7.2: Best Practices

Best Practice: 1

1. Title of the Practice

Promoting Research through Qualitative Assessment of Research Outcomes

2. Objectives of the Practice

- Consolidate its historical legacy of academic and research excellence in the new millennium
- Striving for global eminence with local relevance
- Promoting Qualitative research through incentives/awards/support interventions
- Cutting-edge Science research with equal thrust on Arts, Social Sciences and Humanities
- Inclusivity, equity, and access to all stakeholders
- Research commitment to vulnerable margins
- Thrust on innovative research and Start-up ecosystem
- Interdisciplinary research praxis
- Promoting Area Studies with research emphasis on Kerala's biodiversity, ethnic knowledge, geo-politics, and socio-cultural economy
- Research policy in tune with the demands of the knowledge economy with regular assessment of research outcomes

3. The Context

As a Public University in the lap of a global biodiversity hot spot, a cradle of speciation with a diverse flora of unexplored medicinal significance, alongside a dense population in a fragile ecosystem prone to multiple natural disasters, commitment to socially relevant bio-ethical research, striving towards sustainable contributions to environment and biodiversity conservation.

In a multicultural and multi-ethnic State with high Human Development Indices, yet with industrial and agricultural limitations, significantly high inward/outward migration rates with phenomenal NRI remittances, hundred percent literacy with very high female literacy, severe unemployment/under-employment, ageing in a high-density population, etc., University has pioneered research programmes in addressing these socio-economic imbalances.

Strategically located amidst 26 R&D institutions of national eminence, University has carved a niche for itself through forging academic bonds through collaborative research.

University functions as a catalyst of change, in such a complex and diverse society, augmenting progress towards a knowledge society.

4**. The Practice**

Research excellence through constant assessments of periodic outputs, applications, Intellectual property created, and socially driven research praxis.

Eclectic and dynamic Annual Assessment Practices with Research Colloquiums, Open House, Local body/Industry linkages, etc. Sound practices of measuring applications with outcomes mapped:

- **Medicinal/ Health**:
  - Scientific validation/propagation of ethnomedicinal plants
  - Genome sequencing of ethnobotanic plants.
  - Life-style disease management (natural products/nanomaterials)
  - "Drugs from the Sea"
  - COVID-19 severity detection from CT-images
  - Biocompatible scaffolds for bone, skin, hair, neural regeneration.
  - Nutraceutical and Nutracosmetic products for alopecia.
  - Monoclonal antibodies for liver cancer diagnosis

- **Environmental:**
  - Identified 32 new aquatic species
  - First record of blue whale acoustics from Kerala coast
  - Bioremediation for pollution control
  - Mangrove afforestation in Tsunami afflicted coast
  - Riverbank afforestation
  - Plastic-degrading fungi identification

- **Renewable Energy:**
  - Energy conversion/storage devices invention
  - Cost-effective performance-enhanced Dye-Sensitised Solar Cells
  - Highly efficient photopolymer and Holographic optical elements for roof-top/window solar concentrator.
  - Fabrication of Environment-friendly supercapacitor (electrolyte -water).
  - Supercapacitors from low dimensional systems.
  - Hydrogen Generation through electrochemical/solar water splitting.
  - Sustainable Electricity from bio-waste.

- **Industrial:**
  - Fabricated High power fibre Laser
  - Nanostructured thin film gas-sensors (humidity/hydrogen/ carbon-monoxide/ethanol)
  - Effective utilization of diesel soot.
- **Security:**
  - In-house designed remote monitoring system for fishing vessels using GPS/GPRS-based Security Registration Board.
- **Socio-Economic:**
  - Social Intervention in Palliative Care.
  - **Food Security and Research Policy Evaluation**.
  - **Participatory** research on agriculture/food/public health.
  - Tribal financial **literacy for financial inclusion**
  - **Iron age burial sites**
  - Pilgrim Tourism and Ecological Sustainability research
  - Institutional Intervention impact among Tribes
  - Immigrant Rehabilitation research
  - Psephology

- **Socio-Cultural/Linguistic**
    - Linguistic minority Empowerment
    - Travelling Theatre
    - Translation
    - Tribal language conservation
    - Cultural studies in Kerala
    - Gender/Dalit/Tribal research
- **Groundwater estimation** for local bodies

- **Educational:**
    - Public Environmental/ Educational Research App.
    - Palm-leaf manuscript preservation/digitization
- **Biotechnological:**

- Chitosan-based nano starch-modified films (food packaging)
- Gene cloning (Honeybee Royal Jelly)
- Novel source for antibiotic actinomycin-D
- Anti-microbial/anti-cancerous compounds from microbes
- Micro RNA analysis for Brain diseases
- Quantum dot-mediated bioimaging
- Microbial isolation of Keratinase (cosmetics)

Promotional Measures

- Research/Performance Awards
- Seed Money
- Research/Publication/Travel Grants
- Financial support for patent filing
- 100% Research Fellowship
- Public access to research facilities at affordable rates
- High-end physical/digital library
- Distinguished PDFs

5**. Evidence of Success**

Socially useful, high community impact, futuristic and scientifically rigorous research practices have led to the following outcome:

- Documentation and conservation of medicinal and endangered plants including ‘Arogyapacha’
- Upliftment of society through academic interventions and social self-reflexivity in academia.
- Research infrastructural augmentation with setting up of state-of-art laboratories including CLIF
- Design and fabrication of the Security Registration Board with GPS/GPRS networking resulted in two technology transfers to Govt. of Kerala (Centre for Development of Imaging Technology) and implementing the same in over 2000 seagoing vessels in Kerala coast (Rs. 3.6 crores), a revolutionary step in safeguarding lives and livelihood.
- Water security through groundwater assessment

- Biodiversity conservation and sustainable utilisation
- A wide spectrum of products such as Lasers, sensors, supercapacitors, solar cells, pharmaceutical molecules, cosmetics, nutraceuticals, diagnostic tools, etc has been developed with potential for technological/commercial/social applications.
- Enlightenment, upliftment, and social amelioration of linguistic minorities/vulnerable margins/tribal/gender/Dalit population.
- High-end publications, patents, standard books/reports, awards, and appreciations contribute to intellectual capital of the society

These results indicate a social transformation facilitating the State's transition to the knowledge economy. Significant improvement in the ranking profile of the University, both in national and global scenarios bears testimony to the successful implementation.

6. Problems Encountered and Resources Required

Serious impediments in the path of research and extension due to unprecedented recurrence of natural disasters and pandemics.

Constraints:

- Accessibility constraints in reaching research stations
- Absence of 100% residential campus
- Risk in sampling-
    - Nonavailability of adequate sample
    - Inability to access appropriate sample
    - Human/animal ethics clearance delays
- High cost of support services
- Fund constraints for high-cost equipment
- Exorbitant publication cost (high-end journals)
- Limited research visibility due to inability in meeting high publication charges for publication in open access mode (high-end journals)
- Lack of adequate digital literacy and access among marginals
- Monetary constraints for translating innovative research into practice and products
- Lack of high-end training in specialized areas
- Funding limitations curtailing academic mobility

- Difficulty in timely filling up of vacancies due to procedural complexities

7. Notes (Optional)

Following best practices on assessment of research outcomes, extensive incentives provided to promote research and creation of intellectual property can be adopted by other institutions:

- Annual research awards for teachers
- Performance award for teachers
- Distinguished PDFs
- Annual Research awards for the Department
- Financial support for filing and maintaining patents
- Publication grant
- Free access to digital resources

- Research fellowships for all scholars
- Opportunity to collaborate with Research institutions
- Research Council
- Induction program for Teacher recruits
- Specialized training in the use of sophisticated instruments
- Quality performance enhancement training to Teachers
- Open house and Science week to showcase socially relevant research outcomes
- Start-up research grants for research guides
- Open access to video lectures
- Three-level induction programs

This research ecosystem impelled by social inclusivity and justice can be emulated by others.

Best Practice 2

1. Title of the Practice:

Environmentally Sustainable Responsible Green Campus

2. Objectives of the Practice

What are the objectives / intended outcomes of this "best practice" and what are the underlying principles or concepts of this practice (in about 100 words)?

- Nurturing a model sustainable eco-friendly campus
- Conserving *in situ/ex-situ* biodiversity
- Providing organic green lungs to the neighborhood
- Promoting organic farming for food security
- Practice water conservation and management
- Eco-friendly land-use practices
- Optimum waste management and recycle economy
- Sustainable green energy practices
- Adopting Green consumption protocol with plastic-free campus
- Promoting green technology driven Start-up culture
- Facilitating Green transport systems
- Promoting carbon-neutral technologies/practices
- Minimizing carbon footprints
- Promoting Green pedagogy
- Promoting sustainable aquaculture

3. The Context

University strives to be a model biodiversity niche amidst unprecedented urbanization, high-density population, depleting agriculture, fragile environment, disaster-prone ecosystems, climate crisis, need for alternative energy, water scarcity, and unethical land-use practices.

It seeks to address the crises of modern consumer societies, with their indiscriminate use of pesticides, pandemic/disaster-induced food scarcity, abandoning and depletion of water bodies, conversion of agricultural land for commercial purpose, the explosion of non-biodegradable waste with unscientific management practices.

Amidst the rising incidence of lifestyle diseases, University needs to offer a serene haven of tranquillity within the rising buzz of the city, securing safe and congenial living spaces with sustainable and organic models of food production and consumption.

In the context of the need for enhancing air quality in Thiruvananthapuram due to increasing environmental pollution, University rises up to its social obligation by offering green lungs to the city.

4**. The Practice**

Nurturing an expansive lush green biodiversity heritage, promoting sustainable development, and addressing social demands through:

- Unique Green Charter

  - Plastic-free campus
  - Recycle economy
  - Indigenous fruit-bearing trees replacing Acacia
  - Eco-friendly green practices

- **Sustainable Food Security/Nurturing Agrarian Culture**
- Harithalayam: Novel sustainable food initiative addressing pandemic-induced livelihood crisis
- Reviving paddy cultivation (10 acres)
- Coconut groves (1000 saplings).
- Greening the campus (20,000 indigenous fruit trees)
- Banana plantation (520 saplings)
- Vegetable orchard (1.4 tons organic yield)
- Tuber crop cultivation
- Pisciculture (200kg periodic yield)
- Apiculture
- 1000 Teak saplings
- Students' Agricultural Fellowship
- Model Miyawaki forests creating urban biodiversity corridors
- Andaman Nicobar Plant Conservatory(5 acres)
- Centre for Biodiversity Conservation for Germplasm conservation of Western-Ghats.
- Seed Bank for Rare, Endangered and Threatened(RET) medicinal plants (Kerala State Medicinal Plant Board funded)
- Vegetable Seed Bank(Kerala Biodiversity Board funded)
- Tulsivanam and Star gardens (medicinal plant conservation)
- Special gardens:
  - Sensory Garden
  - Butterfly garden
  - Healing Garden- 'Viridescent Haven'
  - Vertical garden
  - Terrariums, Kokkedama
- **Digital garden**: Digitisation of floristic diversity
- **Waste management**
  - Segregation/collection/disposal
  - Aerobic microbial composting

    - Biogas plants
    - Incinerators
    - Aquaponics
    - Box-type Constructed Wetland (wastewater treatment)
    - Recirculatory aquaculture facility (1,00,000 litre)
    - Water recycling/drip irrigation
    - Bhoomitrasena-Nature club
- Energy audit
- Green Audit
- Renewable Energy
    - Centre for Renewable Energy for research and academic initiatives
    - Greening through Research

- Prolific research on Solar Cells/Super Capacitors
- Generation of electrical energy and Hydrogen from microbial fuel cells

- Energy Conservation

- Wheeling to the grid –

- 100KW solar power plant at Kariavattom campus (Rs.1 crore project with ANERT).
- 85KW Solar Plant at Palayam (Smart City Thiruvananthapuram Ltd.)
- 5KW inverter type Solar power plant at Palayam

- Energy Efficiency Enhancement Measures

- Switching over to LED and energy-efficient fans
- Use of five-star inverter Air Conditioners
- Optimum Power Consumption Policy

- Battery car/ Electric scooter/ Bicycles

- **Sustainable Water Management**

- Rainwater Harvesting-

- Rooftop rainwater harvesting
- Recharge to groundwater after filtration

- Rejuvenation of abandoned ponds and wells
- Construction of large diameter recharge wells
- Management of seepage water for agriculture
- Rejuvenation of a traditional ‘Vaalkinar’(wells)
- Conservation of water bodies

- Observation of major environmental and biodiversity days
- Campus cleaning drives
- Green pedagogy

- Four PG Programmes

- A phenomenal number of courses fostering critical environmental consciousness
- Workshops/seminars

5. **Evidence of Success**

Carved a vibrant and variant biodiversity niche in the middle of urban sprawl, creating a green haven of serene tranquillity in the capital city. Following achievements bear testimony to the consistency and efficiency of the green initiatives:

- Appreciation from Chief Minister of Kerala on the Harithalayam project
- Delivered 4 tons of 'Manuratna' paddy seeds to Kerala Agricultural University through the Harithalayam project.
- Enhanced organic food yield (Vegetable-1400Kg, Fish-200Kg)
- 'A' grade certificate for a green audit conducted by Haritakeralam Mission, Government of Kerala
- Successful monitoring of microclimate through On-campus Weather Station
- Periodic internal and external environment audit
- A weather station on the campus
- Considerable reduction in electricity and water bills through energy and water conservation interventions.
- 6,91,282 KWh electrical energy generated and transferred to grid so far
- Perennial water bodies on campus
- A thriving and harmonious ecosystem with 177 plant,95 bird,12 reptile and 45 insect species, and numerous species of butterflies, dragonflies, honeybees, frogs, tortoise, fish, Asian palm cats, peacocks, monkeys, wild boar, fox, porcupines, etc
- Invasive species replaced with indigenous fruit-bearing trees on a massive scale
- Cooler and cleaner air on campus
- Environmental consciousness among students with flex-free

6. Problems Encountered and Resources Required

Unexpected natural disaster due to climate change

Wild boar and rodent attacks on crops

Instant soil erosion due to uprooting of Acacia

Pandemic induced impediments on the campus for the efficient execution of the project