1st International Precision Agriculture Pakistan Conference (PAPC) - 2022



22-24 Sep, 2022

Center for Precision Agriculture

PMAS-Arid Agriculture University Rawalpindi

Welcome Message

It is our real pleasure to welcome you to 1st International Precision Agriculture Pakistan (PAPC) Conference 2022, organized at PMAS-Arid Agriculture University Rawalpindi from September 22-24, 2022. The PAPC 2022 is an international conference encourages scientifically strong, good quality, original and practical research, experiments, methods, technologies, as well as collaborative and interdisciplinary research being conducted in the fields of precision and Digital Agriculture with special focus on emerging technologies for agriculture sector. It will offer oral and poster presentations and exhibits, as well as a discussions and exchange of information in various aspects of precision and digital agriculture.

Over 200 researchers, students, academia, industries, and farmers are part of the PAPC 2022. The international participation from different countries of the world including USA, Canada, China, Turkey and Australia both physically and through zoom is also overwhelming. The success of PAPC 2022 is doubtlessly the result of the commitment, hard work, and perseverance of organizing, editorial and scientific committees. We seize this opportunity to address them all our most sincere thanks and gratitude.

PAPC 2022 is being held at the heart of Potohar region of Pakistan that is culturally rich and diverse. At the foothills of Margalla mountain range and near to the Capital of the Nation, there are many famous tourist's attractions including Great Faisal Mosque, Monal Wildlife Conservation Park, Rawal Lake, and Pakistan Monument. We ensure that the participants of PAPC 2022 will enjoy these attractions and the signature Pakistani hospitality during their stay in Rawalpindi.

Conference Organizing Team
1st International PAPC 2022

Message from Patron-in-Chief



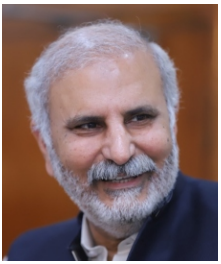
I would like to welcome the international and national participants of the 1st international Precision Agriculture Pakistan Conference (PAPC) 2022. The PAPC will provide opportunities to local researchers to collaborate with national and international researchers in the field of Digital and Precision Agriculture.

Conference will bring new ideas and research topics to solve arising problems in the agriculture sector especially considering the global climate change. Pakistan is one of the most suffered countries from Climate Change and it is indeed need of the hour to adopt new and innovative technologies to manage agriculture fields both spatially and temporally by adopting Precision Agriculture Technologies. Pakistan has a huge potential in the area of Precision Agriculture as Pakistan is agriculture-based economy and crops can be planted throughout the year. We must adopt the innovative technologies to minimize the yield gaps and ensure the national and global food security. We, as Scientists and Engineers, have the collective responsibility to step up and work on development and implementation of the PA in Pakistan.

I would also like to thank all the stakeholders of PAPC 2022, particularly, keynote speakers, invited oral and poster presenters. The organizing committee, and technical committee. I hope you enjoy your time with us here at PMAS-Arid Agriculture University Rawalpindi, Pakistan.

Prof. Dr. Qamar-uz-Zaman
Vice Chancellor,
PMAS-AAUR, Pakistan

Guest of Honor



Honorable Mr. Hussain Jahania Gardezi is a Provincial Mnister for Agriculture, Punjab, Pakistan. He is an agrairian and graduated from University of Agriculture, Faisalabad in 1980, and received a Diploma (L.G) from Foreign Ministry Institute, Denmark in 1993. He belongs to a renowned political and agriculturist family of Punjab. Mr. Gardezi believes in adoption of precision agriculture technologies to increase crop productivity and profitabilty. As progressive farmer, he is also using these technologies at farm level. He is a strong believer in industry-academia collboration in agriculture sector for betterment of farmer community in Pakistan. He has visited the PMAS- Arid Agriculture University Rawalpnidi (PMAS-AAUR) many times and has praised the vision of Prof. Dr. Qamar-uz-Zaman, Vice Chancellor, PMAS-AAUR to adopt and implement smart farming in Pakistan.

Syed Hussain Jahania Gardezi
Agriculture Minister, Punjab

Thursday, 22 September 2022 (GMT + 5)

Venue: Main Auditorium

09:30 – 10:00	**Registration**	
10:00 – 10:30	**Tilawat and Welcome Note**	
10:30 – 11:15	**Dr. Aitazaz Ahsan Farooque**	Interim Associate Dean of the University of Prince Edwards Island, School of Climate Change and Adaptation, Canada
11:15 – 12:00	**Dr. Yubin Lan**	Director and Chief Scientist, National Center for International Collaboration Research on Precision Agricultural Aviation Pesticides Spraying Technology, South China Agricultural University, China
12:00 – 13:00	**Tea Break & Poster Session**	Agriculture Faculty Corridor
13:00 – 14:00	**Lunch**	Alumni Ground adjacent to Main Auditorium
14:00 – 16:00	**Technical Session 1**	KOICA Seminar Room
14:00 – 16:00	**Technical Session 2**	Agriculture Seminar Room

19:00 – 20:00	**Dr. Arnold Schumann**	Professor, Soil and Water Science, University of Florida and Citrus Research Station Florida, USA
20:00 – 20:30	**Dr. Travis Esau**	Associate Professor, Department of Engineering, Faculty of Agriculture, Dalhousie University, Canada
20:30 – 21:30	**Dinner**	Alumni Ground adjacent to Main Auditorium

Friday, 23 September 2022 (GMT + 5)

Venue: Main Auditorium

09:30 – 10:00	**Welcome Note**	
10:00 – 10:30	**Dr. Andre Daccache**	Assistant Professor, Department of Biological and Agricultural Engineering, University of California, Davis, USA
10:30 – 11:00	**Dr. HaungWenchen**	Deputy Director' Key Laboratory of Digital Earth, Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences, China
11:00 – 12:40	**Technical Sessions 3**	KOICA Seminar Room
11:00 – 12:40	**Technical Sessions 4**	Agriculture Seminar Room
12:40 – 14:30	**Lunch Break/certificates distributions**	Main Auditorium
14:30 – 15:30	**Technical Sessions 5**	KOICA Seminar Room
14:30 – 15:30	**Technical Sessions 6**	Agriculture Seminar Room
14:30 – 15:30	**Technical Sessions 7**	Vice Chancellor Committee Room by SDPI (by invitations only)
16:00 – 17:00	**Poster Presentations**	Agriculture Faculty Corridor

Keynote Speakers

◆ Prof. Dr. Arnold Schumann



Dr. Arnold Schumann is working as Professor in Soil and Water Science at University of Florida and at Citrus Research Station Florida, USA. His areas of expertise are identification of soil spatial variability, its causes, and impacts on the environment, citrus growth, nutrition and yield; development of reliable, easily measured indicators of important soil and crop factors linked to growth and yield; appropriate site-specific amendments or management options for soil improvement; and testing and evaluation the best irrigation and variable rate technologies (VRT) for improving fertilizer use efficiency, profitability and groundwater protection in variable citrus groves. Dr. Schumann completed his Ph.D. in Crop & Soil Sciences, University of Georgia, Athens in 1997 and he has served on various national and international positions. Dr. Schumann is author of many book chapters, peer-reviewed journal articles, and national and international patents. He is working closely with Florida Citrus Industry, Wild Blueberry Industry in Nova Scotia, Canada, and Potato Industry, Prince Edward Island, Canada.

◆ Prof. Dr. Yubin Lan



Prof. Dr. Yubin Lan, Ph.D. supervisor, was awarded "Distinguished Professor and Scholars from overseas" by Ministry of Education, Vice Executive President of the National Innovation League of Aviation & Plant Protection and Director of the National Center for International Collaboration Research on Precision Agricultural Pesticides Spraying Technology. He once worked in A & M University in Taxis, University of Nebraska, University of Georgia and Service Office of Agricultural Research in the Department of Agriculture as the tenured professor and senior researcher. In July 2014, Lan was invited to work at South China Agricultural University as the director and top scientist at the National Center for International Collaboration Research on Precision Agricultural Pesticides Spraying Technology and at Guangdong-based International Laboratory of Agricultural Aviation Pesticide Spraying Technology. From May 2017, Prof. Lan has worked at SDUT, now as Assistant to SDUT's President, Head of School of Agricultural Engineering & Food Sciences and Director of Research Center for Technology Application of Precision Agricultural Aviation.

◆ Prof. Dr. Huang Wenjiang



Prof. Dr. Huang Wenjiang is the director of Digital Earth Laboratory and SINO-UK Crop Pest and Disease Forecasting &Management Joint Laboratory, working in Aerospace Information Research Institute, Chinese Academy of Sciences (AIR-CAS). Huang Wenjiang received his Ph.D. degree in cartography and GIS. He was acting as PI for more than 40 majors scientific fundings from Global Earth Observation (GEO), Ministry of Science and Technology(MOST), National Science Foundation of China(NSFC) and Chinese Academy of Sciences (CAS). His research interests focused on remote sensing for monitoring crop, grass and forest monitoring. He has published more than 200 SCI journal papers and awarded more than 10 science and technology award including National Science and Technology Progress Award.

◆ Dr. Aitazaz A. Farooque



Dr. Aitazaz A. Farooque is working as an Associate Professor at the Faculty of Sustainable Design Engineering, University of Prince Edward Island. Dr. Farooque's research focuses on fundamental understanding and development of state of the art precision agriculture (PA) technologies for Eastern Canada's agriculture industry. Development of innovative and novel PA systems utilizes knowledge of engineering design, development and management, instrumentation, design and evaluation of sensors and controllers, development of hardware and software for automation of machines to sense targets in real-time for spot application of agrochemicals on an as-needed basis to improve farm profitability while maintaining environmental sustainability. Dr. Farooque is actively working on machine vision, application of multispectral and thermal imagery using drone technology, delineation of management zones for site-specific fertilization, electromagnetic induction methods, remote sensing, and digital photography technique for mapping, bio-systems modeling, artificial neural network, deep learning, analog and digital sensor integration into agricultural equipment for real-time soil, plant, and yield mapping. Dr. Farooque has been very successful in securing research funding from Natural Science and Engineering Council of Canada, Provincial and Federal Governments and agriculture industry.

◆ Dr. Travis Esau



Dr. Travis Esau is working as Assistant Professor at Department of Agricultural Engineering, Faculty of Agriculture, Dalhousie University Canada. Dr. Esau has been also working in the Precision Agriculture Research Program at the Department of Engineering since 2007 and He's working on developing precision agriculture technologies to increase farm profitability and reduce environmental risks. Also, he has been assisting with multiple other precision agriculture research projects and specifically is involved with wild blueberry harvester control and automation.

◆ Dr. Andre Daccache



Dr. Andre Daccache is working as an Assistant Professor at Department of Biological and Agricultural Engineering, University of California, Davis. He's also working on precision irrigation, remote sensing, crop and soil spatial variability, hydraulics of pipeline systems, crop modeling, water resources management, irrigation engineering, and climate change impact analysis.

Dr. Daccache has more than 10 years of international research experience in agricultural water management and irrigation engineering. He has an MSc in land and water resources management from the International Agronomic Mediterranean Institute of Bari (IAMB) and a Ph.D. in irrigation engineering from the politecnico di Bari (Italy). Before joining UC Davis, he was a senior consultant at IAMB working on EU-Mediterranean projects related to the development of research strategy in water for agriculture and innovative technologies to enhance the adoption of water reuse for irrigation in the North African countries. He also worked as academic fellow at Cranfield University (UK) on numerous projects related to agricultural water management and climate change impact analysis. This includes benchmarking irrigation efficiency and the design of an intelligent overhead system for precision irrigation in horticultural field crops.

Technical Sessions

Thursday, 22 September 2022

Technical Session - 1: Climate and Water

Venue: KOICA Seminar Room

Session Chair: **Dr. Muhammad Ashraf** (Chairman, PCRWR)

Time	Abstract #	Title	Affiliation
14:00 – 14:20		**CLIMATE AND WATER: PAKISTAN'S PERSPECTIVE** **(Opening remarks/ Presentation by Dr. Muhammad Ashraf)**	Chair Keynote
14:20 – 14:40	010	**PRECISION AGRICULTURE AND GROUNDWATER MANAGEMENT FOR FOOD -SECURITY IN THE INDUS BASIN OF PAKISTAN** ***Ghulam Zakir - Hassan*, J F Punthakey, Ghulam Shabir and Saleem Akhtar***	Director, Irrigation Research Institute, Lahore
14:40 – 15:00	027	**IMPLICATIONS OF MICROBIOME ENGINEERING AND SOIL AMENDMENTS FOR SUSTAINABLE CROP IMPROVEMENT UNDER CLIMATIC CHANGE SCENARIO** ***Noshin Ilyas****	Associate Professor, PMAS-AAUR
15:00 – 15:20	033	**EVALUATION FOR EARLY BULKING AND HIGH YIELDING POTATO STRAINS FOR GENERAL CULTIVATION IN CORE PRODUCTION AREAS OF PUNJAB, PAKISTAN IN CLIMATE CHANGE SCENARIO** ***Tariq Javaid*, Mudassir Hussain and Aftab Iqbal***	Sci. Officer, Potato Research Institute, Sahiwal
15:20 – 15:40	039	**MORPHOLOGICAL AND BIOCHEMICAL DIVERSITY AMONG LESS SEEDED KINNOW STRAINS UNDER SAHIWAL CLIMATIC CONDITIONS** ***Naseem Sharif*, Mudassar Naseer, Muahammad Nawaz Maiken***	Prin.Sci., Horticulture Research Station Sahiwal
15:40 – 16:00	052	**MODELING IRRIGATION WATER REQUIREMENT OF MIXED CROP WITH COUPLED SMART IRRIGATION SYSTEM AND SYSTEM DYNAMIC MODEL** ***Fiaz Hussain*, Ray-Shyan Wu***	Assistant Professor, PMAS-AAUR

Technical Session - 2: Crop Protection & Precision Agriculture - I

Venue: Agriculture Seminar Room

Session Chair: **Dr. Saeed Iqbal**, Unit Manager, Fatima Fertilizer Company Ltd

Time	Abstract #	Title	Affiliation
14:00 – 14:20		**(Opening remarks/ Presentation by Dr. Saeed Iqbal)**	Chair Keynote
14:20 – 14:40	020	**A POTENTIAL RESOURCE CONSERVATION TECHNOLOGY FOR MULTI CROP SEEDING AND EXPERIMENTAL PLOTTING** ***Umair Sultan*, Alamgir Akhtar Khan, Abdul Aleem, Zulfiqar Ali, Hafiz Mohkum Hammad, Norhashila Hashim, Muhammad Zohaib***	Assistant Professor MNSUA
14:40 – 15:00	030	**PRIMARY CEREALS PHENOLOGY & PRODUCTIVITY FINGERPRINTS UNDER CLIMATE CHANGE: ADAPTATION STRATEGIES** ***Zartash Fatima, Mukhtar Ahmed, Ghulam Abbas, Shakeel Ahmad ****	Professor BZU
15:00 – 15:20	035	**GRAPEVINE SAPLING PRODUCTION WITH VERTICAL FARMING TECHNOLOGY** ***TefideKizildeniz****	Other Country Head of Dept.
15:20 – 15:40	038	**EFFECT OF ENTOMOPATHOGENIC FUNGI (*BEAUVERIA BASSIANA*) ON THE NATURAL ENEMIES** ***Mubashar Iqbal, Muhammad DildarGogi, Shahbaz Ahmad, Junaid Nisar***	Assistant Professor Punjab Uni
15:40 – 16:00	042	**SUMMARY OF INTERNATIONAL COOPERATION ON BEIDOU NAVIGATION PRECISION AGRICULTURE BETWEEN CHINA AND PAKISTAN** ***Qi Laing, Yun Yaoyao****	China

Friday, 23 September 2022

Technical Session - 3: Variable Rate Technologies

Venue: KOICA Seminar Room

Session Chair: **Dr. Tahir Awan,** In Charge, PPPU, PARB

Time	Abstract #	Title	Affiliation
11:00 – 11:20		**ROLE OF PRECISION AGRICULTURE TECHNOLOGIES FOR SUSTAINABLE, CLIMATE SMART, AND ECONOMICAL PRODUCTIVITY OF RICE -WHEAT CROPPING SYSTEM** ***Dr. Tahir Hussain Awan******	Chair Keynote
11:20 – 11:40	021	**ADAPTATION OF CONSERVATION PRACTICES TO ENHANCE EFFICIENCY OF PRECISION AGRICULTURE IN PAKISTAN** ***Muhammad Mubashar Omar*, Muhammad Usman Khan, Faisal Mahmood, Kamran Ikram, SulaimanAlyahya****	Asst. Prof., Punjab University
11:40 – 12:00	045	**QUANTITATIVE AND VOLUMATIC BASED PRECISION APPLICATION OF CHEMICALS ON CROPS AND VEGETABLES FOR SMALL FARMERS** ***Hafiz Muhammad Nauman*, Abdul Ghafoor, Aamir Saeed, Muhammad Jehanzeb Masud Cheema***	Lecturer, FMP, UAF
12:00 – 12:20	068	**PRECISION PLANTING OF WHEAT FOR SUSTAINABLE AGRICULTURAL MECHANIZATION** ***Hafiz Sultan Mahmood*, Muzammil Husain, Mahmood Ali, and Sikandar Khan Tanveer***	Director ABEI, NARC
12:20 – 12:40	100	**CLIMATE RESILIENCE IN WHEAT: FUTURE SCENARIOS USING SIMULATION APPROACH IN PUNJAB-PAKISTAN** ***Syed Aftab Wajid*, Nusrat Ehsan, Khalid Hussain, Muhammad Rehan and Bilawal Akram***	Professor Agronomy, UAF

Technical Session - 4: Crop Protection & Precision Agriculture-II

Venue: Agriculture Seminar Room

Session Chairs | **Engr. Mansoor Rizvi,** Country Head, CNH Industrial Services SRL
Brig (R) Sardar Sajjad Hussain, CEO, TechGIS Pvt. Ltd.

Time	Abstract #	Title	Affiliation
11:00 – 11:20	-	**A PROSPECTIVE FROM INDUSTRY ON PRECISION AGRICULTURE** ***Brig (R) Sardar Sajjad Hussain****	Chair Keynote
11:20 – 11:40	044	**PRECISION AUTOMATED WEED MANAGEMENT SYSTEM FOR SUSTAINABLE AGRICULTURAL PRODUCTION IN PAKISTAN** ***Hafiz Sultan Mahmood1, Ibrar Ahmad1,2 and Yang Qizhi***	PARC
11:40 – 12:00	035	**SIMULATING THE YIELD RESPONSES OF THE SUGAR BEET UNDER DIFFERENT CLIMATE CHANGE SCENARIOS BY LINTUL -MULTICROP MODEL** ***TefideKızıldeniz*, Zeynep Ünal, Ali KaanYetik***	Turkey
12:00 – 12:20	057	**PRECISION NITROGEN MANAGEMENT FOR COTTON AND WHEAT USING HANDHELD CROP SENSORS** ***Hafiz Umar Farid*, Huzaifa Shahzad, Zahid Mahmood Khan, Muhammad Naveed Anjum, Aamir Shakoor***	Asst. Prof., BZU
12:20 – 12:40	077	**THE CONGRUENCE AND DISGRUENCE OF SPATIAL DATA INFRASTRUCTURE AND CADASTRAL SYSTEMS FOR LAND MANAGEMENT IN PAKISTAN** ***AsmatAli , Walter T. de Vries ****	Director, Survey of Pakistan

Technical Sessions

Friday, 23 September 2022

Technical Session - 5: Artificial Intelligence & Image Processing

Venue: KOICA Seminar Room

Session Chairs | **Prof. Dr. Muhammad Awais,** LUMS, Lahore
Prof. Dr. Andrew Robson, Director, AARSC, University of New England, Australia

Time	Abstract #	Title	Affiliation
14:30 – 14:50	-	**MULTISPECTRAL IMAGERY AND MACHINE VISION APPLICATIONS IN AGRICULTURE** ***Professor Dr. Andrew Robson****	Keynote Talk
14:50 – 15:10	063	**IGAN: IMPROVED GENERATIVE ADVERSARIAL NETWORKS** ***Muhammad Shahzaib Waseem, Haider Ali Khan, Mehmood Lodhi, Jehanzeb Masud Cheema****	Canada
15:10 – 15:30	037	**DIGITAL DISEASE MAPPING OF CITRUS CANKER FROM SELECTED CITRUS ORCHARDS IN POTHOWAR** ***Mr. Amar Mehmood*, Dr. Gulshan Irshad, Prof. Dr. Qamar-Uz-Zaman, Mr. M. Usman Raja, Ms. NoureenZafar and Ms. Tehmina Akbar***	Research Assistant, PMAS-AAUR
15:30 – 15:50	-	**CONCLUDING REMARKS BY PROF.DR. MUHAMMAD AWAIS**	Professor, LUMS

Technical Session - 6: UAVs & Agricultural Robotics

Venue: Agriculture Seminar Room

Session Chair: **Dr. Umar Shahbaz Khan,** Director/Chairman,
National Center of Robotics and Automation, NUST, Islamabad

Time	Abstract #	Title	Affiliation
14:30 – 14:50	-	**APPLICATION OF ROBOTICS AND AUTOMATION IN AGRICULTURAL IN PAKISTAN** **(Opening remarks/ Presentation by Dr. Umar Shahbaz Khan)**	Chair Keynote
14:50 – 15:10	043	**INTELLIGENT SENSING AND ROBOTIC PICKING OF KIWIFRUIT IN ORCHARD** ***Longsheng Fu****	Longsheng Fu Professor
15:10 – 15:30	080	**OPTIMIZATION OF INTELLIGENT IRRIGATION SYSTEM FOR SMART FARMING USING MULTIBAND UNMANNED AERIAL VEHICLE AND DIGITAL TWINS MODELING** ***Muhammad Awais, Wei Li*, Li haoming, Chenchen Liu, Muhammad Jehanzeb Masud Cheema, and Saddam Hussain***	Dr. Awais from China
15:30 – 15:50	050	**MAPPING OF CROPLAND, CROPPING PATTERNS AND CROP TYPES BY COMBINING OPTICAL RE-MOTE SENSING IMAGES WITH DECISION TREE CLASSIFIER AND RANDOM FOREST** ***Aqil Tariq****	Aqil tariq Research scholar USA

Saturday, 24 September 2022

08:00 - 10:00 Inaugural Ceremony at Main Campus
11:30 - 19:00 Field Visit and Inauguration of Smart IoT Farm at URF, Koont

Organizing Committee

Prof. Dr. Qamar-uz-Zaman	Vice Chancellor, PMAS-AAUR
Prof. Dr. Khalid Saifullah Khan	Director, ORIC, PMAS-AAUR
Prof. Dr. Jehanzeb Masud Cheema	Incharge, FAE&T / PD, NCIB
Dr. Tahir Iqbal	Associate Prof. Farm Machinery & PE
Dr. Shoaib Rashid Saleem	Assistant Prof. Farm Machinery & PE
Mr. Muhammad Aqeel Sultan	Registrar, PMAS-AAUR
Mr. Kashif Mehmood	Dy. Registrar, State & Security, AAUR
Mr. Saqib Majeed	Director, External Linkages
Dr. Muhammad Naveed Tahir	Associate Prof. Agronomy / PD, DDSDP
Prof. Dr. Muhmmad Azam Khan	Chairman Dept. Horticulture, AAUR
Prof. Dr. Taj Ali Khan	Chairman Dept. of Agricultural Engineering, UET Peshawar
Dr. Zahid Mehmood Khan	Chairman Dept. of Agricultural Engineering, BZU Multan
Dr. Yasir Niaz	Head, Dept. of Agricultural Engineering KFUET, Rahimyar Khan
Dr. Mehmood Laghari	Associate Prof. FAE, Sindh Agriculture University Tandojam
Engr. Abdul Aleem	Subject Expert, MNS University of Agriculture, Multan
Engr. Mansoor Rizvi	President, Pakistan Society of Agricultural Engineers
Prof. Dr. Arnold Schumann	Professor, Soil and Water Science, University of Florida, USA
Dr. Travis Esau	Associate Prof. Department of Agricultural Engineering, Dalhousie University, Canada
Prof. Dr. Yubin Lan	National Center for International Collaboration Research on Precision Agriculture Aviation Pesticide Spraying, Wushan Guangzhou, P.R. China
Dr. Aitazaz A Farooque	Associate Prof. Department of Engineering School of Sustainable Design Engineering, UPEI, Canada
Dr. Muhammad Amin	Assistant Professor, IGEO, AAUR
Engr. Saddam HussainWahla	1. I&D, UAF, Pakistan 2. BAE, UC Davis, USA
Basit Shahzad Khan	Department of Horticulture, AAUR
Dr. Muhammad Abu Bakr Aslam	NCIB, PMAS-AAUR

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Mr. Ubaid Ur Rehman	Lecturer, FMPE, PMAS-AAUR
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Dr. Fiaz Hussain	Assistant Prof., LWCE,PMAS-AAUR
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Mr. Jehanzaib Hafeez	Data Analyst, DDSDP, PMAS-AAUR
Mr. Salman Qamar	Scientific Officer, DDSDP, PMAS-AAUR
Dr. Muhammad Awais	Scientific Officer, DDSDP, PMAS-AAUR
Ms. Sidra Javed	Research Assistant, NCIB, PMAS-AAUR
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