Project Monitoring & Evaluation Group

CSIR-Central Mechanical Engineering Research Institute

Date: 06.11.2024

Sub: Reply to Parliament Queries asked through email from CSIR HQ dated 06.11.2024

Question:

S.No.	Question/s
04.	How advanced is CSIR technologies in the field of lithium-ion, hydrogen technologies and e-mobility compared to independent startups across country and the world?

Reply:

CMERI has indigenously designed and developed compact 100% Pure Electric Tractor named CSIR PRIMA ET11 mainly to cater small and marginal farmers of India. This tractor has the base power of 11 HP, which falls in the category of N1 tractor.

It has following features:

1) The electric tractor has been designed and manufactured with more than 90% indigenous components and technologies.

2) To cater the demand of agriculture field application, the electric tractor has been designed in such a way that its dynamics, weight distribution, transmission engagements, then lever and pedal position everything has been well considered.

3) The developed electric tractor technology is Women friendly. To achieve this, special attention in the ergonomics, replacement of mechanical levers with electronic switches, to name the few.

4) The farmers can charge the tractor using conventional home charging socket in 7 to 8 hours and operate the tractor for more than 4 hours in the field. Otherwise, tractor can run more than 6 hours in case of normal Haulage operation.

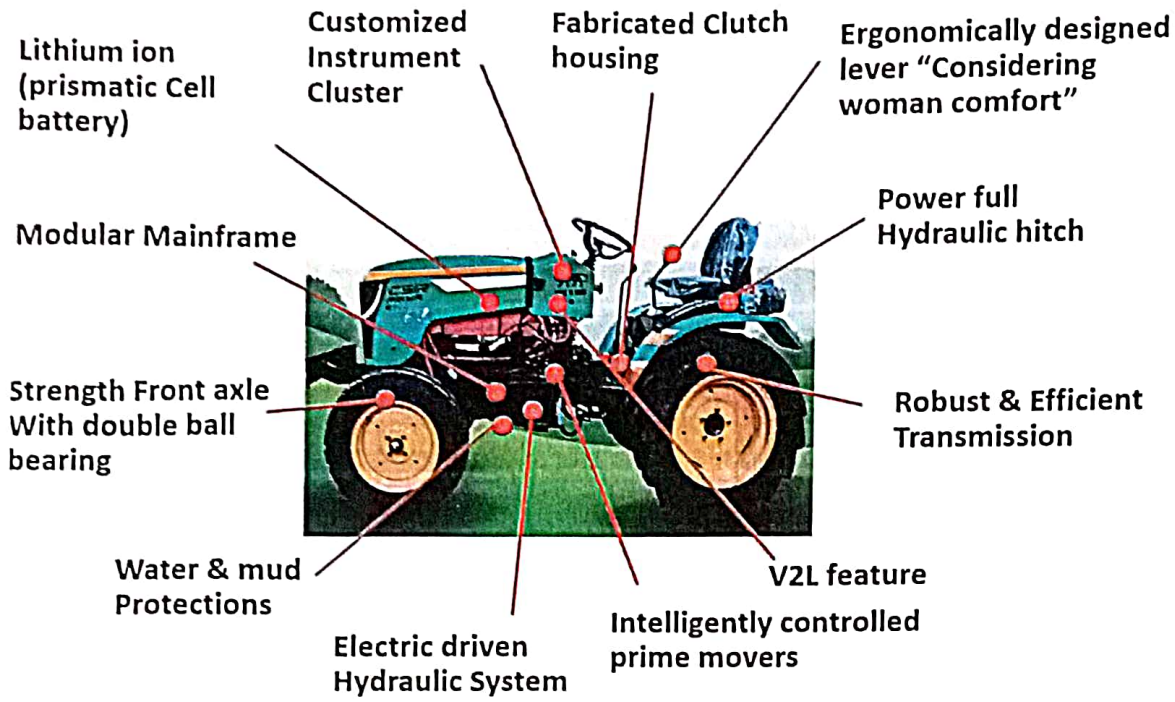
5) The electric tractor is being designed with the robust and efficient transmission system to achieve the desired efficiency.

6) The electric tractor is equipped with best in class hydraulic with lifting capacity of 500 kg. It implies that tractor can lift implements required not only for field operation but also for hauling operation. The electric tractor can also tow 1.6-ton capacity trolley with a speed up to 25 kmph.

7) The Electric tractor is built with Lithium ion battery with Prismatic cell configuration. It has deep discharging capability suitable for farming application and at the same time, having a life of more than 3000 cycles. Moreover, the controller and the instrument cluster has been modified to suit the agriculture needs.

8) The electric tractor is equipped with the V2L port, when the tractor is not in operation, its battery power can be utilized for other secondary applications like pumping, etc.

Salient Features



The technology has been licensed to two companies one Hyderabad based company named K N Biosciences Pvt. Ltd (a), famous for its Kushal Tractors and another is sunrise transmissions (b), Rajkot for its commercialization.

(a)


(b)

Director may kindly accord his approval for sending this reply to CSIR HQ.

Dr. Nilrudra Mandal
Sr. Pr. Scientist & Head PME

DIRECTOR

Project Monitoring & Evaluation Group

CSIR-Central Mechanical Engineering Research Institute

Date: 22.11.2024

Sub: Lok Sabha Unstarred Questions having Diary No. 1601 due for answer on 28.11.2021 regarding "Technology Adoption by MSMEs"

Question:

(a) The details regarding the step/initiatives undertaken by the government to increase/incentivize technology adoption by the MSME sector over the last five years across India, in Andhra Pradesh and in Bapatla Parliamentary Constituency (PC).

Ans: In order to help Micro and Small scale industries, the licensing cost is kept significantly lower than Medium and Large scale industries for a particular technology as per CSIR Technology Transfer guideline. If the industry is in the category of Cottage/Tiny industry or startup, the licensing fee could be made even lesser than cost of licensing for micro and small scale industries as per the guideline. The number of different MSMEs have taken license from CSIR-CMERI Durgapur across the country are mentioned below:

Sl.No.	Year	No. of MSMEs
1.	2020-21	25
2.	2021-22	23
3.	2022-23	06
4.	2023-24	06
5.	2024-25	02
	Total	62

(b) The details regarding the total member of male and female business owners in the MSME sector who have been given proper access to technology and training regarding the same in order to increase the growth of the businesses;

Ans: As per license agreement, it is a standard practice in CSIR-CMERI Durgapur to provide handholding support as well as training to all licensees without any gender biasness for a period of 01 years at no additional cost in order to setting up their business as well as to increase the growth there after. There is also provision for extending the support as desired by the licensees.

(c) The details regarding the funding allocated and utilized by the Government during the last five years to increase technology adoption in the MSME sector in a state-wise manner, in Andhra Pradesh and Bapatla PC, especially amongst rural sector of MSMEs; and

Ans: To upgrade the existing manufacturing setup and to create new market opportunities CSIR-CMERI has received fund from CSIR-HQ of an amount of Rs. 1.95 Crore for development of the following MSME clusters:

1. Shoranur Agricultural Cluster (SAICO), Kearala

2. Baruipur Surgical Cluster (BASIMAA), West Bengal

Similarly, Advanced Entrepreneurship and Skill Development programs are conducted in regular basis at CSIR-CMERI Durgapur with the support of Ministry of MSME.

1. FY 2023-24

Sl. No.	Course title	No. of participants
01	Promoting Gender Diversity in Agriculture through Equitable Design of Safe and Ergonomic Farm Machinery (at CSIR-CMERI, Durgapur	35
02	Application / Opportunity of AI/ML in Agriculture (To be held at CoEFM, Ludhiana)	20
03	Advanced CAD/CAE for Agri-machinery Design (at CoEFM, Ludhiana)	20
04	Precision Agriculture (CoEFM, Ludhiana)	20

1. FY 2024-25

Sl. No.	Course title	Status
01	Upgradation of Skill & Technique towards manufacturing at Shoranur Agricultural Implements Cluster (SAICO)	Sanctioned but not completed
02	Post harvest processing with Value chain Analysis of Agricultural crops at Mizoram	
03	Advanced CAD/CAE for Agri-machinery Design	

(d) Whether the Government has undertaken any promotional activities/campaigns to increase technology adoption by the MSME sector in the country, if so details thereof?

Ans: CSIR has launched the following programs to showcase the technological breakthrough and legacy of all CSIR labs as well as to promote their already existing licensee in the national level.

1. One Week One Lab (OWOL)
2. One Week One Theme (OWOT)
3. India International Science Festival (IISF)

The last One Week One Lab (OWOL) of CSIR-CMERI was inaugurated in CSIR-NPL, New Delhi in presence of Hon'ble Minister of Science & Technology and DG, CSIR where following technologies were licensed:

1. Electric Tractor: CSIR PRIMA ET11
2. Integrated Municipal Solid Waste Management Disposal System (IMSWDS)

The already existing licensees of the following technologies are promoted and felicitated in that platform:

1. Mob Control Vehicle
2. Vehicle Integrated Mechanized Drain Cleaning System

In the other theme based events, platforms for demonstration of newly developed technologies are made and provisions for showcasing the success stories of various licensees are also kept.

Director may kindly accord his approval for sending the reply to CSIR HQ.

22.11.2024

Head, PME

DIRECTOR

22/11/24.

Project Monitoring and Evaluation Group

CSIR-Central Mechanical Engineering Research Institute

Date: 16.03.2025

Sub: Reply to Rajya Sabha Provisionally Admitted Starred Parliament Question Diary No. S5658 due for answer on 27.03.2025 regarding "Mechanized Sewage Cleaning System Developed by CSIR"

1. Whether the Council of Scientific and Industrial Research (CSIR) has developed a mechanized sewage cleaning system; if yes, the details thereof, including the technology used and its operational mechanism;

Reply: Central Mechanial Engineering Research Institute at Durgapur under CSIR has developed mechanized sewer cleaning machine. The technology is vehicle mounted mechanized drain cleaning machine which is fully indigenous, integral and self-powered in nature, developed with a noble intention to eradicate the manual scavenging process and also to provide one-point solution for all sewer related problems like, sewer chocking, overflowing manholes, damaged sewer pipelines etc.

The machine is equipped with many cutting-edge technologies and innovative ideas that makes this machine to stand apart from the other similar equipment's available in the market that includes: innovative mechanical slurry water filtration system, re-using of filtered slurry water for jetting process, three way split type gearbox unit to utilize the engine power for the system's operation. An automated hose reel guiding and disinfectant facility, inbuilt feedback system and underwater camera based post drain cleaning inspection system etc. makes the machine most effective and user friendly in negotiating many drain cleaning related challenges with ease and comfort. All the above sub systems are mounted in the BS-VI chassis very compactly and its gets operated pneumatically to make the operations easy and safe.

Key features of the machines are:

- Utilization of Drain Slurry Water for Chockage cleaning. (Minimizing the usage of the freshwater)
- High-Pressure Jetting System & Inbuilt Disinfectant System
- Equipped with a Closed-loop operator feedback system
- Post-cleaning inspection camera system (self-propelled type)
- Indigenous and Cost-effective

2. Whether the developed system has been transferred to industries for large-scale production and deployment; if yes, the details thereof;

Reply: Yes, the technology of vehicle mounted mechanized drain cleaning machine has been transferred to the following industries for large-scale production and deployment.

- M/s KAM AVIDA ENVIRO ENGINEERS PVT.LTD., Plot No.2, Survey No.255/1, Hinjewadi, Tal: Mulshi, Dist.Pune-411057, Maharashtra
- MANIAR & CO., 110, NR Ajit Mill, Rakhial Road, Ahmedabad-380021, Gujarat

3. Whether the developed system has been used, implemented, or tested in any city or town in India; if yes, the details thereof;

Reply: The mechanized sewer cleaning technology was demonstrated to the following municipalities:

- Rajkot Municipal Corporation, Gujarat
- Municipal Corporation of Bangalore
- Coimbatore City Municipal Corporation
- Amdavad Municipal Corporation
- Jaipur Municipal Corporation
- Chandigarh Municipal Corporation

Additionally, on February 3, 2025, the CMERI team visited Chennai to meet with D. Karthikeyan, Principal Secretary of the Tamil Nadu Municipal Administration and Water Supply Department (MAWS). During the meeting, an in-depth discussion was held with MAWS's top management regarding the mechanized sewer cleaning system. The MAWS team highly appreciated the technology and showed a keen interest in incorporating it into their municipal operations. They also indicated their intent to include the system in their upcoming procurement plans. Furthermore, CMERI facilitated connections between its Technology Transfer (ToT) partners and MAWS to support the necessary follow-up actions.

4. Whether the Government is considering integrating this technology with sanitation programs such as the Swachh Bharat Mission or other similar initiatives; if yes, the details thereof.

Reply: The Government is considering the same and in this direction, the technology has been demonstrated to Swachh Bharat Mission Joint Secretary and Swachh Bharat Mission (SBM) Director, Ministry of Housing and Urban Affairs (MoHUA) provide a letter for the developed technology. MoHUA and SBM team provide the opportunity to show case the sewer cleaning and Sanitation technologies on their recent " High level 12th Regional 3R and Circular Economy Forum in Asia and the Pacific" conference, where major municipality and ULB'S Director/Commissioner attended the event and the technologies details was presented to them.

17.3.25 17.3.25

Director may kindly accord his approval for sending the same to CSIR HQ.

16/03/2025

Nilrudra Mandal
Sr. Pr. Scientist & Head PME

DIRECTOR 17/03/25

CSIR-CENTRAL MECHANICAL ENGINEERING RESEARCH INSITUTE

M G AVENUE, DURGAPUR-713209

Date:04.07.2025

Reply to [MOST URGENT AND PARLIAMENTRY MATTER]: INFORMATION REQUIRED TO DRAFT REPLY IN RELATION TO OBSERVATION MADE BY DRPSC: Reg.

CSIR Lab/ Unit Name: CSIR- CMERI, Durgapur

Total Sanctioned Strength of Scientists (excluding Director/ Head): 149

Total filled positions as on date: 109

Recent Joining of new scientists (From April 2024 – June 2025): NIL

Any Recent Advertisements from April 2024 – June 2025 which are ongoing and yet to be completed (along with details as advertisement number, advertisement date, total number of advertised posts and present status):

Advertisement of Scientists position has been issued vide advertisement no. 04/2025, dated 29.03.2025 (closing date of application: 21.04.2025) wherein total 9 nos. of posts at Scientist (Entry Level) has been advertised. The applications of the candidates have been successfully sought and the Screening of the same will be convened shortly.

Any planned upcoming advertisement (along with details as likely anticipated date of advertisement, total number of scientists' posts likely to be advertised and likely month/year of completion of hiring process):

Another advertisement of 9 nos. of posts at Scientist (Entry Level) is proposed and scheduled to be advertised shortly.

Director may kindly approve the above reply for forwarding to CSIR HQ.

4.7.2025.

Nilrudra Mandal
Sr. Pr. Scientist & Head PME

DIRECTOR 04/07/25

PROJECT MONITORING & EVALUATION UNIT

CSIR-Central Mechanical Engineering Research Institute, Durgapur

Date: 21.07.2024

Sub : **Lok Sabha Provisionally Admitted Starred Question Dy. No. 4793 for 29.7.2025 regarding Research and Development initiatives in Steel Manufacturing.**

Query: (a) The manner in which the Government is supporting research and development initiatives to drive innovation in high-grade steel manufacturing, including specialized steel for defense, infrastructure, and renewable energy applications;

Reply: CSIR-CMERI is not involved for manufacturing of any high grade steel.

Head, PME 21.7.2025

DIRECTOR 22/07/25

Project Monitoring and Evaluation Group

CSIR-Central Mechanical Engineering Research Institute

Date: 03.03.2025

Sub: Reply to Lok Sabha Provisionally Admitted Starred Parliament Question Diary No. S5555 regarding "Mechanized Sewage Cleaning System"

Mechanized Sewage Cleaning System

(a) whether it is true that Council of Scientific & Industrial Research (CSIR) has developed a mechanized sewage cleaning system;

CSIR CMERI developed vehicle mounted mechanized sewer cleaning machine. The technology is vehicle mounted mechanized drain cleaning machine which is fully indigenously developed, integral and self-powered in nature, developed with a noble intention to eradicate the manual scavenging process and also to provide one-point solution for all sewer related problems like, sewer chocking, overflowing manholes, damaged sewer pipelines etc.

(b) if so, the details thereof including its advantages;

I. Key features & Advantages of Mechanized Drain Cleaning Machine:

- Utilization of Drain Slurry Water for Chockage cleaning. (Minimising the usage of the freshwater)
- High-Pressure Jetting System & Inbuilt Disinfectant System
- Equipped with a Closed-loop operator feedback system
- Post-cleaning inspection camera system (self-propelled type)
- Indigenous and Cost-effective

The machine has been prosperously consummated more than 90 hours of rigorous in-house and outside on field testing process in and around Durgapur city to evaluate its felicitous functioning and efficacious execution of intended activities. Technology has been demonstrated at CSIR-NPL New Delhi during Oct-2021 in the august presence of honorable authorities from MoHUA, Jal Board & DG – CSIR.

III. System Inputs:

Waste processed: Sewer Sludge
Electricity: No
Fuel requirement: Diesel
Fuel consumption: around 3 L at speed of 30 km/h
Other consumable requirement: Polymeric Flocculent

IV. Outputs:

Energy: None
Water: Treated water used for Sewer Cleaning Machine.

V. Operational:

Size/footprint: Vehicle dimension (l*w) 6100x2250
Vehicle powered Sewer cleaning machine no separate energy required.

(c) whether the developed system been transferred to industry; and. Yes

The technology of vehicle mounted mechanized drain cleaning machine has already been transferred to:

- M/s KAM AVIDA ENVIRO ENGINEERS PVT.LTD., Plot No.2, Survey No.255/1, Hinjewadi, Tal: Mulshi, Dist.Pune-411057, Maharashtra
- MANIAR & CO., 110, NR Ajit Mill, Rakhial Road, Ahmedabad-380021, Gujarat

(d) if so, the details thereof and if not, the reasons therefore

Not Applicable.

Note: CSIR CMERI recently Developed another inline technology for Septic Management

Mechanized septic tank cleaning machine

CSIR-CMERI has recently developed a compact vehicle and integrated mechanized septic tank cleaning machine for faecal sludge management. By automating the cleaning and treatment process, this technology significantly reduces the risk of human exposure to sludge, improves cleaning efficiency, and minimizes environmental contamination. Additionally, the compact design of the system makes it suitable for navigate in narrow lanes.

Key features & Advantages of Mechanized Septic Tank Cleaning Machine:

- Mechanized cleaning of onsite sanitation system (septic tank)
- Onsite dewatering of septic tank faecal sludge and onsite wastewater treatment
- No electric power requirement to operate the machine
- Compact design of septic tank cleaning machine suitable to navigate in narrow lanes (>8 feet road).
- The septic tank cleaning machine has been designed and manufactured with around 80% indigenous components and technologies.
- Suitable for household septic tank used by up to 10 people
- Range of septic tank users: 5-10 people
- Household septic tank cleaning: Designed as a self-powered compact vehicle integrated septic tank cleaning machine to clean household septic tank unit

The process of Transfer of the Technology of Mechanized Septic Tank Cleaning Machine has been completed for 02 Licensee (Gujarat based Industries, M/s. Subham Corporation & M/s. Amvica Industries) and likely to be handed over on 4th March, 2025 at Jaipur in front of Ministry of Housing and Urban Affairs.

Director may kindly approve the same for submission to CSIR HQ

3/3/2025

Nilrudra Mandal
Sr. Pr. Sct & Head PME

Head, KTMG Dulip Samanta 03/3/25

DIRECTOR 03/03/25

Project Monitoring and Evaluation Group

CSIR-Central Mechanical Engineering Research Institute

Date: 03.03.2025

Sub: Reply to Rajya Sabha Provisionally Admitted Starred Parliament Question Diary No. S3013 due for answer on 13.03.2025 regarding "E- Tractor"

E Tractor

(a) whether it is a fact that CSIR has developed e-tractor;

CSIR-Central Mechanical Engineering Research Institute Durgapur has indigenously developed Electric Tractor, CSIR PRIMA ET-11 in 2023 with a motivation to overcome some major challenges like crude oil import substitution, environmental regulations and improvement of life of small and marginal farmers.

(b) if so, the details thereof and if not, the reasons therefor; and

I. Technical Details:

CSIR CMERI has developed a compact Electric Tractor (CSIR PRIMA ET11), a 100% Pure electric mainly to cater small and marginal farmers of India. This tractor has the base power of 11 HP, which falls in the category of N1 tractor.

Key Features:

- Robust and improvised electro-mechanical drivetrain.
- Modular design and better maintainability and serviceability
- Best-in-class hydraulic capacity
- Intelligently controlled prime movers
- Indigenous development of instrument cluster
- Vehicle health monitoring features
- Improvised drivetrain for smooth transition of gears
- Electric Vehicle to Load feature (V2L concept)
- Women-friendly design
- Indigenous and cost-effective

Specifications:

- Power: 26 hp peak, 11 hp continuous
- Transmission: 3 Forward and 2 speeds combination
- PTO: Standard PTO with 540 rpm
- Linkage: 3 Point-Category IN
- Lifting Capacity: 500 Kg
- Battery: 14.4 kW & prismatic type

II. Commercialization Details:

The technology has been transferred to two industries

a) KN Biosciences Pvt. Ltd, Hyderabad

b) Sunrise Transmission, Rajkot

III. Significant Achievement

At Kartavyapath, New Delhi, on January 26, 2024, the 75th Republic Day Parade featured a viksit Bharat theme, the electric tractor technology was on display in CSIR tableaux.

CSIR-CMERI has initiated a PAN India roadshow with the E Tractor developed by the lab to promote and spread awareness of sustainable agricultural technologies to farmers, the MSME sector, and other stakeholders.

(c) the details of other tractors developed by CSIR?

I. SWARAJ Tractor:

Since the post-independence era, when agriculture was critical to India's survival, CSIR-CMERI has been at the forefront of technological self-reliance. The development of India's first indigenous tractor in 1974 played a pivotal role in the Green Revolution, driving the widespread adoption of tractor technology. The technology was licensed to M/s. Punjab Tractors which was later acquired by M/s. Mahindra and Mahindra in 2007.

II. SONALIKA Tractor:

CSIR-CMERI designed and developed the know-how of 35 HP Tractor and transferred the technology to M/s International Tractors Limited, Hoshiarpur for commercialization in the year 2002 as Sonalika Tractor. The tractor is suitable for medium and large land holdings.

III. KRISHISHAKTI Tractor:

As a new leaf in the CSIR efforts to empower these Indian small farmers, KrishiShakti – a small range diesel engine tractor designed and developed by CSIR-Central Mechanical Engineering Research Institute, Durgapur in 2014. The technology knowhow was transferred to M/s. Singha Components Pvt. Ltd., Howrah who has finally received necessary certification from Central Farm Machinery Training and Testing Institute, Budni (Madhya Pradesh) and in the process of commercialization. This technology has also been transferred to M/s. K N Biosciences Pvt. Ltd, Hyderabad.

Director may kindly approve the same for submission to CSIR HQ.

3/3/2025

Nilrudra Mandal

Sr. Pr. Sct & Head PME

Head, KTMG 03/3/25

DIRECTOR 03/03/25

PROJECT MONITORING & EVALUATION UNIT

CSIR-Central Mechanical Engineering Research Institute, Durgapur

Date: 05.02.2025

Sub : Reply of Rajya Sabha Provisionally Admitted Unstarred Parliament Question Diary No. U1914 regarding "Indigenous Technology Development and Global Competitiveness"- reg.

a. The specific metrics used by the Ministry to assess the global competitiveness of indigenous technologies developed under the "Indigenous Technologies for Viksit Bharat" initiative launched in 2024;

Reply: CSIR-CMERI, Durgapur under Ministry of Science and Technology employs the following metrics to evaluate the global competitiveness of indigenous technologies developed under the initiative:

- **Technology Readiness Level (TRL):**

Technologies are assessed based on their TRL, with a focus on achieving higher levels to ensure market readiness. For example, the **Electric Tractor (CSIR-PRIMA ET11)** has achieved TRL 6, indicating near-commercialization readiness.

- **Performance Benchmarks:**

Indigenous technologies are compared against global standards in terms of efficiency, durability, and cost-effectiveness. For instance:

- The **Electric Tractor** offers clean energy solutions with competitive specifications (e.g., 11 HP rated power, 500 kg lift capacity) and aligns with global trends in sustainable agriculture.
- The **Autonomous Underwater Vehicle (AUV-500)** has demonstrated capabilities such as depth qualification (286 m) and endurance in rough sea conditions, comparable to international counterparts.

- **Cost Competitiveness:**

Technologies are designed to be cost-efficient while maintaining high performance. For example: The **Electric Tiller** provides a low maintenance and cost effective farming solution with features like solar charging and a swappable battery pack.

- **Environmental Impact:**

Technologies are evaluated for their contribution to sustainability and climate change mitigation. Examples include: The **Municipal Solid Waste Disposal System (MSWDS)**, which promotes decentralized waste management and reduces greenhouse gas emissions. The Electric Tiller, which provides a clean, green alternative to conventional tillers.

- **Market Penetration and Adoption:**

Metrics such as the number of technology transfers, licensing agreements, and adoption by industries or government bodies are tracked. For instance:

- The **Mechanized Sewer Cleaning Machine** has been successfully demonstrated and adopted by different municipalities.
- The **Post-Harvest Processing Technologies** for turmeric and ginger have been implemented in Mizoram and Arunachal Pradesh, benefiting thousands of farmers.

- **Intellectual Property (IP) Generation:**

The number of patents filed and granted is a key indicator of innovation. For example, six patents were filed for **post-harvest processing technologies.**

- **Socio-economic Impact:**

Metrics such as employment generation, income enhancement for beneficiaries, and societal benefits are considered. For example:

- The **MSWDS** has created downstream employment opportunities and improved the quality of life for ragpickers.
- **Post-harvest processing technologies** have significantly contributed to enhancing farmers' income by adding value to agricultural produce, reducing post-harvest losses, and improving market opportunities

b. The number of indigenous technologies that have been successfully commercialised in international markets since the initiative's inception;

Reply: Nil

c. The strategies implemented to overcome the challenges in scaling these technologies for global markets;

Reply:

- **Collaborations and Partnerships:**

Strategic collaborations with industries, MSMEs, and international organizations to enhance scalability and market reach. For example:

- The **RE-EMPOWERED Project** (EU-India collaboration) focuses on deploying high-TRL solutions for renewable energy systems in both Indian and European markets.
- Technology transfer agreements with companies like M/s KN Bio Sciences (**Electric Tractor**) for export promotion.

- **Standardization and Certification:**

Ensuring compliance with global standards and obtaining necessary certifications to facilitate international acceptance. For instance:

- **The Type-IV Hydrogen Storage Tank** is designed to meet international safety and performance standards.
- The **Mechanized Sewer Cleaning Machine** is approved by the Ministry of Housing and Urban Affairs and listed on the Government e-Marketplace (GeM).

- **Cost Optimization:**

Focus on reducing production costs through indigenous manufacturing and material optimization. For example: The **Electric Tiller** features in-house designed and fabricated components to ensure affordability.

- **Technology Customization:**

Adapting technologies to meet the specific needs of global markets. For instance: The **AUV-500 and ROV-500** were designed for diverse underwater applications, including seabed mapping and oceanographic data collection.

- **Skill Development and Capacity Building:**

Training programs to build a skilled workforce capable of supporting technology deployment and maintenance. For example: The Ministry has conducted skill development programs for MSMEs and farmers.

- **Sustainability and Green Technology Focus:**

Emphasizing environmentally friendly technologies to align with global sustainability goals. For example: The Electric Mobility Solutions (e.g., **Electric Tractor, Electric Tiller**) and **MSWDS** contribute to reducing carbon emissions and promoting a circular economy.

- **Export Promotion and Market Access:**

Leveraging government initiatives like "Make in India" and export promotion schemes to access global markets. For instance: The **Mechanized Sewer Cleaning Machine and Electric Tractor** are being positioned as export-ready products.

- **R&D and Continuous Innovation:**

Continuous research and development to improve technology performance and address market-specific challenges. For example:

- The development of advanced **traction drives and vehicle control units for electric vehicles.**
- The ongoing enhancement of **graphene ultra-capacitor modules** for energy storage applications.

d. The extent of collaboration with international research institutions to enhance the quality and applicability of indigenous technologies.

Reply: CSIR-CMERI has established significant collaborations with international research institutions to enhance the quality, scalability, and global applicability of indigenous technologies. These collaborations focus on leveraging global expertise, aligning with international standards, and addressing global challenges. Key examples include:

- **EU-India Collaboration: RE-EMPOWERED Project**

Objective: Development and deployment of high-TRL (Technology Readiness Level) solutions for renewable energy systems
Key Contributions:
Multi-energy vector-based micro grid systems integrating solar PV, wind, biomass, and biogas.
Deployment of sustainable energy solutions at four demonstration sites (two in India and two in the EU).
Benefiting approximately 1,100 households in Ghoramara Island, India, with solar energy and ancillary solutions (e.g., solar-powered electric boats, e-loaders, and smart meters).
Development of sustainable business models for renewable energy systems.

Significance:
This collaboration has enabled the development of globally competitive renewable energy technologies and their deployment in diverse environments.

- **FAIR Mega International Science Programme (Germany)**

Objective: Contribution to the Facility for Antiproton and Ion Research (FAIR) in Darmstadt, Germany, as part of India's in-kind contribution.

Key Contributions:

- Design of Beam Stoppers (BC1, BC2, BC3) for Super-FRS in FAIR project to absorb high-energy secondary beams and shield subsequent components from radiation.
- Successful completion of critical design reviews (CDR, FDR) carried out by FAIR.
- Ongoing manufacturing of components of BC3 (pre-series production) in India and subsequent FAT (in progress).

Significance:

This collaboration highlights India's growing influence in global high-energy physics research, demonstrating its ability to contribute advanced engineering solutions to mega-science projects. The successful design and manufacturing of beam stoppers highlight India's expertise in precision engineering, radiation shielding, and accelerator technology, reinforcing its position as a reliable partner in international scientific infrastructure development.

5/2/2025

Head, PME

Head, KTMS. 05/2/25

DIRECTOR

05/02/25.