The SatSure Newsletter

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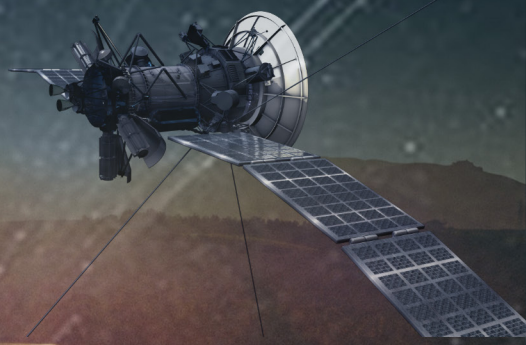
April - June 2021



Enabling Inclusive Ecosystem For Agritech- PJTSAU Experience

Dr. Praveen Rao Velchala

Evolution Of Agricultural Lending: A Rabo Foundation Perspective

Bram Spann

The Missing Link for Satellite Earth Observation to Scale in Commercial Markets

Akash Yalagach

Satellite Earth Observation: An Industry In Transformation

SpaceJam

'In Loving Memory of Dr. S.S. Ray'

India lost one of its most prolific agriculture remote sensing scientists to COVID-19 on the 4th of May, 2021, Dr. Shibendu Shankar Ray - founding Director of the Mahalanobis National Crop Forecasting Centre (MNCFC). His glorious professional journey of more than 25 years started at the Space Applications Centre (ISRO) to becoming the first Director of MNCFC, an organization established under the Department of Agriculture, Cooperation & Farmers Welfare, where he led a team of scientists and researchers for operational national level agricultural programmes on Crop Forecasting (FASAL), National Agricultural Drought Assessment and Monitoring System (NADAMS), Horticulture Inventory & Development (CHAMAN), and most importantly the national crop insurance scheme 'Pradhan Mantri Fasal Bima Yojana (PMFBY) implemented at the lowest IU unit.

But to most of us at SatSure, he was a kind and jovial person who always supported us from the early days when we were just showing presentations of pilots till date, when we had become a full-fledged company. Indeed, our team was in contact with him for an interview for this edition of TSNL and while accepting our request, he said in his typical lively demeanour, "You guys do a great job at these newsletters, your team should someday teach mine on how to write about remote sensing!". As one of his first protegees joined SatSure way back in 2017, he would often joke that he is running a training centre, while driving national scale projects to fruitful conclusions. We will miss the infectious energy of Dr. Ray, one of the finest scientists we had in the agriculture sector.

RIP

FOREWORD

As India recovers from a terrible second wave of COVID-19 that left behind multiple scars for so many of us, we at SatSure are grateful for having come out of it with no direct impact on any of our team members. The motto has been simple – keep your head down, be there for each other, and continue our journey to create value for customers and the industry.

The pandemic however did not seem to affect deal makingin the AgriFinTech and space sectors. Startups like Jai Kisan and Pixxel (congrats guys!) have successfully raised funds and the investor community seems gung-ho on technology startups here in India, going by the deal velocities. Given the continuing growth in agriculture and space sector, this edition of 'The SatSure Newsletter' or TSNL, focuses on these two industry trends with excerpts from industry leaders who are innovating new and non-treaded paths.

The first article is by Dr. Praveen Rao, Vice Chancellor of Professor Jayashankar Telangana State Agriculture University, on the developments in agriculture technology and its impact of farmers and policy making. Bram Spann from the Rabo Foundation speaks about the organizations history of supporting financial solutions for the agriculture sector and their innovations in smallholder farmer finance in developing regions. The third article is by Akash Yalagach, from SatSure who writes about the missing links in connecting demand to supply within the satellite Earth observation industry. As satellites are today becoming more commonplace for the agriculture industry to use, more so in insurance and inputs sectors, the abridged transcript of the first episode of SatSure's video podcast series 'Space Jam' touches upon use-cases, successes and failures of connecting satellite technology to meet demand such as from the agriculture sector with Aravind Ravichandran, Narayan Prasad, Krishna Reddy, and yours truly!

While the government warns us of an impending 3rd wave in the coming weeks, we hope the articles in TSNL adds a little bit of value to our readers in understanding industry trends and their inter-linking. Happy reading!

Prateep Basu
Founder and CEO
SatSure

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Enabling An Inclusive Ecosystem For AgriTech - PJTSAU Experience

Dr. Praveen Rao Velchala

Dr. Praveen Rao Velchala has a Ph.D. in agronomy and specializes in tropical field and orchard crop micro-irrigation and fertigation solutions, as well as crop yield – water modeling. He has worked at the Agricultural University in various roles since 1983, including as a teacher, researcher, extension agronomist, and administrator. He authored 10 books, 9 crop growing guides for farmers, 12 micro-irrigation project documents, and managed 13–Research and 6–Consultancy micro-irrigation projects.

How do you see the role of PJTSAU evolving in supporting agriculture innovations in Telangana?

Introduction:

Professor Jayashankar Telangana State Agricultural University (PJTSAU) is the only Agriculture University in Telangana and is also the youngest Agri University amongst the 75+ Agricultural Universities in India. Closed innovation was the pattern adopted until the early 2000s, in which research and development (R&D) were conducted solely in our **laboratories, using qualified professionals and significant resources. However, in the last decade, open innovation emerged as a new model,** in which we take advantage of the creativity of students, researchers, rural youth or independent inventors through partnerships, thereby obtaining more innovation, faster and with less spending. Inventions generated within the university are offered to the market, bringing additional revenue.

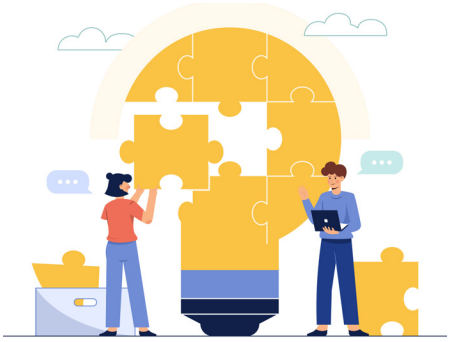
Problems in AgTech Community:

Agritech Startups often struggle to reach out to bureaucracy and policymakers, specifically at the state level. At present, Agritech Startups are supported through its Incubation programs for supporting early-stage

Startups and other Startups to pilot their innovations (either at POC or MVP) at the field level for pilots and validation through a 'First of its Kind program' called' AgriTech Innovation pilot'. We hope to cater to AgriTech Startups and create a culture of entrepreneurship among the young agriculture graduates, rural youth and promote rural agribusinesses.

Engagement Model:

PJTSAU has recognised agri-innovation pathways as emerging routes for enhancing the efficiency of the production system, food and nutritional security, and economic security for the stakeholders in the agri-food value chain, including farmers. We established a dedicated Center of Agri Innovation and Agri-entrepreneurship in 2020 and then an SPV in the form of AgHub, Agri Innovation Hub to cater to innovations in Agriculture. The AgHub is a first of its kind incubator modelled in a "Hub and Spoke" format with its Tech Hub at Hyderabad in the PJTSAU main campus and its rural innovation centres



in districts of Telangana, e.g., Vikarabad, Warangal & Jagtial. The AgHub caters to Agritech Startups through Incubation-Agritech Pilots and Innovation Bridges and builds entrepreneurship skills among Agri graduates/ postgraduates of the PJTSAU and other Agri universities. The rural innovation centres cater to the rural entrepreneurs in Telangana.

In this open innovation model, universities are demanded for closer ties with the productive sector and other stakeholders, forming the third mission for universities, besides (the first and traditional) and researching (the second mission). The recognition of the third mission has increased during the past few years. It involves all collaborations & partnerships between the university and non-academic partners, known as capitalisation of knowledge. The vision of an "entrepreneurial university" is to licence technologies, or business creation by researchers, which are the primary forms of transferring the results of academic research

Role of PJTSAU

We wish to play an essential role in enhancing the skills and capacities of village-level entrepreneurs who can act as channel partners for agritech Startups to make their innovations accessible to farmers.

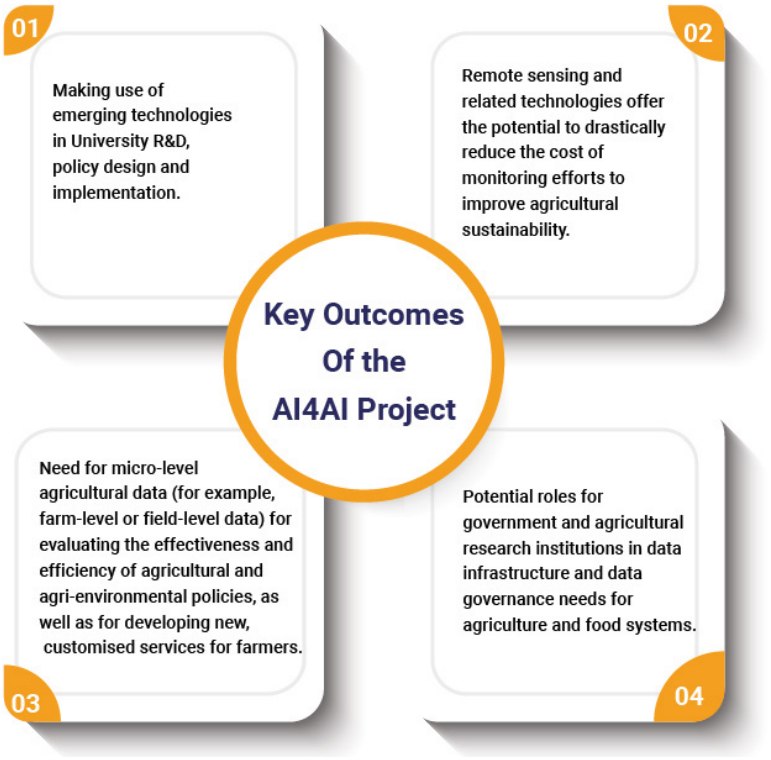
AgHub leverages the progressive ecosystem of the Telangana State with its sprawling network of incubators to partner with established Agribusiness Industries and Research institutions. It aims to implement the reformist initiatives led by the Government of Telangana and its Departments, including the IT department & Department of Emerging technologies etc. Another area we want to focus on is high-quality action research to document how innovations are impacting the farmer's income, challenges in adoption of emerging technologies viz., AI, ML, sensors, blockchain, RS & GIS etc., financing solutions to smallholders and pan-India market linkages by smallholder farmers, innovation in credit financing and pan-India market linkages for agri-commodities.

Can you share with us some of the key outcomes of the AI4AI project spearheaded by

the World Economic Forum, where you have been a part part of the core team?

The agriculture sector has a long history of innovating and adopting new technologies to increase productivity, manage risk and improve environmental, social and economic sustainability. AI4AI Project has substantially broadened the breadth, scale and immediacy of what these emerging technologies such as cloud computing, IoT, AI, Big data analytics, Blockchain, Sensors, UAVs, RS & GIS etc., and related innovation, would be able to deliver to farmers, policymakers and administrators. Emerging technologies can help Telangana State's agriculture policy goals by reducing the problems caused by data & information gaps, information asymmetries, and incentive misalignments. All of these can contribute to increased transaction costs and limit the feasible set of policy options.

Further, the conceptual framework built by World Economic Forum can identify where potential exists to make (increased) use of emerging technologies to underpin more inclusive policies, promoting sustainable & productive agriculture to improve agri-environmental policies



throughout the cycle to estimate the cropped area under rice varieties gave us insights into data challenges, accuracy and reliability of these technologies for improving the farming situation. However, emerging technologies are not a panacea; they are a means to an end and can create new challenges. The potential for these challenges to occur should be considered both upfront, **so that the policy design can take them into account and mitigate them during policy implementation so that the challenges can be addressed as they arise and digital tools can be refined.**

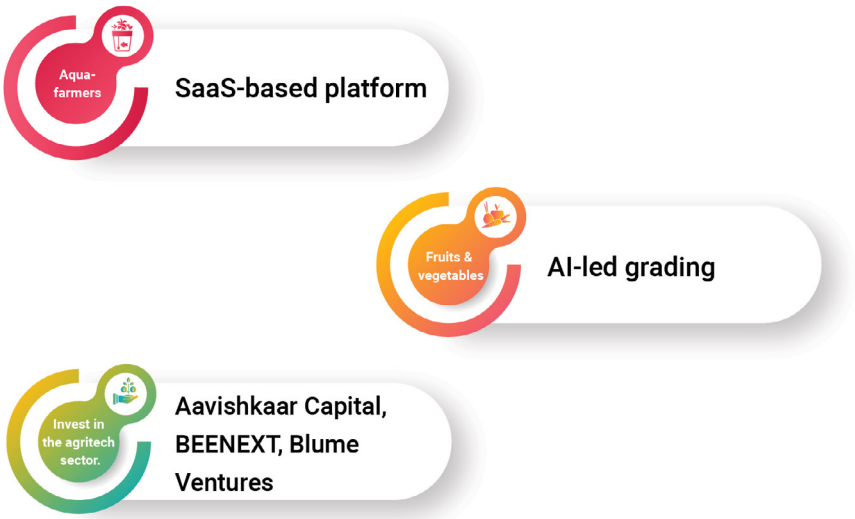
Key Outcomes of the AI4AI Project:

Key outcomes of the AI4AI instead of

- Making use of emerging technologies in University R&D, policy design and implementation.
- Remote sensing and related technologies offer the potential to drastically reduce the cost of monitoring efforts to improve agricultural sustainability.
- Need for micro-level agricultural data (for example, farm-level or field-level data) for evaluating the effectiveness and efficiency of agricultural and agri-environmental policies, as well as for developing new, customised services for farmers.
- Potential roles for government and agricultural research institutions

in data infrastructure and data governance needs for agriculture and food systems.

Fostering deployment of appropriate emerging technologies in identified crops and commodities through a largescale pilot to address agricultural challenges would be the next step by this consortia-led approach.



There has been a boom in AgTech companies across India in the past 3-4 years. Do you see this growth creating an impact for the farmers, or would you say that it's very much venture capital fueled hype?

Yes, certainly there has been a boom in the AgriTech Startups across India despite a pandemic-hit year. According to NASSCOM & Ken Research Report, over 600 post-POC Agritech Startups are **'emerging-growing-scaling'** in the Indian agritech ecosystem, most of them with a vintage of less than 5-years.

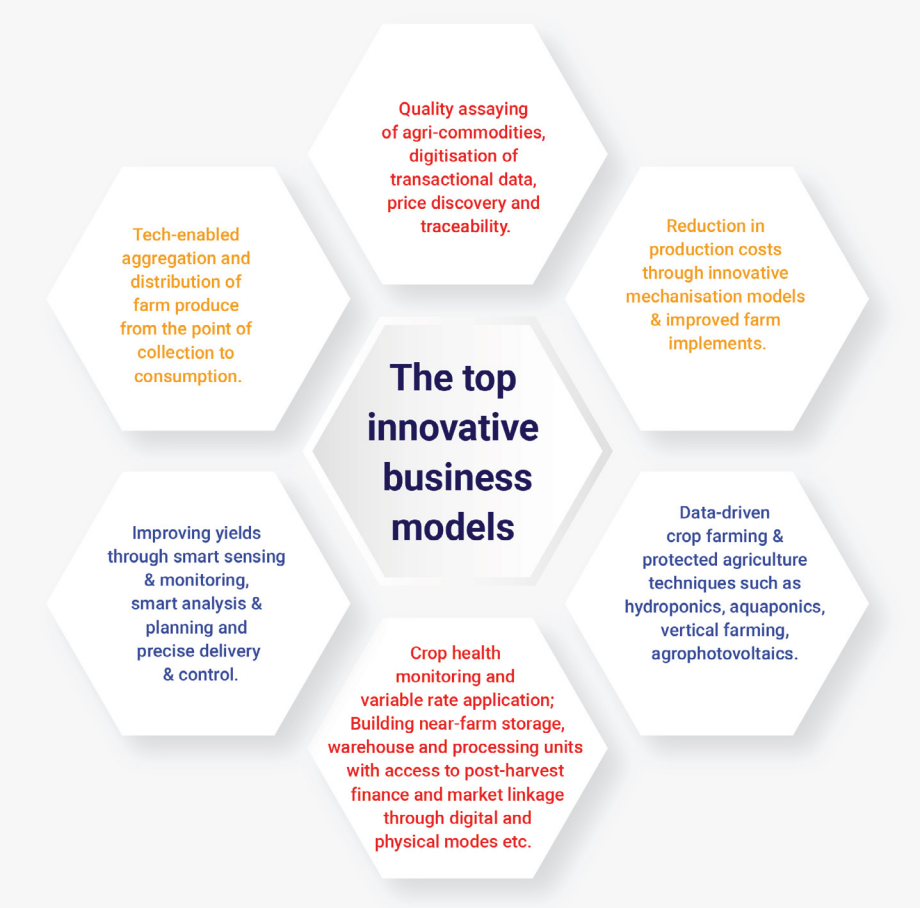
Agriculture, a sector heavily regulated by the government, largely traditional with little or no exposure to digital, and primarily unpredictable due to its heavy dependence on climatic conditions, was not on the VC radar in India. But, agritech was gaining focus globally. Omnivore saw this opportunity and was India's first sector-specific VC funds launched in 2010. Since then, Omnivore has funded 24 Startups across various agritech sub-sectors. These include farmer platform and full-stack agri-market, protected agriculture, dairy digitisation platform, SaaS-based platform for aquafarmers, AI-led grading for fruits & vegetables, farm finance and processed food brands. Several others, CIIE.CO by IIM-A, Villgro, Aavishkaar Capital, BEENEXT, Blume Ventures, and others invest in the agritech sector. According to expert analysis, investors have pumped in close to $1.7 billion in upstream agritech deals between 2014 and 2019.

The momentum has started to pick up with an expected CAGR (revenue) of 32 per cent from FY20 to FY25. The government acknowledges the importance of the agriculture sector. It is also providing support to the agritech landscape through various reforms – amendments to the Essential Commodities Act, Reforms for the produce selling process and The Farmers Empowerment and Protection Agreement on Price Assurance & Farm Services Ordinance besides initiatives such as transporting & marketing assistance, Agri-udaan, multilingual mobile apps, custom hiring centres, computerisation of PACS, PMKSY, PMFBY etc.

Pull and Push Factors Driving The AgTech Sector:

We feel that on the country's agritech market landscape, multiple pull factors are driving growth in this sector:

- Efficiency increase by lower cost price or better market price.



- Improved management control & decision making.

These factors help deal with volatility in weather conditions & climate change, water scarcity, soil degradation, price volatility, annual average post-harvest losses of around USD13 billion in the agri-food value chain, supply chain inefficiencies, food losses and wastage of over 40% before its reaches the end consumer due to supply chain intermediaries. Besides these, public drivers include food & nutritional security, food safety and sustainability.

Whereas, push factors for rising agritech landscape are: general technological developments viz., AI its subsets such as ML, deep learning; IoT, data digitisation & advanced data analytics, GNSS, satellite imaging, robotics, UAVs, advanced RS & GIS, blockchain, biotechnology, nanotechnology etc., and increased digital connectivity & computational power, innovation possibilities (open farm management systems with specific apps, remote/ computer-aided advice & decisions, online farmer shops etc.)

As a result, a variety of business models have already emerged to tackle multidimensional problems prevalent in the Indian agri-food values chain, including low yields & yield gaps, low input (water, fertiliser, pesticide & herbicide) use efficiency, sub-optimal supply chain & post-harvest management, output market linkages, low institutional credit, crop insurance, quality agri-inputs and market linkages.

The top innovative business models include:

- Improving yields through smart sensing & monitoring, smart analysis & planning and precise delivery & control.
- Tech-enabled aggregation and distribution of farm produce from the point of collection to consumption.
- Quality assaying of agri-commodities, digitisation of transactional data, price discovery and traceability;
- Reduction in production costs through innovative mechanisation models & improved farm implements.
- Data-driven crop farming & protected agriculture techniques such as hydroponics, aquaponics, vertical farming, agrophotovoltaics.
- Crop health monitoring (nutrient stress, pest & disease damage) and variable rate application.

Building near-farm storage, warehouse and processing units with access to post-harvest finance and market

linkage through digital and physical modes etc.

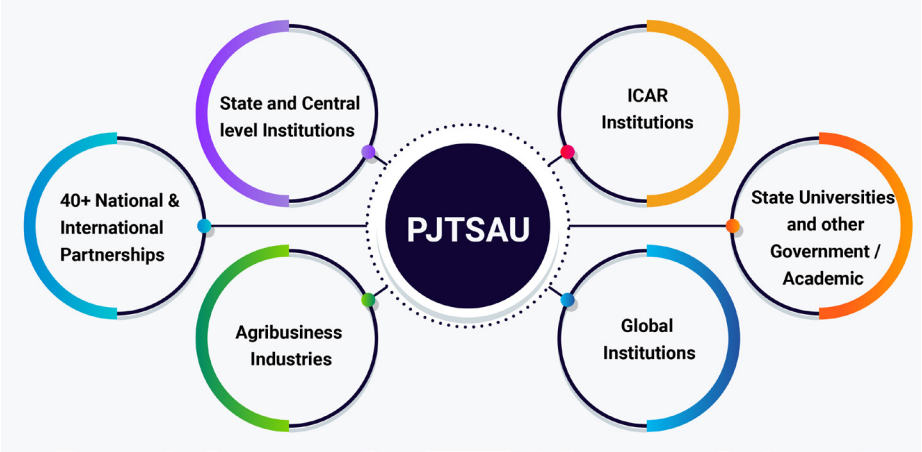
There are estimated about 13.5 million farm households in India, with a majority of small & marginal landholders owning less than 2.0 ha of farmland. According to NSSO Survey, an average agricultural household earns about Rs. 77,112 per year to meet his personal, family, and occupational needs.

As a result, farmers are often left with a little surplus for productive investment for new-age solutions. But, as demonstrated by over 600+ mature agritech Startups, innovations combined with smart farming techniques in the agriculture sector can go a long way in enhancing the efficiency of the production system with reduced production costs. This will improve productivity and farm profitability and empower farmers to de-risk against volatility in market prices, aberrant weather conditions etc.

Under your leadership, PJTSAU has become a unique success story in India's industry-academia partnerships in the agriculture sector. We would love to know how you went about enabling it.

PJTSAU envisages building a vibrant Agritech Incubator in the state Agricultural Universities. We believe that it would be only possible to create such a vibrant innovation ecosystem with the principles of Collaboration, Partnerships and Co-Creation. For that matter, PJTSAU already has 40+ National & International Partnerships with many Industry-Academia – State and Central level Institutions including multiple ICAR Institutions & State Universities and other Government / Academic / R&D Institutions (NRSC, TISS, IIT-H, IIT-Mumbai, ISB etc.), Agribusiness Industries (ITC, Coromandel, Patanjali, TAFE, Pioneer, Nuziveed Seeds, Kaveri Seeds, Tech Mahindra etc.), and highly ranked global institutions, such as University of Florida (Jackson Ville, Florida), University of California (Davis, USA), ICRISAT (Hyderabad, India), Western Sydney University (Australia), Cornell University (New York, USA), The Field Crops Research Institute (Vietnam), University of Hohenheim (Germany), International Rice Research Institute (IRRI) (Philippines), University of Perideniya (Sri Lanka), and others.

These collaborations of PJTSAU with national and global institutions ranging from research, Academia and agroindustry have led to innovative value pathways arrangements focusing on inter-organisational We are conducting collaborative R&D, research services including contract research & consulting, academic entrepreneurship, postgraduate activities in agro-firms, licencing university generated generated technologies to



firms, formation of social networks at conferences, market & entrepreneurship oriented curriculum, reforms in admission framework to attract talent, the establishment of new institutions in Tier-II cities to increase student strength, enhancing human resource capacities, scientific publications in high impact journals, and others.

These active collaborations enabled over 1,000 million INR revenue generation in the past five years and contributed to enhanced University Rankings. It has dovetailed its trajectory to be at 6th position amongst 74 Agricultural Universities in the country and secured 30th Rank during 2019 in INDIA TODAY survey of the all Public Universities in the Country and secured 46th Rank in OUTLOOK India Public University Rankings 2019.

These collaborations have further helped PJTSAU scientists – students – Faculty – farmers, and other agri-stakeholders abreast of the latest happenings in the global agricultural ecosystem. A complimentary initiative was added to the ecosystem, establishing AgHub in 2020 to strengthen the entrepreneurship ecosystem and strategic future collaborations & partnerships. AgHub at PJTSAU has already collaborated with CII, ISB-Mohali, APMAS and We-Hub and as an immersion partner in CISCO Agri Grand Challenge 2021 for enhancing the activities of AgHub to promote the culture of innovation and entrepreneurship in Agriculture.

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Are there any changes made in the curriculum of bachelors and masters students in the recent past to cater to the dynamically evolving talent needs of the commercial agriculture sector?

The agritech sector needs top-quality talent for scaling the innovative agritech models. There is a need for nurturing talent at the college & university level by incorporating skilling and entrepreneurship in all agricultural programmes. The PJTSAU has taken up multiple reforms to enhance the curriculum and pedagogy of the Bachelors, Masters & Doctoral programs.

The PTSAU offers B.Sc., M.Sc., PhD programmes in agricultural sciences, B.Tech., programme in Agriculture Engineering &

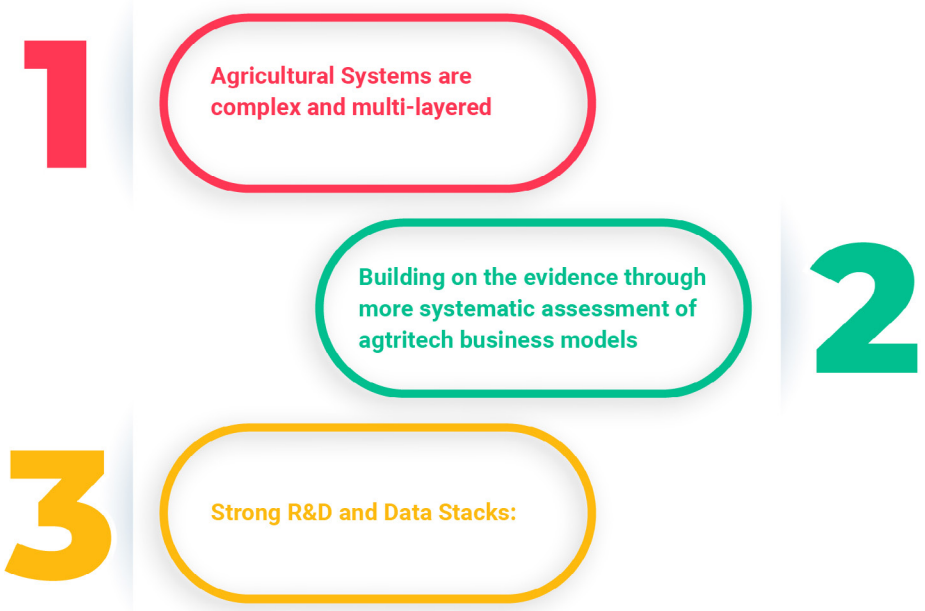
Food Technology and MBA in Agribusiness faculty, besides a 2-year diploma course in agriculture, organic farming, seed production & agriculture engineering exclusively directed towards rural youth. The technical curriculum of these courses is updated periodically, every 5-years, to cater to employability, entrepreneurship & market needs.

Similarly, to cater to the needs of basic & strategic applied research, skilling and entrepreneurship programmes, several initiatives were launched. These are HR need assessment & strategic planning for 2030, e-governance, P&M cell, formation of research communities & discussion boards, the establishment of state-of-the-art physical infrastructure including dedicated academic (virtual & model classrooms) & research blocks, access to digital online national (3400+) & international (530+) peer-reviewed journals, policy for participation in

national & international conferences, Adjunct Professorship, NABL accredited labs, Central Instrumentation Cell, and Pilot Processing units for value addition of agri-commodities.

To inculcate the culture of innovation and entrepreneurship among young graduates, they are offered skillset enhancing experiences like technology-based Agri-Entrepreneurship Learning programs (AELP's), Rural work experience, Agro-industry internships, report writing etc.

Further Design Thinking Programs for Agriculture graduates has already been launched to promote the culture of innovation-led entrepreneurship among the agriculture graduates; the same program would be replicated for the PG and PhD students this year. Further, we are engaging the MBA Agribusiness graduates of PJTSAU in action research and live projects of the Agritech Startups to expose them to the expanding agritech landscape in the country. The premier institute, ISB-Hyderabad, has been roped in to revamp the course curriculum of the MBA-Agribusiness programme. Also, given the huge application of data sciences, AI, Sensing & blockchain technology, RS&GIS in new-age agritech models, a few elective and certificate courses are being planned to benefit students and rural youth.



Internship with agritech Startups could be another way to familiarise young graduates with startup culture

From your long experience as an agriculture scientist, if I have to ask you three key learnings that you would want to share with young AgTech entrepreneurs, what will these be?

Agricultural systems are complex and multi-layered

Each system is set by itself and needs a customised hyperlocal solution approach. The recent trend of tech-based entrepreneurs is welcome. Still, my advice is that since agriculture needs a different set of attitude, knowledge and skills, spare time to understand ground realities, solutions should be worked through a bottom-up approach with stakeholder consultation as the primary tool.

Building on the evidence through more systematic assessment of agtritech business models

One of the most significant knowledge gaps in the agritech sector is the understanding of what works and does not work in building and scaling agritech business models that involve smallholder farmers - particularly models that are inclusive, sustainable, and commercially viable. To a large extent, this is natural; the sector is still in its infancy, with providers experimenting and learning from business model innovations. But as the industry prepares for the next

phase of growth, we must wield a deeper and more systematic understanding of business models.

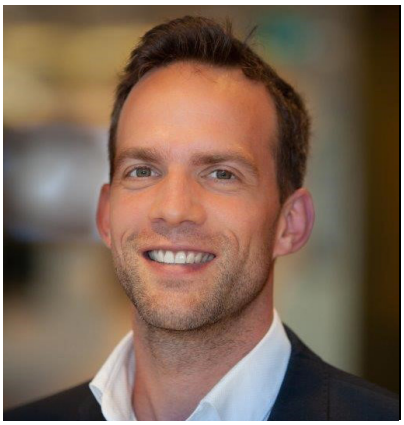
Strong R&D and Data Stacks:

Agritech landscape in India is still in the infancy stage with just 1-2% penetration of the estimated market potential of USD 24 billion. However, for the Indian agritech market to reach its potential, a strong R&D base and international collaborations & partnerships are essential for scientific innovation and building foundational blocks that help the country establish a flourishing startup ecosystem. Further, success in the agritech landscape depends on the Startups' ability to innovate the agri-food value chain without disrupting traditional channels, ability to co-exist and establish partnerships with FPOs, MSMEs, and the Agri-input industry, Agri-machinery& Irrigation industry, Food Processing units, research organisations etc.

Clarity is also needed by researchers of NARES and entrepreneurs on agri-data stacks, data ownership, privacy & security issues, intelligent processing and analytics, and sustainable integration of data sources.

The openness of data platforms will help accelerate solution development and innovation in general and empower farmers in their position in supply chains. The convergence of ideas, partnerships and forward-thinking among policymakers can build the new ecosystem. This needs time and patience.

Evolution of Agricultural Lending: A Rabo Foundation Perspective



Bram Spann

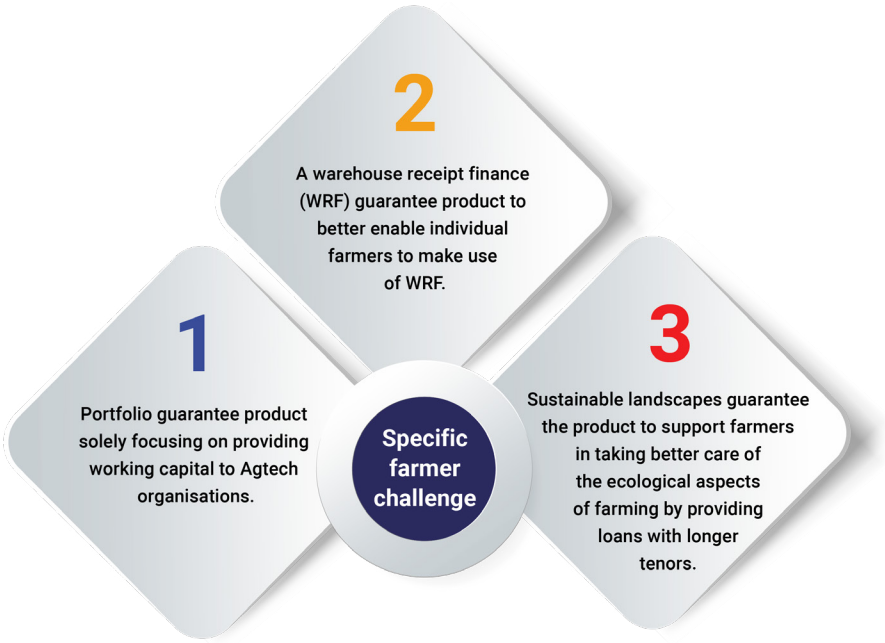
Bram has over 10 years of working experience for Rabobank in different roles like relationship manager and product manager. Since early 2019, he is responsible for a part of Rabo Foundation's Asia portfolio as a program manager, covering India, Myanmar and Sri Lanka.

Bram is passionate about (blended) finance solutions, impact management and building networks. Furthermore, he is keen on innovation in the agricultural sector (AgTech), specifically addressing the challenges of the smallholder farmer.

How has the Rabo Foundation's Vision evolved since its inception in 1974?

Rabo Foundation is the foundation of Rabobank, a full-fledged retail bank in the Netherlands and globally one of the leading financial institutions in Food & Agri. Rabobank started as a farmer cooperative in the late 1800s , and **the primary idea of setting up the foundation was to pay tribute to our farming roots. Initially, we were providing only grants, but over the years we found that this way of support wasn't sustainable enough. For this purpose, we started providing loans and other types of financial instruments towards supporting farmers and generating the required mindset of repaying loans.** Rabo Foundation aims to move farmer organisation or the individual smallholder farmers towards self-reliance, meaning in most cases that they can get access to finance from local financial institutions. These financiers will not provide them with any grants either, so this mindset of repaying loans is paramount for a sustainable financial future.

For example, in India, we have launched several credit products – with every product to addressing a specific farmer challenge. To name a few:



- Portfolio guarantee product solely focusing on providing working capital to Agtech organisations.
- A warehouse receipt finance (WRF) guarantee product to better enable individual farmers to make use of WRF.
- Sustainable landscapes guarantee the product to support farmers in taking better care of the ecological aspects of farming by providing loans with longer tenors.

The most important aspects of our evolution as a foundation are the developments in the way we measure impact and the fact that we have set up a separate innovation department within the foundation. We found the latter development necessary since we are sure that innovation will ignite the next revolution in agriculture. **With impact financing, we can help farming organisations, but by supporting innovative organisations we are systematically bridging the gap in the longer run, especially in the agricultural sector where innovation is required like nothing else.**

What are the different financial instruments using which the Rabo Foundation supports small organisations?

In the **classical Rabo Foundation model where we finance a farmer organisation, we provide a loan for working capital in many of the cases to meet the farmer organisation's finance requirement for the season.** This is done at a competitive interest rate not to disturb the local financial system. Additionally, this comes with a technical assistance grant to a training organisation that is provided for a longer period to build the capacity of a specific rural beneficiary.

In India or Myanmar, we mainly use credit guarantee instruments which is required because of the respective local regulation we have to deal with. Hence, we had to reinvent ourselves and needed to come up with new products that fit the farmer's credit needs equally well as a loan product.

In that sense, a credit guarantee can be an even better instrument, since we can push local financial institutions to take more risk in reaching out to the smallholder farming community. In this way, institutional capital can be unlocked, and the involved financial organisations can be made more comfortable with the target group without running too much risk. We see this as a more sustainable model for the long run for all parties involved. However, every country is different, so we have to tailor these programs to the needs of the stakeholders and rules and regulations per geography.

Therefore, these credit guarantee products cannot be easily replicated in other countries, but provide an excellent finance corridor for our support in India and Myanmar.

Can you please share your experiences or learnings, especially in India, Southeast Asia geographies, about the projects that Rabo Foundation has been financing in towards smallholder farmers financial inclusion?

Talking specifically about the team in India, we went through a steep learning curve. We started 15 years ago, which involved mainly grant-making and bilateral transactions with clients. Even though the impact is there, these bilateral transactions in India are like a drop in the ocean, when you talk about impact.

So, we understood that working with and building a network of partners in a country like India is the best way to find projects and scale them.

Initially, we started off with one person (**Mr. Arindom Datta, Executive Director, Rural & Development Banking/ Advisory, Rabobank**), who built these networks and found the right local partners. That was the platform from which the setup of our local team was crafted. By the time it was 2014-2015, like-minded ecosystem players also entered the scene like NBFCs that provided financial opportunities to smallholder farmers as well.

We started providing working capital to Agtech players after our innovation department was set up around 2017-2018. The development over time from more an NGO kind of organisation to an ecosystem-oriented impact financier was a was valuable insightful lessons. **One of them is that innovation and technology play a crucial role in providing a platform for smallholder farmers to increase their livelihood and income.**

Talking about network and partners, what are the criteria of validating or scouting partners to align with Rabo foundation's objectives?

There are two defined ways for validating this – first is through our network, especially in the countries where we have a local presence like in Indonesia, India, Peru and Kenya. Our network is relatively vast and extensive in these countries, since we have been locally active for a longer time. Because of this long-term presence, we know which partners are relevant and deliver good quality. In terms of leads, network and partners play an essential role in our activities, and it helps us evaluate which partners we should work with and which not.

The second aspect of how we look at our investees is through our potential impact model. This was set up last year and is based on different variables.

We check if the organisation that we are going to work with can reach a certain maturity stage in which they generate a specific impact. And that opportunity of creating impact

most of the times exists, since there are always sectors and geographies in a country where other financial institutions don't dare to step in. As long as there are no other financial institutions to provide the necessary support to the rural community, our role is very relevant.

There are several multi-lateral organisation that are getting into the financing of Agtech start-ups and supporting smallholder farmers – something that the Rabo Foundation has been doing for years now. In the event of such increasing interest in the agriculture finance sector, including philanthropic contributions, how do you see your organisation's role within the ecosystem, and the role of people like yourself who are building the business partnerships?

We always try to have a clear 'Food and Agri' focus, which gives us a unique identity as Rabo Foundation.

Many other foundations have Agriculture as a sector of interest in their portfolio, but to them it's in most cases only one of the many pillars. Also, we are the only foundation in the world that can provide financial instruments through Rabobank itself and use extensive data knowledge that Rabobank has built up over recent years. Our innovation department can therefore, be really hands-on when it comes to the technical support of Agtechs'. This is a real add-on to our product portfolio.

In this way, together with Rabobank's knowledge and network in the global Food and Agri space, we positioned ourselves in the best way possible to make a real impact in the agricultural sector.

It is an exciting model that Rabo Foundation is linked with the Rabobank – the world's largest food and Agri bank. So, there is a tremendous amount of expertise you have, especially with a network of early to growth stage Agtech start-ups partners. Is there any partnerships that Rabo Foundation or Rabobank have in India with large banks like ICICI, HDFC, SBI etc., as they are servicing more smallholder farmers than any of the Agtech's?

In many countries, large banks mostly look for the low-hanging fruit and usually around urban or semi-urban areas. **Unfortunately, and perhaps because of this, they are very hesitant to move into deep rural areas because appraisal and origination of loans involves a time - consuming process, and therefore the transaction costs are very high.** We don't have to tell these larger institutions about how to serve this rural segment. They mostly have the knowledge available, but not the channel or technology. So we see a big role to play for Agtech platform organisations, which can function as an intermediary to the smallholder farmer.

Hence, we are trying to set up a new program to enable these collaborations and of which I am sure it can become a gamechanger for the whole sector.

From my experience, there is a need for lending organisations to build internal capacity for delivering digital

transformation projects, especially in rural banking, where innovative technologies will form an integral part. Do you see Rabo Foundation, with its deep sectoral experience and dedicated innovation team, playing a role here – for providing advisory and consultation to banks, since it could help you reach your impact targets faster due to the scale of these organisation?

It's good to know that Rabobank has a separate advisory arm *(Rabo Partnerships)*. They primarily focus on the development of commercial banks in emerging economies. Agri financing is always a certain part of this development, since the rural population in many emerging economies represents a significant part of the total population and therefore, cannot be neglected. Especially, not as an advisory team of a Food and Agri bank. Such a development can, of course, help Rabo Foundation in unlocking more mainstream capital to the smallholder farmer. Most farmers nowadays already get credit from loan sharks and repay them as well, but at a higher interest percentage than they can get from a traditional bank. The high-risk perception that most of the traditional banks have for rural financing is therefore, in most cases not legitimate. Providing evidence and

and sufficient data to improve this risk perception to extend more credit products to these under and unserved markets is one of the more significant challenges.

The Foundation has backed many technology driven pilot projects in the developing world. How are you involved post the pilot is completed successfully, towards scaling the impact?

In most cases, when we exit the organisation after project completion, the project scaling is taken up by our partners. Where we can have the most added value is to sit with the organisation in the initial stage and to indicate what kind of development we would like to see togther and how we can help in that development. We always link this to certain indicators. When we have defined that gap, we are going to investigate how we can move the project to full scale- up.

After the project completion, we have several options to continue supporting our partners. In the case of Agri companies, we can make use of our Rabo Rural Fund (https://www.rabobank.nl/over-ons/rabofoundation), **which usually starts from $1 million support up to $3 million.**

In this way we can provide the organisation with a 'soft landing' to a like-minded sister organisation. The funding gap can be fulfilled in this way, and as a foundation, we exit the client. In Agtech organisations, we usually see equity investments coming in overtime with which the company can be scaled. After such transactions, the credit appetite of the organisation will quickly be superseded by our own credit limits, and our work will be done. In many cases, we try stay involved from a joint learning perspective, maintain the valuable relationship.

We were talking about innovation in agriculture for financing and you have been supporting so many companies across the globe. Is there any tangible behavioural change brought by these Agtech companies amongst banks?

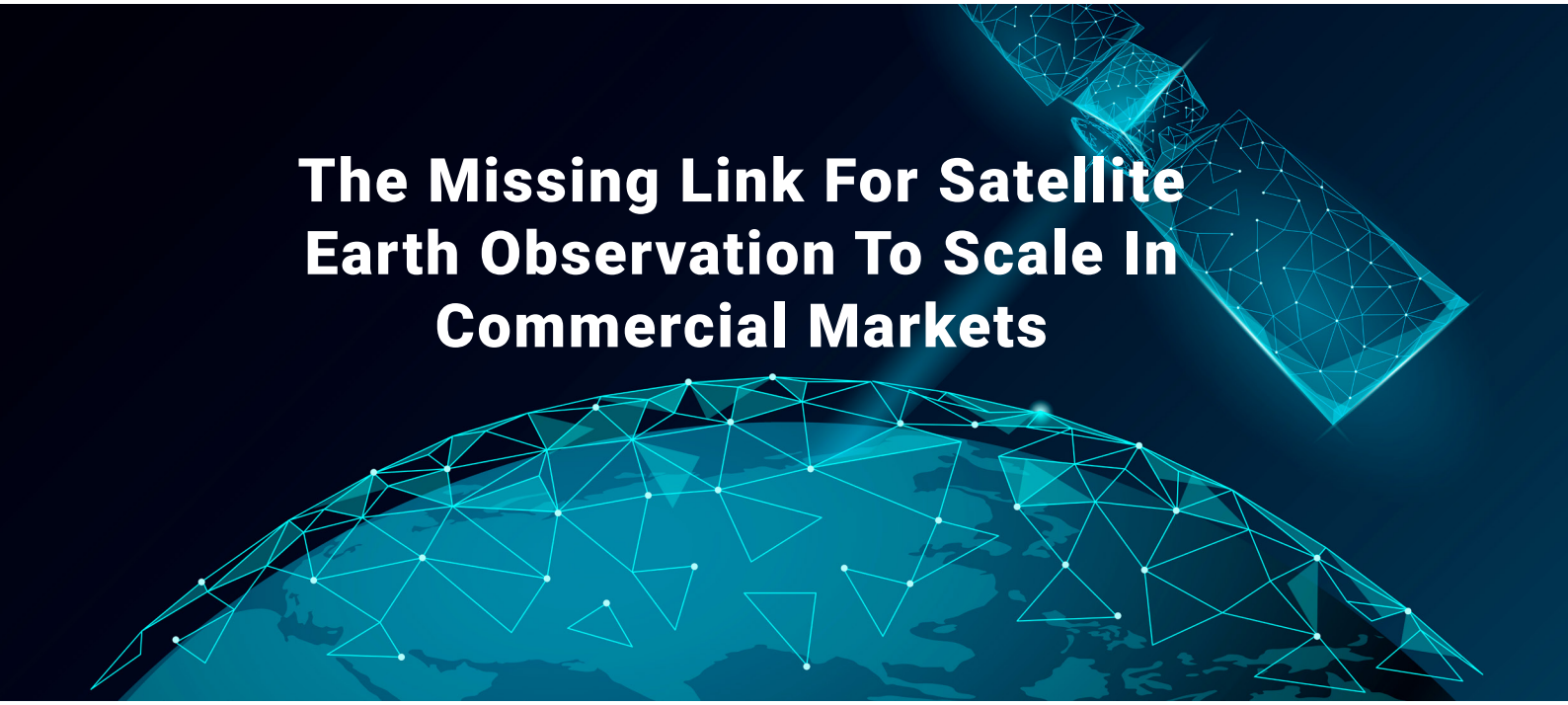
Our goals are focused on developing an Agtech organisation in such a manner or Agtech that their innovation will accommodate smallholder farmers' needs. **Our support mostly extends to the developing world where farmer's low income is still an issue, so increasing that income is one of our key objectives.** The mindset of the employees of mainstream banks will also need to be broadened to focus more on the smallholder farming community.

If we can connect farmers with Agtech platforms that can provide credit from a financial institution, which more or less becomes a 'one-stop shop' for them, the farmer's ability to earn more and repay money in general increases. This is the behavioural change that we would like to see.

Unfortunately, this is yet to be fully operationalised in other geographies, but in India, there are already a few examples where we have been involved. In addition, the climate challenge doesn't aid mainstream banks in their risk perception of the smallholder farmer as an asset class, since the farmer is the most vulnerable group to freak weather events. Therefore, together with the farmer's impact on the environment, we

have made an environmental impact one of the key elements of our new 2020-2025 strategy.

Here lies a big task for impact organisations like ours to come up with solutions that will prevent financial institutions from drawing back from the rural areas because of these higher perceived risks. Again, we cannot do that by ourselves, but we will need mission-aligned partners to push these boundaries together. These relationships have been built over the years and will be made in the coming years, all in the best interest of the smallholder farmer.



The Missing Link For Satellite Earth Observation To Scale In Commercial Markets

Akash Yalagach

Akash is currently the AVP – Defence and Space at SatSure, primarily working towards building a fleet of EO satellites along with other initiatives under the new vertical. Previously, he was at the Vikram Sarabhai Space Centre of ISRO for 6+ years as an AIT engineer for all launch vehicles. He completed his undergraduate studies in Aerospace Engineering at the Indian Institute of Space Science & Technology and was a Commonwealth Scholar at the University of Surrey, where he pursued his masters in Space Engineering.

> ***We live in a society exquisitely dependent on science and technology, in which hardly anyone knows anything about science and technology***
> – Carl Sagan

A technology that is seamlessly adopted by society and does not call for special skills to embrace can be safely assumed to have achieved economies of scale and found a valid application that connects with the civilisation. This can be witnessed from the penetration of smartphones or the internet in our lives. Nobody wonders how the internet links billions of people worldwide with its undersea optical fibre cables or how a smartphone packs so much computational power in such a small form factor. Much of the technology has benefited from the miniaturisation of electronics and declining costs of fabrication and assembly.

The satellite industry has also benefited from the advances in the electronics industry. Satellites have become smaller and yet are able to function better or match the performance of earlier generation satellites. In the space industry (which is still considered very high tech, well, after all, it is rocket science!), SatCom and navigation satellites have already achieved scaling the commercial

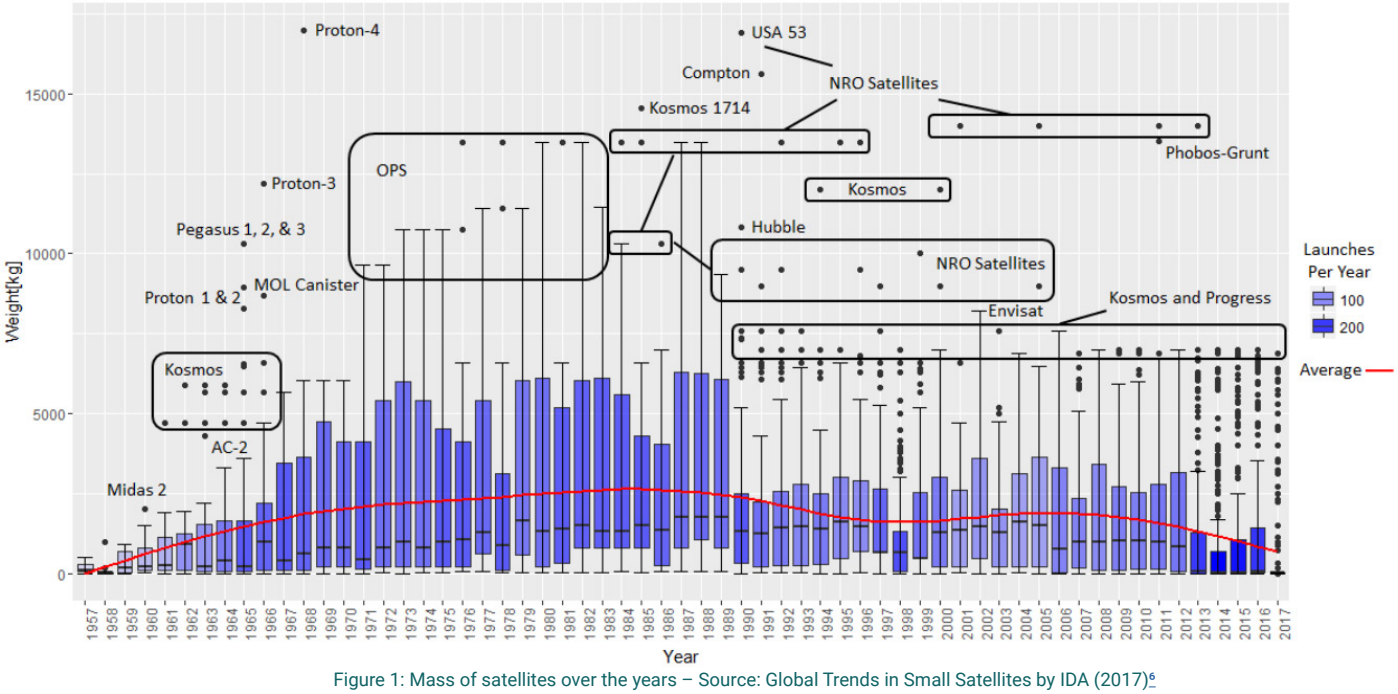


Figure 1: Mass of satellites over the years – Source: Global Trends in Small Satellites by IDA (2017)[6]

application of its services. It is tough to imagine our day-to-day lives without GPS, which is critical for the smooth functioning of our society[1] . In addition, direct-to-home television has become commonplace in every household, although OTT platforms have started giving DTH a run for their money beyond the cities. Further, large corporations such as SpaceX and Amazon are coming closer to providing the promised 24x7 internet connection with global coverage directly from space. Thus, satellites have ubiquitously impacted our lives and will continue to be an indispensable part of our daily. lives[2]

I believe this stat is taking from a single report of NSR. So we can just say As per reputed market research firms such as NSR, the Satellite Earth Observation (EO) industry is flourishing at 9.2% CAGR and $60 billion in revenue potential in the next decade[3] . It is well known that the small satellite revolution has taken the EO industry by storm, with 389 smallsats being launched in 2019, of which 26% were EO satellites[4]. Furthermore, it is predicted that the global pandemic has not put any brakes on the EO industry[5] as remote asset monitoring demand grew rapidly across the globe.

Figure 1 shows the mass of satellites over the years. Though the mass of satellites predominantly varies on the system complexity – payload specs, onboard systems and planned lifetime, we can observe that the mass of satellites has decreased over time since 2005. Further, it can be observed from Figure 2 that the mass of EO satellites to achieve similar performance has decreased over the years. Moreover, with the boom in the small satellite industry, each market segment has been commoditised and

Reference:
• [1]What would the world do without GPS?
[2] https://www.bbc.com/future/article/20201002-would-the-world-cope-without-gps-satellite-navigation
• [3]EO MARKETS PROVE RESILIENT
• [4] https://brycetech.com/reports/report-documents/Bryce_Smallsats_2020.pdf
• [5] NSR Report Shows Satellite-Based Earth Observation (EO) Not Slowed by COVID-19Slowed-by-COVID-19.

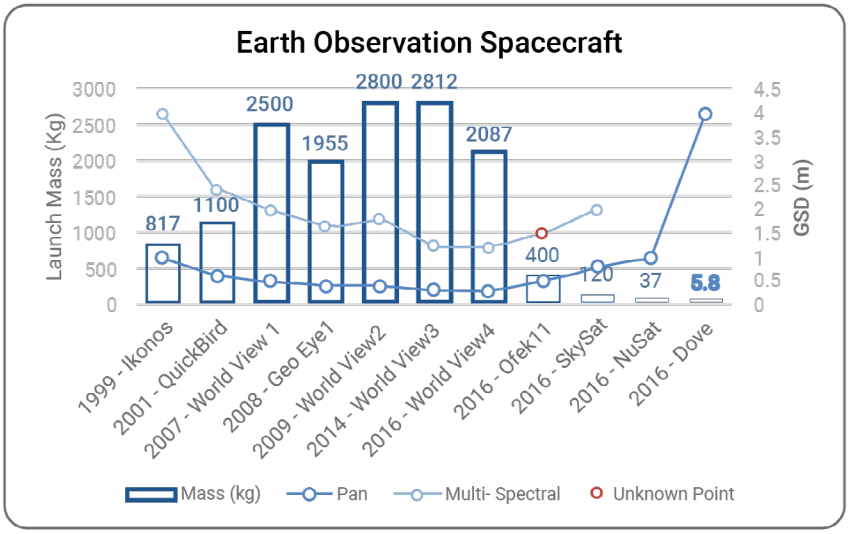


Figure 2: Small EO Satellites - mass and GSD –
Source: Small satellites an overview and assessment, Acta Astronautica 2020[7]

modularised. Some companies handle the entire end-to-end lifecycle of a satellite mission like design, manufacture, AIT, launch and operate, to provide just the requisite data. If the pockets are deep enough (>$4-5M), a 'big enough' satellit e can be ordered as per your requirements, and all one has to do is sit tight to obtain the data. As the mass of satellites decreased over the years to achieve the same performance, the cost to build and launch has also depreciated. The commercial launch industry is also taking off to bring down the cost/kg to orbit with dedicated smallsat launchers and rideshare opportunities on medium-to-heavy launchers, as seen in Figure 3. Hence it is easier than ever before to build, launch and operate satellites. However, it must be cautioned that the launch cost cannot be assessed just by the cost/kg metric[8] .

Currently, there are more than 25 private companies worldwide operating EO satellites.

However, when it comes to the satellite EO industry to impact our daily lives, it is yet to reach that level due to limited commercialisation and scaling. So one wonders as to what is stopping this commercialisation? More than 400 operational EO satellites (optical and SAR) send 100s of TBs of data every day, of which the market is mainly driven by a 2-3 companies worldwide. Nevertheless, access to high-res optical EO data is still a cumbersome process. Joe Morrison has already written an excellent piece on the reason behind it[9].

Despite many predictions by research firms from 2015-16 onwards based on the

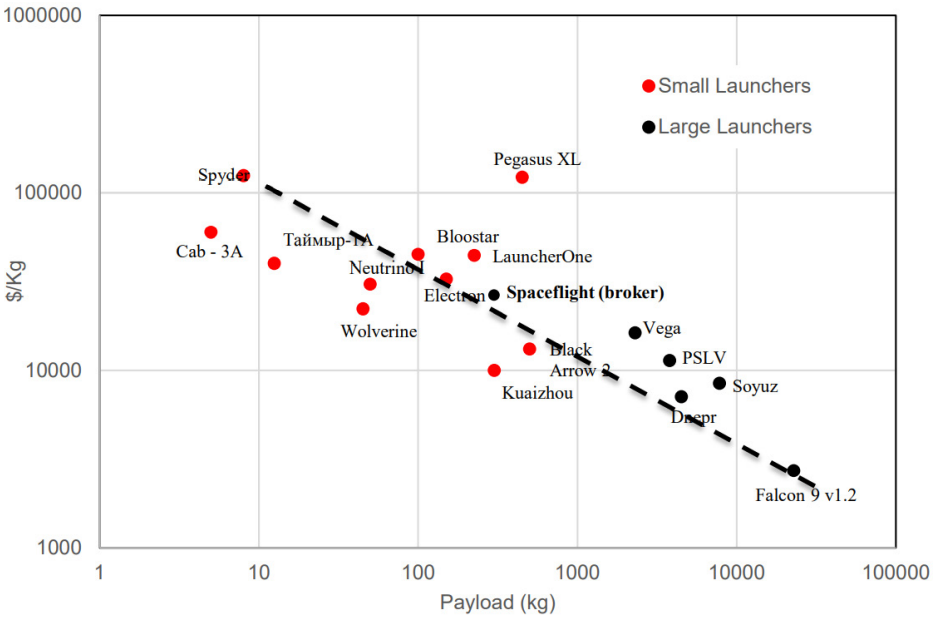


Figure 3: Launch cost for different launch vehicles - Source: Global Trends in Small Satellites by IDA (2017)

Reference:

- [8] https://spaceflight.com/why-dollars-per-kilogram-is-a-poor-way-to-estimate-launch-costs/
- [9] https://joemorrison.medium.com/the-commercial-satellite-imagery-business-model-is-broken-6f0e437ec29d

assumption of increasing supply, the retail pricing per sq.km of images for good quality hi-resolution EO data has not decreased.

However, we saw earlier that the cost of building and launching the last decade, so why is that?

While marketplaces have come up to aggregate the data available out there, they are solving the issue of data access and not more data sales because, for that, the demand has to be elastic. These marketplaces are aggregating data from satellite operators, which could theoretically fuel the demand for EO data beyond the defence and intelligence vertical.

But do these marketplaces have enough bargaining power with the incumbents to convince them of reducing their retail pricing or model? Perhaps not right now, hence the industry will continue to be dominated by defence and government requirements, who will be the significant customer as discussed in SatSure Space Jam 01. Every NewSpace EO company assures disruption and democratisation of EO data. However, they either end up being acquired by a larger company, bullied by large customers, or worse – go bankrupt and shut their shops. Still, this has not stopped VCs from pouring capital into establishing new companies despite industry experts' prediction that this upstream EO industry bubble is set to deflate soon[10] .

The issue of the EO industry not becoming as mainstream as a SatCom or Satellite-based navigation industries is mainly due to the following reasons as we see it from a downstream perspective,

1. Lack of innovation in the downstream industry

Traditionally, the technology constraints around building and launching satellites have driven the business and use-cases for the downstream applications industry. In the past decade, there has been much innovation in the upstream industry. However, the same cannot be said on the downstream side. If the SatCom industry benefited from DTH operators who built content, location-based services became a necessity for every consumer and enterprise service. The same has not happened in the case of satellite EO, where the dream of disruption by downstream actors is mainly driven by cloud

computing or applications of ML/AI techniques to automate and mine for insights in the pool of data. However, there still remains the identification of those few radical end use-cases where the business scalability can be compared with those in the SatCom and the Navigation industries. Albeit, there is little incentive to develop real commercial applications using satellite images when a large customer takes up a considerable chunk of the satellite capacity. This is one industry that prefers high customer concentrations, and investors push for it too!

Such breakthrough innovations will emerge only when the ideas are derived from the first principles. When more and more people outside the space bubble - like economists, public policy and governance professionals, environmentalists, people from the financial sector, etc, are included. Well, after all, the use-

Reference:

• [10] https://spacenews.com/why-the-smallsat-bubble-may-deflate-but-not-burst/• https://spaceflight.com/why-dollars-per-kilogram-is-a-poor-way-to-estimate-launch-costs/

case of monitoring agriculture lands via satellites for insurance payouts was envisaged when ESA had a user workshop meet, where professionals from the insurance industry were invited. The end applications must drive the innovations on upstream.

2. Design of the upstream services or satellites aren't driven by the requirements of the downstream.

Usually, EO satellite companies start building satellites based on a market survey or feedback from industry consultants. Furthermore, those companies then start building applications along with selling their images, hence trying to integrate vertically. In comparison, that is not the case when it comes to SatCom, where the user requirements dictate the number of transponders, frequency, throughput and coverage. While, such is not the market power of any well-established satellite data analytics company today, as most of the revenues for satellite operators come from defence. Also, most such companies are made up of data scientists and remote sensing engineers, not space hardware designers who can connect the nuances and sentiments of end-users as requirements

for the type of satellite(s) that would help produce the best analytics and help capture the maximum value with commercial customers.

Such downstream to upstream vertical integration is yet to be seen in the EO industry. And the system engineer responsible for the design and development of such satellites has to be aware or made aware of market scenarios and requirements to solve the shortcomings of the EO industry. It is no surprise that innovation spurs only when there is a right amalgamation of end-use applications and state-of-the-art technology available at hand. Moreover, when the right customer segment target is identified, the system must be designed and developed for that particular application to achieve a cost-performance optimisation[11]. This trend is recently observed in the NewSpace industry, with EO companies coming up to build payloads to target a specific use-case.

3. Performance metric of satellite images are yet to be standardised

The EO industry mainly talks about GSD and Signal-to-noise (SNR) when describing the quality of image data. However, just the GSD, SNR or even the Modulation Transfer Function (MTF) in that case does not describe the complete information. That is mainly because the information depends on whether each pixel downlinked is usable or not. A standard performance metric for EO data is yet to be defined Maybe it can be a combination of GSD, SNR and MTF? SatCom has already figured out the metric as cost per GB or throughput. On a similar line, we at SatSure believe that an accurate metric for the EO industry is the 'cost per usable bit' downlinked. This captures the cost of every bit of a pixel that is downlinked and can be used to generate a product. And it would be interesting to analyse the performance of EO satellites using this metric. Hence, we believe that a satellite designed with the right first principles approach, like the Sentinel Program of the European Space Agency (ESA), can only lead to the development of downstream

Reference:

• [11] https://simera-sense.com/5-trends-to-shape-the-eo-payload-industry-over-the-next-5-years/

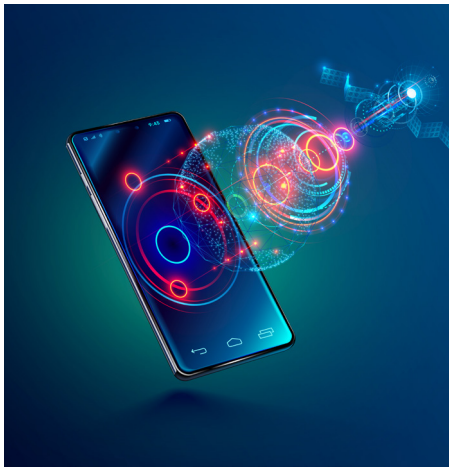
data products for humanity's betterment. And to achieve that without the deep pockets of public space agencies requires innovation on the upstream segment too, and there is still much scope for innovation in satellite hardware.

Proper commercialisation of satellite EO data will only happen when we can cater to multiple industry verticals by going deep into solutioning, have products whose value proposition is tightly tied around the business performance metrics, and doing all of this without discriminating in prioritising satellites' allotment or tasking capacity, while maintaining a price-point that closes the business case for the customers. The prospect of processing images onboard orbiting satellites promises to meet some of these requirements. The concept of edge processing is just getting evolved, and we at SatSure expect to leverage that by downlinking just the insights instead of the whole image, further cutting down on ground station costs.

Furthermore, considering the crowding of Low Earth Orbits lately, it is high time people focus on building a larger field of view sensors for higher coverage area with a few satellites instead of launching a constellation with hundreds of satellites to achieve global coverage. The risk of collision in orbit has never been higher than now, and it is a limited resource that has to be used sustainably. These design philosophies, coupled with identifying the use cases and solutioning for those applications with the best products that can be scaled, will help achieve the economies of scale that can be made affordable to increase the usage further and explore different use cases to ignite any innovation.

On an ending note, we explore one idea (which might not be feasible) which can potentially help to commercialise EO data. Aravind Ravichandran talks about the iPhone moment in the EO industry[12] . But can we get the EO data directly to the iPhone? Perhaps not the image itself, but some insights that are easily consumable? Moreover, if we manage to get the data onto the phone, what are the possibilities of applications?

SatCom companies like Lynk are already attempting to connect regular handheld mobile phones to satellites.



Further, Starlink has already demonstrated connectivity to homes. These use-cases show a promise in achieving mass adoption of SatCom services and hence low-cost on the end-user. Can we attempt something similar in the satellite EO industry? Where we enable the end-user to downlink the insights directly to a regular mobile phone or a laptop connected to the internet. The latter is almost there, with infrastructure like AWS and Azure's ground stations facilitating to get the data from satellites on the internet. However, that data has to be processed through a long pipeline to make it usable. **Only when we make the EO data more accessible, usable, and contextualised can we empower the end user to unearth its endless possibilities.**

Reference:
[12]https://terrawatch.substack.com/p/the-iphone-moment-for-the-space-industry-dealing-with-the-hype-around-earth-observation-b321df18f051

SpaceJam Episode 1

Satellite Earth Observation: An Industry In Transformation

Host

Krishna Reddy
Junior Innovation Officer, Consulate-General of the Kingdom of the Netherlands

Prateep Basu
CEO, SatSure

Panelists

Aravind Ravichandran
Founder, TerraWatch Space

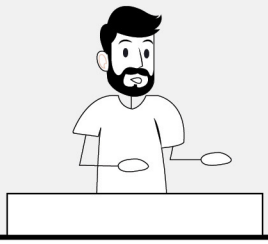
Narayan Prasad
COO, satsearch & Host, NewSpace India Podcast

Space is not just entitled to technology and research for building spacecrafts and rockets that can carry humans to other planets. The sector is more than that; it entails business analysis, financial strategies, policies, investments, and much more. Today, space has become a hot topic in the business world. The sector can provide solutions to almost all the sectors, from your farm to your banks.

Following this, demystifying the space industry is one of the key things to understand its promise in different markets. And who else can provide a better solution than a spacetech stakeholder itself? And that's where SatSure has entered with its indigenous Space Jam series, to help demystify everything related to the space sector with folks from around the world.

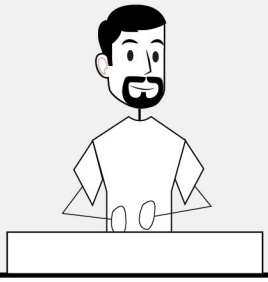
The first episode of the Space Jam series, titled **'Satellite Earth Observation: An Industry in Transformation'**, focused on the critical aspects of the industry and its evolution through the years. The speakers were Narayan Prasad, COO, SatSearch, Aravind Ravichandran, Founder, Terra Watch Space, and Prateep Basu, Founder, SatSure. Krishna Reddy, Jr. Innovation Officer, Space, and Technology, Netherlands Government, moderated this session held on 21 May, 2021.

SpaceJam Cast



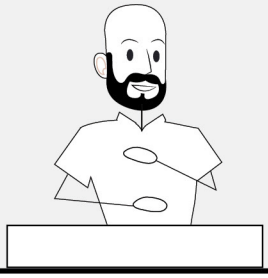
Krishna Reddy

Krishna is a mechanical engineer, with an interest in niche technologies, that entails graphene and the whole spacetech sector per se. With an abundant amount of knowledge to comprehend. He ventured into the field of journalism to understand the skills to build certain channels to explore.



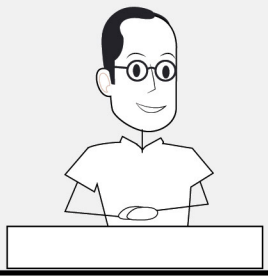
Aravind Ravichandran

Aravind is the founder of TerraWatch Space which provides independent advisory services, insights and thought leadership in the space industry.



Narayan Prasad

Narayan is the Chief Operations Officer and is a Host of NewSpace India Podcast Satsearch. He is also a Curator and community builder of Space 2.0 folks in India.



Prateep Basu

Prateep is the co-founder and Chief Executive Officer at SatSure, a decision analytics startup. He has led the company to become a Global Innovator at the World Economic Forum in 3 years since conception. He has previously worked as a scientist in ISRO, and as a earth observation industry analyst at Boston based Northern Sky Research (NSR).

1

Understanding the end consumers of satellite data operators

2

Go to your browser and type space industry. Most likely, you will see a list of names of spacetech companies providing a range of space-oriented solutions. But you would hardly see a clear list of customers availing of those services, besides the primary customers, the government, and defense forces.

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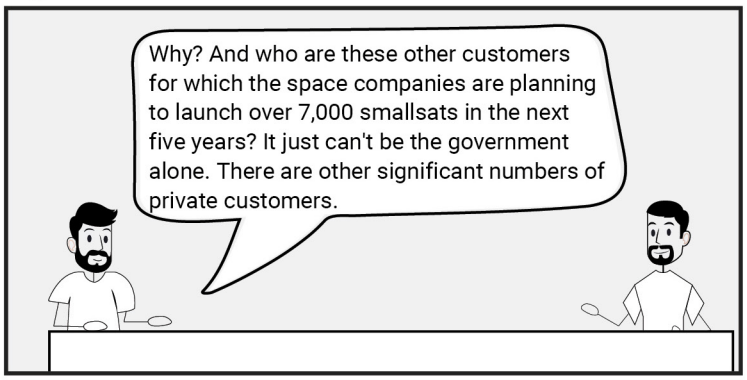

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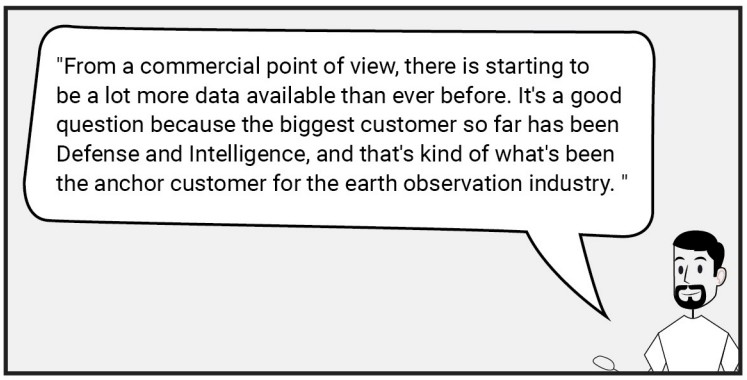

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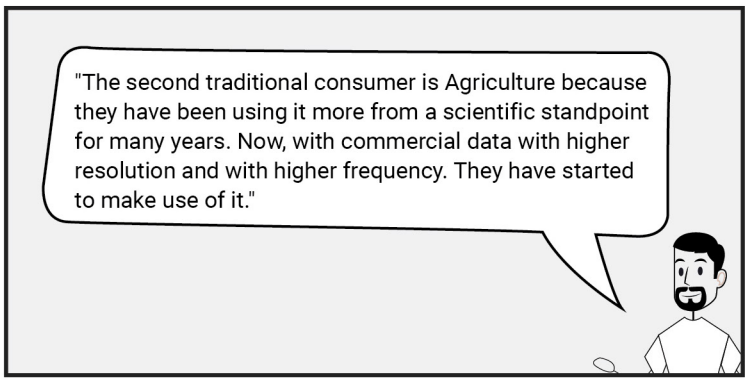

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For decades it was Sentinel, Copernicus program, and Landsat that were leading on the commercial front. It is now that the sector is seeing a disruption by new players, which are offering analytical and data processing-oriented solutions.

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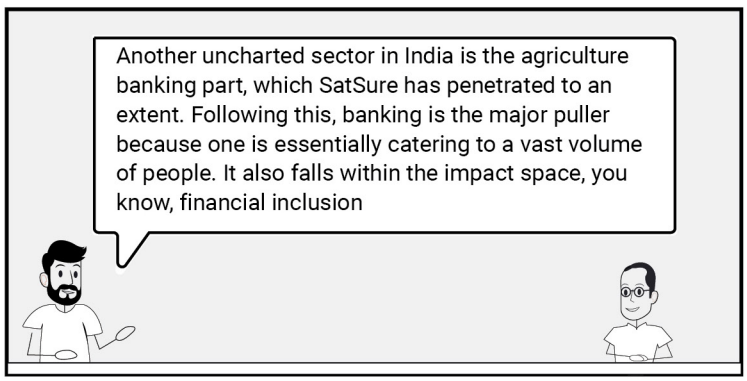

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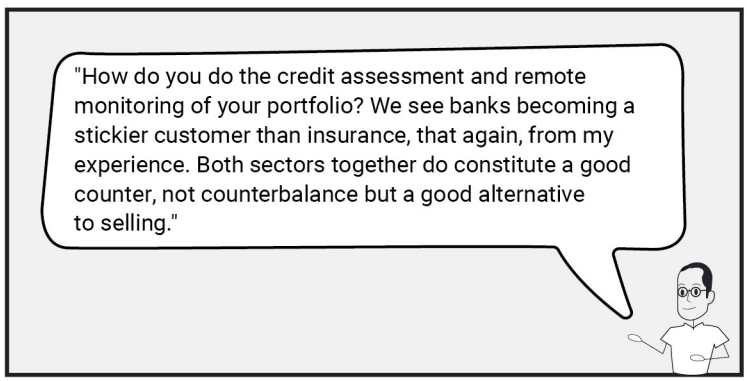

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There are multiple ways to manage data but the core thing is to store data and it completely depends on what type of models we are running. Satellite data is available in the market but not in easily consumable form. In short, one still needs an expert to crunch the data down to access the required information. In contrast, one would assume that anyone can understand the data.

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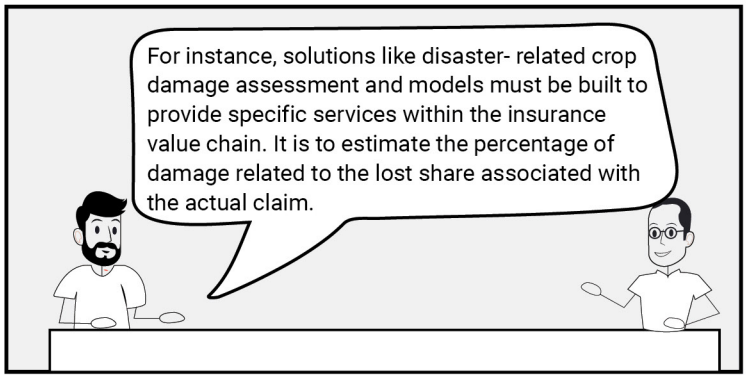

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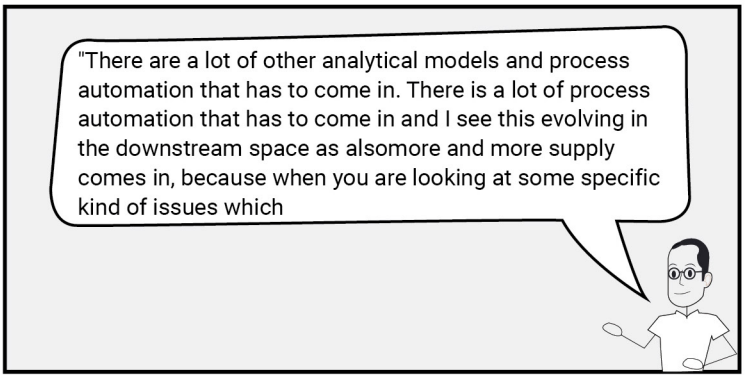

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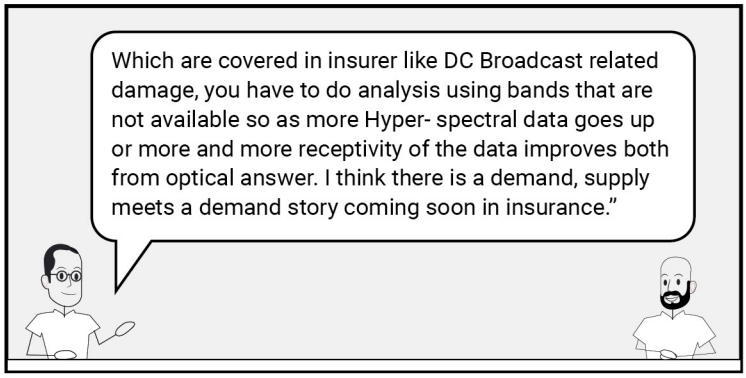

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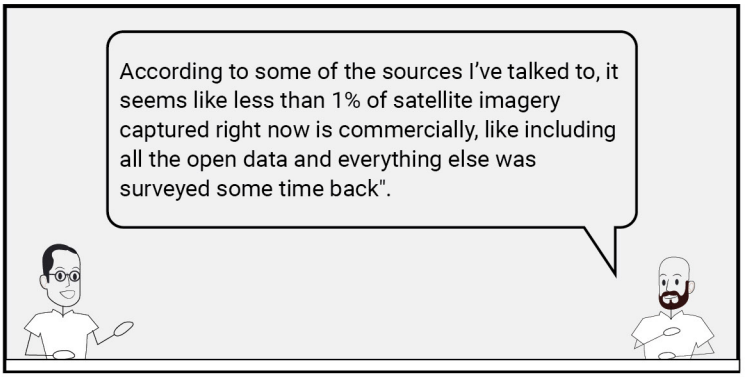

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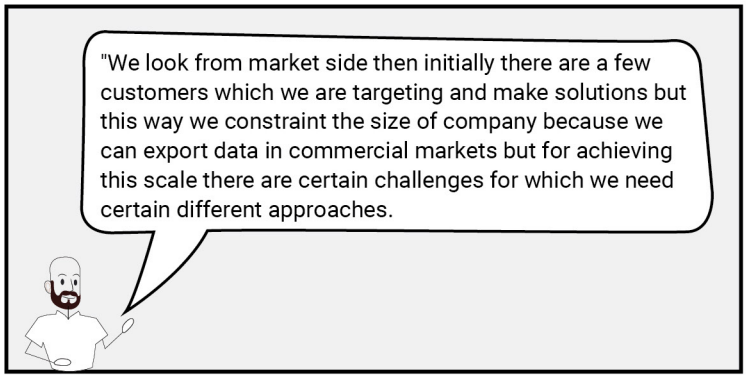

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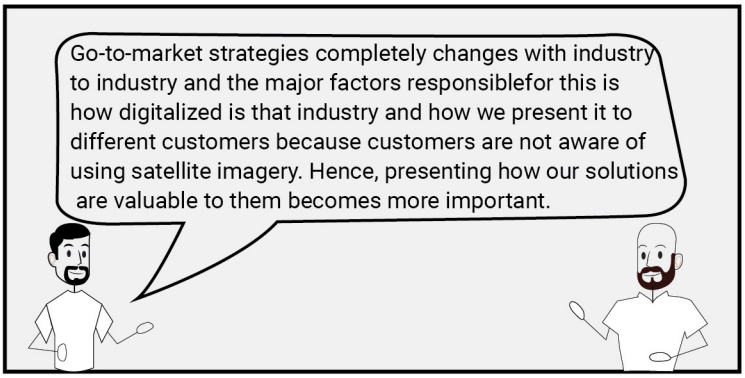

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18

Most of us are inclined to a specific brand when choosing a smartphone, then comes the part where we look at what the device has to offer. In short, most people today buy a brand and not a product. But what about in space? A sector where one wouldn't know beyond a certain Elon Musk.

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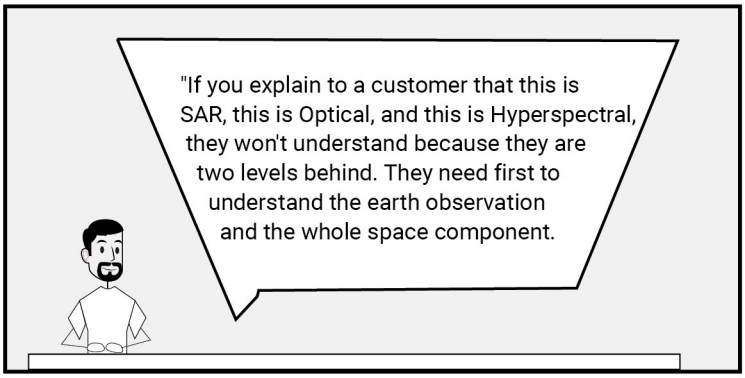

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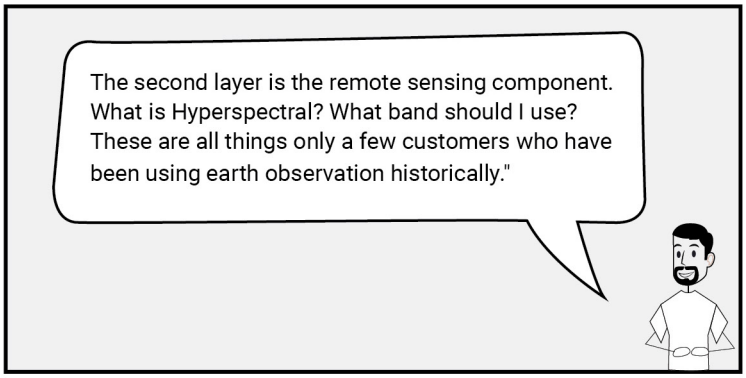

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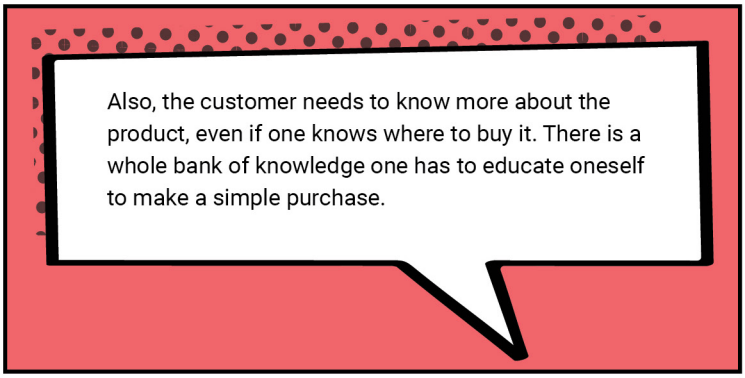

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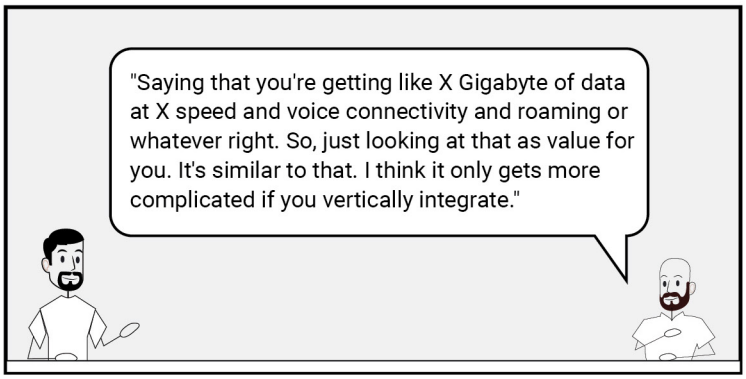

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Defense and government are those customers who are well versed with what an ounce of a solution can bring in. For instance, primarily defense customers want the variety in satellite datasets. Not just the velocity and volume, but they also want to know whose pixel gives the best picture and what the best delivery time you can give.

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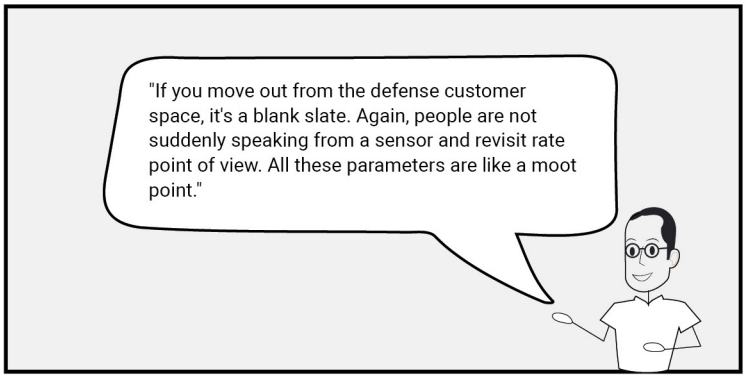

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The offspring of the EO industry - The independent developers

26

A decade ago, the internet was a niche space in India and other developing economies. Only a section of the population with the privilege of internet and smartphone would have access to it. Now, it has changed. Reason? Affordable internet and budget smartphones, and result? We have seen a surge in independent content creators, app developers, and many more, making the whole business a multi-billion-dollar business. .

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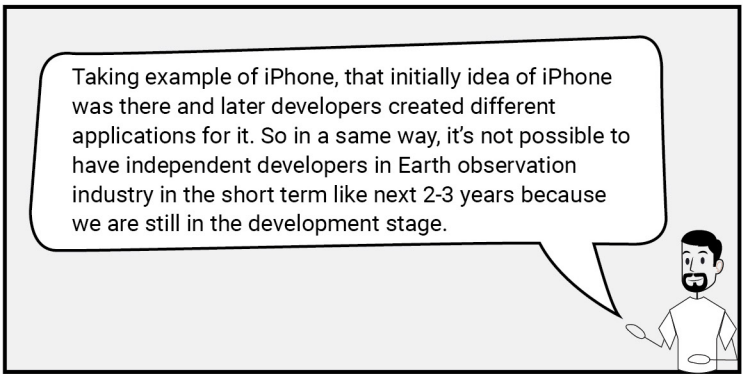

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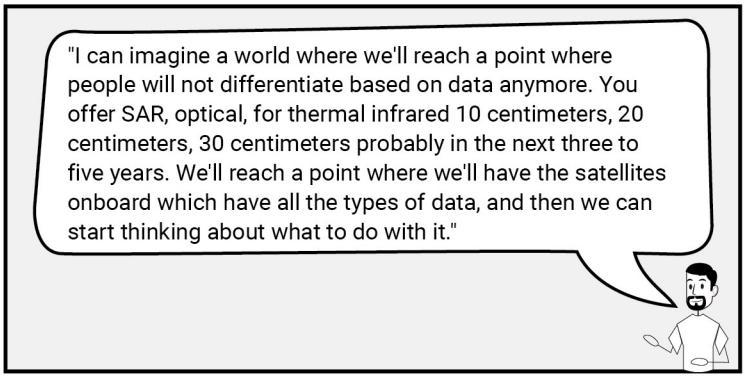

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The bridge between a product and its success is sales. Most of us interested in buying an iPhone would hardly know the hardware, the programming, and the whole mechanism the product entails. But it's easier to sell a product like the iPhone by showing to its users features that would attract them and meet their social requirements. What happens when your product itself is a programming product, or a script, maybe an algorithm?

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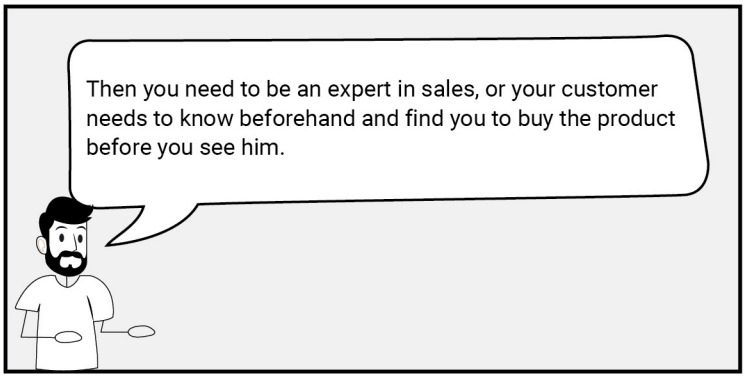

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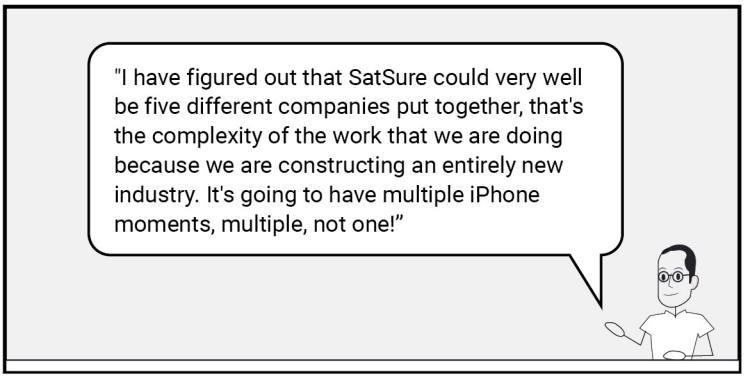

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Another thing which is very important while talking about the future of Earth observation (EO) industry that EO data can become the core part of digital transformation strategy for any government or organization and this industry itself is in the transformation phase, with possibilities of a future where there will be a highly competitive market.

33

While talking about the key challenges in using EO data, defense players are the big buyers because they know how to utilize that data but in the other sectors people are still undergoing training of how to imbibe AI and DT (digital transformation) as part of their strategy for impacting their organization's top-line and bottom-line.

34

As we try and unravel the industry, it seems similar to opening a pandoras box. You just can't entail all the aspects in a single short description. It's because the industry is growing and expanding that fast. Several countries are yet to enter the digital service-oriented era, which means a compelling case lies there.

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With the knowledge of employing satellite data, one can utilize it in the initial stages and skip the evolution part which other nations went through from 1G to 5G and jump straight to the front.

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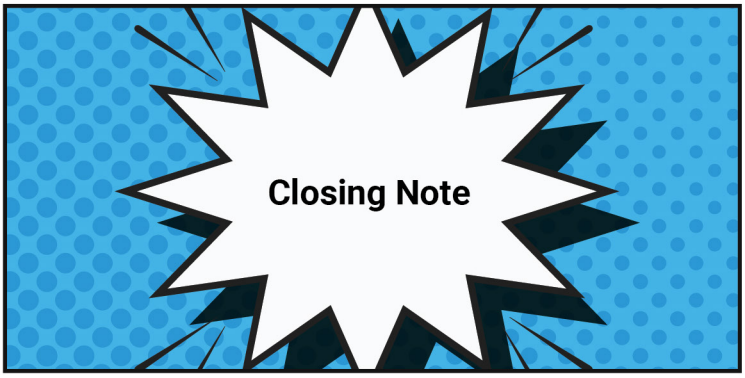

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Space industry comprises of high risks from the beginning and that's why investors hesitate to invest because chances are always 50-50 and the growth of space industry depends a lot on the other industries.

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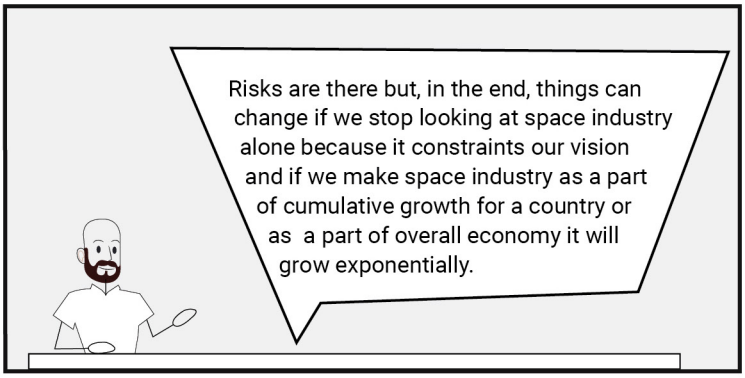

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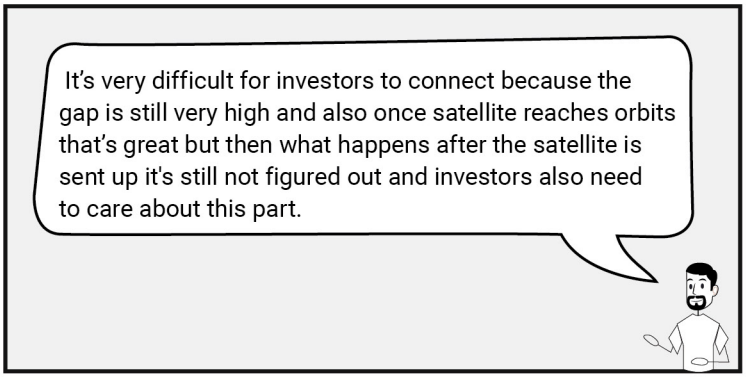

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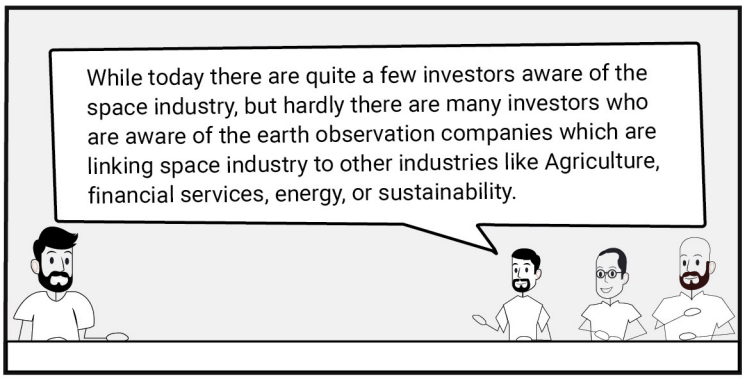

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