being an entrepreneur, NIF has empowered them and in several hundred cases innovators have turned into successful entrepreneurs, with significant milestones like annual turnover to the tune of double digit crores. In this process, employment gets generated and country benefit in terms of tax collection, both direct and indirect. Moreover, a total of twenty-six start-ups have emerged through this mechanism. In other cases, where innovator believes that s/he is technically sound and would prefer someone external to be on-boarded for commercialization aspects, and this is true in cases where innovator is a student always and also common in grassroots innovator cases, NIF has successfully facilitated more than 130 cases of Technology Transfer which also includes licensees of the likes of MNC's, John Deere for instance (Tractor operated Paddy Transplanter), and also national champions like Vissco, India's leading manufacturer of orthopedic products who accepted Walker



Need based Grassroots innovations for remote locations translating into strong business opportunities - The case of Pole Pro, an industrial safety device by a grassroots innovator from Kashmir valley

with adjustable Legs based on an idea that stemmed from IGNITE competition from Shalini Kumari, then a student from Bihar. Year on year, the business development prospects will continue to grow as NIF's portfolio of technologies evolve.

'NIF has successfully facilitated more than 130 cases of Technology Transfer'

During India's Republic Day celebrations in the year 2018, leaders from 10 ASEAN Member States (AMS) were invited to be the Chief guests and on the momentous occasion, ASEAN

India Innovation Platform (AIIP) – social innovations was a major announcement and Government of India had given its responsibility to NIF. Accordingly, NIF has leveraged it to raise the profile of India's innovators globally and also providing them an opportunity to further improve competitiveness by way of getting exposure to contemporary efforts in other countries. Between 2018 and until 2023, four editions of ASEAN India Grassroots Innovation Forum (AIGIF) has been hosted in Indonesia (2018), Philippines (2019), Cambodia (2022) and Malaysia (2023) respectively. Consistently, India's innovators have made the country proud by winning a prize in either the grassroots or the student innovators competitions. More importantly, opportunities were created for a cross border commercial dissemination of technologies. While ASEAN efforts were multilateral in nature, earlier India and South Africa announced Grassroots Innovations program as steps to boost bilateral relations.

NIF has been instrumental in elevating its standards year on year, measurable in terms of ever growing domestic and international market for its technologies and at the same time helping India improve its ties with other countries on the premise of frugal, demand driven grassroots, students and social innovations.

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