

## Sustainable development and the role of science and technology\*

India with its 1.2 billion population needs to achieve sustainable development in various sectors such as energy, food and agriculture, health and many more. A three-day triennial national conference focused on three of the 17 sustainable development goals identified by the United Nations, namely water, energy and food and agriculture. The role of non-governmental organizations (NGOs) in sustainable development was highlighted. The conference focused on the status of each of these sectors, brought forth the challenges and showed the way forward.

Invited experts from the designated fields voiced their opinions. In addition, the conference included several contributory paper presentations and posters on the chosen topics. This report is a bird's-eye view of the proceedings.

In his inaugural address Shyam Asolekar (Indian Institute of Technology Bombay (IITB)) emphasized on frugal engineering and sustainable consumption, science and technology with innovations and preventive environmental strategy. He presented case studies such as wastewater treatment, rejuvenation of lakes and rivers using decentralized natural treatment system.

Anil Kakodkar (Technology Information, Forecasting and Assessment Council (TIFAC), New Delhi) gave a snapshot of India by the year 2035. He said that scientific research impacts the daily lives of people. Technology that emerges from research leads to higher human capabilities and results in growth in economy and consumption. There is a need to develop and adopt affordable and environmentally clean technological solutions. He stressed upon capacity building of youth to meet these aspirations. On one hand there is the question of empowering youth and leveraging their enhanced capabilities. And on the other hand is withstanding the competition from advanced countries while leveraging their current

technological capability to leapfrog in the global competition. This is a challenge that needs to be squarely met. He averred that technology vision is a prerequisite to align the needs of Indians in the years to come. This is precisely why the Technology Vision 2035 exercise was carried out by TIFAC, involving several thousand stakeholders with this objective.

In the first session on energy, Ranjan Banerjee (IITB) talked about sustainable energy for the future and challenges faced by India. Over the last 25 years there has been a significant progress in developing energy systems in India. Despite the best efforts by energy planners, shortages persist. Banerjee reviewed the status of renewable energy options and their possible role in the future sustainable energy systems in the country. India has recently signed the Paris Agreement for combating climate change. The aim is to have a cumulative installed capacity of 40% of non-fossil electricity generation by 2030 and reduce the emissions intensity of GDP by 33–35% (value of 2005). Banerjee affirmed that the country should not replace its reliance on fossil energy imports, mainly oil, with a dependence on renewable technology imports such as PV cells, modules and systems. The challenge of renewable energy penetration will need an emphasis on demand side response (DSR) or, demand-side management (DSM) and energy storage. DSM is the modification of consumer demand for energy through methods such as financial incentives and behavioural change through education.

The session included lectures describing various sustainable energy programmes such as the use of advanced biofuels, solar electricity solutions through horizontal and vertical expansions in rural areas, challenges in the renewable energy sector, urban resource conservation to save energy, use of thorium, use of nuclear energy for hydrogen generation and conservation of energy in everyday life, in addition to several contributory paper presentations.

P. P. Mujumdar (Indian Institute of Science, Bengaluru) in the session on water provided an overview of the current water scenario in India. Developing countries today are facing an impending

water crisis. Climate change such as increasing temperature is likely to change precipitation patterns, resulting in alteration in regional water availability.

The other topics that were discussed included innovations and challenges necessary for sustainability, ecological management of rivers in India, potable water, consequences of human-induced alterations to marine environment, and impact of climate change on water resources. Delegates presented contributory papers.

Efficient production of crops needs effective management of soil with minimum use of fertilizers, water management for optimal growth, use of crop rotation and post-harvest technologies. Newer innovative methods in food processing and packaging ensure that the products have longer shelf-life.

In the session on food and agriculture, S. P. Kale (Symbiosis International University, Pune) suggested an improvement in soil carbon levels of the agricultural fields, and management of agricultural residues and organized processing of food waste to be carried out on a regular basis to achieve increased organic carbon levels. He also stressed upon the need to preserve the agricultural produce through processing and improving the storage facilities. It is important to encourage farming and food processing sectors to attract younger talent, in addition to developing proper infrastructure.

Transforming rural India, tropical tuber crops, role of beneficial microorganisms in sustainable agriculture, post-harvest technology innovations, sustainable technologies for processing fruits and vegetables in India, role of packaging science and technology, and the role of geomatics in sustainable development were also touched upon.

Research in the laboratory should reach the society. Policy decisions for optimal use of resources should receive inputs from the society at large to ensure that all requirements are met. NGOs play a pivotal role in implementing the ideas and involving people in policy decisions. The last session on NGOs and citizen participation included the contribution of NGOs in the preservation of the ecosystem.

Chandrashekhkar Bhadsavle (Saguna Baug, Raigad district, Maharashtra)

\*A report on the XIII Triennial National Conference of Indian Women Scientists' Association (IWSA) on 'Sustainable Development in India: Role of Science and Technology' held during 2–4 December 2016 at the IWSA Campus, Vashi, Navi Mumbai.

talked about sustainable development of India using smart agriculture technology. Saguna rice technique is a unique zero-till conservation agriculture method, a type of cultivation of rice and related rotation crops without ploughing and transplanting rice on permanent raised beds. According to Bhadsavle, the technique reduced treacherous labour by

50%, cost of production by 40%, stopped emission of greenhouse gases and improved soil fertility.

Lalitha Dhareshwar (Indian Women Scientists' Association), Jayshree Phadnis (Vivekanand Education Society, Mumbai), V. S. Shivankar (Karmaveer Bhaurao Patil College, Navi Mumbai) and A. P. Jayaraman (IDP Education,

Mumbai) participated in the panel discussion on the way forward for sustainable development in India.

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## MEETING REPORT

### Organic farming\*

Organic farming is recognized as one of the recent trends in modern agriculture and lifestyle. It has a special value in the human society to a limited extent. Organic farming and vermicomposting issues need to be part of public awareness, learning and education for a sustainable agriculture. Awareness plays a significant role in promoting knowledge, skills and values necessary for the realization of noble goals of sustainability. For safe and better future of the generations to come, awareness and education play a central role in understanding and mitigating the problems related to modern agriculture.

A conference-cum-workshop was organized recently on vermicompost and organic farming with the overall goal of adopting organic farming to combat agricultural pollution and to provide hands-on training on vermicompost preparation rural to the farmers in remote locations. The theme was chosen to popularize organic farming and utilization of vermicompost in agricultural practice to reduce the impact of chemicals on the environment.

The major discussions were on awareness building, information exchange and the role of organic farming with particular emphasis on the challenges faced by farmers after application of chemical fertilizers and pesticides. Deliberations were made on three themes. Under the theme 'Organic farming: approaches and

benefits', participants discussed the current status and different aspects of organic farming in India and abroad, and perspectives on how rural farmers in remote locations can prepare for organic farming. Researchers presented their work on their understanding of organic farming and how one can change the entire panorama for this green practice. They shared their experiences on various positive as well as negative aspects associated with organic farming, its awareness status with special emphasis on the North Indian climate, agricultural tools and materials, and agricultural practices.

Under the second theme, the impacts of agro-chemicals on environment were discussed. P. B. Chauhan (SEHAT-India, Delhi) pointed out the environmental problems arising due to the application of chemical fertilizers and pesticides in agricultural fields. He presented almost every possible route of pollution arising in the agricultural sector. He also emphasized that agriculture has a major influence on the economy of our nation. We need to adapt ourselves according to nature and not oppose it by using chemical fertilizers and pesticides. Conventional agricultural practice has a great potential in rural India, and it can be implemented after minor modifications. Utilization of agri-waste in crop fields, in-house Gobar gas production, and nature-friendly agriculture with less application of chemical fertilizers, insecticides and pesticides are the major key factors for successful and sustainable agriculture.

The third theme dwelt on production and utilization of vermicompost and agricultural pollution mitigation strategies mostly through vermitechnology and integrated pest management. Nitin Pandit (Dhara Organics, Khurja) emphasized on the procedure of vermicompost manufac-

turing and maintaining the vermi-beds in local circumstances. He explained how to adopt vermitechnology in the fields, and how to develop field methods and technologies to produce vermicompost and reduce the impacts of agro-chemicals.

R. Jaswant (SEHAT-India, Meerut) explained the major programmes and initiatives recently carried out by his organization in different arenas. Avnish Chauhan (Phonics Institute, Roorkee) stressed on the need for organic farming and a green society. He lamented how some farmers are using nutrient-rich chemical fertilizers for instant growth of plants. This is resulting in soil fertility problems due to lack of proper enrichment and conditioning of agricultural soil because of changes in soil chemistry and texture. He also stressed on the need to motivate the youth to come forward to adopt organic farming for a better future.

A hands-on training on vermicompost preparation was given to the farmers. Pankaj Saini (SEHAT Organic, Khurja) and Nitin Pandit (Dhara Organic) explained the facts related to vermitechnology application in rural agriculture. Farmers showed deep interest and raised several questions during the training session. In parallel, a poster competition was organized for students of village vicinity, which was appreciated by all. Many farmers felt that such programmes must be organized frequently in rural areas. Discussion among the farmers and experts on various issues made this successful and fruitful event, especially in a remote location.

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\*A report on the conference-cum-workshop for farmers on 'Vermicompost and Organic Farming' organized by the Society for Environment, Health, Awareness of Nutrition and Toxicology (SEHAT-India) on 15 November 2016 with the Junior High School, Jamaalpur Maan, Bijnore with the support of a few progressive farmers.