



INDIA BIOECONOMY REPORT 2022

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JUNE 2022

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This report has been prepared for “Make In India Facilitation Cell for Biotechnology” of Biotechnology Industry Research Assistance Council (BIRAC) by Association of Biotechnology Led Enterprises (ABLE). The report is written by **Narayanan Suresh**, Chief Operating Officer of ABLE and **Srinivas Rao Chandan**, Editorial Consultant for ABLE

CONTENTS

Indian BioEconomy

Highlights/ Overview	4
Executive Summary	6
Inching towards the \$150 billion BioEconomy by 2025	14
BIRAC's Role in Fostering the Biotech Ecosystem In India	18
List of drugs approved in 2021	24
Quotes	30
CovidEconomy	32
BioPharma, CROs, CDMOs, BioIT	46
BioIndustrial	50
BioAgri	55
Start-ups	58
Acknowledgements and Sources	66



KEY HIGHLIGHTS

Amidst the raging Covid-19 pandemic, with two rounds of lockdowns and other disruptions, 2021 has been a remarkable year for India's BioEconomy.

And this happened because the biotechnology industry has been at the forefront of fighting the pandemic by developing and deploying a variety of tools at its disposal such as Vaccines, anti-virals, diagnostic tests, and so on.

Here are the 5 key highlights of what has been a remarkable year when the BioEconomy grew from \$70.2 billion to \$80.12 billion in 2021.

INDIA ADMINISTERED NEARLY

4MN
DOSES

OF COVID-19 VACCINES PER
DAY (TOTAL 1.45 BILLION
DOSES GIVEN IN 2021)

3 BIOTECH START-UPS

WERE INCORPORATED EVERY DAY
IN 2021 (A TOTAL OF 1,128 BIOTECH
STARTUPS SET UP IN 2021)

INDIA GENERATED

\$219MN OF BIOECONOMY

DAILY (ADDING \$80.12
BILLION IN 2021 IN ALL)

UNPRECEDENTED R&D INVESTMENTS.
BIOTECH INDUSTRY **CROSSED**

\$1BN R&D SPEND

1.3MN COVID-19 TESTS PER DAY



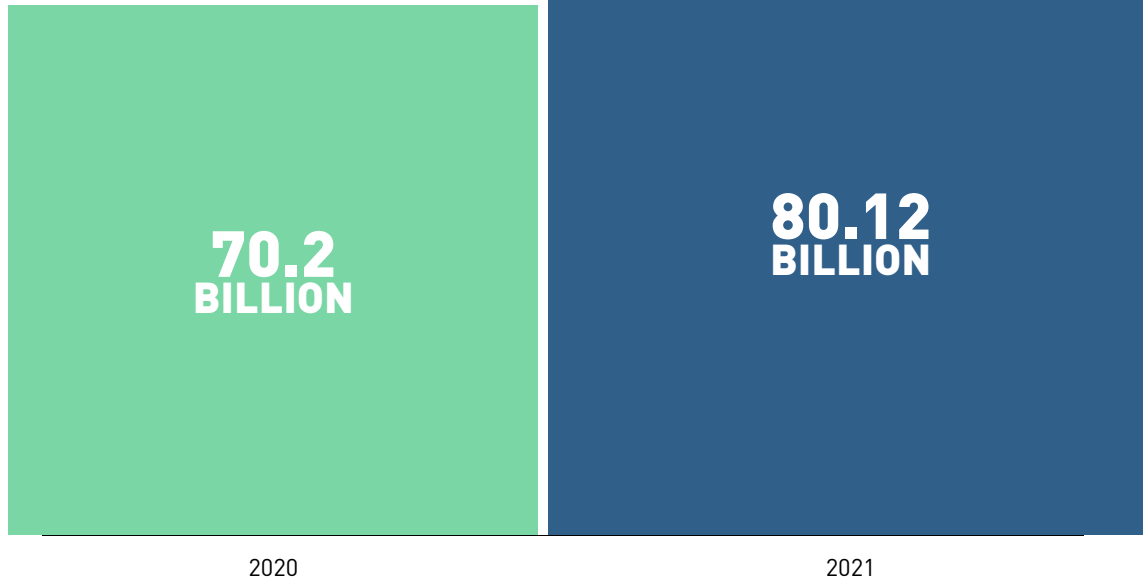
EXECUTIVE SUMMARY

India's BioEconomy in 2021 registered 14.1% growth over 2020. India's The Indian BioEconomy for the period January-December 2021 is valued at \$80.12 billion. The BioEconomy in 2020 was valued at \$70.2 billion.

BIOECONOMY 2020 VS 2021

TOTALS (\$)

14%
GROWTH



The Indian BioEconomy for 2021 (January-December 2021) is estimated at \$80.12 billion. The BioEconomy registered 14% growth over 2020. Indian BioEconomy is continued to nearly account for 2.6 percent share of India's GDP in 2021. India's BioEconomy continued to perform well during the pandemic years as the BioPharma segment responded to the vaccine and testing needs in India.

Nearly a fifth of BioEconomy has been due to the Covid-19 vaccination and testing drive. India saw about 1.45 billion doses administered till 2021. This is stupendous performance by any standards as India cleared the Covid-19 vaccines for emergency use only in January. India achieved administering 1 billion Covid-19 vaccine doses mark in about nine months. The rate of vaccinations is a new high and

never seen before. India took nearly three decades to reach 1 billion TB vaccine and two decades to administer 1 billion polio vaccines, respectively. India and China were the only nations in the 1 billion doses club in 2021. India has done well in Covid-19 testing in terms of absolute numbers. India is the top ranked country in the world in testing and recorded half-a-billion (499 million) tests in 2021.

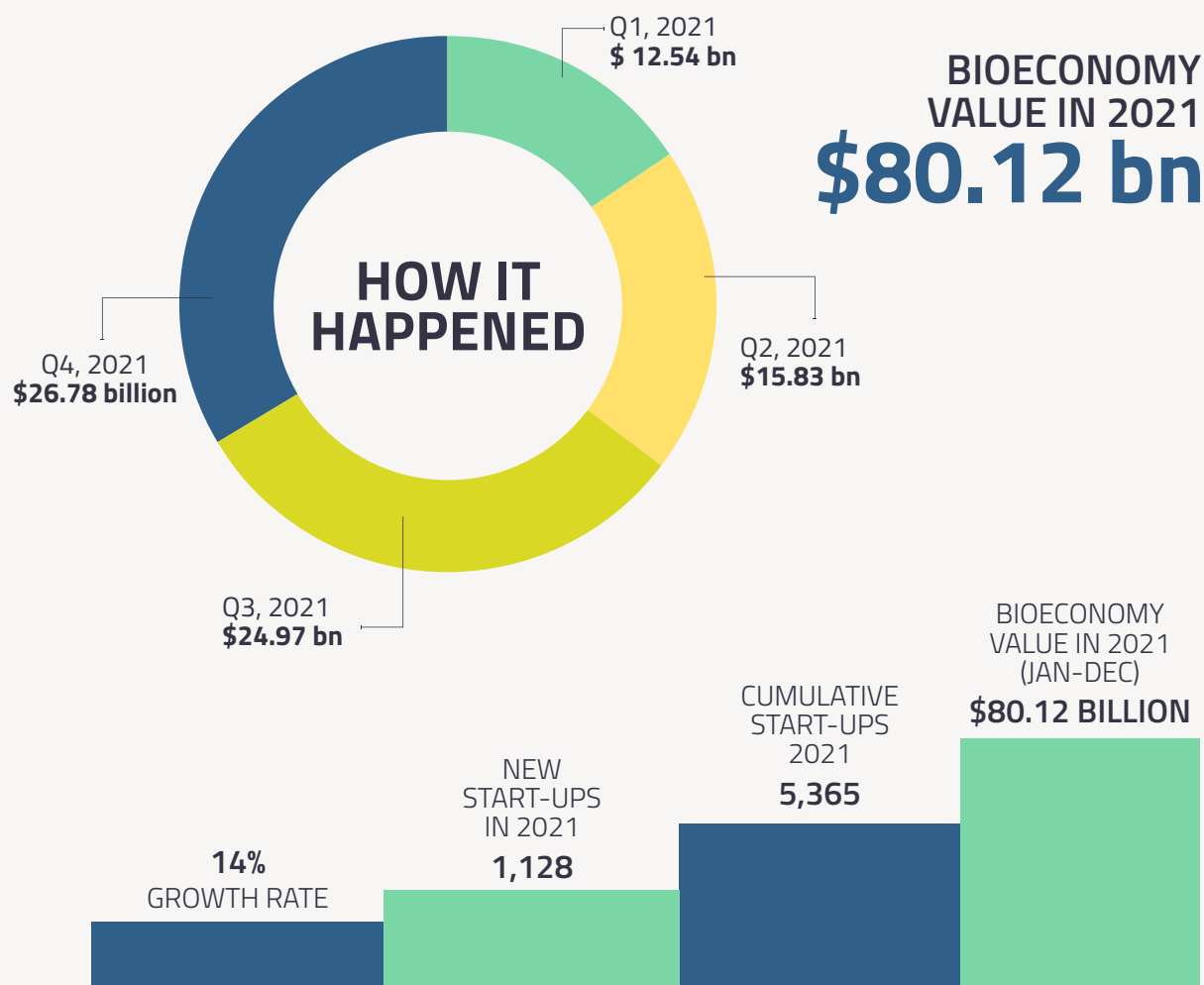
The Covid-19 Bioeconomy was \$14.56 billion in 2021. Covid-19 vaccines accounted for \$8.7 billion in value, while testing accounted for \$5.9 billion. On an average each dose of Covid-19 vaccine created a conservative economic value of \$6, while each sample test is estimated at \$11. The Covid-19 segment is classic example of scaling up of manufacturing and efficiency of administration.

INDIAN BIOECONOMY, DECEMBER 2021

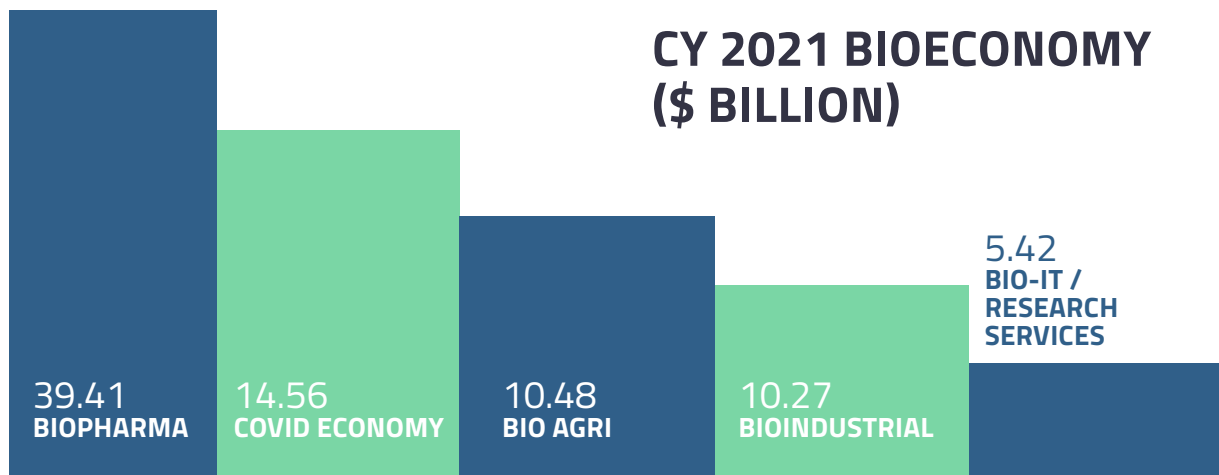
HIGHLIGHTS

This IBER report now has been the guiding force for a host of national policies, regulations, and directives set out to reach ambitious target of \$150 billion BioEconomy by 2025. Further, several states have begun to model their respective Biotechnology sectoral thrusts based on the national Indian BioEconomy Report (IBER).

QUICK FACTS



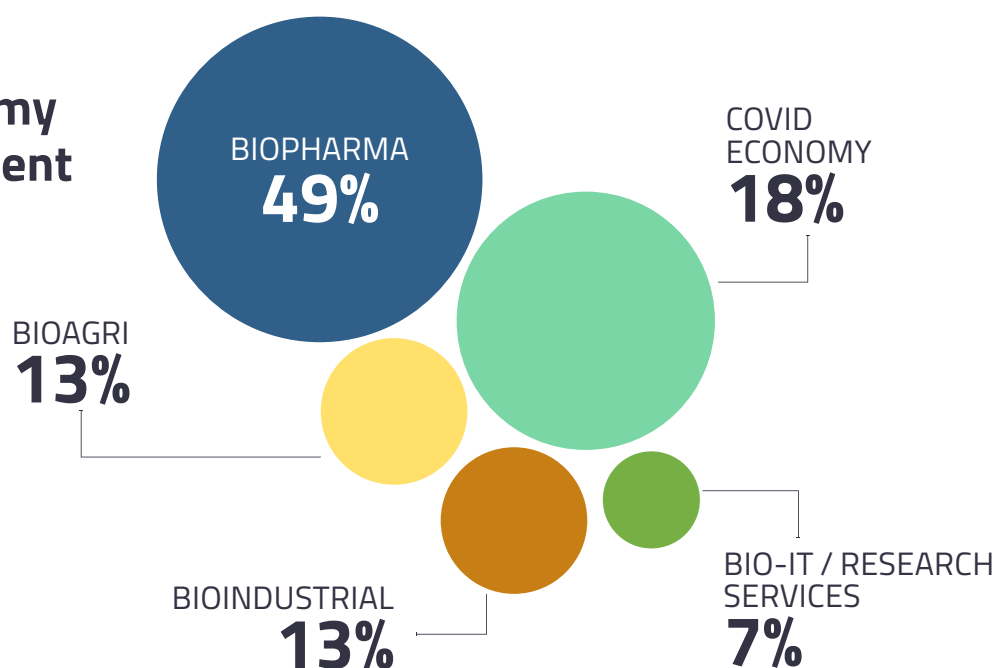
CY 2021 BIOECONOMY (\$ BILLION)

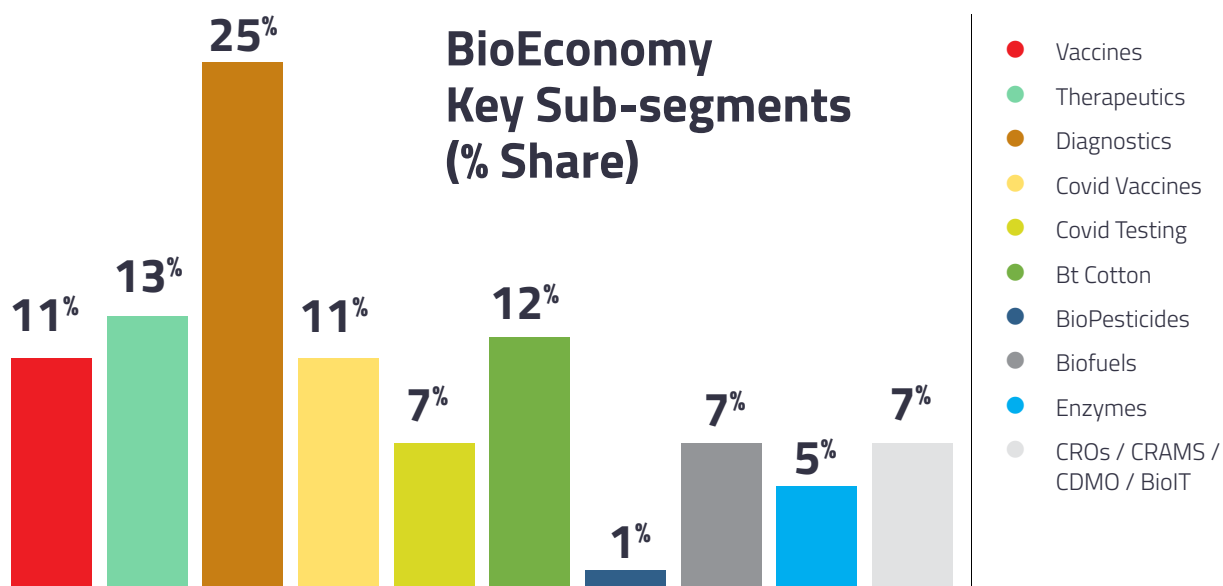


BioPharma still accounts for the largest share of the BioEconomy. BioPharma accounted for 49 percent share of the BioEconomy. The total economic contribution of this segment was estimated at \$39.4 billion. Diagnostics accounted for 52.8% share of the total BioPharma Market, while Therapeutics segment stood at 26%. The vaccines segment excluding Covid Vaccines accounted for the rest. Indian in-vitro diagnostics market is one of the leading

segments in the Diagnostics segment. Factors like high prevalence of chronic diseases, increasing use of point-of-care (POC) diagnostics, and rising awareness and acceptance of personalized medicine and companion diagnostics are pushing the sector's performance. The Biotherapeutics segment is estimated to record \$1.05 billion in value. The diabetes, oncology, infections, and cardiology medication are the primary contributors.

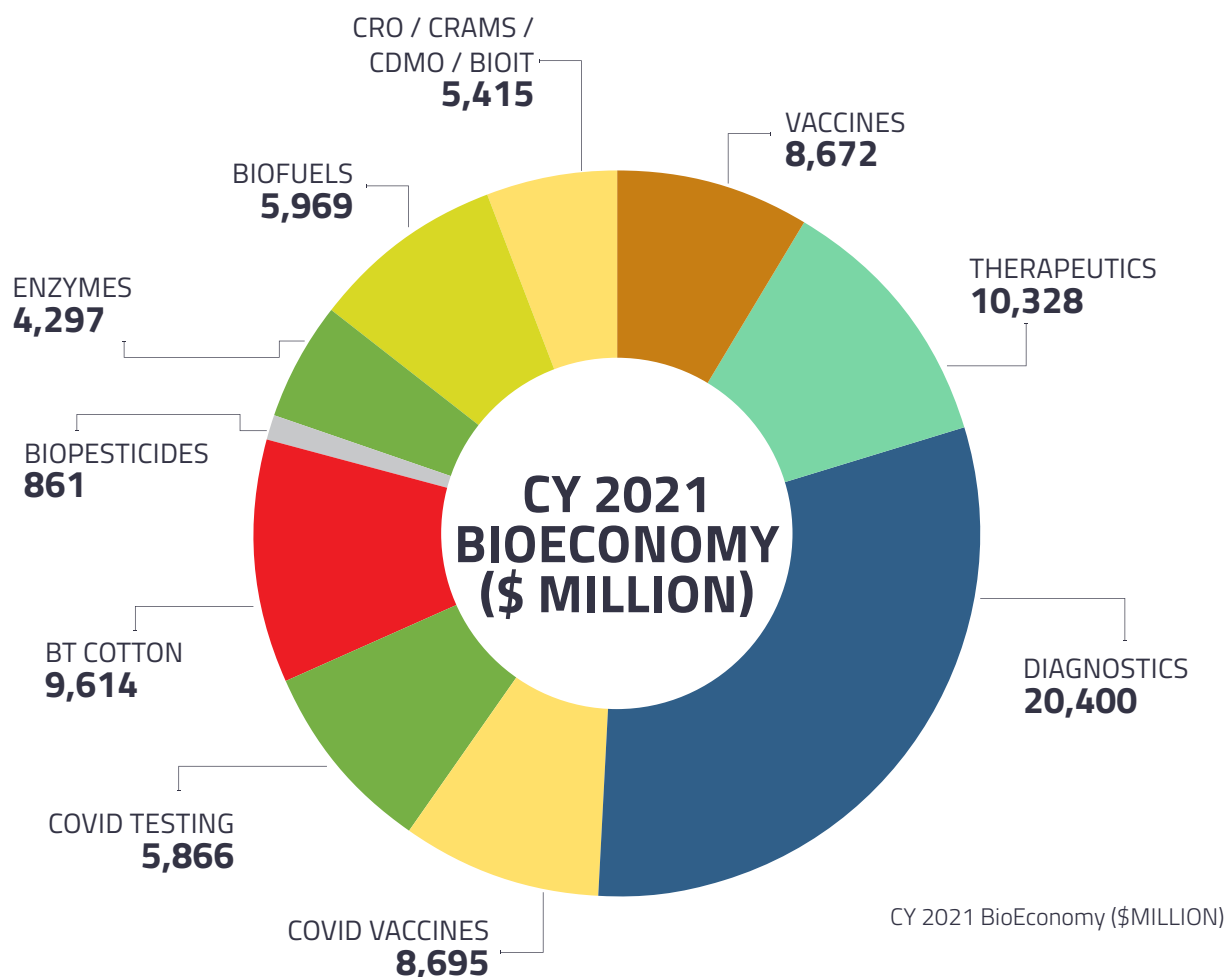
BioEconomy Key Segment (% Share)



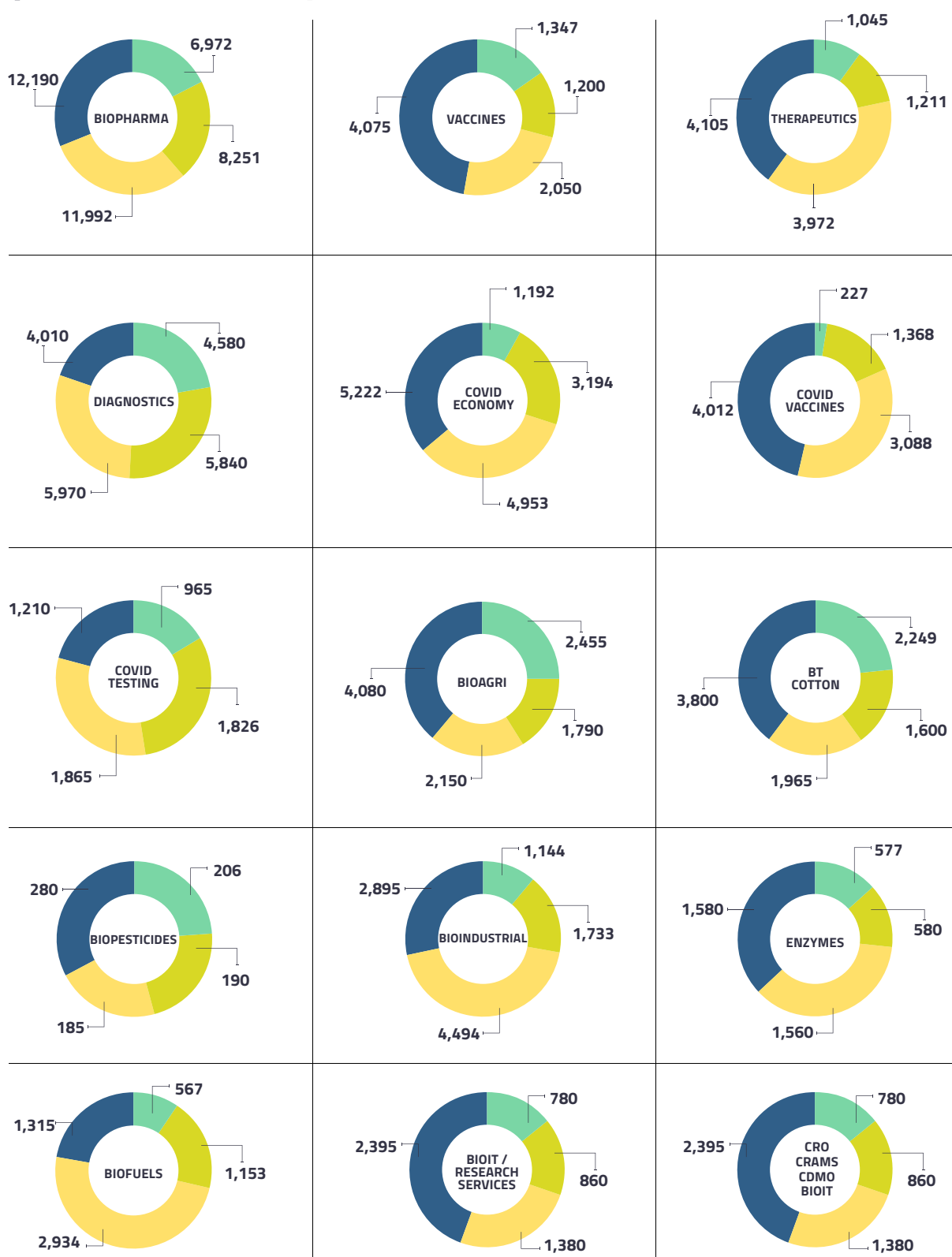


The BioIndustrial segment's contribution to the BioEconomy witnessed 202 percent growth in 2021. The segment is estimated at \$10.27 billion. The primary driver has the government's decision to concentrate on

renewable energy, especially blended fuels. The Biofuels contributed \$5.97 billion in value. The other important sub-segment of BioIndustrial, the enzymes market reached \$4.3 billion.



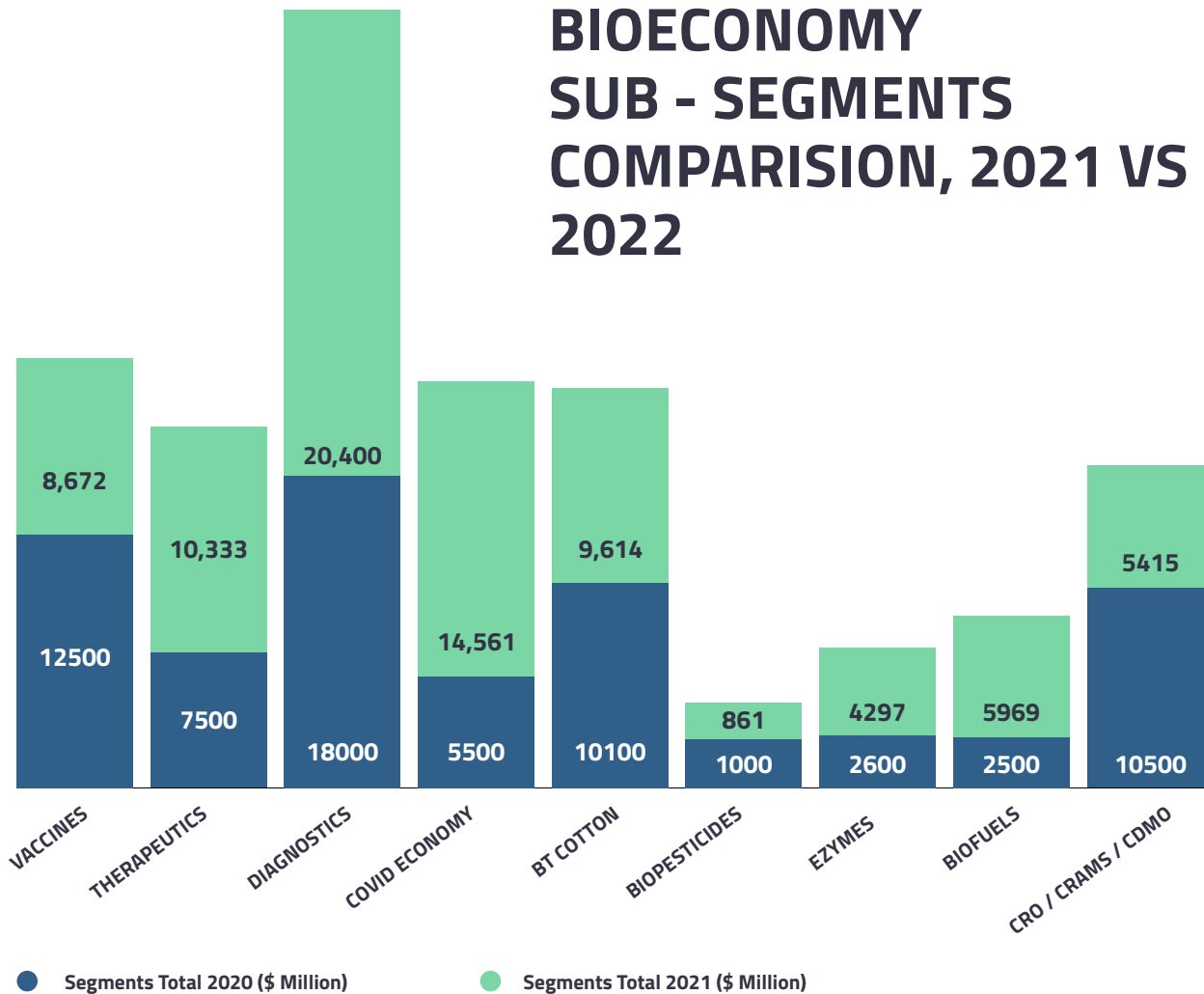
BIOECONOMY QUARTERLY PERFORMANCE, 2021 (SUB-SEGMENTS)



BioEconomy (\$Million)

● Q1, 2021
 ● Q2, 2021
 ● Q3, 2021
 ● Q4, 2021

BIOECONOMY SUB - SEGMENTS COMPARISION, 2021 VS 2022



Foreign Direct Investment (FDI) in biotech is estimated to have touched

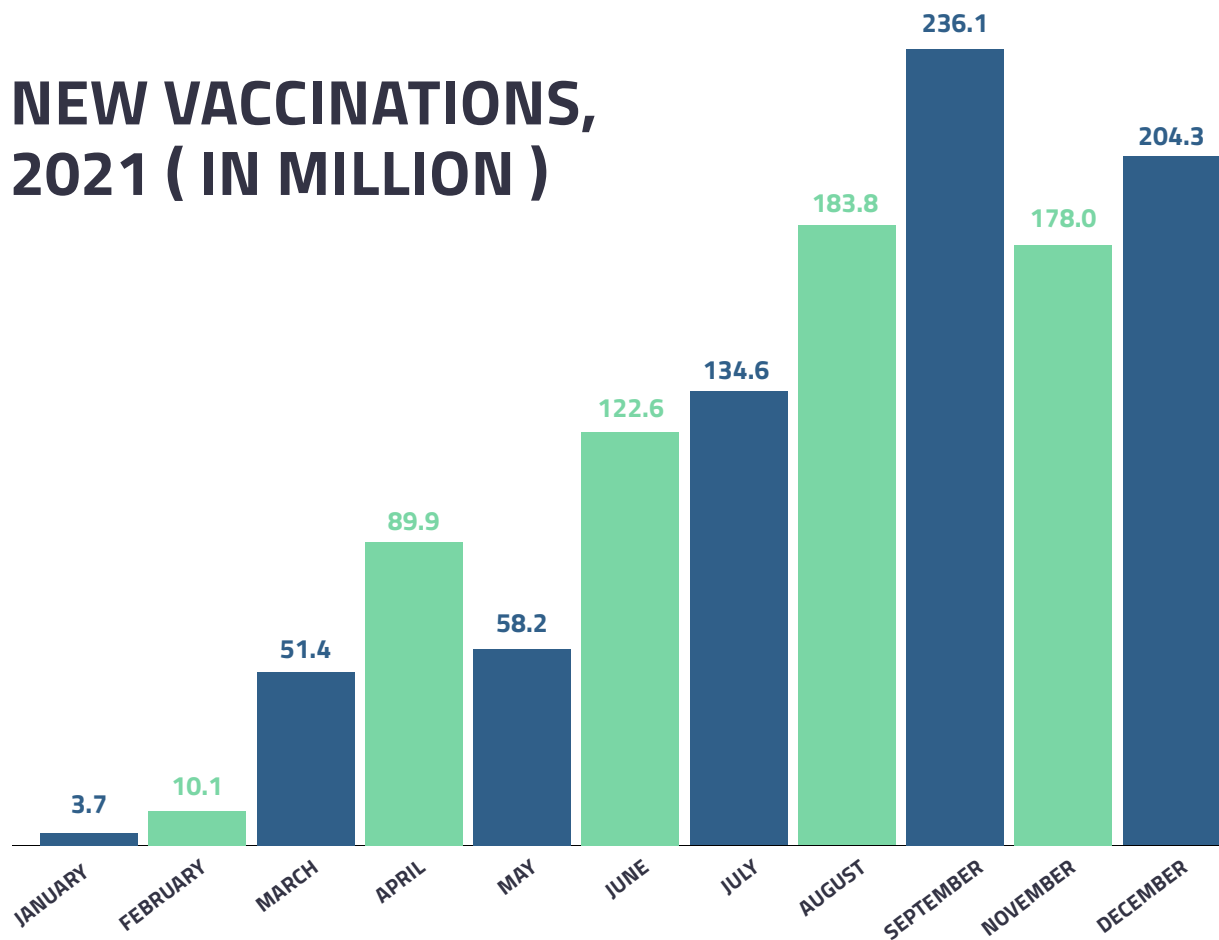
\$830 million

in 2021, up from \$780 million in 2020

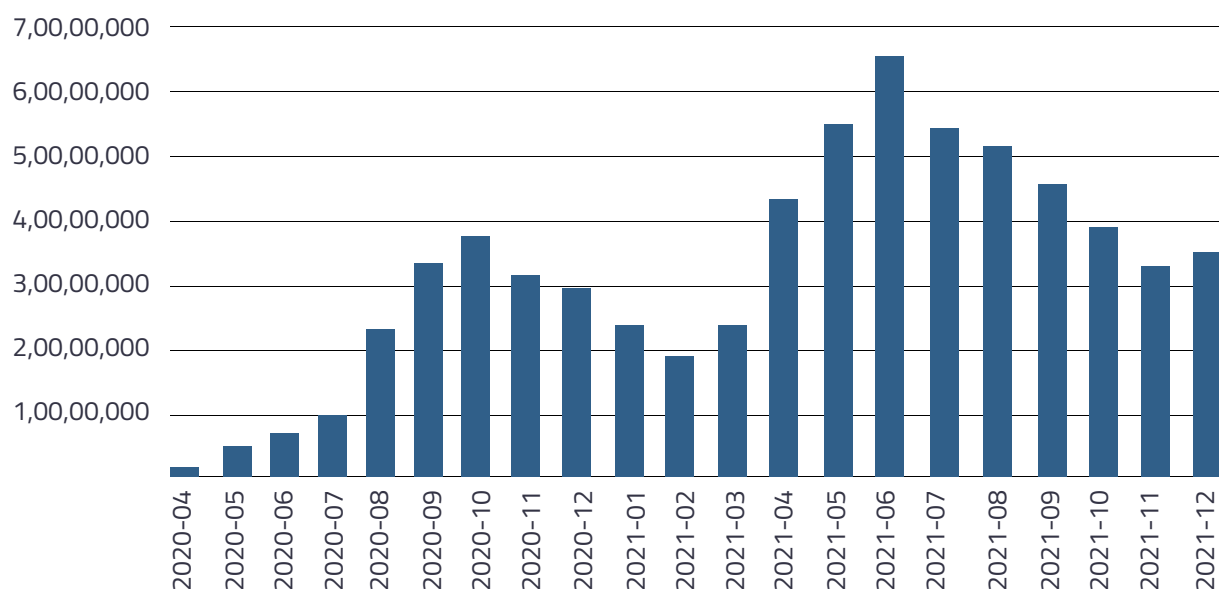
The country also saw increased activity of start-up registrations. The cumulative number of start-ups in 2021 was estimated at 5365. About 1128 companies have registered in 2021. This is the highest number since year 2015. It means on an average 94 companies are being set up every month in the country or nearly 3 companies a day.

The Indian BioEconomy has gained traction with the normal business and it is estimated that sector may witness 8-10 percent growth in 2022.

NEW VACCINATIONS, 2021 (IN MILLION)



COVID TESTING SINCE APRIL 2020



INCHING TOWARDS THE \$150 BILLION BIOECONOMY BY 2025

How we will cross the \$ 150 billion in 2025 and why we can aim to double it to \$ 300 billion by 2030

India's BioEconomy has crossed \$80 billion mark in 2021. The nation has set an ambitious target for the BioEconomy to touch the \$150 billion threshold by 2025.

Essentially, the performance of almost all the sectors that contribute to the national BioEconomy has to nearly double in the next 3-4 years to achieve this target.

People may be sceptical but we believe this is possible because there are many new green shoots within the biotech segment that are showing signs of great performance. And the hope comes from the resilience and the amazing performance of our Vaccine manufacturers and other related sectors who rose to the occasion and contributed nearly a quarter of 2021 BioEconomy, when growth stagnated in other sectors during the pandemic.

HERE'S HOW THE \$ 150 BILLION MAGIC WILL HAPPEN BY 2025:

- BioPharma sector to grow to nearly \$63 billion from \$45 billion in 2022 (nearly 1.4 times). India made biosimilars are getting accepted in developed markets like the USA and we can expect more nations to source cost effective biosimilars in many disease categories as these global quality medical products demonstrate their efficacy and popularity in foreign countries.

- The Indian Diagnostics and medical devices market is likely to see a huge jump both in terms of consumption and exports. Covid-19 helped the nation to create the right ecosystem to manufacture, source, and export as well. The Diagnostics Labs services are also reaching across the breadth and width of country. "RT-PCR tests" done here is a frequently spotted signs even in small cities and towns across the country, indicating the spread of this expertise Ayushman Bharat is aiding the spread and India's BioEconomy from Diagnostics services and medical devices products is expected to touch \$35 billion by 2025.

- Vaccines are expected to generate \$15 billion by 2025 and biotherapeutics another \$15 billion by 2025. The therapeutics segment is likely to create a BioEconomy of \$15 billion from recombinant and biosimilar products.

- BioIndustrial is another important sector that has got fillip from the Prime Ministers vision of Atmanirbhar Bharat and India becoming "energy independent" by 2047. The Indian Government has approved the amendments to the National Policy on Biofuels and took decisions to increase biofuel production and advance the introduction of ethanol blended petrol with up to 20% blend from April 2023. The amendments include allowing more feedstocks for the production of biofuels,

INDIA SHOULD AIM FOR \$ 300 BILLION BIOECONOMY BY 2030

YEAR 2030 FORECAST

India's BioEconomy has the potential to reach \$270-300 Billion by the year 2030 and account for nearly 3.3-3.5 % share of India's GDP from the 2.8 percent share in 2021.

This is possible when the BioPharma sector races to hit the \$120-125 billion mark and each of the three segments—Agriculture including animal biotech and marine biotech, Bioindustrial segment and the BioServices segment of Contract research, contract manufacturing, and, BioIT services cross the \$60 billion mark. It is possible if the Indian continues to take initiatives like it took during Covid and in shaping the Biofuels strategy.

In the BioPharma segment, India can leapfrog in the Vaccines and Therapeutics segment. These two together accounting for nearly 50 percent share of the BioPharma and the Diagnostics labs, medical devices, and services segment estimated to reach \$60 billion. The Biofuels segment is forecast to contribute nearly \$50 billion in value, while enzymes will rake in \$20 billion. The BioServices segment is likely to touch \$50-60 billion or even more.



permission for the export of biofuels in specific cases, support developments of indigenous technologies and generate more employment. The Biofuels capacity in the Indian is expected to grow from 5.2 billion liters in 2021 to 10.1 billion liters in 2025 (almost doubling). In terms of the economic value the Biofuel will generate \$20 billion BioEconomy by 2025 from \$6 billion in 2021 (almost tripling).

- BioAgri comprising of Bt Cotton, pesticides, marine biotech, and animal biotech has the potential to nearly double its BioEconomy contribution from \$10.5

billion to \$20 billion in 2025. The impetus on circular economy will give the needed push to the sector.

- BioServices sector comprising of CROs/CDMOs and BioIT segment is forecast to grow from \$6.4 billion to \$26.6 billion. The segment will nearly quadruple. Most of the large IT companies have dedicated biotech / health care practice. Nearly 5-6 percent of the total value of company's income comes from the biotech portion of healthcare and life sciences practice.

- New segments like smart proteins,

OPTIMISTIC PROJECTION

BIOECONOMY 2025 WITH SUPPORT FROM GOVERNMENT

Segment / Year	2020	2021	2022	2023	2024	2025
BIOPHARMA	38	39.4	45.4	51.5	57.3	63.9
BIOAGRI	11.1	10.5	12.5	14.3	16.9	21.1
BIOINDUSTRIAL	5.1	10.3	14.5	18.5	23.1	28.9
CRO / BIOIT / Research	10.5	5.4	10.6	14.5	19.5	26.6
Covid Economy / Others	5.5	14.5	10	10	10	10
TOTAL BIOECONOMY	70.2	80.1	93	108.8	126.8	150.5

BIOECONOMY 2030 WITH SUPPORT FROM GOVERNMENT

Segment / Year	2025	2026	2027	2028	2029	2030
BIOPHARMA	63.9	70.9	79.2	88.6	101.1	112.2
BIOAGRI	21.1	28.6	32.8	36.3	40.3	45.3
BIOINDUSTRIAL	28.9	32.6	36.1	41.1	46.1	53.1
CRO / BIOIT / Research	26.6	30.2	35.7	41.8	48.8	57.2
Covid Economy / Others	10	10	10	10	10	10
TOTAL BIOECONOMY	150.5	172.3	193.9	217.8	246.3	277.8

protein and peptide-based materials, contact lens, speech restorers, smart pills, nerve regenerators, portable dialysis, prosthetic limbs, new wave of smart tediagnosics, will create a nearly \$10 billion in BioEconomy.

- Just take the case of “ alternate foods” or “smart proteins “ India is the preferred destination for both Innovation and manufacture in the ‘Smart Protein area. There is a very big demand for fermentation capacities in this area from startups in US. We have already seen some of the investment happening and in the next 3-5 years there is a potential for 10 million litre

fermentation capacities to be set up in India. This will attract an investment of more than \$ 500 million which will generate a revenue of \$1 billion every year. These facilities could be located in strategic places which has all the infrastructure for setting these big fermentation faculties. The industry just needs the support from a regulatory and infrastructure point of view to capitalise on this great emerging opportunity.

YEAR 2030 FORECAST

India's BioEconomy has the potential to reach \$270-300 Billion by year 2030 and account for nearly 3.3-3.5 % share of India's GDP from the 2.8 percent share in 2021.

REALISTIC PROJECTION

BIOECONOMY 2020 - 2025 (\$ BILLION)

Segment / Year	2020	2021	2022	2023	2024	2025
BIOPHARMA	38	39.4	45.4	50.5	55.9	61.3
BIOAGRI	11.1	10.5	12.5	14.3	16.4	18.9
BIOINDUSTRIAL	5.1	10.3	13.5	15.5	18.1	21.1
CRO / BIOIT / Research	10.5	5.4	10.6	13.5	16.5	19.5
Covid Economy / Others	5.5	14.5	10	10	10	10
TOTAL BIOECONOMY	70.2	80.1	92	103.8	116.9	130.8

BIOECONOMY 2025 - 2030 (\$ BILLION)

Segment / Year	2025	2026	2027	2028	2029	2030
BIOPHARMA	61.3	66.7	72.2	77.6	83.2	89.8
BIOAGRI	18.9	21.8	25.1	28.6	32.8	36.3
BIOINDUSTRIAL	21.1	24.1	26.9	29.6	32.6	36.1
CRO / BIOIT / Research	19.5	23.1	26.6	30.2	33.7	37.8
Covid Economy / Others	10	10	10	10	10	10
TOTAL BIOECONOMY	130.8	145.7	160.8	176	192.4	210

This is possible when the BioPharma sector races to hit the \$120-125 billion mark and each of the three segments—Agriculture including animal biotech and marine biotech, Bioindustrial segment and the BioServices segment of Contract research, contract manufacturing, and, BioIT services cross the \$60 billion mark. It is possible if the Indian Government continues to take initiatives like it took during Covid and in shaping the Biofuels strategy.

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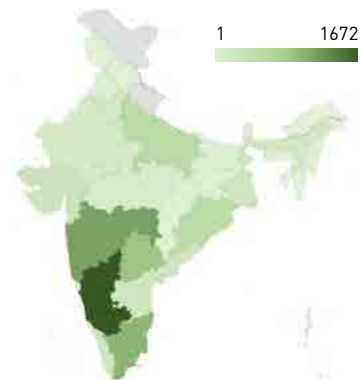
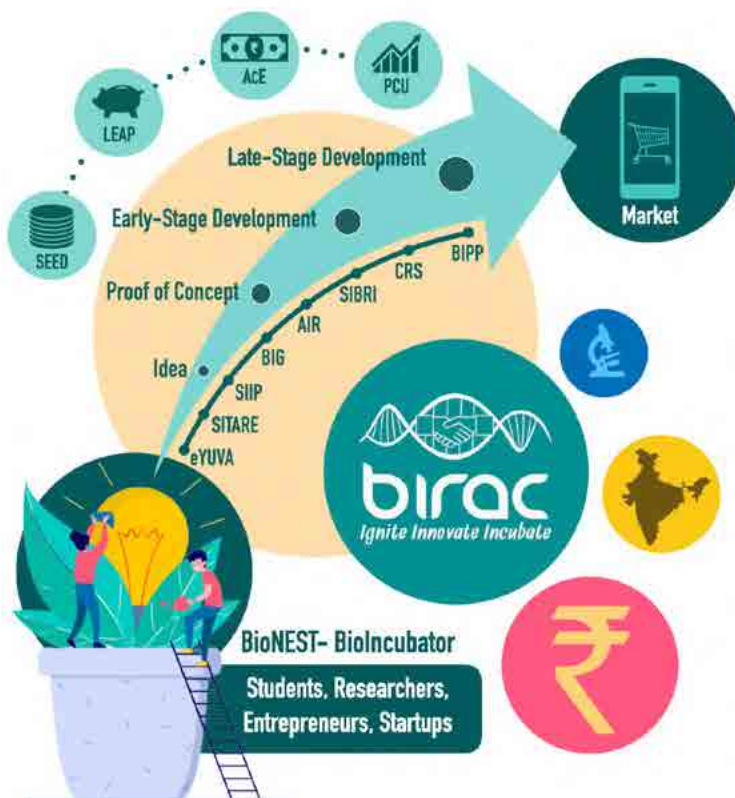
*(The BioEconomy revenue projection has been made by the ABLE Research team of **Narayanan Suresh** and **Srinivas Rao Chandan** with inputs from the ABLE leadership team)*

BIRAC'S ROLE IN FOSTERING THE BIOTECH ECOSYSTEM IN INDIA

Biotechnology has been recognised as the sunshine sector for India that has a cascading multiplier effect on the Indian Economy. The Indian biotechnology sector has entered a new phase of growth where the world acknowledges the enormous potential this sector holds to touch and transform lives. Department of Biotechnology (DBT) set up Biotechnology Industry Research Assistance Council (BIRAC), a not-for-profit, section 8,

public sector enterprise in 2012 to act as an interface agency to strengthen and empower emerging Biotech enterprises. Since then, BIRAC has taken up a multitude of activities, from financing high-risk research to supporting nascent ideas; creating bioincubation centres for shared infrastructure and capacity building to policy advocacy for empowering the biotech ecosystem in India.

NURTURING INNOVATIONS



9200+ APPLICATIONS RECEIVED UNDER BIG



BIRAC'S NETWORK OF 75 INCUBATION CENTRES

BIRAC'S IMPACT

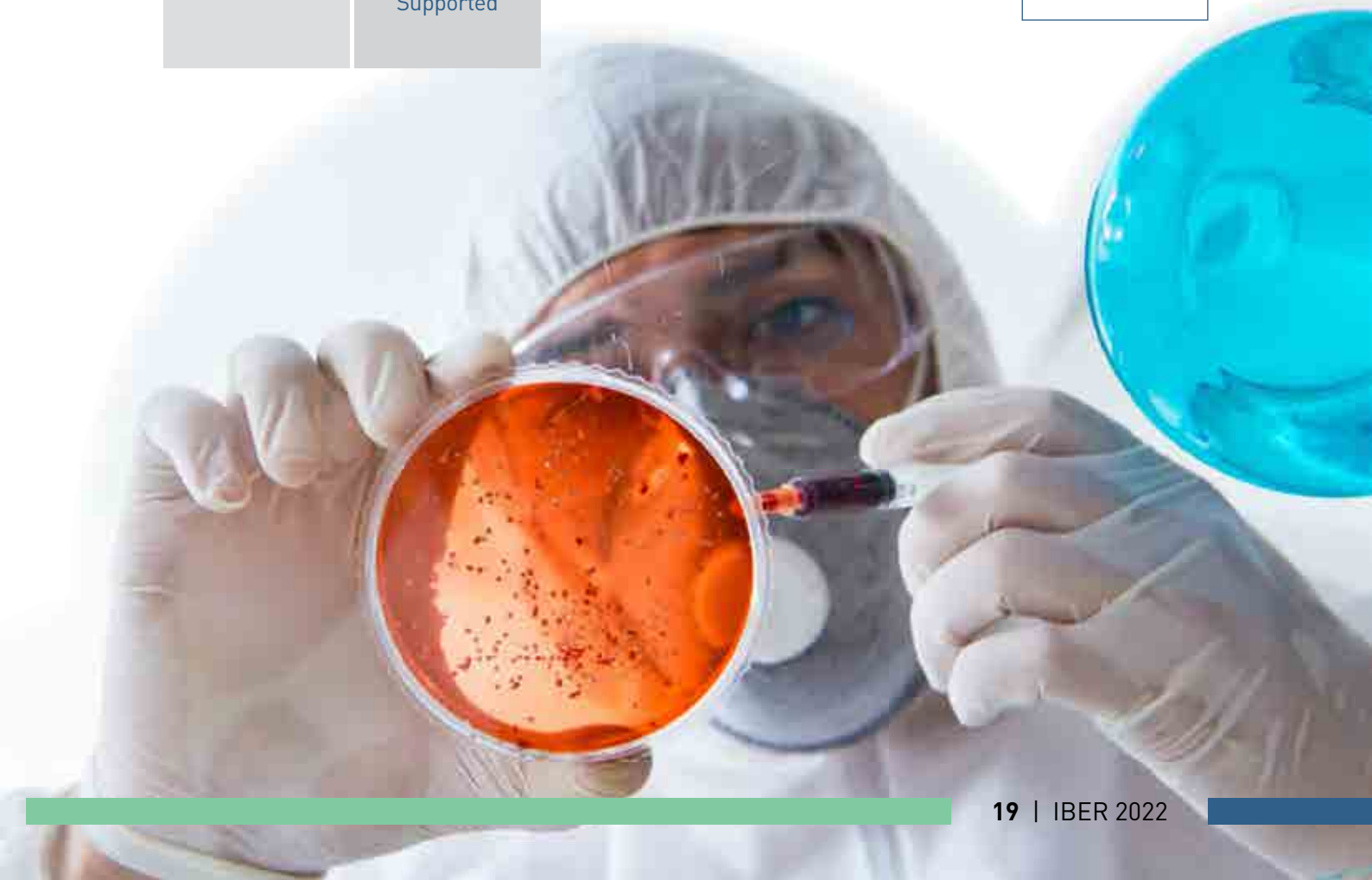
3500+ Startups, Entrepreneurs, Companies Beneficiaries Supported	750+ Products and Technologies Supported
₹4000cr Follow on Funding Raised by >125 Startups	32,474 Employment Generated
75 Bio-Incubation and Pre- Incubation Centers	7.1lakh Square Feet Incubation Space
1,250 IPs Generated	344 Academic Institutes Supported

EQUITY SCHEMES- SEED & LEAP

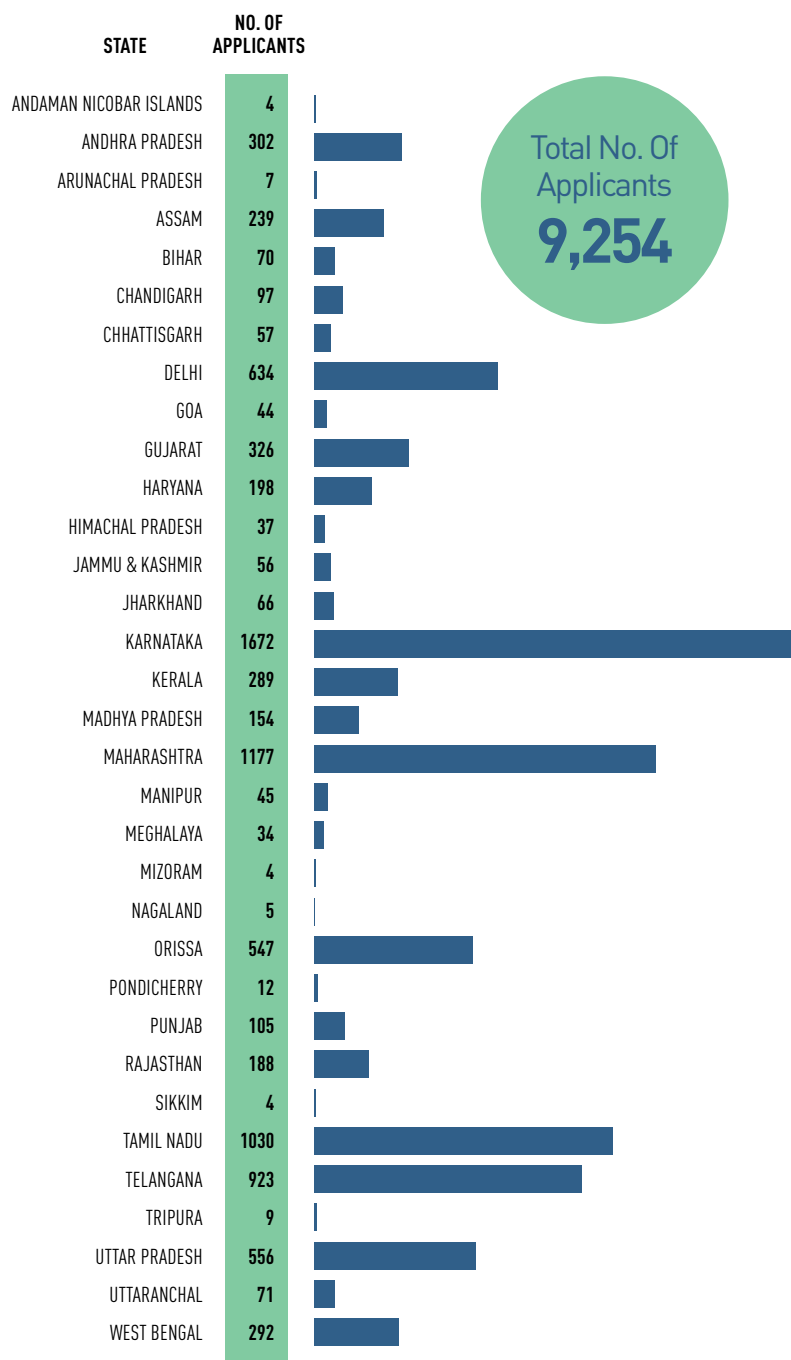
EQUITY SUPPORT TO STARTUPS ₹46 Cr	NO OF STARTUPS 122	FOLLOW ON FUNDS RAISED BY 74 STARTUPS ₹390 Cr
	NO OF PRODUCTS COMMERCIALIZED 71	VALUATION OF 77 STARTUPS ₹2,513 Cr

FUND OF FUNDS- BIOTECHNOLOGY INNOVATION ACE FUND

FUNDS OF FUNDS - ACE FUND ₹150 Cr	NO OF DAUGHTER FUNDS 10	INVESTMENT COMMITMENT FOR BIOTECH STARTUPS ₹300 Cr
	NO OF STARTUPS SUPPORTED 49	INVESTED IN BIOTECH STARTUPS ₹349 Cr



BIG APPLICANT DATA



MAKE IN INDIA IMPACT

#1

in South East Asia & #67 World Rank in Ease of Doing Business

12th

Largest Destination For Biotech Innovation Globally

46th

Rank in the Global Innovation Index

22

States And Union Territories With Biotech Policy

7

Technology Transfer Offices

5

Bio-Connect Offices

4

Regional Centres

7

Regional BioNEST Clusters

27%

Startups led by Women Entrepreneurs

3%

Share In Global Biotech Industry



LIST OF BIONEST BIOINCUBATION CENTRES AND E-YUVA CENTRES SUPPORTED BY BIRAC

Centre Name	City	State
Entrepreneurship Development Centre, Venture Center, NCL, Pune	Pune	Maharashtra
IKP Knowledge Park, Hyderabad	Hyderabad	Andhra Pradesh
IIT Madras Research Park, IIT Madras	Chennai	Tamil Nadu
C-CAMP, Bangalore	Bangalore	Karnataka
SBTIC, Hyderabad	Hyderabad	Telangana
FITT, IIT Delhi	Delhi	NCT
SIDBI Innovation & Incubation Centre (SIIC) at IIT Kanpur	Kanpur	Uttar Pradesh
KIIT-TBI, Bhubaneswar	Bhubaneswar	Odisha
RCB, Faridabad	Faridabad	Haryana
B. V. PATEL PERD Centre	Ahmedabad	Gujarat
ZTM-BPD, IARI	Delhi	NCT
Gujarat State Biotechnology Mission (GSBTM)	Gandhinagar	Gujarat
HTIC, Chennai	Chennai	Tamil Nadu
Women Bio Park, Chennai	Chennai	Tamil Nadu
Bangalore Bioinnovation Centre (BBC)	Bangalore	Karnataka
a-IDEA, NAARM-TBI, Rajendar Nragar, Hyderabad	Hyderabad	Telangana
BITS Pilani K K Birla Goa campus	Goa	Goa
Society for Innovation and Entrepreneurship (SINE)	Mumbai	Maharashtra
Ahmedabad University	Ahmedabad	Gujarat
SRISTI Innovation	Ahmedabad	Gujarat
IIHR, Bangalore	Bangalore	Karnataka
Hyderabad University	Hyderabad	Telangana
PSG-STEP	Coimbatore	Tamil Nadu
Panjab University	Chandigarh	Punjab
VIT-TBI, Vellore	Vellore	Tamil Nadu
ICRISAT, Hyderabad	Hyderabad	Telangana
IKP Eden, Bangalore	Bangalore	Karnataka
RiiDL (Research Innovation Incubation Design laboratory Foundation), Somaiya Vidyavihar	Mumbai	Maharashtra

LIST OF BIONEST BIOINCUBATION CENTRES AND E-YUVA CENTRES SUPPORTED BY BIRAC

Centre Name	City	State
LV Prasad Eye Institute	Hyderabad	Telangana
IIIT Hyderabad	Hyderabad	Telangana
Clean Energy International Incubation Center	Delhi	NCT
Technology Incubation and Entrepreneurship Development Society (TIEDS)	Roorkee	Uttarakhand
SPMVV- Women Biotech Incubation facility (SPMVV-WBIF)	Tirupati	Andhra Pradesh
Andhra Pradesh MedTech Zone(AMTZ)	Visakhapatnam	Andhra Pradesh
B.S. Abdur Rahman Crescent Institute of Science & Technology	Chennai	Tamil Nadu
DPSRU Innovation & Incubator Foundation (DIIF)	Delhi	NCT
Mazumdar Shaw Medical Foundation (MSMF), Bangalore	Bangalore	Karnataka
National Institute of Pharmaceutical Education & Research (NIPER)	Guwahati	Assam
Institute of Advanced Study in Science & Technology (IASST)	Guwahati	Assam
Shanmugha Arts, Science, Technology & Research Academy (SASTRA)	Thanjavur	Tamil Nadu
Mizoram Univeristy	Aizawl	Mizoram
CSIR-Indian Institute of Toxicology Research, Lucknow	Lucknow	Uttar Pradesh
Banaras Hindu University (BHU), Varanasi	Varanasi	Uttar Pradesh
Tamil Nadu Veterinary and Animal Sciences University	Chennai	Tamil Nadu
Institute of Bioresources and Sustainable Development (IBSD)	Shillong	Meghalaya
Indigram Labs Foundation	Delhi	NCT
Delhi University	Delhi	NCT
AmalJyothi College of Engineering	Koovappally	Kerala
Sri Ramachandra Institute of Higher Education and Research	Chennai	Tamil Nadu

LIST OF BIONEST BIOINCUBATION CENTRES AND E-YUVA CENTRES SUPPORTED BY BIRAC

Centre Name	City	State
NIPER, Ahmedabad	Ahmedabad	Gujarat
IIT Jodhpur	Jodhpur	Rajasthan
UAS Bangalore	Bangalore	Karnataka
NEHU, Tura Campus	Chasingre	Meghalaya
NIPER Hyderabad	Hyderabad	Telangana
AIIMS Delhi	Delhi	NCT
VCR Park	Visakhapatnam	Andhra Pradesh
CSIR NEIST, Jorhat	Jorhat	Assam
IIT Guwahati	Guwahati	Assam
Manipal University	Manipal	Karnataka
ILS Bhubaneswar	Bhubaneswar	Odisha
IIIM Jammu	Jammu	Jammu & Kashmir
CSIR-CFTRI	Mysore	Karnataka
CfHE, IIT Hyderabad	Hyderabad	Telangana
DM Waynad institute of Medical Sciences	Waynad	Kerala
Atmiya University	Rajkot	Gujarat
Adamas University	Kolkata	West Bengal
Tamil Nadu Agricultural University	Coimbatore	Tamil Nadu
Career College, Bhopal	Bhopal	Madhya Pradesh
PSGR Krishnammal College for Women	Coimbatore	Tamil Nadu
GIET University	Gunupur	Orissa
Punjab University	Chandigarh	Punjab
Rajasthan University	Jaipur	Rajasthan
UAS, Dharwad	Dhardwad	Karnataka
Anna University	Chennai	Tamil Nadu
Sri Krishnadevaraya University	Anantapur	Andhra Pradesh

LIST OF DRUGS APPROVED IN 2021

The Central Drugs Standards Control Organisation (CDSCO) has approved the use of nearly 25 drugs in 2021. Some of these medicines include.

- Antibodies cocktail drug (Casirivimab and Imdevimab) for restricted emergency use to treat mild to moderate Covid-19 in adults and pediatric patients (12 years or weighing more than at least 40 kg).
- Glenmark Pharmaceuticals' generic for Favipiravir, developed by Toyama Chemical, a subsidiary of Japanese conglomerate Fujifilm
- Cipla and Hetero Drugs' received approval for their respective generics for Remdesivir, for the treatment of Covid-19 patients. Remdesivir is Gilead Sciences' patented anti-viral drug, earlier tried on Ebola
- Anti-Covid pill Molnupiravir

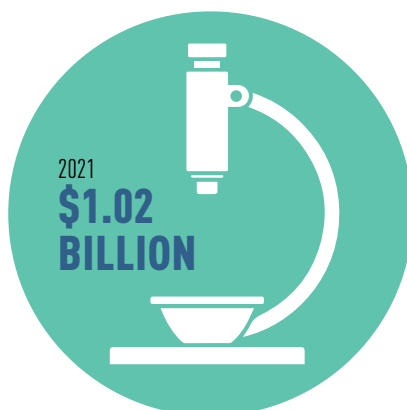
Foreign Direct Investment (FDI) in biotech is estimated to have touched \$830 million in 2021, up from \$780 million in 2020

SOME OF MAJOR FDI COMMITMENTS

Mylan Laboratories Ltd	Amneal Pharmaceuticals
Carlyle Group	KKR
	Advent International

2021 A GREAT YEAR FOR BIOTECH R&D

2020
\$360 MILLION



The Biotech industry in 2021 is estimated to have tripled its R&D spending to \$1.02 billion from \$360 million in 2020. The Biotech industry has increased its spend from 3 percent of its turnover to 5 percent of its turnover on account of developing Covid products and solutions. In 2021, the industry was estimated to have clocked \$21 billion in revenue turnover; the same in 2020 was \$12 billion

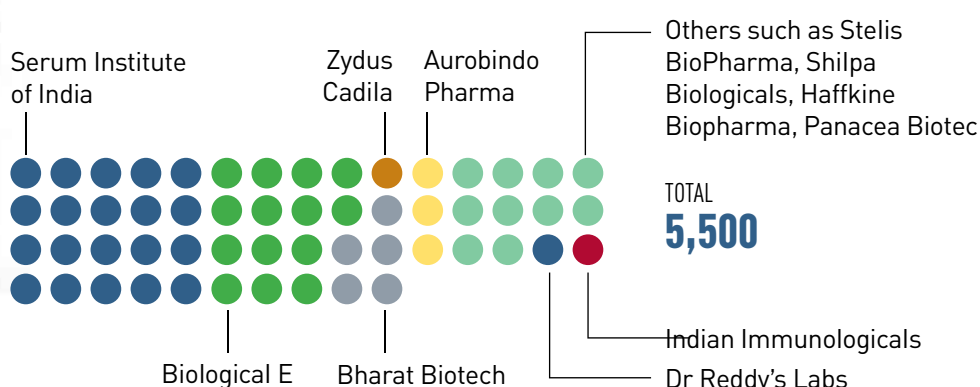
BIOTECH CAPACITY INCREASES IN VARIOUS SEGMENTS

Product Segment	Annual Capacity Description	2020	2021	Change Over 2021 (%)
Covid-19 Vaccines	Million Doses	100	4200	34900%
Other Vaccines	Million Doses	1200	1300	8%
Diagnostics Tests	Million Tests	25	2000	7900%
Cotton Production	Million Bales	36.5	34.8	-5%
Cotton Area	Million Hectare	13.5	13	-4%
Ethanol	Billion Liters	3	6.5	117%



INCREASED INSTALLATION CAPACITIES BY VACCINE COMPANIES

MILLION DOSES (2021)



INDIA BIOECONOMY PERFORMANCE (TARGET VS ACHIEVEMENT)

Year	Projected (\$ Billion)	Actual Achievement (\$ Billion)	Achievement %
2017	44	44.5	101%
2018	50	51	102%
2019	56	62.5	112%
2020	62	70.2	113%
2021	70	80.12	114%
2023	84	-	-
2025	102	-	-

Our Country's BioEconomy is crossing 100 percent target achievement consistently since 2017. At this rate, Indian BioEconomy will achieve the \$100 billion Target may be by a year ahead of 2025.

APPLICATIONS APPROVED UNDER PRODUCTION LINKED INCENTIVE (PLI) SCHEME FOR PHARMACEUTICALS

55 Pharma Biotech companies were approved under Production Linked Incentive (PLI) Scheme for Pharmaceuticals

Name of the applicant	Group by Revenue Size	Applicant Category
Sun Pharmaceutical Industries Ltd	Revenues > \$650 Million	Domestic
Aurobindo Pharma Ltd	Revenues > \$650 Million	Domestic
Dr. Reddy's Laboratories Ltd	Revenues > \$650 Million	Domestic
Lupin Ltd	Revenues > \$650 Million	Domestic
Mylan Laboratories Ltd	Revenues > \$650 Million	Foreign MNC
Cadila Healthcare Ltd	Revenues > \$650 Million	Domestic
Cipla Ltd	Revenues > \$650 Million	Domestic
Amneal Pharmaceuticals Pvt Ltd	Revenues > \$650 Million	Foreign MNC
Glenmark Pharmaceuticals Ltd	Revenues > \$650 Million	Domestic
Intas Pharmaceuticals Ltd	Revenues > \$650 Million	Domestic
Torrent Pharmaceuticals Ltd	Revenues > \$650 Million	Domestic
Biocon Ltd	\$65-650 Million	Domestic
MSN Laboratories Pvt Ltd	\$65-650 Million	Domestic
Wockhardt Ltd	\$65-650 Million	Domestic
Alembic Pharmaceuticals Ltd	\$65-650 Million	Domestic
Emcure Pharmaceuticals Ltd	\$65-650 Million	Domestic
Macleods Pharmaceuticals Ltd	\$65-650 Million	Domestic
Biological E Ltd	\$65-650 Million	Domestic
NatcoPharma Ltd	\$65-650 Million	Domestic
Strides Pharma Science Ltd	< 66 Million	Domestic
Vindhya Pharma (India) Pvt Ltd	< 66 Million	MSME
Aarti Industries Ltd	< 66 Million	Non-MSME
SymbiotecPharmalab Pvt Ltd	< 66 Million	Non-MSME
Transasia Bio-Medicals Ltd	< 66 Million	MSME
Sai Life Sciences Ltd	< 66 Million	Non-MSME
Poly Medicure Ltd	< 66 Million	Non-MSME
Concord Biotech Ltd	< 66 Million	Non-MSME
Amoli Organics Pvt Ltd	< 66 Million	Non-MSME

Name of the applicant	Group by Revenue Size	Applicant Category
BDR Pharmaceuticals International Pvt Ltd	< 66 Million	Non-MSME
Malladi Drugs & Pharmaceuticals Ltd	< 66 Million	Non-MSME
Symed Labs Ltd	< 66 Million	Non-MSME
BalPharma Ltd	< 66 Million	MSME
Abhilash Life Sciences LLP	< 66 Million	MSME
Neogen Chemicals Ltd	< 66 Million	MSME
Biophore India Pharmaceuticals Pvt Ltd	< 66 Million	MSME
Nosch Labs Pvt Ltd	< 66 Million	Non-MSME
Aragen Life Sciences Pvt Ltd	< 66 Million	Non-MSME
Sri Krishna Pharmaceuticals Ltd	< 66 Million	Non-MSME
Optimus Drugs Pvt Ltd	< 66 Million	MSME
Venus Remedies Ltd	< 66 Million	Non-MSME
Psychotropics India Ltd	< 66 Million	MSME
Steril-Gene Life Sciences Pvt Ltd	< 66 Million	Non-MSME
Aurore Life Sciences Pvt Ltd	< 66 Million	MSME
Milan Laboratories India Pvt Ltd	< 66 Million	MSME
Vandana Life Science Pvt Ltd	< 66 Million	MSME
Nitika Pharmaceutical Specialities Pvt Ltd	< 66 Million	MSME
Hy-Gro Chemicals Pharmtek Pvt Ltd	< 66 Million	MSME
MendasPharma Pvt Ltd	< 66 Million	MSME
OptimusPharma Pvt Ltd	< 66 Million	MSME
MaivaPharma Pvt Ltd	< 66 Million	MSME
Trivitron Healthcare Pvt Ltd	< 66 Million	MSME
Agappe Diagnostics Ltd	< 66 Million	MSME
Premier Medical Corporation Pvt Ltd	< 66 Million	MSME

SNAPSHOT OF SOME BIOFUEL PLANTS



PRAJ



BPCL FACILITY



IOCL FACILITY



ETHANOL PRODUCTION



DISTILLERIES IN UTTAR PRADESH

INDIA'S COVID-19 "AATMANIRBHAR" VACCINES THAT MAKE US PROUD GLOBALLY



HOME GROWN DIAGNOSTIC KITS TO DETECT COVID-19 INFECTIONS



These kits helped early detection and saved precious lives

NATION PRAISES OUR BIOTECH INDUSTRY IN 2021

PRIME MINISTER NARENDRA MODI

“When the pandemic hit the world, there were a lot of apprehensions regarding India’s ability to deal with the situation. However, 100 crore doses is an answer to all our critics.”

“At the beginning of this (COVID-19) pandemic, the whole world was worried about India’s situation. But today India’s fight against corona (coronavirus) is inspiring the entire world...India is following a human centrics approach to furthering global good.”

SMT NIRMALA SITHARAMAN, UNION MINISTER OF FINANCE AND CORPORATE AFFAIRS, GOI

“FDI in the pharmaceutical sector has seen a sudden spurt in 2020-21 vis a vis the previous year showing a 200% increase. The extraordinary growth of foreign investments in pharma sector is mainly on account of investments to meet Covid related demands for therapeutics and vaccines.”

DR JITENDRA SINGH, UNION MINISTER OF STATE (INDEPENDENT CHARGE), MINISTRY OF SCIENCE AND TECHNOLOGY & EARTH SCIENCES, GOI

“Precaution, not panic, is the key to fight the pandemic.”

DR MANSUKH MANDAVIYA, UNION MINISTER OF HEALTH AND FAMILY WELFARE; CHEMICALS AND FERTILIZERS, GOI

“Mutual understanding, sharing best practices and collaborative spirit between the Centre and States have helped us in our fight against the pandemic. India’s COVID19 vaccination drive is a global success story, especially for such a populous country like ours.”

DR RAJESH S. GOKHALE, SECRETARY, DEPARTMENT OF BIOTECHNOLOGY (DBT), GOI

“In the Covid outbreak, India started with imported kits, but in record time attained self-reliance and a capacity to supply to neighbouring countries both vaccines and diagnostics products. This success story of biotech developers and manufacturers has been ably supported by Government initiatives in a synergetic manner.”

MR PANKAJ PATEL, CHAIRMAN, ZYDUS

“COVID-19 is not the first healthcare challenge that has brought about a huge change in the world around us and it certainly won’t be the last. But what will make the difference is how we respond to these challenges. This is where Innovation and the ability to bring excellence in execution will matter and make all the difference.”

DR ADAR POONAWALLA, CEO, SERUM INSTITUTE OF INDIA

"We are far better prepared, our health systems, hospitals, oxygen supplies, vaccines, everything; the world is now better prepared for the third, fourth waves, because we have learned what to do and what not to do."

DR SUCHITRA ELLA, CO-FOUNDER AND JOINT MANAGING DIRECTOR OF BHARAT BIOTECH

"The academic world, the scientific world, the biotech, life sciences sector, policy makers, the government, and of course the public at large were confused in March-April 2020. The preparedness towards the vaccine in India, in terms of recombinant technologies, did not exist. We had to simply jump onto the bandwagon of a time-tested vaccine development process, the classic method of developing vaccines that's more than 70-years-old."

DR. PRAMOD CHAUDHARI, FOUNDER & EXECUTIVE CHAIRMAN, PRAJ INDUSTRIES

"As petrol prices in India touch the three-digit figure and are in no mood to stop there, the government has advanced its plan to bring 20% ethanol mixed fuel into the market, from the earlier timeline of 2030 to 2025. It would be logical to welcome the step that would bring about self-reliance in fuel, substantial saving of foreign exchange, and significant reduction in pollution levels and growth in the rural economy."

DR RENU SWARUP, FORMER, SECRETARY, DBT

"The COVID-19 pandemic brought in several challenges and we were able to convert these into opportunities, through innovation-led entrepreneurship and a supportive start-up ecosystem. More than 1300 Startup Solutions reached the market."

DR KIRAN MAZUMDAR-SHAW, EXECUTIVE CHAIRPERSON – BIOCON LIMITED AND BIOCON BIOLOGICS LIMITED

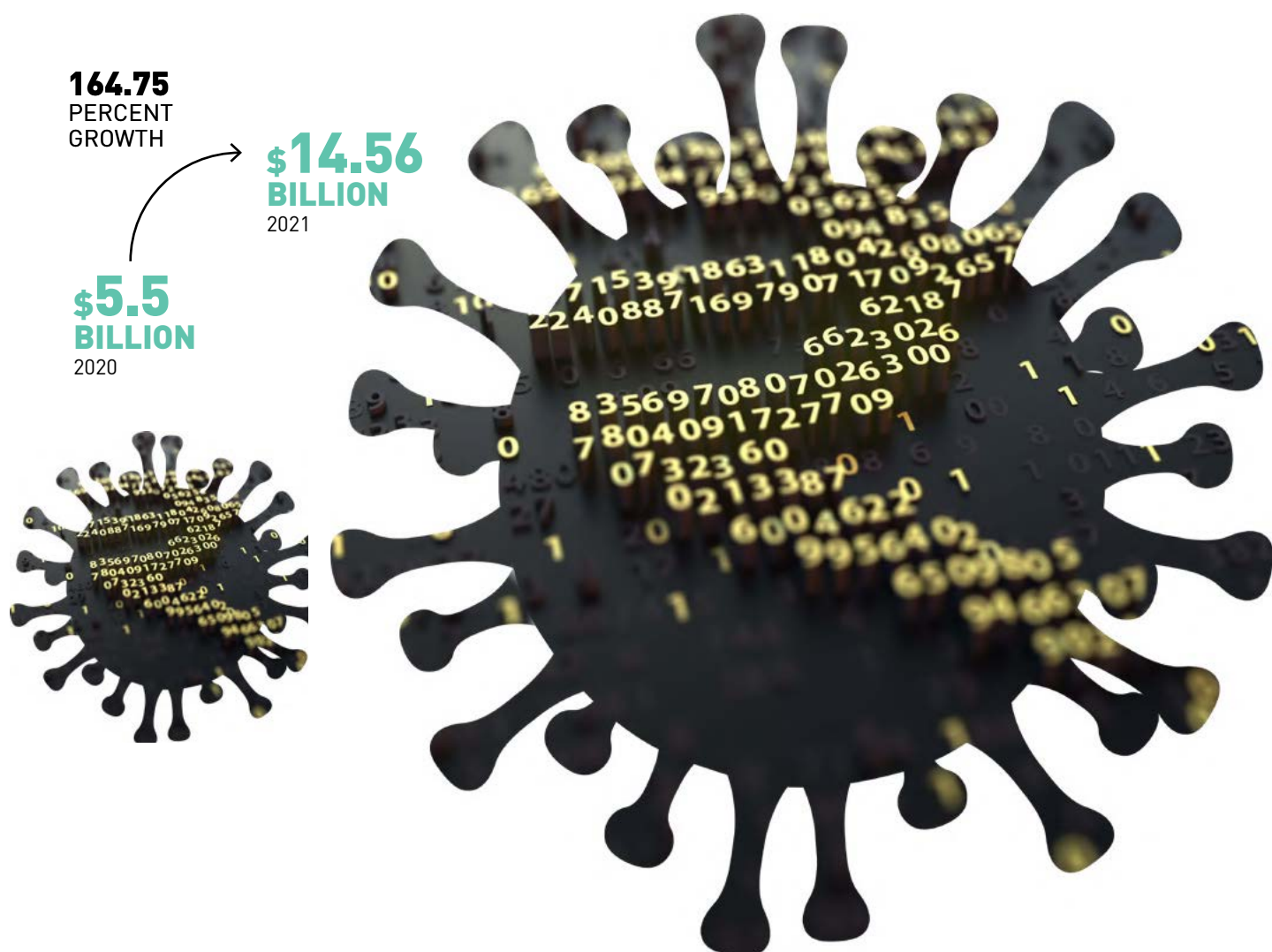
"Ultimately, the greatest lesson that Covid-19 can teach humanity is that we are all in this together, that what affects a single person anywhere affects everyone everywhere, that as homo sapiens we need to think and act unitedly rather than worrying about race, ethnicity, nationality, religion, economic status, and such artificial groupings."

"COVID-19 is the reboot button that will trigger a system-wide overhaul. A year from now, the world we will live in will be very different. It will impact how we live, how we work, and how we use technology."

"For humanity to survive, we will need a multi-disciplinary approach to advancing science and technology, combining biotechnology, biomedical technologies, biological sciences, environmental sciences."

"COVID-19 will reboot the world into virtual reality and after the crisis, work from home models are likely to continue and business travel is likely to be curtailed as virtual meetings have proved to be just as effective."

COVID ECONOMY



The Covid Economy accounted for 18.17 percent share of the total BioEconomy of \$80.12 billion in 2021. This segment was the second largest contributor to the total BioEconomy in 2021 after the BioPharma segment.

Covid-19 was declared by World Health Organization (WHO) as Pandemic in March 2019. India jumped into the race of fighting Covid-19 with the 5T approach, i.e., “Test, Track, Trace, Treat and use of Technology”. India’s biotech ecosystem responded quickly to the situation and made significant contributions towards the Covid-19 diagnostics, vaccines, Covid-19 masks, and Covid-19 Personal Protective Equipment (PPE) for healthcare personnel. One common outcome across all segments

has been success of indigenization of manufacturing and the scale of production. India turned from being a nation that was facing a shortage of products to being a leading manufacturer in the world today.

The Covid Economy has been treated as a separate segment and excluded from the measurement of BioPharma Economy as the pandemic catapulted the diagnostics and vaccines industry to a new high, altering the market dynamics. Hence considering Covid-19 as a separate segment avoids skewing of figures and also helps in strategizing for the future. It also shaped a blueprint and framework to deal and manage health crisis and foster the ecosystem.

The Covid Economy has been tracked under two sub-categories—Covid-19 Vaccines and Covid-19 Testing / Diagnostics. These two sub-categories have been excluded from the measurement of BioPharma Economy. The Covid-19 Economy in 2020, predominantly, comprised of Covid-19 testing. Covid-19 vaccines were approved for emergency use

only in 2021 and it accounted for 60 percent share of contribution of the total Covid-19 Economy. This doesn't include the economic value generated from PPE kits, Covid-19 masks, Oxygen concentrators, ventilators, and other related products.

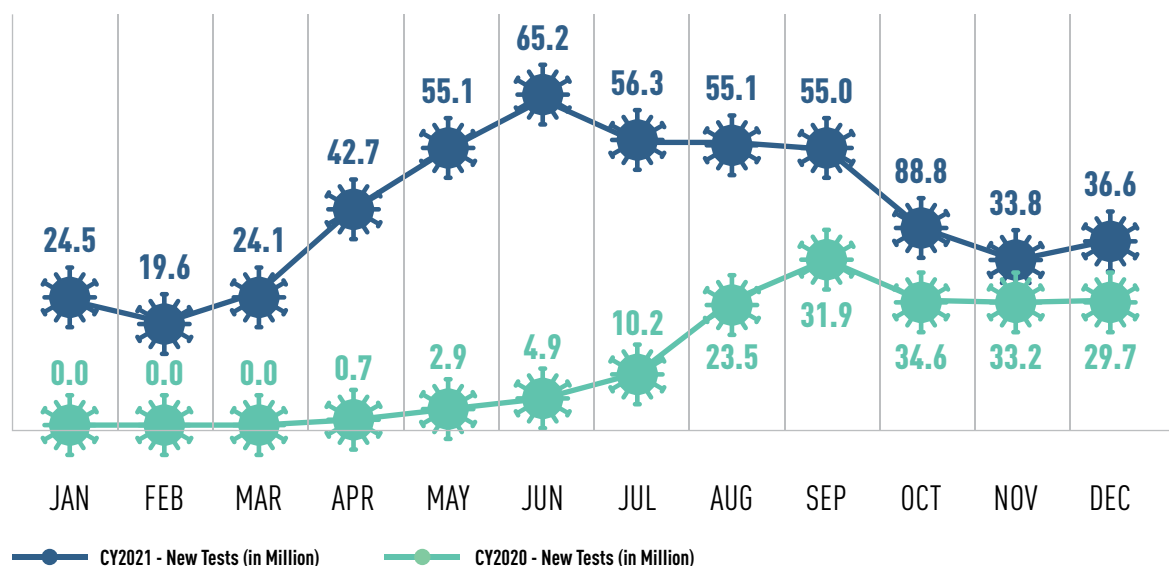
COVID-19 TESTING

In January 2020, there weren't players equipped in India for Covid diagnostics. But in collaboration with the Department of Biotechnology (DBT) and other agencies, Indian biotech companies and laboratories prepared themselves to meet the emerging needs and cater to the exponential demand. India had to import swabs at roughly \$50 cents (Rs 40) and tubes for \$25 cents (Rs 20). The focus on indigenization helped in meeting the demand and also bringing down the prices.

Indigenization of Covid-19 kits were initiated in India in March 2020 and the first high-throughput lab for testing Covid-19 samples was established by first week of April 2020 at National Institute of Biologicals

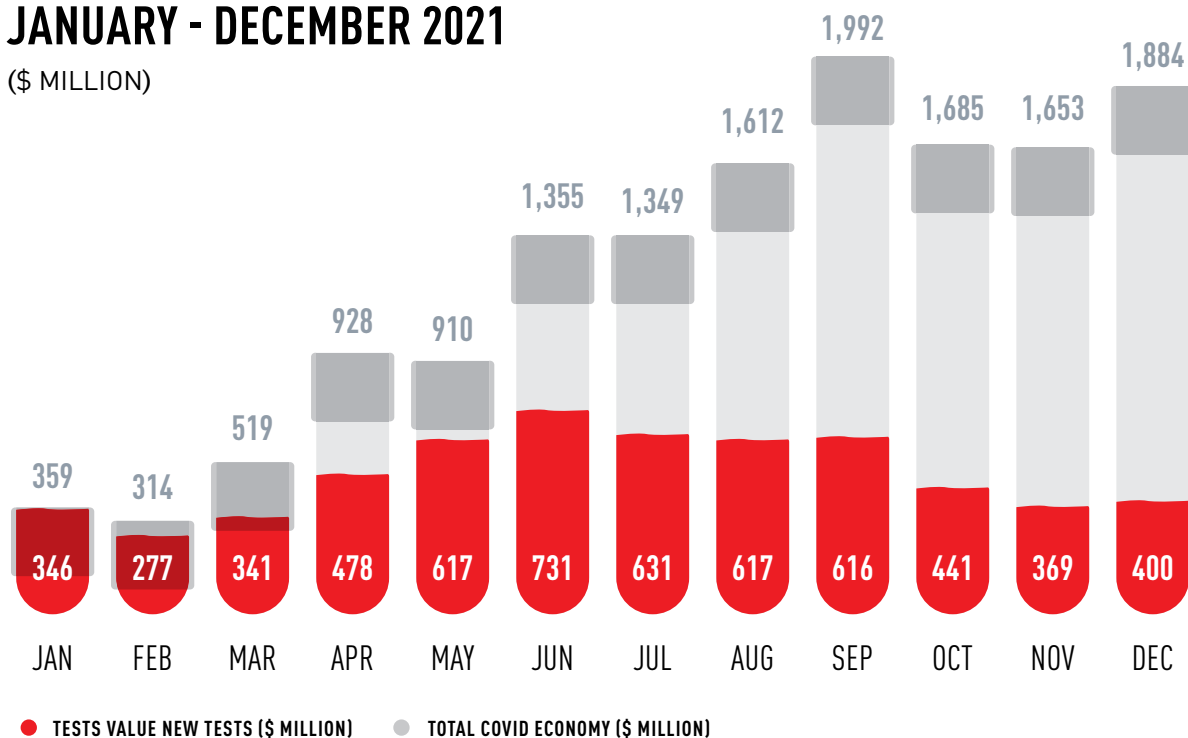
COVID TESTING

(MILLION TESTS)



COVID TESTING ECONOMY, JANUARY - DECEMBER 2021

(\$ MILLION)



NUMBER OF APPROVED KITS

1,859
RT-PCR

3
HOME TEST
KITS

Source: ICMR

123
RAPID ANTIGEN
TEST KITS FOR
COVID-19
(OROPHARYNGEAL /
NASOPHARYNGEAL
SWABS)

(NIB), Noida. The Reverse Transcription Polymerase Chain Reaction (RT-PCR) Labs became operational in over five states by April 2020. And by mid of April 2020, India also announced point-of-care TrueNAT test approved by Indian Council of Medical Research (ICMR).

By end of March 2020, India had 150 labs for testing and by December 2020, the number grew to 2,172 labs.

India as on March 1, 2022 had 3,309 labs. Out of these, about 1,426 are government labs and 1,883 are private labs. Another significant achievement is that nearly two-thirds of these 3,309 labs have Real-Time RT PCR for COVID-19 (2,186) and 951 offer TrueNat Test for COVID-19.

India enhanced production of diagnostic kits as part of its Atma Nirbhar strategy which resulted in reduction of costs and improved availability of testing kits. India achieved the milestone of conducting 500 million (50 crore) tests on August 18, 2021 since 2020.

The months of April, May, and June in 2021 alone saw nearly 18 million (1.8 crore) Covid-19 infections, accounting for nearly 70 percent of the total Covid-19 infections of nearly 25.5 million (2.5 crore) during 2021.

Covid-testing grew by 198 percent from 170 million tests in 2020 to 506.7 million tests in 2021.

NUMBER OF GOVERNMENT AND PRIVATE LABORATORIES IN INDIA WORKING FOR COVID-19 TESTING AS ON MARCH 01, 2022

Testing Performed by Laboratories	No. of Govt. Laboratories	No. of Private Laboratories	Total No. of Laboratories
Real-Time RT PCR	780	1,406	2,186
TrueNat Test	594	357	951
CBNAAT Test	42	89	131
Other Molecular-Nucleic Acid (M-NA) Testing Platforms	10	31	41
TOTAL	1,426	1,883	3,309

COVID-19 SAMPLES TESTING TIMELINE

Testing in million	Date
100 Million	23 Oct 2020
200 Million	6 February 2021
300 Million	8 May 2021
400 million	25 June 2021
500 million	18 Aug 2021
600 million	25 October 2021
700 million	15 January 2022

Nearly 65 percent of the total test of 2021 were conducted in the two quarters of April-June (Q2) and July-September (Q3). Each of these quarters saw over 160 million tests

Even at a conservative value of \$11.5 per test, the Testing economy would be nearly \$5.8 billion in value in 2021. The per test cost in the first three quarters was nearly \$60. The price per test nearly came down by 80 percent.

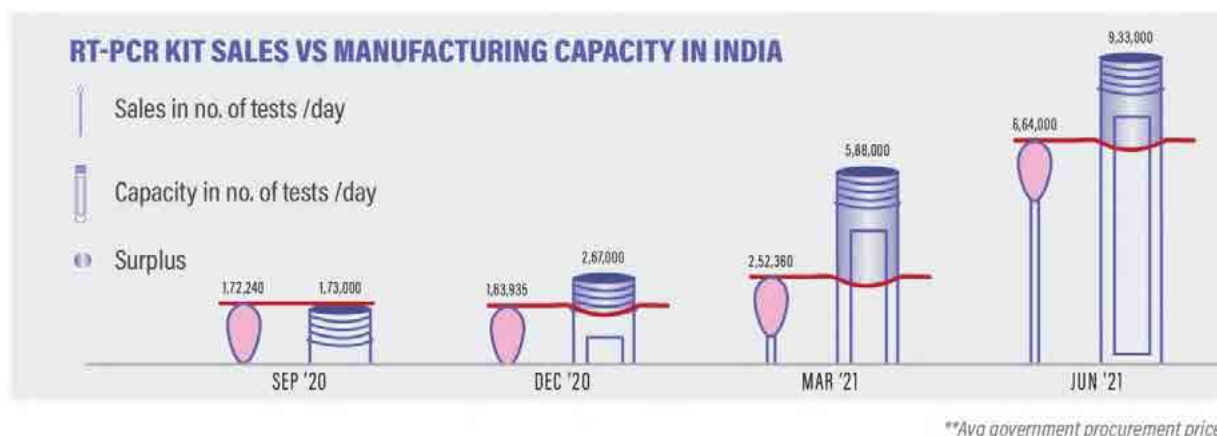
The ramp up was possible because of the Indian Government's push through

Department of Biotechnology (DBT), its Autonomous Institutions (AIs) and the Public Sector Undertaking, Biotechnology Industry Research Assistance Council (BIRAC), that extended support to the manufacturers of kits, reagents, and equipment for COVID-19 diagnostics through several contracts.

DBT had identified 21 City /Regional clusters to scale up covid testing as a part of the Hub and Spoke model. Nine Autonomous Institutes (AIs) of DBT were approved as testing centers for COVID-19 diagnosis. These DBT AIs were identified as hubs for their respective regions.

N-BRIC is a "Make in India" initiative for biomedical research and innovative products, towards promoting import substitution and exports. This was constituted by DBT-BIRAC, hosted and led by C-CAMP.

The government supported 141 projects through DBT-BIRAC COVID-19 Research Consortium Call for development of molecular serology-based diagnostic kits at mass scale and indigenous development of good quality primers and probes.



Under the guidance of the Principal Scientific Adviser to the Government of India, an Indigenization of Diagnostics (Indx) program was anchored at C-CAMP with the aim to build large capacity of COVID-19 molecular diagnostic kits and reagents. This was to promote public-private-partnership and bring together different stakeholders in order to ensure necessary supply of Covid-19 molecular diagnostics reagents.

Pune-based MyLab was one of the first Indigenous Covid-19 kits through the BIRAC supported startup initiative. It is producing nearly 6 million RT-PCR kits per month.

The total number of diagnostic laboratories has reached 3309. Of which dedicated government laboratories are 1426 and private laboratories number stands at 1883 by January 2022.

Till January 2022, 156 Antigen based Rapid Test Kits were validated (including 33 revalidations), and 61 kits were found to be satisfactory. Out of the 61 kits approved only about 8 were imported while the rest 53 kits (87%) were produced domestically.

About 523 RT-PCR kits were evaluated by ICMR validation centers, and 211 kits were found to be satisfactory. Out of these

approved kits, 144 (nearly 68%) were domestically manufactured, while only 67 kits were imported.

During the period of review, 13 Rapid Ag based Home / Self Test Kits were validated and eight of them were approved. Out of these 13 kits, 9 (62%) were made in India.

By August 2020, India built a manufacturing capacity of nearly 1 billion RT-PCR kits. The companies in India could produce nearly 35 million kits per month. By August 2021, India's production capacity rose to over 85 million kits per month. Most of the companies today have the capacity to manufacture about 1-2 million kits per week. Nearly one million tests are conducted daily.

The C-CAMP Indx program focused on creating the digital market place, centers of excellence, and on onboarding the diagnostics manufacturers and service providers. It has shaped a successful cohort of nine centers-of-excellence and a digital platform with over 174 members.

One of the outcomes of this framework has been that India's transformation as diagnostics supplier to the world from being an importer.

According to some estimates, India had 500 RT-PCR machines before the Covid-19 struck and today we have 45,000 RT-PCR machines. This is going to push the demand for molecular diagnostics in the country.

Another significant outcome has been drop in the prices of test kits, components, and raw materials. The price of kits per test dropped nearly by 36-fold from \$24 (Rs 1800) to 67 cents (Rs 50). The cost of primers and probes fell to 14 cents (Rs 10) from nearly \$1 (Rs 72) in June 2020.

COVID VACCINATION

India's vaccination program started in January 2021 in a phased manner. Pune-based Serum Institute of India and Hyderabad-based Bharat Biotech International Limited were the first two companies that got Emergency Use Authorizations in India for producing vaccines against Covid-19. The

focus during the first three months of 2021 (January – March) were on vaccinating the healthcare workers and the vulnerable groups as identified by National Expert Group on Vaccine Administration for Covid-19 (NEGVAC).

Nine Vaccines Approved

Started with manufacture of two vaccines (Covishield by Serum Institute and Covaxin by Bharat Biotech), the vaccine portfolio approved for use in India has expanded to nine products by February 2022. These being Covishield, Covaxin, Sputnik V, single-dose Sputnik Light, Moderna's Spikevax vaccine, J&J's Janssen vaccine, Zydus Cadila's ZyCoV-D, Biological E's Corbevax, and Novovax's Covovax.

\$8.7 Billion Covid-19 Vaccine Economy

India's Covid Vaccine economy is estimated at \$8.7 billion for the calendar year 2021. In

VACCINES APPROVED FOR USE IN INDIA

The National Regulator, i.e., Central Drugs Standard Control Organization (CDSCO) has granted permissions to following vaccines (as on February 2022) for restricted use in emergency situation as per the New Drugs and Clinical Trials (NDCT) Rules, 2019:

Vaccine	Company	Age Category
Covishield	Serum Institute of India	18 years age
COVAXIN	Bharat Biotech	12 years age
ZyCoVd	Cadila Healthcare	12 years age
SPUTNIK-V	imported by Dr. Reddy's Lab and manufactured by Panacea Biotec and Hetero Biopharma,	18 years age
Moderna	imported by Cipla Ltd	18 years age
Janssen Vaccine	imported by Johnson & Johnson Pvt Ltd and manufactured by Biological E	18 years age
CORBEVAX	Biological E	18 years age
COVOVAX	Serum Institute of India	18 years age
Single dose SPUTNIK-LIGHT	Dr. Reddy's Lab	18 years age

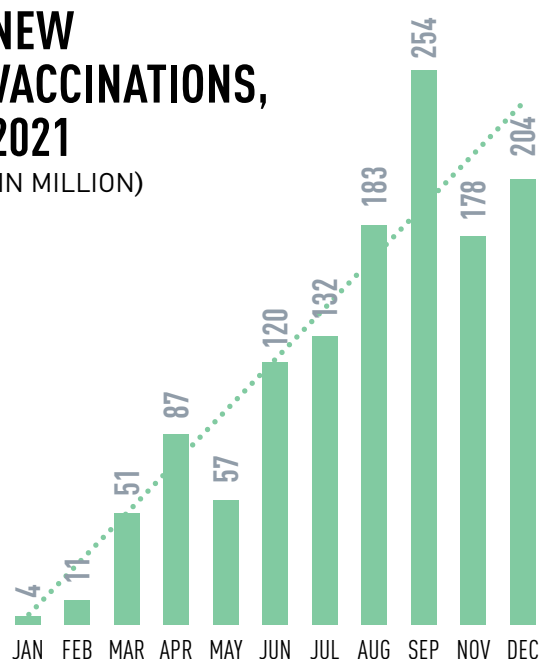
VACCINES IN PIPELINE

The following COVID-19 vaccines are under various phases of clinical development:

Vaccine	Company
Lyophilized mRNA based COVID-19 vaccine	Genova Biopharma (Phase II/III)
Nasal vaccine	Bharat Biotech (Phase III)
Multiple Protein/ Peptide-Based SARS-CoV-2 Vaccine	Aurobindo (Phase II/III)
Inactivated Whole-virion virus (Intra-dermal route)	Bharat Biotech (Phase I/II)
Inactivated Rabies vector platform Corona Virus Vaccine (rDNA-BBV151)	Bharat Biotech (Phase I)
SARS-CoV-2 Recombinant protein subunit vaccine	Reliance (Phase I)

NEW VACCINATIONS, 2021

(IN MILLION)

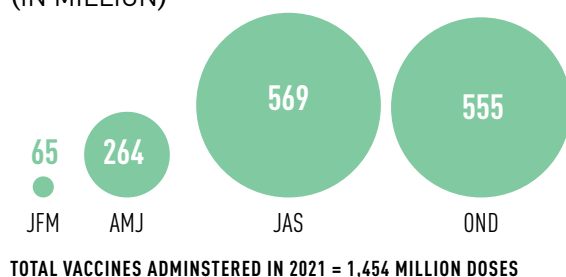


arriving at the BioEconomic value of each dose is considered at nearly \$5.9 per dose, which includes cost of the vaccine along with delivery cost, technical assistance, and financial costs. The manufacturing cost of vaccine is dependent of factors such as development cost, Intellectual Property Rights (IPR) costs, vaccine platform cost, and scale of production.

Success of vaccination is attributed to several reasons. One of them is due the Central Drug Standards and Control Organisation (CDSCO) under the Ministry of Health and Family Welfare that has put in place a system for fast track processing of application for clinical trial and approval for COVID-19 Vaccines.

NEW VACCINATIONS

(IN MILLION)



The Ministry of Health and Family Welfare took proactive and innovative steps to improve accessibility of COVID-19 vaccination services for eligible beneficiaries irrespective of their socio-economic status. It was made possible through increases vaccination centers, a pervasive CoWIN portal, establishment of

24x7 call center helpline, and smooth overall vaccination process.

In 2021-22, a sum of \$4.7 billion (Rs 35,000 crore) has been budgeted for implementation of COVID-19 Vaccination Program. As on 31 January 2022, an expenditure of \$3.77 billion (Rs 27,945.14 crore) has been incurred against this allocation which has been utilized for procurement of COVID-19 vaccine for free of cost supply to State/UTs. As on December 2021, an expenditure of \$2.66 billion (Rs 19,675.46 crore) has been incurred for procurement of COVID-19 vaccines by Government of India for free of cost supplies of vaccine doses to State/UTs.

Indian companies were able to ramp up their production capacities in a record way. Serum Institute of India, the dominant player, raised its vaccine production capacity of Covishield to approximately 250-275 Million doses per month.

Bharat Biotech International Limited, the other early Indian manufacturer, now has a monthly vaccine production capacity of Covaxin of nearly 50-60 Million doses per month. These two companies have achieved close to 90 percent of their production capacities and account for 99 percent share of the total supplies.

Vaccine Procurement

Government of India procured Covid-19 vaccines through HLL Lifecare Limited for supply of vaccines free of cost to supply to various states and Union Territories. By November 30, 2021 the Government of India spent a total of \$2.73 billion on procurement of vaccines and on funding development of vaccines. Most of this expenditure (97 percent or \$2.66 billion) was towards procurement of vaccines.

Only four vaccines have been supplied under National COVID-19 Vaccination Program after approval from CDSCO (as of last week of January 2022). These being Covishield, Covaxin, Sputnik V, and ZyCoVd.

As on February 3, 2022, a total of 897.3 million (95.6%) adult population (aged 18 years and above) received first dose of COVID-19 vaccine, while 718 million (76.5%) got both the doses.

A total of 1.67 billion doses were administered till January 2022. About 85.6 percent of the total administered doses were Covishield vaccine, while Covaxin accounted for 14.3 percent share of the total administered vaccines. Sputnik V accounted for less than 0.1 percent share (1.2 million doses).

Mixed Vaccine Clinical Trials

CDSCO has granted permissions to following organizations for conduct of clinical trials for administration of mixed vaccine regimen:

Christian Medical College, Vellore to conduct Phase IV study with Covishield and COVAXIN to compare immunogenicity of mixed vaccine regimen.

Bharat Biotech for Phase II clinical trial to evaluate the immunogenicity and safety of BBV152 (COVAXIN) with BBV154 (Adenoviral Intranasal COVID-19 vaccine).

VACCINE DEVELOPMENT

The expenditure on development of vaccines was \$71.26 million or nearly 3 percent share of the total vaccine funding. Government spent \$7.9 million on preclinical work, while \$63.4 million was spent on various phases of Clinical trials.

COVID-19 vaccine development in India is being undertaken by nearly 15 entities including Bharat Biotech International Ltd, Biological E, Gennova Biopharmaceuticals Ltd, Mynvax, Serum Institute of India, Zydus

Cadila and more.

Amongst the vaccines already made available, the Indian Council of Medical Research (ICMR) has supported the clinical

ALLOCATION OF FUNDS AND EXPENDITURE INCURRED ON THE DEVELOPMENT OF COVID-19 VACCINES

The DBT extended support to industry and academia for development of various platforms of COVID-19 vaccine candidates.

Sl #	Institute	Platform	Stage of Development	Sanctioned cost (\$ Million)
1	Cadila Healthcare (Zydus Cadila)	DNA	Clinical; received EUA	14.47
2	Bharat Biotech International Ltd	Intranasal vaccine	Clinical; Phase II	13.51
3	Genique Life Sciences Pvt Ltd	Virus Like Particle	Pre-Clinical	0.87
4	Gennova Biopharmaceuticals	mRNA	Clinical; Phase II	16.88
5	Aurobindo Pharma Ltd	Attenuated rVSV-vector vaccine	Pre-Clinical	1.22
6	Biological E Ltd	Protein Subunit	Clinical; Phase II/III	15.16
7	Seagull Biosolutions Pvt Ltd	Active Virosome Platform	Pre-Clinical	0.31
8	Intas pharmaceuticals	rAAV based vaccine	Pre-Clinical	0.40
9	THSTI, Faridabad	mRNA	Pre-Clinical	0.13
10	Mynvax Pvt Ltd	Protein subunit	Pre-Clinical	2.09
11	Epygen Biotech	Protein Subunit	Pre-Clinical	2.57
12	Serum Institute of India Pvt Ltd	BCG Vaccine (repurposing)	Clinical; Phase III	3.38
13	Institute of Chemical Technology (ICT)	Intranasal mucosal nano vaccine	Pre-Clinical	0.06
14	National Institute of Biomedical Genomics	Virus Like Particle	Pre-Clinical	0.11
15	Christian Medical College (CMC), Vellore	Lipid encapsulated mRNA	Pre-Clinical	0.10
TOTAL FUNDING EXPENSES AS ON NOV 30, 2021				71.26

development of Covaxin, which is a whole virion inactivated vaccine. It was developed under public private partnership (PPP) mode between Bharat Biotech International and ICMR at an approximate cost of \$4.8 million (Rs 35 crore). Phase 2/3 bridging clinical trials of Covishield / AstraZeneca were supported by ICMR (Rs. 10 crore). Phase 2/3 bridging clinical trials of Covovax / Novavax are ongoing with ICMR support \$1.4 million (Rs 10 crore).

CAPACITY

Mission COVID Suraksha, the Indian COVID-19 Vaccine Development Mission, supported facility augmentation of Covaxin production through Bharat Biotech and three Public Sector Enterprises (PSEs) including Haffkine Biopharmaceutical Corporation Ltd, Mumbai; Indian Immunologicals Limited (IIL); Hyderabad; Bharat Immunologicals Biologicals Corporation Limited (BIBCOL), Bulandshahr.

Apart from this, technology transfer of Covaxin production is facilitated to Gujarat COVID Vaccine Consortium (GCVC), comprising of Hester Biosciences, OmniBRx Biotechnologies Pvt Ltd and Gujarat Biotechnology Research Centre (GBRC), Department of Science and Technology, Govt. of Gujarat.

Ministry of Health and Family Welfare has provided 100 percent advance to domestic

vaccine manufacturers in respect of procurement order placed with them.

The monthly vaccine production capacity of Covishield is estimated to have increased from 110 Million doses per month in June to more than 240 Million doses per month by December 2021 and the production capacity of Covaxin increased from 25 Million doses per month in August 2021 to around 58 Million doses per month in December.

Till January 215 million COVID-19 vaccine doses were administered. The Centre in the January-March 2022 quarter has ordered for procurement of 50 million doses each of ZyCoV D and Corbevax. These vaccines are yet to be used in the country's vaccination Program.

Covid-19 Vaccine exports have also started. According to MEA figures show that from January 2021 until February 2022, 162.9 million COVID vaccine doses including Covovax, Covishield and Covaxin, were shipped.

The resumption of exports is linked to Serum Institute of India surpassing its original target to produce 1 billion doses of Covishield by the end of 2021. Serum Institute of India has reached the milestone before the deadline through rapid expansion of production capacity.

RT-PCR KIT SUPPLIERS

Name of Company

1Drop Inc, Korea (Nandan Exports & Imports Pvt Ltd)

3B Black Bio Biotech India Ltd, Bhopal, India

AB Diagnopath Mfg Pvt Ltd, Delhi, India

ABI (Applied bio-systems), USA

Accelerate Technologies Pte Ltd (DxD Hub), Singapore

Accurex Biomedical Pvt Ltd, Palghar, Maharashtra

Achira Labs Pvt Ltd, Bengaluru, Karnataka

Acrannolife Genomics Pvt Ltd

ADALTIS S.r.l, Italy (PUG Capital Pvt Ltd)

ADT Biotech Sdn. Bhd. (ADT India Pvt Ltd)

Advanced Molecular Diagnostics (AMD), UK (Diagnostic Biosystems)

AffigenixBiosolutions Pvt Ltd, Bangalore, India

Agappe Diagnostics Ltd, Kerala

AITbiotech Pte Ltd, Singapore (Hiddenite Beverages Pvt Ltd)

Ajay Bio-Tech (India) Ltd

Alchem Diagnostics, Coimbatore

Altona Diagnostics, Germany

Ammagen, Tamil Nadu

Angstrom Biotech Pvt Ltd, Rajasthan

Aspen Laboratories Pvt Ltd, New Delhi (Deep Meditech Pvt Ltd)

Athenese-Dx Pvt Ltd, Tamil Nadu

Aura Biotechnologies Pvt Ltd, Chennai

AvienceBiomedicals Pvt Ltd, Delhi

Axiva Sichem Biotech, Sonipat

Name of Company

BAG Diagnostics, Germany (Shiva Scientific Company, New Delhi)

BGI Genomics, China

Bhat Biotech India Pvt Ltd, Bangalore

BioGenex Hyderabad

Biogenix INC Pvt Ltd, Lucknow

BioGenomics Ltd, Thane, India

Bioneer Corporation, South Korea (Effibar India Pvt Ltd)

Bioneer Corporation, South Korea (Wevio Global Pvt Ltd)

Biosci Healthcare, Madhya Pradesh

BioSewoom, South Korea

BioSystems Diagnostics Pvt Ltd

Bogar Bio Bee Stores Pvt Ltd,

Cancer Rop Co. Ltd (Anjanajyoti Systems Pvt Ltd)

Cepheid, United States (Cepheid India Pvt Ltd)

ChemGenes Corporation, USA (ChemGenes India Pvt Ltd)

CoSara DiagnosticsPvt Ltd, Ahmedabad, India

Daan Gene Co. Ltd, China

Diasolex Solutions LLP, Karnataka, India

DNA technology Research & Production, LLC, Russia (365 Medical India)

DNA XpertPvt Ltd, Noida, India

Equine Biotech, Karnataka (EBT PVT LTD)

EUROIMMUN, UK (CPC Diagnostics Pvt Ltd)

GCC Biotech India Pvt Ltd

Gene Path Diagnostics, Pune, India

Name of Company
Gene Proof, Czech Republic
Genedrive Diagnostics Ltd, UK (Pinktech Design Pvt Ltd, Delhi)
GeneMatrix, South Korea
General Biologicals Corporation, Taiwan (Innovation Ltd, New Delhi)
GeneReach Biotechnology Corporation, Taiwan (Padmanabha Labs Pvt Ltd)
Genes 2 Me Pvt Ltd
Genestore India Pvt Ltd, Gurgaon
Genesystem Co., Ltd, South Korea (Genetix Biotech Asia Pvt Ltd)
Genetix Biotech Asia Pvt Ltd, New Delhi
Genome Diagnostics Pvt Ltd, New Delhi, India
Genores Biotech Pvt Ltd, Maharashtra, India
Gland Pharma Ltd, Hyderabad
Guangdong Ardent Biomed Co., Ltd, Hong Kong (Biotime Healthcare Pvt Ltd)
HA Tech Biopharma & Diagnostics, Australia (RLT Group Services)
Helini Biomolecules, Chennai
HiMedia Laboratories Pvt Ltd, Mumbai
Huwell Lifesciences Pvt Ltd, Hyderabad, India
Indian Institute of Technology, Delhi, India
INDO-MIM Pvt Ltd
InnoDx Solutions Pvt Ltd
iNtRON Biotechnology, Inc., Korea (Loften India Pvt Ltd)
Intron Biotechnology, Korea (Loften India Pvt Ltd)
Jeev Diagnostics Pvt Ltd
JITM Skills Pvt Ltd, New Delhi, India
JN Medsys Pte Ltd, Singapore
Karwa Enterprises Pvt Ltd, Delhi

Name of Company
KILPEST (3B BlackBio Biotech India Ltd, Bhopal, India)
Kogene Biotech Co. Ltd, Seoul, Korea (Kin Diagnostics)
Lab Care Diagnostics (India) Pvt Ltd, Mumbai, India
Lab Genomics Co Ltd, Republic of Korea (Siemens Healthcare Pvt Ltd)
Lifespan Biotech Pvt Ltd, Madhya Pradesh, India
Lipomic Healthcare Pvt Ltd, New Delhi
LLC Art Biotech
M.J. Biopharm Pvt Ltd
Maccura Biotechnology Co Ltd China (Eris Lifesciences Ltd)
MagGenome Technologies Pvt Ltd, Emakulam
Med Achievers Pvt Ltd, Noida, Uttar Pradesh, India
Medical and Biological Laboratories (MBL) Co. Ltd, Japan (OSB Agencies Pvt Ltd)
Medsources Ozone Biomedicals, Faridabad, Haryana
Meril Diagnostics Pvt Ltd, Gujarat, India
MetaDesign Solutions Pvt Ltd, Haryana
Microbiomed Co. Ltd, Korea (POCT Services Pvt Ltd)
Microbio PTY Ltd, Australia (Bizsoch Consultants LLP)
Mylab Discovery Solutions Pvt Ltd
Nanjing Vazyme Medical Technology Co. Ltd, China (BIOTIME Healthcare Pvt Ltd)
NeoDx Biotech Labs Pvt Ltd, India (DSS Imagetech Pvt Ltd)
NextGen Invitro Diagnostics Pvt Ltd, Haryana
Ningbo Health Gene Technologies Co., Ltd (The Rising Medicare Pvt)

Name of Company
Ltd)
NovaTecImmunodiagnostica, Germany (Eurofins Amar Immunodiagnosics Pvt Ltd)
Nucleus Diagnosys LLP, Gujarat, India
OSANG Health Care, South Korea
Oscar Medicare Pvt Ltd, New Delhi, India
Perkin Elmer, Finalnd
PishtazTebZaman Diagnostics, Iran (Corevyan Pvt Ltd)
POCT Services Pvt Ltd, Lucknow, India
Poly Medicure Ltd, Faridabad, Haryana
Primer Design, UK
Progenie Molecular , Spain (CliniExperts Services Pvt Ltd, New Delhi)
Promea Therapeutics, Telangana
QRX Pvt Ltd, Delhi
QuantuMdx, United Kingdom (Ally-Bio Pvt Ltd)
Reliance Industries Ltd, India
Roche Diagnostics, Switzerland
Sansure Biotech Inc., Changsha, China
SD Biosensor, South Korea
Seegene Inc, South Korea
Sentinel Diagnostics, Italy (Kopran Laboratories Ltd)
Shambhav Medical, Uttar Pradesh
Shanghai ZJ Bio-Tech Co., Ltd (Life Technologies (India) Pvt Ltd)
Shankaranarayana Life Sciences LLP, Karnataka
ShenzenUni-Medica Technology Co. Ltd (Vishat Diagnostics Pvt Ltd)

Name of Company
Sidak Life Care Pvt Ltd, Haryana, India
Siemens Healthcare Pvt Ltd, Vadodara, India
Siemens Healthcare Pvt Ltd, Mumbai
SNP Biotechnology R&D Ltd, Turkey (Wockhardt Ltd)
SreeChitraTirunal Institute for Medical Sciences and Technology, Kerala
Stellence Pharmsciences Pvt Ltd
Tata Medical and Diagnostics Ltd
TCM Ltd, Kerala
Theragen Biologics Pvt Ltd, Tamil Nadu
Thermo Fisher Scientific, US (Invitrogen Bioservices India Pvt Ltd)
Transasia Diagnostics Solutions Ltd, Maharashtra
TranScience Innovative Technologies, Chennai
Triviron healthcare Pvt Ltd
Tulip mDiagnostics (P) Ltd, Verna
uBio Biotechnology Systems Pvt Ltd
Vimek Bioconcept Pvt Ltd
Vitane Biologics Pvt Ltd, Telangana
Vitro S.A., Spain (DSS Imagetech Pvt Ltd)
Vitromed Healthcare
Wuhan Easy Diagnosis Biomedicine Co. Ltd
Yaathum Biotech Pvt Ltd, Tamil Nadu, India
Yashraj Biotechnology Ltd
YD Diagnostics Corp., Korea (POCT Services Pvt Ltd)
YOUSEQ, UK
ZyBioInc, China (Biodx healthcare)

RAPID ANTIGEN TEST KITS (RAT) MANUFACTURERS

Name of Company
Abbott Rapid Diagnostics
ADVY Chemical Pvt Ltd,
Agappe Diagnostic Pvt
Alpine Biomedicals Pvt
Angstrom Biotech Pvt Ltd, Alwar, India
Athenese
Biofootprints Healthcare
BioLab
BIOSCI Healthcare, Bhopal (MP), India
Cadila Healthcare Pvt Ltd, Ahmedabad, India
Coris Bioconcept, Belgium
Dia Sure
Diagnocure (India), Solan, HP
Diagnostic Enterprises Parwanoo (Himachal Pradesh), India
Edge Pharma Pvt Ltd, Mumbai, India
GenBody Inc.,
Genes2Me Pvt Ltd, Gurugram, India
Healgen Scientific Ltd, USA (SIEMENS Healthineers)
IMGENEX India Pvt Ltd, Bhubaneswar, India
ImmunoScience India Pvt Ltd
J. Mitra & Co. Ltd, New Delhi, India
Kilpest India Ltd, Bhopal (MP), India
KoshBio Pvt Ltd, Faridabad (Haryana), India
LabCare Diagnostics Ltd,
Lord's Mark Industries Pvt
Ltd , Mumbai (Maharashtra), India
Lorven Biologics Pvt Ltd,
Medzome Lifesciences Pvt Ltd, Solan (Himachal Pradesh), India

Name of Company
Meril Diagnostics Pvt Ltd,
Meril Diagnostics, Vapi
MyLab Discovery Solutions Ltd, Pune, India
NeoDx Biotech Labs Pvt Ltd, Bengaluru (Karnataka), India
NextGen In Vitro Diagnostics (P.) Ltd., Faridabad (Haryana), India
Nucleus Diagnosys LLP., Ahmedabad, India
NuLifecare, Noida (Uttar Pradesh), India
Ortho Clinical Diagnostics,
Oscar Medicare Pvt Ltd,
Panion & BF Biotech., Taiwan
Patanjali Pharma Pvt Ltd, (IIT Mumbai), India
Pathkits Healthcare Pvt
PCL Inc, South Korea
Poly Medicure Ltd, Faridabad, India
Premier Medical, India
QAWACH Bio Pvt Ltd
Recombigen Laboratory, New Delhi, India
Roche Diagnostics Pvt Ltd
SD Biosensor, Korea (Supplied by Roche Diagnostics)
Seloi Healthcare Pvt Ltd, Mumbai, India
Sidak Lifecare Pvt Ltd, Jhajjar (Haryana), India
STRUmed Solutions Pvt
TaiDoc Technology Corporation, Taiwan
Transasia Bio-Medical Ltd
Trivitron Healthcare Pvt Ltd, Chennai, India
Ubio Biotechnology
YuvRaj Biobiz Incubator India Pvt Ltd
Zephyr Biomedicals (Tulip)



ANALYSIS OF KEY SEGMENTS

BIOPHARMA

Prime Minister Shri Narendra Modi at vaccine facility of Serum Institute of India

The BioPharma is the highest contributing segment to the Indian BioEconomy. It accounted for 49 percent share of the total BioEconomy pie.

The BioPharma economy was estimated at \$39.4 billion in 2021 as opposed to \$38 billion in 2020. The segment recorded 3.7 percent growth.

The key constituents of the BioPharma segment include Therapeutics, Vaccines, and Diagnostics. It may be noted here that the Covid-19 vaccines and Covid-19 testing generated bioeconomic value was not considered in the BioPharma estimates.

Within the BioPharma, the share of vaccines stood at 22 percent, therapeutics accounted for 26 percent and diagnostics was at 52 percent. The share of vaccines came down by 11 percent points as the vaccine industry focused mostly on the Covid-19 vaccination.

The vaccines industry excluding Covid-19 Vaccines was valued at \$8.7 billion. The therapeutics segment was valued at 10.3 billion, and diagnostics sector at \$20.4 billion.

VACCINES

Covid-19 has changed the dynamics of the vaccine industry both in terms of managing production capacities and global trade.

THE BIOPHARMA ECONOMY
WAS ESTIMATED AT

\$39.4
BILLION

IN 2021 AS OPPOSED
TO \$38 BILLION IN 2020.



Covid-19 tests

DIAGNOSTICS ACCOUNTED FOR

52.8%
SHARE

OF THE TOTAL BIOPHARMA
MARKET, WHILE THERAPEUTICS
SEGMENT STOOD AT 26%.

Before the pandemic, the leading producers of vaccines were the European Union (EU), the US, and India. The production capacities of EU companies catered to vaccine supplies to developed and rich countries. The US production capacity was mainly met for its own requirement. Vaccine companies from India mostly supplied to the developing countries. China, another large producer, focused on local consumption.

The scenario reversed with Covid-19 vaccines. China became the leading supplier of Covid-19 vaccines to developing countries, while India used its Covid-19 production capacities for its people.

The scenario reversed with Covid-19 vaccines. China became the leading supplier of Covid-19 vaccines to developing countries, while India used its Covid-19 production capacities for its people.

Before the pandemic, India was the second-largest vaccine exporter by volume according to various research studies. Studies suggest that India accounted for nearly a quarter of the total global exports by volume. But in value terms, the share of exports was under 2 percent. This is mainly because Indian companies focused on producing vaccines at affordable prices and mostly supplied to the developing countries or low-income markets.

According to Brussels based economic thinktank, Bruegel, India is the second largest producer of vaccines behind EU. Bruegel estimates annual production capacity of EU to be around 15.5 million kgs of vaccines, while India's production capacity is at 14.5 million kgs. China is third with production capacity of 8-12 million kgs.

BIOTHERAPEUTICS MARKET VALUE

The Biotherapeutics segment is estimated to record \$10.3 billion in value. The diabetes, oncology, infections, and cardiology



Prime Minister reviews vaccine development

medication are the primary contributors. It is also not easy to arrive at the economic valuation as the production numbers are not easily available.

The therapeutics segment accounted for nearly 13 percent share of the total BioEconomy value. Anti-infectives was one the leading segments accounting for nearly accounting for nearly \$1.4 billion in values; Cardiac targeted drugs were \$1.3 billion in value. Anti-diabetes was about \$1.4 billion.

Diagnostics accounted for 52.8% share of the total BioPharma Market, while Therapeutics segment stood at 26%.

Indian in-vitro diagnostics market is one of the leading segments in the Diagnostics segment. Factors like high prevalence of chronic diseases, increasing use of point-of-care (POC) diagnostics, and rising awareness and acceptance of personalized

medicine and companion diagnostics are pushing the sector's performance.

The diagnostic services industry is one of the highly fragmented verticals. It comprises of hospital labs, standalone diagnostic centers, and diagnostic chains. The stand alone and hospital-based services account for 75 percent share of the bioeconomic value creation. The diagnostics services were valued at about \$11 billion. Medical devices and equipment and reagents and test kits accounted for the rest.

The Indian CRO and research services market was valued at \$5.4 billion in 2021. The demand for the research services and manufacturing continues to be driven by outsourced R&D. India is still known for its process chemistry skills and strong cost-value proposition. Companies are focusing on Discovery Services and Dedicated Centers.



People wait for Covid-19 vaccination



BIOINDUSTRIAL

In 2021, the BioIndustrial segment was estimated at \$10.3 billion compared to \$5.1 billion in 2020. This segment registered a strong growth of 101.3 percent in 2021. BioIndustrial segment is categorized into two verticals—(i) Biofuels / Bioenergy and (ii) Industrial Enzymes. Within the segment, the Enzymes category showed a strong growth of 65.7 percent, while the Biofuels sub-segment registered a whopping 138.8 percent growth.

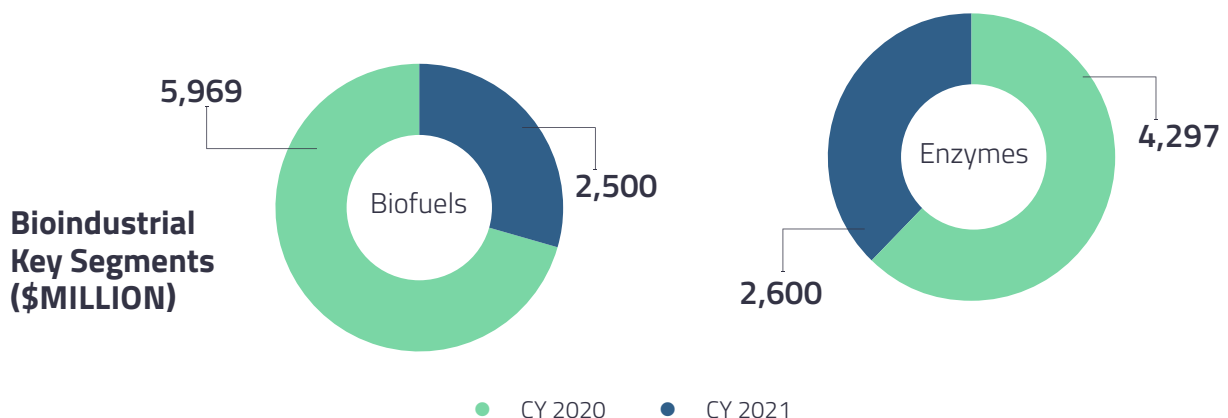
BIOINDUSTRIAL VALUE

(\$ BILLION)



BIOFUELS VALUED AT \$5.97 BILLION

The Biofuels market in India gained momentum due to the strategic push given by the Union Government to encourage blended fuels (green fuels) and clean energy. The Union government announced the roadmap for ethanol blending in India 2020 with a focus on advancing the blended fuels target. Government has allowed blending of ethanol with petrol from sugarcane-based distilleries and grain-based distilleries.



According to analysts of OR Research, India was seventh in the list of top ethanol producers in 2016, and by 2021 it overtook Germany, Thailand, and Canada to become the fourth largest nation producing ethanol. In 2022, India is likely to match ethanol production from China and by 2023 overtake China to claim the third spot after the US and Brazil.



Quality matters

As mentioned earlier, the rise in ethanol production in India is almost entirely policy driven and the uptake has started since June 2021 after the new policy announcement by Niti Aayog and the Ministry of Petroleum & Natural gas (MOPNG).

The conservative estimate of biofuels including Biodiesel, Blended petrol; and Bioplastics along with other renewal derivatives has been pegged at \$5.97 billion in 2021.

BLENDED PETROL

Ethanol blending in India has crossed over 8.2 percent in 2021, up from 5 percent in 2020. This change is due to increase in

supply, which has come about as a result of combination of assured purchases at government-set remunerative prices and interest subsidy for production capacity expansion. The total economic value of Bioethanol was estimated at \$4.78 billion in 2021 as compared to \$1.85 billion in 2020.

According the oil companies, nearly 1.73 billion liters of ethanol was procured in 2020 and 5 percent blending was achieved during ethanol supply year (ESY) 2019-20 (December 2019 to November 2020). The target for ESY-2020-21 (December 2020 to November 2021) was 3.5 billion liters, while the actual achievement during ESY - 2020-21 till December 2021 was 2.43 billion liters. This led to 8.01 percent blending. It means India is on course to meet the target of 10 percent blending by 2022.

Several states like Delhi, Goa, Gujarat, Haryana, Himachal Pradesh, Karnataka, Maharashtra, Punjab, Uttar Pradesh, and Uttarakhand were able to achieve ethanol blending of 6-10 percent with petrol.

Oil marketing companies have asked for 4.57 billion liters for 2020-21. Of this, sugar companies have finalized bids for 3.49 billion liters. Against this, around 2.43 billion liters of ethanol has been contracted. Of these 1 billion liters (around 33.5 percent) has been supplied, while the rest is in the process of being delivered.

Around 1.53 billion liters (57 percent) has been produced from B-heavy molasses and sugarcane juice.

Meanwhile, state-owned Indian Oil Corp (IOC) plans to build two second generation

(2G) bio-refineries in the states of Telangana and Andhra Pradesh. This is drive government's goal of increasing ethanol production in the country.

Each of these 2G biorefineries will be set up at a cost of \$83 million. The refineries will be able to produce nearly 0.5 million liters of ethanol per day from spoilt and surplus food grain from the Food Corporation of India (FCI) as well as from agricultural waste such as wheat and paddy straw. The Indian government has proposed 12 biorefineries to be built across 11 states in the country.

The government has mandated the blending of 10 percent of ethanol in fuel. However only around 6 percent ethanol is being added to fuel. Nearly 4 billion liters of ethanol will be required to achieve the 10 percent ethanol blending ratio.

The Indian government has a clear path to increase the share of biofuels in the transportation sector and cut India's dependence on oil imports, which account for nearly 85 percent share of the domestic requirement. Petrol's occupies 15 percent stake of total oil consumption in the country. And a 10 percent substitution by ethanol could cause reduction in oil imports by as much as 1.5 percentage points.

India is expected to reach 10 percent ethanol blending in petrol in 2022.

Ethanol supplies from sugar sector are set to rise rapidly as nearly four-five mills are being commissioned every month. Recently, the government approved 196 grain-based ethanol projects of 8.59 billion liters. In ESY 2021 that ended in November last year, 85

percent of the ethanol supplies came from the sugar sector and the rest from the grain-based projects.

The government also approved fixing of higher ethanol price. Approval was given for the prices as follows.

(i) The Price of ethanol from C heavy molasses route increased from \$0.62 (Rs 45.69) per liter to \$0.63 (Rs 46.66 per liter).

(ii) The price of ethanol from B heavy molasses route increased from \$0.78 (Rs 57.61) per liter to (\$0.80) Rs 59.08 per liter.

(iii) The price of ethanol from sugarcane juice, sugar / sugar syrup route increased from \$0.85 (Rs 62.65) per liter to \$0.86 (Rs 63.45) per liter.

(iv) Additionally, GST and transportation charges will also be payable.

(v) Government has decided that Oil market companies would be given the freedom to decide the pricing for 2G ethanol as this would help in setting up advanced

biofuel refineries. It is important to note that grain-based ethanol prices are currently being decided by Oil Marketing Companies (OMCs) only.

BIODIESEL

India's monthly production of biodiesel was nearly 16 million liters per month. The total production during 2021 was 197 million liters as per information collated from oil market committees and industry associations. At nearly \$1.08 per liter, the Biodiesel value is estimated to be \$213 million.



BIOFUELS 2020-2022

BIOFUELS	2020 (\$MILLION)	2021 (\$MILLION)	PERCENT CHANGE	2022* (\$ MILLION)
ETHANOL BLENDED PETROL	1845	4775	159%	5775
BIODIESEL	330	679	106%	750
BIOPLASTICS	325	515	58%	700
TOTAL	2500	5969	139%	7225

*Projections

All the oil-marketing companies (OMCs) in India are having increased focus on biofuels. Biodiesel is diesel that is produced from animal fats, vegetable oils, etc. Government sees used cooking oil (UCO) as a good source manufacturing Biodiesel. The OMCs are looking at procuring 260 million liters of UCO by 2030 as compared to 170 million in 2021.

In 2021 Oil Marketing Companies (OMCs) have received offers for setting up of 61 Biodiesel Plants with a proposed yearly production capacity of nearly 0.38 billion liters.

Most of the common blend includes B2 (2 percent biodiesel, 98 percent diesel), B5 (5 percent biodiesel, 95 percent petrodiesel) or B20 (20 percent biodiesel, 80 percent petrodiesel).

He is an example of the consumption. Delhi and Gurugram together consume about

16,99,000 tons of diesel every year. Just for an estimated use, if 5 percent of biodiesel is blended with petroleum diesel, then 84,950 tons of diesels will be saved per year.


There is push for RUCO – Repurpose Used Cooking Oil, an ecosystem that will enable the collection and conversion of used cooking oil to biodiesel.

BIOPLASTICS

The Bioplastics Market was valued at \$ 515 million in 2021 as compared to \$ 325 million in 2020. A jump of 58 percent compared over that in 2020. The Bioplastics market in 2019 was estimated at \$208.5 million. India's bioplastics market is projected to grow at a CAGR of 24-25 percent to reach \$755-800 million by 2025.

ENZYMES MARKET

The enzymes market was estimated at \$4297 billion in 2021 as compared to \$2600 billion in 2020 recording 65 percent growth.



THE BIOECONOMY VALUE
OF BIOAGRI SEGMENT
WAS ESTIMATED AT

\$10.48
BILLION

BT COTTON

IS THE MAIN STAY
OF THE BIOAGRI
SEGMENT. IT
ACCOUNTED FOR

92

PERCENT SHARE
OF THE TOTAL
BIOAGRI ECONOMIC
VALUE OF \$10.48
BILLION.

ANALYSIS OF KEY SEGMENTS

BIOAGRICULTURE

BioAgriculture (BioAgri) segment comprises of Bt cotton, biopesticides, biostimulants, and biofertilizers. The Bioeconomy value of BioAgri segment was estimated at \$10.48 billion. The sector registered nearly 2.7 percentage points drop in value compared to the 2020 figure. Despite this drop, BioAgri still accounted for 13.07 percent share of the total BioEconomy.

Bt cotton is the main stay of the BioAgri segment. It accounted for 92 percent share of the total BioAgri economic value of \$10.48 billion.

Biofertilizers, biopesticides, and biostimulants together contributed \$860 million. This sector was valued at \$1 billion in 2020. This sector is likely to get additional support with the government focusing on organic or chemical-free farming.

The Indian Government encouraged organic farming through schemes like Paramparagat Krishi Vikas Yojana (PKVY), Mission Organic Value Chain Development for North Eastern Region (MOVCDNER), and Capital Investment Subsidy Scheme (CISS). The aim was to promote sustainable agriculture production through organic inputs.

BT COTTON

The BioEconomic value of Bt cotton was estimated at \$9.61 billion in 2021. Bt cotton value recorded 4.81 percent fall in its value. The textile industry plays a very important role in the economic development of the Bt cotton segment. The sector was in the revival mode for most part of 2021.

The textiles and apparels industry, according to some industry associations, was feeling the pinch on margins due to increasing raw material costs as the average prices of cotton rose by 55 percent during the year. The textile industry feels the high cotton prices have put pressure on the complete value chain, though higher price means good news for farmers as they get better rates for their produce.

The procurement prices in several markets are almost double the minimum support price (MSP) leading to drop in the average BioEconomic value generated by Bt Cotton. The MSP per a bale of cotton of 170 kg was around \$128 in 2020 and the same in 2021 was \$177.

The late arrival of cotton in mandis also compounded the matters. Typically, the

time frame between January and February sees highest arrival of cotton. During the peak, the arrival range is around 2.5-3 lakh bales (each bale of 170 kg). The slowed-down arrivals meant increased pressure on delivery schedules.

The area under cotton cultivation is saturating.

Bt cotton was cultivated in an area of 12.1 million hectares in 2021 according to the provisional data of the Meeting of Committee on Cotton Production and Consumption (COCPC) in November 2021. This is nearly 9 percent reduction in the season. The area under cotton cultivation in 2020 season was 13.33 million hectares, while that in 2019 season was 13.5 million. Nearly 5-5.5 packets of Bt Cotton are required for sowing in a hectare area.

According to Ministry of Agriculture data, India's cotton production in 2021 season was estimated at 34 million bales of 170 kg each compared to 35.6 million bales in 2020 season.

The Central Zone, comprising of Gujarat, Madhya Pradesh and Maharashtra, was the largest cotton producing zone. Almost 53 percent of the total cotton production of India happened in the central zone. This zone produced 19.2 million bales of cotton. Gujarat was the highest cotton producer with 9 million bales of cotton. The yield in the zone was 548.25 kg per hectare.

The cotton production in north zone (Rajasthan, Haryana, and Punjab) registered 0.7 percent growth over the 2020 season to touch 6.6 million bales of cotton in 2021 season. North zone accounted for nearly 18



BioEconomy valuation of Bt Cotton

One of the indicators for calculation of the BioEconomic value of Cotton is based on Minimum Support Price (MSP). The derived BioEconomic value was nearly 2.2 times the MSP when exported or procured domestically in the previous year but due to the increase in raw materials costs, the BioEconomic value of Bt Cotton was only around 1.6 times that of MSP in 2021.

Here is an example to understand the value generated by Bt Cotton. The general rule of thumb is that approximately 25 kg of Bt cotton seeds are needed in a hectare of area to produce about 500 kg of cotton per hectare. It means a hectare of cotton field requires about 5.5 packets of Bt cotton packets as each packet roughly weighs 450 gm. Each packet is priced at about \$10 (Rs 740). One packet of Bt cotton yields approximately 90 kg of cotton that can produce approximately 115 jeans. Even at a conservative price of \$10 per jeans, the economic value would work out to be \$1,150 per packet of seeds. This means a packet of Bt Cotton generates an economic value of nearly 11.5 times its price.

INDIA'S TOTAL COTTON PRODUCTION

In lakh (100000)
bales of 170kgs
each

398
2013-14

386
2014-15

332
2015-16

345
2016-17

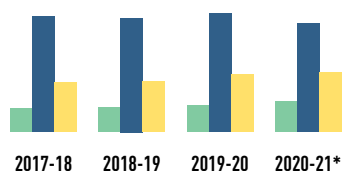
370
2017-18

327
2018-19

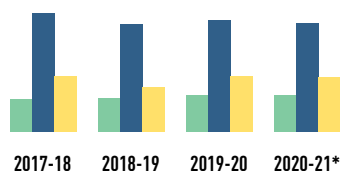
365
2019-20

360
2020-21

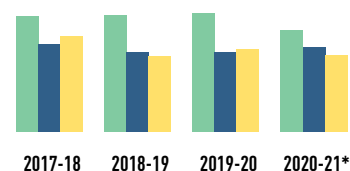
AREA UNDER COTTON CULTIVATION (In Lakh Hectare)



COTTON PRODUCTION (In Lakh bales of 170 kgs each)



COTTON YIELD (In Kg/Hectare)



Source: Estimated by Committee on Cotton
Production and Consumption (COCPC)

■ Northern Zone ■ Central Zone ■ Southern Zone (*)Provisional

percent share of the total cotton production. The cotton yield in north was 548.25 kg per hectare.

The southern zone consisting of Andhra Pradesh, Karnataka, Tamil Nadu, and Telangana recorded 9.6 million bales of cotton in 2021 season. The south zone contributed nearly 27 percent share of the total cotton production. South zone's average yield was of 410 kg per hectare in 2021. Telangana led in the zone with 5.1 million bales of cotton in 2021 season.

India's cotton exports have grown to \$2.5 billion in 2021 from \$1.4 billion. India increased its raw cotton trade to 7.6 million bales of 170 kg each. In 2021, raw cotton was traded at an average price of \$ 1.95 per kg, while that in 2020 was \$1.48 per kg.

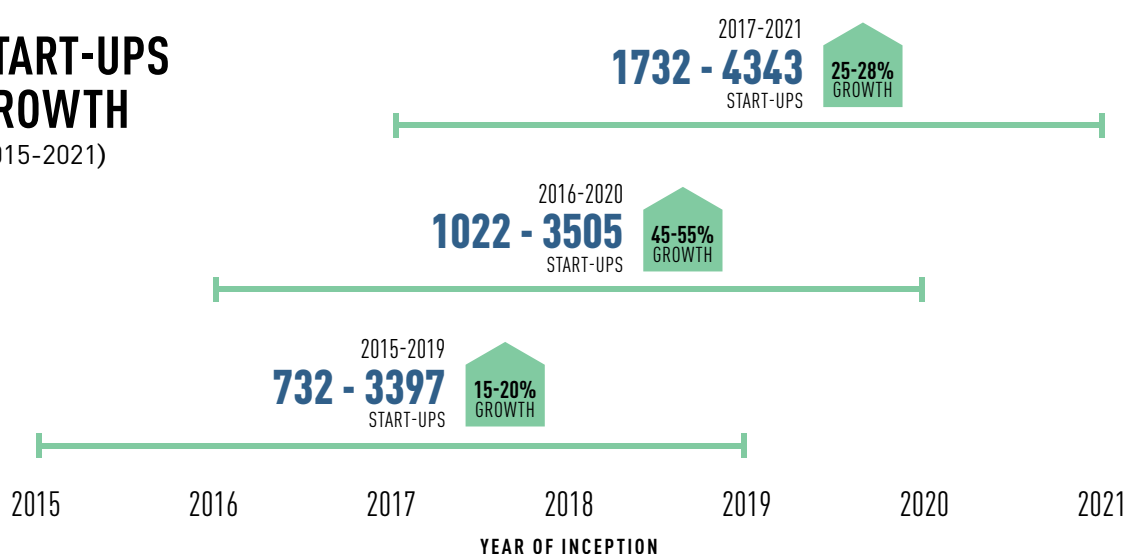
Experts believe farmers are in need of other biotech crops that will provide them profit and help improve their living status. In 2002 approval for the commercial release of Bt cotton hybrids/ varieties resistant to cotton bollworm was given.

START-UPS

India's biotech start-ups base (i.e., total number of companies registered since 2010) continued with the growth momentum in 2021 as well. The total biotech start-up base swelled to 5365 companies from the base of 4,237 companies in 2020. The cumulative start-up base grew by 26.6 percent in 2021. The term "Cumulative" mentioned in the graphs and paragraphs means the total base of start-ups. The term used for companies formed in a specific year is "New Start-ups".

START-UPS GROWTH

(2015-2021)



1000+ Number of start-ups added in 2021	5000+ Cumulative base of start-ups since 2015	7+ Number of industrial verticals with active start-ups	1000+ Solutions provided by start-ups	2600+ Number of start-ups supported by BIRAC funding	130+ Markets reached by Startup solutions for COVID19
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GROWTH OF BIOTECH START-UPS IN INDIA

The Indian biotech ecosystem crossed an important milestone at the end of 2016 when the base of number of start-ups crossed 1000.

Another major threshold was surpassed in 2018 when the cumulative base of start-ups in biotech industry since 2015 crossed

2600. This was a major achievement as the ecosystem achieved the goal of fostering 2,000 biotech start-ups by 2020, almost two years ahead of schedule.

The year 2021 is a landmark achievement again for the start-up ecosystem. This is the first time that biotech industry in India recorded over 1,000 new start-up registrations in a single year. The total

number of new start-ups set up in country touched 1,128 by year end.

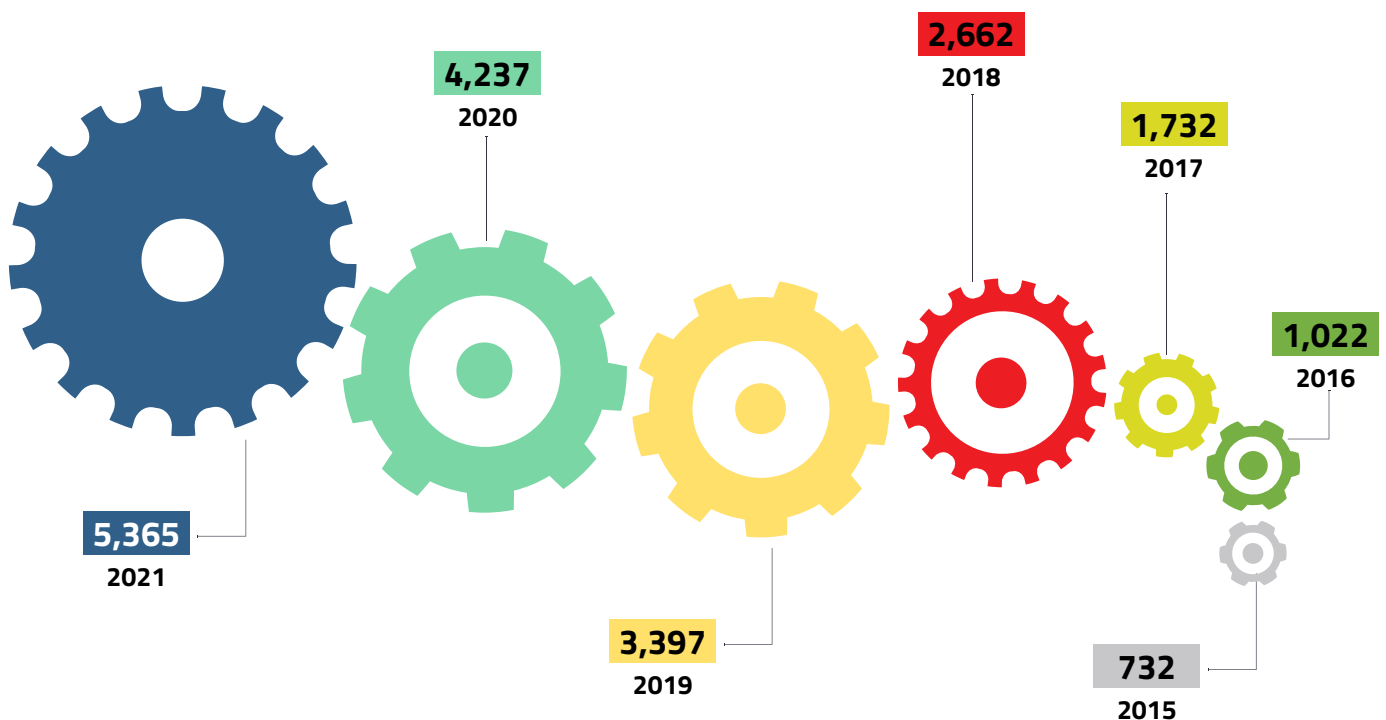
The success in the start-up growth story is primarily the outcome of the vision and efforts of the Department of Biotechnology (DBT) to promote innovation and R&D. The industry, policy makers, and DBT identified “start-ups” as one of the important drivers for growth of biotech industry as early as in 2012-2013.

The entrepreneurship trends in the Biotech industry can be classified into three major time frames. One, the era before 1995, the second period is between 1995 - 2015, and the third phase from 2015. The period prior to the year 2000 had only a few biotech companies in the country like Biocon, Biological E, Concord Biotech,

Panacea Biotec, and Serum Institute of India. The period between 1990-2010 saw emergence of new start-ups like Advanced Enzymes, Bharat Biotech, MetaHelix, Strand Life Sciences, Shantha Biotech, and xCyton Diagnostics. That period registered establishment of over 700 companies. These were started by people who had industry experience and wanted to found companies that addressed different market needs and in different regulatory conditions. The period after 2015 has created yet another trend. A large number of companies being started from the classrooms or from premium schools and labs as well. The regulatory environment was more streamlined and the ecosystem support became available.

DBT had been instrumental in nurturing the skills and building institutions before 2010.

CUMULATIVE START-UPS



DBT also focused on removing hurdles on the regulatory front during 2000-2010. This was the time when DBT recognized the funding and regulatory hurdles of entrepreneurs and began building an ecosystem to encourage entrepreneurship through funding mechanism, help in IP creation, and support development of products and platform technologies. DBT's Biotechnology Industry Research Assistance Council (BIRAC) was set up to be an interface agency to empower the emerging biotech enterprise to undertake strategic research and innovation, addressing nationally relevant product development needs.

BIRAC became the anchor for the new generation of companies after 2012. The biotech industry has had positive outcomes and a robust biotech start-ups ecosystem has thrived since then

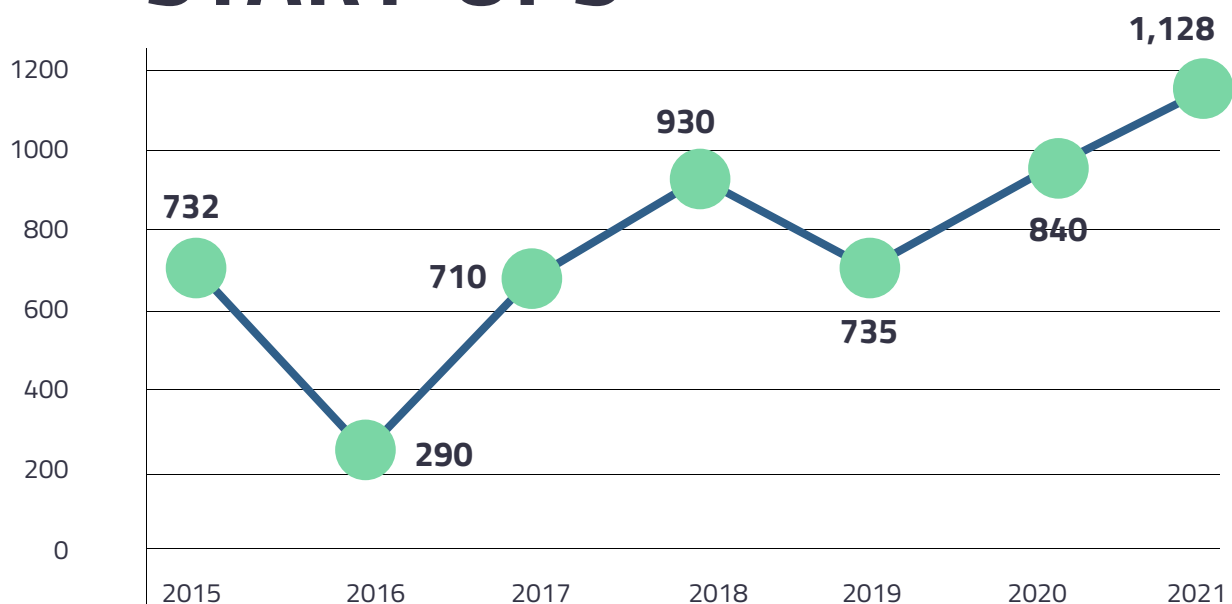
The start-ups information is based on the data filed by enterprises with the Registrars of Companies (ROC).

AGE OF FORMATION

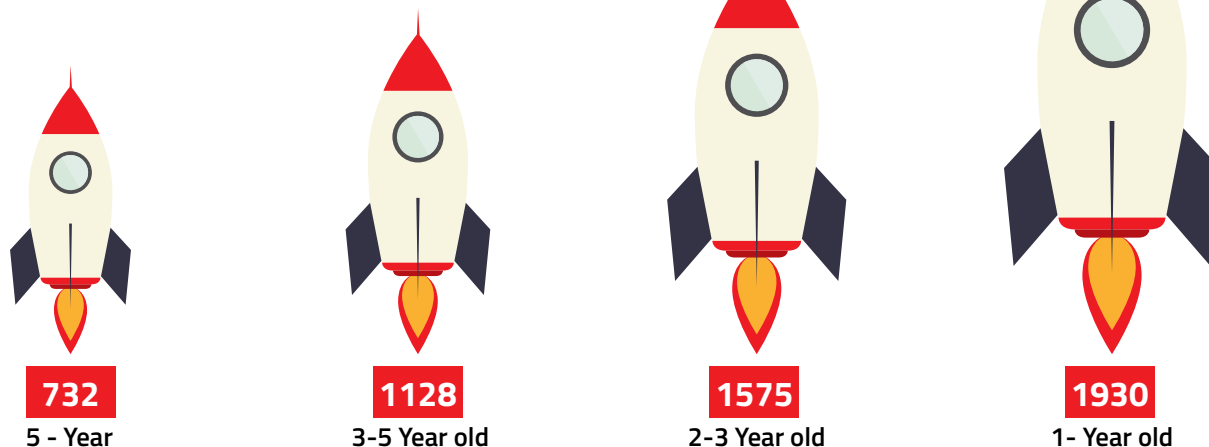
Following were some of the key trends in terms of age of company formation.

- Nearly 21 percent of the total start-ups are less than a year in age (1100+)
- About 29 percent of the companies are between 2-3 years in age (1500+)
- A majority (36 percent) of the start-ups are between 3-5 years (1900+)
- Only 14 percent of the companies are over 5 years old (730+)

NEW START-UPS



AGE OF START-UPS



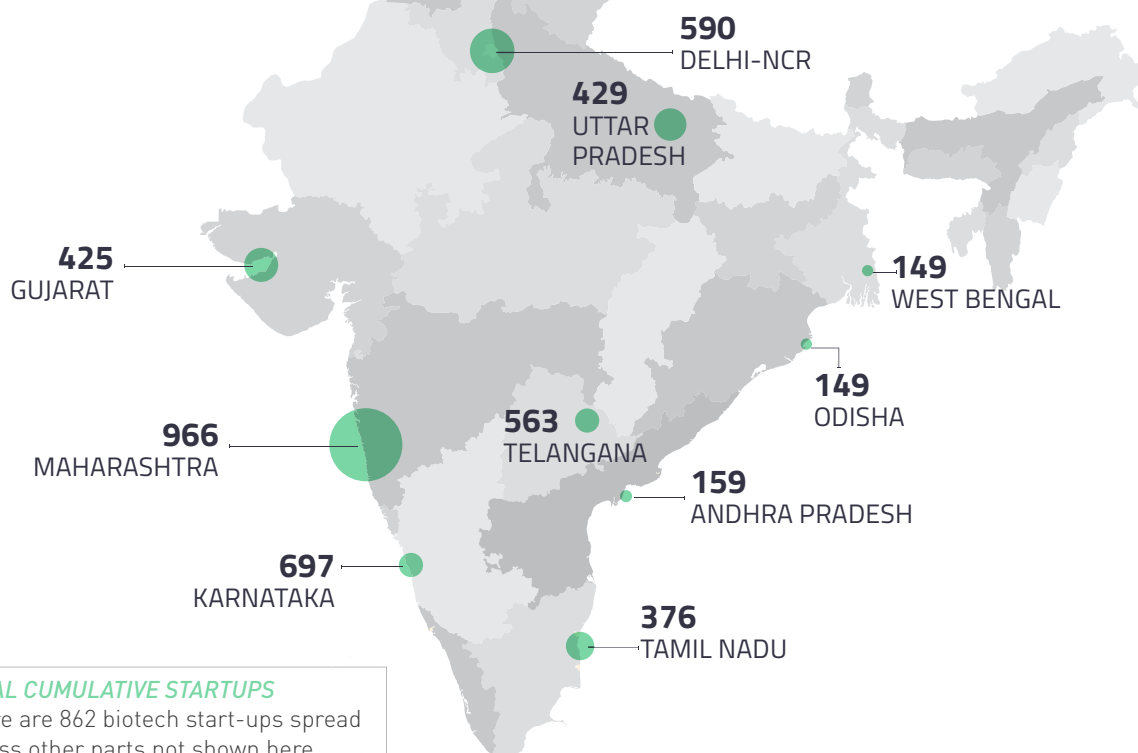
Nearly half of the total 5,365 start-ups were set up during the last three years, the remaining half of the start-ups were established between 2015 and 2018.

WHERE HAVE THEY BEEN FORMED?

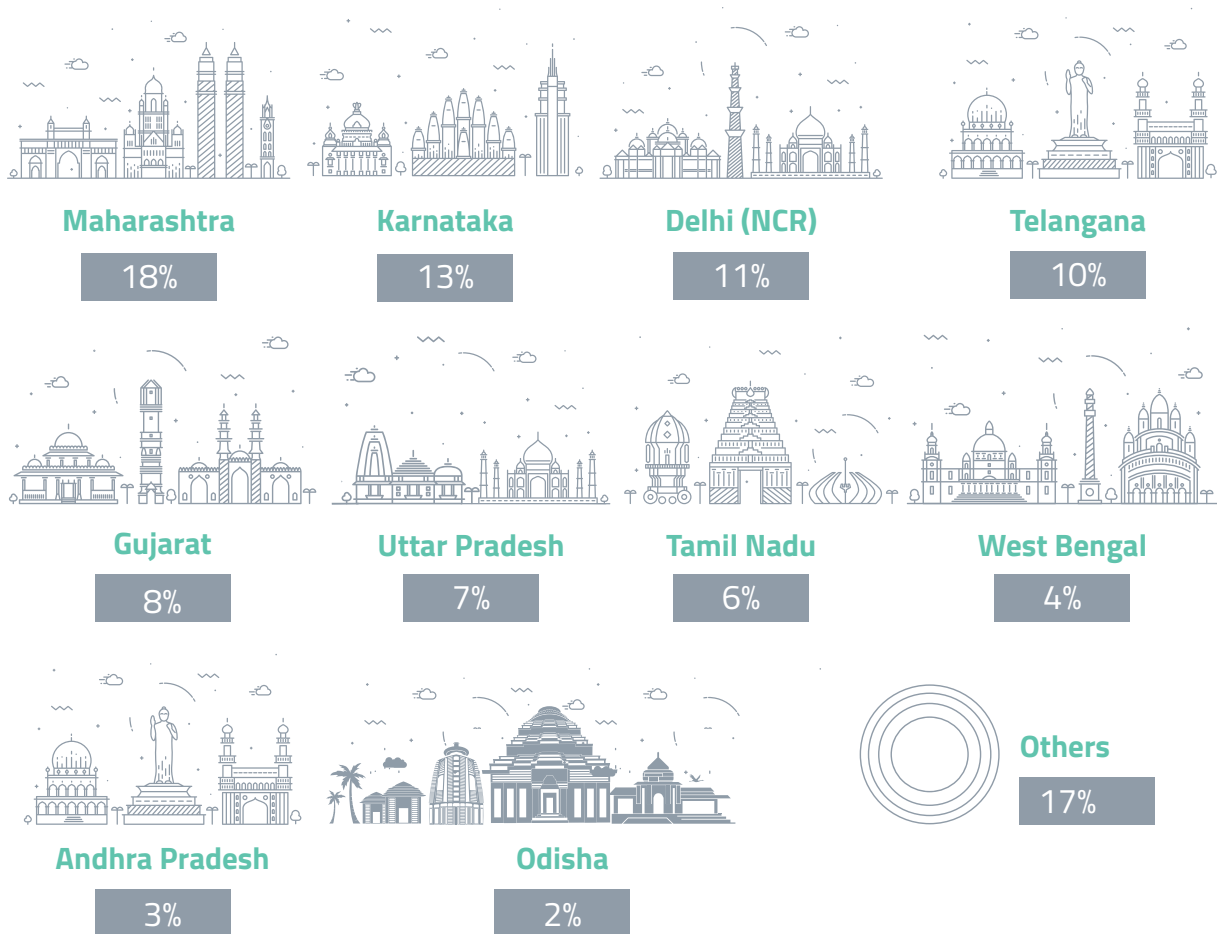
These companies have been registered with ROCs across the country.

CUMULATIVE BASE OF BIOTECH START-UPS (BY REGION)

The spread of Biotech companies in india



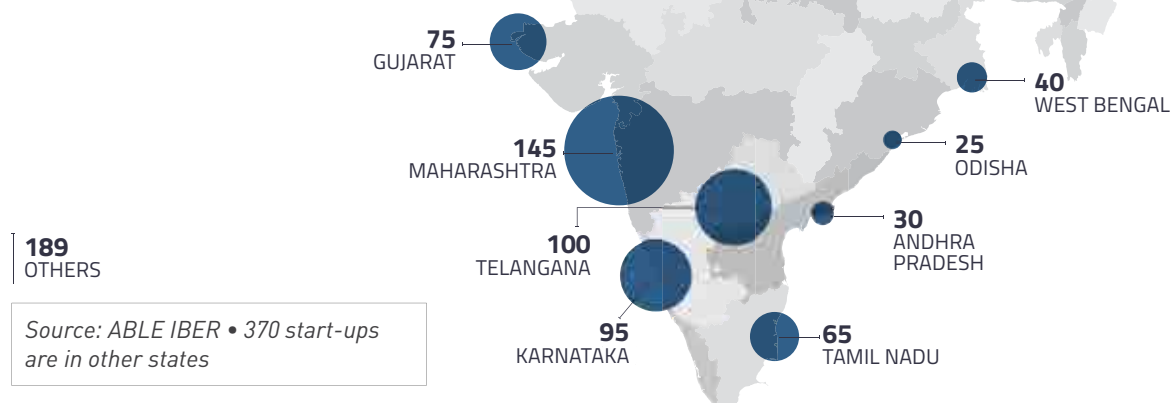
WHERE ARE BIOTECH START-UPS LOCATED?



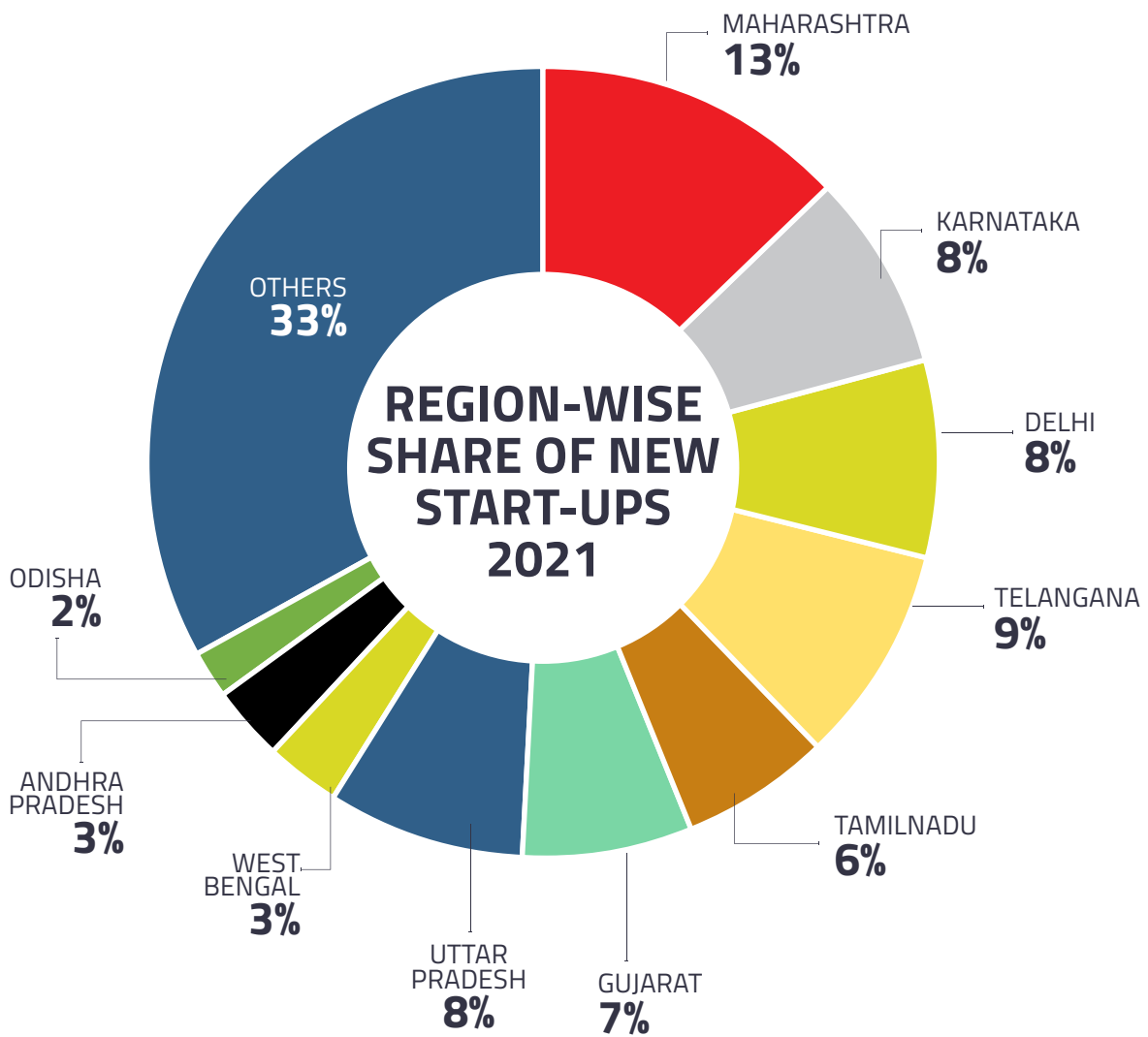
NEW START-UPS IN 2021: TOP 10 STATES

Where did the start-ups register in 2021?

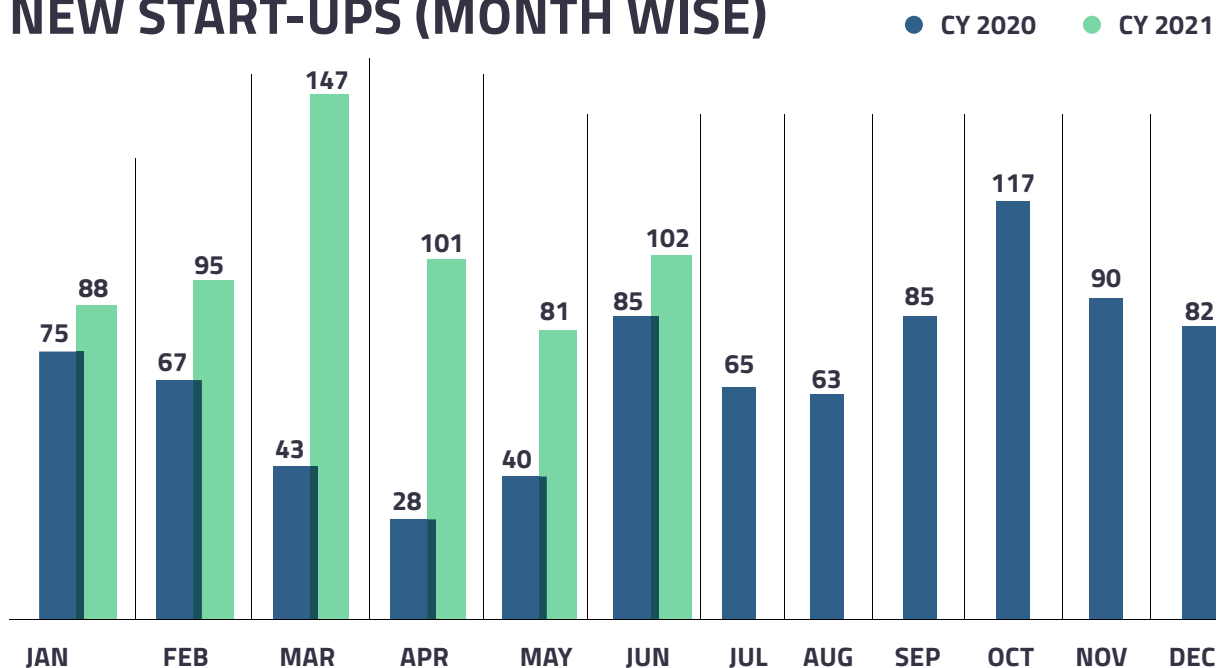
Maharashtra witnessed the largest number of new registrations in 2021.



Source: ABLE IBER • 370 start-ups are in other states



NEW START-UPS (MONTH WISE)



WHAT ARE THE BROAD AREAS THAT THE START-UPS OF 2021 ARE WORKING IN?

Most of the companies registered in India follow the combination of product, development and services. The start-ups focus on a diverse range of technologies and services and across multiple segments. Some of them are into BioEnergy, Biofuel, and Enzymes space. Some are focused in the diagnostics and medical devices space. Some of them are in agriculture and allied services. Many are into manufacturing of reagent and chemicals that go to the life sciences, biotech, space.

- Many focus on research and experimental development (R&D);

- Development and supply of medical health devices, diagnostics, and appliances (Medical devices & Diagnostics)

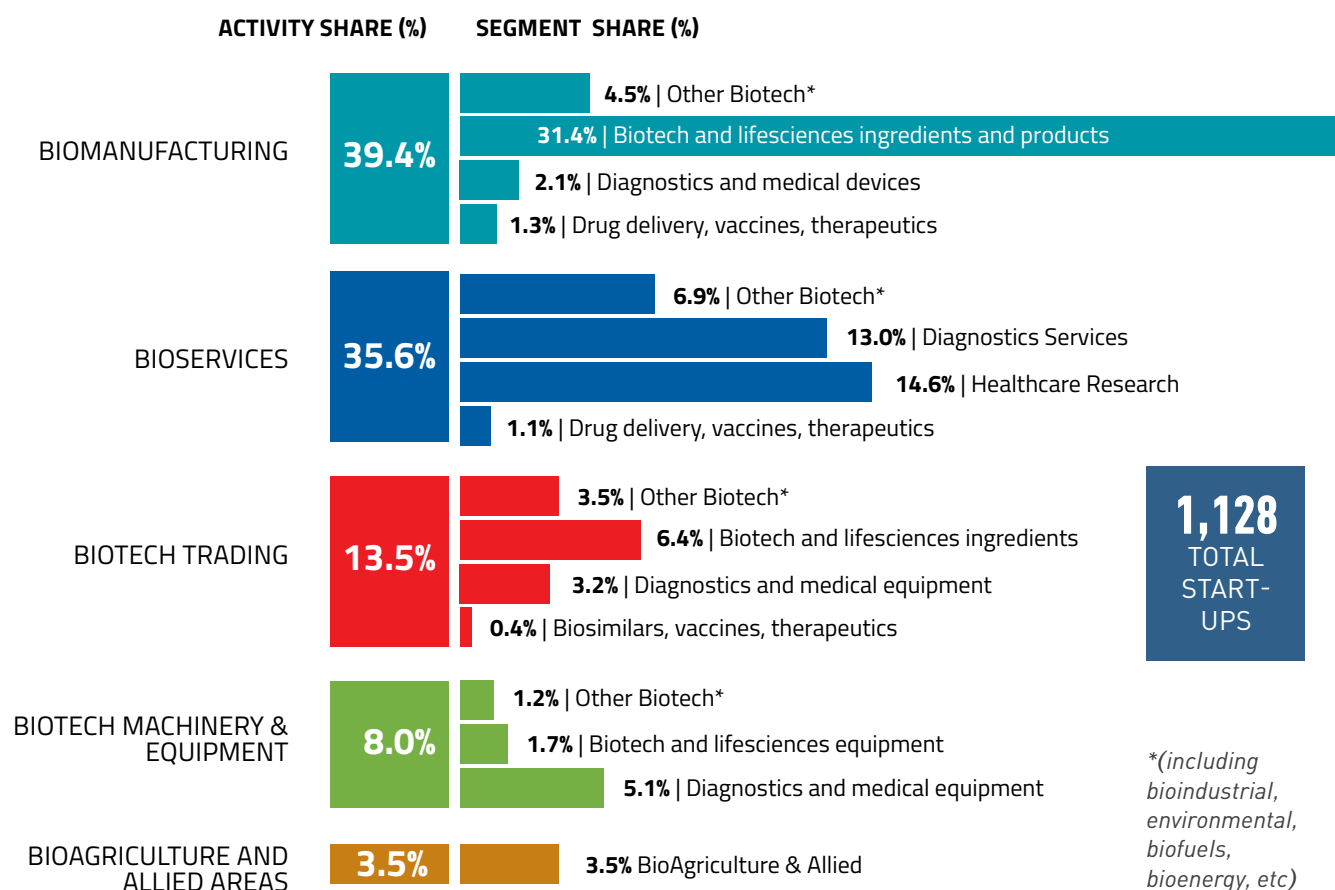
- Manufacture of basic chemicals for medical purposes (Basic biochemical manufacturers)

- Manufacture of other biologic or biotech based products (Other green chemicals)

- Services related to community including Clinical Research, diagnostics, services etc.

Out of the total 1,128 new startups set up in 2021, 39.4 percent of them were in the biotech and life sciences manufacturing space. Neary 35.6 percent of the startups

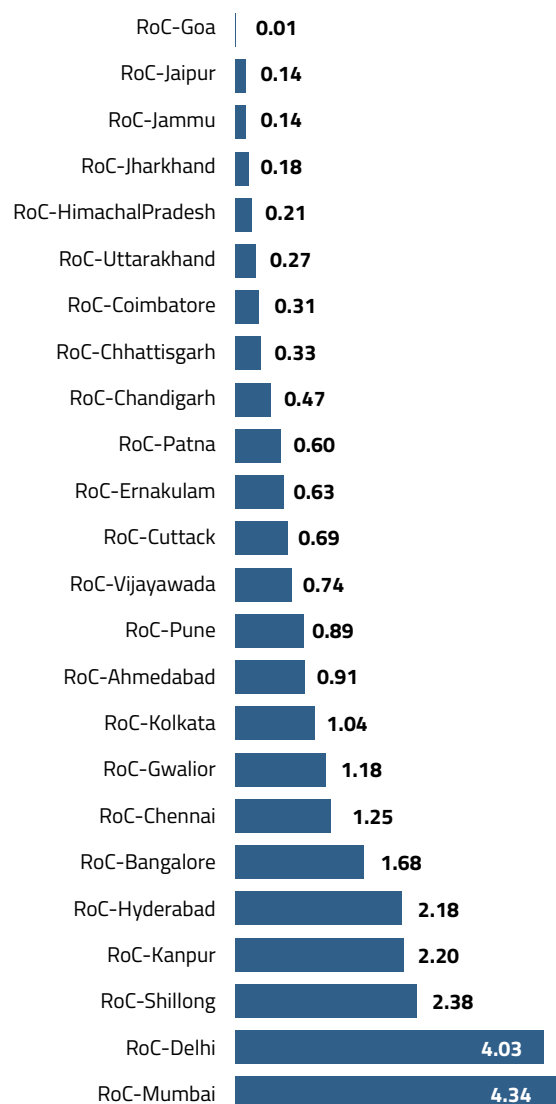
DISTRIBUTION OF START-UPS



BIOTECH START-UPS BY ACTIVITY IN 2021

Segments	Start-ups
BioManufacturing	444
Other Biotech*	51
Biotech and lifesciences ingredients and products	354
Diagnostics and medical devices	24
Drug delivery, vaccines, therapeutics	15
BioServices	402
Other Biotech*	78
Diagnostics Services	147
Healthcare Research	165
Drug delivery, vaccines, therapeutics	12
Biotech Trading	152
Other Biotech*	40
Biotech and lifesciences ingredients	72
Diagnostics and medical equipment	36
Biosimilars, vaccines, therapeutics	4
Biotech Machinery & Equipment	90
Other Biotech*	14
Biotech and lifesciences equipment	19
Diagnostics and medical equipment	57
BioAgriculture and Allied Areas	40
TOTAL START-UPS	1,128

AUTHORIZED CAPITAL (\$ MILLION)



were engaged in BioServices domain including R&D and other services. Another 13.5 percent of the life sciences companies were registered as companies with trading activity. And 8 percent of the companies were active in the engineering, machinery and equipment activities. The BioAgriculture and allied sector accounted for 3.5 percent of the total startups formed in 2021.

The overall industry today is backed by good ecosystem and the industry is on its path to reaching the 10000 biotech start-ups target by 2027.

ACKNOWLEDGEMENTS AND SOURCES

This report has been done gathering information from various websources and public data.

Department of Commerce, Ministry of Commerce & Industry, Government of India

Assistance. Biotechnology Industry Research Assistance Council (BIRAC), a public sector enterprise of DBT, Government of India

The Food and Agriculture Organization (FAO) is a specialized agency of the United Nations

Bioeconomy - Research & Innovation, European Commission

Press release of various organizations and Market Research agencies and Media Publications

CONTRIBUTORS

Association of Biotechnology Led Enterprises (ABLE) is a not-for-profit pan-India forum that represents the Indian Biotechnology Sector.

ABLE (www.ableindia.in, Twitter @able_indiabio) has over 400 members from all across India representing all verticals of the sector like Agribiotech, Bio-pharma, Industrial biotech, Bioinformatics, Investment banks and Venture Capital firms, leading Research and Academic Institutes and Law Firms and Equipment Suppliers.

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LINKS TO SOME REFERENCE WEBSITES SOURCE

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