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NAM S&T Newsletter

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Centre for Science and Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre)

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FROM THE DG'S DESK

Warmest Greetings!!

The NAM S&T Centre in partnership with the Ferdowsi University of Mashhad (FUM), Mashhad, Iran successfully organised an International Workshop on 'Drought Management and Desertification Control' at FUM during 22-24 May 2017, which was attended by 72 scientists, experts and professionals from our 15 member countries - Bangladesh, Bhutan, Cuba, India, Indonesia, Iraq, Malaysia, Mauritius, Myanmar, Nepal, Nigeria, Palestine, Sri Lanka, Uganda and the host country Iran. The event got concluded with the adoption of Mashhad Resolution on the Workshop theme.

The 3rd NAM S&T Centre - DST (South Africa) Training Programme on Minerals Processing and Beneficiation aimed at capacity building in this area commenced at MINTEK, South Africa on 17th May 2017, in which 20 trainees from 12 NAM countries are being hosted by South Africa for three months duration.

We had an excellent response to our announcement for the Joint NAM S&T Centre – ZMT Bremen (Germany) Fellowship in Tropical Coastal Marine Research for the year 2017. The applications for this award will shortly be forwarded to ZMT for selection of five Fellows.

As regularly reported, the Centre has been successfully implementing the 'Research Training Fellowship for Developing Country Scientists (RTF-DCS)' scheme since last five years. An interactive get together of 11 RTF-DCS Fellows (from Bangladesh, Cameroon, Egypt, Mongolia, Myanmar, Nigeria, South Africa, Sudan and Venezuela) affiliated with the Indian institutions located in and around Delhi and their Indian Research Supervisors was organised at the Centre on 6th May 2017.

We are now preparing for our 14th Governing Council meeting to be held in Putrajaya, Malaysia on 5-6 September 2017.

The 2nd Training Workshop by the Centre on 'Industrial Biotechnology' to be held on 22-24 August 2017 at Harare, Zimbabwe jointly with the Ministry of Higher and Tertiary Education, Science and Technology Development and the National Biotechnology Authority (NBA) of Zimbabwe has already been announced and there is enthusiasm among the scientific community to attend the same.

Happy Reading!

(Arun P. Kulshreshtha)

Centre Organised

International Workshop on

Drought Management and Desertification Control

Mashhad, Iran, 22-24 May 2017

Desertification is land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities. This process has already affected one sixth of the world's population, 70% of all drylands of ~3.6 billion hectares, and one quarter of the total land area of the world. The most obvious impact of desertification, in addition to widespread poverty, is the degradation of 3.3 billion hectares of the total area of rangeland, constituting 73% of the rangeland with a low potential for human and animal carrying capacity; decline in soil fertility and soil structure on about 47% of the dryland areas constituting marginal rain fed cropland; and the degradation of irrigated cropland, amounting to 30% of the dryland areas with a high population density and agricultural potential. The priority in combating desertification involves implementing the preventive measures for lands that have still not degraded, or are only slightly degraded. However, the severely degraded areas also need to be kept in focus. In combating desertification and drought, the participation of local communities, rural agencies, national governments, non-governmental organisations (NGOs) and international and regional organisations is essential.

Keeping the above in view, the NAM S&T Centre in partnership with the Ferdowsi University of Mashhad organised an International Workshop on 'Drought Management and Desertification Control' during 22-24 May 2017 at Ferdowsi University, Mashhad, Iran which brought various stake holders, viz. scientists, experts and professionals engaged in R&D, policy making and implementation, to a common platform for upgradation of their skills and sharing views and experiences in the drought management and desertification control.

The Inaugural Session commenced with a welcome note by Dr. Adel Sepehr, Assistant Professor, Ferdowsi University of Mashhad (FUM), Mashhad and Prof. Mohammad Kafi, President FUM and Professor, Department of Agronomy, Faculty of Agriculture, FUM. In his address, he highlighted the need to

INTERNATIONAL WORKSHOP ON DROUGHT MANAGEMENT AND DESERTIFICATION CONTROL
MASHHAD, IRAN, 22-24 MAY 2017

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undertake appropriate policies and programmes for drought management and desertification control in developing countries. He further indicated various academic and research programmes being carried out in these areas in his University. Mr. Mohammad Maghdoori, Deputy of General Governor of Khorasan-Razavi Province, Mashhad in his remarks spoke about the problems of drought and desertification and various initiatives being undertaken in the Khorasan-Razavi Province in this regard. Mr. M. Bandyopadhyay, Senior Expert & Administrative Officer, NAM S&T Centre presented the genesis of the event touching upon the basic issues related to drought management and desertification control and also gave a short description of the functions and activities of the NAM S&T Centre. The Chief Guest, Dr. Hossein Dehghanisanij, Agricultural Research and Education Organisation, Ministry of Jihad-e-Agriculture, Islamic Republic of Irangave a presentation on 'Water Productivity National Plan (WPNP)' of the Government of Iran for Drought Management and Desertification Control.

The Mashhad International Workshop was attended by 72 scientists, experts and professionals from 15 developing countries, including Bangladesh, Bhutan, Cuba, India, Indonesia, Iraq, Malaysia, Mauritius, Myanmar, Nepal, Nigeria, Palestine, Sri Lanka, Uganda and the host country Iran.

The foreign participants were from Bangladesh [Mr. Md. Shafiqul Islam, Assistant Professor, University of Liberal Arts, Dhaka]; Bhutan [Mr. Chenga Tshering, Senior Land Management Officer, National Soil Services Centre, Department of Agriculture, Ministry of Agriculture and Forest, Thimphu]; Cuba [Dr. Rein Orlay Cruz Diaz, Specialist, Ministry of Science, Technology and Environment, Vedado, Havana]; India [Dr. Ram Paul Dhir, Former Director and Principal Scientist, Central Arid Zone Research Institute, Jodhpur and Dr. V.M. Tiwari, Director, CSIR-National Geophysical Research Institute, Hyderabad]; Indonesia [Dr. Nora Herdiana Pandjaitan, Head, Civil and Environmental Engineering Department, Bogor Agricultural University, Bogor]; Iraq [Dr. Baydaa Hassan Alwan, Head of Group, Fertilizer Technology, Soil &Water Resource Centre, Agricultural Research Directorate, Ministry of Science and Technology, Baghdad]; Malaysia [Mrs. Nurazlina Binti Mohd. Zaid, Senior Assistant Director, Department of Drainage and Irrigation, Ministry of Natural Resources and Environment, Kuala Lumpur]; Mauritius [Mr. Jhumka Zayd, Assistant Conservator of Forests, Ministry of Agro Industry, Food Security/Forestry Service, Phoenix]; Myanmar [Mr. Aung Myint, Assistant Lecturer, Remote Sensing Department, Mandalay Technological University, Mandalay]; Nepal [Dr. Buddhi Ratna Khadge, Secretary, Nepal Academy of Science & Technology, Lalitpur]; Nigeria [Mr. Oseni Adedayo Olusegun, Scientific Officer I, Department of Chemical Technology, Federal Ministry of Science and Technology Headquarters, Abuja, and Mr. Abubakar Shehu Kollere, Assistant Director, Raw Material Research and Development Council, Abuja]; Palestine [Mr. Fadel A.A. Almahariq, Director, Technical Department, Hebron Agricultural Directorate, Ministry of Agriculture, Hebron]; Sri Lanka [Prof. Prathiba Aruni Weerasinghe, Rajarata University of Sri Lanka, Anuradhapura]; Uganda [Dr. Kisamba Mugerwa, Executive Chairperson, National Planning Authority, Kampala, and Mr. Tumusiime Collins, Science Officer, International Liaison, International Collaborations Unit, Uganda National Council for Science and Technology, Kampala]. The NAM S&T Centre was represented by its Senior Expert, Mr. M. Bandyopadhyay and Ms. Geeta, Research Associate.

The overall programme of the Workshop was conducted in the Aboonasr Conference Hall of Ferdowsi University of Mashhad in five technical sessions and a Concluding Session.

The presentations made by the participants from the developing countries were on:'Is Groundwater Table depleting in Barind Tracts over Times?' by Mr. Md. Shafiqul Islam; 'Land Degradation and SLM Technologies to combat Degradation and Drought in Bhutan' by Mr. Chenga Tshering; 'Diagnosis of Degradation and Vulnerability of Desertification in Cuban Lands using Tele detection and Geographical Information Systems - Climate Change Future Scenarios' by Dr. Rein Orlay Cruz; 'Problem of Desertification in Developing Countries- A Case Study of the Indian Thar Desert'by Dr. Ram Paul Dhir; 'Water Loss during Recent Droughts in India-

Group Photo
INTERNATIONAL WORKSHOP ON DROUGHT MANAGEMENT AND DESERTIFICATION CONTROL
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Satellite based Estimates' by Dr. V.M. Tiwari; 'Water Management and Infrastructure Planning to cope with Water Scarcity in Drought Prone Areas in India' by Ms. Geeta; 'Facing Drought Problems in Indonesia' by Dr. Nora Herdiana Pandjaitan; 'Sulphuric Acid as a Chemical Amendment for increasing Efficiency of Reclamation Process of Salt Affected Soils of Iraq' by Dr. Baydaa Hassan Alwan; 'Application of Standardized Precipitation Index (SPI) Computation for Drought Monitoring and Management in Bukit Merah Dam, Malaysia' by Mrs. Nurazlina Binti Mohd. Zaid; 'Strategic Plan for enhancing the Tree Cover in Mauritius' by Mr. Jhumka Zayd; 'Drought Assessment using Remote Sensing and GIS under Climate Change in the Mandalay Region, Myanmar' by Mr. Aung Myint; 'Effect of Drought and Its Management in Nepal' by Dr. Buddhi Ratna Khadge; 'Drought Management and Desertification Control in Africa: Issues and Mitigation Strategies with Possible Short and Long Term Solutions' by Mr. Oseni Adedayo Olusegun; 'Drought Management and Desertification Control in Northern Nigeria' by Mr. Abubakar Shehu Kollere; 'Drought Management through the Application of Water Harvesting Techniques in Soumarah Watershed-South West Bank' by Mr. Fadel A.A. Almahariq; 'Drought Management and Water Harvesting in Sri Lanka' by Prof. Prathiba Aruni Weerasinghe;'Capacity Building and Criticality of People's Participation in Drought Management and Desertification Control in Uganda, East Africa' by Dr. Kisamba Mugerwa; and 'Drought Management and Desertification Control' by Mr. Tumusiime Collins.

Four presentations were made by Iranian participants: 'Climate Change and Adaptation Strategies for Water Scarcity in Iran' by Prof. Ali Hassanli, Adjunct Professor, University of South Australia, and Emeritus Professor-Shiraz University, University of Kurdistan, Hewler; 'Desertification, Wind Erosion and Dust Emission in Iran' by Dr. Hamidreza Abbasi, Desert Research Division, Research Institute of Forests and Rangelands, Tehran; 'Drought Monitoring and Forecasting in Iran' by Dr. Javad Bodagh Jamali, Professor, College of Environment (COE), Karaj; and 'Drought Impacts on Water Resources in Iran' by Prof. Abolfazl Mosaedi, Professor, Faculty of Natural Resources and Environment, Ferdowsi University of Mashhad.

In the Concluding Session, a 'Mashhad Resolution on Drought Management and Desertification Control' was extensively deliberated upon under the leadership of a Panel comprising Prof. Ali Hassanli, Iran; Dr. Ram Paul Dhir, India and Dr. A. Farid Hosseini, Iran. At the end, the finalized Resolution with several recommendations was unanimously adopted by the participants for its submission to the concerned ministries, agencies and other authorities in their countries. Subsequently, in his address, Dr. Mahmoud Molanejad, Vice-President of International Cooperation of IROST, Iran once again emphasised the importance of Drought Management and Desertification Control and underlined the need for greater cooperation among the developing countries for the same. Certificates of Participation were handed over to the Workshop participants by Prof. Kafi, Mr. M. Bandyopadhyay and Dr. Ali Akbar Moayedi. The Session concluded with the Vote of Thanks on behalf of the participants by Dr. Kisamba Mugerwa to Prof. Kafi and the entire team of FUM for the excellent hospitality provided to the participants and the fine arrangements made for conducting the Workshop.

Participants visit the FUM Campus

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During the workshop, the participants got an opportunity to visit the FUM Campus, and the Arid Landforms, Land Subsidence Features, Combating Desertification Actions, and Khayyam and Attar's Tomb in Binaloud-Nishabour, Mashhad.

Mashhad Resolution On Drought Management and Desertification Control

WE, THE DELEGATES to the 3-days International Workshop on "Drought Management and Desertification Control", jointly organised by the Centre for Science and Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) and Ferdowsi University of Mashhad, and Khorasan Razavi Agricultural and Natural Resources Research and Education Center (KRANRREC), at Mashhad, Iran during 22nd – 24th May 2017, comprising scientists, researchers, academicians and policy makers from Bangladesh, Bhutan, Cuba, India, Indonesia, Iran, Iraq, Malaysia, Mauritius, Myanmar, Nepal, Nigeria, Palestine, Sri Lanka and Uganda;

RECOGNIZING that though drought, desertification and land degradation in dry lands have been under focus at national and international levels for the past four decades and that some reclamation efforts have also followed, the problem has persisted and even aggravated in some respects;

HAVING considered that the consequences of these environmental issues and the affected populations are more serious particularly in the developing world, there is paucity of enabling resources, and/or inadequacy of expertise that constrain effective desertification control and development efforts;

HAVING deliberated upon the experience over the years, it is seen that the problem of land degradation cannot be tackled by just physical remedies of one or the other types alone and the underlying driving factors namely, the socio-economic milieu and the entailing exploitative systems need an equal attention;

TAKING into account that manifestations of desertification and drought are strongly inter-linked and that major accentuation of the adverse consequences and land degradation and human strife occur during prolonged periods of deficit rainfall or drought, planning and development strategies need to have an inbuilt recognition and preparedness for such eventualities;

UNANIMOUSLY RESOLVE THAT: The Mashhad International Workshop has helped in discussing issues and strategies relevant to enhancement of land productivity on sustainable basis in some of the affected countries with varied socio-cultural levels of economy and nature of biophysical resources to mutual advantage;

AND RECOMMEND THE FOLLOWING

- Since the cost and effort involved in land degradation control are much higher than the prevention, early recognition of the problem and matching conservation-oriented management effort should form a cornerstone of long-term plans of action.
- The recent driving cause underlying all natural resources degradation problems in most countries is the pressure inducted by human activities. Even with possible resource conservation and development effort, the land production may be inadequate to meet the current and aspirational needs. Therefore, as a long term strategy it is important to generate alternative, non-farm employment potential in different sectors of economy.
- Experience over the decades has shown that though technologies have worked in restoring degraded lands, the resultant gains have got undermined to a considerable measure by inadequate management regime arising from socio-economic disparities and community disharmony.
- The problem of safeguarding ecological integrity/services and ensuring livelihood security are constrained by inadequacy of required resource base and capacity and hence a need does exist for a stronger international cooperation amongst the affected and other nations across the world.
- Evaluations have shown that government policies and programs for rehabilitation of degraded lands have not been integrated adequately with the concerns and participation of local stakeholders. Immense amount of emphasis should be placed on the concerns, capacity limitations and expectations of the directly affected populations.
- Climate change and global warming severely impact the performance of agricultural and natural resources sectors and hence adaptation and mitigation strategies are emphasised.
- The time has come that developing countries make rigorous and scientifically sound analysis of all the mitigation and adaptation efforts. Such efforts will come very handy in future course of action and in experience-sharing workshops at the forthcoming Rio+20 and UNCCD international activities.
- Training, education and capacity building are essential components of the strategy for effective desertification control.
- Indigenous knowledge reflects a huge understanding of potentialities and thus should be appropriately adopted as an important component of resource-constrained regions management and development.
- Non-Governmental Organizations can play a critical role in capacity development and in this regard should be appropriately involved and provided necessary support in various programs and projects.
- Research and new technologies are crucial in the mitigation and adaptation of the impact of climate change and desertification and should be included in all projects.
- Drought and desertification are global issues and hence involvement of all countries in management and control is seriously needed.

THUS RESOLVED AND ADOPTED ON THE 23rd MAY 2017 AT MASHHAD, I.R. IRAN

GET-TOGETHER OF RTF-DCS FELLOWS IN NAM S&T CENTRE

In order to provide an opportunity to the researchers from various countries working in Indian academic and R&D institutes of India under the Research Training Fellowship for Developing Country Scientists (RTF-DCS) scheme to know about the working of the NAM S&T Centre and also to interact among themselves, the Centre on 6th May 2017 organised a get together of the Fellows affiliated with the institutions situated in the National Capital Region and a number of other cities near Delhi. The respective Indian Research Supervisors were also invited to join the assembly.

Eleven RTF-DCS Fellows, who attended the get-together were from Bangladesh (Ms. Muslima Khatun, Scientific Officer, Plant Biotechnology Division, National Institute of Biotechnology); Cameroon (Mr. Eke Pierre, Laboratory of Soil Microbiology and Biotechnology, Faculty of Science, University of Yaoundé); Egypt (Dr. Mohammad Reda Mahmoud ABD Elnaby Ismail, Maize Breeder, Maize Research Department, Agricultural Research Center, Cairo); Mongolia (Mrs. Odgerel Bumandalai, Researcher, Institute of General and Experimental Biology, Mongolian Academy of Sciences); Myanmar (Dr. Phyoe Wai Htun, Associate Professor, Department of Biotechnology, Mandalay Technological University); Nigeria (Mr. Esan Adewale Michael, Lecturer II, Biochemistry Department, University of Ibadan and Dr. Malachy Chigozie Ugwu, Lecturer, Department of Pharmaceutical Microbiology & Biotechnology, Faculty of Pharmaceutical Sciences, Nnamdi Azikiwe University); South Africa (Mr. Phakwago Potego Steward Kgaditsi, PhD Student (Dairy Farming), Department of Agriculture & Game Ranch Management, Faculty of Science, Nelson Mandela Metropolitan University, Port Elizabeth and Mr. Amoo Oseni Taiwo, Research Fellow, Department of Civil Engineering and Surveying, Durban University of Technology); Sudan (Mr. Ramzy Ahmed Yousif, PhD Student and Lecturer, Department of Fisheries & Wildlife Science, College of Animal Production Science & Technology, Sudan University of Science and Technology - SUST); and Venezuela (Ms. Gloria Mercedes Escalona Pazo, Instructor Professor, Chemical Technology Department, Science Facility, Universidad Central de Ciencias - UCV).

Group Photo of RTF-DCS Fellows with their Indian Research Supervisors

The Research Supervisors and other Indian scholars accompanying the foreign researchers were Dr. MK Reddy, Group Leader, Crop Improvement Group, International Centre for Genetic Engineering and Biotechnology (ICGEB), New Delhi; Dr. A. Kumar, Principle Scientist, Division of Plant Pathology, Indian Agriculture Research Institute (IARI), New Delhi; Prof. Malini Shariff, Head, Department of Microbiology, Vallabhbhai Patel Chest Institute, Delhi University (DU), Delhi; Ms. Komal and Ms.Tandrali Baruah, Sri Venkataswera College, University of Delhi (South Campus), New Delhi; Dr. Mukhtar A. Khan, Professor & In Charge, Fish Nutrition Research Laboratory, Aligarh Muslim University (AMU), Aligarh; Dr. Rajdeva Singh, Research Management & Outreach Division, National Institute of Hydrology (Ministry of Water Resources, GoI) Roorkee; Dr. Felix Bast, Assistant Professor, Centre for Plant Sciences, Central University of Punjab, Bathinda; and Dr. Samir Humedan, National Dairy Research Institute (NDRI), Karnal.

Prof. Dr. Arun P. Kulshreshtha, Director General, NAM S&T Centre welcomed the visiting foreign scientists and congratulated them at having been selected as Fellows under the RTF-DCS scheme for their research training in India. He also thanked the Indian research supervisors for extending their help in implementing this important Destination India Fellowship programme. He then briefly spoke on the background, objective and functions, programme and achievements of the NAM S&T Centre.

Mr. M. Bandyopadhyay, Senior Expert & Administrative Officer, NAM S&T Centre provided the genesis of the RTF-DCS programme and explained the procedures followed for inviting the applications and for selection of the candidates. He expressed hope that the visit of the foreign scientists to India under the RTF-DCS scheme would be fruitful in the fulfilment of their research objectives.

The foreign scientists thanked the NAM S&T Centre for giving them the opportunity to work in prestigious research institutions of India which will greatly help them in their career. The Indian scientists expressed happiness that the NAM S&T Centre and DST have come together to start such a useful fellowship programme and offered to extend their cooperation in implementing this activity in the future years.

3RD JOINT NAM S&T CENTRE – DST / MINTEK TRAINING FELLOWSHIP PROGRAMME ON MINERALS PROCESSING AND BENEFICIATION OFFICIAL OPENING

Dr. Kavita Mehra, Publication Adviser, NAM S&T Centre was deputed to visit South Africa for attending the Official Opening of the 3rd Joint NAM S&T Centre – DST (South Africa) Training Fellowship on Minerals Processing & Beneficiation at Randburg on 17th May 2017. This Fellowship provides opportunity to the scientists and technologists from the developing countries for affiliation with MINTEK, South Africa for a period of three months to address the skills gap in the minerals beneficiation value chain and to get exposed to minerals processing technologies and undergo in-service training attached to the existing MINTEK programmes. Under the scheme, DST provides a subsistence allowance of US$300 per month, in South African Rand, to the selected Fellows for meals and out-of-pocket expenses in South Africa for the duration of the Fellowship in addition to free accommodation, but the Fellows are required to make own arrangement for their international travel.

In this third batch of the fellowship programme, 20 Fellows were selected from 12 countries, viz., Botswana, Burkina Faso, Egypt, Ethiopia, Guyana, Nigeria, Palestine, South Africa, Sri Lanka, Sudan, Zambia and Zimbabwe, of which Botswana and Sudan are still not the members of the NAM S&T Centre, even though these countries are the members of the Non Aligned Movement (NAM) and are actively taking part in various other activities of the Centre.

The participants of the Official Opening of the Training Programme included the High Commissioner of Sri Lanka to South Africa, H.E. Mr. Sunil De Silva; a Diplomat of the Embassy of Egypt in South Africa; Mr. Daan Du Toit, President of the 13th Session of the Governing Council of the NAM S&T Centre and Deputy Director-General, International Cooperation and Resources, Department of Science & Technology (DST) of South Africa; Mr. Cecil Mosaka, Director for Multilateral Cooperation, DST; and Mr. Alan McKenzie, General Manager (Technology), MINTEK besides several senior officials of DST and MINTEK.

After the welcome remark by Mr. Mckenzie, Ms. Nondumiso Dlamini from the Council for Geosciences, South Africa who had undertaken the training programme in 2016 mentioned her experiences to be an eye opener with an exposure to broad spectrum of issues in the areas of interest which had tremendously benefitted all the participants.

Dr. Kavita Mehra briefly mentioned about the Training Fellowship on Minerals Processing and Beneficiation and also gave a presentation on the genesis, functions and activities of the NAM S&T Centre.

In his Keynote address, Mr. Daan Du Toit mentioned about the interest shown and in initiating the training fellowship programme by the Honourable Minister of Science and Technology of South Africa. He said that five primary areas for economic growth were declared by the Government, Mineral Processing and Beneficiation being one of them, and the emphasis of the Minister of S&T had been to invest in people for human resource development in this area. He further said that beyond this programme, there was a need for networking and bringing togetherness amongst researchers so that there could be solidarity and friendship beyond borders.

Mr. Sunil De Silva spoke on the benefits of the programme as a platform to grab the best opportunities and said that it was the golden opportunity for the participants to gain knowledge and share the expertise with others.

Participation of Centre's Scientists in Scientific Events

11th and 13th April 2017	**Ms. Rashmi Srivatava,** Research Associate attended the National Consultation on **'Sustainable Development Goal 5 (Gender Equality) and 2 (Zero Hunger)'** organised by the Research and Information System for Developing Countries (RIS) at India Habitat Centre, New Delhi.
28th April 2017	**Ms. Meenu Galyan,** Research Associate attended the National Roundtable Consultation on **'Responsible Research and Innovation (RRI): The Indian Perspective'** organised by the Research and Information System for Developing Countries (RIS) at India Habitat Centre, New Delhi.
17th May 2017	**Dr. Kavita Mehra,** Publication Adviser attended the official opening of the 3rd joint NAM S&T Centre – DST / MINTEK Training Fellowship Programme on **'Minerals Processing & Beneficiation'** in Randburg, South Africa.
22nd – 24th May 2017	**Ms. Geeta,** Research Associate participated in the International Workshop on **'Drought Management and Desertification Control'** jointly organised by the Centre for Science & Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) and Ferdowsi University of Mashhad (FUM) at Mashhad, Iran in which she presented a paper on 'Water Management and Infrastructure Planning to cope with Water Scarcity in Drought Prone Areas of India'.
22nd June 2017	**Ms. Keerti Mishra** and **Ms. Meenu Galyan,** Research Associates attended the Keynote Address by Mrs. Sushma Swaraj, Minister of External Affairs, Government of India on **'ASEAN-India Partnership'** in New Delhi.

Science and Technology News in the Developing World

Brazil: Nanoparticles coated with Antibiotic eliminate Drug-Resistant Bacteria

A new strategy to combat antibiotic-resistant bacteria has been developed by researchers at the National Energy & Materials Research Center (CNPEM) of the Brazil Ministry of Science, Technology and Innovation (MCTI) at Campinas. The method consists of coating nanoparticles that are made of silver and silica – potentially toxic to both microorganisms and human cells – with a layer of antibiotic, where owing to chemical affinity, the resulting nano pharmaceutical acts only on the pathogens and is inert to the organism. Antibiotic is used as a sort of bait to have the nanoparticles target the bacteria with a large amount of the drug. The combined action of the drug with the silver ions proves capable of killing even resistant microorganisms. There are commercial drugs that contain nanoparticles, which typically serve to coat the active ingredient and extend its lifetime inside the organism. The strategy is different in this case where the surface of the nanoparticles is decorated with certain chemical groups that direct them to the site where they're designed to act, so they're highly selective. The effectiveness of the nano antibiotic compared with that of conventional ampicillin was assessed using two different strains of *Escherichia coli*, a bacterium that normally inhabits the gut flora of mammals and that can cause food poisoning in certain situations. In the non-resistant strain, nearly 100% of the microorganisms died when attacked both by ampicillin in its conventional form and by the drug combined with silver. In the resistant strain, however, only the nano antibiotic was effective. The next step was to test the effect on human kidney cells. The silver and silica nanoparticles without ampicillin proved highly toxic, while conventional ampicillin and ampicillin combined with silver were found to be equally safe. Confocal microscopy images show that besides being non-toxic, the nanoparticle coated with ampicillin doesn't interfere with the cell cycle. The phases of mitosis take their course without any alterations. The same strategy could be used to combat other bacterial species that have developed resistance to antibiotics. In addition, the drug applied to the surface of the nanoparticle can be varied in order to treat different types of infection. However, the system has one drawback. Because silver and silica are inorganic, the nanoparticles are not metabolized and thus tend to build up in the organism. And one still does not know where the build-up occurs or what effect it has, which would require the tests in animals. One possibility would be to use a second antibiotic with a different component than silver in the core. Another would be to develop a nanoparticle small enough to be excreted in urine.

Source: Agência FAPESP Newsletter, 14th June 2017

Brazil: New Chip to detect Dengue Virus

The epidemiological statistics for mosquito-borne diseases are staggering. In Brazil, according to the Ministry of Health's Surveillance Department (SVS-MS), about 1.5 million cases of dengue were reported in 2016, as well as some 272,000 cases of chikungunya fever and 215,000 cases of Zika fever. 143,000 cases of malaria were notified in 2015. Strategies to defeat these epidemics include prevention by combating the various species of mosquito that transmit the viruses concerned, development of vaccines, epidemiological surveillance with rapid diagnosis of the sick, and clinical and outpatient treatment. In the sphere of epidemiological surveillance, research groups in Brazilian universities are developing low-cost biosensors to speed up diagnosis. For example, the Biopol group in the Chemistry and Biochemistry & Biology Departments of the Federal University of Paraná (UFPR) in Curitiba are developing an immunochip to detect dengue. Dengue is detected indirectly in this sensor. What it detects is not the virus but an antigen that is characteristic of infection by dengue. This is done by means of antibodies immobilised on the biosensor, which rapidly detects the presence of the antigen in a blood sample, indirectly diagnosing infection. The immunochip can detect the presence of molecules of the antigen (NS1) for dengue in blood serum, quickly providing a positive or negative result. The results of the study have been published in the journal *Biosensors and Bioelectronics*. The sensor is based on a technology known as quartz crystal microbalance (QCM), designed to detect amounts of a molecule such as a protein on the order of nanogram (billionths of a gram). This is made possible by using an electrochemical property called the piezoelectric effect – the ability of certain materials, especially quartz crystals, to generate a voltage when subjected to mechanical stress or vibration. Piezoelectric sensors are devices that use the piezoelectric effect to measure changes in pressure, acceleration, temperature, strain or force by converting them to an electrical charge. A microbalance uses the reverse piezoelectric effect. In the specific case of the new immunochip, an electrical charge is applied to the crystal and the frequency of this signal changes when molecules of the dengue antigen NS1 present in a sample are deposited on the crystal. Like the immunochip, the QCM-D also uses the reverse piezoelectric effect. However, its precision is far greater and it can also detect clock changes. IQ-USP's microbalance (QCM-D), as well as the Biopol group's two devices (a QCM purchased with the support of CAPES, the Ministry of Education's Office for Faculty Development, and a QCM-D purchased with the support of FINEP, the Brazilian Innovation Agency) confirmed the presence of NS1 in all the blood samples contaminated by addition of the dengue antigen, thus validating detection via the immunochip.

The immunochip was developed to detect molecules of the dengue antigen in any material in a liquid medium, but the principle can be used to detect other diseases, and in environmental or public health applications to detect contaminants in water, food or elsewhere in the environment. The substrate for the immunochip is an imported quartz crystal on which the other components are deposited in thin layers. The first layer on top of the crystal is gold, and the next is a polyethylenimine film. The third and last layer is a thin film of oxidised nanocrystals derived from chemical treatment of cellulose industrial waste and prepared so as to react chemically in the presence of the dengue antigen. The chemical reaction leads to a change in the response of the nanocrystals, which is reflected in turn by a change in the patterns of frequency and energy dissipation. It is the precise measurement of such changes in frequency and energy dissipation patterns that indicates whether the dengue antigen is present and hence whether the patient from whom the blood sample was taken has been infected by dengue virus.

The process may appear lengthy, but after development of the biosensor the response is practically immediate, approximately 15 minutes. Drops from the sample are placed on the biosensor: the presence of the NS1 antigen can be determined using no more than 0.03 microgram per millilitre. What matters most to patients in terms of diagnosis is not knowing how many molecules of the antigen there are in the sample but knowing

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whether they're infected and if so, starting the right treatment as soon as possible. The aim is a qualitative diagnosis, a positive or negative result.

Source: Agência FAPESP, 26th April 2017

China: Genetic Modification of *Escherichia Coli* for Propionate Production

Propionate is used as an important preservative and important chemical intermediate for the synthesis of cellulose fibres, herbicides, perfumes, and pharmaceuticals. Biosynthetic propionate has mainly been produced by *Propionibacterium*, which has various limitations for industrial application. Researcher from the Chinese Academy of Sciences engineered *Escherichia coli* combining a reduced TCA cycle with the native sleeping beauty mutase (Sbm) cycle to construct a fermentation pathway for anaerobic propionate production. The team over-expressed the Sbm operon in *E. coli* MG1655, yielding 0.24 g/L of propionate. Genetic Modification was also done to convert mixed fermentation products to succinate to increase precursors, thus slightly increasing yield. Different types of promoters were also evaluated to maximise the Sbm operon. The constitutive promoter Pbba led to the highest titre of 2.34 g/L. Methylmalonyl CoA mutase from *Methylobacterium extorquens* AM1 was also added to strain T110 (pbba-Sbm) to enhance this process. This study lays the groundwork for industrial propionate production using *E. coli*.

Source: Crop Biotech Update, 19th April 2017

China: Largest Solar Powered Unmanned Plane

China Academy of Aerospace Aerodynamics (CAAA) has developed a solar-powered unmanned plane known as the Caihong or Rainbow which has the capability to stay in the air for months. The sun-powered unmanned plane has reached a height of 65,000 ft in altitude during a test flight. The plane has an astonishing wingspan of over 40 meters wider than that of a Boeing 737 passenger aircraft. The drone can cruise at a speed of 150 to 200 km per hour. Its maintenance is easy and simple. The test flight was kept a top secret, and the plane is being touted as the second largest solar-powered drone in the world, beaten only by a model by NASA and its performance index and technological capacity are among the most advanced in the world. The US and the UK also have solar-powered drones capable of flying at 65,000 ft in their arsenal. China is likely to sell the design to other countries as per reports. The unmanned aerial vehicle will be used mostly for airborne early warning, aerial reconnaissance, disaster monitoring, meteorological observation and communications relay.

Notably, in 2015 the world's first solar-powered aircraft 'Solar Impulse-2' had made stopovers in Ahmedabad and Varanasi in India. Swiss pilot Bertrand Piccard and his co-pilot Borschbergh had flown the no fuel, purely sun-powered aircraft. Solar Impulse 2 is a lightweight aircraft with the wingspan of a Boeing 747. It is entirely powered by sunlight through 17,000 solar cells built into its carbon fiber wings, with no fuel or polluting emissions. In July last, UN Secretary-General Ban Ki-moon had congratulated the pilot of the Solar Impulse 2 as the solar-powered aircraft completed its epic journey around-the-world spanning over 40,000 kms, saying it was a historic day for humanity.

Source: EQ Weekly Newsletter, 11th June 2017

Egypt: Innovation to slash Energy Consumption

The Pan-Arab Strategy for the Development of Renewable Energy Applications has estimated that demand for conventional energy sources in the region will rise at an annual average rate of six per cent between 2010 and 2030. An Egyptian inventor has successfully tested a safe electricity system for homes that eliminates the risk of electric shocks and significantly reduces energy consumption. The system protects from the dangers of fire and death caused by electric shocks, as it does not pose any risk when the wires touch each other or when they are exposed to water. In this system electricity voltage is transformed from 220V to 14V, making it safe and saving money, without sacrificing the quality of lighting. It does this by relying on an electromagnetic circuit which reduces resistance to the flow of electric current to the lowest possible level. This then reduces the electricity consumed to the lowest level, saving more than 85 per cent of energy consumption. The inventor has tested the system in his four-storey house and is now attempting to scale up his invention, having persuaded a company affiliated with the Ministry of Military Production in Egypt, the Benha Company for Electronic Industries, to evaluate it. He was awarded a patent for the Safe Electrical Connection in Buildings system in 2008 by the Egyptian Academy of Scientific Research and Technology. The invention also won a gold medal at the Geneva International Invention Fair held this year. The inventor is in negotiations for a partnership with two investors, one from Saudi Arabia and the other from the UAE, to produce the system in large scale. Nonetheless, a strong challenge is envisaged from lighting companies, because the innovation means lighting units would have a longer life. Work is also underway to develop the system so it can operate devices that require high electrical loads, such as those required by air conditioning units and electric water heaters.

Source: SciDev.Net, 23rd June 2017

Ghana: Africa's First Functioning Radio Telescope outside South Africa using Defunct Communications Dish

In a milestone for African astronomy, engineers have converted an old telecommunications dish in Ghana into the continent's first functioning radio telescope outside South Africa. The arrival of undersea cables around Africa's coast in the past decade has rendered these dishes obsolete for their original purpose. The telescope, in Kuntunse near Accra, is the first of an array of such instruments expected to be built across Africa over the next five years, and forms part of long-term plans to develop the skills of astronomers on the continent. The switch from old telecommunications dishes to an African VLBI Network (AVN) has been difficult. New telescopes are designed and built to set specifications, but during work on the Kuntunse dish, engineers and scientists have had to adapt their plans. And there have been issues with the stability of electrical power and Internet supply. The AVN made its first observations this year. The Ghana telescope has begun observing methanol masers - radio emissions that can arise from a number of celestial phenomena - and pulsars. The AVN will fill in geographic gaps in the global VLBI, improving imaging by increasing the range of distances and possible angles between the telescopes in the network. The more telescopes there are in a VLBI network, the more detail astronomers can see. Once up and running, the Ghana telescope could be incorporated into the European Very Long Baseline Interferometry (VLBI) Network, a cluster of far-apart radio telescopes that together act as one large instrument. But astronomers also want to use it in a separate African VLBI Network (AVN). For that, plans are under way to convert telecommunications dishes in Zambia, Madagascar and Kenya by mid-2019. New telescopes could also be built in four other African nations by mid-2022. The AVN will develop the capacity for astronomy in countries that have never had a radio telescope. The AVN would also benefit from the technical

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advances made for the SKA and South Africa's radio-astronomy ambitions. The conversion has been in large part funded by South Africa, whose African Renaissance and International Co-Operation Fund and Department of Science and Technology have contributed ~US$9 million to the project. From South Africa's point of view, the AVN would help to prepare the continent for the SKA: many hundreds of dishes, and even more antennas, are set to be built in Australia and South Africa. By the late 2020s, the SKA project also plans to construct other stations - separate from the AVN - in eight other African nations. Later this year, the AVN project and South Africa's SKA project office will be amalgamated into the South African Radio Astronomy Observatory, a unit of the National Research Foundation. The plan, however, is that Ghana and other African nations will ultimately own and operate their AVN telescopes.

Source: Nature News Alert, 11th May 2017

India: Fluoride Removal by Graphene from Brown Seaweed

Long-term exposure to fluoridated drinking water can cause deformation of bones and teeth. Existing techniques for removing fluoride are expensive and complex. Graphene nanosheets made from a brown seaweed biomass can remove excess fluoride from contaminated drinking water. These nanosheets are non-toxic and can be used to make water safe. Scientists from the CSIR-Central Salt & Marine Chemicals Research Institute (CSMCRI) in Bhavnagar and the M.S. University of Baroda and University of Rajasthan synthesised graphene by treating solid granules of the seaweed with solvents made of an organic compound and metal salts. Iron and tin in metal salts modified the graphene, which had sheet-like structures with interconnected networks of nanopores. When dipped in a fluoride-contaminated solution, the graphene efficiently adsorbed fluoride ions, with adsorption rate increasing with time and becoming constant after two hours. The iron-modified graphene showed the highest efficiency to remove fluoride from solution. Presence of iron makes it easy to separate the graphene from the solution using an external magnet and reuse it. The graphene removed more than 80% of fluoride ions at acidic pH from a drinking water sample. Besides fluoride, it was able to remove toxic heavy elements such as mercury and manganese that are usually found in contaminated drinking water. Since the graphene is non-toxic to lung cancer cells, it is safe to use to purify fluoride-contaminated drinking water.

Source: Nature India, 27th March 2017

India: Novel Malaria Control Method by using Crab Shell Powder

Researchers from the National Institute of Communicable Disease Centre in Coimbatore, India along with colleagues from Taiwan, Saudi Arabia and Italy have developed a non-toxic mixture of crushed crab shells and silver nanoparticles that can kill larvae and pupa of malaria-spreading mosquitoes. The mixture could help halt the spread of disease-carrying mosquitoes. They used chitosan, a non-toxic biomaterial derived from crab and lobster shells, to make the mixture. Chitosan has earlier been used in wound healing, membrane water filters and biodegradable food package coating. Chitosan-fabricated silver nanoparticles (Ch-AgNP) were found to be highly toxic to *Anopheles sundaicus*, a malaria vector. In laboratory experiments, the mixture showed 100% larval reduction in 72 hours. The researchers then sprayed the mixture over six water reservoirs. Even in small concentrates, it killed mosquito larvae and pupa quite effectively. The nanosized particles pass through the insect cuticles into individual cells and interfere with various physiological processes in the mosquito's life cycle. The solution did not have any detrimental effect on goldfish (*Carassiu auratus*), which is a natural predator of mosquito larvae indicating that it is an environmentally friendly and non-toxic product. The mixture also inhibited the growth of disease-causing bacterial species such as *Bacillus subtilis, Escherichia coli, Klebsiella pneumoniae* and *Proteus vulgaris*. Ch–AgNP may offer a novel and safer control strategy against *A. sundaicus* mosquito vectors, as well as against Gram-negative and Gram-positive pathogenic bacteria. The finding also suggests that chitosan-based products could potentially be less harmful to non-target insects compared to conventional insecticides.

Source: Nature India, 26th May 2017

Indonesia: Aquaculture as Main Driver of Mangrove Loss

Mangroves, especially of the *Rhizophoraceae* family, are maritime trees or shrubs that form dense masses of roots and foliage that naturally protect coastal ecosystems against storms and sea-level rise. The word 'mangrove' refers to mangrove forests as well as to the trees. Mangroves provide livelihoods through fishing and timber and help mitigate climate change by acting as carbon sinks. Indonesia is home to 3.7 million hectares of mangroves with 70 per cent of it damaged or degraded by aquaculture and human settlement. A study conducted by a team of scientists at Global Mangrove Watch (GMW), published in PLOS One in June 2017, indicates that expanding aquaculture in South-East Asia over the last two decades has been the main driver of mangrove loss in the world. GMW is an international project that begun in 2011 led by the Japan Aerospace Exploration Agency in collaboration with a host of other institutions including Aberystwyth University (UK) and the National Aeronautics and Space Administration (NASA). The study mapped the distribution and changes of mangrove ecosystems in the world during 1996-2010 using satellite imagery. The team analysed 1,168 mangrove areas in North, Central and South America, Africa, Middle East, India and South-East Asia and concluded that mangroves have suffered large losses over the past decade, primarily due to increasing coastal populations and the conversion of mangroves to aquaculture. Aquaculture (shrimp farming) and agriculture (oil palm, rice) were evaluated to be the greatest drivers of mangrove deforestation in the region. South-East Asia, home to 33.8 per cent of the world's mangroves, as well as 90 per cent of the world's aquaculture, was the worst affected region with half of its mangrove areas suffering degradation. Mangroves are being threatened across their entire range and have suffered large losses over the past century, primarily due to increasing coastal populations and the conversion of mangroves to aquaculture. The governments, international NGOs, and coastal people however are now working together to rehabilitate mangroves. There is a growing awareness among coastal communities in Indonesia concerning the role of mangroves for economic livelihoods and disaster mitigation. Mangrove rehabilitation is in progress by coastal communities in East Java, North Sumatra, South Sulawesi, and the north of Jakarta, and the coastal communities are now trying to balance sustainable aquaculture with mangrove conservation. At Serdang Bedagai, North Sumatra, people conserve mangroves at the centre of their shrimp farms and plant oil palm along the borders.

Source: SciDev.Net, 23rd June 2017

Mexico: Rapid Development of Improved Maize Varieties using New Selection Method

A recent study by the scientists at the International Maize and

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Wheat Improvement Center (CIMMYT) in Mexico City has shown that marker-assisted recurrent selection (MARS) is helping maize breeders develop higher yielding and drought-tolerant improved varieties faster than ever before. With conventional breeding, it often takes up to 7-8 years for varieties to reach farmers, but with MARS, those varieties take only 5 years and also display greater genetic gain, even under drought conditions. The study 'Improving Maize Grain Yield under Drought Stress and Non-stress Environments in Sub-Saharan Africa using Marker-Assisted Recurrent Selection' focused on developing improved, drought-tolerant and high yielding tropical maize varieties for areas such as sub-Saharan Africa that suffer from frequent drought and an unpredictable climate. Climate change is changing environments faster than agriculture can naturally adapt. So it is crucial that farmers are able to access drought-resistant maize varieties as quickly as possible so that they can adapt to these new conditions. MARS also dramatically cuts costs by using genotypic data to predict the best maize varieties before planting them. Previously, breeders would have to visually examine and select the best maize varieties every year. The study found that MARS can be used to improve maize varieties in both drought and optimum environments throughout sub-Saharan Africa, where it is the most important staple food for over 300 million people. The study used MARS to estimate the genetic gain for 10 biparental tropical maize populations and found that overall, the grain yield for the 10 populations increased by 105 kg per hectare per year under well-watered and 51 kg per hectare per year under water-stressed conditions using MARS. The subsequent generations of test crosses were found to have significantly greater grain yields than their parents and commercial checks, suggesting that MARS has excellent potential for increasing genetic gain under both drought and optimum environments in sub-Saharan Africa. Over 1,000 improved maize lines, including 352 doubled-haploid lines, have been developed from each cycle of the 10 biparental populations used in this study, and tested in multi-location trials. Several hybrids were derived using lines developed through MARS and pedigree methods. The best hybrids from each population are currently under national performance trials and are expected to be released soon for commercialisation in sub-Saharan Africa. CIMMYT is one of the first research organisations to apply this technology to maize breeding specifically for the needs of smallholder farmers.

Source: Agriculture in the News, CARDI, 26 March – 1 April 2017

Morocco: Working Programme with International Energy Agency (IEA)

The Kingdom of Morocco, which joined the International Energy Agency as an Association Country in November 2016, became the first country in the Middle East and North Africa to join the IEA's Association Initiative aimed at opening the agency's doors to emerging economies and signed a three-year Joint Programme of Work with the IEA to deepen bilateral cooperation in the areas of energy security, energy efficiency, renewable energy, capacity building and data and statistics. The work programme is tailored to Morocco's specific needs as it transitions to a low-carbon economy. Under the programme, the IEA Secretariat and the Ministry of Energy, Mines and Sustainable Development will work closely together to reach the ambitious targets set out in the Kingdom's long-term energy plan. Through this initiative, the IEA has expanded its global footprint and works with key emerging economies for a more secure and sustainable energy future. The 'IEA family' of its members and Association countries now accounts for 70% of global energy use. The other Association countries are China, India, Indonesia, Singapore, and Thailand. Morocco has abundant renewable energy resources, mainly solar, wind and hydro-power, and is a regional leader in deploying clean energy technologies. The government is pursuing a policy of reducing its dependence on imported fossil fuels and increasing the share of renewable energy in power generation. It was also among the first countries of the Middle East and North Africa to cut fossil fuel subsidies and introduce energy efficiency measures.

The IEA's collaboration with Morocco began in 2007, focusing particularly on the areas of energy policy, statistics and R&D. Two years later, the government adopted a national energy strategy, setting clear targets for wind, solar and hydropower. The new programme of work is designed to support Morocco as it implements the energy strategy, including providing guidance and assistance on best practices and technologies that will help the Kingdom attain its clean energy targets.

Source: EQ Magazine, 29th June 2017,

Thailand: Tilapia Virus Outbreak – FAO Warning

The UN Food and Agriculture Organization (FAO) and other organisations have warned that if biosafety measures are not introduced, an emerging viral disease observed in both wild and farmed tilapia could impact global food security and nutrition. All countries culturing tilapia and especially those translocating live tilapia should be vigilant about the disease. Tilapia is a common name for hundreds of species of the tilapiine cichlid fish, and its name comes from the cichlid genus *Tilapia.* It is the most popular farmed fish in the world, after carp and salmon.

According to FAO, tilapia is among the top aquaculture species, in terms of volume, that provide food, jobs and earnings - from domestic trade and export for millions of people, including many smallholders. Tilapia lake virus (TiLV) was first detected in Israel in 2009, but was only confirmed as a new disease in 2014. Cases have since been reported in other parts of the world. According to research, TiLV has been reported in five countries so far: Colombia, Ecuador, Egypt, Israel and Thailand. Outbreaks in Thailand have wiped out 90 per cent of tilapia stocks. TiLV is part of the *Orthomyxoviridae* family of viruses, which is related to the anaemia virus that has heavily damaged the salmon farming industry. It is not known to infect humans. Fish infected with TiLV often display sluggishness, lesions of the skin, eye abnormalities and lens opacity. However, there are still knowledge gaps, such as whether passive carriers of the infection can transmit the virus and whether infections through frozen tilapia products are possible. The countries vulnerable to the TiLV virus need to put in place monitoring and surveillance strategies. Building awareness about TiLV in all sectors of the value chain is also important with special attention given to small-scale farmers with limited access to knowledge and information. At the international level, mobilisation is already underway between various stakeholders to assist affected countries and get them into actions on the movement of live fish. Efforts are also underway to develop a vaccine. China, India and Indonesia are actively monitoring for TiLV. In Israel, an epidemiological survey is expected to determine factors influencing low survival rates and mortalities. China, Indonesia and Egypt are the three leading aquaculture producers of tilapia, a fish deemed to have great potential for expansion in sub-Saharan Africa. In 2015, world tilapia production, from both aquaculture and capture, amounted to 6.4 million tonnes valued at US$9.8 billion.

Source: SciDev.Net Weekly Update, 19th June 2017

Research Training Fellowship for Developing Country Scientists(RTF-DCS) 2016-17

Bangladesh - Project Completion Report of Ms. Mosammat Muslima Khatun

Ms. Mosammat Muslima Khatun, Scientific Officer, National Institute of Biotechnology, Dhaka, Bangladesh was sponsored by the NAM S&T Centre under its RTF-DCS Fellowship scheme for 2016-17 to carry out research in International Centre for Genetic Engineering and Biotechnology (ICGEB), New Delhi, India on a project titled 'Molecular Cloning and Characterization of Mitochondrial Small Heat-Shock Protein Genes in Eggplant for Abiotic Stress Tolerance' under the supervision of Dr. M K Reddy from 1st January to 5th June 2017. The main objective of this research was to express profiling of several Mitochondrial-Small Heat Shock Proteins (*MT-sHSP)* gene (10-25 kDa protein size with a characteristic alpha crystalline domain) under several stress condition (cold, heat, drought, ABA, salinity) along with the isolation and cloning of most highly expressed *MT-sHSP* complementary DNA (cDNA) in order to develop stress tolerant crop plant.

Abiotic stresses are threats that negatively influence crop productivity throughout the world. Stress conditions for crop production are very common due to global climate changes and various anthropogenic activities. Genetic engineering offers unique opportunity of crop improvement by enhancing stress tolerance in crop plants. Plants respond to temperature extremes by inducing the synthesis of a group of proteins called Heat Shock Proteins (HSP). Plants synthesise predominantly Small Heat Shock Proteins (sHSPs) during the heat shock response and the accumulations of sHSPs are correlated with thermo tolerance. It is scientifically suggested that MT-sHSPs plays a major role in heat tolerance of plants mitochondria.

In this study, the full-length sequence information related to MT-sHSPs of eggplant was assembled by using available Expressed Sequence Tag (EST) from the National Center for Biotechnology Information (NCBI) database. Eggplant seeds were then surface sterilized with 1% Bavistin for 20 minutes and grown on vermiculite under greenhouse conditions (14/10 h light/dark cycle illumination at 370 $\mu Em^{-2}s^{-1}$ and 30± 2°C). Eggplant seedlings of 15 d age were chosen for RNA isolation and cDNA synthesis, followed by the amplification of MT-sHSP genes by using nested Polymerase Chain Reaction (PCR). It was found that MT-sHSP was comprised of an Open Reading Frame (ORF) of 636 bp; that encodes a protein of 230 amino acids with an apparent molecular weight of 26.39 kDa and pI of 4.84. MT-sHSP genes were subsequently cloned in between the Cauliflower Mosaic Virus (CAM) 35S promoter and Nopaline Synthase (NOS) gene terminator.

Lastly, complete gene cassette was transferred into the plant transformation vector (pMDC100; containing Neomycin Phospho Transferase II (nptII), kanamycine) by using LR recombinase mediated gateway cloning process. Eventually, the final vector was prepared to insert it into Agrobacterium which could be used for plant genetic transformations.

Ghana- Project Completion Report of Ms. Leticia Amoakoah Twum

Ms. Leticia Amoakoah Twum, Assistant Research Scientist in the Biotechnology and Nuclear Agriculture Research Institute, Ghana Atomic Energy Commission, Ghana was sponsored by the NAM S&T Centre under its RTF-DCS Fellowship scheme for 2016-17 to carry out research in the Indian Institute of Crop Processing Technology, Thanjavur, India on a project titled 'Development of a Soybean based Flour Blends and Food Product to improve the Nutritional Intake of Low Income Household using Local Agriculture Produces' under the supervision of **Dr. C. Anandharamakrishnan** from 29th November 2016 to 23rd May 2017. The main objective of this study was to improve the nutritional status, well-being and livelihood of low income households through the development of soybean based food products.

Global food availability and the cost of available food products are greatly affecting household food choices. Food choices and combination can have great effect on the wellbeing of household member. The deficiency of one or more macro/micro nutrients can impact negatively on people especially children. A

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combination of two or more agricultural produce are said to compensate for the deficiency of some essential nutrients. Food blends are therefore now widely used in the baking industries. Utilization of some food blends is economical, especially when they are produced from readily available local agricultural produce. They are generally rich in one or more nutrients. In this project, combination effects of *four* individual flours in a blend were developed and analysed; and optimization of an extruded products was studied. Flours were made from soybean, brown rice, yellow corn and pineapple pomaces using appropriate methods; and were blended at 20 different levels using Stat-Ease, (Design-Expert version 10.1, Minneapolis, MN, USA) software. The 20 flour blends were analysed for their physical, functional and proximate values. Extruded samples were analysed for exploring their physical and functional properties. The data from individual flour samples revealed that each individual flours had unique characteristics and they possess an ability to positively impact the proximate and physicochemical properties of flour blends, which depends on their levels of incorporation. The results depicted that the brown rice, yellow corn and pineapple pomace had significant effect on most of the physical and functional parameters; and soybean was observed to be prominent (in the extruded product) in increasing the solubility of the final product. The analyses of the mean values from flour blends however, showed improvement in the proximate qualities and physicochemical properties at different levels of combination. Thus by obtaining the above inferences, the final flour blends was cooked in order to develop a 'ready to eat snack' food product for low income households.

Therefore this study facilitated in utilisation of soybean in extrusion cooking and enabled in looking over the ample opportunities that yellow corn, brown rice and pineapple pomace provide to the food industry. Consequently, low income household can become economically more viable by consuming two or more local agriculture produce.

Nigeria - Project Completion Report of Dr. Adedokun Oluwaseun

Dr. Adedokun Oluwaseun, Lecturer II in the Department of Pure and Applied Physics at Ladoke Akintola University of Technology, Nigeria was sponsored by the NAM S&T Centre under its RTF-DCS Fellowship scheme for 2016-17 to carry out research in CSIR- Central Glass and Ceramic Research Institute, Kolkata, India on a project titled 'Fabrication and Characterization of Dye-sensitized Solar Cells using Natural Dye and Natural Counter Electrode derived from Fruit Waste Peels' under the supervision of Dr. P. Sujatha Devi from 13th December 2016 to 31st May 2017. The main objective of this research was to explore and extract new natural dyes for dye sensitized solar cells.

Dye-sensitized Solar Cells (DSSCs) has become one of the most promising photovoltaic devices for our near future. This is generally because of their low cost, easy accessibility, nature of biodegradability and simple fabrication. In this study, *twelve* different extraction solvents namely, distilled water, ethanol, acetone, methanol, acetonitrile, dimethyl sulfoxide (DMSO), chloroform, n-hexane, ethyl acetate, toluene, dichloromethane (DCM) and isopropanol were employed to extract natural dyes from *Punica granatum*, *Citrus reticulata* peels and *Parquetina nigrescens* leaf. The polar solvents like; distilled water, methanol and ethanol were found to perform best for extracting betacyanin dye from *P. granatum* peels while the non-polar solvents like; dichloromethane and chloroform facilitated in extracting most of the carotenoid and chlorophyll from *C. reticulata* peels and *P. nigrescens* leaf, respectively.

Besides, the structure, morphology, composition, nature of the surface, functional group, absorption and emission characteristics of the natural dyes, TiO_2 and dye sensitized TiO_2 films were examined by using various analytical techniques including X-Ray powder Diffraction (XRD), Scanning Electron Microscope (SEM), Energy Dispersive X-Ray Spectroscopy (EDS), Contact Angle, Fourier Transform Infrared (FTIR) Spectroscopy, Fluorescence and Absorption Spectroscopy. To conclude, it was discerned that the best dye adsorption solvent was accomplished by using distilled water, acetone and DCM for *P. granatum*, *C. reticulata* and *P. nigrescens* dyes, respectively. Hence, the results so obtained from the experiment emphasized on the importance of choosing right solvent for extraction as well as for suitable dye adsorption in order to alleviate dye loading onto TiO_2 surface for improving overall performance of the DSSCs.

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Sri Lanka - Project Completion Report of Dr. Ganga Devi Sinniah

Dr. Ganga Devi Sinniah, Senior Research Officer, Tea Research Institute, Sri Lanka was sponsored by the NAM S&T Centre under its RTF-DCS Fellowship scheme for 2016-17 to carry out research in the National Institute of Plant Genome Research (NIPGR), New Delhi, India on a project titled 'Isolation and Characterization of Candidate Effector Proteins of *Rizoctoniasolani,* An Important Pathogen of Rice' under the supervision of Dr. Gopaljee Jha from 19th December 2016 to 16th May 2017. The main objective of this research was to functionally characterise the Effector (EF) Proteins of *Rizoctoniasolani solani* using Yeast Signal Sequence Trap (YSST) assay and study its expression during pathogenesis of rice.

Sheath blight is one of the most destructive diseases of rice that is caused by *Rhizoctoniasolani.* Little is known about the pathogenicity and virulence factors of *R. solani*. Information on rice and *R. solani* interaction is invaluable and is the key to understand pathogenicity, disease management in order to facilitate the development of disease resistant plants. This study was initiated by functionally characterizing the *four* EF proteins in *R. solani* namely, EF1, EF2, EF3 and EF4. The results of this study showed fast and rapid growth of yeast colonies with recombinants of EF2 and EF4 proteins along with the signal peptide on media, when compared to yeast transformants with empty pYST-1 vector. Further, it was found that when the recombinant genes of EF2 and EF4 were expressed and encoded they secreted a fusion protein, invertase which enabled in rescuing the mutant. Among the *four* EF proteins, it was finally inferred that EF2 and EF4 were the secretary proteins of *R. solani,* while the remaining two i.e., EF1 and EF3 are still under the process of characterization.

Consequently, it was determined that the YSST assay seems to be a possible tool for identifying and functionally characterising secretary proteins of *R. solani* from cDNA libraries.

Joint NAM S&T Centre – ZMT Bremen Fellowship

India - Project Completion Report of Dr. Paltu Kumar Dhal

Dr. Paltu Kumar Dhal, Assistant Professor in Department of Life Science and Biotechnology at Jadavpur University, India was sponsored by the NAM S&T Centre under its ZMT Fellowship scheme for 2016 to carry out the research work in Tropical Coastal Marine Research at ZMT, Bremen, Germany under the title 'Microbial Ecology of Sundarban Mangrove Areas: Key of the Mangrove Resource Protection' under the supervision of Dr. Astrid Gärdes from 16th March to 7th June 2017.

The Sundarbans Mangrove is the largest mangrove forest of the world. It is situated in the joint delta of Ganges, Brahmaputra and Meghna Rivers at the Bay of Bengal. It spreads over 10,000 km² in the Indian State of West Bengal (about 40 per cent) and Southwest Bangladesh (about 60 per cent), and intersects with a complex network of channels, tidal waterways and mudflats (Giri et al., 2007). It's an ecologically very dynamic region as a response to the monsoonal rains, floods, tidal influence, delta formation and mangrove colonisation (Giri et al., 2007; Cornforth et al., 2013). Regarding their extent dynamics, Cornforth et al., in 2013 documented a retreat of upto 200 m per year for 71.1 per cent of the coastline. The area ensures physical and livelihood security for the inhabitants of both India and Bangladesh.

The bacterial communities in the forest have played crucial role in high productivity of the mangroves ecosystem and its protection. Therefore, this study was imperative to investigate the vertical distributions of Bacteria and *Archaea* communities in the forest territory. The research was conducted and examined in *eighteen* mangrove water columns at *six* stations of the Sundarban mangrove area. The water qualities, in terms of the presence of pathogenic *Vibrio* spp., were investigated using Catalyzed Reporter Deposition-Fluorescence In Situ Hybridization (CARD-FISH) and Quantitative Polymerase Chain Reaction (qPCR) techniques. The phylogenetic analysis showed that bacterial communities from mangrove water were dominated by genus *Rhodobacteraceae, Pseudoalteromonadaceae, Oceanospirillaceae, Spongiibacteraceae, SAR11 clade and Methylophilaceae* of phylum *Proteobacteria*, followed by *Flavobacteriaceae* of phylum *Bacteroidetes* and OM1 clade of *Actinobacteria*. It was also found that the *Thaumarchaeota* phylum of *Archaea* domain was abundant in all the examined areas. Further, the Non-metric Multidimensional Scaling (NMDS) determined that the bacterial communities could be categorised into three groups according to the Operational Taxonomic Units (OTUs) distribution system. Besides, the water quality in both the analysis (CARD-FISH and qPCR) showed the presence of *Vibrio* spp. but none of them indicated the presence of pathogen *Vibio cholera*. Consequently, this study has provided valuable information about the distribution features of different bacteria from Indian Sundarban mangrove regions and has shed insights into the biogeochemical transformations of its communities.

Past Scientific Associates of NAM S&T Centre

Dr. Gurjeet Kaur

Dr. Gurjeet Kaur joined the NAM S&T Centre in October 2011 as a Scientist and worked until December 2011. During her short association with the Centre she made significant contributions towards planning, implementing, evaluating and assessment of various scientific programs undertaken by the Centre. She actively contributed towards promotion of scientific activities among students, scientists/academia and scientific organisations in the developing countries and also contributed for the S&T Newsletter published quarterly by the Centre. During her tenure, she assisted the organisation in the international scientific events, viz. the International Conference on 'Nanotechnology in the Edge of Convergence' organised by the Centre at the National University of Malaysia during 24-27 November 2011, wherein she presented a research paper titled 'Nanotechnology in Relation to Plant Science- Good Things in Small Package'.

Being determined to gain and enhance the expertise at the Centre, Dr. Gurjeet then contributed in compiling publication of books namely, 'Science and Technology Policy for Sustainable Development' and 'Energy Audit for Professionals'. She also represented the Centre at the Training Workshop sponsored by the Department of Science & Technology (DST), Government of India on 'Advances in Biotechnology' at The Energy and Resources Institute (TERI), New Delhi.

After enriching her experience at the NAM S&T Centre, Dr. Kaur got an opportunity to join the Gargi College, University of Delhi, India as an Assistant Professor in the Department of Botany. Since then, she has been teaching in some of the renowned colleges of the University of Delhi viz., Hans Raj College, STGB Khalsa College, Hindu College and Shivaji College. At present, she is an Assistant Professor in the Department of Botany at Maitreyi College, University of Delhi. In these five years of her association with the university, she has also been actively involved in many discipline related co-curricular activities like environmental science quiz, botanical quiz etc. and attended several faculty development programmes and workshops. One of her recent publications is a book chapter entitled “Phosphate Signaling in Plants: Biochemical and Molecular Approach” in Springer Publications book “Stress Signaling in Plants: Genomics and Proteomics Perspective”, Volume 2.

While expressing her personal experiences at the NAM S&T Centre, she wrote: ***Though my tenure at NAM S&T Centre was brief, it was a very enriching experience in terms of the knowledge I gained there under the leadership of Dr Arun Kulshreshtha and Dr Bandyopadhyay. The Centre comprises of a very active team and I learnt from each one of them. The USP of the Centre is their oneness and their drive for excellence, which could be easily seen in each member. The Centre embraced me with so much love in that short period that while leaving the centre, I felt as if I was working there for ages. My stay at the Centre made me a more disciplined person. As I was involved with the editing and compiling of scientific publications, that training is still helping me immensely while writing my manuscripts at present.***

Mrs. Pinky Singh

Mrs. Pinky Singh worked in the NAM S&T Centre as a Research Assistant from January 2013 to September 2014. Her primary responsibilities included planning, implementation, evaluation and assessment of various scientific programmes carried out by the Centre. She had significantly contributed in conducting a number of international scientific activities, viz., International workshop on the Role of Microhydel for Developing Countries organized by the Centre in Nepal during 19-22 April 2013, in which she presented an innovative research paper on 'Small and Micro-hydro Technology as a Viable Option for Harnessing Renewable Energy in Developing Countries' that was widely applauded and was published as a chapter in a book titled 'The Role of Micro Hydro Power as a Sustainable Energy Solution in Developing Countries'. Besides, her paper on 'Social Security of Women in Developing Countries through the Application of Information & Communication

(Contd. on Page 15)

DISTINGUISHED VISITORS TO THE CENTRE

His Excellency Datuk Seri Panglima Wilfred Madius Tangau, Hon. Minister of Science, Technology and Innovation (MOSTI), Malaysia along with his wife and the delegation

His Excellency Dr. David Goldwin Pollard, High Commissioner of the Cooperative Republic of Guyana to India

Mr. Yusuff Utieyineshola Adeleke, RTF-DCS Fellow (2016-17), Senior Research Officer, Department of Science Policy and Innovation Studies, National Centre for Technology Management (NACETEM), Abuja, Nigeria

DISTINGUISHED VISITORS TO THE CENTRE

2nd April 2017	**His Excellency Datuk Seri Panglima Wilfred Madius Tangau**, Hon. Minister of Science, Technology and Innovation (MOSTI), Malaysia along with his wife and the delegation comprising **Dato' Dr. Lee Yee Cheong**, Hon. Chairman of International Science Technology and Innovation Centre (ISTIC) and Science, Technology, Engineering and Mathematics (STEM) Advisor to the MOSTI, Malaysia; and **Ms. Noor Khalidah Md Khalid**, Deputy Under Secretary, Technology Transfer and R&D Commercialisation Division, MOSTI, Malaysia
9th May 2017	**Mr. Yusuff Utieyineshola Adeleke,** RTF-DCS Fellow (2016-17), Senior Research Officer, Department of Science Policy and Innovation Studies, National Centre for Technology Management (NACETEM), Abuja, Nigeria
27th June 2017	**H.E. Dr. David Goldwin Pollard**, High Commissioner of the Cooperative Republic of Guyana to India

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Technologies' was published in a book titled 'Empowering Women in Developing Countries: ICT Applications and Benefits' edited by Dr. Finarya Legoh (Indonesia) and Prof. Suman Kapur (India).

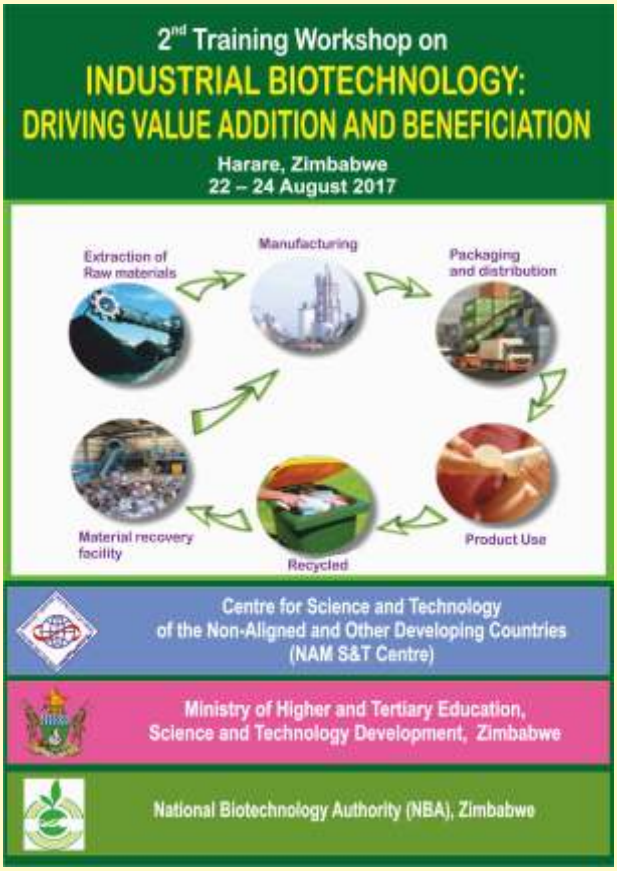
Further, Mrs. Pinky actively participated in organising the International Conference on 'Empowering Women in Developing Countries through Information and Communication Technologies' at Jaypee University of Information Technology (JUIT), Solan (HP) during 1-3 June 2013; and the International Workshop on 'Perspectives on Science & Technology Diplomacy for Sustainable Development in NAM and other Developing Countries' at Manesar (Haryana), India during 27-30 May 2014. For all such scientific events, she undertook several scientific and policy oriented research, independently as well as in partnership with other staff members. During her affiliation with the Centre, she was also responsible for compilation and preliminary scrutiny of scientific articles, research papers and country status papers and also assisted the editors in bringing out various publications.

Moving from the NAM S&T Centre, Mrs. Pinky started working as the Managing Editor with the Nano Science & Technology Consortium, Noida, India and later, joined the National Informatics Centre (NIC) as an Assistant Editor cum Content Writer in R&D Projects, where she got an excellent opportunity to work in close association with Mr. S.B. Singh, Director General of NIC. Currently, she is working as a Development Editor at Agastya International Foundation, Bangalore, India.

Centre Announces

2nd Training Workshop on INDUSTRIAL BIOTECHNOLOGY: DRIVING VALUE ADDITION AND BENEFICIATION

Harare, Zimbabwe, 22-24 August 2017



Industrial Biotechnology can be an enabling tool to achieve social, economic and environmental development. It is one of the most promising new approaches to pollution prevention, resource conservation and cost reduction. Biotechnology uses biological processes and systems found in nature to develop novel products which are eco-efficient and more environment-friendly compared with similar products produced using alternative technologies. The immense potential applications of Biotechnology in industry to produce innovative products in a sustainable manner cannot be over emphasized. Industrial Biotechnology has been termed the "third wave in Biotechnology". If developed to its full potential, Industrial Biotechnology may have a larger impact on the world than health care and Agricultural Biotechnology. The application of Industrial Biotechnology in particular has proven to make significant contributions towards mitigating the impacts of climate change especially in lowering greenhouse gas emissions. There is also the possibility of reduction in cost of business and the creation of new markets.

With the above in view, the Centre for Science & Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) jointly with the Ministry of Higher and Tertiary Education, Science and Technology Development, Zimbabwe; and National Biotechnology Authority (NBA), Zimbabwe announces the organisation of the 2nd Training Workshop on ***'Industrial Biotechnology: Driving Value Addition and Beneficiation'*** in Harare, **Zimbabwe** during **22–24 August 2017.**

The Workshop programme has been primarily designed to make suggestions based on the new results obtained by scientists, researchers, industry experts and agricultural practitioners having interest in industrial biotechnology applications from developing countries, to the policy makers in government departments and ministries. The selection of the participants will be strictly based on merit and relevance of their current responsibilities to the subject of the Workshop as well as the quality of the extended abstract of the paper submitted by them along with the completed nomination form. A pre-condition for participation in the Workshop is that the participants must present a paper during the workshop and submit the full manuscript of their papers, in **MS-Word format**, at least **14 days** before the commencement of the programme.

Scientists and professionals desirous of participating in the Workshop, with the exception of those from Zimbabwe, are required to submit their nomination forms **electronically** directly to the NAM S&T Centre as early as possible but latest by **Friday, 21st July 2017**. However, Zimbabwean scientists and professionals desirous of participating in the workshop should send their applications with completed documents to the Co-Chair of the National Preparatory Committee, **Dr. J Mufandaedza**, at the **National Biotechnology Authority, Zimbabwe** latest by the above stated deadline.

For further details, please visit the Centre's Website: www.namstct.org

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