

ANNUAL REPORT 2015-2016



PUNJAB STATE COUNCIL FOR SCIENCE & TECHNOLOGY

MGSIPAP Complex, Near Sacred Heart School, Sector 26, Chandigarh-160019

Telephones: 0172-2793300, 2793600, 2792325, Fax: 0172-2793143

Website: www.pscst.gov.in

Executive Summary

The Summary of activities taken up by PSCST during 2015-16 under various headings is as under:

SUSTAINABLE DEVELOPMENT

Climate Change

The Ministry of Environment, Forests & Climate Change sanctioned Rs.10.00 lacs for Capacity Building activities related to Climate Change under SAPCC. In addition DST, Govt. of India sanctioned Rs. 2.5 crore for strengthening climate change related programmes by setting up Punjab State Climate Change Knowledge Center (PSCCKC) in PSCST. For effective implementation of SAPCC, Council took various initiatives as under:

I) Formulation of projects under SAPCC for submission to MOEF&CC, GOI for seeking financial support from national and international funds

PSCST took initiative to develop project proposals with involvement of concerned agencies. Following projects have been submitted to MOEF&CC, GOI:

- i. Project proposal "*Towards Climate Resilient Livestock Production System in Punjab*" was prepared with the technical support of GIZ. MoEF&CC, Gol approved the project and sanctioned an amount of Rs.17.39 crores under NAFCC. The project will be implemented through Guru Angad Dev Veterinary and Animal Science University (GADVASU), Punjab Agricultural University (PAU), Deptt. of Animal Husbandry, Dairy Development, Punjab Energy Development Agency (PEDA) and Punjab State Council for Science & Technology (PSCST).
- ii. A project titled '*Technological adaptation for gainful utilization of paddy straw as fuel to replace fossil fuels*' was prepared for accessing funds under Climate Change Action Plan (CCAP). MOEF&CC, GOI has approved the project for an amount of Rs. 3.54 crores (Rs. 2.55 crores from Gol and Rs. 0.99 crore to be contributed by Industry) for a duration of two years and will be implemented by PSCST in collaboration with industries and brick kiln operators which will help in utilizing this biomass/agro-waste at local level and will reduce industry's dependency on fossil fuel besides preventing air pollution due to open burning of paddy straw. The successful adaption of use of paddy straw as fuel would lead to consumption of around two million tons of paddy straw from 3 lac hectares of agricultural land annually.

II) Capacity Building and Awareness activities on Climate Change

In 2015-16, eight workshops/meetings/conferences/ trainings were organized for various stake holders.

Conservation and Management of Wetlands in Punjab

The Council is coordinating “National Wetland Conservation Program (NWCP)” sponsored of MOEF&CC, GOI in the State. Under the scheme, conservation activities for three Ramsar sites (Harike, Kanjli and Ropar Wetlands) and one National wetland (Nangal Wetland) are undertaken through various executing departments which include afforestation of native tree species for habitat improvement, soil conservation to prevent siltation, conservation of wildlife and fisheries, weed control, water quality monitoring and public awareness, etc.

Conservation and management measures on the above wetlands could not be initiated in 2015-16 as the funds were released on 31.3.2016. Outreach activities in these wetlands were carried out. GIS mapping of Dholbaha and Hussainiwala wetlands were taken up through Punjab Remote Sensing Centre.

ENERGY AUDIT AND S&T INTERVENTIONS IN INDUSTRY

1. Project on “Utilization of Paddy Straw”

Punjab is an agricultural state producing about 17-18 million tons of paddy straw annually. The burning of paddy straw is one of the major environmental issue/ concern for the State. Punjab Government has formulated a draft policy for Management and Utilization of paddy straw. Council has carried out the following R&D projects pertaining to the use of paddy straw:

a) PPCB Project ‘Utilization of paddy straw briquettes as fuel in brick kilns’

Punjab Pollution Control Board (PPCB) sanctioned a project in January 2014 for carrying out R&D on use of paddy straw/paddy straw biomass mix as fuel in brick kilns. The study was initiated in January 2014 with 3 pilot trials and it was established that upto 50% biomass/ coal being used as fuel in brick kilns can be safely replaced with briquettes (containing paddy straw and other biomass in 50:50 ratio). Full scale trials have also been conducted in two kilns. The fuel cost works out be Rs.1 per 1000 kcal as compared to conventional coal firing which is around Rs 1.30 per 1000 kcal.

b) NABARD Project ‘Improvement in design & performance of paddy straw chopping machines’

Under a NABARD sanctioned project, R&D has been carried out on Improvement in Design and Performance of Paddy Straw Chopping Machines so as to make paddy straw fuel competitive in comparison to existing fuels being used in such applications. Council organized a Stakeholders’ Consultative Meet of experts and further, the improved machine (*1TPH output*) was developed by M/s. Indo British Knives and Machinery, Yamuna Nagar. The output of new machine was 1 TPH in comparison to 0.6 TPH of conventional chopping machine with same input power (40HP motor), besides consistent chopping quality.

2. UNDP Project ‘Upscaling Energy Efficient Production in Small Scale Steel Industry in India’

Under the project awarded by UNDP in 2014, PSCST identified 60 re-rolling mills and facilitated baseline studies and implementation of 156 Energy Efficient Technology (EET) packages in these mills. Post implementation studies, conducted by an independent

agency- appointed by UNDP, revealed that these 60 units achieved 6-24 % reduction in Specific Energy Consumption (SEC). An annual energy saving of 309.32 TJ worth Rs. 20.35 crores is envisaged besides carbon footprint reduction by 35,533 tonnes from MGG cluster alone. The final report has been submitted to UNDP and the project stands completed.

3. PPCB Project ‘Techno-Economic Feasibility Study for Silica Recovery from Rice Husk Ash (RHA)’

Under a PPCB sponsored project on “Techno-Economic Feasibility Study for Silica Recovery from Rice Husk Ash”, PSCST invited Expression of Interest from Technology Providers / Consultants / Manufacturers to explore the recovery of silica fume / sodium silicate / silica from RHA in Punjab. In response, 4 technology providers submitted their EoI which were evaluated and business models have been proposed for the scientific management and handling of RHA. The project stands completed and the report has been submitted to PPCB in March, 2016.

4. UNDP Project on ‘Setting up of 3 Resource Efficient Brick (REB) Units and preparation of Investment Plant for 25 REB Units’

UNDP has assigned the task for “Setting up of 3 Resource Efficient Brick (REB) Units and preparation of Investment Plants for 25 REB Units” to PSCST at a total cost of Rs. 62.21 lacs. The project aims at reducing energy consumption and thereby GHG emissions by manufacturing and promoting the use of clay fired Resource Efficient Bricks (REBs) including fly-ash based bricks/ blocks, which will have other co-benefits as well, such as soil conservation in the Northern States of Punjab, Haryana, Himachal Pradesh, Jammu & Kashmir, Western U.P. and Rajasthan.

5. PEDDA Projects

a. Impact Assessment Report of Energy Conservation Activities in Punjab for FY 2013-14

Punjab Energy Development Agency (PEDDA) had sanctioned the project on “Preparation of report on Impact of Energy Conservation Activities in the State of Punjab during FY 2013-14”. The project involved preparation of report after collecting the data from Government Departments, R&D Institutes, Industries, Designated Consumers, Accredited Energy Auditors, Hospitals, Hotels and Malls regarding the energy conservation activities during the FY 2013-14.

b. Debate Competition on ‘Energy Efficiency & Conservation’ for ITI, Diploma Engineering and Engineering colleges Students.

Bureau of Energy Efficiency (BEE), Ministry of Power, has launched the National Awareness Campaign to promote energy conservation in the country. Punjab Energy Development Agency (PEDDA) being State nodal agency assigned the task to PSCST for conducting Zonal & State level Debate Competition amongst the students of Industrial Training Institutes (ITIs), Diploma Engineering Colleges and Engineering Colleges in the State. A State level Debate Competition for Engineering Students was conducted jointly by PSCST and Chitkara University, Punjab on 16.04.2015 at Chitkara University. More than 70 students from 15 engineering colleges participated actively in the competition.

c. Establishment of Energy Clubs in the schools

Under this project, PSCST sensitized the youth by establishing energy clubs in the schools. A State Level Capacity Building-cum-Orientation Workshop was organized for DSSs and Energy Club Incharges on 22nd July, 2015 at Chandigarh for capacity building of DSS on Energy Efficiency and Conservation at grass root level.

SOCIO-ECONOMIC DEVELOPEMENT

1. Field Demonstration of Cultivation & Processing of Selected Aromatic Crops in Dhar Block of Punjab

PSCST is implementing above said demonstration project for sustainable livelihood generation in kandi area (Dhar Block, District Pathankot) of Punjab with the support of DBT, Govt. of India and in collaboration with Kelkar's Scientific Research Centre (KSRC), Mumbai; PAU's Regional Research Station, Gurdaspur and Unati Cooperative Marketing-cum-Processing Society. In 2015-16, the activities carried out were:

o Extension of Cultivation at Farmers' Fields

The land brought under cultivation of aromatic grasses viz. Lemongrass (*Cymbopogon flexuosus*), Citronella (*Cymbopogon winterianus*) & Palmarosa (*Cymbopogon martinii*) in Dhar block in the year 2015-16 was 19.5 acres approx., out of which only 15.5 acres survived, thus making the total area under project at present to be 48.5 acres.

o Monitoring of Established Aromatic Crop Fields

The regular on-site monitoring was carried out for successful establishment of aromatic crops at farmers' fields. Farmers were provided complete hand-holding on cultivation and harvesting operations.

o Standardization of Agro-technologies under Local Agro-climatic Conditions

The agronomic research trials to optimize technologies for cultivation of five aromatic crops viz. Lemongrass, Citronella, Palmarosa, Patchouli (*Pogostemon cablin*) & Geranium (*Pelargonium graveolens*) under local climatic conditions have been completed by RRS of PAU at Gurdaspur based on the protocols standardized by KSRC.

o Setting up of Steam Distillation Unit for large scale Distillation of Essential Oil

Besides two farm scale distillation units set up earlier in villages Roug & Jungath, third farm distillation unit (Steam Distillation) was set up in village Phaguli at adopted farmers field in 2015-16 for processing aromatic crops for extraction of essential oil. The unit was able to process about 215 liters of essential oil from cultivated aromatic grasses which was marketed through Unati Cooperative Marketing-cum-Processing Society Ltd.

o Capacity Building Programs & Outreach to Local Community

Five awareness programs to sensitize new farmers of villages Phaguli, Jungath & Bhabbar on potential of aromatic crop cultivation in kandi area & its economic benefits

and 20 hands-on trainings for demonstration of land preparation, application of farm inputs, nursery raising etc. for adopted farmers were organized.

- **On-site Monitoring/Visits of Project**

The on-site monitoring of project was carried out by Adviser, DBT, Govt. of India. The project sites were also visited by ADC (Pathankot) who appreciated the initiative taken up by PSCST for kandi area.

2. Demonstration & Promotion of techno-economically viable options for sustainable livelihood generation in Kandi area of Punjab

PSCST was instrumental in organization of regional level workshop on behalf of DST under its SARTHI program focused on sustainable development and holistic empowerment of Shivalik (kandi) area of the states of Punjab, Haryana, Himachal Pradesh, Uttrakhand and Jammu & Kashmir. A project developed by the Council was sanctioned by DST, GOI for three years under which three technologies viz. mulberry sericulture, natural vinegar production and value addition of locally available bio-resources using low cost poly house solar dryers are being promoted. The activities undertaken in the year 2015-16 were as below:

Mulberry Sericulture

For promotion of scientific & systematic mulberry sericulture technology in Dhar block of District Pathankot in collaboration with Central Silk Board and Department of Sericulture, Govt. of Punjab, the activities undertaken were:

- **Selection of Project Site & Beneficiaries:** Scouting of 15 villages of Dhar Block and selection of three beneficiary villages where awareness programmes were organized to sensitize farmers on viability & economic benefits of mulberry sericulture.
- **Hands-on Training Programs:** Adopted farmers were trained on complete technology operations viz. rearing of chawki silkworms & adult larvae, cocoon production, its harvesting and drying.
- **Establishment of Mulberry Plantation:** Mulberry plantation (high yield varieties) was established on bunds/border of agricultural fields (0.5 acre) of adopted beneficiaries. The farmers were trained on cultivation & management operations of mulberry plantation.
- **Seed Procurement, Distribution, Rearing of Silk-worms and Marketing:** The quality commercial seeds (bivoltine F1 hybrid variety) sourced from National Silkworm Seed Organization, Dehradun were reared and distributed to 25 adopted farmers (50 dfls per farmer) for undertaking adult silkworm rearing at their premises along with its harvesting and cocoon production. The marketing linkages were provided for cocoon produced by the adopted farmers.

Natural Vinegar Production

The natural vinegar production technology from grapes & sugarcane have been developed and scaled up by PSCST in collaboration with Department of Microbiology, PAU. The technology is being promoted as part time entrepreneurial activity. Awareness, Technology Demonstration/ Training and Technology Refinement Programs were undertaken during the year.

Value addition of locally available bio-resources using low cost polyhouse solar dryer

The kandi area has abundantly available natural bio-resources which are currently being dried conventionally in open sun. The current practices suffer from limitations in terms of uneven moisture in final product which leads to fungal infestation, hence lowering the quality of produce and fetching less market value. The poly house solar drying technology and upcoming scientific approach for production of quality hygienic products was promoted in the area through activities such as survey of Bioresource abundance in Kandi Area and Setting up of Poly House Demonstration Unit in Adopted Cluster.

3. Cultivation & Value Addition through Post Harvest Processing of Bioresources in Shivalik belt

PSCST has set up a Bioresource Processing Facility in collaboration with Unati Cooperative Marketing-cum-Processing Society Ltd. at Talwara, with the support of DBT, Govt. of India and the facility is now self sustainable. The facility is presently processing annually 560MT of Amla, 400 MT of Karela, 44 MT of Jamun, 40 MT Carrot, 24 MT Harad, 14 MT Giloye and many more bio-resources like guava, bottle gourd, neem, turmeric, litchi, pear, ginger etc. Further, PSCST has also set up Demonstration Unit on Natural Vinegar Production at the Facility under another DST-GOI supported Project. The technology for vinegar production has been transferred by Department of Microbiology, PAU. The Facility produced about 1,02,000 L Natural Vinegar in variants of *amla*, sugarcane, apple, *jamun* in the year 2015-16. Besides, extraction of 825 kg essential oil from lemon grass was also facilitated. The Unit is providing direct employment to 95 women & 25 men and is successfully generating about 1,00,000 man days work/ annum for harvesting, sorting, grading and processing of natural bio resources for local community.

4. Nutrition & Bone Health of Women in Punjab – A Community Study

Osteoporosis is a skeletal disorder characterized by low bone strength that leads to an increased risk of fragility & fractures. It is a major public health problem and progressive metabolic bone disorder mainly affecting elderly population especially the ageing women population. Various outreach programs like sensitization workshops and public contact programs were conducted under the project.

5. Promotion of Use of Medicinal Plants as household remedies among Rural Women of Punjab

Medicinal plants are major resource base for the traditional medicines and herbal industry. To revive & strengthen indigenous system of medicine and to renew the interest for utilization of medicinal plants for common ailments especially in rural areas where the access to primary health care system is limited, a project supported by Science for Equity & Empowerment Division of DST-GOI was implemented in six districts of Punjab viz. Ropar, Faridkot, Ludhiana,

Pathankot, Mohali & Hoshiarpur with the involvement of partner organizations/NGOs actively working in the field of indigenous health care needs of the said districts. 12 awareness programmes were organized in the year 2015-16.

B. Initiatives for Empowerment of SC Community

Assessment & management of fluoride levels in pregnant SC women from fluoride endemic zone

Punjab is the second highest endemic zone for fluoride in the country with 17 districts reported to be fluoride endemic. Higher levels of fluoride result in painful & crippling disorder called dental and musculoskeletal fluorosis affecting children & adults respectively. The pregnant women/expecting mothers are also critically affected by high fluoride body levels. The problem is more severe in low socio-economic strata. Hence, PSCST implemented a pilot project on assessment of baseline data on fluoride levels in pregnant SC women of Punjab, with the support of Department of Welfare (Directorate of SC/ST), Govt. of Punjab. The project was carried out in fluoride endemic Faridkot district in collaboration with Department of Gynecology, Guru Gobind Singh Medical College & Hospital (GGSMCH), BFUHS, Faridkot.

Eight public contact programs were also organized in adopted SC villages where about 400 women were made aware about all the aspects of fluorosis & possible nutritional interventions for its management. A District Level Workshop on 'Prevention & Management of Fluorosis' was organized in which about 60 participants including ASHA workers, Anganwari workers, ANMs etc. participated.

Socio-Economic Development of Scheduled Caste Community through Technology interventions in Horticulture and Related Ventures

PSCST implemented a project for economic empowerment of SC population of Punjab through technology interventions in horticulture & related ventures with the financial assistance of Department of Welfare (Directorate of SC/ST), Govt. of Punjab. Under this, three technological interventions viz. floriculture, olericulture and mushroom production were promoted for empowerment of SC community in Noormahal Block of district Jalandhar in collaboration with PAU, Ludhiana, which has more than 60% SC population. Twelve capacity building/hands-on-training programs were organized in collaboration of KVK Noormahal and Agricultural Technology Management Agency (ATMA).

PROTECTION OF INTELLECTUAL PROPERTY RIGHTS (IPRS)

Patent Information Centre (PIC), Punjab at Punjab State Council for Science & Technology (PSCST) is effectively taking IPR issues to the grass-root R&D workers and innovators, especially in the academics and industry by raising awareness, capacity building and facilitating IPR filing. Awareness activities & IP trainings are regularly organized by PIC to train faculty of educational institutions on various IPR issues.

Gist of the activities undertaken by PIC, PSCST during 2015-2016 is as follows:

1..	Patent Searches Conducted	65
2.	Patent Applications forwarded to TIFAC for Filing	14
3.	Patent Applications presented in TIFAC's CIPF Meetings: 22,	10

	Approved for filing	
4.	Patents Filed at Indian Patent Office	05
5.	Patents Granted by Indian Patent Office	02
6.	IPR Faculty Training Camps organized in Govt. Polytechnics	06
7.	Celebration of World IP Day, 2015	01
8.	IPR Awareness Programs in Collaboration with University IPR Cells	11
9	Workshops (with Panjab University, Chandigarh; Central University of Punjab, Bathinda; & Guru Nanak Dev University, Amritsar)	03
10	Seminars (with PAU, Ludhiana; PTU, Jalandhar; Punjabi university, Patiala, Lovely Professional university, Phagwara & Baba Farid University of health Sciences, Faridkot)	05
11	IPR Clinic (with Chitkara University)	01
12	IPR Brochure Release (Desh Bhagat University, Mandi Gobindgarh)	01
13	Release of IPR Brochure (Desh Bhagat University, Mandi Gobindgarh)	01
14	Special Lectures/Seminars on IPR	12
15.	IPR Trainings Imparted	04
16.	Publications	02
17	New Initiatives undertaken by PIC, PSCST:	
(I)	Formulation of IPR Policies for academic institutions of the state	04
(II)	Registration of Authorized User of GI Phulkari	01

Further, the following activities were undertaken in 2015-16 through IPFC to cater to IPR needs of MSMEs (such as capacity building, filing facilitation, infringement protection & to use IPRs as effective tool for technology up-gradation and enhancing business competitiveness):

1.	IPR sensitization workshops for MSMEs of Punjab	03
2.	Trademarks searches conducted	06
3.	Copyrights filed	04

SCIENCE COMMUNICATION & POPULARIZATION

The Council has identified Popularization & Communication of Science as one of its key areas with the purpose of infusing scientific attitude in the public mind, through various means of display, publications and programs. The following activities were taken up by the division during 2015-2016:

Annual Programs

1. Celebration of National Science Day – 2015

National Science Day is celebrated each year on or around 28th February as a mark of respect to the great Indian scientist and noble laureate Dr. C.V. Raman who announced “Raman Effect” on this day in 1928. PSCST celebrates this day under the aegis of NCSTC, DST, Govt. of India and Govt. of Punjab by organizing and supporting activities like science exhibitions, lectures, seminars, slide shows, debates, training workshops, and competitions etc. at school, college, and university levels under the program every year in the State since 1990.

NSD-2015 was celebrated on the focal theme: “**Science for Nation Building**”. Fifty seven organizations of the State, involving more than 1,00,000 students, teachers and general public

carried out activities such as science exhibitions, lectures, slide shows, seminars, debates, training workshops, conferences, competitions etc.

To discover scientific talent and encourage students to think on broader aspects of science and technology, the Council also organizes a **District and State Level Science Essay Writing Competition** for the children (12-16 years) of Punjab every year, as a part of various activities taken up under National Science Day Celebrations. The competition at district level was organized in English & Punjabi on the following topics:

1. 25 Years of Advancements in Science
2. Contribution of Punjab in Science and Technology
3. Science Attitude for Nation Building
4. Role of Science in Poverty Alleviation

The State Level Science Essay Writing Competition-2015 was organized on 27th November, 2015. The best four entries in both languages were chosen for prizes. Cheques worth Rs. 1500/-; 1000/-; 750/- and 500/- and certificates were given to 1st, 2nd, 3rd and consolation prize winners respectively.

2. Organization of National Children's Science Congress- 2015

The National Children's Science Congress (NCSC) is a nationwide activity being organized every year since 1993. NCSTC, DST, GOI and DST, GOP supports the Children Science Congress in Punjab, for which PSCST is the nodal agency. CSC is organized at District, State and National levels. CSC-2015 was initiated by PSCST by organizing a two-day orientation training workshop for DSSs and Teachers on 14th and 15th July, 2015 on the focal theme '**Understanding Weather & Climate**' to share the guidelines of organizing CSC-2015 in a proper way and for qualitative and quantitative improvement of projects especially at the District level.

The District Level CSC-2015 was organized in all districts of the state by the District Science Supervisors during August to November 2015 to select the best six projects in each district for participation in the state level CSC-2015 which was organized at ISF College of Pharmacy, Moga from 2nd to 4th December, 2015. In this event, five hundred and fifty three students and two hundred and twenty one teachers participated. A total of one hundred and eighteen projects were presented, out of which sixty five projects were from rural areas and fifty three were from urban areas. Science Activity Corners were set up for the participants. Sixteen projects were selected from the state for participation at the National Level CSC-2015 at Chandigarh from 27th-31st December, 2015. At the National Level, two projects from the state were placed amongst the best thirty one projects while one project was selected amongst the best sixteen projects.

3. Celebration of National Mathematics Day-2015

National Mathematics Day is celebrated each year on 22nd December in recognition of the contribution of the Indian mathematical genius Srinivasa Ramanujan who was born on 22nd December, 1887. PSCST has been celebrating National Mathematics Day (NMD) since 2012 with support from NCSTC, DST, GOI by involving the educational institutes and Govt./Non-Govt. organizations in a series of activities to highlight the importance of mathematics and to create interest in the subject amongst students. PSCST celebrated NMD-2015 by involving

thirty five organizations to carry out various activities like lectures, exhibitions, competitions etc. to popularize mathematics amongst students.

Short Term Training Courses/Workshops

i) Motivational Contact Programs for Talented School Students of Punjab:

PSCST was sanctioned a project by NCSTC, DST, GOI to organize twelve programs in Punjab/Chandigarh NCSTC, DST, GOI for Motivation of Talented School Students to encourage them to select careers in science and to expose them to research methodology and interacting with scientists. During 2015-16, nine motivational contact programs were organized at Universities/ S&T Institutions of Punjab & Chandigarh. In each of the above programs, the meritorious students selected from different districts of the state were motivated to select basic sciences as career. They were taken to various laboratories and exposed to sophisticated instruments. Eminent scientists of the organizing institutes/universities interacted with the students and provided them first-hand-information on different fields/topics of science & technology. One day in each program was reserved for visit to PGSC, Kapurthala while a career counseling session was organized on the last day for the participating students, where they were made aware about career opportunities in different fields of Science & Technology.

ii) Water and Solid Waste Auditing in 20 Schools of District Mohali (WaSH project)

NCSTC, DST, Govt. of India has sanctioned a project titled, "Water and Solid Waste Auditing Assessment with Implementation Plan in twenty schools of district Mohali, Punjab" under 'Jal Sutra Eco-WaSH Futures Program'. The project aims to conduct water and solid waste auditing in twenty schools of Mohali, district. The first capacity building workshop under this program was organized at PSCST on 22nd January, 2016. The objective of this awareness workshop was to introduce the program to the teachers of the selected schools and discuss the implementation of the year long program related to water and solid waste auditing. Total twenty one participants including District Science Supervisor (DSS), Mohali and twenty nominated school teachers participated in the workshop.

iii) Brain Storming Meeting on Awareness Program on Cancer in Women in Malwa region of Punjab

PSCST has been sanctioned a project by DST, GOI to create and raise awareness about health & nutrition in the Malwa region of Punjab with special emphasis on women cancer. The project will involve survey and awareness campaign aimed at educating women on early detection of breast and cervix cancers through breast self examination and Pap smear tests. A series of activities have been planned to carry out the awareness campaign including preparation of resource material. A brain storming meeting with experts from PGIMER, Chandigarh, PU, Chandigarh, BFUHS, Faridkot, ROKO Cancer Organization, New Delhi. District Health Officers and District Science Supervisors of four district of Malwa region was held on 29th March, 2016 to plan the implementation of the project.

iv) Residential Internship Program for Child Scientists– A Visit to Science City, Kapurthala on 27th June, 2015 by PSCST

NCSTC, DST, GOI organized a two week Residential Internship Program for Child Scientists in collaboration with IISER, Mohali from 22nd June to 4th July, 2015 at IISER. Students selected for

this program were from the top 20 projects selected at National Children Science Congress-2013 held at Bhopal. Under this program, PSCST was assigned to organize a one day educational trip for the child scientists and teachers to Pushpa Gujral Science City, Kapurthala on 27th June, 2015.

OUTREACH PROGRAMS

Environment Outreach

i) National Green Corps Program

PSCST is the nodal agency for implementation of National Green Corps (NGC) Program of the Ministry of Environment, Forests & Climate Change (MoEF&CC), Government of India. It is being implemented in 5500 schools of Punjab (250 schools per district) through eco-clubs. In 2015-16, PSCST organized workshops-cum-meetings with District Science Supervisors (DSSs) to review the progress of activities and celebrate environmentally important days etc. PSCST took an initiative to celebrate 'Climate Change Awareness Week' in various NGC schools of the state which is first of its kind activity targeted to create mass awareness among students.

ii) Science Express

Climate Action Special (SECAS) was designed by MoEF&CC and Ministry of Railways, Government of India to create awareness among various sections of society about basic concepts of Climate Change, its impacts and related mitigation and adaptation strategies. PSCST mobilized students teachers, officials and masses of various districts for visiting the train at their nearest halting stations. 41,007 students and 1414 teachers from 391 schools from various districts of Punjab visited the train at three different stations.

Wetland Outreach:

i) Celebration of World Environment Day-2015:

PSCST organized a program for students on 5th June, 2015 at Ropar wetland in collaboration with Department of Forests & Wildlife, Punjab. Around fifty students and ten teachers from different schools participated in this program.

ii) Training Workshop for Nature Guide Student Volunteers at Pushpa Gujral Science City, Kapurthala:

A Nature Guide Training Workshop for student volunteers was organised on 31st August, 2015 by PSCST in collaboration with Pushpa Gujral Science City at Science City, Kapurthala. It was attended by around hundred students and twenty teachers from different districts of Punjab.

iii) Capacity Building Workshop on Fishermen Livelihood at Khalsa College, Amritsar:

A capacity building workshop on Fishermen Livelihood was organised by PSCST in collaboration with Swami Vivekanand Medical Mission at Khalsa College, Amritsar on 17th September, 2015. Around hundred fishermen attended this workshop.

iv) Celebration of World Bird Watch Day at Khalsa College, Anandpur Sahib:

World Bird Watch Day was celebrated at SGTB Khalsa College, Anandpur Sahib on 7th October, 2015 by Punjab State Council for Science & Technology in collaboration with Department of Forests & Wildlife, Ropar. Around 30-40 students and ten teachers the college participated in this program.

v) Celebration of World Wetlands Day-2016

World Wetlands Day is celebrated globally on 2nd February each year to commemorate the international treaty signed by various countries in 1971 at Ramsar, Iran for conservation of wetlands. The theme opted for the current year was, 'Wetlands for our Future: Sustainable Livelihoods'. PSCST celebrated the event on 2nd February, 2016 through organizing "Wetlands Awareness & Protection Workshop" for students and teachers at Science City, Kapurthala. A Jal Mela was organized with PAHAL society at Kanjli wetland. About 600 schools of Punjab took up several activities like Poster-making competitions, rallies, exhibitions, cleanliness drives, plantation, visit to wetlands, etc.

ENVIS Outreach

Environmental Information System (ENVIS) Centre on "Status of Environment & Related Issues" has been set up in PSCST to collect and collate information/data of various environmental & related issues of the state of Punjab and disseminate the same through its bilingual website (www.punenvis.nic.in). During 2015-16, the Centre maintained and uploaded new information on the website and India State-Level Basic Environmental Information Database (ISBEID) in collaboration with National Information Centre. The Centre staff participated in various meetings of ENVIS and conducted outreach activities like setting up ENVIS Gallery/ENVIS Wall at SCERT office at Mohali, Exhibition Stalls at various places, field visits and coordinating various activities of 'RCE Chandigarh and CloudSat Program' on environmental & related issues in the direction of sustainable development.

Biotechnology Outreach

I) Har Gobind Khorana Lecture Series – A Unique Initiative for Invigorating Students of Biological Sciences

Punjab State Council for Science & Technology and Institute of Nano Science & Technology has jointly instituted Hargobind Khorana Lecture Series as a tribute to Nobel Laureate Prof. Khorana, the world acclaimed bio-scientist of Indian origin. The objective is to invigorate science students and teachers of the State and help them gain deeper insights into realms of science by providing an opportunity to learn about path-breaking endeavours of Prof. Hargobind Khorana as well as other internationally renowned scientists of Indian origin.

In 2015-16, the first HGK Lecture Series was organized on 5th January, 2016 at Panjab University, Chandigarh. The inaugural HGK Lecture was delivered by Nobel Laureate Prof.

Venkatraman Ramakrishnan FRS, an Indian born structural biologist and physicist. More than 1000 science students & teachers from Punjab & adjoining states participated in the program.

II) 22nd Popular Biotechnology Lecture Series

The theme of Popular Biotechnology Lecture Series organized by PSCST this year was 'Innovations and IPRs in Biotechnology'. The lecture series is being supported as annual feature by DBT, Govt. of India for the last 22 years. This year the series was organized at Khalsa College, Patiala on 26th February, 2016. It comprised of three popular biotechnology lectures.

EXTRA-MURAL R&D PROJECTS

Development and Validation of Microbial Consortium as single window delivery system for growth promotion of summer mungbean in rice Wheat System in Punjab:

This DST-GOI supported project is being implemented in collaboration with Department of Plant Breeding and Genetics, PAU to develop, validate and promote a consortium of Rhizobium and Plant Growth Promoting Rhizobacteria (PGPR) as a dual inoculant for increasing the growth and nitrogen fixation of summer mungbean and reduce the dependency on chemical fertilizers. The scientific trials for evaluation of developed consortium were conducted based on which PAU has given recommendation to the developed consortia. Further, demonstration trials for validation of developed technology at farmers' fields are underway in district Ludhiana. Awareness programs/field days were organized to popularize cultivation of summer mungbean in rice-wheat system and promote developed consortia on tested varieties in adopted village Galib Khurd of district Ludhiana.

Importance of S&T in the Development of States: An Empirical Investigation of Vidhan Sabha Questions:

This project is being implemented to examine the importance given to Science & Technology issues in sectors such as agriculture, industry, health, gender issues, water, energy, sanitation, education & training, irrigation, family planning, population, literacy rate, HDI etc. in seven states (Haryana, Punjab, Assam, Gujarat, Maharashtra, Kerala and Karnataka).

During the year, 10 year data (starred and un-starred questions) from the states of Kerala, Assam, Gujarat and Maharashtra was procured from the respective state assemblies and is being translated and subjected to analysis. Further, the 3rd & 4th Local Project Advisory Committee Meetings under the project were organized.

PUBLICATIONS/RESOURCE MATERIAL

Popularization of Science:

- **Punjabi Science Magazine - 'Nirantar Soach' -12 issues**
- **Quarterly Newsletter - 'Future Frontiers'- 4 issues**

- **Summary Book of ‘Children’s Science Congress-2015’**

Children’s Science Congress-2015 was organized by PSCST at district and state levels on the focal theme “Understanding Weather and Climate”. A Summary Book of CSC-2015 (*Authors: K.S. Bath & M. Thakur*) has been printed to document all projects presented at the State Level.

- **Release of “History of Science & Technology in Punjab” by Hon’ble CM**

Hon’ble Chief Minister of Punjab, S. Parkash Singh Badal released the document titled “History of Science & Technology in Punjab” on 23rd June, 2015 in the Committee Room of Punjab Civil Secretariat, Chandigarh. This document has been compiled by PSCST to depict the History of Science & Technology in the region of Punjab in different eras (covering a period of around 4000 years) as well as in different sectors like agriculture, irrigation, industry, education, town planning, engineering, mathematics, medicine & health, environment, traditional technologies etc.

Environment

- **Development of Information Material:** The following quarterly newsletters with lead articles were published by ENVIS Centre:

- a) Vulture: An Endangered Bird (Vol. 13, Issue No. 1 & 2)**

- b) International Environmental Conventions: An Indian Perspective (Vol. 13, Issue No. 3)**

- c) Climate Change (Vol. 13, Issue No. 4).**

- **Display Material:** The Centre developed 9 posters/display boards on various environmental issues pertaining to State of Punjab as under:

- i. Invasive Alien Plant Species in Punjab
- ii. Indus River Dolphin (*Platanista gangetica minor*)
- iii. Water Resources in Punjab
- iv. Popular Ornamental Flower
- v. Biodiversity
- vi. Protected Area Network of Punjab
- vii. Wetlands of Punjab
- viii. Air Purifying Indoor Plants
- ix. Action towards Sustainability

- **Software/Technical/Non-technical Reports**

Software on ‘Tree of Punjab’ for ENVIS Website, technical report on Data Analysis of data uploaded on ISBEID Portal, & non-technical report on Annual Progress Report of Activities in 2015-16 and report on Science Express-Climate Action Special (SECAS) visit to Punjab was prepared.

Climate Change in Punjab

Punjab State Climate Change Knowledge Center, PSCST developed information kit on Climate Change in Punjab with focus on agriculture, water, managing paddy-straw, capacity building under Punjab State Action Plan on Climate Change (SAPCC) and key achievements under Solar Mission.

Patent Information Cell:

- An Abstract titled, “*Role of Patent Information Centre, Punjab State Council for Science & Technology: Building IPR Ecosystem in Punjab and Chandigarh*” in a book titled, “Sustainable Polymer Applications” published by Excel India Publishers, Munirka, New Delhi (ISBN: 978-93-85777-01-1).
- A Chapter titled, “*Overview of Intellectual Property Rights & Some Case Studies*” in “Popular Biotechnology Lecture Series. Focus: Innovations & IPRs in Biotechnology” published by Biotech Division of Punjab State Council for Science & Technology, Chandigarh (ISBN: 978-81-88362-40-0).

Biotechnology:

- **Booklet ‘Innovations & IPRs in Biotechnology’**

A booklet titled ‘Innovations & IPRs in Biotechnology’ (Eds. J.K. Arora & Alkesh) was published by the Council with latest information pertaining to key segments of biotechnology sector having commercial potential, framework and facilitations available for protecting the IPRs for novel innovations.

- **Resource Material on Fluorosis**

A Brochure titled ‘Prevention & Management of Fluorosis’ has been developed, both in English and Punjabi under the project ‘Assessment & Management of Fluoride levels in pregnant SC women from fluoride endemic zone’ which covers different aspects viz. significance of fluoride in human development, implications of high fluoride levels, risks in pregnant women & their pregnancy, interventions for managing high level of fluoride and endeavours of PSCST for reducing the burden of fluorosis in the community.

AWARDS

Eminent Environment Engineer Award to Dr. S.S. Ladhar: Dr. S.S. Ladhar, AD(Env.) was conferred with Eminent Environment Engineer Award for his contributions to environment conservation by Sh. Birender Singh, Minister of Rural Development, Govt. of India on 6.11.2015.

Role & Organization

The Punjab State Council for Science & Technology was established on July 21st, 1983 under the aegis of the Department of Science Technology & Environment, Punjab. It serves as the technical secretariat of the State Department on matters related to Science, Technology & Environment.

The Council is headed by the Chief Minister, Punjab, who is the Chairman. Minister for Science & Technology is the Vice Chairman of the Council. The General Body, which is the apex body of the Council, has 40 members representing various departments of the State, Vice-Chancellors of the 4 universities and eminent scientists representing state and national level scientific institutions. Secretary for Science & Technology is the Member Secretary of the Council. The Executive Committee of the Council is headed by the Chief Secretary, GOP. It has 16 eminent members from various Departments such as Agriculture, Technical Education, Industry, PSEB etc and eminent scientists from social & scientific organizations. Executive Director is the Chief Executive of the Council. The organizational structure of the Council is at **Annexure-I**.

The Council is undertaking activities under the following areas:

- Popularization of Science
- Environment Conservation and Industrial Consultancy
- Biotechnology
- Intellectual Property Rights
- Besides, the Council is providing technical and administrative support to Punjab Biodiversity Board established as a stationary body under the Biodiversity Act 2002 and to the Punjab State Innovative Council.

OBJECTIVES

- To identify, generate, utilize and promote new technologies relevant to the developmental needs of the State in the light of Socio-Economic developmental objectives
- To popularize science and spread scientific temper and attitude among the people of the State
- To promote and establish pilot-plants and programmes including demonstration units and commercial exploitation of Science and Technology for priority developmental needs of the State
- To interact with other State and National S&T bodies having similar or related objectives
- To establish infrastructure, institutions, organizations etc. necessary to achieve the aforesaid objective
- To advise the State govt. in technical matters relating to Science, Technology and Environment