

MUHAMMAD SANA ULLAH

Ph.D. (CARBON SEQUESTRATION & CHANGING CLIMATE)

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RESEARCH AREAS

- Carbon sequestration under changing climate
- Land-use changes and greenhouse gases emissions
- Microbial activities at root-soil interface
- Nutrient dynamics under abiotic stresses
- Agro-waste management for climate change mitigation

EDUCATION

- 2007-10** Ph. D. "Climatic influence on decomposition and stabilization of soil organic matter in grassland ecosystem with special reference to drought", University of Paris VI, France.
- 2006-07** Master-2-Research Science, Technology and Health, University of Paris-Est Créteil Val de Marne, France.
- 2004-06** Master of Science (Hons.) Soil science, University of Agriculture, Faisalabad, Pakistan.
- 2000-04** Bachelor of Science (Hons.), Soil sciences, University of Agriculture, Faisalabad, Pakistan.

PROFESSIONAL EXPERIENCE

- 2024 to date** Tenured Associate Professor, Institute of Soil and Environmental Sciences, University of Agriculture, Faisalabad
- 2016 to date** Coordinator, M.Sc. (Hons.) Climate change degree program
- 2019 to 2024** Tenured Associate Professor, Institute of Soil and Environmental Sciences, University of Agriculture, Faisalabad
- 2011 to 2019** Assistant Professor, Institute of Soil and Environmental Sciences, University of Agriculture, Faisalabad
- 2013-15** Alexander von Humboldt (AvH) Post-doc fellowship "Effect of plant communities on nutrient cycling in soil under drought stress", University of Göttingen, Germany

DISTINCTIONS

- 2015-2017** Recipient of Research Productivity Award (RPA), Pakistan Council for Science and Technology
- 2013-2015** Recipient of Alexander von Humboldt (AvH) Post-doc fellowship, Germany
- 2006-2010** Recipient of HEC MPhil leading to PhD scholarship in France

CURRENT PROJECTS

- Greenhouse gases inventories of major crops of Pakistan, funded by Asian Development Bank (ADB) (840 million PKR, 2025-2029)
- South Asian Nitrogen Hub (SANH) for enhancing nitrogen use efficiencies on sustainable basis, funded by UKRI-GCRF, UK (90 million PKR, 2019-2024).
- Rice residue is a boon not bane, don't burn, reuse it: Evaluation to persuade farming community for mitigating smog and ensuring sustainable food production, funded by Higher Education of Pakistan (5.7 million PKR, 2022-25).
- Atmospheric measurements in Pakistan, funded by GCRF, UK (6.5 million PKR, 2023-24).

SCIENTIFIC PUBLICATIONS

- Wakeel, A., A. Qadeer, Z. Bano, M.R. Shahid, M. Rizwan, A. Kiran, **M. Sanaullah***, T. Aziz, R. M. Rees, A. Bhatia and J. Drewer. 2025. Managing Fertilizer Rates and Tillage Depth to Improve Nitrogen Use Efficiency and Soil Health. *Journal of Soil Science and Plant Nutrition*. <https://doi.org/10.1007/s42729-025-02310-5>.
- Anwar, F., F. Mahmood, S. Hussain, **M. Sanaullah** and T. Shahzad. 2025. Disentangling climatic and intrinsic physicochemical controls on organic carbon pools of agricultural soils along a climate gradient. *The Journal of Animal and Plant Sciences*. <https://doi.org/10.36899/JAPS.2025.2.0044>.
- Qadeer, A., A. Wakeel, S.A. Cheema, T. Shahzad and **M. Sanaullah***. 2024. Integrated impacts of soil salinity and drought stresses on the decomposition of plant residues. *Sustainability*. 16:5368.
- Anwar, F., **M. Sanaullah**, H.M. Ali, S. Hussain, F. Mahmood, Z. Zahid and T. Shahzad. 2024. Effect of combined application of inorganic nitrogen and phosphorus to an organic-matter poor soil on soil organic matter cycling. *PeerJ* 12:e17984
- Afzal, T., A. Wakeel, S.A. Cheema, J. Iqbal, and **M. Sanaullah***. 2024. Influence of quality and quantity of crop residues on organic carbon dynamics and microbial activity in soil. *Soil & Environment*, 43: 53-64.
- Rizwan, M., H. Tanveer, M.H. Ali, **M. Sanaullah** and A. Wakeel. 2024. Role of reactive nitrogen species in changing climate and future concerns of environmental sustainability. *Environmental Science and Pollution Research*. 31:51147-51163
- Malik, L., **M. Sanaullah**, F. Mahmood, S. Hussain and T. Shahzad. 2024. Co-application of biochar and salt tolerant PGPR to improve soil quality and wheat production in a naturally saline soil. *Rhizosphere*. 29:100849.
- Shahid, M.R., A. Wakeel, **M. Sanaullah** and D.S. Gaydon. 2024. Identifying changes to key APSIM-wheat constants to sensibly simulate high temperature crop response in Pakistan. *Field Crops Research*. 307: 109265.

- Ahmed, W., M.N. Ashraf, **M. Sanaullah**, M.A. Maqsood, M.A. Waqas, S.U. Rahman, S. Hussain, H.R. Ahmad, A. Mustafa and X. Minggang. 2024. Soil organic carbon and nitrogen mineralization potential of manures regulated by soil microbial activities in contrasting soil textures. *Journal of Soil Science and Plant Nutrition*. 24:3056-3067.
- Noor, M., A. Kiran, M. Shahbaz, **M. Sanaullah** and A. Wakeel. 2024. Root system architecture associated zinc variability in wheat (*Triticum aestivum* L.). *Scientific Reports*. 14:1781.
- Afzal, A., A. Wakeel, T. Shahzad, S. Hussain and **M. Sanaullah***. Phosphorus and zinc nutrition in maize (*Zea mays* L.) under drought stress. *The Journal of Animal and Plant Sciences*. 33: 1292-1303.
- Haider, I., M.A. Ali, **M. Sanaullah**, N. Ahmed, S. Hussain, M.T. Shakeel, S.A.H. Naqvi, J.S. Dar, M. Moustafa, M.O. Alshaharni. 2023. Unlocking the secrets of soil microbes: How decades-long contamination and heavy metals accumulation from sewage water and industrial effluents shape soil biological health. *Chemosphere*. 342: 140193.
- Sultana, R., A. Kiran, **M. Sanaullah** and A. Wakeel. 2023. Exploring the linkage between root system architecture and grain iron content in wheat (*Triticum aestivum* L.). *Frontiers in Sustainable Food Systems*. 7:1156728.
- Tayyab, M., **M. Sanaullah** and A. Wakeel. 2023. Sodium substitutes potassium requirements of sugar beet under saline–sodic conditions. *Journal of Plant Nutrition and Soil Science*. 186:464–472.
- Bushra, A. Kiran, M. Ahmad, T. Shahzad and **M. Sanaullah***. 2023. Mitigation of drought stress in wheat through exogenous application of proline. *The Journal of Animal and Plant Sciences*. 33: 1392-1401.
- Haider I., M.A. Ali and **M. Sanaullah**. 2023. Change in Lettuce nutrients, soil enzymes, soil microbial biomass and activities under chromium toxicity. *Pakistan Journal of Botany*. 55: 89-96.
- Nawaz, A., H. Rehman, M. Usman, A. Wakeel, M.S. Shahid, S. Alam, **M. Sanaullah**, M. Atiq and M. Farooq. 2023. Nanobiotechnology in Crop Stress Management: An Overview of Novel Applications. *Discover Nano*. 18:74.
- Tayyab, M., A. Wakeel, **M. Sanaullah**, S.M.A. Basra. 2023. Physiological and biochemical characterization of sugar beet against salt-stress. *Pakistan Journal of Agricultural Sciences*. 60: 235-247.
- Iqbal, M., M. Naveed, **M. Sanaullah***, M. Brtnicky, M.I. Hussain, J. Kucerik, J. Holatko and A. Mustafa. 2023. Plant microbe mediated enhancement in growth and yield of canola (*Brassica napus* L.) plant through auxin production and increased nutrient acquisition. *Journal of Soils and Sediments*. 23:1233–1249.
- Tayyab, M., A. Wakeel, **M. Sanaullah**, M. Zahir, M.U. Mubarak, M. Ijaz and M. Ishfaq. 2023. Foliar

- application of boron enhances sugar beet yield and industrial sugar content by promoting indigenous soil-boron uptake. *Pakistan Journal of Botany*. 55: 1295-1303.
- Qadeer, A., A. Wakeel A, S.A. Cheema and **M. Sanaullah***. 2022. Interactive effects of salinity and drought stresses on soil respiration and microbial activities. *Pakistan Journal of Agricultural Sciences*. 59: 35-42.
- Usman, M., **M. Sanaullah**, A. Ullah, S. Li and M. Farooq. 2022. Nitrogen pollution originating from wastewater and agriculture: Advances in treatment and management. *Reviews of Environmental Contamination and Toxicology*. 260:9.
- Ullah, A., M. Farooq, A. Qadeer, **M. Sanaullah***. 2022. Impact of zinc and plant growth-promoting bacteria on soil health as well as aboveground biomass of desi and kabuli chickpea under arid conditions. *Journal of the Science of Food and Agriculture*. 102: 2262-2269.
- Malik, L., **M. Sanaullah**, F. Mahmood, S. Hussain, M. H. Siddique, F. Anwar and T. Shahzad. 2022. Unlocking the potential of co-applied biochar and plant growth-promoting rhizobacteria (PGPR) for sustainable agriculture under stress conditions. *Chemical and biological techniques in agriculture*. 9:58
- Iqbal, S., M. Farooq, **M. Sanaullah***, A. Ullah and F. Nadeem. 2022. Effect of nitrogen application and sorghum mulch on nitrogen use efficiency, microbial biomass carbon, extracellular enzymes activities and growth of mashbean (*Vigna mungo* (L.) Hepper). *Journal of Plant Nutrition*. 45:703-712.
- Khan, S. N., G. Hassan, M. R. Khan, Z. H. Facho, D. Singh, K. S. Sandhu, **M. Sanaullah**, M. Imtiaz, and S. Ali. 2022. Field assessment and molecular markers-based characterization of yellow rust resistance in wheat hybrid progenies. *Journal of Animal and Plant Sciences*. 32:127-137.
- Khan, M.I., M.J. Afzal, S. Bashir, M. Naveed, S. Anum, S.A. Cheema, A. Wakeel, **M. Sanaullah**, M.H. Ali and Z. Chen. 2021. Improving Nutrient Uptake, Growth, Yield and Protein Content in Chickpea by the Co-Addition of Phosphorus Fertilizers, Organic Manures, and *Bacillus* sp. MN-54. *Agronomy*. 11: 436.
- B. Hussain, **M. Sanaullah**, M. Iqbal, F. Mahmood, F. Azeem, M. Shahid, T. Shahzad and S. Hussain. 2021. Effect of arsenic (AS) on growth and physiology of maize (*Zea mays*) in varying soils. *The Journal of Animal and Plant Sciences*. 31: 1366-1376.
- Iqbal, M.M., I. Khan, **M. Sanaullah***, M. Farooq. 2021. Influence of seed size on the growth, productivity, and water use efficiency of bread wheat planted by different methods. *Archives of Agronomy and Soil Science*. 67: 354-370.
- Sanaullah, M.***, M. Usman, A. Wakeel, S.A. Cheema, I. Ashraf and M. Farooq. 2020. Terrestrial ecosystem functioning affected by agricultural management systems: A review. *Soil and Tillage Research*. 196: 104464.

- Rumpel, C., V. Ann, H. Bahri, M.C. Floody, S. Cheik, T.T. Doan, A. Harit, J.L. Janeau, P. Jouquet, M.L. Mora, P. Podwojewski, T.M. Tran, Q.A. Ngo, P.L. Rossi and **M. Sanaullah**. 2020. Research for development in the 21st century. *Geoderma*. 378:114558.
- Usman, M., M. Farooq, A. Wakeel, A. Nawaz, S.A. Cheema, H. Rehman, I. Ashraf, **M. Sanaullah**. 2020. Nanotechnology in agriculture: Current status, challenges and future opportunities. *Science of the Total Environment*. 721: 137778.
- Hussain, B., Q. Lin, Y. Hamid, **M. Sanaullah**, et al. 2020. Foliage application of selenium and silicon nanoparticles alleviates Cd and Pb toxicity in rice (*Oryza sativa* L.). *Science of the Total Environment*. 712: 136497.
- Hussain, S., S.A. Cheema, **M. Sanaullah**, M. Farooq. 2020. Weed Management in Direct-Seeded Fine Rice Using Allelopathic Crop Residue Mulches and Nitrogen for Sustained Yields in Pakistan. *International Journal of Agriculture and Biology*. 24:1178-1186.
- Rehman, MZ., M. Rizwan, A. Rauf, M.A. Ayub, S. Ali, M.F. Qayyum, A.A. Waris, A. Naeem and **M. Sanaullah**. 2019. Split application of silicon in cadmium spiked alkaline soil plays a vital role in decreasing Cd accumulation in rice (*Oryza sativa* L.) grains. *Chemosphere*. 226: 454-462.
- Rasheed, N., M.A. Maqsood, T. Aziz, M.Z. Rehman, H.M. Bilal, M.A. Ayub, M. Irfan and **M. Sanaullah***. 2019. Zinc application methods affect its accumulation and allocation pattern in maize grown in solution culture. *International Journal of Agriculture and Biology*. 21: 1197-1204.
- Mganga K., B.S. Razavi, **M. Sanaullah**, Y. Kuzyakov. 2019. Phenological stage, plant biomass and drought conditions affect enzyme activities and microbial biomass in the rhizosphere of *Enteropogon macrostachyus*. *Pedosphere*. 29:259-265.
- Shahzad, T., F. Anwar, S. Hussain, F. Mahmood, M.S. Arif, A. Sahar, M.F. Nawaz, N. Perveen, **M. Sanaullah**, K. Rehman and M.I. Rashid. 2019. Carbon dynamics in surface and deep soil in response to increasing litter addition rates in an agro-ecosystem. *Geoderma*. 333:1–9.
- Ahmed, M.A., **M. Sanaullah***, E. Blagodatskaya, K. Mason-Jones, H. Jawad, Y. Kuzyakov, M.A. Dippold. 2018. Soil microorganisms exhibit enzymatic and priming response to root mucilage under drought. *Soil Biology and Biochemistry*. 116:410-418.
- Ahmed, M.A, C.C. Banfield, **M. Sanaullah***, A. Gunina and M.A. Dippold. 2017. Utilisation of mucilage C by microbial communities under drought. *Biology and Fertility of Soils*. 54:1-12.
- Maharjan, M., **M. Sanaullah**, B.S. Razavi, Y. Kuzyakov. 2017. Effect of land use and management practices on microbial biomass and enzyme activities in subtropical top-and sub-soils. *Applied Soil Ecology*. 113:22-28.
- Shahbaz, M., Y. Kuzyakov, **M. Sanaullah**, et al. 2017. Microbial decomposition of soil organic matter

is mediated by quality and quantity of crop residues: mechanisms and thresholds. *Biology and Fertility of Soils*. 53:287–301.

Sanaullah, M.*, A. Chabbi, P.A. Maron, K. Baumann, V. Tardy, E. Blagodatskaya, Y. Kuzyakov and C. Rumpel. 2016. How do microbial communities in top- and subsoil respond to root litter addition under field conditions? *Soil Biology and Biochemistry*. 103:28-38.

Sanaullah, M*., B.S. Razavi, E. Blagodatskaya and Y. Kuzyakov. 2016. Spatial distribution and catalytic mechanisms of β -glucosidase activity at the root-soil interface. *Biology and Fertility of Soils*. 52:505–514.

Sanaullah, M.*, A. Chabbi, C. Girardin, J.L. Durand and C. Rumpel. 2014. Effects of elevated temperature and drought on biochemical composition of forage plants and their mineralization potential in grassland soil. *Plant and Soil*. 374: 767-778

Shahid, M., A. Austruy, G. Echevarria, M. Arshad, **M. Sanaullah**, et al. 2014. EDTA-Enhanced Phytoremediation of Heavy Metals: A Review. *Soil and Sediment Contamination: An International Journal*. 23: 389-416

Baumann, K., **M. Sanaullah**, A. Chabbi et al. 2013. Changes in litter chemistry and soil lignin signature during decomposition and stabilization of ^{13}C labelled wheat roots in three soil horizons. *Soil Biology and Biochemistry* 67: 55-61

Wakeel, A., M. Gul, **M. Sanaullah**. 2013. Potassium dynamics in three alluvial soils differing in clay contents. *Emirates Journal of Food and Agriculture*. 25: 39-44

Sanaullah, M*., A. Chabbi, X. Charrier and C. Rumpel. 2012. How does drought stress influence the decomposition of plant litter with contrasting quality in a grassland ecosystem? *Plant and soil*. 353:277-288

Sanaullah, M.*, A. Chabbi, C. Rumpel, and Y. Kuzyakov. 2012. Carbon allocation in grassland communities under drought stress followed by ^{14}C pulse labelling. *Soil Biology and Biochemistry*. 55:132-139

Sanaullah, M.*, E. Blagodatskaya, A. Chabbi, C. Rumpel, and Y. Kuzyakov. 2011. Drought effects on microbial biomass and enzyme activities in the rhizosphere of grasses depending on plant community composition. *Applied Soil Ecology*. 48:38–44

Sanaullah, M*., A. Chabbi, J. Leifeld, G. Bardoux and C. Rumpel. 2011. Decomposition and stabilization of root litter in top-and subsoil horizons: what is the difference? *Plant and soil*. 338:127–141

Sanaullah, M*., A. Chabbi, G. Lemaire, X. Charrier and C. Rumpel 2010. How does plant leaf senescence of grassland species influence decomposition kinetics and litter compounds dynamics? *Nutrient cycling in agroecosystems*. 88:159–171.

BOOKS/BOOK CHAPTERS

- Sanaullah, M.**, A. Wakeel, M. S. Sajid and G. Murtaza. 2022. Proceedings of International conference on Climate Change: Impacts and solutions, published by University of Agriculture, Faisalabad Pakistan. ISBN: 978-969-8237-94-3.
- Aziz, T., A. Wakeel, M.A. Watto, **M. Sanaullah**, M.A. Maqsood and A. Kiran. 2022. Nitrogen Assessment: Pakistan as a case study. Elsevier, Amsterdam, Netherlands. ISBN: 978-0-12-824417-3.
- Sanaullah, M.**, M. Usman, H. Rehman and A. Wakeel. 2019. Proceedings of conference on Innovations in agriculture: Nourishing Pakistan in changing climate, published by University of Agriculture, Faisalabad Pakistan. ISBN: 978-969-8237-83-7.
- Farooq, M., **M. Sanaullah** and I. Ashraf. 2016. Proceedings of conference on sustainable crop and animal productions systems, published by University of Haripur, Pakistan. ISBN: 978-969-7721-00-9.
- Afzal, T., A. Singh, J. Iqbal, **M. Sanaullah**. 2023. Alkamides and Humic Acids: Insights into Soil Fertility. In: Mukherjee, S. and T. Aftab (Eds.). Strigolactones, Alkamides and Karrikins in Plants: Recent Updates and Future Prospects. CRC Press, UK. pp: 103-114.
- Sanaullah, M.**, T. Afzal, T. Shahzad, and A. Wakeel. 2022. Soil organic carbon sequestration and climate change. In: Rumpel, C. (Ed.). Understanding and fostering soil carbon sequestration. Burleigh Dodds Science Publishing, Cambridge, UK. pp: 237-270.
- Sanaullah, M.**, A. Mujtaba, G. Haider, H. ur Rehman, F. Mubeen. 2022. Mitigation and actions toward nitrogen losses in Pakistan In: Aziz, T., A. Wakeel, M.A. Watto, M. Sanaullah, M.A. Maqsood and A. Kiran (Eds.). Nitrogen Assessment: Pakistan as a case study. Elsevier, Amsterdam, Netherlands. pp:149-175.
- Sanaullah, M.**, T. Afzal, T. Shahzad, and A. Wakeel. 2019. Carbon Sequestration for Sustainable Agriculture. In: M. Farooq, M. Pisante (Eds.), Innovations in Sustainable Agriculture. Springer Nature Switzerland. pp: 469-500.
- Farooq, M., **M. Sanaullah**, F. Nadeem, N. Gogoi, M.S. Arshad and R. Lal. 2018. Soil degradation and climate change in South Asia. In: R. Lal and B.A. Stewart (Eds.). Advances in Soil Science: Soil and Climate. CRC Press, USA.
- Sanaullah, M.**, M. Saqib and A. Wakeel. 2017. Climate Change and Carbon Sequestration. In: Sabir M., J. Akhtar K.R. Hakeem (Eds.). Soil Science: Basic Concepts and Applications. University of Agriculture Faisalabad, Press, Pakistan.

Wakeel, A., M. Yaseen, M.A. Maqsood, **M. Sanaullah**, and T. Aziz. 2017. Plant Nutrients and Soil Fertility Management. In: Sabir M., J. Akhtar K.R. Hakeem (Eds.). Soil Science: Basic Concepts and Applications. University of Agriculture Faisalabad, Press, Pakistan.

Maqsood M.A., A. Wakeel, M. Sabir, **M. Sanaullah** and T. Aziz. 2017 Soil Organic Matter: Significance, Sources and Functions. In: Sabir M., J. Akhtar K.R. Hakeem (Eds.). Soil Science: Basic Concepts and Applications. University of Agriculture Faisalabad, Press, Pakistan.

Arshad, M.S., **M. Sanaullah** and M. Farooq. 2016. Soil carbon sequestration in dryland agriculture. In: Farooq, M. and Kadambot H.M. Siddique (Eds.). Innovations in dryland agriculture. Springer, Cham, Switzerland. pp:469-490.