

Annex 01: Priority Research Focus Areas

Applications are expected ONLY from the following identified priority research focus areas.

NB: The following priority areas are not organized according to the order of six university thematic areas. Instead, they are presented in a way that encourages multidisciplinary approaches. Therefore, researchers are advised to review all identified priority areas and then apply under the theme most relevant to their proposed research.

1. Sustainable Crop Systems, Climate-Smart Agriculture, and Value Chains

- Crop biotechnology, genomics, climate-resilient and nutritionary enhanced breeding for high-yielding varieties with abiotic stress tolerance and pest resistance.
- Seed systems, formal certification protocols, and digital seed logistics along the value chain.
- Precision agriculture, integrated agronomic management, and low-cost irrigation for optimized nutrient application, leaching fractions, and seed priming.
- Crop pest epidemiology, surveillance, and mitigation for regionally important cereal, horticultural, and cash crops (peach, mango, khat, coffee).
- Agricultural diversification and nutrition-dense crop production systems for commercial tomato, cabbage, eggplant cultivars and etc.
- Biopesticides, biofertilizers, and sustainable crop protection and production formulations from local plants and microbes to enhance productivity.
- Agribusiness, value chain analysis, and technology adoption for improving market access for economically vital crops.

2. Sustainable Livestock Production, Animal Health, and Value Chains

- Animal nutrition and low-cost alternative feed resources for sustainable livestock and poultry feed formulations.
- Livestock genetics and breed improvement technologies for the genetic enhancement of indigenous breeds.
- Point-of-care animal health diagnostic tools and field kits for rapid disease identification and monitoring.
- Chemical residue detection and eco-friendly mitigation solutions in animal-source foods and feeds.
- Fisheries, aquaculture systems, and low-cost fish feed formulation for optimized aquatic disease



management.

- Apiculture optimization, advanced bee colony management, and queen rearing technologies for enhanced honey production.
- Livestock marketing, cross-border trade networks, and logistics efficiencies for optimized value chains.

3. One Health, Biosecurity, and Resilient Health Systems

- Integrated human–animal disease surveillance and spillover dynamics at the human–animal–environment interface.
- Antimicrobial resistance (AMR) transmission pathways and mitigation dynamics across human populations, livestock, and aquatic systems.
- Infectious disease control and multi-sectoral epidemiological modeling for major endemic, waterborne, and vector-borne conditions.
- Food safety, bio-safety monitoring, and production-line pathogen management across dairy farms and factory Wastewater System in WASH Framework.
- Health system resilience, early warning networks, and predictive disease mapping using AI-enabled digital tracking tools and geographic forecasting.

4. Human Health, Nutrition-Sensitive Systems, and Well-being

- Maternal and child health services and continuity of care across reproductive, maternal, neonatal, and child health pipelines.
- Nutrition-sensitive systems and targeted malnutrition interventions to combat stunting, wasting, and micronutrient deficiencies.
- Natural product drug discovery and traditional medicinal plant therapeutics for chronic conditions like liver diseases and cancers.
- Chronic disease dynamics, non-communicable conditions, and targeted nanomedicine for novel screening, imaging, and treatment systems.
- Mental health frameworks, behavioral health systems, and community-based interventions to eliminate cultural stigma surrounding healthcare access.
- Occupational health, safety systems, and industrial hazard mitigation for safer workplace environments.



5. Integrated Water Resource Management, Hydrogeology, and Climate Adaptation

- Groundwater hydrology, hydrogeological modeling, and 3D flow dynamics for water storage tracking in semi-arid and urban environments.
- Climate change adaptation and disaster risk nexus analytics for comprehensive regional vulnerability assessments.
- Smart water infrastructure, IoT sensors, and automated distribution grids for irrigation water use efficiency and urban water supply.
- AI-based early warning networks, flood forecasting, and drought prediction for stakeholder-driven natural disaster response.
- WASH infrastructure sustainability and community hygiene delivery models for scalable, context-specific public health intervention.
- Salinity amelioration and low-cost groundwater desalination technologies for saline water resources in arid and semi-arid regions.
- Water governance, national water policy, and conflict mitigation models for equitable resource allocation and utilization.

6. Climate Adaptation and Natural Resource Management

- Disaster risk reduction and extreme event climate modeling for regional environmental resilience.
- Landscape rehabilitation, soil conservation, and integrated watershed management for degraded ecosystem recovery.
- Ecosystem conservation, biodiversity tracking, and carbon sequestration modeling across forest, woodland, and wetland zones under land-use changes.
- Environmental risk assessments, pollution mitigation, and renewable energy transitions for clean-burning alternative energy systems.

7. Artificial Intelligence, Data Science, and Smart Infrastructure for Societal Resilience

- Precision agriculture, remote sensing, and machine learning forecasting for crop yield prediction, pest detection, and digital marketplaces.
- Postharvest quality control, data-driven traceability, and smart storage systems to reduce product loss using digital and indigenous knowledge.
- E-governance platforms and institutional data systems engineering for evidence-based public administration and institutional decision-making.
- Health informatics, digital diagnostics, and automated disease surveillance for predictive patient



tracking tools.

- Eco-informatics, computational physics, and numerical pollutant dispersion modeling for climate, hydrogeological, and soil moisture downscaling.
- AI-enabled renewable energy systems and smart grid optimizations for deep learning-based energy forecasting in low-carbon transitions.
- Resilient civil engineering and climate-hardy construction materials to optimize indigenous building methodologies against environmental stressors.

8. Public Policy and Enterprise Development Innovation

- Financial inclusion models, digital money platforms, and rural credit access for unbanked populations and microfinance networks.
- Behavioral economics and technological innovation adoption in agriculture to evaluate risk preferences and savings behaviors within smallholder communities.
- Labor market dynamics, structural employment shifts, and industrial transitions across agricultural, manufacturing, and industrial park sectors.
- Logistics infrastructure, trade corridors, and transport network optimizations for regional economic and spatial hub mapping.
- Informal markets, cross-border trade, and economic leakage dynamics to analyze informal economy mechanics and border corridor vulnerabilities.
- Enterprise growth policies, business incubation models, and micro-enterprise survival for youth- and women-led enterprises.
- Accounting systems, financial governance, economic policy, and impact evaluation for evidence-based public financial management, SME development, and agricultural innovation.

9. Social Development, Inclusive Governance, and Human Capital

- Justice systems, judicial access, and structural law reform for developing victim-centered judicial approaches.
- Vulnerable population protections, human rights, and abuse mitigation for child, women, and domestic exploitation defense systems.
- Human trafficking, internal displacement, and forced migration dynamics to track vulnerable regional populations.
- Governance capacity, public institutional transparency, and accountability metrics for public sector performance evaluations.



- Educational leadership, curriculum development, and digital learning systems for professional development across the school ecosystem.
- Street life socio-dynamics, child protection frameworks, and adoption patterns to assist abandoned youth and mitigate sexual abuse risks.

10. Renewable Energy and Water-Energy-Food Nexus

- Off-grid rural electrification and hybrid renewable energy system techno-economics to evaluate breaking-even points for grid extensions.
- Solar-powered irrigation, low-cost pumping systems, and gravity-fed water delivery.
- Water-energy-food nexus structural management and digital system optimization for community-based energy solutions.

11. Resilient and Smart Urban Development

- Urban infrastructure planning, land-use management, and affordable eco-housing for climate-resilient communal facilities.
- Integrated waste management, recycling technologies, and Nature-Based Solutions (NbS) for urban water management, flood mitigation, and heat risk reduction.
- Smart city integrations, urban-rural networks, and digital public service delivery to improve civic engagement and administrative platforms.


