

HORIZONS

STARTING UP, UP AND AWAY

Social Alpha has fostered a spectrum of startups working to make a difference in the social development sector



WATER WARRIOR

Mridula Ramesh on India's water woes and how community-driven efforts can turn the dismal tide

COMMONS CAUSE

25 million people have gained from a programme that helps rural folks access shared natural resources

RED ON THE RISE

Tomatoes are the ticket to a juicier future for farmers in the Chittoor district of Andhra Pradesh



EDITORIAL

Whether in life or in business, it's the warmest of comforts to know somebody has your back when you take those first baby steps. That's the part Social Alpha has been playing as it nurtures and shepherds a bunch of startups looking to make a mark in the development sector with solutions that are, necessarily, of a distinctive order.

The focus of our cover feature in this issue of *Horizons* is as much an ecosystem as an organisation. Social Alpha, an initiative supported by the Tata Trusts, seeks out and sustains fledgling enterprises offering products and services that address India's development challenges. Beginning right and bright is crucial for these startups and that's where Social Alpha pitches in as enabler, collaborator and cheerleader. There's more than the monetary in the blended boost that Social Alpha offers as it pushes forward with its mission of creating social, economic and environmental impact.

Sports and the backing it gets from the Tata Trusts is the subject of our special report. Befittingly, we have chosen to tell the story through photographs and there is, given the breadth of the involvement, a lot to capture: hockey in Jharkhand and Odisha, badminton and football in Mizoram, athletics in Uttarakhand, boxing in Manipur and cricket in Mumbai. It's a full spread of programmes, from the grassroots to top-notch academies, and completing the coverage is an insightful article by Neelam Babardesai, head of sports at the Trusts.

In our basket of feature articles, we have a crop-mapping effort in Maharashtra that has gone digital; a collaborative skilling project by the Trusts and Siemens that makes jobseekers job-ready; an ecology-friendly endeavour that has turned the tide for once-dry Dayarani Lake in Uttarakhand; a programme to help rural communities access and benefit from what is called 'commons', or shared natural resources; and a tech-heavy initiative that is ushering in change for farmers in Odisha.

We also have in this edition a thought-provoking interview with Mridula Ramesh of the Sundaram Climate Institute on the water crisis we have brought upon ourselves and why we need to rethink our ways to avoid swimming further towards disaster. Speaking to us in a different context are the prolific and exceptional Malayalam writer S Sivadas and author and illustrator Deepa Balsavar, both winners of the Big Little Book Awards, instituted by the Parag Initiative of the Trusts, to encourage children's literature.

Wrapping it up is our showcase section, which is about tomatoes and the farmers who grow them to juicy advantage in the Chittoor district of Andhra Pradesh.

Christabelle Narasimha

We hope you will help us make Horizons better with your valuable feedback. Please do write to us at horizons@tatatrusters.org.

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EDITOR

Christabelle Noronha
Email: cnoronha@tatatrusters.org

EDITORIAL TEAM

Philip Chacko
Gayatri Kamath
Labonita Ghosh
Shubha Madhukar

EDITORIAL COORDINATORS

Kainaz Mistry
Sonia Divyang

EDITORIAL ADVISORS

Debasis Ray
Laxman Sivasubramanian

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Shilpa Naresh
Abraham K John

CONTACT

Tata Trusts
World Trade Centre 1
26th Floor, Cuffe Parade
Mumbai 400 005
India

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Skyward bound

Social Alpha has taken its aim of supporting entrepreneurs and startups to a higher plane by venturing into aerospace. By Labonita Ghosh

Last November, in a first in India, Meghalaya used a drone to deliver medical supplies to a remote primary healthcare centre in the West Khasi hills. The centre is just 25 km from Noingstoin District Hospital, the source of the supplies, but by road it takes four hard hours to reach. The drone did the job in under 30 minutes.

Telangana followed Meghalaya's lead when its 'medicine from the sky' initiative got off the ground, with drones carrying vaccines, serum, blood samples and diagnostic specimens to villages where access by other means is difficult.

These two experiments have

caught the eye of Social Alpha, a multi-stage innovation and venture development platform for science and technology startups seeking to address some of India's pressing development sector challenges.

Launched in 2016, Social Alpha supports entrepreneurs and startups in their lab-to-market journey through a network of innovation labs, startup incubators, accelerator programmes, seed funds and market access mechanisms.

Central to Social Alpha is its three-tiered architecture, powered by the Foundation for Innovation and Social Entrepreneurship (FISE), a Tata Trusts supported initiative to co-create and foster

solutions with the potential to meet the needs of underserved communities in areas of climate and sustainability, healthcare, livelihoods and more.

Drones for medical supplies as well as for weather analytics and land-use patterns, and satellite sensing for remote crop monitoring, pest control and imagery are examples of space-tech applications that Social Alpha has been venturing into. It has recently launched mach33.aero, a private-public partnership with the Government of India's Council of Scientific and Industrial Research (CSIR), National Aerospace Laboratories (NAL) and the

National Research Development Corporation.

Mach33.aero will look at accelerating breakthrough ideas in aviation, aerospace and space tech with cross sectoral applications in climate, healthcare and livelihoods. With its lab-to-market mandate, it expects to be a catalyst that advances the social development cause. The first stop for that is finding and supporting startups that fit the bill.

There are caveats attached. The startup must show promise and be in line with Social Alpha’s credo: to tackle critical social, economic and environmental challenges through sustainable and scalable solutions. The objective is to use technology to craft solutions that are affordable and accessible, high on quality and user experience.

Full-stack backing

Such startups can then avail Social Alpha’s full stack of support – from access to a number of specialised innovations labs and incubators, mentoring, help with design, development and testing of prototypes, to accessing funds from multiple pools of capital and finding new markets.

The startups being scouted are not cut from conventional cloth. “If you look at startups today, they are all about e-commerce, fintech, edtech, microfinance and food delivery,” explains Manoj Kumar, chief executive and cofounder of Social Alpha. “While the growing startup ecosystem is very promising for the economy, we don’t see enough entrepreneurial



activity in climate action, in primary healthcare, in water and sanitation, in agriculture and other livelihood areas.

“We encourage entrepreneurial risk-taking in these spaces with the hope that, eventually, they will

become more mainstream and the philanthropic capital invested in them today will give way to commercial capital. This is how we are attempting to address market failure by de-risking some of the neglected sectors of the economy.”

Jacob Poullose, the incubation programme director of Social Alpha (he is transitioning to mach33 to set it up as its chief operating officer), emphasises the importance of smoothening the lab-to-market pathway.

“A lot of deep science and tech innovations are being created across the country today at institutes like CSIR-NAL,” he says. “The creators are often unaware that these technologies have the potential for dual use. That means, apart from addressing the problems they were created for, they can also offer pathbreaking solutions to social and environmental challenges.”

Aerospace engineering is an example. Its versatility extends to applications that can easily be deployed to find remedies for complex issues like poverty, underdevelopment, climate change and healthcare, and solve these problems at scale.

Chasing the missing

“In India, we certainly have the scientific and intellectual capability to address our social and economic challenges. But their translation to commercial ventures through entrepreneurship, and something that becomes useful for wider society, is entirely missing from the value chain,” says Harshan Vazhakunnam, a programme director with Social Alpha. “That’s where our intervention through offerings such as the scientist/entrepreneur-in-residence and market access programmes can come in handy.”

Mach33.aero — a name derived from the common scientific term for the speed of sound — is billed as India’s first aerospace-focused innovation curation and venture development programme. It leverages the platform architecture of Social Alpha and pledges to provide a common ground for government, industry and academia to nurture entrepreneurship, indigenous manufacturing and promote dual-use technology in spheres such as healthcare, climate change, agriculture and natural resources management.

Even though mach33.aero has been launched recently, the folks at Social Alpha believe it will have no problem finding partners. “Companies from around the globe, who are working in aerospace, have been approaching us,” adds Mr Kumar.

Scientists at NAL have recently demonstrated, in Karnataka and Jammu & Kashmir, that drones initially manufactured for surveillance, aerial photography or mapping can be a quick and inexpensive vehicle for transporting medical supplies or even food and essentials to remote locations. They can even be used by small farmers to monitor their fields.

Agriculture is a space where such technologies can be more than useful. “The struggle for the marginal farmer is getting the right data,” says Mr Kumar. “They never know in advance if a disaster is about to hit, or if there has been a pest attack in a neighbouring village or they may just be

struggling to find an efficient and precise way of spraying pesticides and fertilisers.”

Data collected via satellite, and then disseminated among farmers, would be a big help. Geospatial imaging and analysis can provide inputs about the amount of water in rivers and ponds and even changes in topography.

For the farmer’s sake

A startup working in this area could, based on a predictive model, advise farmers on what to grow. If the climate is likely to change causing a water shortage or the water table is rapidly depleting, farmers could be persuaded to grow hardy crops like millets instead of rice. Remote sensing will help them manage scattered holdings or alert them to a crop-killing swarm headed their way.

In a few years, air taxis might become a reality for city commuters. This could also help farmers carry their produce to markets both near and far, substantially increasing their income. Many of these ground-up innovations are being designed to be non-polluting and zero-emission, making them eco-friendly as well.

Entrepreneurship is crucial in all of this. “Climate action, poverty and healthcare require innovation, but not if it’s confined to academia or research centres,” adds Mr Kumar. “Taking innovation from the lab to the community or the market is something that only entrepreneurs can do. ■

Social all the way

Launched in 2016, Social Alpha has been evolving as a pan-India platform that promotes entrepreneurship and innovation in the development sector. This Tata Trusts-supported initiative works to incubate and nurture startups involved in addressing the country's multiple development challenges, and it does this by backing them in their 'lab to market' journey. Featured here are some of the standout startups that Social Alpha has fostered during the course of its mission to create social, economic and environmental impact.



A NETWORK COMES ALIVE

Social Alpha has consolidated its backing for startups under three verticals: livelihoods and prosperity; health and wellness; and sustainability and climate change



1,000+
number of
startups
supported



200+
early-stage
startups
incubated



60
startups helped
with direct
funding



₹300+
million
equity
investments in
startups



₹600+
million
grants
provided to
startups



₹1.5+
billion
follow-on
capital for
startups

BLACKFROG TECHNOLOGIES

Cool as you like

The portable refrigerator that Blackfrog Technologies has crafted aids in the last-mile delivery of vaccines and other medical material



A health worker carries the Emvolio refrigerator containing Covid vaccines to a primary health centre in Diyungmukh in the Dima Hasao district of Assam

Mayur Shetty, chief executive of the Manipal-based startup Blackfrog Technologies, recalls with relish the chance encounter with Social Alpha that changed his career.

“In 2018 we became a Social Alpha partner and it’s been an end-to-end journey since then,” he says. “They have been mentor, incubator, investor and, now, also a customer. Social Alpha has been a part of all aspects of our growth. At the time our association began, we really had no other option.”

Blackfrog has created medical-grade cooling units that can be used to carry vaccines, blood, tissue samples, serum and other biological fluids. The company’s battery-operated ‘portable refrigerator’ aids in last-mile delivery and can be transported easily.

Called Emvolio (from the Greek word for vaccine), the refrigerator is small enough so that in places with poor infrastructure — like a health centre in a remote village — it can be hauled by a bike rider on his or her back.

Mr Shetty initially approached Social Alpha to invest in Blackfrog, but the relationship took a different turn. “We spent a year working with them,” he says. “As a young

company, we had trouble with our balance sheet, cash-flow management etc. We needed a lot of handholding and Social Alpha did that for us.”

Later, the mentor turned investor as well and now Social Alpha’s other partners, like the Collectives for Integrated Livelihood Initiatives – an associate organisation of the Tata Trusts – and Support Jharkhand, have purchased the refrigerators.

Emvolio caught the public eye in 2020 when it was used to carry specimens for Covid testing in Karnataka. Its USP is temperature control, which means the temperature can be set to precision, and there is no danger of under-cooling or over-cooling, which protects the molecular integrity of the substance being transported.

Charged up

Emvolio’s two-litre chamber can carry up to 50 vials and runs for over 12 hours at a time on a single battery charge (some versions of the carrier are solar compatible). The device allows users to track the progress of delivery in real time through geo-mapping.

Blackfrog’s cooling units can be used during routine immunisation drives as well, which give them relevance beyond Covid. “Our focus is not just on Covid-related vaccines but all vaccines,” says Mr Shetty. The last-mile reach of maternal and child vaccines, for instance, has always been a problem and we wanted to solve that.”

Emvolio ensures that such vaccines reach the right recipients



A doctor at a health centre in Bihar administers a Covid vaccine; the Emvolio refrigerator here is used for carrying and storing these and other vaccines

in the right conditions and it eliminates wastage. (Ordinarily, during a vaccination drive in a distant place, the carrier is loaded with extra doses. If there are any doses left over at the end of the day, they are thrown away since bringing them back would inevitably mean that they get spoilt.)

Emvolio, apart from being a carrier, can also operate as a stand-alone refrigerator once it is plugged into a power source. So any additional doses stay protected even over long periods.

The portable refrigerator idea came to the Blackfrog team years ago during a conversation with a former professor of Mr Shetty’s. “His daughter was due for her polio drops and the healthcare worker who came to immunise her carried the drops in a thermos with ice cubes in it,” says Mr Shetty. “By the time she arrived, the ice had long melted and there was just water in the flask. My professor was shocked. That got us talking about why we still resort to these crude forms of cold-chain management.”

Given that vaccine purchase and delivery is a centralised process, Blackfrog depends entirely on government procurement of its Emvolio units. “It’s not like an ultrasound machine that you can sell to a private hospital,” says Mr Shetty. “There’s bound to be little interest from the private sector for our product.” Depending on the variant – there are three – an Emvolio could cost anywhere between ₹54,000 to ₹130,000.

The partnership has provided both validation for, and access to, customers for Blackfrog. The startup is working closely with UNAIDS and arms of the World Health Organization to deploy Emvolio carriers outside India (this includes a pilot project in Kenya).

Mr Shetty is not one to understate the role that Social Alpha has played in giving Blackfrog a leg up. “They’ve been a knowledge partner. They trusted our product even when we were just starting out, and they’ve been advocating for us ever since. It’s holistic support.” ■

VOXELGRIDS INNOVATIONS

Scan plan

The MRI machines of Voxelgrids Innovations have the potential to break through barriers in affordability, quality and deployment

Ours was an expensive idea on paper. Then I met Manoj Kumar [the chief executive of Social Alpha] in 2016 and he immediately said he would support us.” The ‘expensive idea’ that Arjun Arunachalam, founder and head of the startup, Voxelgrids Innovations, refers to is a high-quality Magnetic Resonance Imaging (MRI) machine.

Voxelgrids received its first monetary and incubatory help from Social Alpha and it hasn’t looked back since. “We were literally incubated in Manoj’s apartment in Bengaluru,” says Mr Arunachalam. “They funded us for everything right from day one, whether it was space to work in, salaries for our people, expenses for buying things as well as network and software support.”

It’s the sort of backing that comes naturally to Social Alpha, which made Voxelgrids part of its entrepreneur-in-residence programme. In 2016, when Mr Arunachalam and his five-member team came under Social Alpha’s wing, Voxelgrids had not even been founded. At that point they operated much like Social Alpha employees, working to lay the foundation for the future.



Voxelgrids’ MRI machine can deliver high-quality images at a cheaper price

When Voxelgrids was formed a year later it received a large grant from the Biotechnology Industry Research Assistance Council (BIRAC), a nonprofit set up by the Indian government's Department of Biotechnology to enable emerging biotech enterprises to undertake research and innovation that addresses nationally-relevant product development needs.

Backing from BIRAC meant that Voxelgrids could begin paying Social Alpha for its incubatory support, which had translated into the startup being able to build its team, to find and hire people for the varied functions so essential for an enterprise with big dreams and ambitions.

Voxelgrids' MRI machines hold the promise of revolutionising the diagnostics space. They are lightweight (2-3 tonnes, as opposed to traditional machines, which may weigh up to 6 tonnes), can be placed in the back of a truck and transported and set up in the remotest of centres. That translates, particularly, into serving the needs of India's rural regions, notoriously lacking in adequate testing facilities.

The scanners can be de-energised and re-energised – switched on and off, to put it simply – and they don't need the expensive liquid cryogenics that regular MRI machines rely on. The Voxelgrids machines use a dry magnet that makes them lighter and more portable.

These machines consume 50% less power, adds Mr Arunachalam, and can withstand erratic supply and voltage fluctuations, as also



heat, dust and changes in temperature, issues that typically plague village healthcare centres. "If there is a sudden loss of power, the system has 12 to 18 hours to auto-recover data," says Mr Arunachalam.

Speed for the need

The machines can produce reports four times faster than other scanners and they offer full-body imaging, which increases the scope of diagnoses. "You have machines that scan only the knee or the brain," explains Mr Arunachalam. "Here we're talking about an MRI machine that can scan the full body or any specific part."

The Voxelgrids machines are currently being clinically tested and should be ready for launch by end-2022. "We hope to set the cost at about half the price of the standard MRI machine, which usually comes to about Rs50 million and racks up operational expenses of anywhere between Rs20,000 and Rs40,000 a month,"

says Mr Arunachalam. "Our scanner will cost a lot less."

The time is ripe for Voxelgrids to make its machine play. "It's been a while since MRI machines saw effective upgrades," says Mr Arunachalam. "With all other imaging modalities, like CT scanners or x-ray machines, there have been tremendous innovations in making them more affordable and accessible. Despite much talk, that transition has not yet happened with MRI machines. I think we have come closest to a solution."

Mr Arunachalam is clear about what the Voxelgrids machines will accomplish. "Our primary motivation was to create a state-of-the-art apparatus that can perform all of the imaging people require, do it with very high quality, and yet have design innovations that can make the system cost effective."

Such innovation could only have come from a startup stable, says Mr Arunachalam. He doesn't expect established companies to take the risk and create a machine that would not – at least in the beginning – reap monetary benefits. Which is why Social Alpha's initial all-encompassing assistance was vital for Voxelgrids.

Voxelgrids has recently received \$5 million in funding from Zoho Corporation, the Indian multinational company. The early care his baby received was just as crucial, says Mr Arunachalam. "If Social Alpha had not taken care of all our early expenses in our first year, any seed money we received would have been burnt through paying for essentials." ■

KHETHWORKS

Come rain or shine

Khethworks' solar-powered pumps are helping farmers in eastern India pull the plug on erratic electricity supply

In 2016, Khethworks, a Pune-based enterprise started by former Massachusetts Institute of Technology (MIT) students, found a partner and benefactor in Social Alpha. Khethworks, which looks to improve the job and food security of small farmers across India, has created a portable, solar-powered pump that farmers can use to draw water, from whatever open source they have at their disposal, to cultivate their fields.

“Our pumps are specifically for smallholder farmers who own an

acre or less of land, and these pumps can irrigate their holdings all year round,” says Victor Lesniewski, the chief executive and cofounder of Khethworks. “We work primarily with farmers in Jharkhand and Odisha. Many of them are trying to go commercial by growing vegetables instead of staples like paddy, which are less lucrative.”

Having a solar-powered pump means farmers are freed from the increasing fuel costs of diesel and kerosene versions, and are also spared the vagaries of inconsistent monsoons. A 2019 study by the

research advisory body Koan on the demand for micro solar pumps in India states: “It is estimated that energy costs for irrigation average between 20-40% of production costs for farmers.”

“If you are trying to draw water in areas that tend to be underserved in terms of productive electricity, you must either own or rent a diesel pump,” says Mr Lesniewski. “We’re trying to provide an alternative, an asset that farmers have confidence in.”

Paucity of electricity is a recurring problem for farmers in



Members of a federation in the Ranchi district of Jharkhand test the solar-powered pump during a workshop



Khethworks staff conducting a training session in the Gumla district of Jharkhand

these parts. Large tracts of land in eastern India are under-cultivated because of poor irrigation cover and that can be blamed on the unavailability of electricity. Portability and ease of use are additional advantages with the Khethworks pumps, which are small and light enough to carry to the fields and simple to set up.

At ₹47,000 a unit, the Khethworks solar pump does not come cheap (a diesel or kerosene pump costs between ₹10,000 and 20,000). “But the operating costs for fuel pumps are high, whereas our pumps cost practically nothing to run, and we’ve found that farmers recover their money in two or three seasons,” adds Mr Lesniewski.

There are some 30 million smallholder farmers in eastern India, where a shallow water table provides easier access to the precious resource. During the Covid outbreak, when the lockdown forced migrants to return to their villages in large numbers, many of them decided to take up farming again. This has increased demand for the solar pumps.

After Jharkhand and Odisha, Khethworks is now exploring opportunities in other states. It has deployed pumps to Assam and 11 other states across the country. Steadfast support from Social Alpha is an enabler in this regard.

Khethworks’ founders were engaged with the Tata Center for Technology and Design at MIT, which supports the institute’s research projects. It was through the Tata Trusts that they came in contact with Social Alpha, this while working on a prototype of the solar pump.

Home comforts

“We had a close relationship with the Trusts even before the incorporation of Khethworks in 2016,” says Mr Lesniewski. “By the time we shifted to India to continue our work, Social Alpha had been registered as an organisation and became a home of sorts.”

Social Alpha was an early incubator for Khethworks and later became an investor as well, providing pre-seed capital for the venture. Khethworks shared Social Alpha’s office space in Pune, was

given access to whatever software and other tools it required and, when the time came, was connected to other entrepreneurs, nonprofits and potential backers.

The linkages were particularly important since the founding team of Khethworks was not from India and, therefore, didn’t have the networking prowess to get started on a strong footing.

“Part of the strength of Social Alpha is the network it has built through a range of relationships, both within the Tata group and otherwise,” says Mr Lesniewski. “That’s been a huge source of value for us.”

Social Alpha now has a representative on Khethworks’ advisory board. “It continues to have programming for entrepreneurs within its portfolio, so we are part of webinars and such to support funding opportunities,” says Mr Lesniewski. “Whenever we need an introduction or a connection, Social Alpha is there.”

Indeed, he adds, there are lots of primary and secondary advantages for Khethworks’ business, just from the credibility of being a part of the Social Alpha family.

With a capacity to produce 120 pumps a week, the startup is now eyeing scale. “While our founding mission was to serve smallholder farmers in India’s eastern region, we are looking at global markets too,” says Mr Lesniewski. “We have already exported a number of pumps to Nepal and Malawi. We also see an opportunity to provide irrigation solutions in East Africa.” ■

HASIRU DALA INNOVATIONS

Riches from rags

Hasiru Dala Innovations has committed itself to improving the lives of one of the most marginalised working communities in India



A group of waste-pickers with Hasiru Dala cofounder Nalini Shekar (centre)

Lotfar began his life as a waste-picker in Delhi. By the time he moved to Bengaluru in 2010, the 40-year-old was struggling to make ends meet. That's when he heard about Hasiru Dala, a not-for-profit organisation working with waste-pickers.

Things were difficult in the beginning, when Hasiru Dala (coined by the waste-pickers themselves, the name means 'green force' in the local Kannada language) was trying to establish processes and relationships with its stakeholders. Lotfar was the first

waste-picker entrepreneur that it partnered with, even raising funds so he could buy a truck.

Today, Lotfar owns four trucks and employs about 20 waste-pickers who collect, transport and sort garbage from bulk generators such as housing societies, offices, events and weddings. His earnings — between ₹20,000 and 25,000 a month — have enabled Lotfar to move into a rented house, access bank loans for a two-wheeler, and also look for land to build a home.

"Hasiru Dala is the reason I am what I am today," says Lotfar. "Where else would I get such

respect and dignity as a waste entrepreneur?"

He is actually referring to Hasiru Dala Innovations, a for-purpose company that was formed, in November 2015, as an offshoot of the parent nonprofit, Hasiru Dala. The latter started out as an organisation focussed on social justice for waste-pickers, including education for their children, healthcare and housing for their families, advocacy, financial inclusion and programmes for community libraries and the like.

Since this seemed to be a scalable model for providing

entrepreneurship opportunities to waste-pickers, Nalini Shekar, Shekar Prabhakar and Marwan Abubaker decided to found Hasiru Dala Innovations (HDI). They realised that their operations required a certain business rigour to be truly beneficial for waste-pickers. While they first considered turning it into a cooperative, they later decided on making it a for-profit company.

A jobs cascade

The quantum change in the quality of life for Loftar and other waste-pickers has been possible thanks to HDI's business model. A partner of Social Alpha, which invested a seed fund of Rs5 million in 2016 in the Bengaluru-based startup, it now has 24 waste-picker entrepreneurs who, in turn, have given jobs to some 300 other waste-pickers. They not only get paid for collecting garbage from, say, housing societies, but also make money from sorting and selling recyclable waste.

"We started working in waste management in a bid to find a different sort of employment and livelihood opportunity for waste-pickers," says Ms Shekar. "We started by looking at two different kinds of services: collecting from housing societies and then managing the waste. In some places we even did in-situ composting."

The idea for the enterprise, says Mr Prabhakar, emerged from a conversation he had with Social Alpha's chief executive, Manoj Kumar. "Nalini was already running the nonprofit, so when I mentioned that this could be extended as an employment opportunity for

waste-pickers, Manoj suggested we form a separate company.

"There was no ecosystem to support something like this when we first started. But Social Alpha agreed immediately to invest in us, which was heartening. It showed us that we were on the right path."

The garbage collected through the venture is responsibly disposed, and very little of it makes it to landfills, which in itself is an eco-friendly step. "For us Social Alpha is a support system that we can always rely on," adds Mr Prabhakar. "If there is anything we need to discuss, we can just pick up the phone and call them."

Mr Kumar, who has been an advisor to the Hasiru Dala management team is "our go-to person and sounding board for new business initiatives, or when we're stuck with something," says Mr Prabhakar. The Social Alpha team also helped the startup create business plans and pitch for their most recent round of financing.

Furthermore, Social Alpha has

enabled HDI to connect with other startups operating in the same sector. "We did not leverage the usual incubation services that Social Alpha offers to all its seed investments," adds Mr Prabhakar, "but since Social Alpha is deeply engaged in impact investing, it saw merit in Hasiru Dala Innovations' ability to fulfil its social and environmental commitment."

What got Social Alpha really interested in HDI was their mutual allegiance to social betterment and the latter's dedication to the cause of waste-pickers, one of the most marginalised working communities in India.

HDI is now replicating its services in Aurangabad and considering a debut in other cities. "Our entrepreneurship model has shown that it's possible to vastly improve the lives of waste-pickers," says Mr Prabhakar. "We are clear about our objective: whatever we do has to be good for the waste-picker." ■



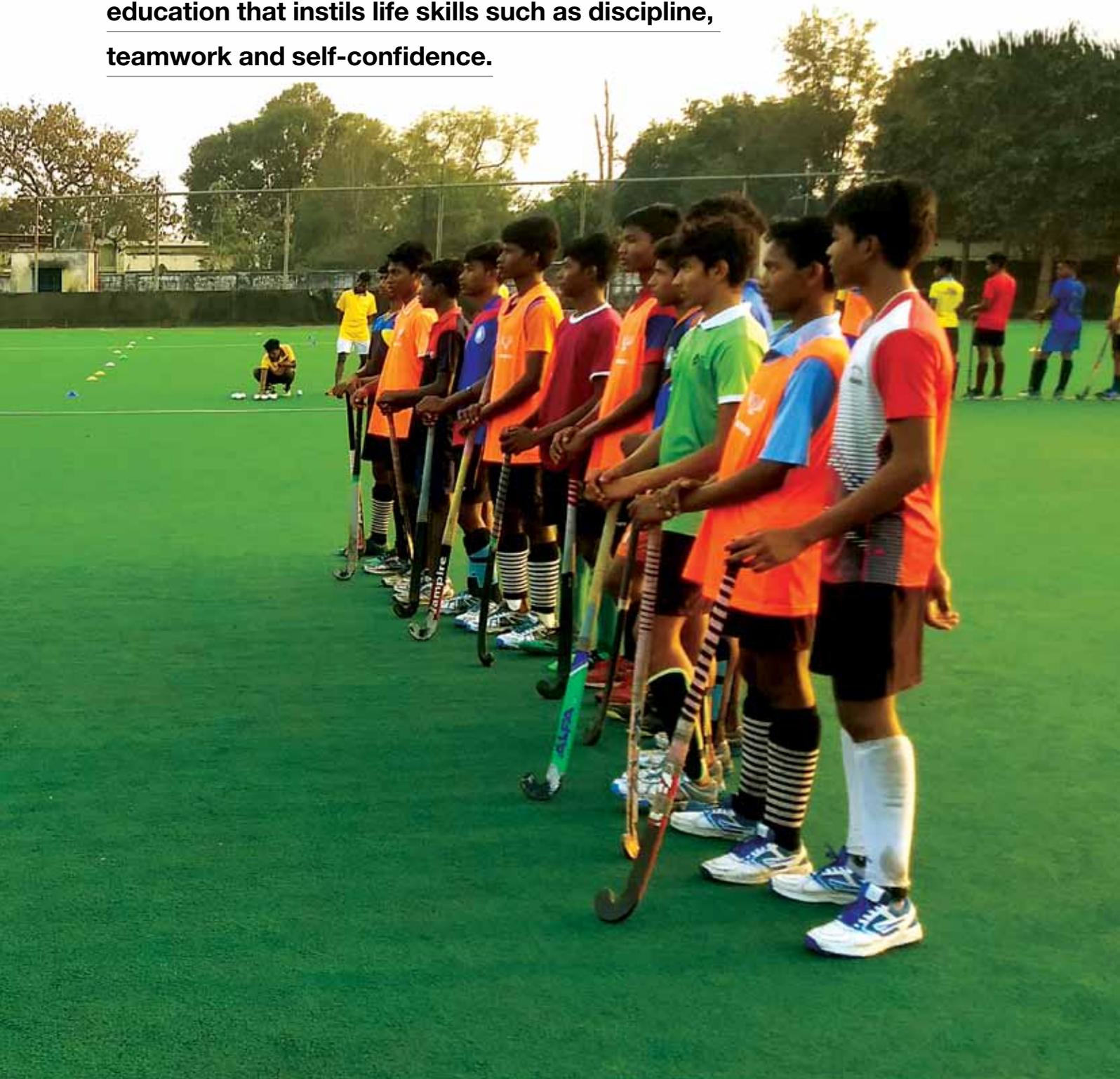
Waste workers from Hasiru Dala at a garbage collection centre in Bengaluru

The sporting life and a social bent



An expert from technical partners Bovelander & Bovelander BV, founded by Dutch hockey legend Floris Jan Bovelander, interacts with coaches at the Naval Tata Hockey Academy in Jamshedpur. The Academy was set up jointly by the Tata Trusts and Tata Steel.

Hockey in Jharkhand and Odisha, badminton in Mizoram, athletics in Uttarakhand, football and boxing in Manipur and cricket in Mumbai – the Tata Trusts have long promoted the cause of different sports and those who pursue them, particularly children and young adults. This sporting effort is channelised through programmes that start at the grassroots and then progress to regional development centres and academies of excellence. A critical component here is blending sports and a regular education that instils life skills such as discipline, teamwork and self-confidence.





(from above) **A grassroots centre** in Gangutoli in Simdega district in Jharkhand.

A coach with his wards at the Birsa College ground in Khunti (Jharkhand) during a clinic conducted as part of a hockey festival in March this year.

Former India ace Dhanraj Pillay with junior women's players at the 'high-performance centre' in Bhubaneswar in Odisha.





(from above) **Girls training** at the Gutuhatu grassroots centre in Khunti, which has 42 children from two villages, 50% of them girls. **A coach maps** out tactics ahead of a friendly match in Rourkela between girls from the Simdega regional development centre and the Panposh Sports Hostel.



Trainees, coaches and team members of Bovelander & Bovelander BV, founded by Dutch great Floris Jan Bovelander (standing fifth from left), at the launch of the Simdega grassroots hockey programme in December 2017.





Scenes from the badminton initiative in Aizawl in Mizoram, which includes grassroots training and two regional development centres where 30 of the most promising players are given special coaching, proper equipment and exposure to out-of-state tournaments. Seen above right is **Pullela Gopichand** (in red), former All England winner in men's singles and currently the chief national coach of the Indian team. Mr Gopichand and his team have been ardent supporters of the Tata Trusts' badminton programme.





(clockwise from above) **The launch of the Manipur grassroots football programme. Players from the centre of excellence training at the Rajiv Gandhi Stadium in Mizoram. Primary school teachers from Jadipani in Uttarakhand's Tehri Garhwal district during a 'physical literacy workshop' (they were trained to teach academic concepts through experiential physical activities). Children from a primary school in Jadipani making alphabet shapes with their hands during the same programme.**





Two of the trainees at the Mary Kom Boxing Academy in Imphal, Manipur, who have been supported by the Tata Trusts: state-level junior boys champion Amarjit Singh (left) and Elangbam Thoithoi Devi, a state-level champion in the junior girls category.



Taking a swing at a tournament organised under the 'life through cricket' programme, which trained 48 girls and 98 boys in Mumbai.

Anil Mundu training at Jamshedpur's Naval Tata Hockey Academy, which he joined in 2017



Playing for keeps

The sports programmes of the Tata Trusts are designed to promote excellence in different disciplines, and to equip children and young adults with life skills

It was a sunny day in Khunti in Jharkhand in December 2017 — just a couple of months after I had joined the Tata Trusts as head of sports — fine weather and a ground teeming with girls and boys all set to take part in a 'barefoot hockey festival' organised by Collectives for Integrated Livelihood Initiatives, an associate organisation of the Trusts.

Lined up along the pathway to the ground were some of Jharkhand's, and indeed India's, hockey stalwarts of the past: Sylvanus Dung Dung, Bimal Lakra, Sumrai Tete and Jaipal Singh Munda. They were there to remind everybody present of the state's rich hockey culture and to support a wider programme that reaches out to children, the majority of them from tribal communities, through the sport.

Just before the finals of the hockey

festival unfolded, I had the opportunity to wish each member of the two teams. Eager faces ready to play, some barefoot, some not even in the same uniform, shy smiles, minimal eye contact and uncertain handshakes greeted me.

Two years later, same place and same event: the moment I enter the ground, sporting a Tata Trusts T-shirt, I am warmly welcomed by the girls and boys waiting for their match. Morning wishes and smiling faces, brighter smiles and firmer handshakes, much more eye contact and louder thank yous — the joy the children felt at being part of the celebratory occasion was palpable.

I was struck by the change, by the power of sports and the impact this had made on the lives of all these children and youth growing up playing hockey in village mud pitches. On view was vindication and



Neelam Babardesai
is head of sports at
the Tata Trusts

validation of the greater value that sports can deliver when used as a means to provide opportunities to the underprivileged from India's rural and tribal regions.

Due to its popularity and existing infrastructure (mud pitches to play), hockey has been the perfect vehicle for the Tata Trusts to extend and solidify their 'sports for social development' programmes. This translates into sports for holistic development and, for the really talented, the backing to cement a career in a chosen discipline.

Creating an ecosystem

Keeping children and young adults at the centre of the frame is also, for the Trusts, a way to help develop different sports and a sporting culture in India. Our sports initiatives are guided by an ecosystem-driven approach, built by fostering partnerships with local bodies and working to create an environment of opportunity and excellence.

The Tata Trusts strategy here is based on a 'sports development pyramid' that aims to lay a strong foundation of fun, physical education and sports through in-school and grassroots projects. From these fundamental building blocks to talented players and coaches, advanced training and competitive events, all leading to excellence programmes.

The foundational layer is critical. That's how we can reach the maximum number of children, not just to enable them to have fun playing and adopt healthy lifestyles but also to instil in them a variety of life skills: discipline, teamwork, confidence and more.

Where possible, the Trusts blend their sports programmes with existing education initiatives. Typically, the sport chosen is traditional to the region, which helps infuse a connect with the local

community. These principles have defined the design and implementation of — besides hockey in Jharkhand and Odisha — football in the Northeast, badminton in Mizoram and 'physical literacy' and athletics in Uttarakhand.

The initiative in Jharkhand focuses on the Khunti and Simdega regions, both of which have a thriving hockey tradition that has produced many players for the country. Add to this basic infrastructure, including mud grounds prepared and managed by schools and communities, and we had the essentials to create a network of nearly 60 grassroots hockey centres in the state.

The best talents go to one of the two regional development centres, in Khunti or Simdega, for further coaching on astroturf pitches. The hockey-playing pool also provides coaches, many of whom have come through a 'train the trainer'



A football camp for children at the Assam Rifles ground in Aizawl (Mizoram), where a grassroots project has reached more than 3,000 kids

component where coaches were picked after trials involving experts from our technical partners, Bovelande & Bovelande B V, founded by Dutch hockey legend Floris Jan Bovelande.

The Trusts have also set up the Naval Tata Hockey Academy (NTHA) in Jamshedpur in partnership with Tata Steel. NTHA is at the apex of a framework that strives to offer high-quality hockey training alongside a regular education.

In 2019, we replicated the programme structure in neighbouring Odisha. Applying what we had learned from Jamshedpur, we partnered the Odisha government to reuse existing infrastructure and designed projects to complement official initiatives. The Odisha model has already produced four women's junior India players. The hockey academies in the state and in Jharkhand together provide high-performance training to 40 girls and 90 boys.

The Tata Trusts' badminton programme in Mizoram is similar to what is happening through hockey in Jharkhand and Odisha, and quite different as well. The close-knit Mizo community have a love of sports, art and music. Badminton is a favoured sport and it suits the children here, inherently endowed with a good physique and hardworking by nature.

This is another three-tiered programme based on collaboration, community

ownership and sustainability. The infrastructure for a grassroots effort was in place and to this was added centre management committees (CMCs), comprising community members, the district badminton association and coaches, to manage operations at the chosen centres.

There is a flexible fee structure (the amount is decided by the respective CMCs based on paying capacity) and the money collected is employed for further developing players and sport in the region. The state administration has been extremely supportive and we have been fortunate enough to have the vision, the moral and technical support of Pullela Gopichand, one of India's top badminton coaches.

Exposure for the talented

Besides the grassroots network, we have two regional development centres where 30 of the most promising players are given special coaching, proper equipment and exposure to out-of-state tournaments. In just three years, we have placed — on full scholarships — 15 players in the best residential training academies in the country. We have, meanwhile, also created sports careers for coaches.

It's a matter of pride for us that today, even following our exit — after an intervention lasting three-and-a-half years — 26 out of the 40 grassroots centres we set



The Tata Trusts-supported 'centre of excellence' football team won the inaugural Mizoram U-15 league in 2018 and successfully defended the title in 2019

up continue to operate independently, a true measure of their sustainability quotient. Designing this programme and working closely with our associate organisation, the North East Initiative Development Agency (NEIDA), at every step during its implementation has been a satisfying journey for me.

In Uttarakhand, the Trusts piloted three diverse projects in the past two years:

- A physical literacy initiative for primary-grade schoolchildren, where teachers were trained to teach academic concepts through experiential physical activities that require no equipment and can be conducted in classrooms.
- In collaboration with the Dehradun-based National Institute for the Visually Handicapped (NIVH), we crafted a project to support the development of sports for visually handicapped children.
- In athletics, we designed a programme where the goal was to plug gaps in the existing setup and enable talent to blossom at the competitive level. Quality coaching, adequate nutrition and sports science were important ingredients here.

In football, the Trusts backed the establishment of a 'centre of excellence' in Aizawl in Mizoram, the objective being to groom fledgling talents in a sport very dear to Northeastern hearts. The Mizoram government, the Mizoram Football Association and the Aizawl Diocesan Education Society were partners in this standout effort.

In sports science, a relatively new field in India, the Trusts allocated a sports scientist and data analyst and helped put together a team, including a physiotherapist, psychologist, nutritionist and strength and conditioning expert, to work as a support group for NTHA in



Odisha and for those in our badminton and athletics initiatives.

Last but far from least, the Trusts have been supporting the Mary Kom Boxing Academy in Imphal in Manipur since 2017. We do this by sponsoring promising young boxers from poor backgrounds who train at the Academy. And then there's the 'life through cricket' programme – a collaborative effort involving the Trusts and the Cricket Live Foundation from New Zealand – which seeks to harness the power of sport to develop life skills and education for children from marginalised communities in Mumbai.

I have had the chance to get to know and work closely with some fascinating sportspersons over the course of my years with the Trusts. One quality common in all of them – other than their sporting prowess, dedication and resilience – is their humility. Experiencing this has strengthened my belief that sport goes a long way in developing great human beings. ■

Children at a badminton training centre in Aizawl

‘Our water is variable and volatile’

Mridula Ramesh is the founder of the Sundaram Climate Institute, which focuses on water and waste solutions, and author of *The Climate Solution* and the recently released *Watershed: How We Destroyed India’s Water and How We Can Save It*. She is also a prolific angel investor and, far from least, executive director of Sundaram Textiles.

Ms Ramesh, who studied and worked in the United States before returning to India — she lives in Madurai with her husband and two children — speaks to Labonita Ghosh about the water crisis confronting the country, rejuvenating traditional water bodies and about co-opting sewage treatment. *Excerpts from the interview:*

India has, historically, been water-abundant but today we are facing a water scarcity. How did we get to this point?

I wouldn’t say abundant but we’ve been somewhat water secure. India sees an enormous variability in water availability. Jaisalmer in Rajasthan survives on 165mm of rain a year while Sikkim and the Northeast receive plenty of rainfall in a matter of months. Why have we become water-insecure? There are several reasons. First, there is water insecurity in farms caused by the change in cropping patterns and population increase.

In the 1880s, we were a nation of some 200 million people eating mostly millets. Today we are over 1.3 billion, eating largely rice and wheat. Millets are hardy crops that can survive the volatility of India’s water. Farmers in ancient India understood that and grew it. However, the British, blind to the volatility, imposed a fixed cash tax on India’s farmers, who began to increasingly turn to water-hungry crops like rice and wheat.

Historically, Indian farmers have always paid a variable crop tax. They would pay more when there was a bounty and less during a drought. After the British introduced the fixed cash tax, farmers realised they needed to grow crops that fetched more money and switched to rice and wheat, as well as sugarcane and indigo, which were in great demand then in the international market.

“Everyone talks about climate change in terms of carbon, but not in terms of water. In India, climate change accentuates water contrasts.”



Post Independence, and after the green revolution, rice and wheat were cultivated in the driest parts of the country, Punjab and Haryana, for example. This makes no sense. Rice requires about 1,240mm of rainfall but Punjab receives only between 400 and 600mm. This gap is bridged by drawing groundwater, and these groundwater reserves are beginning to empty out. State-level reports from 2019 estimate that Punjab may run out of groundwater in 20-25 years.

Besides changing our cropping patterns, the British also cut down our forests. Places like Sikkim and the Northeast have steep, almost vertical slopes. The forests there not only hold the soil in place, it slows down water runoff after the rains and stores it in the ground. But now, in areas where forests have been cleared, flash floods and landslides have become more commonplace. We've destabilised our water systems by growing crops that have no business being grown in certain regions and by clearing our forests.

Everyone talks about climate change in terms of carbon, but not in terms of water. In India, climate change accentuates water contrasts. It makes dry regions and dry seasons drier and wet regions and seasons wetter. That's the worst thing to happen to our already variable water.

What about our cities?

Besides geographic variability, India's water is also highly seasonal. A World Resources Institute study found that we have one of the most seasonal rains in the world, and this is also temporally skewed. Most of our cities get between 40 and 50 rain days a year (more in places like Mumbai). If you have seasonal rainfall, you need place to store it to cater



Teppakulam is a square tank spread over 16 acres in Madurai; many Indian cities have failed to protect similar water bodies

to the everyday water needs of cities. But we are destroying what little water storage we have.

Historically, people understood the need for this, which is why many cities created lakes to store water in a distributed fashion, and these were managed by local communities. But the British wanted a centrally controlled supply of water; they didn't like these community-controlled lakes and tanks.

Health inspector reports from Madras or Bombay of that time insisted that these tanks were breeding mosquitoes, polluting the air and such. The British opted for piped water and filled up many of the existing tanks. In the bargain, they got prime land in the heart of cities.

In T Nagar, one of Chennai's biggest and most affluent neighbourhoods, there was an enormous lake up until 1920 (the Chennai Boat Club used to hold its winter regatta there). This was filled up and turned into real estate. Now the neighbourhood floods after heavy rains. It's bound to, since this low-lying area was once a lake designed to collect water.

It's the same with hundreds of water bodies all over India. We have forgotten that our water is this special, variable and volatile being, and we are paying the price for it.

At Sundaram Climate Institute, we have done an extensive study on tanks and found that if you live in the periphery of a 'functional' tank, your groundwater levels tend to be about 200ft higher than if you don't. We spoke to 2,000-odd households in Madurai and found that 40% of them buy water, spending ₹400 per month on average. This drops by ₹100 if you live next to a functional tank.

What is a 'functional' tank?

Tanks (or lakes) build water security by collecting the seasonal and temporally skewed rains and by recharging the groundwater. During heavy

rains they are a place for water to collect to avoid flooding. A functional tank is one that does all these things.

What helps it do its job well? Our studies found three factors. Many lakes and tanks in India are cascading systems of water fed by a common stream; the excess water flows from one into another. The inlet through which it flows must not be clogged with garbage or disrupted in any fashion, like by putting a playground or a parking lot over it. If the inlet is clogged or encroached upon, the downstream tank gets starved of water.

The second point is about how many months these tanks hold water. The third, and most important, is that no matter the size of the lake or tank, does it have deep links with the local community? We found that tiny tanks in crowded areas remained functional if the community valued them. The locals treated the water as sacred.

Such tanks are kept in pristine condition because the community finds great value (even spiritual value) in it. It may be a source of cash, too, with fishing or water for animal husbandry. Since incomes from these tanks flow back to the community, the locals go all out to protect them.

With tanks being managed by government departments, the community doesn't benefit anymore. Fishing doesn't take place (or happens surreptitiously) so the benefit doesn't go to the community. And tanks and lakes located in places with high land value are covered up (like in T Nagar).

In my book *Watershed*, I've talked about how tanks can be rejuvenated. Once a tank is functional again, it starts recharging groundwater. Delhi, for example, is reeling from a groundwater crisis. It used to have more than a thousand water bodies; many of them have either been encroached upon or are in terrible shape. Imagine how much more water-secure Delhi could become if those water bodies are revived.

You also mention in your book that because water is seen as a free resource we tend to denigrate it. How can we change this attitude?

I wouldn't say denigrate, but we don't manage it correctly because we feel it's free. And that is sad because India's water resources are crying out to be better managed. The question is: how do we get people to do this?

First — and this harks back to colonial times — we think of water as something to be managed by the government, and through policy. That's unlikely to work. The moment you think of water as your problem, you will solve it. That's what happened with my family. We ran out of water at our home in Madurai in 2013. Since nobody was coming to help, we figured out a solution ourselves.

It's only when we started paying for water that it became visible. Until then we had no clue how or where we were using it, or why we had run out of it. We managed to fix our water scarcity by 2015 and in 2017, when Madurai experienced its worst drought in 140 years, we were the only household there with no need to buy water. We felt water was our responsibility and we managed it.

“[Delhi] used to have more than a thousand water bodies; many of them have either been encroached upon or are in terrible shape.”



Ms Ramesh, seen at a water treatment facility, says we have all the technology needed to solve our water problems

Second, the change in philosophy needs to come through a mass movement, not just by demanding government policies and action. We've been looking to the government for a solution for long; it's time to try something different now.

In the same way, how do we get farmers to cultivate water-appropriate crops?

If you want farmers to change their crop, you will have to create a demand. People are talking about millets now and that frightens me, because millets don't have the kind of yield required and many millets have a higher water footprint than even paddy. The trick is to engineer millets to deliver higher yields without sacrificing their climate and water resilience.

I invest in climate tech startups and one of them works with farmers in Punjab to manage their water resources better and increase their yield. They have offered to facilitate a 'sustainability tag' for the paddy the farmers grow. When this paddy is exported with this tag, it will fetch more money.

How can we harness technology to solve our water problems?

Technology is not the bottleneck; we have everything technologically required to solve our water problems. But as long as there is no incentive to conserve water, it will not happen. Technology is the cart. You need to put the horse – the incentives – before it.

All this technology comes for a ridiculously small amount of money. We use things like float walls to prevent overflows. We use drip irrigation in the farms, and we also have someone monitoring the lines to check for leaks.

My favourite is sewage treatment. Done right, it's like having the Brahmastra [the supernatural weapon from Indian mythology] in our back pocket, the perfect vaccination for India's water volatility. Sewage is not seasonal; it's available every day.

If you ask me to bet on one technology, I'd go with the system of cascading tanks, which is an ancient form of technology that we have. Alongside sewage treatment, it's entirely suited to manage India's water.

Money is not a bottleneck either, to build water resilience. You have hundreds of thousands of crores being spent on water in India and that's mainly on borewells and tankers. If that money was poured into decentralised sewage treatment or analytic sensors, we could be more water secure. I think the bottleneck is incentives.

What remedial measures would you suggest to protect our water?

First, we have to think of water as our collective problem, not wait for policy or government action to solve it. It must also be decentralised. Second, adopt the nearest lake. You are its community; the moment you and others in the neighbourhood behave that way, you can make it healthy again. Third, treat and reuse your sewage. You don't have to use it for drinking water but you can use it to flush your toilets or in the garden. ■



PI Pawar, a farmer from Hadgaon village in Maharashtra's Parbhani district, with his harvest-ready onion crop

Field day for data

Peek Pahani, the age-old practice of revenue officials visiting farmers to record information on crops grown, has taken a digital turn for the better in Maharashtra

Every year during the sowing and harvest seasons, Vishnu Sonavne would trudge nearly 30km a week on foot from one village to another to carry out an important, if cumbersome, task – the collection of farming data in the old-fashioned way.

Mr Sonavne is a *talathi* (village revenue officer) in Maharashtra's Aurangabad district and his job entailed physically observing and recording the crops sown by each farmer on his list. The data he gathered would then become part of India's massive crop-reporting exercise, which informs the agricultural economy as to how many farmers are growing which crop and how much of it.

"Irrespective of the weather, I would walk for hours on end to cover all the survey numbers for crop reporting," says Mr Sonavne. That changed in 2020 when the archaic, and often inefficient, practice known in Marathi as *peek pahani* (or crop survey) was digitised for the Maharashtra government by the data-driven governance team of the Tata Trusts. The result – a first-of-its-kind mobile app called E-Peek Pahani (EPP).

Started as a pilot in nine *talukas* (administrative divisions) in eight districts, EPP is now being used in all of Maharashtra's 43,000 villages (this after it was launched across the state in August 2021). Farmers are now self-reporting their



A training session for agriculture assistants and other village-level government officials in Phulambri in the Aurangabad district of Maharashtra

Clear-cut evidence

A unique feature of the E-Peek Pahani mobile application is its geotagging feature. This does away with the need for manual checking by the village revenue officer. The advantages here are multifold.

Geotagging cannot be falsified because there is pictorial proof, with locations embedded in the photos submitted. These meet the requirements of various government departments, be it agriculture, irrigation or horticulture. Down the line, buyers such as sugarcane cooperatives also get accurate data as well as prior information about crop volumes.

“With this technology, farmers have bypassed the middleman and become the central stakeholder,” says Sachin Ralhan, a programme manager with the Tata Trusts.

In times of natural calamity, the farmer can tag the photos of the damaged crop and it serves as testimony for verification (previously done physically by a government official). “Having pictures is also helpful when farmers have to connect in real time with the state government’s helplines,” adds Mr Ralhan. ■

crops and farm infrastructure through the app, which has a feature that enables uploading of geotagged photos of what is being grown.

The data is analysed at an EPP lab set up in Mumbai by the Trusts, and the reports generated go to government officials for due diligence and record keeping. “I now have all the crop reports with proof on my computer, and I don’t have to walk a single step for it,” says Mr Sonavne.

A hit with farmers

The farmers being surveyed are happy, too. One of the beneficiaries is Laxman Deshmukh, a farmer from Mohadi village in Nashik district. He has been using the app to log sowing, planting, irrigation and other data during the *kharij* (monsoon) and *rabi* (winter) seasons. “It saves a lot of time and results in accurate, photo-assisted recording of the sown crops,” he says.

The EPP app has brought reliability and efficiency to Maharashtra’s agricultural reporting mechanism, and has delivered unexpected benefits as well. One is capturing data on many more crop varieties. Manually collected data was limited to fewer than 30 crop varieties. The app has removed that constraint. Today, farmers are reporting more than 200 varieties of produce, including ‘foreign’ produce such as broccoli and Chinese cabbage.

The mentor behind the EPP project is Jayant Kumar Banthia, a retired bureaucrat who was India’s census commissioner from 1999 to 2004. Dr Banthia is no stranger to the challenges of collecting and crunching large data sets. He says that EPP was created to address the biggest pain point of the previous system: accuracy.

“Crop data in India is so dynamic that the government is incapable of collecting it without the farmer’s help,” he says. “EPP addresses this gap by allowing users to share information, and that has been a big win.”

The lack of timely and high-quality data on farm output has long been a bugbear for economists and policymakers across India. In many parts of the country, village revenue officers make the rounds of farmers' fields three times a year to take stock of what they are growing. Besides being unreliable and time-consuming, the process also causes delays in reporting. This renders the exercise highly inept, often bordering on meaningless.

Dr Banthia highlights how the lack of dynamic and real-time recording of crop data has hit Indian farmers hardest. One of the biggest challenges facing farmers is getting compensated by the government for crop losses. "This reporting system was begging to be digitised. Farmers cannot wait for years before being made good for their crop losses," he says.

The EPP project began in 2018 after the Trusts got the go-ahead from the state government's revenue department to implement what is a unique self-reporting programme for farmers. Nine *talukas* were brought under the digital umbrella and the app itself was built by a third-party vendor to specifications provided by the Trusts.

Leap of faith

Building the app required a leap of faith. Using crowdsourcing as a means of data collection and making the farmer the central stakeholder in the process of crop reporting was a huge step. This had never before been attempted in India and success could not have been achieved without the full support of the government machinery.

According to Sachin Ralhan, a programme manager with the Trusts, the ingenuity of EPP was not so much the technology but the strategy powering it. "Establishing ownership with the state government right from the beginning has been a major reason for the scaling up and sustainability of the EPP effort," he says.



A farmer at work in Phulambri, where use of the EPP app is widespread

The Trusts started with small steps. Karanjpada and Hamrapur, two villages in Maharashtra's Palghar district, were chosen to test the app and programme design. The participants included farmers and *talathis*. A dedicated EPP helpline was set up to assist users.

A crucial need from the technology was that it had to be easily usable by farmers. The EPP app was modified during testing to ensure that farmers with little tech knowledge would be able to handle it. This was done by ensuring that the farmer has to do close to zero typing, and that the language input is limited to simple Marathi.

Farmers caught on quickly. "Before we knew it, they became savvy with their reporting," says Mr Ralhan. Instrumental in the initiative taking off was the smartphone. Most of the farmers involved already had one, those who didn't managed the task with a friend's phone.



This farmer in Phulambri in Aurangabad district has installed shade nets to protect his plants

The technology used in the app cuts the time taken to process data from years to just days. One example is the GIS (geographic information system) tool embedded in the app. This enables farmers to geotag their crops, making the data authentic and real time enough for a quick response by authorities where required (see *Clear-cut evidence* on page 36).

The EPP app delivers other benefits for farmers. It helps tracks market trends and tells farmers which crops they can plant in order to connect directly with the market and get the best possible price for their produce. For instance, in Undangav village in Aurangabad's Sillod taluka, some 250 farmers have used the app to sell maize at purchase centres where the authorised price support system is in place.

Claiming compensation

Another standout feature of EPP is that farmers who lose crops to unseasonal rains and for other reasons can register the damage by taking photos through the app. Nagorao Kadam of Mudkhed in Nanded district says that farmers are now getting compensated by the government more swiftly for crop damage. "I hope more farmers are able to use EPP in the future," he says.

For the EPP team, the project has led to unexpected insights. As farmers began using the app, more 'unusual' produce

began to feature in the list. "Farmers are no longer dependent only on traditional crops," says Dr Banthia. "They are growing cherry tomatoes, dragon fruit and exotic grapes because these fetch better prices in the market. It was only when the team saw those pictures that they realised the precise source of the exotic vegetables sold in urban centres such as Mumbai and Pune."

EPP's robust success is the reason why the Maharashtra government has expanded usage of the app to cover the entire state. Other states are making enquiries that suggests EPP is poised to go places. An important factor driving the attraction is the app's scalability.

EPP is modular and has the ability to fit into any governance system. It can be linked, for example, to various government schemes, to insurance providers and to sellers of seeds and fertilisers. By eliminating conventional intermediaries – brokers or tradespeople who take a major chunk of the profit – farmers can sell directly to the market and get better prices.

EPP serves as a model for data-driven governance and systems reengineering programmes across the world. By replacing an antediluvian crop-reporting system, the EPP project holds out promise for what has seemed like a ghost for long – the revival of India's farm sector. ■

By Kalpana Shah



An all-woman batch of 20 electrician trainees from an ITI in Thane, Maharashtra during a single-day industry exposure programme

Careers calling

A vocational skilling programme with a German connection is enabling young and able jobseekers to make a smoother transition from classroom to shop floor

Unlike so many of his age group, 23-year-old Mohammed Shakeel has a career path mapped out. An electrician by training, Mr Shakeel works as a technician with the Bihar State Electricity Board and has recently cleared an exam that will certify him for employment as a junior engineer. It's a dream career, says Mr Shakeel, and he owes it all to the training he has received.

Mr Shakeel has been skilled through the 'dual vocational education training' (Dual VET) programme, a joint effort by Tata Strive, which operates under the aegis of the Tata Trusts, and Siemens to provide technical education to young jobseekers in five Indian states. There is no understating the need for such initiatives at a time when unemployment numbers are rocketing.

India's education system is often disconnected from the realities of the job market. Dual VET aims to bridge the

chasm by bringing a higher order of industry-aligned skilling to prospective employees. 'Dual' here refers to the blend of practical and theoretical learning that makes the initiative effective in meeting industry needs.

"The programme introduced us to modern machines and the systems used by industries. This made us more confident as jobseekers," says Mr Shakeel, who came through a Dual VET course conducted at an Industrial Training Institute (ITI) in Harinagar, New Delhi.

India has a vast network of ITIs, with around 15,000 government-run and private institutes teaching trades such as electrical, welding, fitting and machining. However, the system has atrophied over time, with outdated teaching methods and inadequate importance being given to training in industry settings.

Tata Strive, with help from Siemens, is



Sunitha, an electrical trade student from a Mumbai-based ITI, does her in-plant training at a control panel manufacturing firm based in the city

Spark and spunk

Shivangi Gupta was the only woman electrician-in-training at her Industrial Training Institute in Narela, New Delhi. That was not much of a hurdle for this young and ambitious woman, who has progressed to joining the public sector Bharat Petroleum Corporation in her native city as an apprentice technician.

Ms Gupta's job has helped her parents reconcile with the fact that their daughter wanted to work in a male-dominated space. The lady herself credits the Dual VET programme with giving her much-needed industry exposure and the confidence to perform well on the shop floor.

Ms Gupta learned the technician trade in the classroom and from training stints at different industrial units. "The in-plant training I received has enabled me to learn about what industry expects of people like us and it has also prepared me to handle projects independently," she says. "Dual VET creates well-rounded professionals who are welcomed by industries."

The experience has boosted her confidence. Ms Gupta now aims to clear the Graduate Aptitude Test in Engineering (GATE) and become an electrical engineer. "There are very few women in technical fields and I feel happy about setting an example for others." ■

using Dual VET as a vehicle to revamp pedagogies and practices at 196 government-run ITIs across India. Nearly 44,000 youth have passed through the programme – currently operational in Delhi, Maharashtra, West Bengal, Gujarat and Punjab – since its launch in 2017.

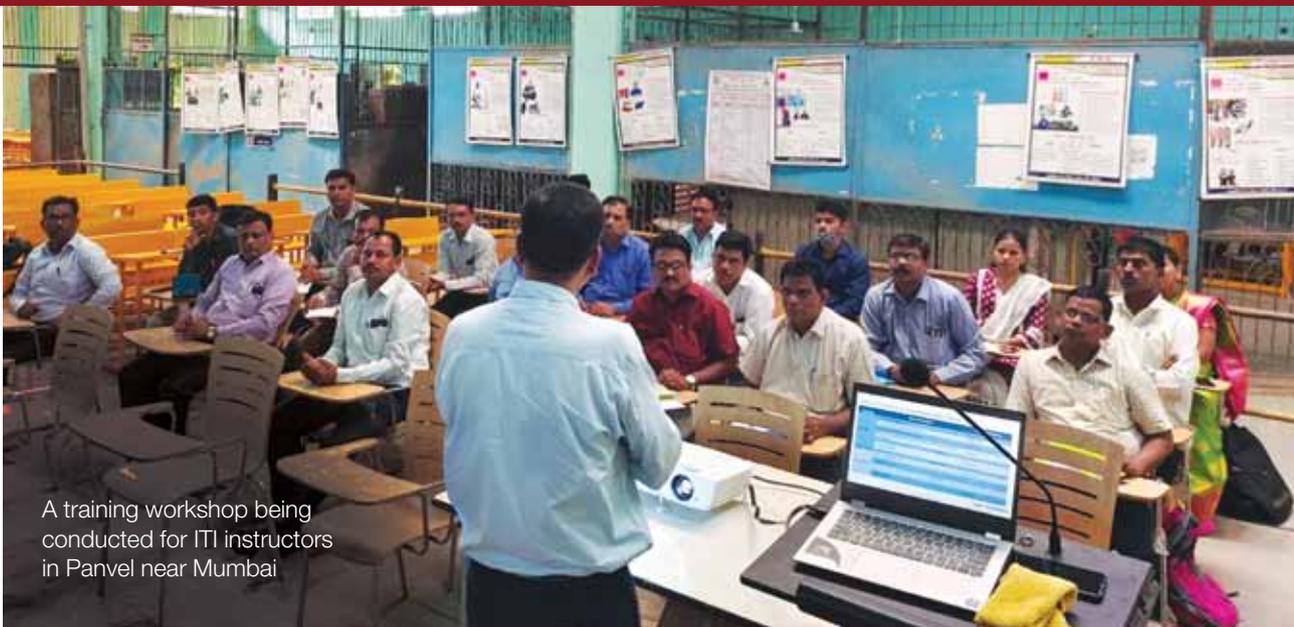
What makes Dual VET stand apart in the skilling sector is that it enables students to gain valuable experience through 30-60 days of hands-on training every year on the shop floor. This 'industry connect' facet is vital, given that it addresses the unemployability crisis at ITIs while creating a pipeline of skilled workers for micro, small and medium industries (better known as MSMEs).

Stronger together

To strengthen the link between workplace and workforce, Tata Strive has signed up with more than 1,500 industry partners. A third of these have started accepting Dual VET students and some 2,800 candidates have undergone in-plant training as a result.

Dual VET got off the ground in 2015 following a meeting in Germany between representatives of Tata Sons and Siemens. An agreement was reached on bringing the German model of Dual VET, which has a tried-and-tested framework, to the country. The partnership was a good fit, with Siemens bringing its rich experience of the German skilling model and Tata Strive complementing this with its aspirations of reimagining vocational education in India.

As a first step, Siemens set up a technical academy – a lighthouse centre as it was called – in Mumbai in 2016 to train candidates in-house. But a single centre was never going to be enough. The Tata Strive-Siemens team realised that a multiplier effect could be fashioned by tapping into and upgrading the ITI ecosystem. That vision triggered the public-private partnership model that now



A training workshop being conducted for ITI instructors in Panvel near Mumbai

SKILLING THEM SOFTLY

The Dual VET programme is operational in five states – Delhi, Maharashtra, West Bengal, Punjab and Gujarat – and it has notched up impressive numbers:

43,670

trainees covered by the programme

196

ITIs currently involved

1,514

ITI instructors covered

2,800+

students who have completed in-plant training

1,525

industry partners

powers the programme.

To make the partnership work, Tata Strive ensured that the training prototype fitted in seamlessly with the ITI course framework prescribed by the central government. This made it easier for students as well as instructors to adopt it. “We are innovatively disrupting the technical education system in India, but without creating any upheavals in the system itself,” explains Anita Rajan, the chief executive of Tata Strive.

“Working with the ITIs helped us scale up the concept and contribute to the Indian government’s ‘Skill India’ and ‘Make in India’ programmes in a significant way,” adds Manmohan Koranga, head of the Siemens Technical Academy, while underlining the value of the collaboration.

The Dual VET mission has not been easy to accomplish. Most ITIs are riddled with inefficiencies. Quality instructors, machine tools, computer infrastructure and safety equipment are often unavailable

and there is little knowledge-sharing between faculty and industry. ITI students receive scant support to secure apprenticeships, which impacts their job-readiness upon graduation.

To get around these challenges, the Dual VET team decided to tie up with state governments. In 2016, the team signed a memorandum of understanding (MoU) with the Delhi government, making it the first state to come on board. Similar MoUs were signed with Maharashtra in 2018, West Bengal and Gujarat in 2019 and with Punjab in 2021.

Having the state governments as stakeholders has proved useful in ironing out operational wrinkles. “Often, even senior officials are unaware that certain infrastructure, tools or safety equipment are defunct or missing,” says Ms Rajan, “We inform them of these gaps and ensure that the ITIs meet the prescribed standards.”

Another issue that needed tackling



ITI students get a feel of what the job entails

was the upskilling of instructors, many of whom were reluctant to deviate from the prescribed curriculum. It was crucial to get them to believe in the Dual VET idea and the team responded by focusing on training them in the new pedagogy as well as in safety aspects.

The pedagogical pivots were the introduction of inquiry- and project-based learning (IBL and PBL). These methods, previously unheard of at ITIs, meant students would learn through questioning and having to find their own answers.

Debdas Maji, a fitter instructor at an ITI in Durgapur, West Bengal, says that students, especially the less confident or motivated ones, learn faster through IBL and PBL. “Rather than give them the answer, we ask them to do their own research,” he says. “And very often they are able to come up with the right answers.”

The Tata Strive team also worked to strengthen the industry connect part of the

equation. The team has established relationships with local industries so that students can experience learning in real-life situations. Instructors are encouraged to visit industrial units to keep abreast of the latest developments and to get feedback from students working at plants.

Top of the class

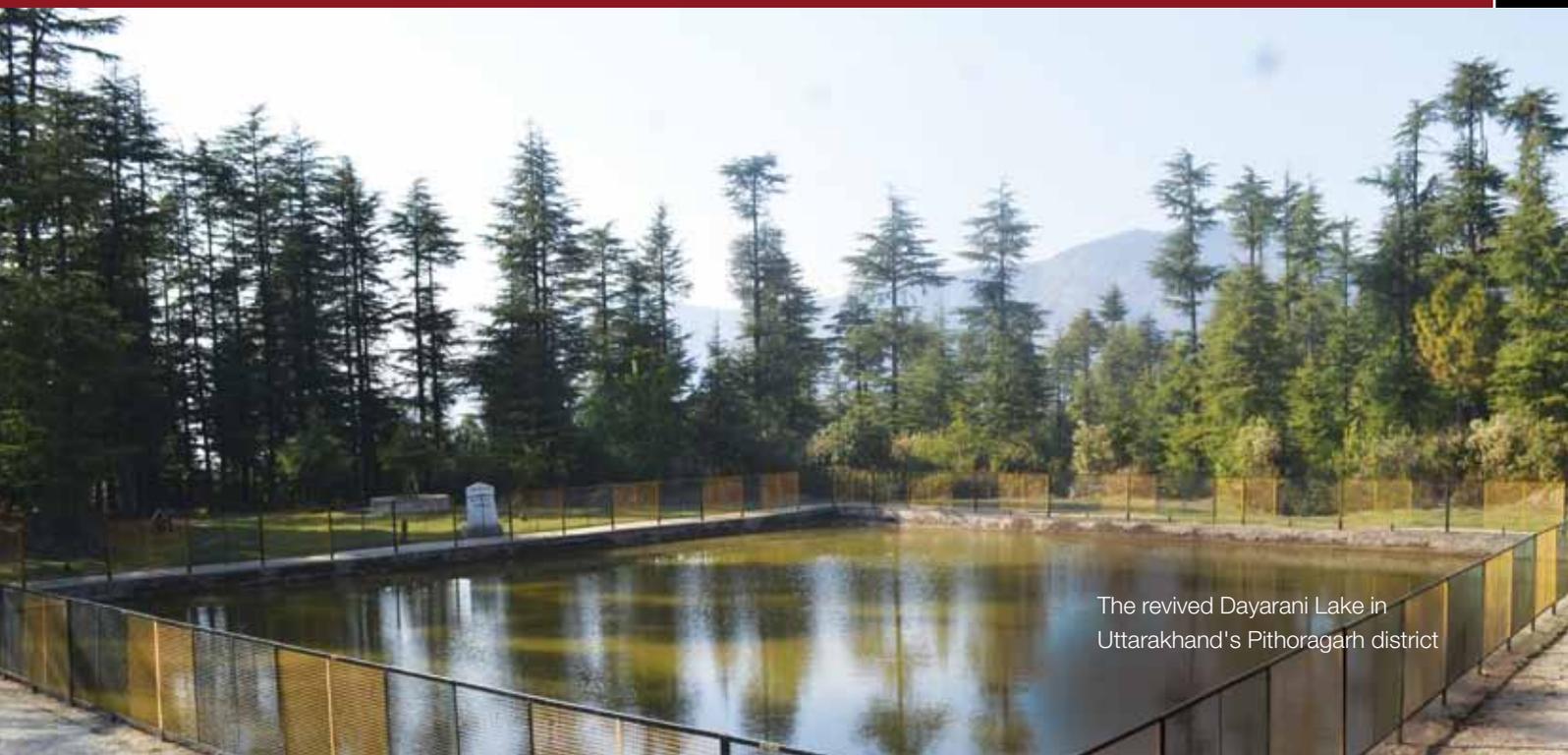
Delhi and Maharashtra have recorded the biggest success stories when it comes to in-plant training sessions under Dual VET, while pedagogical training has been the focus in West Bengal, Gujarat and Punjab. Delhi alone accounts for more than 2,000 in-plant trainings (out of 2,800). The high numbers are because the state government has invested in procuring safety equipment and insurance for ITI students.

Dual VET has found acceptance from beyond the student community. Yogesh Patil, joint director of Maharashtra’s Directorate of Vocational Education and Training, says that there is a sea change in the way organisations respond to ITI candidates. “Earlier, they were hesitant to let inexperienced students operate costly equipment,” he says, “but now these very industries are coming forward and asking for more trainees.”

Tata Strive aims to take the Dual VET programme to other states as well (agreements are about to be inked with three more government partners: Uttarakhand, Jharkhand and Kerala). And while challenges remain — infrastructure, safety and red tape — the Tata Strive-Siemens team remains confident about realising its objectives.

“There was an urgent need for a mindset change at all levels, from government leaders to ITI faculty. Triggering that change has been our greatest achievement,” says Ms Rajan. ■

By Nikhil Menon



The revived Dayarani Lake in Uttarakhand's Pithoragarh district

No more dry days

The restoration of a once-parched Himalayan lake has been a blessing for the community and the ecosystem

Indra Verma cannot forget the time when Dayarani Lake, the water body that used to sustain life in her community, dried up. “We lived on this water from the hills for generations, and then it disappeared,” says the 70-year-old from Basai Talli, a remote village in Uttarakhand’s Pithoragarh district. “We women had to bear the brunt of the loss, because we were the ones forced to walk long distances to fetch water for our homes.”

That painful memory may linger but Ms Verma has plenty to feel happy about following the return to good health of Dayarani Lake, an invaluable source of water that sits pretty at about 1,800m above sea level close to Uparara village. Dayarani, which means ‘puddle in the middle of a *deodar* [Himalayan cedar] forest’ in the Kumaoni dialect, is more than puddle, of course, given that it feeds the mountain springs that are the primary

source of water for rural households in the surrounding areas.

The galvanising force behind Dayarani’s revival is the Himmotthan Society, an associate organisation of the Tata Trusts, which brought together government departments, geo-hydrologists and local communities in a collaborative project to recharge the lake and the natural water bodies around it. The outcome of the effort has been remarkable. “There is no shortage of water here now even during the summer months,” says 25-year-old Deena Devi from Basai Malli village.

Despite their critical role in supporting human habitations, Uttarakhand’s mountain springs — the source for more than 90% of the state’s rural water supply — are in grave danger. A 2018 report by NITI Aayog, the Indian government think tank, states that up to 60% of the Himalayan region’s springs have dried up or are drying up. The root problems are



Springs fed by Dayarani lake are in better health thanks to improved springshed management practices

Springtide story

Uttarakhand has more than 20,000 natural springs spread across its 10 hill districts. Many mighty rivers that flow across North India, including the Ganga and the Yamuna, originate here, yet the mountainous regions of the state face an acute scarcity of water.

“*Roti, kapda aur makaan* (food, clothing and shelter) are the primary struggles of life across rural India. Here in Uttarakhand, *paani* (water) has been added to the list,” says Vinod Kothari, a manager at the Tata Trusts and theme lead for the water portfolio with Himmotthan. The Himmotthan Society has since its setting up in 2001 been working overtime to ease this water burden.

Himmotthan’s projects and programmes aim to address the root causes of underdevelopment and enhance the quality of life of rural communities in Uttarakhand through self-sustained community institutions and livelihood interventions. Water supply, sanitation and hygiene form an important thematic area in the blend of social development initiatives the organisation has fostered.

Springshed management projects by Himmotthan are being implemented in six districts of Uttarakhand and there are plans to extend these across the state. A spectrum of projects, from rainwater harvesting to recharging water tables, is being undertaken and about 300 springs in the hill regions of Tehri Garhwal and Pithoragarh are part of the effort.

The resulting benefits are clear to see. Data collected by Himmotthan reveals that water levels have increased in its project areas and springs have regained their natural flow. In Gangolihat in Pithoragarh district, for instance, water discharge from springs during the peak of summer has increased by 48%. In all, Himmotthan has promoted some 270 water schemes over three phases from 2002, reaching more than 30,000 households and 150,000-plus people. ■

change in land-use patterns, the increasing demand for water, monsoon variations and deforestation.

The denuding of forests has had a calamitous effect on Uttarakhand’s rural economy and its ecological well-being. Forest watersheds provide 75% of freshwater for human consumption in the state. They act as sponges that hold rainwater before releasing it slowly. In addition, the trees and ground vegetation in forest ecosystems help stabilise the soil and prevent erosion, which in turn helps reduce the pollution caused by sedimentation in streams, rivers and lakes.

“Rampant development, declining green cover and increased land use are depleting Uttarakhand’s natural water resources,” explains Vinod Kothari, a manager at the Tata Trusts and theme lead for the water portfolio with Himmotthan. “Perennial springs are becoming seasonal and seasonal ones are becoming inactive. This has serious repercussions for people.”

The drying up of Dayarani Lake is an example of the fallout and it led to the district administration seeking the services of Himmotthan for a remedy. Science and technology were crucial tools as the Himmotthan team took up the lake revitalisation programme in 2017. A survey was conducted and a report prepared. Alongside, a committee comprising representatives from the government, Himmotthan and village communities was formed to supervise activities.

Scientific springshed management practices were adopted to improve a catchment area spread over 6 hectares. Artificial recharge techniques were used; staggered contoured trenches (SCT), percolation ponds and recharge pits were constructed to reduce runoff and increase infiltration; the drainage system was channelised; artificial drainage lines were developed to divert the precious liquid (or use overflow) to the lake; and Napier grass, fodder and fuelwood trees were planted to reduce soil erosion.

Complications aplenty

The implementation team had to find solutions beyond the hydrogeological. Springshed management was new to the region's villagers and they had apprehensions. There were bureaucratic hurdles to be overcome as well. The catchment area was spread across two village councils, Jajoli and Uprada, and both had to work in sync. Another complication was the lack of data on springs and spring-fed systems.

A year of concerted endeavour, commitment to the cause and the experience of implementing similar projects in other parts of Uttarakhand helped the Himmatthan team make a success of the Dayarani Lake project. The average discharge during the lean season (April-June) in Basai Talli and Basai Malli, the villages nearest the lake, rose to 6 lpm (litres per minute) from 1.5 lpm before the intervention. Also, there has been a significant increase in water discharge from springs in downstream villages.

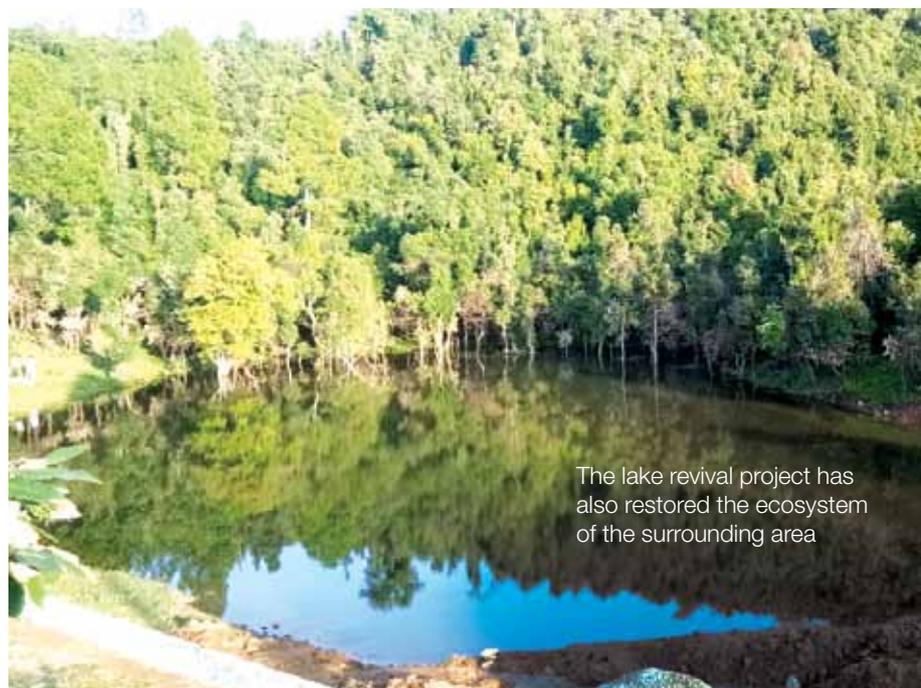
Besides easing water shortage, the lake revival project has had other benefits. The spring recharge areas are now free of open defecation and this has not only improved water quality, but also had a positive impact on community hygiene habits. The team has, additionally, trained a cadre of

village-based workers to manage post-recharge activities and build capacity in the community.

The lake project has provided a template for springshed management initiatives across Uttarakhand and the state government has stepped on the gas to back similar efforts. It has established a spring management consortium that has taken the lead in reviving more than 150 springs. Meanwhile, Himmatthan has expanded its springshed management programme in different parts of Uttarakhand.

As for Dayarani Lake itself, the land encircling it has turned into a green oasis. The biggest benefits have, naturally enough, accrued to the women in the project villages. "Earlier, much of our work at home used to remain unfinished because we had to spend hours every day fetching water," says Ms Verma. "Now it takes just 10-15 minutes." Aside from the drudgery of finding and getting water, there have been other positives. "Our health has improved and our children are studying better," adds Shobhit Kumar of Basai Malli. ■

By Samod Sarngan



The lake revival project has also restored the ecosystem of the surrounding area

Commons cause

Enabling rural communities to access shared natural resources is the objective of a remarkable endeavour that has reached 25 million people in 13 states

Kundanali village in Odisha's Angul district nestles in a forested stretch between the Panchadhara hill range and the Mahanadi river. With fertile soil and green vistas, this is a place that oozes idyllic charm. There was a problem, though, with the picture-perfect setting — Kundanali once had to battle a crippling water crisis.

Local farmers, struggling with limited access to groundwater and a 2-km walk to the river to otherwise find the prized liquid, found it difficult to irrigate their land. "We dug some tube wells but nothing worked," says Niranjan Hota, a villager.

The obvious solution would have been to construct rainwater reservoirs or ponds on the community's shared lands. But in rural India, ideas like these are often

nonstarters because most villagers do not have legal rights over what is called 'commons', a term that refers to the natural resources — forests, pastures, rivers and other water bodies — adjoining their lands.

India's commons cover about 205 million acres and sustain around 350 million people with fodder, fuel, forest produce, fish, bamboo and much more. Lack of clarity on the ownership of these commons has led to the tragic neglect of resources that are vital to communities.

Worse still, these resources are easy targets for illegal appropriation and exploitation, including land grab, theft of timber and poaching. They are also vulnerable to calamities such as landslides and forest fires.

When it comes to water in unprotected



By restoring their commons, these villagers of Khakhra Khuna near Udaipur in Rajasthan have sufficient fodder for their cattle, enabling them to increase their herd size and improve incomes



Parbati Hantal, president of an all-women farmer’s collective, speaks to her sisterhood in Dumuriguda village in Odisha’s Koraput district about soil health and its importance

CARING FOR SHARING

The Promise of the Commons initiative is being implemented in Andhra Pradesh, Gujarat, Himachal Pradesh, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Nagaland, Odisha, Rajasthan, Manipur, Meghalaya and Chhattisgarh. Here are some of the highlights from the programme:



12.52
million acres
common lands
conserved



24.8
million
lives impacted



41,880
village institutions
strengthened



30-50%
increase in
household
incomes



78%
increase in
double-crop area

commons, losses lead to falling agricultural yields and increased costs for farmers. This fuels distress migration, inequality and greater pressure on communities, especially women and marginalised sections.

Kundanali has been able to cope, even thrive, thanks to a programme that lives up to its name. Seeded and implemented by the Foundation for Ecological Security (FES), a Gujarat-based nonprofit that has been supported by the Tata Trusts since 2019, ‘Promise of the Commons’ aims to help villages become sustainable by securing tenure and improving governance of their shared resources.

In Kundanali, FES teamed up with villagers in 2020 to build four ponds on common lands. These ponds now meet the

needs of 1,200-plus people, enabling farmers here to grow two crops a year instead of just one. “Prosperity has come to our village as a result,” says Mr Hota.

Such welcome words are a booster for FES, which works for the restoration and conservation of land and water resources in ecologically fragile, degraded and marginalised regions of India through the collective efforts of village communities. Over the past few years, FES, along with more than 100 NGOs and in partnership with seven state governments, has helped conserve 12.5 million acres of commons across 13 states, cumulatively benefiting nearly 25 million people.

The commons issue is a colonial legacy. It was during the British era that the state



A 'community resource person' explains to villagers in Balikuma in Odisha's Dhenkanal district how to use a landscape assessment and restoration tool

began to exert its rights over India's common lands. Prejudice was at play here, beginning with the belief that rural communities were incapable of managing their commons. Unfortunately, this thinking — and the regulations born of it — continued after Independence.

The consequences have been ruinous for rural India, and directly responsible for a bunch of its ills. It has eroded the agency of village communities and institutions and has had deleterious effects on ecology, the economy and development planning.

Laws to the rescue

Change had to come and it duly did. From the 1990s onwards, laws supporting community-led restoration of commons were enacted, among them the Panchayati Raj Act, the Panchayat Extension to Scheduled Areas Act and the Forest Rights Act. The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) is another enabler in this context (through it around \$5 billion is spent annually on restoring natural resources).

In rural India, ecology, economy and community are interlinked and have to

necessarily be considered together. That explains FES' three-tier strategy: guiding communities through procedures to secure land rights; enabling collective action for responsible and inclusive resource management and governance; and unlocking access to public funds.

Getting all these pieces in place is far from easy, as is evident from FES' work in Mukundgarh, a village in Rajasthan's Bhilwara district. Among the difficulties faced by Mukundgarh's residents was the damage caused to their crops by stray cattle and *nilgai* (Asian antelope). The solution: develop common village and forest lands, about 70 hectares in all, into fodder-rich pastureland for strays and local animals.

The outcome was impressive. Crops suffered far less damage from foraging animals, groundwater levels improved thanks to the added green cover, and equitable rules governing the pasture's usage ensured that fodder from the commons was available even to the poorest cattle-owners. "Rich or poor, every villager could ask for their rights with confidence and dignity," says Durga Singh Saktawat, who worked with FES on the project.

Community rights are crucial in the context. FES strengthens the capacity of rural institutions like *gram panchayats* (village councils) and commons development committees to function in a democratic and transparent manner. It also negotiates for fair representation for women and marginalised and backward communities.

FES has raised a grassroots army of 1,100-plus community resource persons (CRPs) to conduct door-to-door surveys and inform community members about the importance of securing tenure over their commons. Nearly 40% of them are women.

Clarity on conservation

Urmila Behera from Kashinathpur in Angul is one such resource person. Before her training, Ms Behera understood little about the issues facing her hamlet of 150-odd residents. Today she deftly navigates forest roads on her bicycle, monitors well-water levels and tells people how to budget for water usage. “We explain that forests support our livelihoods and that is why communities must support conservation,” she says.

Says Asha Suthar, a resource person from Dolpura in Bhilwara, Rajasthan: “Earlier, four-five men from the village would convene meetings and decide everything. Now we have a few women showing up for these meetings. Many of them still hesitate to speak, but at least they are aware of the issues.”

By increasing representation and economic opportunities in rural households, Promise of the Commons has laid out a roadmap for the conservation and better governance of India’s shared resources. FES, for its part, aims to secure tenure over 30 million acres of commons and reach 38 million people. That should spur a groundswell of action to restore India’s commons to the its rightful owners – rural communities. ■

By Nikhil Menon



Community forest resource rights being explained to villagers in Hadagari in Dhenkanal district

Turning to tech

When FES’ teams and community workers have conversations with villagers about ecology, rights and livelihoods, they carry with them a suite of technology tools built in-house by the organisation’s India Observatory team.

Using public and private data sets, the team has built geospatial layers of 1,600-plus data sets. This makes it possible for communities and decision-makers to check ecological and socioeconomic data, from census and agriculture information, to rainfall, groundwater, schooling, health infrastructure and more. The insights thus gained inform the planning of commons restoration projects.

Take, for example, the ‘composite landscape assessment & restoration tool’ (CLART), which displays location-specific information about ground or surface water availability in a simple, colour-coded format that anyone can follow.

The ‘design estimate tool’, used in conjunction with CLART, helps prepare the proposed engineering blueprint as well as the cost and labour estimation for the project (for a pond or rainwater harvesting structure, for instance).

Another more-than-useful tool is the ‘groundwater monitoring tool’. This has been employed to measure and track pre- and post-monsoon water levels in 35,000 wells in different parts of India.

Says Ashok Jani, who heads India Observatory: “Our objective is to organise rural data into public assets that everyone – governments, NGOs and local communities – can use.” ■



Dulu and Marichabati Pidikaka of Dhobagudi village in Odisha's Rayagada district are among the farmers who have benefitted from the Agri-GIS app

Tech seeds change

Spatial analytics, geographic information systems and more are sowing progress for farmers in Odisha

For evidence that technology can be a potent tool in bettering the lives of India's disadvantaged, look no further than South Odisha, home to one of India's poorest communities and the setting for an Agri-GIS (geographic information system) application that is delivering in spades to farmers with small land holdings.

Take Bana Kumbruka, a 50-year-old marginal farmer from Pichiliguda village in South Odisha's Rayagada district. The agricultural advisories Mr Kumbruka gets on his smartphone have changed his life and future prospects. That's a far cry from what it used to be.

Until a few years ago, Mr Kumbruka struggled to make a living from his 1-acre plot and the story was similar for thousands of small farmers like him. High crop mortality, ignorance about scientific

farming techniques and fickle weather would conspire to undermine their labour. Countless farmers from across the backward and predominantly tribal districts of Odisha have had to, consequently, give up on agriculture and migrate to wherever they could find daily-wage work.

A silver lining in this dark cloud appeared in 2017 in South Odisha, a region comprising 10 districts, thanks to an initiative that enables farmers to improve their lives and livelihoods through the use of Agri-GIS, which basically is a suite of agriculture-related applications that rely on satellite imagery, spatial analytics and more to enhance farm-dependent incomes.

The Agri-GIS app has since its launch reached about 150,000 farmers from 532 villages in the Kalahandi, Kandhamal and Rayagada districts of South Odisha. It was

developed by the Bengaluru-based Centre for Spatial Analytics and Advanced GIS (C-SAG), a collaborative effort involving the Tata Trusts, the National Institute of Advanced Studies and the Bill and Melinda Gates Foundation.

C-SAG's larger goal is to increase farmer incomes while supporting the sustainability of small farmers. It generates advisories for farmers that are specific to their plot of land and the crops they grow. The Agri-GIS app is an example and it includes crop recommendations based on soil type, right time to sow, weather advisories and best practices in agriculture.

"Agri-GIS is about upping farmer incomes through cropping and allied agricultural activities," says Sneha Dicholkar, a programme manager with the Tata Trusts, "and it encourages them to adopt sustainable agriculture practices." Using digital technologies to accelerate social change is another objective here.

Putting the farmer at the centre of its data and analytics stack has been the key differentiator in the Agri-GIS programme. That means collating and analysing varied and voluminous data and aggregating them to create easily understood advisories.

Before the data and science could be put to beneficial use, the Tata Trusts team had a critical precursor to go through: getting farmers to listen and get on board. The implementation team invested plenty of time in educating villagers about the advantages of the app and its benefits.

Tracking and evaluating outcomes has been a priority for C-SAG. It established a feedback cycle in 2020 to understand the impact of Agri-GIS on the ground. The findings were more than encouraging.

From a sample size of 1,222 farmers, over 40% trusted Agri-GIS and adopted the crop recommendations, 98% accepted the weather advisories and cropping practice recommendations, and 88% saw a positive impact thanks to the advisories, either in terms of cost savings or better incomes.

The numbers are good news for C-SAG but the lives impacted are better still. "The advisories helped me improve my knowledge and have yielded promising results for me," says Dulu Pidikaka, a farmer from Dhobagudi village in Rayagada. "I have shifted to cultivating cowpeas, brinjal and chillies and the outcome has been good." ■

By Kalpana Shah



Farmers interact with the Agri-GIS team in a village in Rayagada district



A farmer collects a soil sample for lab analysis, information that will then be integrated into the Agri-GIS app

Simplifying the complex

There's a huge quantum of work that goes on at the back end in order to make information generated by the Agri-GIS app easily available and understood by farmers.

Information about crop status, land and water availability comes from a variety of satellites. Weather forecasts are assembled from different sources on a daily basis and shared with farmers as advisories. High-end image analytics deliver weekly water- and crop-status reports at the plot and village level. Advanced meteorological forecasts do a similar job with respect to the weather.

Suitability analyses determine the optimal crops for each plot of land, based on soil, climate, terrain conditions and the social and economic status of the farmer, while pinpointing best practices and recommendations for every plot and also for different stages of the farming cycle.

Beneficiary analytics forecasts what benefits, such as income or assets, a farmer can expect to receive. And market analyses recommend the best access pathways and pricing at different levels. All this is integrated into the final advisories that farmers receive on a daily basis.

Advanced data engineering principles are adopted to collate a geo-database that consists of 104-plus parameters. Some parameters are updated daily, some on a monthly basis and others less frequently. All of these form part of the massive geo-database for the 532 villages in the programme.

The datasets are designed in such a way that they can be disaggregated to create plot-specific information and spatially analyse this to generate advisories for each farmer. It can also be aggregated to generate quick policy dashboards at the village, subdistrict and district levels for governmental information requirements.

Agri-GIS relies on spatial analytics capabilities to reduce complex datasets to simple advisories. C-SAG uses various spatial analytics tools and combines them with machine learning and artificial intelligence tools to autonomously analyse and generate advisories.

The analyses generate insights about individual plots of land or a village and become part of the intelligence that Agri-GIS employs to conduct future studies.

A suite of 16 apps has been developed to serve different Agri-GIS requirements for field and for backend operations. For instance, farmers can use the plot-level soil sample app, the crop mapper app, the facilities mapper app and various dashboards to access and update critical crop data. Government agencies can use the Agri-GIS portal to access the data of any specific plot.

Clearly, Agri-GIS can create a wave of technology-supported agriculture in the country. "It has shown an end-to-end capability in this regard," says Mukund Rao, chief executive of the Bengaluru-based Centre for Spatial Analytics and Advanced GIS. ■



A sunny stage for storytellers

It's called the Big Little Book Award (BLBA) and the big and the little of the name complement each other. Launched in 2016 to recognise and reward writers and illustrators of children's books in different Indian languages, BLBA is a first-of-its-kind accolade for storytellers creating outstanding literature for kids and young adults (and the not-so-young too).

BLBA was instituted by the Parag Initiative, which is part of the education portfolio of the Tata Trusts. Parag's focus is children's literature and it has a three-pronged model — sourcing, publishing and dissemination — to enable and encourage the reading habit among those in the 3-to-16 age group. Towards this end, the Initiative has supported the publishing of books in multiple Indian languages, promoted talented authors and illustrators and set up school and community libraries, some of them mobile, in underserved regions across India.

The BLBA effort is an important component of the work that Parag does and its greatest value lies in the boost it has given to children's literature in the country and to storytellers with remarkable talent. **S Sivasadas** and **Deepa Balsavar**, both BLBA winners in 2021, are standout examples. Prof Sivasadas is an octogenarian writer from Kottayam, Kerala, who pioneered children's science writing in Malayalam, while the Mumbai-based Ms Balsavar is a writer, illustrator and educationist.

‘Every child is a wonder of creation’

Winning the Big Little Book Award 2021 was another well-deserved accolade for **S Sivadas**, a wellspring of creativity who has authored more than 200 books in a writing career stretching over six decades. Writing was not originally part of the plan for this college chemistry professor based in Kottayam in Kerala, but he has stuck with it, and to great effect, since making a tentative debut with his first book back in 1973.

Prof Sivadas’s best-known work, *Vayichalum Vayichalum Theeratha Pusthakam* (the book that never ends) has been staple reading for generations of children and he is widely recognised in the world of Malayalam literature, and beyond, for his simplicity, sensitivity and quirky science-themed narratives, not to mention the range of topics he tackles. In this interview with Nikhil Menon, the prolific professor says that his mind continues to buzz with ideas, adding that his only concern is having enough time to cover them all. *Edited excerpts:*

What was it like for you when you became a writer?

Never did I even dream of being a writer; my goal was to become a scientist. I was brought up in a village, where I enjoyed a life immersed in nature, books and people from all walks of life. Reading from the book of nature helped me acquire knowledge, wisdom and the idea of simple living and great thinking. By the time I became a teacher, I was already a communicator with ideas and language.

A great social leader and communicator of that time, the late PT Bhaskara Panicker, chanced upon my talent and urged me to write science stories for *Eureka*, the children’s magazine of the Kerala Sasthra Sahitya Parishad [KSSP]. Even though the material for this was not available anywhere, I obeyed and embarked upon the journey. To my surprise, my first book received the Kerala Sahitya Academy Endowment Award in 1973 and after that I became an active writer for KSSP. It was a tricky circus act, but I juggled the roles of college lecturer, writer and head of my family.

“Each individual is endowed with immense potential, each one of us is a sleeping genius. So what’s there to writing 200 books in a lifetime?”



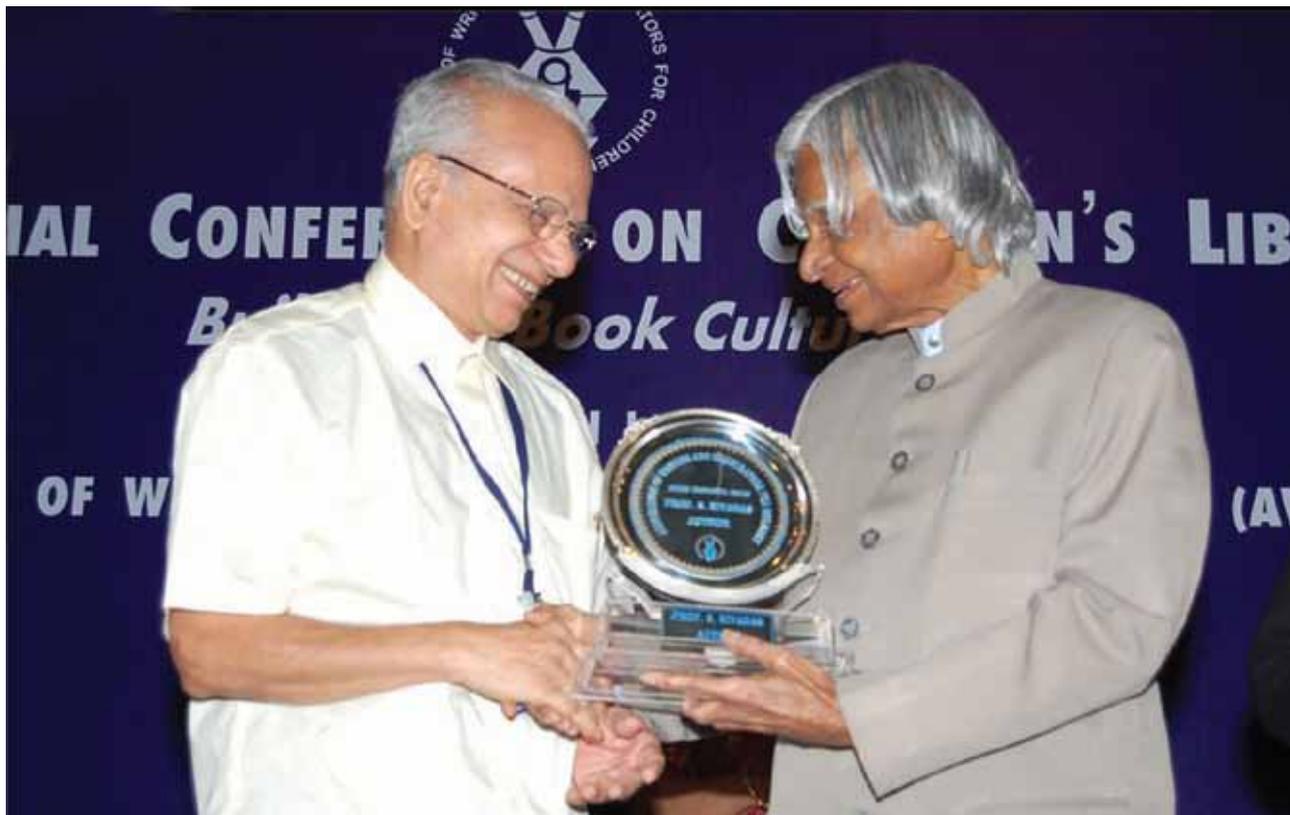
Later, I became the editor of *Eureka*. This allowed me to experiment with various writing formats, on the one hand, and to acquire knowledge on the other. Thus, my transformation into a fulltime writer was complete. In order to give children well-rounded knowledge, I began to write books on nature, ecology, science, mythology, religion and history. In fact, everything under (and above) the sun.

Is science underrepresented in children’s literature?

Children’s literature as a whole is underrepresented in India. Urgent steps have to be taken by all organisations, including the government, to give due importance to children’s literature, including science literature. In addition to good food, healthcare and education, it is imperative to provide children with good literature. Every child deserves to develop an ethical and scientific temperament and a feeling for culture and wisdom.

You have written more than 200 books. What keeps you so prolific as an author?

There’s nothing extraordinary about penning so many books if we realise



Prof Sivadas receives the Association of Writers and Illustrators for Children award from the late Indian president, APJ Abdul Kalam, in Delhi

that it is the result of using the wonderful human brain properly. The brain has about a hundred billion neurons. Each neuron is like a microcomputer, able to connect up to 10,000 other neurons at a time. The supercomputer that is the brain can pass as many as 1,000 trillion synapses, or signals, at a time. But we use only a very small percentage of the brain's capacity. Each individual is endowed with immense potential, each one of us is a sleeping genius. So what's there to writing 200 books in a lifetime?

Sensitivity towards nature is a consistent theme in your work. How can parents inculcate this in their children?

Nature is the most fragile, exquisite and delicate web of interrelated living and non-living things, and mother nature maintains an equilibrium for the well-being of all. We must expose children to nature and let them feel its warmth. Only when children experience and appreciate nature do they begin to love it and become responsible citizens committed to conservation.

Like any other value system that we desperately try to inculcate in children, parents are duty-bound to teach children to revere nature. And every writer, particularly writers of stories for children, should passionately work to ingrain a love of nature in children.

How do you go about selecting themes and weaving them into your books?

Sometimes themes flow in naturally and unexpectedly; at other times one selects them consciously. A writer must be like an alert detective, and

then themes will be revealed to them at any moment. Long ago, one early morning, I noticed a mother bird perched outside my window, rearing her young. That observation inspired me to write an eco-spirituality novel, *Keeyo Keeyo*, a reader favourite that won awards.

I like to write on all types of themes, from eco-spirituality to environmental degradation, motivational books, fun books, books on learning techniques and even 'modern' topics like nanoscience and Covid-19. The one thing I'm not worried about is running out of themes. When I began writing I did worry about that. But after writing all these, I have another grave concern: at 82, and left with so many themes, subjects and ideas to choose from, I'm afraid I may not be able to cover everything.

In your more recent work, do you see a greater skew towards themes such as climate change? What are you focused on these days?

Problems like climate change need to be addressed. In fact, I have written a novel based on the experiences of the devastating flood that hit Kerala in 2018 (*Snehappuzha*, or River of love). In it I highlighted not only the calamity but also the positive response from society in the aftermath, the social impact of community kitchens and relief camps, how differences of faith, culture, wealth and so on instantaneously vanished before the monster.

What must be done to strengthen and promote regional children's literature (and the reading habit) in India? And what role do initiatives like Parag play here?

India is a great country of diverse cultures, languages and religions. A majority of our people, including children, live in regions with a mix of cultures and languages. This reality makes it immediate, important and imperative to develop children's literature in regional languages. It's not an easy task, considering the vastness of our country and the different standards of living. Organisations like Parag, with their experience and networks, could bring in a lot of change in this area.

What, to you, is the significance of the Big Little Book Award?

Every prize is definitely uplifting for a writer. BLBA, the most significant such prize in India, is a recognition that every author dreams of. As a BLBA winner, I feel jubilant but humble, since it has bestowed on me the liability to prove that I am worthy of this recognition.

What is your message for school educators and children's writers?

Every child is a wonder of creation, a potential genius ready to open the petals of talent and bloom, to fill the world with fragrance. You are destined to do the divine task of transforming the child into a wonderful human being, capable of creating a brave new world. Devote your life to that great task. ■

“Only when children experience and appreciate nature do they begin to love it and become responsible citizens committed to conservation.”

‘Books should help children think openly’

Mumbai-based writer and illustrator **Deepa Balsavar**, a recipient of the Big Little Book Award, speaks to Labonita Ghosh about books and why they should, besides being fun to read, foster critical thinking in children. *Edited excerpts from the interview:*

The Parag Initiative endeavours to promote reading, particularly among first-time learners. What are the challenges involved in making this happen?

The challenge has always been with distribution and reaching children. We’re not talking about kids in the big cities who go to schools with well-funded libraries. We’re talking about children in smaller towns and villages who, traditionally, haven’t had access to books. That’s where organisations like Parag have an immensely important role to play – in making sure that more children have access, not just to school books but also books that are informative and fun to read.

It’s a challenge also because education seems to be extremely low in our list of priorities. India’s education budget has been falling every year; more is allocated to defence than education. In states such as Maharashtra, education is sometimes outsourced to private agencies because the government doesn’t see it as an imperative. That’s why others have to pick up the slack.

How do you inculcate the reading habit in children hooked to screens?

When parents pose this question, I ask them: how much time do you spend reading? Children imitate their parents. You can tell them repeatedly to read a book, but if they see you on your mobile phone or computer all day, those are the actions they will emulate.

Set an example for your children. Make reading a daily activity. If it’s a young child, read to her. If she’s older, take her to a bookshop. When we were young we had corner libraries but they were full of Western books, so we grew up on a cultural diet we knew little about. But that didn’t prevent us from enjoying those books. Today you have more options.

Schools have an important role in propagating a love for books. The library should be the centre of the school, and every subject taught or every project assigned should take the child back to the library. Kids don’t just

“When writing and illustrating myself, the process is simultaneous as I form pictures in my mind while writing, which complement or extend the story.”

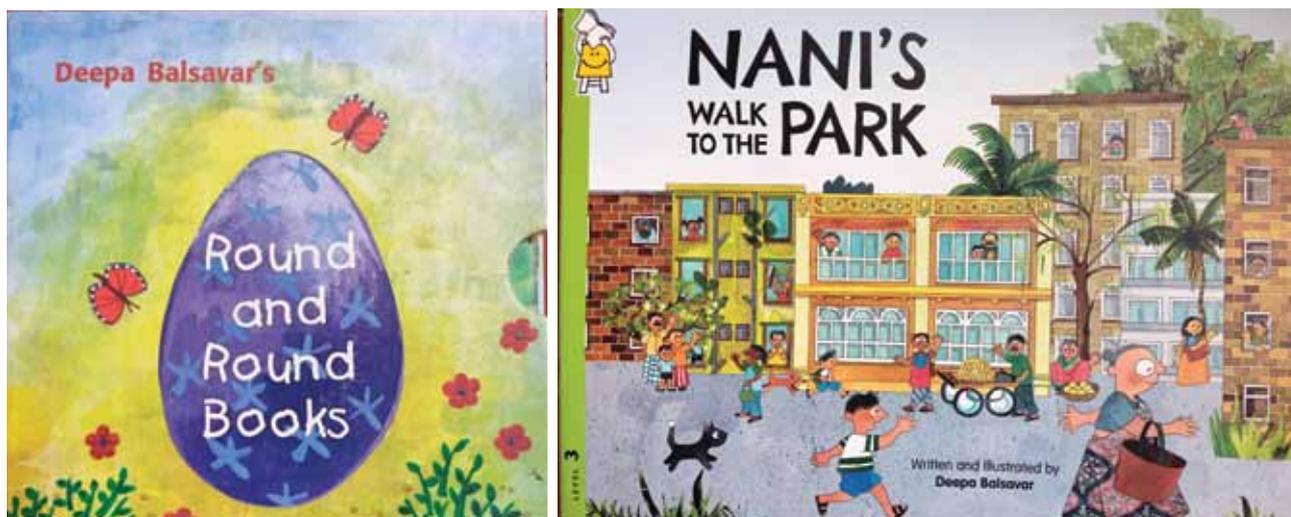


see libraries as a place to source information but as a place to meet new friends through the characters in books. A library should be a place of joy and teachers should also treat it as such.

What about kids from disadvantaged backgrounds and those who have these facilities but are not using them?

There are two wonderful examples in Mumbai. In Ghatkopar there is an organisation called Sahyog Roshan Library which began a community library in a place where children had no access to books. It was run by people from the community who had done a library teachers' course. Every session for the kids began with a discussion about maps or a treasure hunt. The library was a safe and happy place for them.

When the pandemic hit, the organisation trained some mothers in the community to run small libraries from their homes. They gave them books



and shared ideas on how to initiate discussions with the children. Crucially, since there was no monetary incentive, every mother who volunteered did so because she felt it was important. Those little home libraries catered to all the children in the vicinity and their mothers, too, got introduced to the joy of reading, many of them for the first time.

At the other end of the spectrum, in Bandra, is a small library called MCubed. The space is open to children of the area to experience the joy of going to a neighbourhood library. They also have programmes inviting authors, dramatists, theatre people, illustrators and many others to come and talk, tell stories and conduct workshops, for children as well as adults.

Parag encourages illustrations that fight gender and caste stereotypes. As an illustrator, how do you feel about this?

My process of illustration is something I call 'conscious drawing'. I draw the people that I see around me and they are of all sorts, from different communities, engaged in different kinds of jobs, dressed in different ways and such. I don't only draw people who are like me. It's tricky because I don't want to introduce a 'token' person from a particular community, somebody with a disability, for instance. They should be a part of the story. If they fall organically into the narrative, then children will accept them.

Is there any character that you have struggled with?

With most of my books, I have written and illustrated them myself. I have also written books that others have illustrated, and vice versa. When writing and illustrating myself, the process is simultaneous as I form pictures in my mind while writing, which complement or extend the story. I let my mind or my pencil draw these characters and then I develop them further.

A lot of authors today are exploring the young adult (YA) literature space. Have you ever considered it?

I basically do picture books, which means the pictures take predominance over the text. Sometimes they could be all pictures without any text.

While a lot of YA books have illustrations, the storyline and writing take precedence over the illustrations.

Some 30 years ago, there were hardly any books for young children [written in India]. As a teen you either read school books or graduated to Agatha Christies, Stanley Gardners and the like. Then, about 10-12 years ago, there came the realisation that children need books that address the things they're interested in – growing up, problems at school, problems with the family – or simply books that would be fun and would encourage them to read later in their lives. That's when the YA sector started.

YA literature has enabled children to see the world around them reflected in different ways. It has also allowed writers to bring in subjects that were taboo earlier: identity, gender confusion, sexuality, etc. It is now possible to talk to children about all of this through YA books.

How do you navigate being both an author and an illustrator?

First, I think I'm a better writer than an illustrator. There are illustrators whose work I absolutely adore, and I wish I could draw like them. But the thoughts in my books are my own; I draw what I see. I know what I want to depict, so it becomes easier than having to explain it to somebody else.

There are times when I have illustrated somebody else's book. Usually, when the manuscript is ready and the story has been accepted, the publisher commissions the illustrations. There is no connection between the illustrator and the writer; the editors are the go-betweens. I've wondered what pictures were going through the writer's mind when he or she was writing.

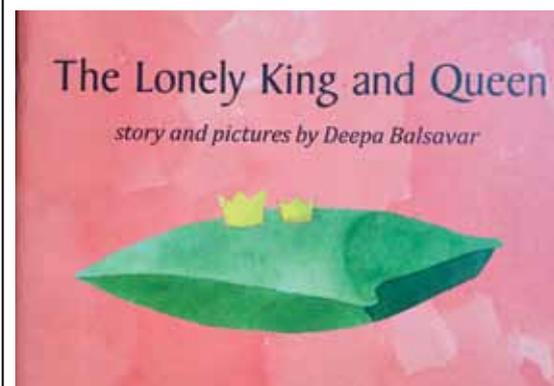
Similarly, when I've written something and somebody else is illustrating it, there are times when I've been happily surprised. When I'm illustrating my own books, let's just say that there are no surprises.

In these changing times, what elements do you think children's books should include? Not just for the pleasure of reading, but ideas they will carry with them through their lives?

Of primary importance, especially in these times of growing biases and prejudices, are books that help children think critically and openly, books that reflect the diversity of people around them and open a window, as it were, to different possibilities.

We don't see the connection between what we're doing and what is happening around the world. It's the way we're taught in school. You never see how history is connected to geography, or mathematics is linked to the way things function in the outside world.

These connections are never made in school, so you grow up compartmentalising your life. You can't see how cutting down trees is related to increasing temperatures, or how women and men reacting to one another is a result of the history and socioeconomic conditions of a place. Fostering critical thinking and the ability to reason for yourself – that's what we need more of. ■



“[Young adult] literature has enabled children to see the world around them reflected in different ways. It has also allowed writers to bring in subjects that were taboo earlier.”



RED RISING GOOD

The best tomatoes taste like sunshine, it is said, but how exactly do you label them? Depending on who you ask, tomatoes are fruits or vegetables. Scientifically speaking, they are fruits, which is why botanists categorise them as such. But nutritionists and cooks insist they are vegetables. The tomato farmers of Chittoor district in Andhra Pradesh are not bothered about such classifications. Their concern is livelihoods and that's where the Vijayavahini Charitable Foundation (VCF), an associate organisation of the Tata Trusts, comes in. VCF has been working with farmers in Chittoor since 2019 to enhance the quality, quantity and saleability of the tomatoes they cultivate. The VCF initiative has benefitted more than 6,500 farmers in 12 subdivisions of Chittoor, and the going can only get juicier.



(from top) **Farmers from** Mulakalacheruvu in Chittoor district receive training from a VCF volunteer on best practices in cultivating tomatoes; **Sidda Reddy** from Tokalapalli village at his farm; **a volunteer** shares his observations with farmer Bhasker Reddy (left) and his family on managing blight disease in tomato plants.

(top) **Two farmers** from Godavulakota village with a VCF volunteer and the Arka samarat variety of tomato plants that they grow in their fields; **Farmers from** Javakalakota village during an exposure visit to a plant nursery to learn about seed variety, seedling selection and nursery management.





(clockwise from above) **The Arka samarat** variety of tomato seeds sowed with pro-trays in Mulakalacheruvu; **tomato plants** being inspected for pests and diseases by visiting research students Messy and Nadav (left) in farmer Viswanath Reddy's field in Bayappagaripalli village; **a yellow sticky** trap, used to catch and immobilise pests, in a tomato field in Reddivaripalli village.





(top) **A scene** from Mandanapalli, Asia's largest tomato market, which receives up to 1,700 tonnes of the crop every day; **farmers from** Javakalakota village at a plant nursery.

