

UNESCO Chair on Low Carbon and Sustainable Agriculture in Biosphere Reserve



Theme

Over the years, extensive and injudicious use of natural resources especially water has created immense threats because of increasing carbon footprints, environmental sustainability, resource use efficiency, and socio-economic livelihood issues. One of the key strategies is to enhance climate adaptation capacity of the UNITWIN community and improve their resilience through empowering communities with innovative tools, building their capacity to use these tools effectively, policy support and cross cultivation of the ideas. The Chair at MNSAUM, aim to promote low carbon and sustainable agriculture practices; and local and regional capacity building that can play an effective role in devising a road map for sustainable agriculture system in local context. The chair will impart research and education for “sustainable resource use” by improving efficient use and reducing environmental impacts in the selected biosphere reserve as a pilot scale intervention(s). The learnings will be disseminated to a larger community with inspiration for more sustainable agriculture.



Introduction

MNS- University of Agriculture has been playing a key role in bringing different stakeholders together for making collaborative efforts for community education and sustainable agriculture practices especially through research excellence, outreach, and policy advocacy. The university not only enjoys a strategic location in agriculture domain in South Punjab and close to Biosphere reserve site but also possess the requisite international collaborative project experiences so make this chair a successful UNESCO initiative. The selected biosphere reserve of Lal Suhanra is being used as a learning space for testing and developing interdisciplinary approaches towards sustainable agriculture. The learnings will be disseminated and used for capacity-building at a larger scale at national and international level.

UNSECO Chair for low Carbon and Sustainable agriculture biosphere reserves MNSUAM, situated in the heart of the South Punjab is contributing towards reduced carbon footprint in agriculture. The chair emphasizes on establishing the Learning Management for Sustainable Agriculture Development (LSAD), biosphere protection, and protecting customary rural cultures by integrating associated sustainability and conservation indicators. Our chair contributes not only to hosting UNESCO initiative of biosphere protection but also synergizing with neighboring countries who are facing similar challenges to rural economy. The Chair at MNSUAM is actively engaged and extending its linkages with existing UNESCO chair(s) (at COMSATS IslaUNITWINad) as the chair will yield on the strengths of these chairs to extend their initiatives for larger benefits

Introduction

of the community through sustainable agriculture and rural economy, and biosphere protection.

The chair at MNSUAM will contribute to Strategic objective **1, 2 and 4** of **UNESCO Mid-term strategy 2022-29**, by strengthening national and international knowledge exchange programs and developing training programs in promoting low carbon footprint and sustainable agriculture at national and regional level. UNESCO Biosphere Reserve at Lal Suhanra will be used as testing and application grounds of research activities and projects, to draw lessons and disseminate them in a wider context (national and regional) especially for the benefit of the communities operating in Transitional Zones of designated BRs.



Objectives

1. Research, in collaboration with local and international partners and exchanges of researchers for protecting biodiversity and improving water-energy-food nexus by proposing sustainable systems, which can facilitate the farmers in affective adoption of innovative technologies and also help increase their income and reduce poverty.
2. Education at University level, using the results of the research and possibility to have field visits at the Biosphere Reserve.
3. Capacity building of managers, decision-makers, stakeholders, at the chosen Biosphere Reserve and also in a wider context (even international).
4. Dissemination of good practices, results, policy advice, and other learnings to a larger community.
5. Close cooperate with UNESCO, other UNESCO Chairs and UNITWIN Networks on relevant programmes and activities.



Purpose

The chair will serve as a UNESCO UNITWIN hub for reducing carbon footprints and promoting sustainable agriculture in the region and the neighboring countries at various levels:

-Local: The chair will promote various research development, and cultural activities to promote sustainable agriculture at Lal Suhanra biosphere reserve. The learnings and outcomes of research experiments will be disseminated to the local community through training and workshops. The learnings from activities modelled around the BR will be translated for the benefit of the farming and rural communities living in 11 districts of South Punjab especially.

-Regional/ National: The learning outcomes achieved at local level will be used to develop policies at the national and regional level geared towards poverty alleviation through improved crop production and income through sustainable resource utilization. These activities will contribute towards the Lima Action Plan in sustaining the biosphere reserves, introducing the concept of sustainable development especially in the transitional zone, improving resource use efficiency but also provide opportunities to build on global best practices in the water-energy-food nexus and sustainable agriculture practices. to improve the livelihood of local communities and minimize environmental impact. Best practice will be shared with the communities in arid regions of Punjab (comprised of 5 districts) and Thar desert in Sindh with the help of partners like CUI and MUET.

Purpose

-Global: At the global level, there will be various exchange programs for knowledge sharing among students, faculty, and researchers. National and International linkages will be developed among UNESCO chairs and beyond, in line with priorities areas and objectives set by UNESCO. The chair will work collaboratively with other UNESCO initiatives and chairs to facilitate knowledge exchange and help achieving common objectives especially learnings from other BRs in the Countries falling under South-South Cooperation.



Journey

The establishment of the **UNESCO Chair for Low Carbon and Sustainable Agriculture Biosphere Reserves at MNSUAM** marks a significant milestone in advancing climate-resilient and sustainable agricultural practices in South Punjab. Leveraging its strategic location near the **Lal Suhanra Biosphere Reserve**, the Chair successfully transformed the reserve into a living laboratory for testing climate-smart agriculture, water-energy-food nexus solutions, and biodiversity-friendly farming systems.

Through collaborative research with national and international partners, the Chair introduced innovative low-carbon technologies that improved resource-use efficiency while reducing environmental impacts. Capacity-building workshops and community outreach programs empowered local farmers and managers with practical tools and knowledge, enabling them to adopt sustainable practices that enhanced productivity and livelihoods.

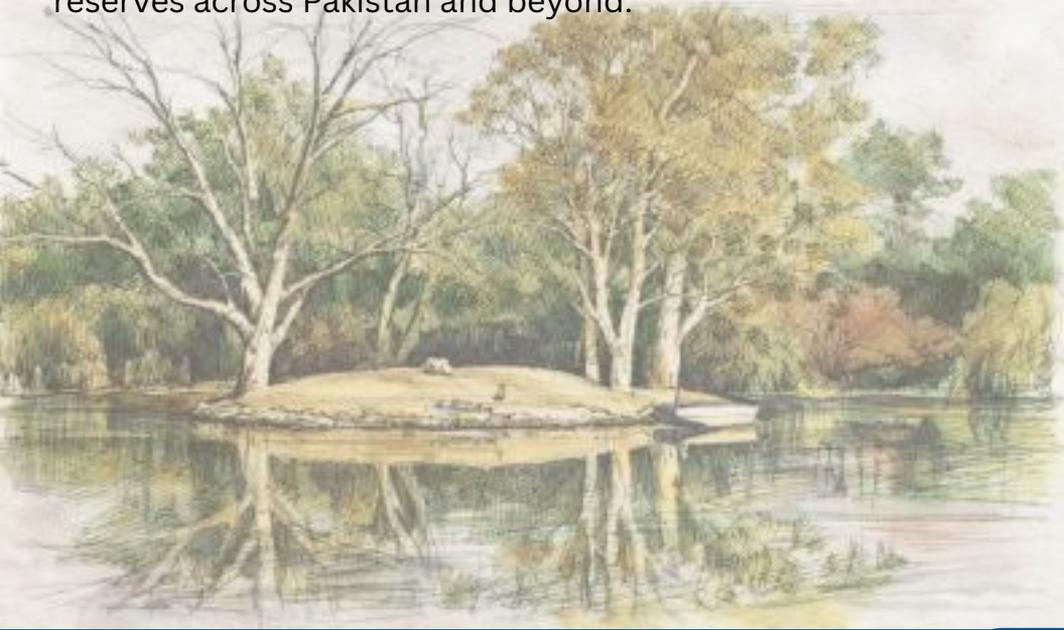
At the academic level, the Chair integrated research outcomes into postgraduate education and field-based learning, fostering a new generation of sustainability-focused professionals. The dissemination of best practices and policy recommendations strengthened linkages between research, communities, and decision-makers.

On a social societal level the chair believes in gender mainstreaming and promotes female engagement in climate education and carbon footprints reduction through sustainable agriculture practices. The team members include Dr. ayesha Hakim for technology who is an active researcher on emerging technologies such as Artificial

Journey

Intelligence and IoT also working as focal person for blended learning at the university and Miss Aiman Batool working as focal person to UNSECO chair, who is an active researcher on Eco literature and postmodern feminism. In line with UNESCO priority gender equality that is mainstreamed through the Medium-Term Strategy (41 C/4) and the Programme and Budget (41 C/5), the research activities and training programs will be designed to encourage female participation to empower them and let them play their role in socio-economic development.

By aligning its activities with UNESCO's Mid-Term Strategy (2022–2029), the Chair has emerged as a regional hub for sustainable agriculture, contributing to biodiversity conservation, reduced carbon footprints, and resilient rural economies—while offering a scalable model for biosphere reserves across Pakistan and beyond.



Activities

Lal Sohanra Biosphere Reserve Tour

This summary consolidates findings from the preparatory field survey on November 6, 2025, and the official UNESCO delegation visit on November 19, 2025, organized by MNS University of Agriculture Multan and the TARA Group.

Preparatory Technical Visit

A technical team, including Dr. Zeeshan Ali and Dr. Usman Jamshaid, surveyed the reserve to assess ecological conditions and community needs.

- **Ecological Observations:** The reserve spans approximately 200,000 acres, divided into "Commanded" (irrigated) and "Un-commanded" (rain-dependent) zones. Soil analysis revealed good sub-surface moisture retention. Wildlife observations included the endangered Blackbuck, Neel Cow, and migratory birds.



Activities

- **Community & Agriculture:** Discussions with local farmers highlighted major challenges, including low-quality seeds, ineffective pesticides, and unstable fertilizer prices.
- **Key Recommendations:** The team proposed replacing non-native Eucalyptus trees with indigenous species like Keekar and Ber, expanding irrigation, and developing eco-tourism.



Activities

UNESCO Chairholders' Coordination Meeting in Pakistan

On 18 November 2025, the UNESCO Chair on Low Carbon and Sustainable Agriculture in Biosphere Reserves at MNS University of Agriculture, Multan (MNSUAM), hosted a high-level coordination meeting for UNESCO Chairs across Pakistan. Convened by Vice Chancellor Prof. Dr. Asif Ali, the session brought together academic leaders to unify efforts against national challenges such as climate change, water scarcity, and biodiversity loss. The meeting served as a platform to enhance inter-chair collaboration and establish a shared strategic direction for future UNESCO-led research and community engagement in the country.



The proceedings featured significant policy inputs from key leadership. Prof. Dr. Asif Ali emphasized that individual academic efforts are insufficient to tackle Pakistan's environmental crises, advocating strongly for the creation of a National Consortium of UNESCO Chairs. He specifically highlighted the Lal Sohanra Biosphere Reserve as a model for ecological resilience requiring collective protection. Mr. Fuad Pashayev, the UNESCO Representative in Pakistan, underscored the demographic reality that youth comprise over 65% of the population.

Activities

He urged the Chairs to prioritize responsible digital awareness to combat misinformation and foster critical thinking, ensuring that academic work translates into tangible community empowerment. Technical presentations from the participating Chairs showcased a diverse range of strategic initiatives. The Chair on ICT for Development (ITU, Lahore) focused on cybersecurity and root-level scientific schooling, while the Chair on Inclusion Through Arts (BNU, Lahore) highlighted social empowerment plans including the upcoming "Nothing Fest 2025." The Chair on Integrated Water Resources Management (COMSATS, Wah) outlined a 2025–2027 action plan utilizing AI and machine learning for hydrology and disaster risk reduction. Similarly, the Chair on Sustainable Urban Regions (NED University, Karachi) detailed its commitment to SDG 11 through green infrastructure research. The host Chair at MNSUAM presented its integrated sustainability model centered on Lal Sohanra, featuring a partnership with TARA Group to implement carbon-offset plantations and smart farming tools.



Activities

The meeting concluded with a collective resolution to form a National Consortium of UNESCO Chairs to facilitate resource sharing and annual coordination. The delegates agreed to launch collaborative research proposals focusing on climate resilience and biodiversity, deeply integrate youth into all future initiatives, and align strictly with global SDGs to enhance UNESCO's visibility in Pakistan. The session closed with a specific commitment to support biosphere reserves through joint scientific and community-based projects, marking the transition from dialogue to a deeper phase of collaboration.



Activities

Seminar on People, Nature, and Harmony: Pakistan's Biosphere Reserves in Focus

The seminar "People, Nature, and Harmony," organized by the UNESCO Chair at MNS University of Agriculture, Multan, highlighted the ecological and socio-economic significance of Pakistan's biosphere reserves, specifically positioning the Lal Sohanra Biosphere Reserve as a model "living landscape" where conservation meets sustainable livelihoods. Vice Chancellor Prof. Dr. Asif Ali and international experts addressed the global "triple planetary crisis," advocating for an "ecological civilization" that balances development with environmental stewardship through stronger science-policy linkages and regional cooperation on food security.



Activities

From a technical and operational perspective, the event focused on practical management strategies for Lal Sohanra, including zoning plans, desert forestry, and the adoption of solar drip irrigation to combat desertification. Concluding with a focus on the future, UNESCO Representative Mr. Fuad Pashayev emphasized the critical role of Pakistan's youth and digital awareness in conservation, while the roadmap forward prioritized creating a national research network and using digital tools to monitor these ecosystems effectively.

MOU Between MNSAUM and Tara Group

A significant step in collaborative governance was achieved through the signing of a Memorandum of Cooperation with the TARA Group, establishing a framework for public-private partnerships in research.



Activities

UNESCO Delegation Visit (November 19, 2025)

The primary objective was to brief UNESCO Country Head, Mr. Fuad Pashayev, on sustainability initiatives at the reserve. The visit showcased specific technical solutions to the challenges identified earlier:

- **Seed Ball Technology:** Dr. Muqarrab Ali presented this technology to improve vegetation cover and restore wildlife habitats in dry, un-commanded areas.
- **CO₂ Absorption Strategy:** Dr. Tanveer Ahmad introduced a plantation model using climate-resilient species designed for high carbon absorption.
- **Water Purification:** Dr. Zeeshan Ali demonstrated a low-cost filtration system using crop residue to purify canal water for domestic use.
- **Farmer Support:** Dr. Sagheer (TARA Group) outlined efforts to provide high-quality seeds and technical assistance to local communities.



Activities

Hands-on Training Workshop on Climate and Crop Growth Modelling (DSSAT)

On the advice of Vice Chancellor Prof. Asif Ali (T.I.), a three-day hands-on training workshop on Climate and Crop Growth Modeling was successfully organized from January 07 to 09, 2026, under the umbrella of the UNESCO Chair and CAS-SP at Muhammad Nawaz Shareef University of Agriculture, Multan, Pakistan.



The workshop aimed to strengthen capacity in climate-resilient agriculture by providing practical training in crop simulation and modeling tools to faculty members, researchers, and students. The workshop proved to be highly informative and valuable. During the training, participants gained in-depth knowledge about climate change and its impacts on agricultural crops and ecosystems. The practical applications of the DSSAT model were demonstrated effectively, including its use for analyzing climate change, assessing crop growth, and evaluating various crop management strategies.

Activities

Prof. Dr. Irfan Ahmad highlighted that the DSSAT model is an invaluable tool for researchers, students, and agricultural professionals, as it supports in decision-making for future climatic scenarios, optimizing crop management practices, and developing mitigation and adaptation strategies under changing climate conditions.

In his address, he also expressed gratitude to Dr. Mohkum Hammad (Trainer), and Mr. Saeed Ahmad (Co-Trainer), for managing such a well-structured and impactful training program. He advised the participants to apply the DSSAT model in their research activities for promoting climate-smart agriculture and encouraged the students to seek guidance from Climate and Crop Modeling Lab. He also assured that such workshops would continue in the future so that more students and researchers can benefit and contribute to addressing agricultural challenges.



Activities

Hands-on Training Workshop on Sustainable Aquifers through Climate-Resilient Agriculture

Prof. Dr. Irfan Ahmad Baig delivered the opening remarks, highlighting the issue of groundwater over-extraction for agricultural purposes. Dr. Muhammad Saifullah and Engr. Mudassar Masood served as the technical resource persons for the session. The participants were from stakeholder department as well as academia. The two-day (18-19 December, 2025) training workshop combined theoretical lectures and hands-on exercises to equip participants with skills in groundwater modelling and management. Day 1 covered aquifer behaviour, climate-induced stress, and GW Vistas model setup, including grid construction and refinement. Day 2 focused on modelling exercises, boundary conditions, hydraulic properties, and input file handling, ensuring participants could develop and analyze groundwater models. Interactive discussions and case studies highlighted local groundwater challenges, with emphasis on climate-smart agriculture, Managed Aquifer Recharge, remote sensing, evapotranspiration-based irrigation scheduling, and integrated groundwater planning. The workshop strengthened participants' theoretical understanding and practical proficiency in sustainable groundwater management. Vice Chancellor Prof. Dr. Asif Ali (T.I.) concluded the training session with utilization to apply the modelling tools for climate-resilient agriculture, and certificates were distributed to the participants.

Collaboration

National:

1. **Prof. Dr. Shoaib Ahmad Khan**, College of Electrical and Mechanical Engineering, NUST
2. **Dr. Bukhshal Lashari**, U.S._Pakistan Center for Advanced Studies in Water, MUET, Jamshoro, Pakistan
3. **Mr. Ather Shah Khagga**, Conservative Forest, Lal Sohanra Biosphere Park, Bahawalpur
4. **Prof. Dr. Muhammad Abid**, UNESCO Chair on Knowledge Systems for Integrated Water Resources Management (IWRM), COMSATS University Islamabad, Wah Campus
5. **Prof. Dr. Khalid Mushtaq**, Director, Institute of Agri. & Res. Economics, UAF



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International:

1. **Prof. Dr. Richard Trethowan**, Plant Breeding Institute, University of Sydney, Australia
2. **Prof. Dr. Zhang Rui**, BRI Chinese Academy of Agricultural Sciences, China
3. **Prof. Dr. Andreas Buerkert**, Organic Plant Production & Agroecosystems Research in the Tropics and Subtropics, University of Kassel, Germany
4. **Prof. Jingwei Wu**, UNESCO Chair on Asia-Pacific Water-Food-Environment Nexus, Wuhan Uni, China
5. Prof. Fenghua Zhang, Shihezi University, Xinjiang, China

Technical Advisor:

1. **Dr. Tariq Rana**, Water and Environmental Policy & Planning Expert, Murray-Darling Basin Authority, Canberra, Australia (CV at Annex-O)



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