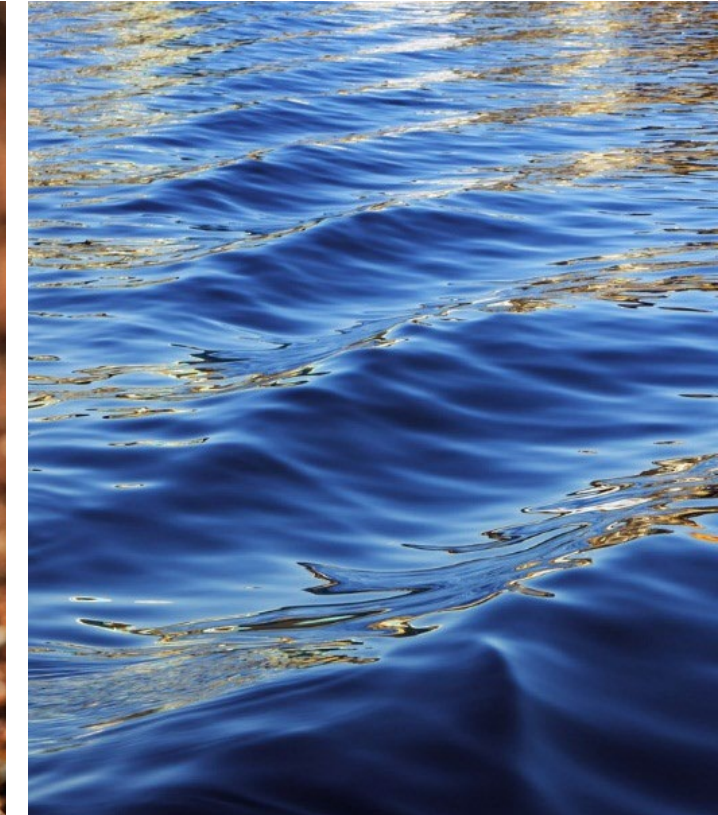


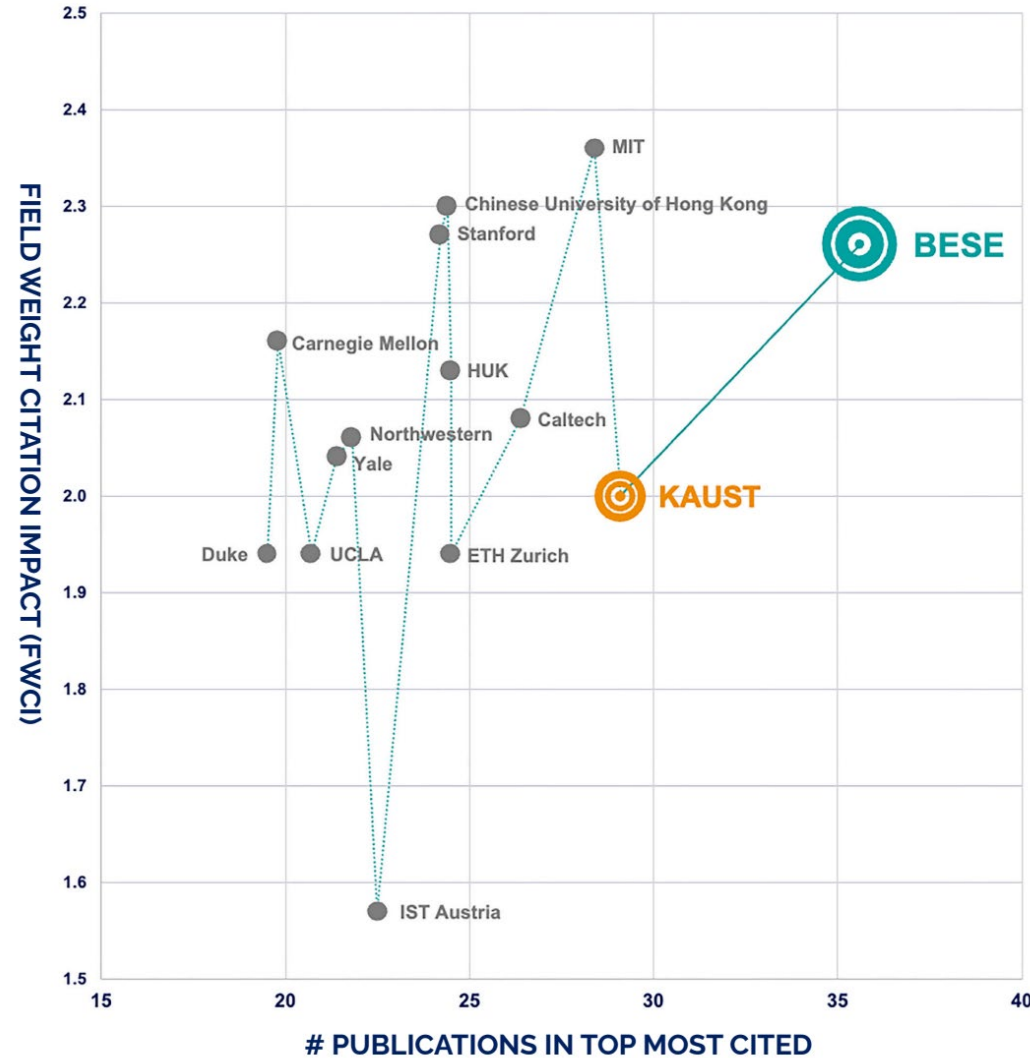


BESE Success Stories

December 2024

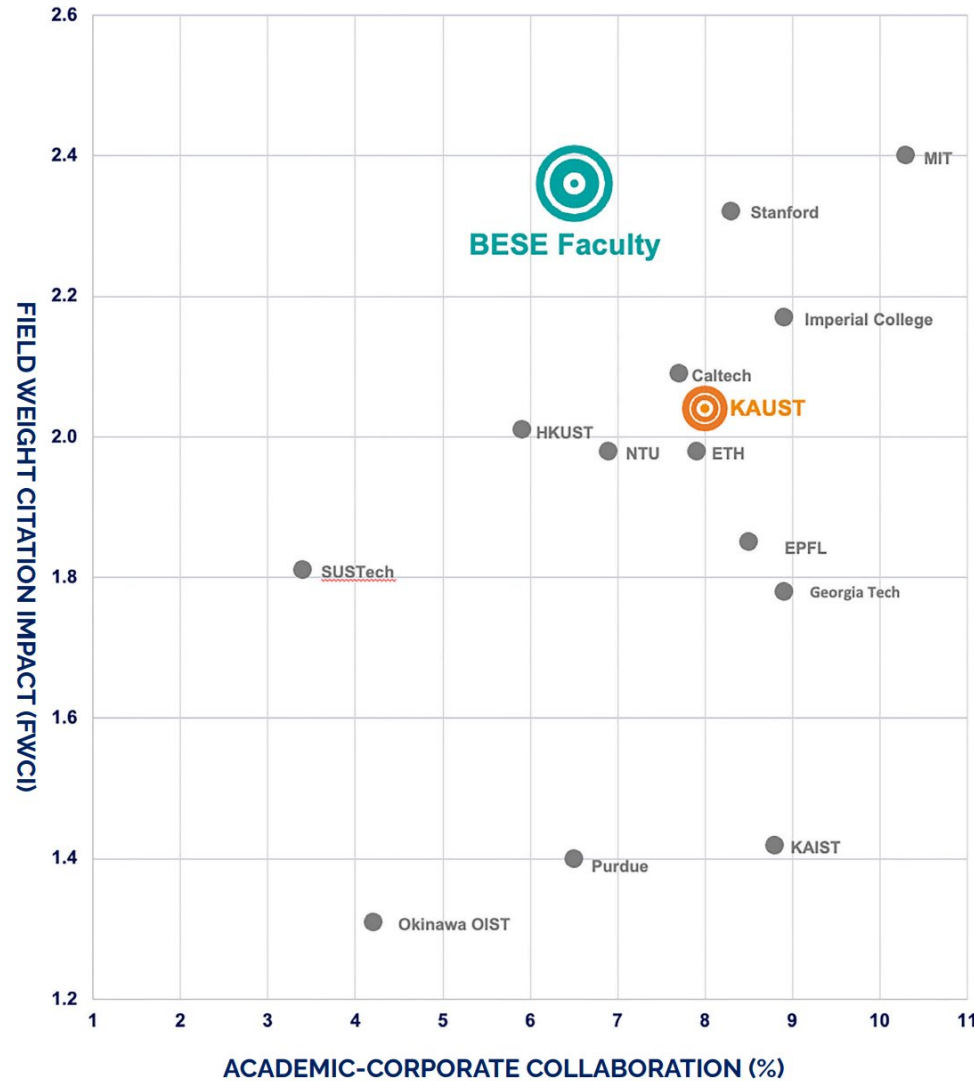


KAUST & BESE Benchmark against International Universities



Benchmarking KAUST vs Global Universities (2018-2022)

BESE research is balanced across high quality fundamental research and applied research and compares well against our competitors.





14
KAUST faculty among
highly cited researchers



Osman M. Bakr
Chemistry



Carlos M. Duarte
Environment and Ecology



Yoshihide Wada
Environment and Ecology



Mohamed Eddaoudi
Chemistry



Luigi Cavallo
Cross-Field



Stefaan De Wolf
Cross-Field



Huabin Zhang
Cross-Field



Fernando T. Maestre
Environment and Ecology



Yu Han
Chemistry



Hylke Beck
Cross-Field



Heribert Hirt
Cross-Field



Matthew F. McCabe
Cross-Field



Salim Al-Babili
Plant and Animal Science



Omar F. Mohammed
Cross-Field

Startup: Iyris

Transforming Agriculture with Saltwater Solutions

Problem Statement

Agriculture in arid regions relies heavily on freshwater, leading to unsustainable practices and low food production.

Technical Solution

- **Saltwater Greenhouses:** Reduce freshwater use by up to 90%.
- **Saline Crops:** Grow resilient crops in high-salinity conditions.
- **Smart Monitoring:** Use IoT and AI for resource efficiency and crop health.
- **Innovations:** Develop patented systems tailored to arid climates.

Current Status

- **Operations:** Pilot greenhouses in Saudi Arabia producing crops like tomatoes.
- **Collaborations:** Partnering globally to expand saline agriculture.
- **Expansion:** Funding secured for commercial operations across six hectares.

Funding

- **Initial:** \$10M from KAUST, Aramco's Wa'ed, and others.
- **Additional:** \$18.5M for global and regional growth.

Impact

- **Water Conservation:** Cut freshwater use by 90%.
- **Food Security:** Boost local production, reduce imports.
- **Global Reach:** Expand to arid regions worldwide.

Partners

- KAUST
- Aramco's Wa'ed
- Future Investment Initiative Institute
- Global Ventures



Principal Investigator: Professor Mark Tester

- Recognized expert in plant science and food security
- Research Interests: Plant stress tolerance, salinity resistance, and sustainable agriculture solutions.

Startup: TERRAXY

Innovating Sustainable Soil Solutions for Arid Lands

Problem Statement

Arid regions face significant challenges in agriculture due to poor soil quality and limited water resources, leading to low productivity and environmental degradation.

Technical Solution

- **SandX™:** A nature-based soil amendment that enhances water retention and nutrient availability in sandy soils, improving agricultural productivity.
- **CarboSoil™:** An engineered biochar that sequesters carbon and boosts soil fertility, contributing to climate change mitigation and sustainable farming practices.

Current Status

- **Operational Developments:** Constructing a decentralized facility to process regional poultry farm waste into soil amendments for local desert rehabilitation.

Funding

- **Research Support:** Professor Mishra's research program has attracted over US\$5 million in competitive funding, facilitating the development of SandX™ and CarboSoil™ technologies.

Impact

- **Landfill Diversion:** Utilizing organic waste to produce soil amendments, reducing landfill burden.
- **Desert Rehabilitation:** Applying innovative soil treatments to restore desert lands for agriculture and greening initiatives.
- **Carbon Sequestration:** Implementing CarboSoil™ to capture atmospheric carbon, aiding in climate change mitigation.

Partners

- KAUST
- Regional poultry farms



TERRAXY

Principal Investigator: Professor Himanshu Mishra

- Recognized for translating fundamental science into practical solutions for societal challenges.
- Research Interests: Water interfaces, wetting phenomena, microdroplet chemistry, and sustainable agricultural technologies.

Startup: GROWBIOM

Biological Innovations for Sustainable Agriculture

Problem Statement

Modern agriculture faces critical challenges such as declining soil health, nutrient depletion, and climate stress, especially in arid and semi-arid regions, that limit sustainable crop production and ecosystem resilience.

Technical Solution

- **Biostimulants:** Advanced microbial formulations to enhance plant growth and stress resilience.
- **AI-Driven Solutions:** Leveraging data and AI to tailor interventions using a comprehensive microbial biobank.
- **Soil Expertise:** Diagnostic soil analysis to deliver precise, effective biological solutions.

Current Status

- **Operations:** Active in regional and global projects, offering biological solutions for soil and crop enhancement.
- **Collaborations:** Working with KSA researchers and international partners to advance biological agriculture.

Expansion

Developing scalable solutions to address global soil and crop challenges.

Funding

- **Research Support of \$1.7M** from NTCG- KAUST

Impact

- **Soil Health:** Restoring fertility and biodiversity.
- **Water Conservation:** Save freshwater use by 40%.
- **Reduced Chemical Dependency:** Decreasing the use of chemical fertilizers by 30%.
- **Climate Action:** Enhancing carbon sequestration.
- **Resilient Farming:** Supporting productivity in harsh environments.

Partners

- KAUST
- NEOM
- MEWA



Principal Investigator: Professor Heribert Hirt & Dr. Maged M. SAAD

Recognized expert in plant science, stress biology, and microbial genetics
Research Interests: Plant tolerance, abiotic and biotic stress, and biological solutions.

BESE Research Highlights



Advancing the Next Green Revolution

Salim Al-Babili

Professor of Plant Science

Professor Al-Babili is a renowned expert in plant biotechnology, focusing on crop resilience and food security in arid regions. His pioneering work addresses critical challenges like combating parasitic plants such as *Striga* and enhancing crop productivity.



Engineering Resilient Corals

Raquel Peixoto

Associate Professor of Marine Science

Professor Peixoto is a leading marine microbiologist, recognized for her innovative probiotic-based solutions to enhance coral resilience. Her work focuses on restoring and protecting marine ecosystems against the impacts of climate change.



Revolutionizing Energy Efficiency in Cooling

Kim Choon Ng

Professor of Environmental Science and Engineering

Professor Ng is an esteemed authority in sustainable air conditioning, with his hybrid cooling systems achieving nearly 50% energy savings. His research is transforming cooling technologies to address energy and environmental challenges.



Innovating Sustainable Specialty Chemical Production

Kyle Lauersen

Assistant Professor of Bioengineering

Professor Lauersen applies synthetic biology and metabolic engineering to create environmentally friendly specialty chemicals like those used in fragrances and pharmaceuticals, reducing the ecological footprint of industrial production and contributing to biodiversity conservation.

BESE Research Highlights



Driving Innovation in Regenerative Medicine

Valerio Orlando
Professor, Bioscience

Professor Orlando applies chromatin-mediated mechanisms and epigenetics to develop innovative tissue regeneration technologies through his startup, REPEATERA LLC, including treatments for osteoporosis, advancing regenerative medicine and improving global healthcare solutions.



Championing Arid Ecosystem Sustainability

Fernando Maestre
Professor, Environmental Science and Engineering

Professor Maestre is a globally recognized dryland ecologist whose work focuses on protecting and restoring arid ecosystems. He develops strategies to mitigate desertification and ensure ecosystem stability.



Integrating Sustainability into Giga City Designs

Sami AlGhamdi
Associate Professor, Environmental Science and Engineering

Professor AlGhamdi specializes in sustainable urban planning, driving energy-efficient innovations for large-scale urban developments such as NEOM. His research integrates sustainability principles into urban systems and infrastructure.



Advancing Cellular Therapies and Biotechnology

Jasmeen Merzaban
Professor, Bioscience

Professor Merzaban's research focuses on understanding cellular migration and adhesion, with implications for stem cell therapies and immune system disorders. Her work supports advancements in regenerative medicine and health, aligning with Saudi Arabia's efforts to drive innovation in biotechnology and healthcare.

Recent Faculty Awards



Leena Ibrahim
Assistant Professor,
Bioscience

- L'Oréal-UNESCO For Women in Science Middle East Young Talent Award 2024



Suzana Nunes
Professor, Chemical and
Environmental Science and
Engineering

- Fellow of The World Academy of Science 2025
- L'Oréal-UNESCO For Women in Science International Award 2023
- Honorary Member of the European Membrane Society



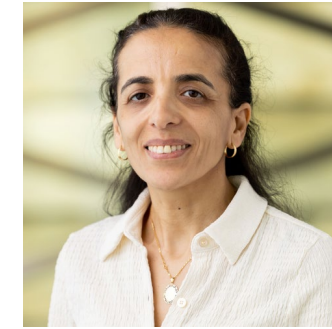
Raquel Peixoto
Associate Professor,
Marine Science

- Frontiers Planet Prize 2024
- Rachel Carson Prize for Microbiology 2023



Pascal Saikaly
Professor, Environmental
Science and Engineering

- Honorary Member of Association of Environmental Engineering and Science Professors



Ikram Blilou
Professor, Plant Science

- National Centre for Palms & Dates International Prize 2024



Fernando Maestre
Professor, Environmental
Science and Engineering

- Journal of Ecology Eminent Ecologist 2024



Student to watch

Rayyanah Barnawi

Bioscience Ph.D. student and astronaut

Rayyanah Barnawi, a current KAUST Ph.D. student with Professor Imed Gallouzi and Saudi Arabia's first female astronaut, is advancing microgravity research.

Recent Student and Researcher Awards



Hamed AlBalawi
Bioengineering, MS '20, Ph.D.
Student

AlBalawi's research focuses on developing an ecofriendly material and fabrication process for coral restoration and bone tissue engineering.

Recognition:

- Forbes Middle East 30 Under 30
- MIT Innovators Under 35 MENA



Taiba Alamoudi
Marine Science, MS '21, Ph.D.
Student

Alamoudi's research focuses on macroalgae's role in coral resilience plus its potential to combat climate change and support marine biodiversity.

Recognition:

- L'Oréal-UNESCO For Women in Science Middle East Young Talent Award



Ali Alabyadh
Marine Science, Ph.D. Student

Alabyadh's research focuses on coral restoration in the Red Sea and its role in enhancing reef resilience, supporting marine biodiversity, and advancing ocean sustainability.

Recognition:

- First Saudi selected for the RE.GENERATION Future Leaders Cohort, Prince Albert II of Monaco Foundation



Vinoth Balasubramani
PostDoctoral Fellow

Balasubramani's research focuses on advancing holographic tomography, driving innovation in imaging technologies with impactful applications.

Recognition:

- Honored as an *Emerging Research Scientist* and awarded a *Visiting Scientist* position at the University of Tartu

Alumni to Watch



Sandra Medina

Environmental Science and
Engineering, PhD '20
Founder & COO of Wayakit

Luisa Javier Fregoso

Environmental Science and
Engineering, MS '11, PhD '21
Founder & CEO of Wayakit

Luisa Javier and Sandra Medina, founders of KAUST spinout WAYAKIT, co-created sustainable cleaning and maintenance solutions for the aviation, transportation, healthcare and facilities management sectors. WAYAKIT showcases their commitment to innovation and sustainability, reflecting their strong connection to KAUST and their significant impact on Saudi Arabia's biotech industry.



Abhinay Ramaprasad

Bioscience, MS '12, PhD '17

MRC Career Development Fellow at the University of Glasgow

Abhinay Ramaprasad is a KAUST alumnus whose work in malaria genomics and pathogen biology addresses global health challenges. His research focuses on understanding malaria parasite genetics to develop innovative treatment and prevention strategies. His impactful contributions highlight the strength of KAUST's bioscience program and its influence on advancing global health solutions.

Empowering Women in Science

The BESE Division at KAUST

22%
Female Faculty

62%
Female Students

47%
In-Kingdom Alumnae



جامعة الملك عبد الله
للعلوم والتقنية
King Abdullah University of
Science and Technology

BESE Biological and
Environmental Sciences
and Engineering