

**GOVERNMENT OF INDIA  
SCIENCE AND TECHNOLOGY  
LOK SABHA**

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Research Projects of CSIR

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**Will the Minister of SCIENCE AND TECHNOLOGY be pleased to state:**

(a) whether the Council of Scientific and Industrial Research (CSIR) has taken up any research projects for new inventions in various fields for the benefit of the common people during the last three years and the current year; and

(b) if so, the details thereof particularly in Jharkhand?

**Answer**

MINISTER OF STATE FOR SCIENCE AND TECHNOLOGY AND EARTH SCIENCES

(SHRI Y.S. CHOWDARY)

(a) The Council of Scientific and Industrial Research (CSIR) has been providing the S&T knowledgebase needed for the benefit of the common people. The efforts are focused at bringing in desired S&T interventions for improving the quality of life, removing drudgery and augmenting income of the people.

CSIR has developed technologies for: food and food processing; water; healthcare; building and construction; water; environment and sanitation; rural roads; cultivation and processing economic plants; farm machinery; leather; pottery etc. The technologies developed have been gainfully utilized in several states and contributed for improving quality of life and economic growth of common people.

CSIR has developed a number of technologies on water, ranging from source finding to mapping of water resources, from quality assessment to enhancing potability of water and from recycling to waste water treatment. The technology for community scale RO desalination plants has been developed. The RO plants in various states (Rajasthan, Tamil Nadu, Delhi, West Bengal, Gujarat etc.) have been set up based on the technology. Further, technology for arsenic removal from water has been developed and based on the same common people have benefitted in the state of West Bengal. Also high flux hollow fibre membrane based technology for water disinfection and purification at affordable cost has been developed and is being used at commercial level.

CSIR has developed KrishiShakti, a small range (11.2 hp) diesel engine tractor for farmers with small land holdings for effective tilling. The technology of the same has been transferred and manufacturing has been initiated in West Bengal. The tractor was launched in Delhi on 20th November 2014 and five tractors were handed over to farmers.

CSIR has improved the performance of gur bhattis which are used in large number by the villagers in sugarcane crop areas. The improved gur bhattis have longer furnace life, consume less fuel (bagasse) and emit less exhaust smoke. CSIR has developed improved design kerosene multi wick stove (non-pressure type), which is popularly known as 'Nutan Large' stove. By use of the improved design stoves, about 25-30% fuel saving is achieved. CSIR has also developed a kerosene pressure stove (offset burner type) with 10-15% fuel saving. These stoves are used in households, small restaurants, roadside tea shops etc. They are popular among rural masses and are also used in urban and semi-urban areas.

A cost effective and efficient anti tarnishing lacquer has been developed for brasswares, helping the Moradabad brass cluster. The developed lacquer is very efficient to prevent tarnishing for long durations. Also, energy efficient brass melting furnace has been developed which is smoke-free coal furnace, handles more charge (brass melt), reduces gas emission and pollution by 80% and consumes 20% less coal. It is user friendly as artisans can adopt this furnace without changing their current practices and like the present furnace, this modified version can also be repaired by the artisans. The knowhow has been transferred for commercial use.

CSIR has developed an indigenous substitute of Ukraine clay in granito ceramic tiles which has reduced the Ukraine clay requirement from 20% to about 1%, reducing thus the foreign material import and associated costs. This has made major economic difference and benefitted small and medium scale enterprises in Gujarat.

A food processing unit has been set up at CSIR-Centre for High Altitude Biology (CSIR-CeHAB) in the remote tribal region of Lahaul and Spiti. A brining unit has been designed and prototype developed for the preservation of locally and abundantly produced peas and cauliflowers. The knowhow was showcased at the District level Tribal Fair at Keylong and training organized for the benefit of progressive farmers in the area of food and food processing: making novel products from Buckwheat; and also brining of the peas which is a major crop.

CSIR has worked with the Indian Council of Agricultural Research (ICAR) for the development of highly priced rice variety, Samba Mahsuri, resistant to the serious Bacterial Blight (BB) disease. This new variety called, improved Samba Mahsuri has been released for commercial cultivation and is being very much appreciated by farmers growing rice.

A novel variety of Ashwagandha with high root yield of 15 quintal/hectare has been developed and released to farmers which would help farmers with more

earnings. The Ashwagandha has useful applications in pharma applications as anti-inflammatory, anti-stroke and anti-arthritis drug adjuvant.

The people of North East India make a number of leather products but they were unable to reach the market and earn desired profit due to lack of aesthetic appeal and standardisation. There was a need to transform this knowledge into wealth by increasing the value of the products without losing its real essence. CSIR carried out a comprehensive survey in the north eastern region. Based on the inputs from the survey, new ranges of products were developed. The handbags are crafted and designed with the ethnic materials of the northeast and the inspirations are derived from Ornaments, Dresses & Artifacts adorned by tribal folks of the northeast India. The products were displayed in various national/ international fairs and have attracted many enquiries. This has benefited the women entrepreneurs of North Eastern region.

CSIR has set up post-harvest centres in Mizoram (Aizawl) and Arunachal Pradesh (Pashighat). These centres are focused at helping the local farmers in the region for value addition to their agricultural produce. The centres house technology for high efficiency drying and processing of ginger, cardamom, turmeric, chilies etc. The farmers are able to sell their produce at 20 – 25% higher price to the processing centres set up. The CSIR Post Harvest Technology Centres would generate direct employment to about 300 people.

CSIR has introduced and commercialized floriculture in Lahaul and Spiti region of Himachal Pradesh. The laboratory has played a catalytic role in the promotion of the commercial floriculture in Himachal Pradesh. Utilizing CSIR agro-technologies of Liliun, carnation, and gladiolus flowers in the region, the flower growers have realized good income through sale of loose and cut flowers at Delhi flower market. Over 3000 farmers are engaged in floriculture in Himachal Pradesh.

Knowhow for economically valuable cultivation for the seaweed *Kappaphys alvarezii* have been developed. This seaweed is being commercially cultivated by >800 SHGs in Tamil Nadu. Each member involved in seaweed cultivation is earning on an average ₹ 5000/- per month for a period of 8 months in a year. The seaweed also yields bioenergy products along with co-generation of bio-fertilizer.

CSIR has been adopting villages to promote employment generation and income augmentation. It has thus catalyzed commercial cultivation of Geranium in Uttaranchal and Lavender in Jammu & Kashmir through community participation. In these end to end missions, farmers have been trained not only for cultivation of Geranium and Lavender but also for extraction of oil, augmenting thus their income. Likewise CSIR efforts through development of niche Mentha varieties and their propagation for mass cultivation are noteworthy. The efforts have led to economic growth and have enabled India to acquire a world leadership position in Menthol mint oil production and export.

CSIR efforts for socio-economic development had led to: empowering people of the Kashmir Valley through creation of aromatic industry; development of bio-inoculants for enhancing plant productivity and its dissemination to the farmers in Uttar Pradesh in the partnership with the State Government on a very large scale and it has enhanced agriculture productivity; and development of mushroom technology, its transfer and training which has benefitted economically the rural women in North East States.

CSIR has been contributing in the area of healthcare. Some recently developed technologies/interventions benefitting the common people include: Streptokinase (a drug for cardiovascular disease); Risorine (a cost effective bioavailability enhanced anti-tuberculosis drug); Battery operated hand-held MicroPCR (towards affordable and point of care disease diagnostics for Tuberculosis, Malaria, Dengue, Chikungunya, Hepatitis B and H1N1); nonClonableID technology for medical product authentication; Diagnostic system for affordable, point of need testing to manage HIV and TB; Novel molecular diagnostics for eye diseases; and eHealth Center (eHC, a platform for the fourth paradigm of science, data-intensive discovery, while bringing affordable healthcare services to the doorstep of people).

CSIR has played a major role in protecting the traditional knowledge by creating a Traditional Knowledge Digital Library (TKDL). The TKDL contains information in 5 international languages, i.e. English, Japanese, Spanish, French and German concerning 2.93 lakh medicinal formulations in Ayurveda, Unani and Siddha. Through the TKDL access agreement concluded with European Patent Office (EPO, 34 Member States), US Patent & Trade Mark Office (USPTO), Canadian Intellectual Property Office (CIPO), IP Australia, Japan Patent Office (JPO), United Kingdom Patent and Trademark Office (UKPTO) and German Patent Office (GPO) examiners of these offices can utilize TKDL for search and examination of Intellectual Property applications filed but cannot make any third party disclosure. TKDL is recognized globally as a model for protection of traditional knowledge.

CSIR laboratories are further strengthening aromatic industry in Kashmir Valley through currently working towards field level demonstration and propagation of region specific superior genotypes of CSIR's medicinal & Aromatic plants in Jammu & Kashmir region. Efforts are being made to train farmers on cultivation and value addition of medicinal and aromatic plants like Lavender, Rose, Lemongrass, Tegetes, Mint, and Phalsa. Awareness camps for farmers of the area besides demonstrations of Mobile Distillation

Unit for extraction of essential oils are conducted. Already more than seventy farmers in 14 villages of Kathua district (J&K) have been distributed slips of lemongrass, Java citronella and vetiver for cultivation in 17.47 hectares area under a project.

The R&D project activities undertaken by CSIR laboratories for welfare of the rural areas across the country, during past few years are provided at Annexure-1.

(b) The knowledgebase developed by the constituent CSIR laboratories across the country are utilizable by Jharkhand state as well. In addition, the CSIR-CIMFR (CSIR-Central Institute of Mining & Fuel Research) in Jharkhand is pursuing R&D towards achieving scientific and technological excellence in the area of Mining & Fuel Research, similarly CSIR-NML (CSIR-National Metallurgical Laboratory), Jamshedpur is pursuing R&D towards achieving scientific and technological excellence in the area of Minerals, Metals

and Materials. Both the labs have taken into account the region-specific requirements as well.

#### CSIR lab Focus of R&D

CSIR-CIMFR (CSIR-Central Institute of Mining & Fuel Research), Dhanbad

- Underground mining technologies for safe and economic extraction of thick and/or steep seams, Coastal Placer Mining;

- Mines safety monitoring;

- Detection and mapping of old and unapproachable workings and stabilization of unstable areas; and

- Disaster Management

CSIR-NML (CSIR-National Metallurgical Laboratory), Jamshedpur

- Mineral Processing

- Extractive Metallurgy

- Iron and Steel, ferroalloys

- Nonferrous metal extraction

- Advanced material processing/ post – processing

- Materials characterization, synthesis and modelling

- Non-destructive testing and evaluation

- Corrosion of metals and alloys

- Green Metallurgical technologies

- Waste utilization and metal recycling

The projects carried out in recent past and some on-going projects of the 12th Five Year Plan are as follows:

#### S. No. Project Title Brief Information

Projects carried out in recent past

1. Utilization of natural minerals for providing safe drinking water Database created on the possible usage of a wide range of naturally occurring minerals having potential as water purifiers and launched as an open access web portal ([www.safewater.in](http://www.safewater.in))

Portal contains valuable knowledgebase for negotiating various water quality issues

Portal has two dedicated pages on arsenic and fluoride posted in Hindi, Oriya, Telugu and other regional languages

#### Ongoing 12th Five Year Plan Projects

1. CSIR-Central Institute of Mining & Fuel Research, Dhanbad

- Clean Coal Technology

- Development of a technology for optimal extraction of locked-up coal from underground mines using artificial pillars

- Development of underground coal gasification technology in India

- Development of suitable design methodology for extraction of coal at greater depths (>300 m) for Indian geomining conditions

2. CSIR-National Metallurgical Laboratory, Jamshedpur

- Development of Zero Waste Technology for Processing and Utilization of Thermal Coal

- Development of Magnesium Metal Production Technology

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#### Annexure-1

Some of key projects carried out by CSIR at different villages/ locations in recent years, at a glance are as follows:

#### S. No. CSIR project activities Work Area and villages

1. Sisal-potentials for Rural Development and General Balaghat, Chindwara, Seoni, Sehore, Hoshangabad region in Madhya Pradesh State. Sisal Resources Centers established at 12 villages of these districts for generating additional income to farmers

2. Dissemination and showcasing of CSIR rural Technologies Various locations in the country

3. Dissemination, Training and Demonstration of appropriate rural housing technologies Different locations spread all over the country including North-East and Himalayan Hills at following:

- Muzaffarpur, Bihar

- Shillong, Meghalaya

- Shimla, Himachal Pradesh

- Dehradun, Uttarakhand

- New Delhi

- Bhopal

- Ashok Sansthan, Ghazipur, UP

â€¢ Chamoli, Uttrakhand

â€¢ Midnapur WB

â€¢ NEIST, Jorhat

4. Establishment of a Rural centre to carry out epidemiological study of various hereditary disorders and to create facility for their Genetic analysis Benefitting villages around Jaunpur namely Kalwari, Premrajpur, Ramnagar, Rithi, Bhabhauri, Tikri, Deopur, Purabaghela, Sherawa, and Dudhowli

5. Development of Electrochemical technologies for drinking water upgradation in Northeast region North east region

6. Strategic Rural Income enhancements by Medicinal & Industrial plants based technologies AP: Hyderabad, Anantpur and Kurnul districts.

Karnataka: Bhatkal Taluk of Karnataka, villages Ujjinagere, Hulihonda, Arasinagere and Tattihalli and Bangalore

Uttarakhand: Purara, Pantnagar

Uttar Pradesh: Sitapur, Barabanki and Lucknow districts

Gujrat: Gandhinagar

North east: Jorhat

Bihar and Chhattisgarh

7. Development and demonstration of technology for better recovery and utilization of fallen animal carcasses Gujrat: Kanjari, Tranja, Bardoli, Nadiad

Rajasthan:: Pipad City, Mathaniya and Balwa (Jodhpur District)

Odisha: Jeypore

Punjab: Alawal, Gurdaspur , Dhakoli

8. Development of appropriate technology/techniques and demonstrations for improving rural tanning Gujarat, Bhinmal & Sanchor, Dist-Jhalore in Rajasthan, Kolhapur in Maharashtra, Sobhapur in U.P. and Leh in Jammu & Kashmir.

9. Development/ Demonstration of technologies for strengthening rural leather footwear sector Kolhapur region in Maharashtra

10. Development of novel leather products based on ethnic designs Manipur and Assam region.

11. Development of Post-Harvest Processing Technology for Ginger, Turmeric, Chilli and its implementation for augmenting Regional economy of Mizoram Aizawl District Block Tlangnuam (within city area), Rural Blocks ( Thingsulthiah, Aibawk, Phullen, Darlawn)

12. Development of post-harvest processing technology and to enhance the farmer"s economy of Arunachal Pradesh Upper Siang District (Arunachal Pradesh) Blocks: Jengging, Yingkiong, Maryang, Tuting

13. Specific polymeric ion exchanger based water purification domestic units for arsenic and fluoride removal Villages of 24 North Parganas and Sangrampur Sibati Gram Panchayat West Bengal

14. Development of cottage industries for gypsum based products Haripar, Venasar, Bhavpar and Bagasara villages of Maliya Taluka in Rajkot District, Gujarat

Humma region, Ganjam District of Odisha, Tiruchirapalli in Tamil Nadu

15. Improving the quality and yield of salt produced by the marginal salt producers across the country Haripar, Venasar, Bhavpar, Varshamedi and Bagasara villages of Maliya Taluka in Rajkot District, Gujarat. The up graded salt technology implemented in 170 marginal salt works in the region.

Kharaghoda, Degam, Kuda, Nimak Nagar, Kidi, Jogad, Mangadh, Ranmalpur, Sultanpur villages in Little Rann of Kutch (Gujarat) – 300 marginal salt works covered under training and 150 salt works covered under direct supervision.

Bherai, Port Victor & Kathivadar para of Rajula Taluka in Amareli District of Gujarat - adopted 30 marginal salt works in the above regions. One model salt farm established at Port Victor region.

Nawa, Phalodi, Kuchaman & Pachabhadra in Rajasthan - the good quality salt technology demonstrated at Nawa in Rajasthan is being extended to Phalodi, Kuchaman and Pachbhadra regions of Rajasthan. 30 salt producers given modified design and layout of solar salt works. 29 salt manufacturers implemented the latest salt manufacturing practices in Phalodi and Nawa of Rajasthan.

The high purity solar salt production with improvement in yield demonstrated at Humma in Ganjam district by establishing a model salt farm and training program / exposure visit for the salt producers of Ganjam, Surla-Sumandi, Bolong in Odisha and Contai in West Bengal.

Sahupuram village of Tuticorin District in Tamil Nadu - the good quality salt technology was demonstrated and the technical personnel were trained to adopt the latest salt manufacturing practices. Markanam village in Tamil Nadu – One of the salt works adopted as model and a model salt farm as per the latest design & layout.

16. Farming of seaweeds and their value addition as an alternative livelihood for coastal fisher folk 1. Pullivasal and Hare island -- Tuticorin Block & District , Tamilnadu – 0.8 ha

2. Kulasekaranpattinam – Tiruchendur Block (Tuticorin, District), Tamilnadu – 0.25

3. T.Nagar – Mandapam Block (Ramanathapuram, District), Tamilnadu – 10.0 ha.

4. Akkalmadam, Mandapam Block (Ramanathapuram, District), Tamilnadu - 3.0 ha.

5. Pamban - Mandapam Block (Ramanathapuram, District), Tamilnadu - 0.7 ha.

6. Ariyankundu – Rameswaram Block (Ramanathapuram, District), Tamilnadu - 3.5 ha.

7. Hamsaladivi Block (Krishna District), AP – 1.0 acre

8. Gujarat Maritime Board Port Area, Okha Block (Jamnagar District), Gujarat – 1.0 acre

9. Mandvi Block (Kutch District), Gujarat – 1 acre

17. Tea farm mechanization Bir, Baijnath, Palampur and Dharamshala area of Himachal Pradesh (HP)

18. Tea advisory services for production of quality tea Kangra and Mandi Districts of Himachal Pradesh

19. Design and development of mobile essential oil extraction units Kangra, Mandi and Chamba District of Himachal Pradesh

20. Training on virus-tested planting material production technology of apple, plum and cherry Kashmir: Shopian, Baramulla, Ganderbal and Sopore,

Himachal Pradesh: Solan, Ghurmawin, (Bilaspur), Mehatpur (Una), Gopalpur (Kangra)

21. Demonstration of Curcuma and hedychium cultivation in agro-forestry system Dalhousie, Kihar (Churah) and Bharmour forest divisions in district Chamba, and Uhl Range of forest in district Kangra of Himachal Pradesh. Total area covered 6.2 ha.

22. Utilization of locally available plant raw material for fetching high price Kangra and Mandi District of Himachal Pradesh

23. Promotion and utilization of bamboos Quality bamboo plants supplied to Arunachal, Assam, Delhi, Haryana, Himachal Pradesh, J&K (Introduced at Srinagar, Rajauri and Jammu for the first time), Mizoram, Nagaland, Sikkim, Uttarakhand and West Bengal

24. Promoting large scale cultivation of medicinal, aromatic and other high valued crops Kangra, Chamba, Mandi of HP and Gurdaspur of Punjab

25. Transfer of cut flower and virus tested planting material production technologies Himachal Pradesh, Jammu & Kashmir, Punjab and Uttarakhand

26. Implementation of new technology and training program for rural development in sericulture at North East states of India (Assam and Manipur) Jorhat, (Assam), Imphal (Manipur)

27. Samadhan Kendra: A rural Information technology centre for benefit of rural population in West and East Godavari districts of Andhra Pradesh Four Samadhan Kendra established in Godavari district of Andhra Pradesh. Each Kendra catered to 20 surrounding villages.

Nallajerla Samadhan Kendra villages: 1. Nallajerla, 2. Pullalapadu, 3. Jaganadhapuram, 4. Achannapalem, 5. Kouluru, 6. Pothavam, 7. Chipirigudum, 8. Pandireddi Gudem, 9. Marlamudi, 10. Dubacherla, 11. Ananthapalli, 12. Avupadu., 13. Singharajupalem 14. Prakashrao Palem 15. Gantari Gudem 16. Gopalapuram 17. Thimmanapalem 18. Nabipeta 19. Kothaguedm 20. Krishnamma Gudem

Prattipadu Samadhan Kendra villages: 1. Kunchenapalli 2. Arugolanu 3. Kotturu 4. Jagannadhapuram 5. Madhavaram 6. Dandagarra 7. Linga Reddy Gudem 8. Amruthapuram 9. Upparagudem 10. Apparao Peta 11. Kommu Gudem 12. Neeladripuram 13. Krishapuram 14. Khadiyadda 15. Chinna Tadeipalli 16. Pedda Tadeipalli 17. Ramanna Gudem 18. Venkataramana Gudem 19. Kadakatla 20. Yagarlapalli.

Pydiparru Samadhan Kendra villages: 1. Paidipuram 2. Mandapaka 3. Velpur 4. Venkatarayapuram 5. Tetali 6. Vadduru 7. Suryaraopalem 8. Godicherla 9. Duva 10. Muddapuram 11. Palangi 12. Undrajvaram 13. Mortha 14. Dammenu 15. Nadipalli 16. Kanuru 17. Valivenu 18. Kaldhari 19. Satyawada 20. Ajjaram

Balusumudi Samadhan Kendra villages: 1. Bhimavaram Rural 2. Prakash Nagar 3. Deghapuram 4. Dirsumarru 5. Yanamaduru 6. Gorlamoodi 7. Anakoderu 8. kovvada 9. Elitooru 10. Annavarm 11. Thummagoppu 12. Eelampudi 13. Balusumoodi 14. Rayalam 15. Vempadu 16. Kopalla 17. Yendagandi 18. Mytu 19. China Amiram 20. Gollalakoderu

28. Rural development program including (i) Cultivation of medicinal plants & aromatic plants, (ii) Bio-pesticides & bio-fertilizers and (iii) Mosquito eradication program Jammu region, Kashmir region & Ladakh region (J&K)

29. Development & Popularization of cost effective & efficient Technologies for Sustainable Rural Development Govt. of Orissa, Govt. of Assam, Meghalaya, Chhattisgarh, Karnataka etc. installed 1,000 LPD Terafil water purification plants in large numbers. Also in Sikkim, Assam, Meghalaya, Arunachal Pradesh, Jharkhand, Chhattisgarh, West Bengal

30. Environmentally safe Natural dyes for rural handloom sectors Maharashtra region

31. Rural development programs: (i) Sustainable development and utilization of solid wastelands, adopting green technologies using schools as knowledge dissemination centres (ii) Dissemination of dry flower/ cut flower technologies and (iii) Remediation of waste lands Lucknow, Sultanpur and other nearby districts, having vast sodic wastelands

32. Control of Indoor Air Pollution in Rural Areas 15 villages from Nagpur districts

33. Production and recovery of bio-flavours from damaged cull fruits and biomass Assam and Tripura

34. Rural development through aromatic plants and mushroom and their processing in North East India i. Chumukdema, Tanphye, Nagaland

ii. Silghat, Nagoan, Assam

iii. Papumpare, Kurungkume, Sonjuli- Arunachal Pradesh

iv. Chukitong, Wokha, Nagaland

v. Kalugagon, Sibsagar, Assam

vi. Khairabari, BTC, Assam

vii. Gandhigram, Tripura

viii. Majuli, Sibsagar, Assam

ix. Senapati, Manipur

x. Borum village, Arunachal Pradesh

xi. Langhing, Karbi Anglong, Assam

xii. Nonoi, Nagoan, Assam

xiii. Belonia, Tripura

xiv. Sangrat village, Churachandpur, Manipur

xv. Nungba, Tamenglong, Manipur

xvi. 6 district of Assam- Sibsagar, Lakhimpur, Dibrugarh, Kamrup, Darrang, Tinsukia

35. Earthquake studies in North East India with special emphasis on understanding the seismicity along Kopili lineament North East India Region

36. Development of a reverse flow natural convection driers and cottage scale processing for rural development Villages in many parts of Kerala; Total area covered is the region consisting of Kerala, Karnataka, Andhra Pradesh, Tamil Nadu and Lakshadweep

37. Use of natural occurring minerals for providing safe drinking water at domestic level in state of Jharkhand Minerals are available in the state of Jharkhand; however, knowledge generated will also be applicable to similar minerals obtained in other parts of the country or world.

38. Development of self-sustaining technology enabled villages through MAPs based technological interventions Uttarakhand, Tamil Nadu, Bihar, Sikkim, West Bengal and Chhattisgarh:

A biovillage established near Bakshi ka Talab. One new Self Help Group (SHG) established at Dewaralkalan comprising 14 women members. Chandankund and Pawaiyabad already functioning comprising about 40 women members.

Hill tribal areas of Visakhapatnam and East Godavari districts of Andhra Pradesh, four clusters consisting of seventy one tribal farmers (71) formed and the associations registered as self help groups (SHG'S). Trainings provided for making agarbattis (Incense sticks) and Gulab jal (Rose water).

Training cum awareness programmes organized and more than 350 persons trained in Andhra Pradesh and Tamil Nadu. Database of the interested farmers is being prepared and efforts are being made to initiate SMS based e-agro advisory in these regions. Publications of popular magazines, farm bulletins, pamphlets, CDs, cultivation manuals etc. in Hindi and regional languages brought out.

Efforts made to establish nursery of high yielding medicinal and aromatic plants in states like Tamil Nadu and Kerala. Two point of presence (POPs) established, one at Gandhigram (Dindigul, Tamil Nadu) and another at CSIR-NIIST, Trivandrum where a nursery of 28 Medicinal and Aromatic Plants is being developed. These POPs can serve as nodes of supply of authentic planting material of high yielding varieties to farmers. The main objectives of the project were to enhance farm incomes, generating at farm rural employment and products for cottage industry involving women and unemployed youth and reaching the unreached. Apart from economic gains, the project may help in knowledge empowerment of the rural youth and women by dissemination of knowledge through personal interaction, published literature and regular magazines, audio visual media, knowledge kiosk, mobile vans and skill upgradation through training programs.

Further, the other R&D project activities undertaken by 22 CSIR laboratories for welfare of the rural areas across the country, during recently completed financial year 2015-16 are as follows:

1. Scientific and technological interventions at Tumda Kheda village, Barkheda Setu Panchayat and surrounding villiages of Raisen district, Madhya Pradesh for improving rural livelihood
2. Documentation and S&T Intervention in the traditional architecture of rural areas of the Western Himalayan region: To provide S&T solutions for design and construction of hill houses maintaining traditional architecture duly strengthened using the innovative technologies, and to reduce the use of the more demanding building materials; Transformation of knowledge on appropriate housing technology to the rural masses for the construction safe houses and establishment of Technical Museum in CSIR-CBRI to showcase housing technologies developed by the institute since its inception and its utilization in the country.
3. Increasing incomes of rice farmers by popularization of improved Samba Mahsuri, a bacterial blight resistant rice cultivar, and Popularization of Apple cultivation in Eastern ghats and Gondwana regions Telagana, Andhra Pradesh and Odisha
4. (i) Installation of a 500 LPD reverse osmosis plant for purifying drinking water to the rural backward village Muthuvayal, Ramanathapuram District, (ii) Replacement of cyanide copper electrolytes with economically viable, environment friendly cyanide free electrolytes for finishing of brass, silver and gold, (iii) Installation of a gold and nickel plating unit and common facilities center at Ariyakkudi for plating on copper and brassware components at Ariyakkudi, (iv) Organization of science quiz and elocution competition at various village schools and to set up a mobile science van for doing 10+2 chemistry/physics experiments at remote village schools in Sivagangai district, and (v) Provision of sustainable environmental technology for domestic and textile water quality management:
5. Technology development in the area of food processing and enabling hygienic and safe food for rural folks
6. (i) Field demonstration and permanent installation of Ceramic Membrane based contactor for enhanced Arsenic and iron oxidation at a conventional Arsenic and iron Removal plant, Ichtampur, North 24 PGS, West Bengal, (ii) Demonstration and handing over an 80,000 LPD capacity ceramic membrane based turbid and saline river water purification system and coupling with a 30,000 LPD capacity Reverse Osmosis unit, (iii) Demonstration of high capacity membrane modules (8m<sup>3</sup>/hr) for arsenic and iron removal at Ramchandrapur village district Malda, Wesst Bengal, (iv) Technological intervention of terracotta sector in Bankura/ South 24 parganas district of West Bengal, (v) Water quality monitoring and assessment on river ganga near dimaond harbour sewage water treatment plant, (vi) Quality checking of drinking water in rural areas to detect the presence of endocrine disrupters
7. Development and deployment of improved agro-and processing technologies of economically important medicinal and aromatic crops for income enhancement and employment generation
8. Providing solutions through sceince and technologies for problems of rural sector (Improving livelihood of People below the poverty line by Augmenting income and quality of lives in Cuddalore district of Tamil Nadu)
9. (i) Ensuring sustainable livelihood for womenfolk in Mizoram, (ii) Rural Life Quality Improvement through Installation of Iron Removl Plants in Bankura District of West Bengal
10. Indigenouse RO membrane technology deployment, modifications if any with maintenance and repairing of plants in rural development sector/ societal mission for producing safe drinking water
11. Rural development in the Western Himalayan region and Adjoining Plains through transfer of CSIR-IHBT technologies
12. (i) Identification of novel molecules from medicinal plants from North East and awareness programs for the control of Malaria, (ii) Establishment and propagation of Samadhan Kendra at Jakaram (Warangal) Telangana & Jagannadhapuram, Kommugudem (West Godavari), Andhra Pradesh, (iii) Sustainable Tassar culture development and Improvement of socio-economic conditions of tribal tasar farmers in Telangana and Andhra Pradesh, (iv) Popularization of Pheromone Application Technology (PAT): An Upcoming Versatile Agro Practice for Pest Management, (v) Erection and commissioning of Water treatment plants
13. Development of aroma products/value addition of aromatic oils
14. R&D Activities focused at Rural Development uder CSIR 800 programme: (i) Development of energy efficient biomass Chullha and its wide dissemination in rural areas, (ii) Development of stove for efficient combustion of pine needle coke and its popularization in rural areas of Uttarakhand, (iii) Development of Baggasse drying unit for Gur making plants using waste heat recovery technique, (iv) Development of improved Gur bhatti for energy efficiency and baggasse saving
15. Development, demonstration and dissemination of CSIR technologies under CSIR-800 to bring improvement in the socio-

economic condition of rural people in the state of Odisha.

16. CSIR-NBRI initiatives for rural development through green technologies including bio-inoculants promotion program for enhancing performance of crops using the most potential salt and temperature tolerant strains of *Trichoderma* spp., *Bacillus* spp. And *Pseudomonas* spp., popularization of improved model Bareja for betelvine production, dehydrated floral and foliage crafts techniques for women empowerment and skill development programs in horticulture (Gardeners training, vertical gardening, nursery establishment and Bonsai making)

17. Fabrication and deployment of CSIR-NCL's oxygen enrichment units (OEU) and UF-membrane based water purification units for Indian rural/ tribal community

18. (i) Indoor Air Pollution Control in Rural areas, (ii) Clean water and sanitation in rural areas, (iii) Scientific Management of plant and algal biomass in rural areas

19. Rural Entrepreneurship and skill development through demonstration and training of appropriate technologies of CSIR-NEIST

20. Identification and exploration of groundwater resources in problematic terrains and drought affected regions for meeting the drinking water needs of rural communities

21. (i) Deployment of bio-extraction plants for production of fibers from pineapple leaf, banana and coconut husks., (ii) Natural fiber reinforced composites , (iii) Systems to treat food wastes and bio wastes at source, (iv) Bio wastes treatment system at higher scale producers , (v) Bio-drying technology for MSW (municipal solid wastes) Treatment technology useful for small towns and communities, (vi) Emission control system for small slaughterhouse wastes rendering plants, and (vii) Development of Green Enterprises with income and employment generation capabilities for low income groups in the region of Kerala and the neighboring states.

22. Construction technology for Precast concrete ferrocement toilet core unit.