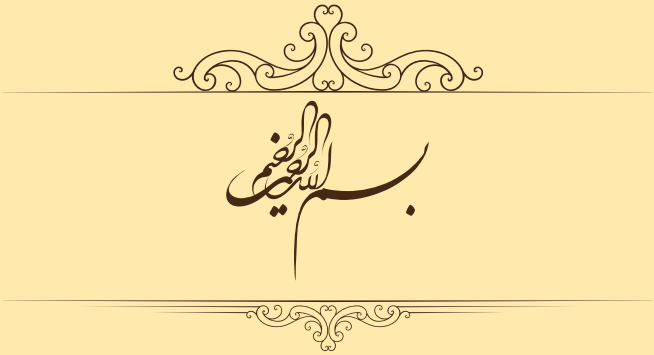

International Summit of Health and Lifestyle

Global Soil Threats

4-5 May 2016

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Messages

Prof. Dr. Ali. A. Moosavi-Movahedi (SASTIW Director General)

Greeting and a warm welcome to the scientists and participants of the International Summit of Health and Lifestyle: Global Soil Threats.

This summit is organized by the Secretariat for the Advancement of Science and Technology in the Islamic World (SASTIW) affiliated to the University of Tehran. This Secretariat holds three summits entitled Culture and Cyberspace; Water, Sustainable Development and Healthy Life, and Global Soil Threats in 2016. Other summits will also be held in the coming years. The main theme of the three summits held in 2016 is Health and Lifestyle. This theme has been chosen as the need for a better lifestyle is felt by the human society. Today, humans' technological achievement is not synchronous with sustainable development and has caused damaging consequences for the Earth. In order to have sustainable development, humans' technological achievement should be compatible with the environment and biosphere.

One of the missions bestowed upon man by Almighty God is to build up the Earth. People should change their style of industry building and incline toward industries compatible with the environment. In order to achieve this objective and avoid damages to the Earth, science and technology should be accompanied with ethics and wisdom.

Soil is the essential component of life. A threat to soil is a threat to the life for human, plant and other living creatures. A fertile land nurtures plenty of plants and healthy living creatures while in a barren land few plants grow and unhealthy animate beings develop. Human nature is made up of soil. Thus, congruence with nature is one of the greatest needs of humankind and a source of his tranquility. If nature is harmed and soil is contaminated, human body and soul will also be affected. Environmental imbalance leads to imbalance in human nature and makes life unhealthy for human beings and other creatures. Human soul will flourish in its natural shape. Nature gives life to human beings, plants, and microorganisms and compatibility with nature is the source of human tranquility. Soil does not only provide food for human body but is also a food for human soul. Human identity and civilization originate from soil. Respect for soil is respect for human dignity. Soil threat is not only an environmental threat but also a threat to human nature, identity, dignity, and civilization. Soil erosion appears to be the erosion of human ethics and conscience. Human beings are made up of soil and return to soil and one of their duties is to build up the Earth.

I hope that this international summit will lead to the creation of a new spiritual and influential discourse on the importance of soil to human society and to

a change in lifestyle. In order to protect the soil, we need to enhance public education so that people appreciate soil as a great national treasure for human health and tranquility.

In sum, I thank all summit participants and hope that this summit will lead to the dissemination of interdisciplinary knowledge of soil and is a path toward holding other summits in Iran and the world in future.

Prof. Dr. Seyed Kazem Alavipanah (Summit Chair)

ای خاک اگر سینه تو بشکافند بس گوهر قیمتی که در سینه تست

If the soil of thy heart break
Precious gem that breast cease testing
(Khayyam Neyshabouri)

It is my great honor to welcome you to the International Summit organized by the secretariat for the advancement of Science and Technology in the Islamic World (SASTIW) affiliated with the University of Tehran with the Topic of Health and Lifestyle: Global Soil Threats. I am so glad to see all of you as top soil scientists at University of Tehran. Your positive contribution is greatly appreciated, in addition to you, there were other scholars very much interested to attend this summit but could not do so. I learned from you that we can be more effective and positive if we initiate a program even with a limited number of scientists.

International Year of Soil, 2015 passed. Hopefully, it will be a memorable year and a milestone for the soil community contribution to food security, climate change adaptation and sustainable development, and also we need to highlight and publicize the world soil knowledge, most importantly, constructive, positive plans, and local management.

FAO Director-General in 2015 said that we have taken soils for granted for a long time but he immediately asked why such an assessment was not carried out before. Yes, why now but anyhow now we must not lose the time anymore. If we start to do our best efforts just now, can we still guarantee to have soil conservation and soil management? I believe not! We must be aware of the fact that many counties are mainly suffering from a symptom based management paradigm, which mainly focuses on curing the problem symptom rather than addressing the main causes.

To know more about the main causes, I will discuss the soil system definition. Almost everybody knows that soils are the foundation of food production and food security, supplying plants with nutrients, water and support for their roots, but how many people or policy makers know that? Soil is a complex, dynamic, and open system and so is life! Thus, what is the relationship between lifestyle and soils?!

This theme has been chosen as the need for a better lifestyle is felt by human society. So not only soil is known as complex, dynamic and open system, but also a social system! Open system does not mean that the implementation of

soil management decisions must occur within a wide differing socio-economic context. So, the development of specific measures appropriate for adoption by local decision-makers requires multi-level, interdisciplinary initiatives by many stakeholders and partnerships are essential.

Not only is the environment and soil complex and multi-faceted but also the societal responses required to achieve sustainable soil management (Arnold et al., 1990). The implementation of soil management decisions is typically made locally and occurs within widely differing socio-economic contexts.

Finding a practical cooperation protocol is the most important expected achievement of this summit in Tehran. In addition, the establishment of soil network in the Islamic World is required in order to have more collaboration among the Islamic countries. It is also valuable to find a practical sustainable soil management system, using scientific and local knowledge and evidence-based proven remotely sensed data, GIS techniques that both help us to increase nutritious food supply and sustain our environment.

Finally I would like to thank all of the participants of this summit and wish more future success in all fields related to soil management for a better life.

“Every unique herb vegetated next to a stream
is as if grown from the lip of an angelical beauty
don’t stampede (degrade) that herb because
it is vegetated from the soil of a beauty
whose face is like a tulip”
(Khayyam Neyshabouri)

Mr. Serge Nakouzi (FAO Representative to Iran & to the Economic Cooperation Organization (ECO))

Dear excellencies, colleagues and friends,
2015 has been celebrated as the International Year of Soils. Many countries around the world joined the celebration, organizing events that highlighted the importance of soils as the foundation of sustainable food systems. Soils are the basis for the production of food, feed, fuel, and fiber. Soils are critical for achieving food security and nutrition as approximately 95% of our food is produced in soils. But apart from these key functions that are central to FAO's mandate, soils also deliver ecosystem services that enable life on earth. They store and filter water, improving resilience to floods and droughts. They are the home for about one-quarter of our biodiversity. Soils also potentially contribute to adapting /mitigating to climate change (due to total organic carbon stored); contributing to overall sustainable development and security (host of quarter global biodiversity, fundamental for human health).But soils are a very fragile, non-renewable natural resource. It can take up to one thousand years to create one centimeter of topsoil. And we can lose it all in just a few minutes. We need to use and preserve soils wisely. Unfortunately, this is not always the case.

Thanks to the work of the Intergovernmental Technical Panel on Soils and many top global soil scientists, the Status of the World's Soil Resources report was launched on 5th December 2015. The report identifies that global soils are in only fair, poor or very poor condition.
Today, one third (around 33%) of global soils are degraded. The most significant threats (in order of importance) to soil function at the global scale are soil erosion, loss of soil organic carbon, nutrient imbalance, soil salinity, soil contamination, soil acidification, loss of soil biodiversity, soil sealing, soil compaction, and waterlogging. The current outlook is for the situation to worsen unless concerted actions are taken by individuals, the private sector, governments and international organizations.

The Status of the World's Soil Resources report should constitute a key route map, a Rosetta stone from which to establish the basis for planning our future interventions towards promoting sustainable soil management, reflecting the main challenges in all the regions of the world. One of the success of the International Year of Soils was the advocacy for including soils into the Sustainable Development Goals. Fortunately, the SDGs, adopted the last September, also recognized the need to preserve and restore degraded land and soil.4 of these

Goals make explicit reference to soils, including key aspects such as improving soil quality, reducing the number of deaths and illnesses caused by soil pollution, combating desertification and restoring degraded land and soil. From the FAO's Global Soil Partnership, we are working towards using the IYS legacy in order to promote sustainable soil management (SSM) at all levels. The endorsed World Soil Charter provide us with the principles to promote SSM. We are currently working on the development of Voluntary Guidelines for Sustainable Soil Management which hopefully will allow for full implementation of good practices.

Finally, I would like to summarize some of the priorities that we need to pay attention to:

Minimize further degradation of soils and restore the productivity of soils that are already degraded in those regions where people are most vulnerable. [Sustainable soil management];
The global stores of soil organic matter should be stabilized or increased. [SOC-improving management practices];
Stabilize or reduce global nitrogen (N) and phosphorous (P) fertilizer use while simultaneously increasing fertilizer use in regions of nutrient deficiency;
Improve our knowledge about the current state and trends of soil condition.

I'm sure that with events like this, we could all contribute to our strive to promote sustainable soil management for food security and nutrition, climate change adaptation and overall development for all and by all.

I thank you!

Intergovernmental Technical Panel on Soils (ITPS)-FAO-UN

The Intergovernmental Technical Panel on Soils (ITPS) was established at the first Plenary Assembly of the Global Soil Partnership (GSP) held at FAO Headquarters on 11 and 12 of June, 2013.The ITPS is composed of 27 top soil experts representing all the regions of the world. The main function of the ITPS is to provide scientific and technical advice and guidance on global soil issues to the Global Soil Partnership primarily and to specific requests submitted by global or regional institutions.

Since its establishment, ITPS has held five working session from 2013-2016 and played a fundamental role in positioning soils on the global agenda through sound science.In the first working session, in response to pressing requirements both internal and external to the GS, the ITPS agreed to embark on a very intensive program of activities.The second working session contained a particular heavy agenda that was fully covered by ITPS members. Third session took place in Potsdam, Germany was connected with the third Global Soil Week by IASS. During this event, a first ever joint session of the ITPS and the Science Policy Interface of the UNCCD was implemented with the aim of finding potential synergies and collaboration.Fourth working session in September 2015. New ITPS members committed to contribute to a busy agenda for the term 2015-2017 and ITPS held its fifth working session in March 2016 at FAO headquarters.

The 5 pillars of action

The Global Soil Partnership will support the process leading to the adoption of sustainable development goals for soils. In order to achieve these objectives, the GSP should address five main pillars of action:

1- Promote sustainable management of soil resources for soil protection, conservation and sustainable productivity

2- Encourage investment, technical cooperation, policy, education awareness and extension in soil

3- Promote targeted soil research and development focusing on identified gaps and priorities and synergies with related productive, environmental and social development actions

4- Enhance the quantity and quality of soil data and information: data collection (generation), analysis, validation, reporting, monitoring and integration with other disciplines

5- Harmonization of methods, measurements and indicators for the sustainable management and protection of soil resources

Publications of ITPS's include the flowing:

- Status of the World's Soil Resources (SWSR)
- Revised World Soil Charter

• Can Carbon (SOC) offset the Climate Change?

Regional Soil Partnerships

Regional Soil Partnerships (RSPs) are being established among interested and active stakeholders. These RSPs will work in close coordination with FAO Regional Offices and will establish an interactive consultative process with national soils entities (soil survey institutions, soil management institutions, scientific soil societies, and soils scientists working in land resources, climate change and biodiversity institutions/programs, etc.), as well as with regional soil science societies and other relevant regional mechanisms under the various related conventions.

Preferably, Regional Soil Partnerships will build on existing regional networks or collaborative processes. In this regard, the world was divided in 8 zones as regional soil partnerships including Africa, Asia, Central America, Europe, South America, Pacific, Near East-North Africa and North America. Iran is part ofthe Near East-North Africa (NENA) region. In this region Prof. Dr. Seyed Kazem Alavipanah as ITPS member and regional coordinator presented an overview of the status and trends of the major and minor soil threats of NENA in the FAO Status of World Soil Resourcesreport.

Each of these RSPs should provide guidance on regional goals/ priorities and the required implementation mechanisms and should regularly review progress in reaching common objectives and targets. In particular, RSPs should facilitate links with national and local soil management programs and activities with a view to strengthening work on soils and to develop synergies with other relevant initiatives and activities.

Abstracts

Session One

Soil Degradation

Prof. Dr. Pavel Krasilnikov (Lomonosov Moscow State University, Russia)

Prof. Dr. Pavel Krasilnikov graduated from the Faculty of Soil Science of Lomonosov Moscow State University in 1992. Received the degrees of Candidate of Biological Sciences (Ph.D.) in 1996, Doctor of Biological Sciences (Dr. Habil.) in 2009. Worked in Institute of Biology, Karelian Research Centre of RAS since 1992 as a researcher of various levels and the Head of the laboratory of Soil Ecology and Geography. Currently works as the Head of Department of Land Resources of the Eurasian Center for Food Security of MSU and Professor of the faculty of Soil Science of MSU. Member of the Central Council of the Dokuchaev Soil Science Society. Served as Vice-Chair of the Commission 1.4. "Soil classification" of the International Union of Soil Science for the period 2010 - 2014. Member of the Intergovernmental Technical Panel on Soils (2013-2015 and 2015-2017 periods). Member of the editorial boards of the journals Eurasian Soil Science (MAIK-Nauka), Boletin de la Sociedad Geologica Mexicana (Mexico), Geoderma and Geoderma Regional (Elsevier).

Food security, ecosystem services and economics of land degradation

Food security is the major challenge for the 21st century. The basic requirements of food security are stability of food production and sustainability of its increase along with increasing population, reducing poverty and improving nutrition. Agriculturalists face the challenge of the demand for increasing production with reducing arable land area, taking into account a requirement for reduced agrochemicals use. Soil scientists should develop new landscape adapted technologies to contribute to the sustainable intensification of agriculture, especially in the developing countries. The main trends of the development of agriculture in the future would be, on the one hand, smart land use planning and construction of artificial soilscapes, and, on the other hand, the use of new generations of biochemical fertilizers such as humates, biochar, etc. Closer interaction between the stakeholders is needed to improve physical availability of food in a global scale.

According to the estimations of FAO, the agricultural production should be increased 70% until 2050 to ensure food security in the world. The task is complex, especially taking into account continuous decrease in the area of fertile arable land due to land degradation and urban sprawl. It is estimated that until 2050 the area of agricultural land per person would reduce to less than 0.2 hectare. Land degradation is a global phenomenon, but there is certain disproportion in its

geographical distribution. It is believed that the main hotspots are Sub-Saharan Africa, South-East Asia and Central America.

Economics of land degradation (ELD) is a challenging initiative focused on the motivation of the decision makers to pay attention to land and soil degradation and thus promote sustainable land management approaches in land use. At the initial stage of its development the initiative provided global and regional overviews of the extent of land degradation and its economic effect, taking into account the loss of the major ecosystem services besides agricultural food production. Land degradation leads to the loss of multiple ecosystem services, including those related to soil functions, such as carbon sequestration, biodiversity maintenance, and filtering groundwater. Current approach to the ELD focuses mainly on the decision making on global and national level. Much should be done yet to include ELD in the management procedures at the farm level.

Prof. Dr. Seyed Kazem Alavipanah (University of Tehran, Iran)

Prof. Dr. Seyed Kazem Alavipanah received his Master of Science in both remote sensing and GIS and soil salinity in 1995 form University of Gent, Belgium and University of Tarbiat Modarres, Iran. He received his PhD in soil science (Remote Sensing and GIS) in University of Gent, Belgium, in 1997. He is now a faculty member of department of Remote Sensing and GIS in University of Tehran. He has received about 10 awards and honors and issued 10 books mainly on RS and GIS, on art and humanities, and he has published more than 300 articles and conducted more than 20 projects. He is member of International DESERTNET. He is also a member of Intergovernmental Panel on Soils (ITPS), and coordinator of World Soil Report of North East and North Africa, FAO-UN. His main expertise is interested in thermal remote sensing with first book published in this field. He has conducted many projects and efforts in environmental change studies and sustainable development planning.

Soils under the threat in Near East and North Africa

Man is dependent on soil, and to a certain extent soil's health and productivity is dependent upon man and his use of soil. Soils have more meaning than a habitat for growing plants, and here we are talking about soils as complex, dynamic, open systems that are basically related to broad societal concern. Obviously if soil is managed poorly, it is impossible to be optimistic about the future, because the current trajectories in soil condition especially soil erosion and dust storms have potentially catastrophic consequences that will affect millions of people in the vulnerable Near East and North Africa (NENA) region over the coming decades. The fragile desert ecosystem of NENA that has been severely damaged by the war and strife on soils, the rate of sand dune movement and dust storm all indicate that future environment needs to be assessed and monitored. Land mismanagement in agriculture, overgrazing and land cover changes are problematic to some extent. We have already discussed the most important threats of soils in Iran, NENA and also in the world. Regarding spatial distribution, the main drivers of soil threats will be discussed locally, regionally and globally. Soil erosion, soil sanity, soil organic carbon and soil acidification will be addressed at different scales. A global and regional summary of soil change and climate regulation are also discussed. Moreover, the necessity of using emerging technologies likes Remote Sensing; Geographic Information Systems for spatial and temporal soil monitoring and soil management are

analyzed. Finally some selected constraints and potentials of soil management based on the status of the world soil reports by Intergovernmental Technical Panel on Soils (ITPS) are shown and related soil recommendations are given.

Dr. Talal Darwish (Center for Remote Sensing, Lebanon)

Dr. Talal Darwish, Born in Lebanon in 1950, Lebanese. PhD in Agriculture (Soil Science), Director of Research/CNRS (Lebanon). Former director of the Center for Remote Sensing (CNRS). Since 1980 has been working with research projects dealing with assessment of land resources and land degradation, sustainable soil management and soil studies and soil mapping. A special place has been attributed to water balance and fertigation of vegetable crops using 15N, management, protection and sustainable use of soil and groundwater resources. Author of the detailed soil map of Lebanon 1:50.000 scale, national land capability map and soil suitability for irrigation. Elaborated the soil maps for the national land use planning project. Author of the soil vulnerability to desertification for the National Action Program to combat desertification UNCCD. Member of the IWG on land degradation and member of the ITPS of the FAO GSP. He has 135 papers in refereed journals and proceedings.

Human pressure on limited soil resources in Lebanon- East Mediterranean

Lebanon is a small mountainous country located on the eastern Mediterranean shore. Both topographic nature and climatic conditions precondition the high vulnerability of the soil cover to water erosion. Since ancient times local people explained the development of the water color in the Lebanese rivers during the spring to miffs and battles offsetting the noble (Goddess Adoniss) and evil (Ugly beast). However, the erosion sedimentation process in Lebanon continues to shape the landscape and to accelerate causing contamination of water streams and reservoirs. Modeling of soil erosion risks using multiple geomorphological, vegetation cover and soil-climatic factors revealed more than 75% of the territory to be moderately and highly vulnerable to water erosion. Human pressure on soil erosion is directly related to the high rates of deforestation and recent urban expansion. The area of the forest stands was reduced from 33.5% to 14.3% of the Lebanese area, equivalent to 3500 and 1500 Km^2 respectively. Large change in land cover contributed to accelerated runoff, intensive erosion and reduced natural recharge. Only between 2000 and 2010 satellite images revealed a reduction of permanent crops by 8% from 1544 to 1307 km^2 accompanied with a shift to annual crops which increased by 12.4%, i.e., from 1486 to 1670 km^2. Urban sprawl at the country level converted fertile lands with highly productive soils to concrete and thus expanded the sealed areas which also promotes surface runoff and negatively affects the quantity of renewable ground water

resources. In 2010, the urban agglomeration caused the loss of 803 km^2 of agricultural soils, equivalent to 20% of the arable lands of the country. Near 70% of urban expansion occurred on moderately and highly productive soils like Fluvisols, Cambisols, Luvisols and Vertisols. Human pressure and increased food demands favored large and intensive agricultural production. Often mismanaged fertilization and irrigation practices caused a drop of the groundwater level by intensive pumping, promoted seawater intrusion into coastal aquifers and lead to secondary salinization of the soil-groundwater system. The creation of the Global and Regional Soil Partnerships and announcement of 2015 by FAO as International Year of Soil contributed to the development of guidelines and action plans to promote sustainable land management. It also supported the foundation of soil information system to raise awareness on the multiple and diverse functions of the soil, education and policy to conserve the soil to meet the food security of increased population and meet the needs and demands of future generations.

Prof. Dr. Ahmad S. Muhaimeed (Baghdad University, Iraq)

Prof. Dr. Ahmad S Muhaimeed, received B.S degree in Soil Science from Baghdad University in 1974 and M.Sc. in Soil Survey and Classification from the University of Nebraska – Lincoln, USA in 1978. Have Ph.D. in Soil Survey from Colorado State University, USA in 1981. He served as lecher of soil survey and land management in the following universities Salahaldeen, Mosul and Baghdad. He worked as Head of soil science and water resources and currently in the Desertification Combat Department, college of Agriculture at Baghdad University. He presented many papers in national and international conferences. Published 3 text book and more than 100 papers. He served as supervisor for more than 30 graduate students in the area of Soil Survey and land management using GIS and Remote Sensing. He was nominated as soil sciences expert member in FAO – GSP-ITPS, 2015.

Threats of desertification forms on Iraqi Soils

Iraq with a total land of 435 square Kilometres is located between longitudes 38 45 and 48 45 E, and between 29 5 and 37 15 N. Iraq was divided into different regions, largely based on physiographic formations .These regions are: Mountains, Foothills, Jezira, Lower Mesopotamian Plain, and Deserts .The desert is the largest physiographic region in the country. It occupies an area of 171,817 km2, or about 39.2% of Iraq's total area. More than 50 % of Iraqi land area is desert, and an increasing part of the permanent pasture areas is subject to erosion because of reduced vegetation cover. Additionally, much of the crop land is losing its inherent productivity due to poor agricultural practices and over exploitation. The direct loss of agricultural land is most acute around urban centers, where established agricultural land is being lost to alternative uses, including urbanization. The main production and land use environments are the rainfed, rangelands and irrigated areas. Six processes of soil degradation are usually recognized including salinization, erosion, urbanization, chemical degradation, physical degradation and biological degradation. Salinity is one of the most serious degradation processes in the central and southern Iraq lands .More than 70 % of the irrigated agriculture lands in the central and southern Iraq have been abandoned in the recent years and causing yield declined between 30 to 60 % as a result, mainly ,of salt accumulation by salinization process. About more than 25 % of the land area of Iraq has a serious erosion problem. More than 20 % of the total area, mainly in southern Iraq was seriously affected by water lodging. So, most of Iraqi agricultural lands are highly effected by one or more of the desertification processes due to poor management practices, dry climatic conditions and to the effects of socio-economic.

Session Two

Sustainable Soil Management

Prof. Dr. Hossein Ghadiri (Griffith University, Brisbane, Australia)

Prof. Dr. Hossein Ghadiri completed his undergraduate studies at Jundi-Shapur University of Ahwaz, Iran, in 1968 and received his MSc and PhD degrees from Reading University of UK in 1974 and 1978 respectively. He then returned to Iran and resumed his academic career at Jundi-Shapur University as an Assistant and Associate Professor of Soil Science, which continued for 7 years. He then immigrated to Australia in 1986 and began his academic life at the Faculty of Environmental Sciences of Griffith University in Brisbane. The Faculty of Environmental Science of Griffith University at which Professor Ghadiri had been conducting his academic activities is the largest and the oldest school of environment in the southern hemisphere and one of the largest in the world which enjoys a very high world ranking. In line with the objectives of his faculty, Professor Ghadiri's teaching and research has been mainly in the field of "environmental soil science". He has more than 200 publications which include books, book chapters, papers, academic and consultancy reports, etc.

What do we mean by sustainable soil management?

Sustainable management of land is part and parcel of sustainable management of total environment and it would be a mistake if we treat it in isolation. Despite the increased popularity of the use of the term "sustainability", the possibility that human societies will achieve environmental sustainability has been, and continues to be, questioned—in light of environmental degradation, climate change, overconsumption, population growth and societies' pursuit of indefinite economic growth. Most western countries are, nevertheless, trying to take a holistic approach to environmental management and pursue their land and water management in such a way not to encroach on the rights of all of users of these finite resources other than agriculture, which seems to be the case in most third world countries. Land management is the process by which the resources of land are put to good effect in a way that productivity is not diminished over time or such production does not adversely impact on the viability or survival of species other than human being. In the course of national politics and programs, most western countries use the terminology "sustainable land management". Here Australia and New Zealand are to be mentioned, as both countries have agreed on sustainable land management with respect to climate change as part of their government programs. Climate change has now been overwhelmingly accepted by scientists as a fact of life which is going to make significant changes in the way we deal with our land and water resources. This is another significant

difference between developed and developing countries. While developed countries can afford to consider climate change in their policy, planning and practice of land and water resources management, most developing countries are still following unchecked exploitation of their resources in order to raise the standard of living of their populations and no one can blame them for doing so (nevertheless it is the perfect example of cutting the branch that they are sitting on or cutting the hand that feeds them). Another major limitation of any land management system, which is especially acute in the developing countries, is that economically and politically powerful users can easily quantify and argue for their needs, or worse, corruptly influence the decision makers. It is hard to define the economic value of ecosystem services and, therefore, the ecosystems and people most dependent on them for their subsistence become voiceless and often neglected users. In theory the holistic approach is supposed to addresses this issue, but it is not always seen in the field. In this paper I will be addressing all these differences which give the term “sustainable land management” different meaning and interpretation in different countries or regions of the world.

Dr. Amanullah Khan (University of Agriculture Peshawar, Pakistan)

Dr. Amanullah is currently working as Associate Professor in the Department of Agronomy, Faculty of Crop Production Sciences, the University of Agriculture Peshawar, Pakistan. He did his PhD in Agronomy from University of Agriculture Peshawar in 2004 and was declared the youngest PhD holder in the university at that time. Dr. Amanullah did his Post Doctorate from Dryland Agriculture Institute, WTAMU, Canyon Texas, USA in 2009-2010 sponsored by HEC, Islamabad. He has been awarded with 2 consecutive Research Productivity Awards by the Pakistan Council for Science and Technology (PCST), Islamabad in 2011-12 and 2012-13. Dr. Amanullah also won the first prize in the innovative research proposal competition arranged by DICE at the University of Gujarat in 2013-14. Due to his outstanding research in the field of crop production, the FAO (Rome Italy) was kind enough to nominate Dr. Amanullah for the Intergovernmental Technical Panel on Soils (2015-17).

Integrated nutrient management improve crop productivity and profitability under semiarid climates: field experiences

Soil fertility is continuously depleting due to mining of the essential plant nutrients from the soils under semiarid climates. Under semiarid climates, the deficiencies of essential plant nutrients, organic matter and beneficial microbes in the soils are the major constraints for low crop productivity. Integrated nutrients management under semiarid climate could increase soil fertility, crop productivity and growers income on sustainable basis. Integrated nutrients management refers to the maintenance of soil fertility and improvement in crop productivity with application of plant nutrients through combined application of organic, inorganic and biofertilizers. Our long term field experiments confirmed a significant increase in field crop production with the incorporation of different organic sources (farmyard manure; animal manures: poultry manure, cattle manure, sheep manure, goat manure etc.; plant residues: onion residues, garlic residues, wheat residues, rice residues, chickpea residues, canola residues etc.; composts, biochar, ash etc.) into the soil under semiarid climate. The combined application of plant nutrients especially major nutrients (nitrogen, phosphorus and potash) along with different organic sources had significantly improved crop growth and increased productivity and profitability in different field crops. Under semiarid condition the application of beneficial microbes (Biofertilizers) was found beneficial in terms of higher nutrients use efficiencies, yield and growers income. The combined use of micro and macro nutrients as foliar spray also increased wheat and maize productivity and profitability under moisture stress condition in semiarid climates.

Dr. Wan Rasidah Kadir(Forest Research Institute Malaysia, Malaysia)

Dr. Wan Rasidah Kadir, was elected as a President of the Malaysian Society of Soil Science (MSSS) during the MSSS AGM in April 2014, being the first female President since its founding in 1971. Prior to her appointment as a President, she had served in the MSSS management committee since 2010, mobilizing the team to organize the annual meeting; Soil Science Conference of Malaysia. Her obligation as a President also requires her involvement in IUSS council meeting and ESAFS biannual meeting. She obtained B.Sc. (Hons) in Chemistry in 1984 and M.Sc. (Chemistry) in 1991 from Universiti Kebangsaan Malaysia. Later she pursued for PhD in Soil Chemistry at Faculty of Agricultural and Applied Biological Sciences, University of Ghent, Belgium and graduated in 1995. She was first appointed as a Research Officer at the Forest Research Institute Malaysia (FRIM) in April 1984, assigned to the Soil Unit. She is now Head of Forest Plantation Programme and Head of Soil Management Branch. The height of her achievement was being the first recipient for the Best FRIM Scientist Award which she received in 2012.

Soils of Malaysia; potential threats and strategies for sustainable soil management
Being in the tropics with high intensity rainfall and warm temperature all year round, majority of Malaysian soils are highly weathered. These old soils falls under Ultisols and Oxisols according to USDA Soil Taxonomy. They are acidic, high iron and aluminium fixation with inherent low fertility level. Other soils of significant hectarage are organic peat, coastal sandy (BRIS) and mangrove swamp of marine clay origin. The latter type of soil is the only saline soil in Malaysia, however upon land use change large areas forms an acid sulphate soil.

Rainfall intensity in Malaysia can reach up to 5,000 mm per year and with highly weathered rocks and soils they are most fragile particularly on steep land. Major soil threats in this country are soil erosion by water (including coastal erosion), decline in soil organic matter in both peat and mineral soils due to land use change, soil compaction, soil sealing due to urbanization and population pressure, soil contamination (coastal deposits and mining), acidification (acid sulphate soil formation), flooding and landslides, and decline in soil biodiversity due to the loss of top soil.

Management strategies to sustain soil productivity and quality are basically published as guidelines and acts. The highest ranking document is National Land Code which is rather general but relevant as it spells out land use categories. Steepland, being a fragile areas, has a comprehensive guide for agriculture

development. This Guidelines for Agriculture Development on Steep Land spell out in details the terminology, definition, categories of suitable and unsuitable sites based on soil texture and gradient class, guides to terracing and procedures for soil conservation. With regards to logging, a Selective Management System (SMS) is practiced and the system is proven effective to ensure sustainability of both highland and lowland forests. The SMS involves selection of a management regime to cater for efficient and economic harvesting, reforestation and sustained yield, as well as to ensure that forest development is biologically, ecologically and environmentally sustainable. Forestry is instrumental in Malaysia for economic and people's welfare apart from its vital role in maintaining environmental stability and quality, protecting soil and water resources, conserving biological diversity, and preserving cultural, recreational and other intrinsic values which enhance people's quality of life. The National Forestry Policy (NFP) for peninsular Malaysia was approved by the National Forestry Council and endorsed by the National Land Council in 1978. On a coastal scenario, a National Peatland Policy is being proposed to re-evaluate the basis for development of tropical lowland peat, as well as to assist the government in making decision whether to develop or to conserve a particular peat swamp areas. Following tsunami catastrophic in December 2004, an effort was initiated at the Ministry level to create buffer zones at selected coastal shore by planting suitable tree species, which at the same time conserving coastal soil resources. Other initiatives was by the private sector embarking on replanting of trees on ex-mining sites to restore the soil resources.

Dr. Mohammad R. Balali (Soil and Water Research Institute, Iran)

Dr. Mohammad R. Balali is an environmental philosopher who received his M.Sc. in soil science in 1997 and started his career as a researcher at the Soil and Water Research Institute (SWRI).He continue his PhD study in the western context which is the origin of concepts and theories of modernization and sustainability. The Applied Philosophy Chair group at Wageningen University, The Netherlands, which is devoted to problems of agriculture and the environment, presented a middle course between pure philosophy and natural science which offered a new language enabling him to communicate with the people who wear different glasses and to get deeper into the complex phenomena of land and water management. His thesis with the title "Reflexive land and water management in Iran: Linking technology, governance and culture" can be seen as the story of his journey which he has tried to bring and link different aspects of land and water issues together in a reflexive way to shed light on the complex phenomena of the environmental crisis in order to find a way out towards sustainable land and water management.

Stewardship soil and water management approaching sustainability in the Islamic context: case of Iran

The world is currently facing an unprecedented environmental crisis. Concerns on land degradation and water scarcity which ultimately threaten food security are growing rapidly around the world as well as Iran and Middle East and North Africa (MENA) region. The transition to sustainable land and water management is especially urgent for this region which not only has a similar (arid and semi-arid) environment but, to a large extent, also share the same religion and history. The general picture of Iran and the region as well reveals that the current land and water issues are complex and that the different aspects are intertwined. With respect to the question of the causes and consequences of this crisis, opinions and responses can be categorized into three groups that focus more or less on single aspects. While the first group of people stresses the - partially technologically induced- scarcity and shortages of our limited land and water resources, and the second group focuses on unsound governance and mismanagement, the third group draws our attention to public perceptions and preferences. There is growing awareness that these different aspects should not be treated separately because technological developments, governance regimes and personal belief systems and lifestyles are strongly interconnected. Hence, to accomplish a successful transition to sustainable land and water management need to construct a

framework to be context dependent and also sensitive to the specific features of the region. To this end, tacking into the account "technology-governance-mentality nexus" study of the co-evolution of agricultural technologies, social institutions, and ethical and religious mentalities throughout history in Iran show that three periods could be distinguished: pre-modernity, industrial modernity and reflexive modernity. The pre-modern era can be characterized by its key technical system (the Qanat system of underground irrigation channels), its main governance institution (the Buneh cooperative organization of agricultural production) and its ethico-religious belief system (Zoroastrianism and Islam). The epoch of industrial modernity can be identified by the partial replacement of Qanats by deep wells and large dams, the substitution of the Buneh by a system of smallholding, and the emergence of a mechanistic worldview. Currently, Iran seems to be in stage of transition from industrial modernity to what has come to be known as reflexive or second modernity in the age of sustainability. Islamic stewardship should be considered as the platform for the construction and development of the definition of sustainability and can be characterized by the revitalization of traditional structures and their integration with the structures of industrial modernity, in such a way that the benefits and advantages of both will be preserved as much as possible. Accordingly, this reflexive framework includes four key elements. First, reflexive land and water technological innovation with its strategy of contextualization strives for restoration and integration of traditional and modern technology that focuses on the whole socio-technical system. To achieve this technological strategy, and as a second element, reflexive land and water governance should facilitate the inclusion of stakeholders in the process of transition. The third element is the Islamic land and water ethics with the core concepts of Islamic stewardship and environmental virtue ethics which can help people to understand how to live a good life in relationship to nature and the environment. The fourth element covers the reflexive soil and water sciences revitalized by an Islam-inspired mode of inquiry that encourages to achieve stewardship management; this post-normal science and Mode 2 science facilitates the democratization of science to cope with the issue of inter disciplinarily and the exclusion of stakeholders (improving the relation between science and society) in the scientific atmosphere and research area. Finally, the land and water professional of tomorrow was portrayed as a "trans disciplinary engineer", a "public leader" and "Stewardship engineer".

Session Three

Soil and human life

Prof. Dr. Ahmet Mermut (University of Harran, Turkey)

Prof. Dr. Ahmet Mermut is the recipient of FCSS, FASA, FSSSA, International Soil Science Award of the SSSA, honorary member of IUSS 2014. He also received the Turkish TUBITAK science award for the year of 2005. He earned a B.Sc. in Soil Science and a Ph.D. from the University of Ankara, Turkey and State Agricultural University at Wageningen Netherlands in 1968. Dr. Mermut is with Department of Soil Science, University of Saskatchewan since 1982. He has served at Harran University 2004-2006, Turkey. He also taught courses at the University of Toronto, in Brazil, and at various universities in the Middle East. He has served as associate editor and editor of Canadian Journal of Soil Science. He has also served as associate editor of Clays and Clay minerals and has been a guest editor for 3 Geoderma and Catena Special issues. He has become recognized as one of leading second generation pedologists in North America. His work on Vertisols contributed substantially to getting the new order recognized in Canada. He is leadership in various committees of Canadian Society of Soil Science, Soil Science Society of America, and International Society of Soil Science, and in organization of many International Conferences.

Soils the most important natural resources for life on earth

Many ancient religions recognized the importance of soils, and a spiritual attachment to the life-giving Earth. However surprisingly, ancient and classical scholars did no work on the nature of soil. The importance of soils as a life-support system was gradually recognized by scientist and the concept of food security, in an ever growing human population, is now recognized by every sector of the human society. The consequence is a new challenge that seeks a balance between human demands and ecosystem services and their integrity. This changing demand of society has spurred new areas of investigation such as soil and water quality, land degradation, cycling of bio-geochemicals, carbon cycle in the soils in relation to global climate change, dust on Earth and food security etc. Development in information technology specifically the use of Geographic Information Systems and database management systems is dramatically improving the presentation and use of the soil data and soil survey information. New concepts such as multi-functionality of land, soil quality, health and sustainability of agriculture concepts have emerged that led to develop new management strategies and enhanced the quality of life on earth. Soils are vital to both for production of food and fiber and global ecosystems function, especially in developing countries. Scientists around the globe are now making a significant

contribution to sustainable land management by translating scientific knowledge and information on soil function into practical tools and approaches by which the land managers can assess the sustainability of their management practices. It is generally agreed that soil problems arise from local conditions and can only be resolved by local actions. Soils serves as a platform for human activities, our landscape and heritage plays a central role as the habitat and gene pool. It stores, filters and transforms substances such as water, plant nutrients and carbon.

To replace or reduce the amount of commercial fertiliser application, alternative crop production techniques, such as the use of organic fertilisation and other organic inputs have been tested. This includes the use of legume species (green manure), compost manure, sewage sludge, wood chips, and peat, beside crop residues. Crop rotation, i.e. introduction of forages and legumes that have extensive rooting systems leave large amounts of organic matter and nitrogen is also used by farmers as a technique.

The study on existing land resources on Earth must continue to ensure growing population and environmental sustainability for all living matters. Food security is becoming a very important matter for mankind on Planet Earth and soils are recognized as central to ensure this consideration.

Prof. Dr. Majid Afyuni (Isfahan University of Technology, Iran)

Prof . Dr. Majid Afyuni received B.Sc. in Soil Science from Utah State University, USA in 1984 and M.Sc. in Agronomy Soil Science from New Mexico State University Las Cruses, USA in 1987. He also has Ph.D. in Soil Science, from North Carolina State University in 1992. .He was head of Center of Excellence Soil and Pollution Studies at Isfahan University of Technology from 2005 to 2012. He presented many papers in national and international conferences. He published three text book and more than 100 papers.

The Develop of Iran Soil Standards

Soil guideline values are generic quality standards adopted in many countries to regulate the management of contaminated land. They are usually in the form of concentration thresholds (mg/kg soil dry weight) of contaminants in soil, above which certain actions are recommended or enforced. They range from the need for further investigations to the need for remedial actions. In this project soil standard values are derived as the regulatory framework. The soil standards are values at which when exceeded further investigation is necessary to determine the effect on human, animals, and plants and other environmental phases such surface and groundwater resources. The soil standard value specifically refers to a soil contaminant concentration that, if exceeded, may result in health effects that are more than minor for some people. On the other hand, if actual soil concentrations are less than or equal to the soil standard value then this is acceptable because any adverse effects on human health for most people are likely to be no more than minor. In this project, soil clean-up standards have been also determined. The soil clean-up standards are values that at or when exceeded the soil contamination posses a potentially unacceptable risk to human, animals, plant or other phases of environment. At this stage there is need of remediation of the soil to remove the pollution. The soil standards and soil clean-up values have been calculated for five different land-use exposure scenarios. The land-use scenarios were residential, parks and recreation, commercial/ industrial, agricultural, and natural lands. The potential pathways of exposure to contaminants in soil are direct ingestion, ingestion of contaminated ground water caused by migration of chemicals through soil to an underlying potable aquifer, dermal absorption, ingestion of produce that has been contaminated via plant uptake.The soil standard and clean-up values were determine for 20 inorganic and 58 organic chemicals. All the standards were calculated for alkaline, pH>7, and acidic, pH< 7, soils.

Prof. Dr. Mohammad H. Roozitalab (Agricultural Research and Education Organization, Iran)

Mohammad H Roozitalab, received B.Sc. in Soil Science from Tehran University in 1970 and M.Sc. in Agronomy Soil Science from University of Oklahoma State University , USA in 1974. He also have Ph.D. in Soil Science from University of Oklahoma State University, USA in 1978 .He was president of the Soil Science Society of Iran, from 1992 to 2009 and general director of Soil and Water Research Institute. Also he was deputy head of Agricultural Research and Education Organization of Iran. He was head of ICARDA-Office in Iran and coordinator of ICARDA Highland Regional Research Network from 2008 to 2011. Also he is executive secretary, water, environment, food security and natural resources center for Islamic–Iranian Model of Progress from 2012 up to now. He was chairman of the Global Forum on Agricultural Research (GFAR) from 2002 to 2006 and president of Association of Agricultural Research Institutions in the Near East and North Africa (AARINENA) from 1998 to 2000.Also he was vice-president of AARINENA from 1996 to 1998 and from 2002 to 2004.In addition he was member of the Board of Directors, International Center for Biosaline Agriculture (ICBA) during 2003 to 2005. Also he was member of Consultative and Executive Council of CGIAR from 1998 to 2006. He was member of Interim Panel of Eminent Expert on Global Crop Diversity Trust, FAO/IPGRI, from 2003-2006.

Soils and food security in Iran

Iran is a vast territory with diverse agro ecological zones and different soil resources, which allow the country to produce various field crops and fruit trees. This has provided an opportunity for the country to export different crops and fruits such as pistachio, date, pomegranate, apple, saffron, food legumes, medicinal and ornamental plants, vegetables, etc. On the other hand, the country has been an importer of several commodities such as wheat, rice, sugar, oiled seeds and maize to bridge the gap between the local food production and the need of the population consumption. On an average, the country is more than 70 percent self-sufficient in food, in term of adequate calories needed for the present population.

In 2014, the total agricultural land area was reported to be about 16.5 mha (% 10 of total land) from which about 13.6 mha (%8.2) were under field crops and orchards. The irrigated land area, which was about 7.9 mha (% 60 of the agricultural land) produced more than % 90 of agricultural production. Dryland agriculture produces only %10 of the total production. The crop production

increased from about 20 m ha in 1980 to around 75 m ha in 2007. However, in the last decade the growth of crop production, especially wheat was not satisfactory due to various factors .Therefore, the country needed to import more food and feed to compensate the deficit, despite a lot of investment made and the technologies developed. This seems to be the same trend for many countries in the world, especially in the region of Near East and North Africa which is presently the biggest importer of food grain in the world. Gradual decline in soil quality might be a major contributing factor in reducing crop productivity in Iran and other countries in the region.

About 97 percent of the soils in Iran have been developed in the arid to semiarid climates. Soils play an important role in the development of agriculture and enhancement of food security in the country. They are mostly classified in three orders of Aridisols (%41.1), Entisols (%41.3) and Inceptisols (%14.5). Soils are mostly calcareous and deficient in available N, P, Fe and Zn. Increased salinity is a major constraint in the irrigated farming system. Another major challenge facing soils are loss of soil organic carbon, which adversely affect the soil productivity and crop yield, particularly in irrigated area. The productivity of dryland agriculture has remained very low in spite of many technologies developed during the last 25 years to enhance the production. Many soils under dryland are facing severe erosion and loss of organic matter at the soil surface. Conservation agriculture and integrated soil and water management are recognized to be the key issues for sustainable soil management under irrigated and dryland faming system.

Water scarcity and impact of the incipient climate change are also other major threats to soil productivity in many regions of Iran. The country urgently needs to take an active national policy to support and strengthen civil society organizations and farmers associations and to implement programs for enhancing knowledge and skill of the framers and other stakeholders to meet the challenges ahead. It is also suggested that the government facilitate adequate investment by public and private sectors for promoting integrated and multidisciplinary research projects and improving infrastructures. Generating suitable technologies for small resource farmers and providing enabling environment for increased resiliency and adaption of agriculture to the outcome of the incipient climate change are in dire need.