

**UNDER THE HIGH PATRONAGE OF HIS  
EXCELLENCY THE PRESIDENT OF PAKISTAN**

*The 25<sup>th</sup> Conference of the  
Islamic World Academy of Sciences (IAS) on*  
**WATER-ENERGY-FOOD-ECOSYSTEM  
NEXUS FOR THE SECURITY OF THE  
OIC COUNTRIES**

*22 - 24 July, 2024  
Islamabad - Pakistan*

**CONFERENCE BROCHURE**

## INTRODUCTION

The Water-Energy-Food-Ecosystem (WEFE) nexus is a conceptual framework that emphasizes the interconnectedness and interdependencies between water, energy, food, and ecosystems. It acknowledges that actions and decisions in one sector can have significant impacts on the others, creating a complex web of relationships that must be managed holistically to achieve sustainable development goals.

The WEFE nexus approach recognizes that water, energy, food, and ecosystems are not isolated sectors but are closely linked through various feedback loops, synergies, and trade-offs. For example, water is needed for energy production (e.g., hydropower), food production (e.g., irrigation), and ecosystem health (e.g., maintaining wetlands). Energy is required for water extraction, treatment, and distribution, as well as for agricultural production and processing. Food production, in turn, depends on water availability, energy inputs, and the health of ecosystems for pollination and soil fertility. Ecosystems provide essential services such as regulating water flows, purifying water, and supporting biodiversity, which are crucial for sustaining agricultural productivity, energy generation, and overall human well-being.

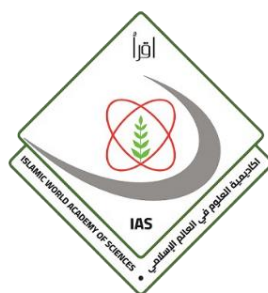
By adopting a WEFE nexus approach, policymakers, planners, and stakeholders aim to enhance resource efficiency, reduce trade-offs and conflicts between sectors, and promote integrated and sustainable management practices. This approach is particularly relevant in the context of increasing water scarcity, energy demand, food insecurity, and ecosystem degradation driven by population growth, urbanization, climate change, and other global challenges.



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# **CONFERENCE ORGANIZERS & SPONSORS**

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**Islamic World Academy of Sciences (IAS)**  
**Amman - Jordan**  
[www.iasworld.org](http://www.iasworld.org)

The nascent idea of establishing the Islamic World Academy of Sciences (IAS) first appeared in the plan of action developed by the OIC's Standing Committee for Scientific and Technological Cooperation (COMSTECH). Upon the invitation of Jordan, the Founding Conference of the Academy was held in Amman (Jordan) in October 1986. The IAS came into being as an independent, non-political, non-governmental and non-profit organization of distinguished scientists dedicated to the promotion of all aspects of science and technology in the Islamic world.

The IAS seeks to act as functional platform for improving, facilitating and nurturing interaction, collaboration, networking and enhancing knowledge sharing in a bet to address pressing challenges facing socio-economic development in OIC member states.

The IAS aspires to avail its capacity and capability to serve as Islamic Brain Think Tank and to respond effectively and timely to current and futuristic needs for advancing and promoting developmental goals and objectives to realize aspirations of the Ummah.

The main objectives of the IAS are:

1. To serve as an advisory and consultative organization of the institutions and organizations of Member States of the Organization of Islamic Cooperation (OIC) and other countries and communities requiring its advice and guidance on matters related to the field of science and technology as well as their applications;
2. To initiate scientific and technological programs and activities in science and technology, and to encourage co-operation among research workers and groups in various Islamic countries on problems and projects of common interest;
3. To encourage and promote research on major problems of importance facing Islamic countries and to identify future technologies of relevance for possible adoption, adaptation, and utilization;
4. To formulate standards of scientific performance and attainment, and to award prizes, medals, fellowships, distinctions, and honors for outstanding scientific achievements; and
5. To promote continuing education and training courses to enhance capacity building of human resources with certification.



**Pakistan Academy of Sciences (PAS)**  
**Islamabad - Pakistan**  
[www.paspk.org](http://www.paspk.org)

Pakistan Academy of Sciences is a supreme scientific body of distinguished academicians and scientists in the country. The Government of Pakistan has given the consultative and advisory status to the Academy “on all problems relating to the development of scientific efforts in the country”, and “generally on such matters of national and international importance in the field of science as may be referred to the Academy”. The affairs of the Academy are regulated by its Charter and Bye-Laws approved by the Fellows. The Mission of the Academy is to “Promote Science, Technology and Innovation for Socio-economic Development in the Country while, the Mandate of the academy is quite in line with Science, Technology and Innovation related national SDGs. The main objectives of the Academy are:

- To promote higher studies and research on pure and applied sciences in Pakistan and to disseminate scientific knowledge.
- To formulate standards of scientific effort and achievement in Pakistan and to recognize outstanding contributions to the advancement of science.
- To publish and assist in the publication of Scientific Proceedings, Journals, Transactions, Monographs, Books and other scientific literature.
- To establish and maintain associations and relations between Pakistani scientists and international groups, meetings and unions of scientists, and between Pakistani scientific activities and the activities of scientists in other countries.
- To award grants, scholarships, fellowships, prizes and medals for scientific research.
- To undertake such scientific work of national or international importance as the Academy may be called upon to perform by the Government; to have the advisory and consultative status with the Ministries and Divisions of Government dealing with scientific and technical matters, and to represent internationally the scientific work of Pakistan.
- To secure and administer funds, endowments and other grants for the promotion and development of scientific research or projects of a scientific nature, and for the attainment of the aims and objectives of the Academy.
- To correlate and assist in correlating the efforts of other scientific bodies.
- To do all other lawful things that the Academy may consider conducive to, or necessary for, the attainment of its aims and objects.



**The Higher Council for Science and Technology (HCST)**  
**Amman - Jordan**  
[www.hcst.gov.jo](http://www.hcst.gov.jo)

The Higher Council for Science and Technology was established in 1987 as a public independent institution and acts as a national umbrella for all science & technology (S&T) activities in Jordan.

The objective of the Higher Council is to build a national science and technology base to contribute to the achievement of development goals, through increasing awareness of the significance of scientific research and development, granting the necessary funding and directing scientific and research activities, within national priorities, in line with development orientations.

The Higher Council was also entrusted with the establishment of specialized centers for R&D activities, the support of innovation and entrepreneurship to contribute to commercialize scientific and technological ideas into products and businesses, the conclusion of agreements relating to cooperation with Arab, regional and international parties, the representation of the Kingdom in scientific and technological activities, at the Arab, regional and international levels.

The Higher Council is chaired by HRH Prince El Hassan Bin Talal, who has been instrumental to the progress of science and technology in Jordan from the beginning.



**Higher Education Commission (HEC)**  
**Islamabad - Pakistan**  
[www.hec.gov.pk](http://www.hec.gov.pk)

The Higher Education Commission (HEC) of Pakistan was established in 2002, transforming the higher education landscape by replacing the University Grants Commission. Its inception aimed to improve the quality, accessibility, and relevance of higher education in the country. The HEC was entrusted with the responsibilities of accreditation, funding, and regulation of universities and degree-awarding institutions, aligning them with international standards and fostering a culture of research and innovation.

The salient objectives of the HEC are as follows:

- Improve the standards of higher education institutions to meet international benchmarks.
- Encourage and fund research activities to advance scientific and technological development.
- Ensure higher education is accessible to a larger portion of the population through scholarships and infrastructure development.
- Oversee the accreditation of institutions and ensure compliance with educational standards.
- Provide training and professional development opportunities for university faculty.
- Update and align academic programs with industry needs and job market requirements.
- Foster partnerships and exchange programs with foreign universities to enhance global competitiveness.
- Ensure transparent and effective use of funds and resources in higher education.
- Formulate and implement policies that support the growth and improvement of higher education.
- Promote entrepreneurship and innovation within the higher education sector.

## CONFERENCE ORGANIZING COMMITTEE

### **ISLAMIC WORLD ACADEMY OF SCIENCES (IAS), JORDAN:**

Prof. Adnan Badran, President & Director General, IAS.

Ms. Taghreed Saqer, Executive Secretary, IAS.

Ms. Najwa Daghestani, Programs Manager, IAS.

### **PAKISTAN ACADEMY OF SCIENCES (PAS), ISLAMABAD, PAKISTAN:**

Prof. Kauser Abdulla Malik, President, PAS.

Prof. M. Aslam Baig, Secretary General, PAS.

Prof. Tasawar Hayat, Fellow, PAS & Secretary General, IAS.

## CONFERENCE VENUE

A. Q. Khan Auditorium, Pakistan Academy of Sciences.

## ACCOMMODATION

Accommodation will be at the Legend Hotel, 56A Ataturk Ave, G-5/2, Islamabad, a 5-minute walk from the Pakistan Academy of Sciences. Accommodation will be covered for 4 nights at the hotel. Participants checking in before the 21<sup>st</sup> and after the 25<sup>th</sup> will be charged for room and board. Transportation from and to the airport will be provided.

## CONFERENCE LANGUAGES

The working language of the conference will be English.

## WEATHER IN ISLAMABAD

Daytime temperatures usually reach 33°C in Islamabad, Pakistan in July with very high heat and humidity, falling to 23°C at night.

## CURRENCY

The Rupee (PKR) is the official currency of Pakistan. 1 USD ≈ 270 PKR.

## CORRESPONDENCE

### **ISLAMIC WORLD ACADEMY OF SCIENCES (IAS), JORDAN**

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### **PAKISTAN ACADEMY OF SCIENCES (PAS) PAKISTAN**

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(+92) 345 6083069





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# **CONFERENCE PROGRAM**

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## **TIME TABLE OF ACTIVITIES**

### **SUNDAY 21 JULY 2024**

AM & PM      Arrival of participants to Islamabad.  
Dinner at the Hotel.

### **CONFERENCE DAY ONE: MONDAY 22 JULY 2024**

09:45-10:45      Inaugural Session.  
10:45-11:00      Tea Break.  
11:00-13:30      Session 1: Keynotes.  
13:30-14:30      Lunch.  
14:30-16:40      Session 2.

### **CONFERENCE DAY TWO: TUESDAY 23 JULY 2024**

09:30-10:40      Session 3.  
10:40-11:00      Tea Break.  
11:00-13:30      Session 4.  
13:30-14:30      Lunch.  
14:30-16:00      Session 5.

### **CONFERENCE DAY THREE: WEDNESDAY 24 JULY 2024**

09:30-10:50      Session 6.  
10:50-11:20      Tea Break.  
11:20-12:30      Session 7.  
12:30-13:20      Session 8: Concluding Session.  
13:30-14:30      Lunch.  
14:30-16:00      IAS Council Meeting and General Assembly Meeting.

### **THURSDAY 25 JULY 2024**

AM & PM      Checkout and Departure.

**CONFERENCE DAY ONE**  
**MONDAY 22 JULY 2024**

<b>INAUGURAL SESSION</b>	
<b>09:45-09:50</b>	National Anthem & Recitation from the Holy Qur'an.
<b>09:50-10:00</b>	Address of <b>Prof. Kauser Abdulla Malik</b> , President, Pakistan Academy of Sciences (PAS), Pakistan.
<b>10:00-10:10</b>	Address by <b>Prof. Mukhtar Ahmad</b> , Chairman Higher Education Commission (HEC), Pakistan.
<b>10:10-10:20</b>	Address of <b>H.E. Prof. Adnan Badran</b> , President, Islamic World Academy of Sciences (IAS), Jordan.
<b>10:20-10:30</b>	Message of <b>H.E. President of the Islamic Republic of Pakistan</b> and Patron of the Islamic World Academy of Sciences (IAS), Pakistan.
<b>10:30-10:40</b>	Message of <b>H.R.H. Prince El-Hassan bin Talal</b> , Founding Patron of the Islamic World Academy of Sciences (IAS), Jordan.
<b>10:40-10:45</b>	Shields Distribution.
<b>10:45-11:00</b>	<b>Tea Break.</b>

<b>SESSION 1: KEYNOTES</b>	
<b>CHAIR: PROF. M. ASLAM BAIG</b>	
<b>11:00-12:00</b>	<b>Higher Education, Science and Technology-Imperatives for Socio-Economic Development</b> <b>Atta-Ur-Rahman</b> FIAS, Professor Emeritus, International Centre for Chemical and Biological Sciences, University of Karachi, Pakistan.
<b>12:00-13:00</b>	<b>Managing Water-Energy-Food Security-Ecosphere Nexus</b> <b>Adnan Badran</b> FIAS, President IAS, Professor and Chancellor, University of Petra and Chairman of the Board of Trustees of the University of Jordan, Jordan.
<b>13:00-13:30</b>	<b>The Role of Renewable and Nano Technologies in Energy Security in the 21<sup>st</sup> Century</b> <b>Munir H. Nayfeh</b> FIAS, Professor of Physics University of Illinois at Urbana-Champaign, USA.
<b>13:30-14:30</b>	<b>Lunch.</b>

<b>SESSION 2</b>	
<b>CHAIR: PROF. KHALID MAHMOOD KHAN</b>	
<b>14:30-14:50</b>	<p><b>Challenges and Opportunities in Achieving SDGs in OIC Countries: Role of STI</b></p> <p><b>Mohamed Hag Ali Hassan</b> FIAS, President, Sudanese National Academy of Sciences (SNAS), Sudan.</p>
<b>14:50-15:10</b>	<p><b>The Biodiversity Nexus and Security in OIC Nations</b></p> <p><b>Zabta Khan Shinwari</b> FIAS, Vice President, IAS and Vice Chancellor, Federal Urdu University of Arts Science and Technology, Pakistan.</p>
<b>15:10-15:30</b>	<p><b>Enhancing Food Security and Ecosystem Health through Biochar Innovation</b></p> <p><b>Dilfuza Egamberdieva</b>, FIAS, Institute of Fundamental and Applied Research, National Research University TIAME, Tashkent, Uzbekistan.</p>
<b>15:30-15:40</b>	<b>Tea Break.</b>
<b>15:40-16:00</b>	<p><b>Exploring the Impact of Size and Thickness of Nanoparticle Hollow Spheres on their Performance</b></p> <p><b>Hala El-Khozondar</b> FIAS, Professor, Electrical Engineering and Smart Systems Departments, Islamic University of Gaza, Palestine.</p>
<b>16:00-16:20</b>	<p><b>Malnutrition and Dementia among Elderly: A Growing Food Security Concern in the OIC Countries</b></p> <p><b>Liaquat Ali</b> FIAS, Honorary Chief Scientist and Advisor, Pothikrit Institute of Health Studies, Dhaka, Bangladesh</p>
<b>16:20-16:40</b>	<p><b>Impact of Local Stresses and External Shocks on the Food System in the Arab Region</b></p> <p><b>Abdullah Al Musa</b>, President, National Center for Research and Development (NCRD), Jordan.</p>

**CONFERENCE DAY TWO**  
**TUESDAY 23 JULY 2024**

<b>SESSION 3</b> <b>CHAIR: PROF. M. QASIM JAN</b>	
<b>9:30-10:50</b>	<b>Integrating Science with Socio-Cultural Dimensions for Good Water Governance</b> <b>Shahbaz Khan</b> , Director and Representative to UNESCO Regional Office for East Asia.
<b>10:50-10:10</b>	<b>From Engaging Stakeholders to Influencing Policy and Practice: Aims, Design, Outputs and Hopes of The EU UPWATER Project for Projecting Groundwater and Enhancing Water Quality</b> <b>Jeff Camkin</b> , University of Western Australia and Global Consultant, Australia/Portugal.
<b>10:10-10:30</b>	<b>Unveiling Hidden Treasures: Identifying Rare Earth Elements in Northern Pakistan</b> <b>Muhammad Aslam Baig</b> , Secretary General, Pakistan Academy of Sciences (PAS).
<b>10:30-10:40</b>	<b>Impact of Pollutants on Human Health and Climate Change</b> <b>Shahid Mahmood Baig</b> , Professor / Head of Life Sciences Department, Health Services Academy, Islamabad, Pakistan.
<b>10:40-11:00</b>	<b>Tea Break.</b>

<b>SESSION 4</b> <b>CHAIR: PROF. MUSHTAQ AHMAD</b> <b>GROUP WORKS</b> <b>PROPOSED THEMES AND OBJECTIVES</b>	
<b>Theme 1: Integrated Water Resource Management for Sustainable Agriculture</b>	
<b>Objectives:</b>	
<ul style="list-style-type: none"> <li>• Explore strategies for efficient water use in agriculture to enhance food security.</li> </ul>	

- Discuss the implementation of advanced irrigation technologies and practices.
- Evaluate the impact of climate change on water availability and agricultural productivity.

**Key Discussion Points:**

- Case studies of successful water management systems in OIC countries.
- Policy recommendations for improving water governance.
- Collaboration between OIC member states for shared water resources.

**Theme 2: Renewable Energy Solutions for Sustainable Food Production**

**Objectives:**

- Investigate the role of renewable energy in reducing the carbon footprint of food production.
- Identify potential for solar, wind, and biomass energy to support agricultural operations.
- Assess the economic viability of integrating renewable energy sources in rural areas.

**Key Discussion Points:**

- Examples of renewable energy projects in agriculture within OIC countries.
- Financial models and incentives for promoting renewable energy adoption.
- Overcoming barriers to implementation, including infrastructure and policy challenges.

**Theme 3: Enhancing Food Security through Ecosystem-Based Approaches**

**Objectives:**

- Promote ecosystem-based management practices to ensure long-term food security.
- Analyze the interplay between biodiversity conservation and food production.
- Develop frameworks for sustainable land use that balance agricultural needs with ecosystem preservation.

**Key Discussion Points:**

- Successful integration of ecosystem services in agricultural policies.
- Strategies for mitigating the impact of agriculture on natural ecosystems.

- Cross-border cooperation on transboundary ecosystem management within the OIC.

These themes encourage comprehensive discussions and collaborative efforts among OIC countries to address the interconnected challenges of water, energy, and food security through sustainable and innovative solutions.

<b>13:30-14:30</b>	<b><i>Lunch.</i></b>
<b>SESSION 5</b> <b>CHAIR: PROF. AMIN BADSHAH</b>	
<b>14:30-15:00</b>	<b>Global Warming and Climate Change Threats to the Natural Habitat of the Tibetan Plateau</b> <b>M. Qasim Jan</b> FIAS, Professor Emeritus, University of Peshawar, Peshawar, Pakistan.
<b>15:00-15:20</b>	<b>Impact of the Industrial Revolution on the Environment</b> <b>Muhammad Ali</b> , Vice Chancellor, Bahauddin Zakariya University, Multan, Pakistan.
<b>15:20-15:40</b>	<b>Climate-Triggered Threats to Food Security in the OIC Regions</b> <b>Muhammad Ashraf</b> FIAS, Rector, University of Lahore, Lahore, Pakistan.
<b>15:40-16:00</b>	<b>Combating Micronutrient Malnutrition in Human Populations by Agronomic Biofortification of Staple Cereals</b> <b>Abdul Rashid</b> , Fellow, Pakistan Academy of Sciences, Islamabad, Pakistan.

**CONFERENCE DAY THREE**  
**WEDNESDAY 24 JULY 2024**

<b>SESSION 6</b> <b>CHAIR: PROF. MUHAMMAD ALI</b>	
<b>09:30-09:50</b>	<b>Climate Change and Health in Pakistan</b> <i>Mohammad Perwaiz Iqbal</i> , Professor, School of Science, Department of Life Sciences, Lahore, Pakistan.
<b>09:50-10:10</b>	<b><i>Ensuring Food Security through Sustainable Agriculture in Changing Climate</i></b> <i>Anwar Gillani</i> , Advisor, Higher Education Commission, Islamabad, Pakistan.
<b>10:10-10:30</b>	<b>Botanic Gardens and Food Security in the Present Scenario of Climate Change</b> <i>Mohammad Qaiser</i> , University of Karachi, Karachi, Pakistan.
<b>10:30-10:50</b>	<b>Food and Agriculture Nexus with Water and Energy</b> <i>Iqrar Ahmad Khan</i> , Vice Chancellor, University of Agriculture Faisalabad, Faisalabad, Pakistan.
<b>10:50-11:20</b>	<b>Tea Break.</b>

<b>SESSION 7: "Navigating Shared Water Resources: Strategies for Ensuring Future Food Security"</b> <b>PANELISTS: H.E. ADNAN BADRAN, K.A. MALIK AND M. QASIM JAN</b> <b>MODERATOR: PROF. N. M. BUTT</b> <b>11:20 TO 12:30</b> <b>10 MINUTES PRESENTATION BY EACH PANELIST FOLLOWED BY QUESTION-ANSWER</b>
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<b>SESSION 8</b> <b>CONCLUDING SESSION: 12:30-13:20</b>	
<b>12:30-12:35</b>	Recitation from the Holy Qur'an.
<b>12:35-12:45</b>	Address of <b>Prof. Kauser Abdulla Malik</b> , President, Pakistan Academy of Sciences (PAS), Pakistan.
<b>12:45-13:00</b>	Recommendations of the workshop.
<b>13:00-13:10</b>	Address of <b>H.E. Prof. Adnan Badran</b> , President, Islamic World Academy of Sciences (IAS), Jordan.



<b>13:10-13:20</b>	Vote of thanks and future course of action by <b>Prof. Tasawar Hayat.</b>
<b>13:30-14:30</b>	<b>Lunch.</b>
<b>14:30-16:00</b>	IAS Council Meeting and General Assembly Meeting (Committee Room, PAS).



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# KEYNOTE SPEAKERS

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## ATTA-UR-RAHMAN FRS FIAS PAKISTAN

**Atta-ur-Rahman** obtained his Ph.D. in organic chemistry from Kings College, University of Cambridge (1968). He has over 1333 international publications in several fields of organic chemistry (h index 75, citations 35,639)

(<https://scholar.google.com/citations?user=bSBNj1MAAAAJ>) He is Editor of the world's leading encyclopedic series of volumes on natural products "*Studies in Natural Product Chemistry*", 80 volumes of which have been published by Elsevier Science Publishers under his Editorship during the last two decades.

He was elected as Fellow of Royal Society (London) on 14th July 2006, won the prestigious UNESCO Science Prize (1999) and was elected Honorary Life Fellow of Kings College, Cambridge University, UK (2007). Prof. Rahman has been conferred honorary doctorate degrees by many leading world universities including: Cambridge University (UK) (1987), Coventry University (UK) (2007), Bradford University (UK) (2010), Asian Institute of Technology (Thailand) (2010) and University of Technology, (Malaysia)(2011).

Prof. Rahman is the most decorated scientist of Pakistan having won four civil awards including Tamgha-i-Imtiaz (1983), Sitara-i-Imtiaz (1991), Hilal-i-Imtiaz (1998), and the highest national civil award Nishan-i-Imtiaz (2002). Prof. Atta-ur-Rahman was conferred The World Academy of Sciences (TWAS) (Italy) Prize for Institution Building in October (2009) and the high civil award ("Grosse Goldene Ehrenzeischen am Bande") by the Austrian government (2007) and the highest scientific award of China, "The International Science & Technology Cooperation Award" (2020).

Prof. Rahman was appointed Academician (Foreign Member) of the prestigious Chinese Academy of Sciences (2015) and Fellow (Foreign Member) of the Korean Academy of Science and Technology. The leading Chinese University on Traditional Medicine in Changsha, Hunan has established the "Academician Professor Atta-ur-Rahman One Belt and One Road TCM Research Center" in October 2019 and the largest university in Malaysia, Universiti Teknologi, Mara, Malaysia (UiTM), has also established an institution entitled, "Atta-ur-Rahman Institute on Natural Product Discovery (AuRins)" in 2013.

Prof. Atta-ur-Rahman was the Federal Minister for Science and Technology (14th March, 2000 – 20th November, 2002), Federal Minister of Education (2002) and Chairman of the Higher Education Commission with the status of a Federal Minister from 2002-2008. Prof. Atta-ur-Rahman was the Coordinator General of COMSTECH, an OIC Ministerial Committee comprising the 57 Ministers of Science & Technology from 57 OIC member countries from 1996 to 2012. He is presently Professor Emeritus at the International Center for Chemical and Biological Sciences, University of Karachi which is now internationally recognized as the UNESCO Center of Excellence.

## **HIGHER EDUCATION, SCIENCE AND TECHNOLOGY--- IMPERATIVES FOR SOCIO-ECONOMIC DEVELOPMENT**

**ATTA-UR-RAHMAN FRS**

*UNESCO Science Laureate and*

*Professor Emeritus, International Centre for Chemical and Biological  
Sciences, University of Karachi, Pakistan*

The future of the Islamic world lies in the giving of the highest national development priorities to education, science, technology and innovation. The beginning made by Pakistan during 2000-2008 when I was Federal Minister of Science and Technology/Chairman Higher Education Commission (HEC) has been designated as a model for other developing countries by the Royal Society (London) in a book entitled "A New Golden Age?". The remarkable developments in the higher education sector, triggered by the higher education reforms introduced by us in Pakistan during 2002-2008, have led to an unprecedented growth in high quality research publications in Pakistan. The focus of the HEC reforms under my stewardship was to improve the quality of higher education and research, provide greater access to higher education, and provide education relevant to national needs and international demands. The establishment of the Pakistan Education and Research Network (PERN) in 2004 brought a revolution by providing free access of 65,000 textbooks and 25,000 international journals to students, teachers and researchers. The single biggest contribution to the improvement of the higher education research environment was the emphasis of the HEC programmes on the development and absorption of high-quality faculty. Thousands of our brightest students were selected and sent abroad for training at PhD and post-doctoral levels to leading universities of the world in USA, UK, Germany, France, Sweden, Australia and Austria. The world's largest Fulbright program was initiated with 50% of the funds being invested by Pakistan. Pakistan was about 400% behind India in research output on a per capita basis but overtook India in 2017 and was about 15% ahead of India by 2018---- no mean achievement. A satellite (Paksat 1) was placed in space with some of its capacity directed to education. The rapid progress made by Pakistan set off alarm bells in India. The Indian Prime Minister was given a formal presentation regarding the programmes that I had launched as Chairman HEC. This was reported on 22nd July 2006 in India's main English newspaper Hindustan Times on 23rd July 2006 (article headed "Pak Threat to Indian Science" by Neha Mehta). Neutral international observers reviewed these programmes. Comprehensive reports applauding them were written by the World Bank, British Council, The role of higher education, science and technology has now become central to socio-economic development. The stunning developments in artificial intelligence, new materials, energy storage systems, biotechnology, gene editing, regenerative medicine, and other disruptive innovations are changing the landscape of businesses of today and tomorrow. Some of these developments will be described



## **ADNAN BADRAN FIAS**

### **JORDAN**

**Adnan Badran** is a biologist, his early original research was the discovery of the mechanism of browning catalyzed by Polyphenol-oxidase and the substrate L-Dopamine and inhibited by the polymer Leucodelphinidin-tannin (Nature 206: 622-624). Another was the discovery of extending storage and shelf life of fruits by inhibiting the biogenesis of ethylene responsible of triggering climacteric rise in respiration, the ripening process, through understanding its interaction with O<sub>2</sub> and CO<sub>2</sub> (Patent, Ser. U.S. 3,450,543). This discovery has allowed shipping fresh food-fruits and vegetables across countries around the world. His current work now, is on alcoholic extraction of different cultivars of Seaweeds from the Red Sea to cure breast cancer cells.

Badran was awarded an Honorary Doctorate from Sungkyunkwan University, Seoul (1981); an Honorary Doctorate in Science from Michigan State University, (2007); Honorary Doctorate in Business from Yarmouk University, Jordan (2014); the West Watkins distinguished Lectureship Award (2009) USA; the Hall of Fame Alumni Award from Oklahoma State University, USA; and the Honorary Professorship from L.N. Gumilev Eurasian National University Kazakhstan (2012). Also, he was awarded the Arab Thought Foundation Award for best Arab scientist in higher education research (2005); the TWAS Regional Prize for "Building Scientific Institutions" (2009); the World Education Asia award for Outstanding Contribution to Education (2011) and the Shoman award for Peer review of young Arab scientists.

Badran was Prime Minister (2005), Minister of Agriculture and Minister of Education (1989) in Jordan. He served as Senator and Chair of the Senate Committee on Science, Education and Culture (2006-2010). He served as Assistant Director General for Science and served as Deputy Director-General of UNESCO Paris, (1990-1998). He is the founding President of two public and two private universities. He is a Fellow and former vice-president of TWAS, and he is the president of Arab Academy of Sciences, and president of World Affairs Council, and served as president of the National Center for Curriculum Development and the National Center for Human Rights.

Badran received his B.Sc from Oklahoma State University (1959), and Master then PhD from Michigan State University (1963), USA.

## **MANAGING WATER-ENERGY-FOOD SECURITY-ECOSPHERE NEXUS**

**ADNAN BADRAN**

*President, Islamic World Academy of Sciences*

*Chancellor, University of Petra*

*Chairman of the Board of Trustees of the University of Jordan, Jordan*

Nature is at risk due to climate change, demography, unfriendly economy in a world of globalization, forced migration, and overtaxing and exploiting our natural resources to a level of irreversibility. In addition to mass destruction of the habitat of fauna and flora, not excluding eradication of Homo sapiens, their infrastructure and ecosystems.

Intersectoral linkages are needed to achieve the SDGs 17 goals. Building synergy is needed for Water-Energy-Food Security-Ecosphere (WEFE) Nexus and Efficient integrative governance approach and management beyond the traditional silos. Under the Nexus paradigm, there is a need to integrate priorities from a single sector policy to overall trade-off solutions and evidence-based policy making. The fundamental principles of WEFE Nexus is to understand the interdependence of resources within a system across space and time, recognizing the power of synergy between water, energy, food and ecosystems, identifying integrative approach and policy solutions to optimize trade-offs and maximize synergies across sectors, ensuring coordination with stakeholders and value the natural capital of land, water, energy sources and ecosystems. WEFE Nexus aims to enhance water-energy-food security without compromising ecosystems through exploitation of co-benefits to improve overall performance, and streamlining development and improving resilience, with stimulating policy and investments. So, managing the nexus efficiently requires assessment of interactions of outputs and evidence-based data. In addition to a scenario development stimulation of the delivery of the Nexus. Water-energy-Food-Ecosphere Nexus is an economic and social priority and a common interest for OIC action plan. Around this Nexus may develop a common OIC market economy to share and care of raising the standard of living of all OIC population. It is indeed a win-win scenario to be undertaken and included in Islamabad declaration of IAS.



## **MUNIR H. NAYFEH FIAS** **USA/ JORDAN**

**Munir H. Nayfeh** is an atomic physicist renowned for his groundbreaking work in nanotechnology. He was born in Tulkarem, and lived in Ramallah, Palestine and in Irbid, Jordan. He received his BSc/MSc from the American University of Beirut and his PhD from Stanford University. He was a postdoc at Oak Ridge National Laboratory, a lecturer at Yale University, and a consultant at the Argonne National Laboratory, and is currently professor of physics at the University of Illinois at Urbana-Champaign. He served as an adviser on nanotechnology at institutions in Saudi Arabia, Palestine, and Vietnam.

Dr. Nayfeh co-authored *Electricity and Magnetism* (also translated into Farsi and Arabic) and is the author of the book *Fundamentals of nano silicon and applications in plasmonics and Fullerenes* (Elsevier), authored the book “Nano silicon in space from the big bang to our present day” (to be published), and co-author of the book *Integrated silicon-metal systems at the nanoscale* (Elsevier), and co-edited three books on laser science and technology. He presents science-fiction comic stories in English, Arabic, Turkish, Urdu and Kazakh languages, using the trademark “Dr. Nano,” to simplify nanotechnology for children and the youth.

In the field of nanotechnology, Dr. Nayfeh has developed breakthrough imprints by developing detection of single atoms and writing with atoms and drawing some of the smallest graffiti in the world. He has also made silicon (the dullest material in the universe and backbone of the electronics industry) glow by dispersing it into ultra-bright ultra-small nanoparticles. This enables the integration of electronics and optics as well as construction of advanced low-cost devices for use in poor and remote areas, with diverse high-tech applications from harvesting solar energy and lighting to deep space exploration to early detection and treatment of acute diseases, such as cancer or cacogenic disease (hereditary diseases).

Dr. Nayfeh holds the largest number of patents in nano silicon worldwide (23 issued in US-Europe). He is founder-chief-officer of three nanotechnology companies – NanoSi Advanced Technologies (USA), Nano Silicon Solar (USA), and Parasat-Nanosi (Kazakhstan) – and has been the president of the Network of Arab Scientists and Technologists Abroad and is an Islamic Academy of Science fellow. He received the Beckman, AT&T, Industrial 100, and Energy 100 Awards.

# THE ROLE OF RENEWABLE AND NANO TECHNOLOGIES IN ENERGY SECURITY IN THE 21<sup>ST</sup> CENTURY

MUNIR H. NAYFEH

*Professor, Department of Physics, University of Illinois at Urbana-Champaign & President, NanoSi Advanced Technologies, Inc.  
Champaign, Illinois, USA*

Considerable effort is focused on developing alternative approaches to reduce the world's reliance on fossil fuels. Hydrogen fuel, nuclear reactors, and other renewable sources are proving to be the cleanest energy sources that offer such alternatives with CO<sub>2</sub> zero-emission. Hydrogen gas powers our primary renewable solar light, i.e., our sun through thermonuclear fusion burning of hydrogen. Renewables such as solar, wind, geothermal, hydro, and biomass including biofuels constitute a potentially very useful component, but they are intermittent. Burning hydrogen and oxygen on earth releases chemical energy efficiently with only water emission; but it is locked in hydrocarbon fossil fuels, and in water, both are problematic. Being in a hydrocarbon carrier allows it to burn but with the CO<sub>2</sub> emission while it is incapable of burning while it is locked in water. It is therefore imperative to harvest pure hydrogen. However, harvesting and storing hydrogen by methods that are both cost-effective and environmentally friendly and safe faces a significant challenge. The advent and development of nano science and technology and nano materials have opened new avenues for novel renewable technologies. Laser ablation, ball milling, electrochemical etching, are among the high-tech technologies that enable synthesis of novel fuels, such as nano silicon powder and other nano metal powders (nanoMg, nanoAl, and nanoFe, ..) and mixtures that efficiently react with water to generate hydrogen gas ('Silicon Fuel' and 'Metal Fuel'). Other innovative developments include nanostructured electrodes, and miniaturized micro cells for fuel, current, and biofuel and more. These innovations are destined to drive low-cost portable devices of renewable energy sources, and conservation, as well as mass production that meets the demand of the ever-increasing population, scattered in remote areas and poor neighborhoods in industrial and developing countries alike. Nuclear energy, however, remains critical, and there can be no real security without advanced modular nuclear energy to provide the package with a *steady energy* component. Finally, we believe that hydrogen and nuclear-based energy remain the ideal and cleanest supplementary components for the 21st century, that offer true security and stability in the World's energy market for all participants, importers, and exporters, rather than the narrowly defined interest of any one country.



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# **SPEAKERS & ABSTRACTS**

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## **MOHAMMAD HAG HASSAN FIAS**

### **SUDAN**

**Mohamed Hag Ali Hassan** is currently President of the Sudanese National Academy of Sciences (SNAS). He was Dean of the School of Mathematical Sciences, University of Khartoum; Chairman of the International Advisory Board of the Centre for International Development (ZEF), Germany; President of the InterAcademy Partnership (IAP); founding Executive Director of TWAS; President of the African Academy of Sciences (AAS); founding President of the Network of African Science Academies (NASAC); Chairman of the Council of the United Nations University (UNU); Chairman of the Governing Council of the United Nations Technology Bank, Turkey and Chairman of the Honorary Presidential Advisory Council for Science and Technology, Nigeria. He was vice- chair of the scientific group of the UN Food Systems Summit. Among his honours: Comendator, Grand Cross, and National Order of Scientific Merit, Brazil; and Officer, Order of Merit of the Italian Republic. He is a member of 12 merit-based academies of science, which include, TWAS, AAS, the academy of Sciences of South Africa ;the Pontifical Academy of Sciences, Hassan II Academy of Science and Technology and the American Academy of Arts and Sciences.

## **CHALLENGES AND OPPORTUNITIES IN ACHIEVING SDGs IN OIC COUNTRIES: ROLE OF STI**

**MOHAMED HAG ALI HASSAN**

*President, Sudanese National Academy of Sciences (SNAS)  
Sudan*

In this presentation, I will highlight the sustainability challenges that OIC countries face in their efforts to achieve the UN Sustainable Development Goals (SDGs). These goals are complex, multidisciplinary, and interconnected, requiring the building, sustaining, and applying of innovation capacities in frontier science, technology, and innovation (STI), particularly in OIC Least Developing Countries (LDCs). I will illustrate how cutting-edge innovations in digital technology, biotechnology, and renewable energy can accelerate the achievement of the SDGs in OIC countries. Additionally, I will examine the role of science diplomacy in promoting global partnerships to address these challenges and how such partnerships can help OIC countries build and sustain homegrown capacities in quality education and research.



## **ZABTA KHAN SHINWARI FIAS PAKISTAN**

**Zabta Khan Shinwari** earned his Ph.D. from Kyoto University, Japan, and pursued several Post Doctoral Fellowships in the same country. His career includes roles at institutions such as the Pakistan Museum of Natural History, National Agricultural Research Centre, WWF-Pakistan, and COMSTECH. He later became Vice Chancellor of Kohat University of Science & Technology and established the University of Science & Technology, Bannu, as well as the KUST Institute of Medical Sciences (KIMS). Dr. Shinwari has also held leadership positions in the private sector, including CEO of Qarshi Research International and Vice Chancellor/PD of Qarshi University-Lahore. Currently, he serves as Professor and Chairman of Biotechnology at Quaid-i-Azam University, Islamabad, focusing on Molecular Systematics, Bioethics, and Biotechnology.

Dr. Zabta Khan Shinwari has made significant contributions to plant genetics, discovering over 200 genes, including five known for drought, cold, and stress tolerance. He is an author of 11 books and has edited 8 international proceedings, along with publishing 520 articles, cited over 22,750 times with an H index of 56 and i10-index of 252. He has supervised over 100 M.Phil and Ph.D. students and holds two patents.

A distinguished figure in scientific research and management, Dr. Shinwari is a role model for communities where education is scarce. He is a Fellow and Secretary General of the Pakistan Academy of Sciences and the Islamic World Academy of Sciences, having received awards such as the Tamgha-e-Imtiaz (2011), Sitara-e-Imtiaz (2018), and the Best University Teacher Award from the Higher Education Commission. He also serves as Treasurer of the Academies and Societies of Sciences in Asia (AASSA) and has been President of the National Council of Tibb.

Dr. Shinwari's current focus includes teaching and developing modules on Dual Use Education and promoting Biosecurity education in Pakistan. He has established collaborations with international agencies such as BEP (USA), LNCV (Italy), and Bradford University to advance these initiatives. His goal is to create a national Biosecurity network in Pakistan, fostering economic growth in the biotechnology sector and ensuring compliance with international ethical and safety standards.

## **THE BIODIVERSITY NEXUS AND SECURITY IN OIC NATIONS**

**ZABTA KHAN SHINWARI**

*Vice Chancellor, Federal Urdu University of Arts Science and  
Technology &*

*Vice President Islamic World Academy of Sciences*

Efforts are needed to bring together policymakers, scientists, and environmentalists to discuss the role of biodiversity in mitigating conflicts, enhancing food and water security, and fostering resilience against natural disasters. We studied the intricate relationship between biodiversity conservation and national security within the member states of the Organization of Islamic Cooperation (OIC). As these nations face mounting environmental, economic, and social challenges, the preservation of biodiversity is increasingly recognized as vital to maintaining stability and security. The paper examines how biodiversity contributes to food and water security, reduces vulnerability to natural disasters, and mitigates conflicts over natural resources. Through case studies and empirical analysis, the research highlights successful initiatives and policies implemented across OIC countries that demonstrate the dual benefits of environmental stewardship and security enhancement. The findings underscore the importance of integrating biodiversity conservation into national security strategies, advocating for a holistic approach that aligns ecological health with socio-economic resilience in the OIC region. Through comprehensive discussions and collaborative initiatives, the paper to highlight innovative strategies and policies that can harmonize environmental conservation with socio-economic stability, ultimately fostering a unified approach to addressing both ecological and security concerns in the OIC region.



## DILFUZA EGAMBERDIEVA FIAS UZBEKISTAN

**Dilfuza Egamberdieva** is the head of the Biological Research and Food Safety Lab, Institute of Fundamental and Applied Research, National Research University (TIAME). She received her PhD in agricultural sciences from the Humboldt University of Berlin, Germany. She pioneered research on the soil and plant microbiome. She conducted her postdoctoral studies at the Helsinki University of Finland, the University of Florence, Italy, the Manchester Metropolitan University, UK, and Leiden University of Netherlands. She continued her research activities at the Leibniz Centre for Agricultural Landscape Research and the Institute of Ecology and Geography, Chinese Academy of Sciences. Her remarkable contributions to science in the field of microbiology received the UNESCO-Carlos J. Finlay Prize for Microbiology (2023), SCOPUS-2019 Regional Award. “Top Scientist of the Year”, TWAS (The World Academy of Science) Award in Agricultural Sciences (2013). TWAS-TWOWS-SCOPUS Young Women Research Award (2009), L’OREAL-UNESCO Fellowship for Women in Science (2006), American Society of Microbiology, (ASM) Morrison Rogosa Award (2006), UNESCO-Man and Biosphere (MAB) Award (2005). On the national level she has played a leading role in the implementation and evaluation the national programs and projects in microbiological and biotechnological research for sustainable development. She act as a chair of the Executive Committee of the OWSD Central Asia National Chapter, and vice-chair and national focal point representative to the UNESCO-STEPAN (Science and Technology Policy Asian Network). Dilfuza is also involved in science policy, and served on the advisory committee of the German Council of Science and Humanities (WR), and member of The High-Level Panel of Experts on Food Security and Nutrition (HLPE), The Committee on World Food Security, and also acts as the Country Ambassador for the American Society for Microbiology (ASM). She is a member of the Global Young Academy (GYA), the World Academy of Sciences (TWAS), and the Islamic World Academy of Sciences (IAS). She is co-editor of the Environmental Sustainability Journal (Springer) and serves on the editorial board of several professional journals including BMC Microbiology, Frontiers in Microbiology, and Plants (MDPI). She authored/co-authored over 200 research articles and edited 8 books published by Springer and Elsevier.

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## **ENHANCING FOOD SECURITY AND ECOSYSTEM HEALTH THROUGH BIOCHAR INNOVATION**

**DILFUZA EGAMBERDIEVA**

*Head of Department of Biological Research and Food safety,  
Institute of Fundamental and Applied Research, National Research  
University (TIAME), Uzbekistan*

In recent decades ecological problems increased in many regions of the world, and these conditions are likely to contribute to increased food security and health risks. The low technological development, improper agricultural methods and policies are major hindrances against agricultural development in many developing economies. Climate change may lead to even more degraded landscapes in many non-irrigated regions since it is accompanied by less rainfall and higher temperatures. These facts represent a serious threat to sustainable food production and to our natural resources. Owing to population growth and increasing food demand, intensive and environment-friendly agricultural techniques such as application of bio-fertilizers have become a promising model for many countries in the world. Biofertilizers contribute environmental benefits and help to conserve resources for crop cultivation, especially for poor farmers. The reduction of chemical fertilizers by using biological fertilizers is one of the effective steps in sustainable agriculture. The application of biochar produced through pyrolysis in the absence or limited oxygen to improve soil fertility and plant growth is gained attention worldwide. The application of biochar to soil is considered to mitigate climate change by increasing carbon storage in soils, improve fertility of degraded soils, plant growth and development, increase fertilizer efficiency, and suppress soil pathogens. In addition, soil amendment with biochar increased soil biological activity, such as microbial biomass and enzyme activities. There are also several reports on the improved plant stress tolerance to drought by biochar application. Biochar-type materials have been also suggested as inoculant carriers and will remain stable in the soil and thus may positively influence abundance of the inoculant organisms such as rhizobia, or plant growth promoting rhizobacteria. Efforts to better understand the role of biochar-based biofertilizers in nutrient uptake and plant response to environmental stress is more compelling now, since a continuous use of high amounts of chemical inputs are generating environmental problems and not sustainability.

Key words: biochar, biofertilizers, crops, abiotic stress, food security



## HALA EL KHOZONDAR FIAS PALESTINE

**Hala J. El-Khozondar**, currently is a visiting professor at Materials, Imperial college London, is working at electrical engineering (EE) and smart systems departments in Islamic University of Gaza, **Palestine**. she got her B.Sc. in Physics from BirZeit University, Palestine in 1987. She earned her Ph.D. in physics from New Mexico State University (NMSU), USA in 1999. She served as teaching and research assistance at the physics department in BirZeit University in 1987. She had a Postdoc award at Max Planck Institute in Heidelberg, Germany in 1999. She is member for several international and national organizations. She participated in several conferences and workshops. Her research includes studying nanotechnology, solar systems, wireless communication, optical fiber sensors, MTMs devices, and polycrystalline materials. She has over 100 publications. She is a recipient of several awards and prizes including Fulbright Scholarship, DAAD, AvH, Erasmus Mundus, TWAS medal lecture, and ISESCO Prize in Science & Technolgy 2014.

# **EXPLORING THE IMPACT OF SIZE AND THICKNESS OF NANOPARTICLE HOLLOW SPHERES ON THEIR PERFORMANCE**

**HALA EL KHOZONDAR**

*Electrical Engineering and Smart Systems Departments, Islamic  
University of Gaza, Gaza, Palestine  
Visiting scholar at Materials Department, Imperial College London,  
London, UK*

The versatile applications of nanoparticle hollow spheres in drug delivery, energy storage, and catalysis have attracted a lot of attention. This study investigates how the size, thickness, and material inside the refractive index of nanoparticle hollow spheres affect their performance. Nanoparticles with different sizes were created and characterized to clarify their structural and functional characteristics by applying Mie theory using the COMSOL software. The findings show interesting correlations between the size and functionality of nanoparticles, offering important information for refining the design and use of nanoparticle hollow spheres in real-world applications. This work provides opportunities for more research in nanomaterial engineering and emphasizes the significance of modifying nanoparticle morphology for improved performance.





## LIAQUAT ALI FIAS BANGLADESH

**Liaquat Ali** is a biomedical scientist, educationist, and sociocultural activist with national and international reputation. With graduation in Medicine and MPhil in Medical Biochemistry from Dhaka University and PhD in Medical Cell Biology from Uppsala University (Sweden) he served various public and private institutions including IPGMR, BIRDEM and the Bangladesh University of Health Sciences or BUHS where he was the Founding Vice-Chancellor. In collaboration with a fairly large number of institutions in home and abroad he has supervised and co-supervised more than 300 MS, MPhil, MD and PhD students in various health and biomedical disciplines who are now working all over the world. About one-fifth of these students are from regional and international origin. With >280 papers/articles in peer-reviewed journals/books and nearly 150 invited lectures in 39 countries of the world Prof Ali is one of the most cited biomedical scientists in the region. He has made significant contributions in the etiopathogenesis of diabetes mellitus among Bangalee population, methodology of antidiabetic plant medicine research, nutritional evaluation of local food materials, epidemiology of cardiometabolic diseases, and health system research in general. Along with his academic and scientific works, he has always participated actively in health related initiatives from the public as well as private sectors. He has been serving the Ministry of Health & Family Welfare and its Directorates & Agencies as an Expert Member in a number of Committees. He is one of the 8 Public Health Advisors as well as the Convener/Member of several Committees of the Government to fight the COVID-19 Pandemic.

For his contribution in education, science and healthcare Prof Ali has been awarded with Fellowships/ Memberships/Honors from various professional organizations including Bangladesh Academy of Sciences, Indian Public Health Association, Islamic World Academy of Sciences and Indian Association for the Study of Asian Traditional Medicine.

In addition to his contribution in his professional fields Prof Ali is also known as a sociocultural and literary activist in Bangladesh. He is the Founding Chair of Pothikrit Foundation which operates a popular intellectually oriented cultural Center (Sanskriti Bikash Kendra or SBK) in Dhaka. He is also a Visiting Faculty in the Department of Theater & Performance Studies of Dhaka University teaching the 'Philosophy and Psychology of Theater' Course. He has particular interest in history & philosophy of sciences, and among his writings in this field the book 'Geometry and Philosophy', published by Bangla Academy is widely acclaimed by the readers.

## **MALNUTRITION AND DEMENTIA AMONG ELDERLY: A GROWING FOOD SECURITY CONCERN IN THE OIC COUNTRIES**

**LIAQUAT ALI**

*Honorary Chief Scientist and Advisor, Pothikrit Institute of Health  
Studies, Dhaka, Bangladesh*

Malnutrition is now a three-pronged global burden with varying intensities of the individual prongs in various countries/ regions of the world. A major proportion of the global population still suffers from undernutrition, but a growing proportion has started to suffer from overnutrition even in many lower-middle-income countries (LMICs). In addition, specific nutrient (especially micronutrient) deficiencies (also termed 'Hidden Hunger') are becoming a major burden in many countries and communities. These three types of disorders under the common umbrella of 'malnutrition' lead to specific health problems ranging from nutritional, communicable and noncommunicable ones. Achievement of SDG 3 (Good Health and Wellbeing) is inconceivable without reasonable solutions to the malnutrition-related challenges. The malnutrition burden has become especially complicated in the context of the growing proportion of the aging population all over the world. Aging, by itself, creates certain nutritional demands. On top of those demands, the rapidly growing burden of Type 2 Diabetes Mellitus (T2DM) and Dementia, is complicating the situation further. T2DM creates a much higher risk of Dementia which is the loss of cognitive functions, especially prevalent among the aged population. Both disorders are linked to metabolic and nutritional abnormalities with potential involvement of the whole spectrum of malnutrition. Overweight and obesity, through the mediation of insulin resistance (IR), are among the major risk factors for T2DM as well as dementia. On the other hand, selective nutrient deficiencies, especially some minerals and vitamins, are among the major risk factors for both disorders. From the data of our studies, the causal association of obesity and Mg-deficiency with IR and T2DM have been revealed in case of DM among Bangalee population. It has also been found that both Alzheimer's Disease (AD, the most prevalent type of dementia) and vascular dementia (VD) are associated with obesity as well as with the degree of hyperglycemia and IR in T2DM. Deficiencies of Vit B6 and Vit B12, through the mediation of hyperhomocysteinemia, have been found to be linked with IR and dementia among T2DM subjects (nearly two-third of them, aged over 65 years, being the sufferers of the cognitive disorder). The OIC countries form a heterogeneous group both from the geographical and socioeconomic points of view. As a consequence, the demography of aging, epidemiology of dementia and T2DM, and burden of various types of malnutrition are highly variable among these countries. At one end of the spectrum, there are poorer countries where undernutrition (with generalized/ specific calorie and/or nutrient deficiencies) is still the major burden that leads to mainly communicable and nutritional diseases. On the other extreme, overweight and obesity are driving epidemics of noncommunicable diseases (NCDs). Aging and rapidly increasing prevalence of T2DM, at different rates, are common in all OIC countries. Accordingly, the burden of dementia is already a real challenge for attaining SDG3 in these countries. The OIC Strategy on Elderly (adopted in 2019 at the 1<sup>st</sup> Session of The Ministerial Conference on Social Development) and the SERIC Report (in 2018) on 'State of Elderly in OIC Member Countries' have touched the issue of dementia only marginally. The OIC Strategic Health Programme of Action 2013-2022 and the COMCEC Report (in 2017) on 'Malnutrition in the OIC Member Countries: A Trap for Poverty' have also not addressed the issue of aging, nutrition and dementia comprehensively. The aged population in the OIC countries has both advantages (in terms of family responsibilities often linked with religious ethics) and disadvantages (in terms of poverty, ignorance and social stigma). Taking all these factors into consideration, category- and country-specific suggestions, should be generated under an overall strategy relating health and food security to combat the interrelated burdens of dementia, DM and malnutrition in the OIC countries.



## **ABDULLAH AL MUSA JORDAN**

**Abdullah Al-Musa** is an academician with more than 20 years of experience in higher institution management at different levels starting from department head to president of the largest 2 Universities in Jordan; namely the University of Jordan (3 Years) and Yarmouk University (4 Years). Prior to involvement in management and at intermittent periods when released from management assignments, He got involved in teaching and research. He is well published (h-index 18, i10-index 23) in the field of plant virology (etiology & epidemiology).

### **Professional Experiences:**

- President, the National Center for Research and Development NCRD, January 2021 – Now.
- Secretary General - the Higher Council for Science and Technology, September 2022 – September 2023.
- Acting Secretary General - the Higher Council for Science and Technology, February 2022 – September 2022.
- Member of the Board of Trustees, The PRIMA Foundation.
- Chairman of Board of Trustees, Philadelphia University.
- Director General, Islamic World Academy of Sciences (IAS), 2019 - 2022.
- Member of the Advisory Group of the Higher Council for Science and Technology. 2020 - Now.
- Co-Chair of the Union for the Mediterranean (UfM).
- Member of Technical Experts Group in the domain of climate change, Union for the Mediterranean (UfM). 2020 - Now.
- Member of the Senate 2016 - October 2020.
- President / Yarmouk University, July 2011 - July 2015.
- President / University of Jordan, February 2002 - December 2004.
- Academic Vice President (Scientific and Medical Faculties) / University of Jordan, 1999 - February 2002.
- Dean / Faculty of Agriculture / University of Jordan, 1997 - 1999.
- Deputy Dean / Faculty of Agriculture / University of Jordan, 1993 - 1997
- Head of the Department of Plant Protection / Faculty of Agriculture / University of Jordan, 1989 - 1992.
- Professor / Faculty of Agriculture / University of Jordan, 1991 - Now.
- Associate Professor / Faculty of Agriculture / University of Jordan, 1985 - 1990.
- Assistant Professor / Faculty of Agriculture / University of Jordan, 1979 - 1984.
- Graduate Research Assistant, American University of Beirut, 1974 - 1975.

### **Other Involvements:**

- Member of the board of trustees of the National Human Right Center. (2003 - 2006).
- Member of the board of trustees of National Center for Badia Development 1993 – 1997.
- Member of the board of trustees of Al-Zarqa University (2005 - 2009).
- Member of the administrative council of the National Centre for Biotechnology, 2008 - 2010

- Member of the Higher Education Councils (2009 - 2011).
- Acting director of biotechnology program. (part time)/ The National Center for Research and Development (HCST) 2010 - 2011.
- Board Member / Century Investment Group 2011 – 2015.
- Board Member/ Irbid District Electricity Company (IDECO) 2011 - 2015.
- Member of the Advisory Board / Royal Scientific society 2012 - 2015.
- Member of the Board of Trustees endowment programs/ Education Program/ Ministry of Awqaf and Islamic shrines 2012 - Now.
- Member of steering committee of Beer Mathkooor Tourist Project/ The Hashemite Fund for Development of Jordan Badia July 2012 - 2015.
- Member of the board of trustees of Royal Scientific Society.
- Member of the Hashemite Fund 2012 - 2015.
- Member of the board of the Ministry of Education 2013- 2014.

#### **Awards and Honors:**

- DAAD Fellowship Research grant for 3 months at the University of Bonn.
- Fulbright Fellowship, 1985-1986 Sabbatical year at UCR, U.S.A.
- Shuman prize for Young Arab Scientists, 1984.
- Hejawi Prize, 1994.
- Distinguished Alumnus Award. American University of Beirut.
- Honorary Doctorate Degree Kabardino-Balkarian State University, Russia, 2004.
- Alumni achievement Award, Washington State University 2004.
- Certificate of recognition for promoting and offering of youth leadership in the UJ and other Universities. United Nations University-International leadership Institute. 2004.
- Plaque of the Association of Jordanian Agricultural Engineers 2002.
- Plaque of the Brigham Young University 2004.

#### **Published over 50 research articles in peer-reviewed international journals and 4 published books.**

Prof. Abdullah Al-Musa earned his B.Sc. in Pesticides from Alexandria University, Egypt, 1971, M.Sc. in Horticulture from the American University of Beirut, Lebanon, 1975, and Ph.D. in Plant Pathology (Virology) from Washington State University, USA, 1979.

## **IMPACT OF LOCAL STRESSES AND EXTERNAL SHOCKS ON THE FOOD SYSTEM IN THE ARAB REGION**

**ABDULLAH AL MUSA**

*President*

*National Center for Research and Development (NCRD), Jordan*

The framework of the food system interlinked three components namely the food supply chain, the food environment and the consumer behavior. The latter could be filtered at the individual level. The system is driven by exogenous determinants including demographic, economical, socio-cultural, political and institutional, technological and infrastructure, biophysical and environmental elements. This conceptual framework analyzes the complexity of interaction among the system components and its drivers and further illustrates the impact of different shocks and stresses the system is exposed to.

The Arab food system is subjected to shocks characterized by short duration, abrupt and rapid onset events such as those caused by climate change, sudden eruption of pandemic (i.e. COVID-19), macroeconomic shocks and violence and conflicts.

These shocks exacerbate the impact of persistent pressures exerted by already intrinsic local drivers of the system.

A major shock to the Arab Region's food system comes about by flaring violence and conflicts that engulfed one-third of the countries in the Region.

These conflicts have resulted in extensive population displacement exacerbating food insecurity in the conflict and host countries as indicated in prevalence of under nourishment and food insecurity experience scale indicators.

The advent of COVID-19 further strained the economies of the countries in the Region resulting in 5.35-19.6% of GDP decline in 2020.

Shocks emanated from climate change aggravated already scarce water and arable land resources in the Region. Surface temperature in the region estimated to increase between 1.7-3.36°C in 2060. Moreover, water scarcity is complicated by water policies taken by governments within and outside the Region in Turkey and Ethiopia.

The Region's food system is vulnerable to volatile oil prices and food prices, as the majority of countries depends on oil export which constitute 18.5-96.5% of government revenue in oil exporting countries.

The dependence on food import is obvious in all countries in the region as indicated by the wheat self-sufficiency ratio that range from zero in Kuwait, Djibouti and UAE to 58% in Morocco.

The above mentioned shocks impacted livelihoods, productivity, displacement of people or caused slow economic growth with negative consequences on the food system's outcomes specially the food and nutrition security. Such impact is more pronounced on financially vulnerable countries or those mired with conflicts. At the individual country level the impact threatens the disadvantaged population such as small-holder farmers and informal urban producers and workers.

The food and nutrition security outcome of the food system in the Arab Region is also subjected to stresses associated with its drivers. Such stresses are characterized by lasting duration and slow onset.

Stresses created by the intrinsic biophysical and environmental elements are shown in the ever-diminishing arable land and water availability due to variability and shortage of rainfall which further is complicated by pollution, over extraction of fossil water from deep aquifers and ever dwindling surface water that run across international borders.

Technology can present dual impact on the food system. It can improve productivity and resource conservation at one hand. But at the same time it allows exhaustion of resources that otherwise are not accessible (extraction of water from deep aquifers). Moreover, technology could widen disparity among players in the food system with reference to their differential capacities, capabilities, affordability and financial accessibility.

The stresses imposed by socio-cultural factors are best illustrated in higher prevalence of poverty in rural settings and in existing gender inequalities.

The fact that the Arab Region is a net-food importer makes it vulnerable to war and conflicts in food-exporting countries and subsequent sanctions, embargoes and commodity price fluctuation.

Stresses emanated from the rapid population growth in the Arab Region resulted in extensive urbanization which is associated with soil degradation and diet shift towards more processed, calorie-dense food with higher carbon foot print and resulting in high incidence of obesity and non-communicable diseases.

The aforementioned shocks and stresses have accumulative impact on the Arab Region food system and resulted in weakening the food Supply chain, the food environment and the consumer behavior in the Region.



## **SHAHBAZ KHAN**

### **CHINA**

Professor Shahbaz Khan is a foreign fellow of the Pakistan Academy of Sciences and a distinguished figure in the field of water management and sustainable development. As the Director and Representative to UNESCO's Regional Office for East Asia, he has been instrumental in advancing UNESCO's mission in the region. With a rich background in civil engineering and environmental law, Professor Khan's expertise encompasses a broad spectrum of water-related disciplines, including hydrology, ecohydrology, and the water-energy nexus.

Professor Khan's leadership at UNESCO has been marked by his commitment to science capacity building and policy advice, particularly through key programs such as Water Education for Sustainable Development and the Hydrology for Environment, Life and Policy (HELP) initiative. His work has significantly contributed to the development of strategies for managing water resources in a way that is both environmentally sustainable and beneficial to communities.

Beyond his role at UNESCO, Professor Khan's academic contributions are equally noteworthy. He holds adjunct and distinguished professorships at several universities, where he continues to influence the next generation of water management professionals. His international recognition, including prestigious awards like the Australian Museum Eureka Prize, China Friendship Award, CSIRO Medal and the UNESCO Team Award for Managing Hydro Hazards, underscores his impact on global water management practices.

Professor Khan's dedication to integrating scientific knowledge with socio-cultural considerations has positioned him as a key proponent of ethical and inclusive water governance. His vision for a world where water security is a reality for all is reflected in his tireless efforts to bridge the gap between science and policy, ensuring that water management strategies are informed by both technical expertise and the needs of diverse communities.

## **INTEGRATING SCIENCE WITH SOCIO-CULTURAL DIMENSIONS FOR GOOD WATER GOVERNANCE**

**SHAHBAZ KHAN**

*Director and Representative to UNESCO Regional Office for East Asia*

The integration of science with socio-cultural dimensions is pivotal for advancing water security and good governance, particularly within the framework of UNESCO's programs. The Intergovernmental Hydrological Programme (IHP) and the World Water Assessment Programme (WWAP) are UNESCO's leading initiatives that build scientific knowledge to manage water resources sustainably. These programs underscore the importance of protecting water systems, mitigating water-related hazards, and ensuring equitable water resource management.

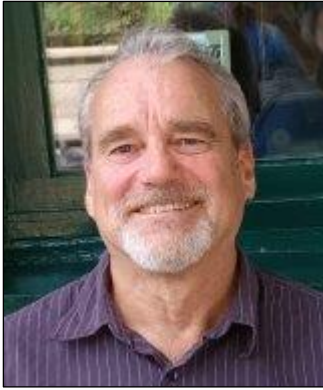
Incorporating socio-cultural dimensions, UNESCO's efforts recognize the intrinsic value of local knowledge and cultural practices in water governance. The Management of Social Transformations (MOST) Programme exemplifies this by translating scientific knowledge into policies that consider social dynamics and cultural diversity. This approach is further enriched by the Culture Programme, which emphasizes the role of heritage and creativity in fostering resilient communities.

The integration of these dimensions is essential for addressing the multifaceted challenges of water security. It involves understanding the complex interplay between human activities and natural water systems, acknowledging diverse water values, and promoting participatory governance models. By blending scientific rigor with socio-cultural awareness, UNESCO's approach facilitates a governance model that is adaptive, anticipates societal needs, and respects diverse knowledge systems.

This model promotes a governance ethos that is not only efficient but also equitable, ensuring that all stakeholders have a voice in shaping water policies. It advocates for the ethical governance of water resources, emphasizing the human right to water and the need for policies that are informed by cultural contexts and social imperatives.

In conclusion, UNESCO's integrated approach to water security serves as a blueprint for nations to navigate the complexities of water governance. It ensures that development is sustainable, culturally sensitive, and socially inclusive, ultimately contributing to the global agenda for good governance and sustainable development.





## **JEFF CAMKIN** **AUSTRALIA/PORTUGAL**

**Jeff Camkin** is an Adjunct Professor with both the University of Western Australia's Institute of Agriculture and the International Water Centre, Griffith University, as well as an international water and sustainability consultant. Currently he is also Visiting Professor at the Portuguese National Laboratory of Civil Engineering in Lisbon, Research Associate with the UNESCO International Centre for Coastal

Ecology and University of Algarve in Faro, Portugal, Honorary Lecturer at both the University of Queensland in Brisbane, Australia and the Technical University of Darmstadt, Germany, Invited Expert (International Watershed Management Training) with the Jiangsu Yuzhi Basin Management Technology Research Institute, Nanjing, China, and Senior Fellow (Water Policy and Management) with the Institute for Studies and Development Worldwide, Sydney, Australia.

With tertiary qualifications in Applied Science (Fisheries) from the Australian Maritime College (now University of Tasmania) and Natural Resources Law from the University of Wollongong, Australia, Jeff has held a wide range of positions in rural and urban water, irrigation, fisheries and other natural resources education, research, management, policy and governance over 30 years. As a Churchill Fellow, Endeavour Executive Fellow, Australian National Committee on Irrigation and Drainage International Travel Fellow, Cooperative Research Centre for Irrigation Futures Visiting Scientist, through his career in public policy, research and education, and now as a consultant, Prof Camkin has observed water management in numerous countries in south and north America, Europe, Africa, Asia and The Pacific, primarily with a view to identifying opportunities to improve water governance.

In recent years, Jeff has turned his attention to the development of new training and education methodologies to help meet the growing worldwide need for capacity in water management, in partnership with Dr Susana Neto from the University of Lisbon. Through the design and delivery of new Master courses in Australia for the International Water Centre, Germany for the Technical University of Darmstadt, and in Portugal for University of Algarve under a collaboration with universities in Netherlands, Germany, Poland and Argentina, together with technical level training through Australian Aid for the International Centre for Water Resource Management and the University of Western Australia.

To further support global capacity building in water management, Jeff proposed and founded New Water Policy and Practice Journal in 2013. Supported by Policy Studies Organisation, Washington D.C., the journal aims to provide a platform for the world's emerging water leaders and thinkers. It is now published by Wiley-Blackwell as World Water Policy Journal and Jeff remains Editor-in-Chief.

### **FROM ENGAGING STAKEHOLDERS TO INFLUENCING POLICY AND PRACTICE: AIMS, DESIGN, OUTPUTS AND HOPES OF THE EU UPWATER PROJECT FOR PROJECTING GROUNDWATER AND ENHANCING WATER QUALITY**

**JEFF CAMKIN**  
*University of Western Australia and Global Consultant,  
Australia/Portugal*



## **M. ASLAM BAIG** **PAKISTAN**

**Muhammad Aslam Baig** is working as Professor Emeritus - Distinguished National Professor at the Quaid-i-Azam University, Islamabad. He established the laser-based experimental facilities for the elemental analysis of materials, alloys, and ores using Laser-Induced Breakdown Spectroscopy, Laser ablation Time of Flight Mass Spectrometry for isotopic abundance measurements and Pulsed Laser Deposition of thin films. Besides, he is developing a Fiber Laser facility and a Stand-off LIBS facility for environmental monitoring and explosive detection.

From 1977-1979, Dr. Baig worked at Imperial College, London, and obtained D.I.C and Ph.D. He then moved to Bonn University as Alexander von Humboldt Fellow to set up a facility at the synchrotron radiation source to study the inner-shell excitation in atoms. In 1981, he was given the Research Associate position and his group demonstrated high-resolution studies and the magneto-optical studies of the Rydberg atomic states. In 1985, his name was included in the Marquis International Who's Who in Optical Science and Engineering (USA).

Dr. Baig moved to the Quaid-i-Azam University, Islamabad in 1986 and established the Atomic and Molecular Physics Laboratory where different aspects of the atomic structure were investigated using multi-step and multi-photon laser excitation and ionization techniques. He developed indigenously, a thermionic diode ion detector, an atomic beam apparatus to study the highly excited Rydberg states of atoms, and Laser Ablation Time of Flight Mass Spectrometer for isotopic studies. Prof. Baig has supervised 34 Ph.D. and more than 95 - M. Phil. He has published more than 350 Research Papers in peer reviewed journals with more than 6500 citations and 37 h-index. Based on his contributions, he was awarded the GOLD-MEDAL for Physical Sciences by the Pakistan Academy of Sciences. He was decorated with the prestigious Civil Awards “Tamgha-i-Imtiaz”, “Sitara-i-Imtiaz” and “Hilal-i-Imtiaz” in Science by the President of Pakistan. In 2012, he was awarded the ZA Hashmi Gold Medal by PSF.

Dr. Baig was the ICTP Associate (1986-1991) and ICS Associate (1991-1997). He was the recipient of the Fulbright Scholarship, Senior Alexander von Humboldt Fellow, and Visiting Professor at the Kaiserslautern University, Germany. He has the honor to be a lecturer at the “Winter college on Quantum Optics” 1997, “Winter College on Spectroscopy and Applications” at ICTP, Trieste Italy, 1999, and 2001. He was involved in the SESAME project, a sixteen nations joint venture funded by UNESCO, established in Amman, Jordan. He served for SESAME as a Council member, as a UNESCO consultant, and later as the Founding Director Science. He is the President of the Science Council of Asia (SCA) 2023-2025, (Japan), and Vice-President of the Asian LIBS Community (ASLIBS), (China). Presently, he is serving as a Secretary General of the Pakistan Academy of Sciences (PAS) for 2024 – 2026.

# **UNVEILING HIDDEN TREASURES: IDENTIFYING RARE EARTH ELEMENTS IN NORTHERN PAKISTAN**

**MUHAMMAD ASLAM BAIG**

*Secretary General, Pakistan Academy of Sciences (PAS)*

&

*Professor Emeritus, Quaid-i-Azam University, 45320 Islamabad,  
Pakistan*

The exploration and identification of rare earth elements (REEs) have gained substantial importance due to their critical role in advanced technologies and sustainable expansion. This study reports on the importance of REEs and their applications, from renewable energy technologies and electronics to defense and medical imaging. Northern Pakistan, with its rich and diverse geological landscape, presents a promising area for REE exploration. Our research focuses on the identification of these elements using Laser-Induced Breakdown Spectroscopy (LIBS). The LIBS technique offers rapid, *in-situ* analysis with minimal sample preparation, making it an ideal analytical technique. To enhance the accuracy and sensitivity of our findings, the LIBS technique is supplemented by Laser Ablation Time-of-Flight Mass Spectrometry (LA-TOF-MS) and Energy-Dispersive X-ray Spectroscopy (EDX). These complementary methods allow for detailed mass measurement of the ionized species, providing a complete elemental composition and confirming the presence of the specific rare earth elements. Our findings contribute to the understanding of the geological distribution of REEs in Northern Pakistan and the extraction and utilization of these invaluable resources will help the country's economic development and technological advancement.



## SHAHID MAHMOOD BAIG PAKISTAN

**Shahid Mahmood Baig**, *HI, SI*, FPAS, born in Rawalpindi Pakistan, Dr. Baig received his BSc. from Gordon College, MSc and MPhil in Biology from Quaid-i-Azam University Islamabad. Started his career as Research Scholar at Nuclear Medicine Oncology and Radiotherapy Institute (NORI-PAEC) Islamabad in 1986. He completed PhD research on “prenatal diagnosis of  $\beta$ -thalassemia” jointly from Bosphorus University Istanbul Turkey and Quaid-i-Azam University Islamabad in 1996. He joined National Institute for Biotechnology and Genetic Engineering (NIBGE) College PIEAS-PAEC Faisalabad in 1995 where he served as professor and head of Human Molecular Genetics till 2020. Prior to his joining Pakistan Science Foundation (PSF) as Chairman in 2020 (28.12.2020-27.12.2023) he also holds a position of Full Professor of Biology (currently on sabbatical leave) at Department of Biological and Biomedical Sciences Aga Khan University Karachi. He was also offered the position of Vice Chancellor of a University but he preferred to join PSF to serve the whole nation for the promotion of science and technology. He was assigned the additional charge of Director General National Institute of Electronics (NIE, March 2023-Dec 27.2023). He is currently working as Dean of Life Sciences, Health Services Academy (HSA), Islamabad. Dr. Baig conducted his postdoctoral research at Oncogenomics Laboratory, Duke University Medical Center, USA (2012) and King Saud University Saudi Arabia (2000-3). His research interests include disease gene discovery and elucidation of gene function in various inherited diseases in the Pakistani population. He is working on the prevention of genetic diseases through genetic analysis, prenatal diagnosis and genetic counseling.

He has identified a number of novel disease-causing genes, elucidated their functions and published in high impact scientific journals. He jointly received the Geers Foundation (Germany) best paper award in 2011 for publishing his research article in *Nature Neuroscience* as first author. In recognition of his services in the field of Life Sciences he has been awarded the second and third highest civil awards of the country *Hilal-i-Imtiaz* and *Sitara-i-Imtiaz*, and elected as Fellow of Pakistan Academy of Sciences (FPAS).

Prof. Baig has established international research collaborations and serving as visiting Research Professor with Uppsala University Sweden; Copenhagen University Denmark, Cologne University, Germany; Lubeck University Germany, Duke University USA and Northwestern University USA in the area of Human Genomics since 2007. His research team members and he himself visit these universities regularly for joint research projects of human genomics.

Prof. Baig is author or co-author of 155 peer-reviewed research articles (several in high-impact journals; e.g. *Nature Genetics*, *Nature Neuroscience*, *Nature Communications*, *Cell Metabolism*, *J Clinical Investigations*, *American Journal of Human Genetics* and *Genetics in Medicine* etc.). His cumulative impact factor is more than 700, H index 38. In his career he has mentored 37 PhD and 10 postdoctoral fellows and currently PI or key researcher in several large national and international research projects. He has delivered a number of invited lectures in USA, Sweden, Denmark, Germany, Saudi Arabia, Sri Lanka, China and Japan etc. He is reviewer of several high impact research journals.

Prof. Baig wish to create a science conducive culture and establish a National Center for Genomic Medicine in Pakistan to discover the disease genes to understand the molecular genetics of rare human diseases, to provide carrier screening, genetic counseling, prenatal diagnosis, reduce the disease burden and to establish precision medicine for this population at high risk of genetic diseases due to consanguineous marriages.

## **IMPACT OF POLLUTANTS ON HUMAN HEALTH AND CLIMATE CHANGE**

**SHAHID MAHMOOD BAIG**

*Professor, Head of Life Sciences Department,  
Health Services Academy, Islamabad, Pakistan*

The UN declaration (2021) has firmly established, through research, an association between climate change, environmental degradation and its adverse effects on health. Reversing the level of current greenhouse gas emissions is crucial to prevent future disasters like extreme heat waves, flooding, tropical storms, rising sea levels supercharged by trapped carbons in the biosphere. The recent surge in dengue in Pakistan, and COVID 19 pandemic led to an increase of zoonotic diseases, consisting of various bacteria, parasites, viruses, fungi proliferating wildly and affecting populations globally. The dengue transmission is on the rise due to unusual global warming, as various vectors like mosquitoes, are breeding rapidly. As a result, the geographical distribution of vector-borne infectious diseases is likely to rise with an incremental increase in the duration and intensity of heat and humidity.

Mitigation and/or reversing these trends would require collective efforts on part of all the stakeholders; the governments, public health systems and civil society organizations. Air pollution remains a major public health problem globally which poses a major environmental hazard to human health, alongside climate change. According to World Health Organization (WHO) estimates, approximately 92 percent of the human population is exposed to air pollution. Pakistan is also facing the growing hazard of air pollution, as various human activities including vehicular, industrial and brick kilns units etc result in emissions in critical levels, raising the specter of toxic smog, particularly during the winter season in some major cities of Pakistan.

Recent medical research on health impact of air pollution is alarming. Air pollution strikes at almost every organ of the human body; not just the respiratory system, like asthma and chronic obstructive pulmonary disease, besides, heart conditions, strokes and cancers. Air pollution exposure in children adversely impacts their cognitive development. Pakistan is also listed among other “vulnerable” countries in the South Asian region. It is through interactive partnerships with civil society, academia, and public health experts and government that the vision for healthy Pakistan can achieve successful outcomes. There is a dire need to mitigate the effects of multi pollutants on public health in Pakistan.



## M. QASIM JAN FIAS PAKISTAN

**Qasim Jan** is an internationally established scientist and academician. He is HEC Distinguished National Professor, and Professor Emeritus at the University of Peshawar (UoP) Geology Centre. Qasim Jan received BSc Hons (Peshawar), MS (Oregon), PhD (London), and Honorary DSc (King's College London & University of Leicester). (He became professor (1983), Director Geology Centre (1988), and Dean of Science Faculty (1997) at UoP. He was a visiting professor at University of Oregon, USA, in 1994-95. From Oct 1997 to Dec 2000, he was Vice Chancellor (VC), UoP, 2001 to 2003 the founder VC of Sarhad Univ., and Oct 2005 to Feb 2010 VC of Quaid-i-Azam Univ., Islamabad. From July 2011 to July 2020, he was Advisor COMSTEC, Islamabad. Dr. Jan served as President of the Pakistan Academy of Sciences from Jan 2018 to Dec 2020, and Vice President of Association of International science organization (ANSO) on the Belt & Road.(2020-2019)

He has travelled extensively, availed prestigious fellowships/scholarships (Royal Society Guest Research Fellowship), Fulbright, British NERC, US NSF, British Council), CAS PIFI, paid visits to many institutions, and delivered invited talks in Europe, USA, Australia, and Asia. He is/was a member of governing bodies of many institutions, peer-review committees, editorial boards of several journals, and Chairman of the Himalayan Regional Committee of the ILP. (2004-1998) He has received many honours and awards, such as ISESCO prize in Science, three Pak. Civil awards, including Hilal-i-Imtiaz, (2010) PAS Distinguished Scientist of the Year (2009), etc.

Jan is a member/Fellow of several professional societies, including TWAS, PAS, Islamic World Acad. Sci. and Chinese Acad. Sciences (Foreign Member-Academician) and. He participated actively in several national and international research projects, and has published and edited over a dozen monographs and hundreds of papers on the geology and Tectonics of Pakistan. MQ Jan conducted detailed investigations of crust-building processes in Kohistan & NW Himalaya, Chagai-Raskoh arc (Balochistan), and Nagarparkar Neo-Proterozoic granitoids (SE Sindh). He has also supervised many masters and PhD students.

# **GLOBAL WARMING AND CLIMATE CHANGE THREATS TO THE NATURAL HABITAT OF THE TIBETAN PLATEAU**

**M. QASIM JAN**

*Professor Emeritus, University of Peshawar, Pakistan*

Rise in recorded temperature, warming of oceans, melting of glaciers, recession of polar ice caps and thawing permafrost, rise in sea level, and damage to coral reefs provide enough evidence for global warming. Its causes can be anthropogenic: Solar flares, cosmic radiation, low-level clouds, volcanic eruptions, earth rotational orbit, meteorite falls, floods, storms, wildfires, decline in carbon sink, water vapor, atmospheric circulations, deforestation, urbanization, and thawing permafrost. But the present day warming is mostly attributed to anthropogenic causes: burning of fossil fuel, land use changes, agriculture and dairy farming. Global warming has serious impact on climate change and related outcomes which pose high threat to our world. Climate change is an imminent global threat that will disrupt all aspects of ecosystem and human activities.

The land, mountains, flora and fauna, and breathtaking natural beauty are the prized treasures of Tibet. The region also holds great environmental significance. It has a profound impact on the southeast Asian monsoon, indeed global climate, and most of the important rivers of S- and SE Asia, and China are sourced in glaciers of Tibet and adjoining Karakoram, Himalaya, Hindu Kush. Tibet has a history of promoting a culture of harmony between mankind and nature. Unfortunately, the pristine and fragile ecosystem of Tibet, mainly because of its high elevation and topography, is under serious threat from global warming and climate change.

The impact of global warming on huge water resources hosted in the glaciers of the greater Tibetan region (also named as the Third Pole) poses a fearsome threat. Apart from melting of glaciers, Tibet faces the threats of thawing of permafrost, changes in water cycle, Impact on water resources and agriculture, rapid warming and moistening, solar dimming, deeper clouds, decline in wind speed and atmospheric circulation, and changes in habitat degradation and human migration.

Some remedial actions are suggested, particularly those related to sustainable agriculture and food security, need for use of green energy to reduce CO<sub>2</sub> emission, close cooperation between all the stake holders, and international collaboration to address the global issue of climate change. Ecological progress and security cannot be achieved in a sustainable and long-lasting way without developing a harmony between nature and people. Any progress that creates an imbalance may have negative repercussions.





## MUHAMMAD ALI PAKISTAN

**Muhammad Ali** has a Ph.D. in Biological Sciences from University of Wales, UK and has 35 years of Teaching, research and administrative experience. Prof. Ali was appointed Vice Chancellor QAU, Islamabad in 2018 till 2022 in recognition of the excellent work he did at GCUF and University of Jhang as Vice Chancellor by mobilizing younger faculty members, inspiring students, building the entire campus, promoting innovation and commercialization, building bridges with business community and enhancing the standard of the institution. During his academic career, he has served in BZU as registrar Officer, resident officer, Director ORIC, Chairman transport Committee, Chairman sports, Director Biotechnology, Chairman Research and Planar Group etc. He has been awarded Best University Teacher for the years 2002, 2005 and 2011 by Higher Education Commission of Pakistan in recognition of his teaching and research excellence.

He has supervised 100 M.Phil. 39 PhD students. Dr. Muhammad Ali is also the writer of two International Books and presented papers in any national and international conferences. He has published 235 papers in national and international well reputed journals with IF 497. He is the selected fellow of Pakistan Academy of Sciences since 2020.

Prof. Ali had been conferred Tamgha-e- Imtiaz by President Islamic Republic of Pakistan on Independence Day 2015 and Sitara-e- Imtiaz 2022 for his outstanding performance and excellence in the field of Biological Sciences. Prof. Ali won and completed 30 projects funded by national and international agencies. Prof. Muhammad Ali is amongst one of few whose research is linked with Animal sciences and Biotechnology. He has vast experience of establishing new institutions and centers, under his dynamic leadership Construction of New Campus of Government College University Faisalabad including 20 Departments and 10 Girls Hostels and 100 residences for faculty members completed.

Prof. Ali is the Chairman Syndicate, Member Board of Governors and Member selection Board of more than 50 Universities and Institutes all over the Pakistan.

## **IMPACT OF THE INDUSTRIAL REVOLUTION ON THE ENVIRONMENT**

**MUHAMMAD ALI**

*Vice Chancellor, Bahauddin Zakariya University, Multan, Pakistan*

Environmental degradation has been the main distress in recent years due to the drastic effect of climate change. The Purpose of Environmental sustainability is quickly becoming one of the most critical issues in the industry development. Since the Industrial Revolution, human activities have made a significant negative impact on the environment. Pollution and carbon emissions contribute to deteriorating our natural environment and atmosphere. These consequences of industrial action pose a threat to human society and all other life on Earth. Understanding the environmental effects of industry is essential so we can move forward with appropriate decision-making and remedy these issues. When we comprehend the consequences of our actions, we can begin to make changes in our behaviors that can promote environmental protection. The purpose of the presentation is to look into the environmental impact of industrial practices. The first part of the presentation will cover the Industrial Revolution and what has occurred since then. The other part of the presentation will look at the specific ways industry impacts the environment and which industries are responsible for the most significant environmental impact. Finally, we will go over some solutions to the issues industry presents to us.

**Keywords:** Environment, Emissions, Industrialization, Pollution, Global Warming, Biodiversity



## MUHAMMAD ASHRAF FIAS PAKISTAN

**Muhammad Ashraf** has been working actively on agriculture related issues by devising and implementing some viable strategies to bring derelict and stress-ridden lands under cultivation because with the burgeoning human population we are bound to utilize our untapped resources. He has been revealing the mechanisms of tolerance of commercially important plants to various abiotic stresses particularly salinity, drought, and extremes of temperature for over last 40 years. Extensive research work has been carried out at whole plant, tissue and molecular levels to examine the effects of different stresses on various crops including cereals, oilseeds and vegetables, etc. Improvement in crop tolerance to various stresses has been one of his major focuses of research. Owing to his considerable scientific attainment in the field of “Improvement of stress tolerance in plants” he was awarded D.Sc (a substantive degree) in 2011 by the University of Liverpool UK, which is an international recognition of his excellent work on plant stress tolerance. According to Google Scholar, his *h*-index is 138 and citations are over 92,000. He has also been declared as “Highly-Cited Researcher” by the Clarivate Analytics (Web of Science). Moreover, he has earned a number of prestigious national and international awards.

## **CLIMATE-TRIGGERED THREATS TO FOOD SECURITY IN THE OIC REGIONS**

**MUHAMMAD ASHRAF**

*Rector, The University of Lahore, Lahore, Pakistan*

In the Organization of Islamic Cooperation (OIC) regions, which comprise 57 member states spanning Africa, Asia, Europe, and the Middle East, climate is characterized as from tropical through subtropical to temperate. Average rainfall in most of the OIC countries is very low, resulting in arid and semiarid conditions. Such conditions give rise a multitude of abiotic stresses, which are undoubtedly some of the premier factors of low agricultural productivity in these areas. Superimposed on this climate-induced changes in precipitation patterns, rising temperatures, and abrupt changes in extreme weather events such as droughts, floods, and storms impede crop and livestock productivity, thereby causing a serious threat to food security. For example, prolonged droughts in the Sahel region and North Africa have diminished water availability, leading to crop failure and pasture degradation, thus threatening the human livelihoods. The major threat to the fertile agricultural lands, particularly in the delta regions like the Nile, Mekong, and Indus is sea-level rise and increased salinization of coastal areas. Increasing salinity intrudes into freshwater systems, compromising water quality and agricultural sustainability. Moreover, increased incidences of pests and diseases fueled by climate variability, are further straining food production systems in the OIC regions. The affected human population of these regions, particularly small holder farmers do not have capacity to adapt to altering environmental cues. Consequently, there is a dire need for detailed climate adaptation and potential mitigation strategies. These strategies include improving water management practices, implementing early warning systems for climate-related disasters and finally investing appreciably in climate-resilient agriculture. International support and cooperation are necessary for building a sound cutting-edge multidisciplinary research base and capacity of the OIC member states with the provision of advanced digital and other state-of-the-art technologies to safeguard food security in the face of escalating climate threats.



## ABDUL RASHID PAKISTAN

**Abdul Rashid** earned his PhD (Agronomy & Soil Science) from *University of Hawaii, USA*, and is a *Distinguished Alumni Award recipient* of *East-West Center, Hawaii*. He is an *eminent* crop nutritionist; his micronutrient research is recognized globally and his farmer-friendly fertilizer use technologies are adopted by farmers widely. His recent research is on *agronomic biofortification* of food grains with micronutrients to combat ‘hidden hunger’ in human populations.

Dr Rashid has published his research widely and effectively. He is lead author of the BOOK “*Micronutrient Fertilizer Use in Pakistan: Historical Perspective and 4R Nutrient Stewardship*”, published by *CRC Press, Florida, USA (2023)*.

Dr Rashid has served as Member (Bio-Sciences) of Pakistan Atomic Energy Commission and Director General of National Agricultural Research Center. He is a Past-President of Soil Science Society of Pakistan and *Fellow* of *Pakistan Academy of Sciences, Indian Society of Soil Science* and *Soil Science Society of Pakistan*. He is recipient of most prestigious global scientific recognitions: *International Fertilizer Association’s Norman Borlaug Award for excellence in crop nutrition* and *International Plant Nutrition Science Award*.

## COMBATING MICRONUTRIENT MALNUTRITION IN HUMAN POPULATIONS BY AGRONOMIC BIOFORTIFICATION OF STAPLE CEREALS

ABDUL RASHD

*Lahore, International Fertilizer Association's NORMAN BORLAUG Laureate and Fellow, Pakistan Academy of Sciences, Pakistan*

Globally, 2 billion people, mostly resource-poor dependent on cereal-based foods (wheat, rice, maize) are suffering with micronutrient [zinc (Zn), iron (Fe), iodine (I) and selenium (Se)] malnutrition (*'hidden hunger'*) and consequent stunting, wasting and chronic diseases impacting morbidity, mortality, and quality of life. A major cause of micronutrient malnutrition is inherently low concentrations and bioavailability of zinc, iron, iodine and selenium in staple cereals (wheat, rice, maize). Two complementary approaches, *genetic biofortification* (developing micronutrient efficient crop varieties) and *agronomic biofortification* (enriching food grains by fertilizer use) are employed to enrich food grains with micronutrients. Both strategies are effective for enriching food grains with micronutrients; however, genetic biofortification alone may not achieve desired concentrations of micronutrients for human nutrition due to several soil- and plant-related factors. For instance, genetically zinc biofortified wheat varieties in Pakistan and India, on an average, contain 8–10 mg per kg more Zn in grains than conventional wheat varieties, which contain around 25 mg Zn per kg grain. The desired zinc level in wheat grains for adequate zinc nutrition in humans is 50 mg per kg. It has been demonstrated that foliar feeding of zinc fertilizer to Zn-biofortified wheat genotypes provides additional increment of up to more than 15 mg Zn per kg grain. Thus, combining agronomic and genetic strategies can raise grain zinc concentrations to adequate levels. More than a decade of field-cum-laboratory research in many countries around the globe, under HarvestZinc project ([www.harvestzinc.org](http://www.harvestzinc.org)), has established that combined foliar-applications of zinc, iodine and selenium at earing and early milk development growth stages is effective in simultaneous enrichment of wheat and rice grains with these micronutrients as well as with iron. Agronomically biofortified micronutrients are bioavailable. Thus, cereal based foods made from biofortified grains contain nutritionally significant amounts of micronutrients with high levels of bio-accessibility, demonstrating an effective transfer of zinc, selenium and iodine from the field to the grain and, ultimately, to the end-product. This demonstrates the potential of combining plant genetic- and fertilizer-based approaches to create additive and synergistic impacts for the accumulation of zinc in wheat grain at desirable levels for human nutrition. Thus, agronomically biofortified cereal grains containing high concentrations of these micronutrients could contribute to the fight against a host of health problems in populations suffering with micronutrient malnutrition.



## MOHAMMAD PERWAIZ IQBAL PAKISTAN

**Mohammad Perwaiz Iqbal** obtained his Masters in Chemistry with Biochemistry major from the Government College, Lahore in 1970 with distinction. He then joined the University of Maryland's International Center for Medical Research and Training, Lahore and initiated his research on genetics of various mosquito species in Pakistan. In 1974, he went to USA and joined the New York Medical College where he started his pioneering work on folate metabolism under the mentorship of Professor Sheldon Rothenberg. This novel research work led to the development of first radioimmunoassay for dihydrofolate reductase (DHFR) which is a key enzyme in cell proliferation. Using this as a tool he studied the role of multiple forms of DHFR in various types of cancers. He joined the New York University in 1976 from where he completed his Masters and PhD in Biological Sciences in 1981. He was appointed as faculty in the Downstate Medical Center, State University of New York, Brooklyn and was soon promoted to the rank of Assistant Professor. During this period, he developed novel radioassays for dihydrofolic acid and the anti-cancer drug, Methotrexate which had immense application in cancer chemotherapy.

In 1983, he returned to Pakistan to join the first private university in Pakistan, the Aga Khan University as Founding faculty in Biochemistry and became Professor in 1992. He laid the early foundations of this Department and provided leadership towards growth and development of the healthcare education and scholarship of discovery through his outstanding teaching and innovative research. He served the Aga Khan University for 36 years with distinction. He has received three Outstanding Teacher Awards (1995, 2006, and 2010) and an Award of Excellence in Education in 2006. He retired in 2019 and was bestowed upon the "*Professor Emeritus*" Award in 2019.

He has been among the leading basic scientists in this country; has published 176 research papers; received numerous research grants worth millions of rupees and provided guidance to numerous PhD students. He has been a recipient of several other awards including INFAQ Foundation Gold Medal in Biological Sciences (1992), PAS/INFAQ Gold Medal in Medical Sciences (2001). He is also Fellow of Pakistan Academy of Medical Sciences, Pakistan Academy of Sciences and Pakistan Society for Biochemistry and Molecular Biology. He was decorated with the Civil Award, *Sitara-i-Imtiaz* in 2002 by the President of Pakistan for his outstanding contribution to teaching and research in Pakistan.

Through his dedicated efforts during the past 4 decades, he has impacted the life of several thousand students who hold leadership positions in academia and community service within Pakistan and abroad.

## **CLIMATE CHANGE AND HEALTH IN PAKISTAN**

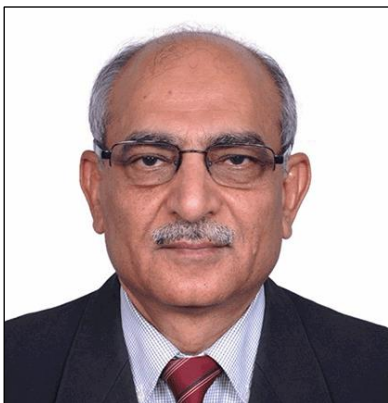
**MOHAMMAD PERWAIZ IQBAL**

*Professor, Life Sciences Department, University of Management and  
Technology, Lahore, Pakistan*

*Professor Emeritus, Aga Khan University, Karachi*

Rapidly emerging climatic changes in south Asia have adversely affected the life of people in this region. Floods in recent years in Pakistan due to unprecedented heavy rains have affected more than 33 million people in this country. These unseasonal heavy rains have been attributed to climate change. Although, Pakistan's contribution to global warming in terms of greenhouse effect is less than 1 %, yet its impact on human health has been quite devastating. It has been reported at the international level that Pakistan has become the 5<sup>th</sup> most vulnerable country to climate change in the world. Due to global warming, there is melting of glaciers, unseasonal rains, flooding, heat waves, wild fires, prolonged droughts and desertification of fertile cultivable land. These changes have resulted into shortage of clean drinking water and food. Food insecurity is likely to lead to malnutrition and hunger in this country. Moreover, stagnant water due to heavy rains and "smog" during the winter are likely to cause malaria, dengue, typhoid, cholera, hepatitis, asthma, hay fever, allergies, respiratory diseases and several chronic diseases. Recent studies have shown that life expectancy is significantly decreasing in heavily polluted areas in Lahore and Peshawar. Besides, frequent outbreaks of new viral diseases are also likely to occur in our region. It is the responsibility of scientific community, civil society, government and other stakeholders to reduce the adverse impact of climate change as much as possible so that people of this country could have a better and healthy living.





## ANWAR-UL-HASSAN GILANI PAKISTAN

**Anwar Gilani** possesses distinguished academic record with basic degree in Agriculture (Food and Nutrition), and PhD in Pharmacology from University of Sydney. Having served on different leadership positions at Aga Khan University, he served as Tandem Dean, Chairman, Pakistan Council for Science & Technology and Vice Chancellor, University of Haripur. Currently, he holds the title of *Distinguished National*

*Professor and Consultant* at the Higher Education Commission.

Prof. Gilani's research is primarily on Functional Foods, which attracted over 30,000 citations with an h-index of 91 and he is the recipients of several national/international awards including three civil awards (*Hilal-i-Imtiaz, Sitara-i-Imtiaz and Pride of Performance*), and *Life-Time Academic Achievement Award* by the Government of Pakistan, in addition, to *Boehringer International Award* (Germany); *Salam Prize* by TWAS (Italy), *Ibn-Al-Haytham and Aga Hassan Abidi Gold Medals* by Pakistan Academy of Sciences (PAS) & *Dr. ZA Hashmi Gold Medal* by PSF.

Prof. Gilani has served as Advisor to WHO and IFS, is a Fellow of Pakistan Academy of Sciences, as well as Fellow of TWAS- The World Academy of Sciences. He has participated in around 100 international conferences (mostly as invited speaker) and represented Pakistan in three United Nations meetings on Science, Technology and Innovation.

## **ENSURING FOOD SECURITY THROUGH SUSTAINABLE AGRICULTURE IN CHANGING CLIMATE**

**ANWAR-UL-HASSAN GILANI**

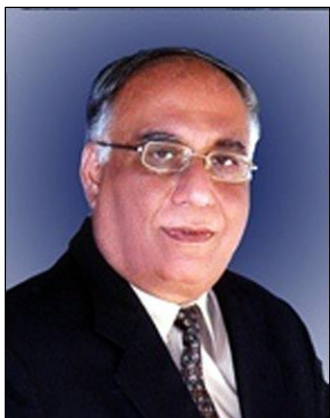
*Fellow, Pakistan Academy of Sciences,*

*Distinguished National Professor*

*&*

*Consultant, Higher Education Commission, Islamabad*

The challenges that we face today include *Climate Change and Global Warming, Insufficient Farmland and Forests, Shortage of Food and Population Growth, Massive Urbanization, Impure Food and Growing Health Issues, Food Loss and Waste, Weak Science & Technology System to cope with challenges, Weak IPR (required to protect innovative ideas), Insensitivity to consequences of Global warming and Depleting/ Wasting Natural Resources including Water, Nutrient (Soil quality) and Forests/Mountains*, thus disturbing Environment and Ecosystem. Food Security dimension include 1) *Food availability* 2) *Food Access* 3) *Food Use/Utilization* and 4) *Food Sustainability*. FAO (2006) identified a “food gap” close to 70 % between the crop calories available in 2006 and the expected calorie demand in 2050. Around one billion people around the globe have insufficient calories and nutrients. The dilemma of today’s world is that on one hand around 805 million people suffer-chronic hunger, 161 million children are stunted (> 40 % children in Pakistan), around 2 billion people suffer micronutrient deficiency, or “hidden hunger”, on the other hand, over 500 million adults are obese, while over 42 million children (<5 year) are overweight due to overeating, hence, non-communicable diseases, such as heart diseases, cancer & diabetes are growing with rapid pace, posing major health issues. Some measures to address the challenge of Food Security through Sustainable Agriculture under the changing climate include, *educating public on consequences of climate change particularly on Agriculture and Health, massive plantation, making crops more efficient & resilient to climate change, rescue more Farmland, help Biodiversity flourish, rotating crops and embracing diversity, empower Smallholders (Land Reforms), Promote Agri-Tourism (cutting down role of middleman), Rural Development and De-urbanization, Preserving water (changing attitude as well as adopting technology), Integrating Livestock/Poultry and Crops (Ecosystem, where waste of one specie is used as food for the other) and saving Food through cutting down the waste and fair distribution of food, following fundamental principles of Islam.*



## MOHAMAMAD QAISER PAKISTAN

**Muhammad Qaiser** is the former Vice-Chancellor of Federal Urdu University of Science and Technology, Islamabad/ Karachi (2008-2013) and University of Karachi (2012-2017). During 2012-2013 he looked after both the universities. Prior to this assignment he served as Dean, Faculty of Sciences, University of Karachi. At present he is Chief Editor of Pakistan Journal of Botany, an impact factor bimonthly journal. He did his Post Doctorate from Freie University, Berlin under post doctorate fellowship (Alexander von Humboldt Stiftung, Germany) in 1984-1985 and his second post doctorate was from University of Reading, U.K. in 1989 (British Council Fellowship). Prof. Qaiser is an elected Fellow of Pakistan Academy of Sciences (PAS) and the World Academy of Sciences (TWAS).

Prof. Qaiser is an eminent plant scientist (taxonomist) of the country and is well known all over the world for his contribution in plant sciences particularly with reference to Flora of Pakistan. His most important contribution is writing, editing and completion of Flora of Pakistan. The Flora of Pakistan is now considered as one of the most authentic documents for the identification of the plants of Pakistan in particular and South-West Asia in general. This Flora is now being utilized by the pharmacists, herbalists, foresters, ecologists, environmentalists and other research organizations. The standard of the Flora has been acknowledged by leading botanists of UK, USA, Netherlands, Finland etc. There are reviews on the Flora of Pakistan in important botanical journals such as *Taxon* (51:221,2002), the most important journal of Plant Taxonomy and *Economic Botany* (58: 740-741). Prof. Qaiser was instrumental in finishing this gigantic project of "Flora of Pakistan" which took more than fifty years, though it was initially started under the Editorship of Prof. E. Nasir (Islamabad) and Prof. S. I. Ali (Karachi). However, after the departure of Nasirs to Canada (Father and son both) Prof. Ali & Prof. Qaiser edited the Flora of Pakistan (1993-2022) till its completion. The Flora of Pakistan deals with nearly 6000 plant species of flowering plants spreading in 225 fascicles. Besides the editorship, Dr. Qaiser's own contribution in this gigantic work is the treatment of more than 800 species distributed in 20 plant families. He was also one of the contributors of Flora of Libya Project. He has revised some of the larger plant families like Scrophulariaceae, Boraginaceae and Ranunculaceae for Flora of Libya.

Besides his contribution to Flora of Pakistan and Flora of Libya, he has published over 250 research papers including a monograph on the genus *Phagnalon* of Asteraceae from Tropical Africa and Arabian peninsula in journals of international repute, mostly in impact factor journals and also authored 5 books.

In view of his contribution in plant sciences Prof. Qaiser was conferred gold medal in Botany by Pakistan Academy of Sciences in 2004; best teacher award in 2005 among all the universities of Sindh by Prime Minister of Pakistan and lifetime achievement award in 2012 by Botanical Society of Pakistan.

## **BOTANIC GARDENS AND FOOD SECURITY IN THE PRESENT SCENARIO OF CLIMATE CHANGE**

**MOHAMMAD QAISER**  
*Centre for Plant Conservation*  
*University of Karachi*

&  
*Fellow, Pakistan Academy of Sciences Islamabad*

Climate change is one of the greatest challenges faced by human society. Global warming and the increasing aridity make growing conditions unsuitable for the plants. Moreover, plant biodiversity is currently being lost at an unprecedented rate. About 1/3<sup>rd</sup> of vascular plants are facing the threat of extinction due to various devastating anthropogenic activities. At present slightly over 100 plants species provide 90% food to mankind, of which 3 species *Triticum aestivum* (wheat) *Oryza Sativa* (Rice) and *Zee mays* (maize) provide 2/3 of total food. This base has to be broadened. According to a report of FAO about 75% of crop diversity was lost between 1900 – 2000. A recent study predicts that as much as 22% of wild relatives of crop plant such as peanuts, Potato, beans will disappear by 2055 under changing climate. Crop wild relatives (CWRs) are genetically resilient to heat, drought diseases there is a dire need to collect, identify, document and conserve these CWRs. In the global agricultural gene bank CWRs collection are poorly represented (2 to 10%). Whereas Botanic Gardens have 70% live collection of CWRs representing crops and other economically important plants. Most of the botanic gardens have expertise in plant taxonomy, physiology, plant breeding and conservation. They can play a significant role in *ex situ* and in *situ* conservation of these CWRs. Some of large Botanic Gardens such as Kew (U.K) Missouri Botanic Gardens (USA) are already working on this strategy. In the past Botanic Gardens located in tropics have played a major role in plant introduction and spread of germplasm of economically important plants such as coffee (*Coffea arabica*), tea (*Camellia sinensis*), oil palm (*Elaeis guinensis*), rubber (*Hevia brasiliensis*) and cassava (*Manihot esculenta*). Under the influence of climate change there is a possibility of the spread of invasive species which will be threat to agricultural productivity food security along with spread of weeds pests and diseases. There is a need to introduces of adaptable exotic species for agriculture, biofuel etc. However, care must be taken in the selection of such species. Botanic Gardens can play important role before introducing on larger scale. Hence the Botanic Gardens can play a multifarious role in the present scenario of climate change including plant conservation and plant introduction for addressing food security.



## **IQRAR AHMAD KHAN** **PAKISTAN**

**Iqrar Ahmad Khan** is a graduate of the University of Agriculture, Faisalabad and the University of California, Riverside. He has been serving as Vice Chancellor of University of Agriculture Faisalabad since 2008. He is former Director/DG Nuclear Institute for Agriculture and Biology (NIAB) and Chief of party U.S.-Pakistan Center for Advanced Studies in Agriculture and Food Security. He has supervised more

than 100 MPhil/PhD students, secured 40 funded research projects, published 150 refereed publications, edited 50 books and proceedings, released 13 cultivars/varieties, and established new universities, sub-campuses, and several new centers and institutions.

He drafted Agriculture Policy for the Government of Punjab in 2017 and a Strategic Agriculture Development Plan in 2024. He led Agro Ecological Zoning of the Punjab Province in collaboration with FAO, published in 2019. His academic and research work has benefitted disadvantaged communities and women. He is a Fellow of Pakistan Academy of Sciences, a recipient of Sitara-E-Imtiaz and Ordre des Palmes Académiques (Civil Award, French Government-with the grade of Officer) for his contribution in agricultural research and education. Recently Government of Pakistan has awarded him Hilal-E-Imtiaz (Civil Award). The Prime Minister of Pakistan has appointed him as a member of the Higher Education Commission for four years.

## FOOD AND AGRICULTURE NEXUS WITH WATER AND ENERGY

**IQRAR AHMAD KHAN**

*Vice Chancellor, University of Agriculture Faisalabad, Faisalabad,  
Pakistan*

Sustainable food production (agriculture) for a world population of 10 billion people by 2050 is a global agenda (SDG-2). Agriculture in Pakistan contributes 24% share in Gross Domestic Product (GDP). It provides direct employment to 37% of its labor force and provides raw material for industry. Limited capacity of the small farmers to invest and adopt new technologies and insufficient public support have resulted in stagnation. A forecasting exercise conducted at the University of Agriculture Faisalabad (UAF) for crop production and population indicates that the country will face a net deficit of more than 5 million tons of wheat annually by 2033. Climate change predicts more droughts and floods. We are witness to the drought caused migration and misery in Baluchistan, Ethiopia and Somalia. The Sindh province is struggling to recover from the 2022 floods. It is now an accepted fact that a temperature rise of 2°C in a century time is near to arrive. Climate change is affecting crop yields, livestock productivity, water availability, soil health, and ecosystem stability. Pakistan is ranked among the top ten countries vulnerable to climate change. A critical word is water; harvest, conserve and divert to the deserts to be greened. The colony agriculture in Punjab and Sindh are outstanding examples of deserts greened by diverting river waters. The then gravity run design of water flow and flood irrigation practices have outlived their utility. Time is ripe to redesign the water flows and use it sustainably. Rice-Wheat cropping system is important to understand climate adaptation and mitigation as it utilizes 2/3<sup>rd</sup> of country's cultivated land and irrigation water. The unprecedented growth in global geospatial information, processing power and access to the data archives provide the opportunity to better understand climate impacts. The availability of large-scale datasets offers effective solution to analyze and understand agro-ecosystems and provide insights for climate action. This talk will highlight some of the indigenous research outputs with pilot scale success at the University of Agriculture Faisalabad including the adaptation and mitigation strategies like redefining agro-ecological zones, bed-planting, agro-forestry, insect-pest-pathogen control, heat tolerant wheat varieties, GM crops, solar technologies and livestock waste management. The threats to agriculture can be mitigated by engagement of policymakers, researchers, industry, farmers, capacity building of the vulnerable communities, advocacy, and global partnerships.





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