



Future Frontiers



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A Quarterly Newsletter of the Punjab State Council for Science & Technology

Oct. - Dec. 2011

Editorial

Another fruitful year has come to an end during which PSCST was active in all fronts to propagate the fundamentals of science & technology to the grass roots in the state of Punjab. The last quarter of the year witnessed a series of activities by the Council. Scientists from PSCST were invited by United Nations Asian & Pacific Centre for Agricultural Engineering & Machinery (UNAPCAEM) and Food & Agriculture Organization (FAO) to present two papers on environmental appraisal and socio-economic impacts of intensive agriculture at the roundtable meeting on "Sustainable Agricultural Mechanization in Asia" at Bangkok, Thailand on 8th-9th December, 2011. The meeting was sponsored jointly by UNAPCAEM and FAO. The objectives of the roundtable were to discuss status of agricultural mechanization in Asia and identify constraints as well as best options for achieving environmentally sound sustainable agricultural mechanization in the region. During the period, Senior Scientific Officer (Env.) was also selected by Japan International Cooperation Agency (JICA) for "A Group Training Course in Regional Development by Sustainable Use of Biodiversity" in Japan under the Technical Cooperation Program of Govt. of Japan. PSCST also organized the State Level Children's Science Congress at Khalsa College, Amritsar and a workshop on Micro-organisms at Panjab University, during this quarter.

Activities of ENVIS Centre, PIC, BT division and participation of PSCST in International Trade Fair at New Delhi have been reported in this issue.

Another landmark project initiated by the Council during this year is the compilation of the History of S&T in Punjab, with financial assistance from DST, GOI. Under this project, thorough research is being conducted to prepare a document depicting developments in S&T in different eras such as Indus valley civilization, Aryan civilization, Rule of various kingdoms (Budhist, Mauryan, Gupta, Kushan & Harsha), Persian and Mughal rules, Sikh kingdom, British era and post-independence period. Special emphasis is being laid on the history of development of agriculture as Punjab is a predominantly agricultural state. Information on developments in various other sectors, traditional technologies of Punjab and recent developments in S&T including prominent institutes is being compiled. It is hoped that once compiled, this would be a landmark document. A multimedia CD depicting the history of S&T in Punjab is also being prepared under the project.

On behalf of the Council, I wish a very happy and prosperous new year to all our readers.

(Neelima Jerath)

State Level Children's Science Congress – 2011

Punjab State Council for Science & Technology organized State Level Children Science Congress-2011 in collaboration with Khalsa College, Amritsar from 29th November to 1st December, 2011 at Khalsa College, Amritsar, on focal theme: 'Land Resources: Use for Prosperity, Save for Posterity'.



Around 450 students and 106 teachers from 82 schools of Punjab participated in the Congress and presented their projects on the given theme. The projects were evaluated by a team of eminent judges from GNDU, Amritsar; Khalsa College, Amritsar and Panjab University, Chandigarh on 29th & 30th November, 2011. The results of the State Level CSC-2011 in order of merit are as under:-

Senior Category			
Sr. No.	School Name	Team Leader	Title of project
1	Delhi Public School, Ludhiana	Shivanshu	Hidden Hunger
2	Springdales Public Sen. Sec. School, Sangrur	Balpreet Singh Dhindsa	An innovative technique for soil sampling & measuring its carbon sink capacity for better yield
3	Our Lady of Fatima Convent Sen. Sec. School, Patiala	Garima Bansal	Organic Gardening / a natural therapy of soil
4	Guru Amar Das Sen. Sec. School, Goindwal Sahib, Tarn Taran	Diksha Bhardwaj	To save the land by proper arrangement of sewage
5	Sri Ram Ashram Sen. Sec. School, Amritsar	Harsh Banaal	Pollution in water sources
6	Sri Guru Nanak Dev Sen. Sec. School, Jaurian Kalan, Gurdaspur	Shamsher Singh	Over use of fertilizer
7	Govt. High School, Dasgrain, Ropar	Harpreet Kaur	Ways to improve soil organic matter
8	Govt. High School, Koharwala, Faridkot	Mandeep Kaur	Rain Water Harvesting

Junior Category			
Sr. No.	School Name	Team Leader	Title of project
1	Our Lady of Fatima Convent Sen. Sec. School, Patiala	Guneet Sharma	Miniature Fern- a natural wonder
2	Guru Amar Das Sen. Sec. School, Goindwal Sahib, Tarn Taran	Varinder Singh	To make the farmers aware about the bad effects of chemical fertilizers
3	Vivek High School, Mohali	Shaurya Gulati	Lend a Hand to save the land-Eradicate Parthenium
4	Guru Gobind Singh Public Sen. Sec. School, Jindra, Moga	Amrinder Kaur	Burning of Parali (Husk)
5	Ch. Balbir Singh Public School, Hoshiarpur	Nitin	To Know the vertical distribution of soil layers of your locality
6	Sri. Guru Harkrishan Public School, Hoshiarpur	Manjot Kaur	Effects of pesticides on Land
7	J.N.J.DAV Sen. Sec. School, Giddarbaha, Muktsar	Sonali	Effect of brick kilns on Land
8	The Millennium School, Bathinda	Diya Singla	Status of Water Quality & its impact on Soil Properties

The event was coordinated by Dr. Jasjeet Kaur Randhawa, Head, Department of Zoology and Prof. Jaswinder Singh and Prof. Zorawar Singh of Khalsa College, Amritsar.

The prize distribution program was organized on 1st December, 2011. Dr. R.S. Khandpur, Director General, Pushpa Gujral Science City, Kapurthala, gave away the prizes to the winning teams while Dr. Daljeet Singh, Principal, Khalsa College, Amritsar, presided over the function. Sixteen teams at the State Level were selected to participate in the National Level Children Science Congress-2011 at Jaipur from 27th to 31st December, 2011 in which one project from Punjab was selected among the best 25 projects.

District Level Workshop on Microorganisms: Let Us Observe and Learn

Punjab State Council for Science & Technology organized a three day training workshop on "Microorganisms: Let us Observe and Learn" in collaboration with Department of Botany, Panjab University, Chandigarh at PU, Chandigarh from 14th to 16th November, 2011. This workshop was catalyzed and supported by NCSTC, DST, GOI, New Delhi. The workshop was attended by 29 school teachers of biology from different schools of Chandigarh. The 3-day workshop

was designed to provide exposure to school teachers about various aspects and techniques of Microbiology. The inaugural session was conducted in the Seminar Room of Department of Botany, PU, Chandigarh on 14th Nov, 2011. Dr. Swaranjit Singh (Senior Scientist, Institute of Microbial Technology (IMTECH), Chandigarh) was the chief guest at the inaugural session. In his address, he highlighted the benefits of microbes in cleaning our environment from pollutants/carcinogens, in food bio-processing, in production of biofuels, probiotics, vitamins, hormones, enzymes, etc. He also enlightened the participants about the rich microbial diversity of the country which should be conserved for the human welfare. The first technical session of the workshop began with a lecture on 'Microbial World: Fungi an Overview' by Prof. I.B. Prashar. This session mainly concentrated on the recent developments in the fungal world including new system of classification, morphology, benefits and harmful effects of fungi. The hands on training for the culturing of fungus like *Curvularia*, *Morchella* and *Aspergillus* was also given.



The second day of the workshop began with the lecture of Prof. Prince Sharma on 'Microbial World' in which he gave a brief introduction about the microbes, their testing, morphology, benefits and harmful effects. A detailed illustration of Yakult – a pro-biotic drink containing *Lactobacillus caesi* was given by him. In the practical session, the participants performed the basic practicals pertaining to the presence of microbes. The next technical session (Microbial World II) was conducted by Prof. Parveen Rishi. She gave a detailed information about the different types of media (chemical/synthetic/complex) used for culturing of micro-organisms. On the third day of the workshop, all the participants visited the lab in the Department of Microbiology, PU to see the results of the culturing they had done on the previous day of the workshop. After this, all the participants were taken to Central Instrumentation Scientific Lab, PU,

Chandigarh where Transmission (TEM) and Scanning (SEM) Electron Microscope along with Ultramicrotomy apparatus used for cutting the sample and mass spectrometer were demonstrated to the participants. The mounting of the sample to be used in SEM and TEM was also demonstrated.

Thereafter, in the next session, the participants were shown a presentation on Spirulina (a wonder algae). In the end, Prof. A.S. Ahluwalia spoke on the topic "Phycology: An Overview." His talk mainly concentrated on the recent developments in the field of phycology, along with its classification. He discussed the various types of life cycles (asexual, vegetative, coenobial, sexual-Haplontic, Diplontic, Diplohaplontic) which different types of algae undergo.

During the valedictory session, Dr. Paramjit Singh (Director Academic Staff College), Dr. Neelam Gulati Sharma, Prof. A.S. Ahluwalia, Prof. I.B. Prashar, Prof. Parveen Rishi and participants were present. Dr. I.S. Prashar presented a brief overview of the whole workshop. Dr. Neelam Gulati Sharma highlighted the importance of the workshop and insisted the participating teachers to practically apply the knowledge gained during the workshop in their schools. Mrs. Sangeeta Bedi and Mrs. Japinder Kaur on behalf of all the participants presented the feedback of the workshop. Certificate & Kits were distributed to the participants.

Activities of ENVIS Centre, Punjab

Punjab ENVIS Centre in the Council is collecting, collating and disseminating information on 'Status of Environment and Related Issues'. The Centre has a bilingual (English & Punjabi) website "www.punenvnis.nic.in". The Centre designed 46 web pages and uploaded information on eleven links on the Punjabi website.

Ms. Madhumita Joint Director, MoEF visited ENVIS Centre in the Council on 18th October, 2011. A presentation on the major activities of the Centre was given by Information



CloudSat Team
at Harike Wetland

Students at Harike Wetland
Interpretation Centre

Officer (ENVIS). Ms. Madhumita appreciated the work of Punjab ENVIS Centre. Further, she informed that ENVIS Sectt., Delhi is advising the adjoining State Centers to take guidance & training for website management and reporting from Punjab ENVIS Centre.

A field trip to Harike wetland was facilitated by Punjab ENVIS Centre for the students of PAP D.A.V School, Jalandhar. 300 students and 20 teachers visited the Harike wetland in two groups (130+170) on 6th and 14th December. The students and teachers welcomed the migratory birds. Further, the CloudSat team of the school also took an opportunity to share their understanding and experiences related to clouds and their types with the fellow students.

Roundtable Meeting on Sustainable Agricultural Mechanization in Asia held in Bangkok, Thailand

United Nations Asian & Pacific Centre for Agricultural Engineering & Machinery (UNAPCAEM) and Food & Agriculture Organization (FAO) had jointly organized a roundtable meeting on "Sustainable Agricultural Mechanization in Asia" at Bangkok, Thailand on 8th -9th December, 2011. The objectives of the roundtable were to discuss status of agricultural mechanization in Asia and identify constraints as well as best options for achieving environmentally sound sustainable agricultural mechanization in the region. Based on the work done by PSCST on agriculture and environment issues in its publication on "State of Environment Report- 2007" and ENVIS Centre website, UNAPCAEM and FAO invited two experts from PSCST to present papers relevant to roundtable objective. Dr. Neelima Jerath, Executive Director and Mr. Gurharminder Singh, Senior Scientific Officer (Env) attended the roundtable meeting as special invitees and presented the following papers:-

1. "Intensive Agriculture in Punjab: An Environmental Appraisal" by Dr. Neelima Jerath.
2. "Farm Mechanization in Punjab and its Social, Economic and Environmental Implications" by Mr. Gurharminder Singh.

The visit was sponsored by UNAPCAEM. The meeting was attended by representatives of 14 Asia-Pacific region countries including India, Asian Development Bank and



Dr. Neelima Jerath presenting her paper

PSCST publication being presented to Head UNAPCAEM

John Deere (Tractor Manufacture). The roundtable brought together key country stakeholders and experts on agricultural mechanization to discuss the modalities in developing Sustainable Agricultural Mechanization Strategies (SAMS) as well as gauge country interest in conducting SAMS in individual countries. A draft regional framework for SAMS was also developed after various country presentations, discussions and group work. Copies of PSCST publications 'State of Environment, Punjab-2007' and 'Climate Change, Biodiversity and Food Security in South Asian Region' were presented to Mr. Hiroyuki Konuma, Director General & Regional Representative FAO and Mr. LeRoy Hollenbeck, Head of UNAPCAEM by Dr. Neelima Jerath.

Project titled 'Field Demonstration of Cultivation & Processing of selected Aromatic Crops in Dhar Block of District Gurdaspur, Punjab'

Dhar block of district Gurdaspur is in Kandi area in the Shivalik foothills. It has small land holdings, undulating topography and problems of soil erosion, lack of soil moisture, low fertility and is primarily rainfed. Further, Lantana weed has heavily infested the natural pastures here, hence, frequent attack of stray animals on cultivated land resulting in heavy crop losses is very common in this region. In view of these problems, farmers of this block had urged Ministry of Science & Technology, Govt. of India to suggest S&T interventions for socio-economic development of the area. Thus, Department of Biotechnology, Govt. of India planned to initiate an end-to-end demonstration project in

farmer's field to demonstrate the feasibility of cultivation of selected aromatic crops in this block.

As PSCST had the experience of successfully implementing DBT supported project for promoting cultivation & processing of medicinal & aromatic plants in Talwara block of Kandi area, DBT invited Council to take up the above said project in collaboration with Kelkar's Scientific Research Centre (KSRC), Mumbai. KSRC has standardized protocols for cultivation and post-harvest processing of various aromatic crops and have demonstrated the same in various parts of the country. Initially, DBT provided project formulation budget to the Council. The Council thus organized series of brain-storming sessions and developed the detailed project proposal in coordination with KSRC, Regional Research Station, Gurdaspur of PAU and Unati Cooperative Marketing-cum-Processing Society and made presentation of the same before the expert committee of DBT. The expert committee recommended the proposal for funding and DBT-GOI has sanctioned the project at a total cost of Rs.143.83 lacs for 4 year duration. The project involves standardization of agro technologies under local conditions for optimal yield production of five aromatic crops viz. Lemon grass (*Cymbopogon flexuosus*), Citronella (*Cymbopogon winterianus*), Palmarosa (*Cymbopogon martini*), Patchouli (*Pogostemon cablin*) and Geranium (*Pelargonium graveolens*); evaluating their performance in 50 acre area in farmer's fields, organizing training programmes for capacity building of farmers, setting up two farm scale distillation units for value addition through extraction of essential oils and arranging marketing tie-ups for its buy-back through Keva Biotech, the industrial arm of Kelkar group and Unati.

Initiatives under project 'Scale up, demonstration & promotion of technology for production of natural vinegar and non-alcoholic self carbonated beverages'

The Council in collaboration with PAU, Ludhiana organized 2 programmes for generating awareness on benefits of natural vinegar / beverages as compared to their synthetic counterparts. The first awareness programme was organized at village Saholi, Nabha, Patiala which was attended by 60-70 participants. Further a two days hands-on training

workshop for prospective entrepreneurs was organized at Department of Microbiology, PAU on 8-9th November which was attended by 24 participants on technologies from various districts of the state. Expert lectures and practical demonstrations were delivered by scientists from Council, PAU and PAMETI.

Participation of PSCST in International Trade Fair (IITF, 2011), New Delhi

The Council participated in Punjab Pavilion at India International Trade Fair (IITF) from 14- 27th November, 2011 on theme "The Magic of gifted Hands" at Pragati Maidan, New Delhi. On request of PSIEC, the major activities of Council especially the Geographical Indicators (Phulkari), Biotechnology based programme for women & rural development and Cupola Furnace, Resource efficient bricks were showcased. The Council has taken up a pilot project with Deptt. of Forests, GOP, involving an NGO (Sai Dharam Singh Grover Foundation) for utilizing water hyacinth gainfully in making handicrafts items. These handicrafts were appreciated by the Chief Guest and other visitors.

Activities of Patent Information Centre

A one day Patent Awareness Workshop was organized on 14th December, 2011 by Patent Information Centre, Punjab State Council for Science & Technology (PIC-PSCST), Chandigarh at Indo Global College of Engineering, Abhipur. In all, 120 participants from various academic & technical institutes of the area participated in the workshop. The workshop was attended by faculty of Indo Global College of Engineering, Abhipur and Rayat & Bahra Institute of Management, Kharar.

The workshop started with inaugural session followed by two technical sessions. In the Inaugural session, Dr. Promila Kaushal, Principal, Indo Global College of Engineering, Abhipur welcomed the participants and emphasized on protecting one's Intellectual Property Rights in modern competitive knowledge society. The various objectives of the workshop were briefly explained by Mrs. Divya Kaushik, Scientist (PIC), Punjab State Council for Science & Technology, Chandigarh. Dr. Balwinder Singh

Sooch, Assistant Professor & IP Expert, Department of Biotechnology, Punjabi University, Patiala delivered the keynote address and spoke on 'Introduction to IPRs and Some Case Studies'. In the first technical session Mr. N. Ram Chandani, Ex. Assistant Controller of Patents, Patent Office, New Delhi spoke on 'Patenting System in India' and also informed about the patent scenario of India with respect to other countries. Mrs. Shikha Tejswi, IPR Scientist, TIFAC, DST, New Delhi spoke on 'Patenting in Chemical Invention & Role of PFC, TIFAC'. She motivated the female participants to compete in the Women Scientist Scholarship Scheme-WOS. In second technical session, Dr Preeti Arora Khetarpal, Project Associate (PIC), PSCST gave a lecture on Design Registration in India. Mrs. Divya Kaushik, spoke on 'Role and facilities provided by Patent Information Centre'. This was followed by discussions and doubt removal session. The participants evinced a keen response during the session and experts answered to specific (oral/written) queries raised by the participants. The workshop ended with vote of thanks by Mr. Kamal Khetarpal, Assistant Professor, Department of Civil Engineering, Indo Global College of Engineering, Abhipur. The certificates were also distributed to the participants.



A view of Participants at IGCE, Abhipur

Patents Searches and IPR Filing

Nine National and International patent searches were conducted for the following institutions from October 2011 till December 2011:

Panjab University, Chandigarh: 3; Punjabi University, Patiala :2; GSS School, Patiala:1; BFUHS, Faridkot: 1; DAVIET, Jalandhar :1; Chitkara Univ., Rajpura : 1

In addition, PIC has forwarded 2 patent applications to TIFAC for filing of patent.

Activities of Intellectual Property Facilitation Center (IPFC) for MSMEs of Punjab

Facilitations in IPRs filing by IPFC

- IPFC, Punjab facilitated filing of two Patent Applications from Oct, 2011 to Dec, 2011.
- Further three Design Applications filings in class 23-02 of Mr. Bali Ram, Dirba Mandi, Sangrur, facilitated by IPFC, Punjab in September 2011 have been registered by The Patent Office, Kolkata.

Participation in "Destination Punjab Fair"

PSCST participated in "Destination Punjab Fair" organized by Confederation of Indian Industry (CII) at Amritsar from 7th October to 10th October, 2011 by putting up an exhibition stall. The major objective of the fair was to project "Brand Punjab" for creating linkages for SMEs and creating networking opportunities across key sectors with special focus on agricultural & food sector. Various value added Amla products displayed by the processing unit, set up by the council at Talwara, attracted many visitors. Visitors from various MSMEs were also informed about IPR filing facilitation services of IPFC for MSMEs of Punjab. More than 80 specific queries related to services provided by PSCST were responded. Literature on IPRs and Resource Efficient Bricks were also distributed to the visitors.



PSCST staff responding to Queries of Visitors

Energy conservation through waste heat recovery system (recuperator) in pulverized coal fired steel re-rolling mills - A Success Story

Most of the small scale steel re-rolling mills in India are based on pulverized coal (fuel) for heating of raw materials like ingots, billets, blooms or scarp. There are around 1200 rolling mills in India out of which around 300 steel re-rolling mills are operating in the state of Punjab where around 4 million tons per annum of steel products are rolled using 2,44,000 MT pulverized coal as fuel worth ₹ 3400 million.

In a reheating furnace, combustion/flue gases generated from the combustion of pulverized coal leaves the furnace at very high temperature along with sufficient concentration of suspended ash particles. These furnaces operate at a thermal efficiency of 20-30%, resulting in wastage of precious heat energy. Various energy audits reveal 30-40% heat losses from flue gas only leaving the furnace at a very high temperature (400-650°C). Further, flue gases contribute to release of 6.70 lacs tons of CO₂ into the environment per annum from 300 steel re-rolling mills.

Existing Scenario of Recuperator: Recuperators and air heaters are waste heat recovery equipments that use the energy in hot waste flue gases to preheat combustion air. Realizing the high cost of fuel per ton of steel re-rolled as well as benefits of using preheated air for combustion, the steel re-rolling mills in Punjab are making consistent efforts to recover the waste heat from the flue gases by installing recuperators. However, these advantages are not realized by re-rolling mills as conventional recuperator has not met with reasonable success so far because of following reasons:

- Recuperators were not scientifically designed.
- The recuperators were found to be installed underground in which tubes get frequently choked due to deposition of solid particles (ash) present in the flue gases which results in less heat transfer from hot flue gases. Thus decreasing efficiency drastically. Further, underground installation does not provide requisite frequent access required for cleaning of tubes and for attending to maintenance.
- Effectiveness of conventional recuperator has been found to be in the range of 35-40%.

Technological Improvements in Recuperator: PSCST has developed and demonstrated Shell & Shell Type recuperator in re-rolling mills at Mandi Gobindgarh & Khanna under a project funded by Petroleum Conservation Research Association. The problems encountered in conventional

recuperator have been duly addressed while designing the shell & shell type recuperators. In the modified recuperators, the problem of choking gets minimized due to provision of shells instead of small dia tubes in earlier installed recuperators. Further by installing the recuperator above ground, the problem of accessibility for maintenance has been eliminated. The efficiency of modified recuperator has been increased by transferring heat using the principle of gas radiation especially in a straight duct feeding hot flue gas to a recuperator which provides a large radiation length, besides heat transfer by convection.

Salient features of both the types of recuperators are as :-

Parameter	Conventional	New demonstrated design
Effectiveness	35-40%	55-60%
Installation	Under ground	Over ground
Troubleshooting	Frequent choking & warping of tubes	Trouble free
Payback	12 months	6 months

Potential for Energy Savings: As stated above, coal worth ₹ 3400 million is being consumed per annum which can be saved by a minimum of 10% i.e. worth ₹ 340 million by utilizing waste flue gases. Besides, reducing the fuel consumption, it will also reduce the carbon footprint to the extent of 0.67 lacs tons of CO₂. Use of preheated combustion air will also result in reduction of scale losses worth ₹ 650 million per annum, along with improved quality of finished product.

For faster dissemination of the potential for energy savings, the Council organized a workshop on 'Energy Conservation Measures in Steel Re-Rolling Mills in association with All India Steel Re-Rollers' Association (AISRA) in December, 2011 at Khanna to highlight the energy conservation techniques



Conventional Recuperator shell & Tube Type installed under ground

Improved Shell & Shell Type Recuperator installed Over Ground

developed and demonstrated by Council. Beneficiary units appreciated the efforts of the Council and shared the benefits accrued with the participants. Most of the participating units have given their consent to avail the services of the Council in order to implement the various energy conservation measures in re-rolling mills.

Training/Conferences Attended

- United Nations Centre for Regional Development (UNCRD) and Japan International Cooperation Agency (JICA) had organized "A Group Training Course in Regional Development by Sustainable Use of Biodiversity" in Japan from 2nd October 2011 to 3rd November 2011" under the Technical Cooperation Programme of Govt. of Japan. The objective of training course was to facilitate regional development plans with the perspective of biodiversity conservation and its sustainable use. Mr. Gurharminder Singh, Senior Scientific Officer, PSCST who was nominated by Deptt. of Science, Technology & Environment, Govt. of Punjab was selected as one of the 7 worldwide positions available for the above said training. The other participants were from China, Ecuador, Chile, Philippines, Vietnam and Malaysia.

The training course covered the following components:

Module 1: Preliminary identification of the current situation of biodiversity and the issues

Module 2: Understanding Japan's administrative systems, specific measures and methodologies pertaining to biodiversity conservation

Module 3: Field visits, exercises, discussions and group presentations

Module 4: Formulating a draft Action Plan on the priority issues

An Action Plan for "Conservation, Management and Sustainable Use of Biodiversity of Punjab through People's Participation" was prepared and presented by SSO (Env.). UNCRD and JICA appreciated the Action Plan and advised SSO (Env.) to prepare a pilot project covering 5 blocks of Punjab and submit the same to JICA, India for availing financial assistance in the next financial year i.e. 2012-13.

- Scientist (PIC) attended a five days training programme on "Technology Diplomacy" at Jaipur organized by

Consumer Unity & Trust Society, Jaipur from 14th November to 18th November 2011. The training programme was aimed to provide an overview of basic principles of technology diplomacy, technology sourcing and assessment, acquisition, negotiations for technology transfer and Role of IPRs in Technology Transfer. The eminent speakers included Sh. Anthony De Sa, Director, UNIDO, Gurgaon; Sh. Vinay Kumar, Former Advisor & Head Technology Management Division, DSIR; Mr. T.C. James, Director, NIPO, New Delhi and Ms. Chitra Arvind, IP Attorney, Rajeshwari & Associates, Gurgaon.

- Scientist (PIC) attended the one day "India National forum on sharing of best practices on Intellectual Property for Micro, Small And Medium Sized Enterprises (MSMEs), policy makers and facilitation agencies" organized by Confederation of Indian Industry (CII), New Delhi in collaboration with Ministry of MSME, New Delhi & World Intellectual Property Organization, Geneva on 11th October 2011 at India Habitat Centre, New Delhi. Scientist (PIC) spoke on "Intellectual Property Policies, Program and Support Schemes for MSMEs in context to Punjab" and presented the various services being provided by IPFC, PSCST to MSMEs of Punjab.



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