College of Engineering & Technical Vocational Education & Training (CETVET)

2024

Annual Research and Graduate Studies Report

1.0 Summary

In 2024, the college made substantial progress in research, innovation, and the enhancement of its graduate studies profile. The institution's alignment with Sustainable Development Goals (SDGs) and key priority areas is evident, with well-defined plans, timelines, and monitoring processes in place. Noteworthy improvements include increased publication output and a rise in the number of research students. The next subsections outline the publications list, master by research and PhD admission, research students' milestones, scholarship recipients 2024, graduations, seed grants, research student grants, industry collaborative grants, workshop and seminars, awards and recognition followed by conclusion.

2.0 Publications

The journal articles, book chapters, conference proceedings and thesis published with CETVET affiliation is listed in Table 1 to Table 4. A total of 37 journal publications, 10 book chapters, 1 conference proceeding and 1 research thesis is noted. Additionally Figure 1 illustrates the ranking of total journal articles published.

Table 1: Publication list – Journal Articles

1. Chand, S.S., Kumar, B.A. Applying the UTAUT Model to Understand M-payment Adoption. A Case Study of Western Part of Fiji. J Knowl Econ (2024). https://doi.org/10.1007/s13132-023-01722-x
2. Satyanand, Joanna Rosak-Szyrocka, and Balàzs Lukàcs. 2024. "Design and Analysis of a Bandwidth Aware Adaptive Multipath N-Channel Routing Protocol for 5G Internet of Things (IoT)." Emerging Science Journal 8(1): 251–69. doi:10.28991/ESJ-2024-08-01018.
3. A topological characterization of an almost Boolean Algebra, K.Ramanuja Rao, K.Rama Prasad, G. Vara Lakshmi and CH. Shanthi Sundar Raj, ISSN:26055686, Extracta Mathematicae.
4. Kumar, B.A., Chand, S.S. and Goundar, M.S. (2024), "Usability testing of mobile learning applications: a systematic mapping study", International Journal of Information and Learning Technology, pp 1 – 17. https://doi.org/10.1108/IJILT-03-2023-0029
5. Faisal, S., Soni, B. P., Goyal, G. R., Bakhsh, F. I., Husain, D., & Ahmad, A. (2024). Reducing the Ecological Footprint and charging cost of electric vehicle charging station using renewable energy based power system. ePrime- Advances in Electrical Engineering, Electronics and Energy, 7, 100398.
6. Prasad, R. D. (2024). School electricity consumption in a small island country: the case of Fiji. Energies, 17(7), 1727. https://doi.org/10.3390/en17071727
7. Kothari, K. (2024). Application of Fractional Calculus for Parameter Estimation of Nonlinear Wiener Systems With Time Delay. IEEE Access, 12, 26281-26294. doi:10.1109/ACCESS.2024.3367441.
8. Zaman, A., Kumar, S., Shatabda, S., Dehzangi, I., & Sharma, A. (2024). SleepBoost: A multi-level tree-based ensemble model for automatic sleep stage classification. Medical & Biological Engineering & Computing. https://doi.org/10.1007/s11517-024-03124-w
9. Dayal, K.K., Cater, J.E., Bellon, G., Kingan, M.J., Sharma, R.N. (2024) Evaluation of the mesoscale–microscale (WRF–WAsP) coupling methodology for wind resource parameters in Fiji. Energy Exploration & Exploitation. 42(4):1201-1217. doi:10.1177/01445987241237561"

10. Sharma, Vijay Kumar , Soni, Bhanu Pratap , Janu, Neha , Aziz, Sadaf & Shekhawat, Deepika (2024) Review on image steganography using different LSB methods, Journal of Discrete Mathematical Sciences and Cryptography, 27:4, 1319–1329, DOI: 10.47974/JDMSC-1985
11. Akzambekkyzy, A., Vasa, L., Forrest, J. Y. L., Sarkambayeva, S., & Singh, S. (2024). Impact of Projects with Future Potential on the Global Competitiveness Index of Countries. Emerging Science Journal, 8(2), 557–573. https://doi.org/10.28991/ESJ-2024-08-02-012
12. Singh, S., Singh, P., Rosak-Szyrocka, J., & Vasa, L. (2024). 5G Opportunities in the South Pacific: Leveraging Low-Band Spectrum for Socio-Economic Development. HighTech and Innovation Journal, 5(2), 508–533. https://doi.org/10.28991/HIJ-2024-05-02-020.
13. Kumar, A., & Ali, A. (2024). Big Data Visualization in Digital Marketplaces A Systematic Review and Future Directions. International Journal of Computers and Their Applications, 31(2), 138. http://isca-hq.org/Documents/Journal/Archive/2024/2024volume3102/2024volume310207.pdf
14. Reddy, P. S., Venu, M., & Reddy, N. G. (2024). Mechanical and sustainability assessments of cement-free GGBS-based Geopolymer concrete exposed to elevated temperatures. International Journal of Low-Carbon Technologies, 19, 2839-2847.
15. Lal R, Li Z, Li M. Accuracy verification of a 2D adaptive mesh refinement method by the benchmarks of lid-driven cavity flows with an arbitrary number of refinements. Mathematics. 2024; 12(18): 2831. https://doi.org/10.3390/math12182831"
16. Kumar, A. and Ali, S. (2024) 'Comparative Study of Classical And Modern Forecasting Algorithms To Predict Customer Behavior', Communication and Management Journal, 9(10), pp. 112–130. doi:10.36896/CMJ2024.V9I10.24.21728.
17. SHARMA, S., Rajnesh, L. A. L., & KUMAR, B. (2024). DEVELOPING MACHINE LEARNING APPLICATION FOR EARLY CARDIOVASCULAR DISEASE (CVD) RISK DETECTION IN FIJI: A DESIGN SCIENCE APPROACH. Applied Computer Science, 20(3), 132-152.
18. Ramu, K., Raju, S. V. S. R. K., Singh, S., Rachapudi, V., Mary, M. A., Roy, V., & Joshi, S. (2024). Deep Learning-Infused Hybrid Security Model for Energy Optimization and Enhanced Security in Wireless Sensor Networks. SN Computer Science, 5(7). https://doi.org/10.1007/s42979-024-03193-6
19. Sarkambayeva, S., Akzambekkyzy, A., Singh, S., & Tsekhovoy, A. (2024). Exploring Self-Management Practices in SMES: Insights from an Initial Survey. HighTech and Innovation Journal, 5(3), 774–793. https://doi.org/10.28991/HIJ-2024-05-03-016
20. Chand, V., Islam, A. R. M. T., Mia, M. Y., Islam, M. S., Masud, M. A. A., Khan, R., Pal, S. C., Singh, S. K., & Deo, R. R. (2024). Investigating soil physicochemical factors influencing trace element contamination at the semi-urban-rural home gardening interfaces on the Fiji Islands. Geoderma Regional, 39, e00884. https://doi.org/https://doi.org/10.1016/j.geodrs.2024.e00884
21. Chand, S.S. and Kumar, B.A. (2024), "Investigating mobile blended learning adoption with usability factors: an empirical study", Interactive Technology and Smart Education, Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/ITSE-08-2024-0182
22. Meli Nakauvadra Tanuku, Adimaitoga Tauyavunilotu William Rabuku, Dr. R. K. Prajapati, & Sarvesh Cha. (2024). Enhancing Counseling Support for Families of Individuals with Disabilities in Fiji: Integrating Cultural Sensitivity and Information Technology. ISIR Journal of Business and Management Studies (ISIRJBMS), 1(3), 18–22. https://doi.org/10.5281/zenodo.14229343

23. Prasad, S. S., Joseph, L. P., Ghimire, S., Deo, R. C., Downs, N. J., Acharya, R., & Yaseen, Z. M. (2024). Explainable hybrid deep learning framework for enhancing multi-step solar ultraviolet-B radiation predictions. Atmospheric Environment, 120951. https://doi.org/10.1016/j.atmosenv.2024.120951
24. Ghimire, S., Abdulla, S., Joseph, L. P., Prasad, S., Murphy, A., Devi, A., Barua, P. D., Deo, R. C., Acharya, R., & Yaseen, Z. M. (2024). Explainable Artificial Intelligence-Machine Learning Models to estimate overall scores in tertiary preparatory General Science course. Computers and Education Artificial Intelligence, 100331. https://doi.org/10.1016/j.caeai.2024.100331
25. Medina, L. B., Joehnk, K., Deo, R. C., Ali, M., Prasad, S. S., & Downs, N. (2024). Forecasting river water temperature using explainable artificial intelligence and hybrid machine learning: case studies in Menindee region in Australia. Water, 16(24), 3720. https://doi.org/10.3390/w16243720
26. Kumar, S. A., Chand, R. P., Chand, R., & Sharma, B. (2024). Entertainment and assistive robot: acceleration controllers of an autonomous Kids Personal Transporter (KPT). Engineered Science. https://doi.org/10.30919/es1318
27. Kumar, A., Narayan, A., Sharma, V., Prasad, A., Sami, M., & Jamnadas, H. (2024). Decoding the Web CMS Landscape: A comparative study of popular web content management systems. International Journal of Computers and Their Applications, 31. https://isca-hq.org/Documents/Journal/Archive/2024/2024volume3104/2024volume310406.pdf
28. Nair, V. K. (2024). Occupational health and safety conditions among SMEs: a case study based in the District of BA, FIJI. International Journal of Business & Management Studies, 05(04), 94–118. https://doi.org/10.56734/ijbms.v5n4a8
29. Pasinszki, T., & Devi, D. D. (2023b). The Kavalactone content and profile of Fiji kava sold on the local market. Beverages, 10(1), 4. https://doi.org/10.3390/beverages10010004
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31. Lal, R., & Li, Z. (2024). FURTHER ACCURACY VERIFICATION OF a 2D ADAPTIVE MESH REFINEMENT METHOD USING STEADY FLOW PAST a SQUARE CYLINDER. The ANZIAM Journal, 1–10. https://doi.org/10.1017/s1446181124000166
32. Kumar, A., Narayan, A., Sharma, V., Sami, M., & Chandra, S. (2024). Navigating Uncharted Waters via web search Trends: The impact and recovery of the Pacific tourism industry amidst the COVID-19 pandemic. International Journal of Hospitality and Tourism Systems, 17(4), 14–28. https://doi.org/10.21863/ijhts/2024.17.4.002
33. Prasad, A., Kumar, S. A., & Chand, R. (2024). New strategy aiding the motion control of a standard N-Trailer system in a constrained environment. Engineered Science. https://doi.org/10.30919/es1275
34. Zhao, B., Lu, D., Kondamareddy, K. K., Gu, W., Li, J., Tian, T., Li, L., Fan, H., & Ho, W. (2024). Nitrogen vacancies contained all-organic g-C3N4/tetra (4-carboxylphenyl) porphyrin heterojunction formed with π-π interactions for efficient visible light photocatalytic performance. Journal of Alloys and Compounds, 984, 174004. https://doi.org/10.1016/j.jallcom.2024.174004
35. Gu, W., Lu, D., Kondamareddy, K. K., Li, J., Cheng, P., Ho, W., Wang, Y., Zhao, Z., & Wang, Z. (2024). Efficient photocatalytic decomposition of NO and mechanism insight enabled by

NaBH4-reduced N(ligancy-3)-vacancy-rich-graphitic carbon nitride. Materials Today Physics, 46, 101487. https://doi.org/10.1016/j.mtphys.2024.101487

36. Wang Z, Lu D, Kondamareddy KK, He Y, Gu W, Li J, Fan H, Wang H, Ho W. Recent Advances and Insights in Designing ZnxCd1-xS-Based Photocatalysts for Hydrogen Production and Synergistic Selective Oxidation to Value-Added Chemical Production. ACS Appl Mater Interfaces. 2024 Sep 18;16(37):48895-48926. doi: 10.1021/acsami.4c09599. Epub 2024 Sep 5. PMID: 39235068.
37. "Jing Li, Dingze Lu, Kiran Kumar Kondamareddy, Wenju Gu, Yucheng Liu, Yaoheng Su, Zhanghai You, Huiqing Fan, and Wingkei Ho Crystal Growth & Design 2024 24 (21), 8769-8781DOI: 10.1021/acs.cgd.4c00651"

Table 2: Publication list – Book Chapter

1. Naika, A., Pillay, A. S., & Paliwal, A. (2024). Indigenous Food System for Sustainability: South Pacific Study. In World sustainability series (pp. 35–53). https://doi.org/10.1007/978-3-031-47122-3_3
2. Jiuliasi V. Uluiburotu, Salaseini B. Rabuka. "Exploring the Applications and Significance of Digital Twin Technology in Everyday Life," IGI Global Publishing Tomorrow's Research today.
3. Chand, R., Raj, J., Raghuwaiya, K., Vanualailai, J. (2024). 3D Formation Control of Multiple Cooperating Autonomous Agents via Leader-Follower Strategy. In: Yan, W.Q., Nguyen, M., Nand, P., Li, X. (eds) Image and Video Technology. PSIVT 2023. Lecture Notes in Computer Science, vol 14403. Springer, Singapore. https://doi.org/10.1007/978-981-97-0376-0_21
4. Reddy, N.G., Siddiqua, T., Devarangadi, M., Bogireddy, C. (2024). Suitability of Bauxite Residue as a Landfill Liner Material—An Overview. In: Das, S.K., Reddy, K.R., Nainegali, L., Jain, S. (eds) Geoenvironmental and Geotechnical Issues of Coal Mine Overburden and Mine Tailings. Springer Transactions in Civil and Environmental Engineering. Springer, Singapore. https://doi.org/10.1007/978-981-99-6294-5_6
5. Chandra, Abel & López, Yosvany & Dehzangi, Iman & Shatabda, Swakkhar & Sattar, Abdul & Kamola, Piotr & Sharma, Ronesh & Shigemizu, Daichi & Tsunoda, Tatsuhiko & Sharma, Alok. (2024). Advances in Computational Pipelines and Workflows in Bioinformatics. 10.1016/B978-0-323-95502-7.00283-9.
6. Paliwal, A. (2024). Secondary Processing Technologies of Nutri-Cereals. In: Thakur, M. (eds) Millets: The Multi-Cereal Paradigm for Food Sustainability. World Sustainability Series. Springer, Cham. https://doi.org/10.1007/978-3-031-64237-1_15
7. Chand, R., Raghuwaiya, K., Vanualailai, J., Karishma, K. (2024). Motion Planning of Multiple Fixed-Wing Unmanned Aerial Vehicles in 3 Dimension. In: Jia, L., Easa, S., Qin, Y. (eds) Developments and Applications in SmartRail, Traffic, and Transportation Engineering. ICSTTE 2023. Lecture Notes in Electrical Engineering, vol 1209. Springer, Singapore.
8. Kumar, S., & Sharma, A. (2024). Advances in non-invasive EEG-based brain-computer interfaces: Signal acquisition, processing, emerging approaches, and applications. In Elsevier eBooks (pp. 281–310). https://doi.org/10.1016/b978-0-323-95437-2.00014-8
9. Zaman, A., Kumar, S., Shatabda, S., Dehzangi, I., & Sharma, A. (2024). Recent development of single-channel EEG-based automated sleep stage classification: Review and future perspectives. In Brain-Computer Interfaces (pp. 445–470). https://doi.org/10.1016/b978-0-323-95439-6.00008-9

10. Harshna Charan, Reema Prakash, Ravneel Chand, Chapter 2 - An overview of solid waste management in the Pacific: Current status, challenges, and recommendations, Editor(s): Richa Singh, Sanjeeb Mohapatra, Mui-Choo Jong, In Waste And The Environment: Underlying Burdens And Management Strategies, Solid Waste Management for Resource-Efficient Systems, Elsevier, 2024, Pages 29-42, ISBN 9780443237751, https://doi.org/10.1016/B978-0-443-23775-1.00021-7.

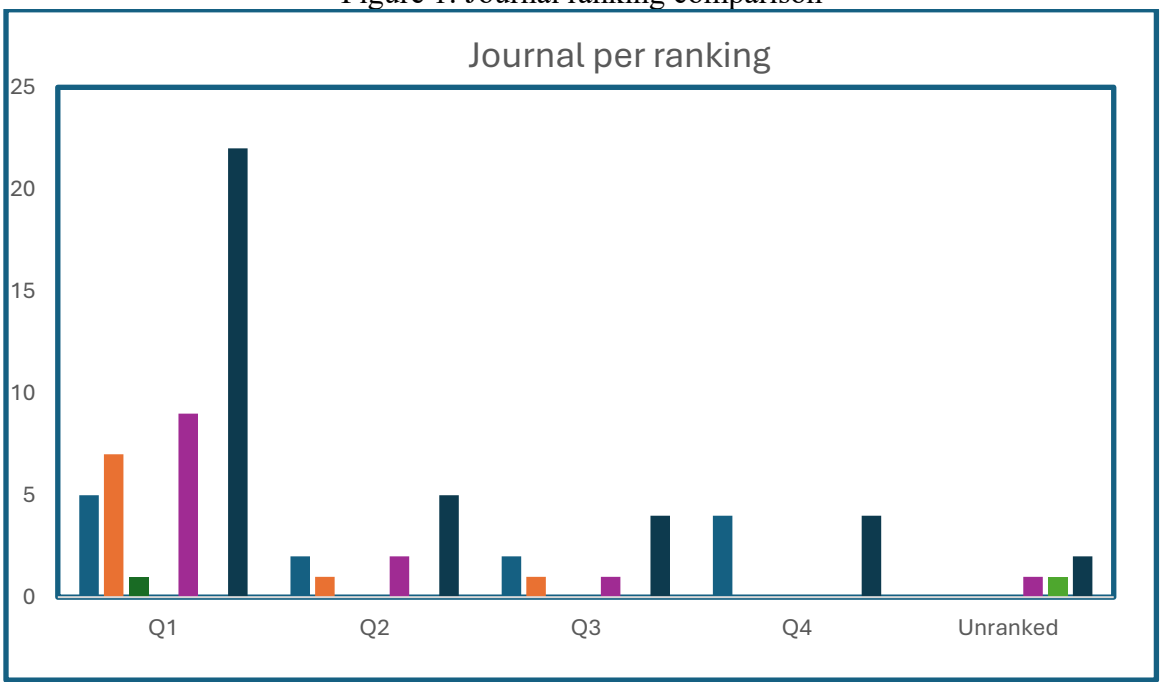
Table 3: Publication list – Conference proceeding

1. Singh, N., Kothari, K., Kumar, S., & Assaf, M. (2024). Review on the enhancement of 5G communications using LEO satellites. In Lecture notes in networks and systems (pp. 119–129). https://doi.org/10.1007/978-981-97-7710-5_10

Table 4: Publication list – Student thesis

1. Shahil Sharma, "Early detection of NCDs in Fiji: A machine-learning- based approach", Thesis Master by research, FNU Library. Principal supervisor Dr. Rajnesh Lal, Co-Supervisor Dr Bimal Aklesh Kuma.

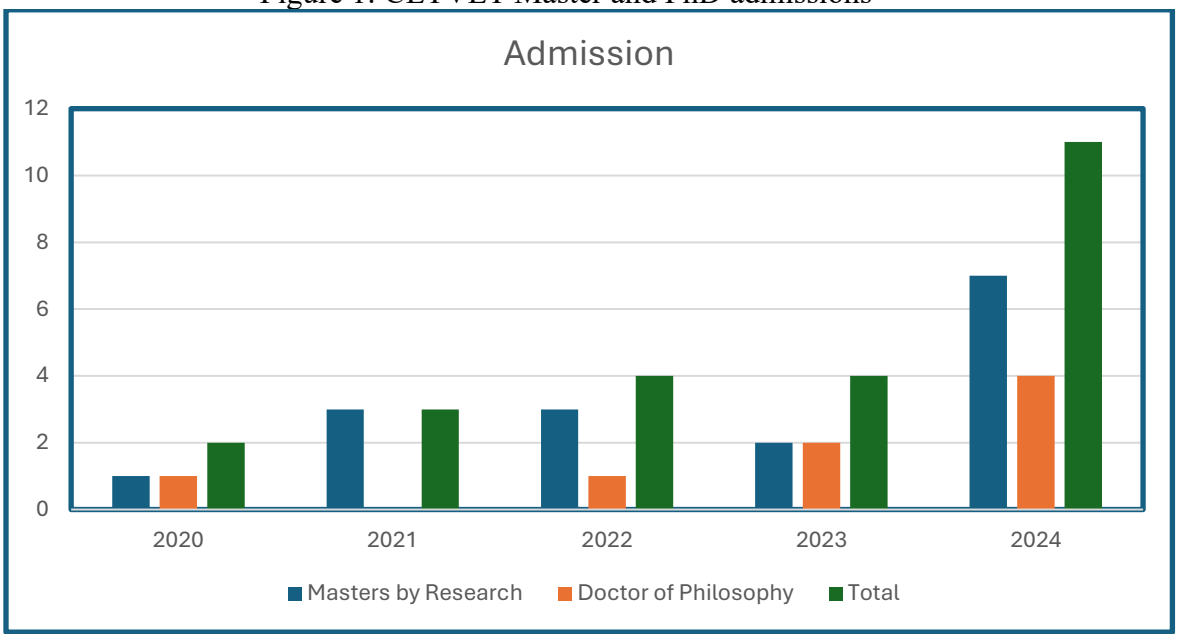
Figure 1: Journal ranking comparison



3.0 Master by Research and PhD admissions

In 2024, a total of 11 students' admission was done, where 7 students were for Master by Research Programme and 4 students for Doctor of Philosophy Programme. Figure 2 shows the admission information. Noting an increase in admission compared to 2020 to 2023.

Figure 1: CETVET Master and PhD admissions



4.0 Research students' milestones

Master and PhD students completing their milestones, a total of 5 students completed candidature confirmation and 4 students completed completion seminar (Table 5 and Table 6).

Table 5 - Candidature Confirmation

1. **Name**: Viliame Sakiti **Programme name**: Doctor of Philosophy **Thesis Title**: An Assessment of Sustainable Design and Construction Practices of Residential Buildings in Fiji **Principal Supervisor:** Dr. Patrick Singh **Co-Supervisor:** Prof. Daniel Franks Prof. Phillip B. Roös **Abstract**: Green buildings and construction activities play an important role in formalizing quality residential living spaces and standards that positively contribute to national economies. However, the construction of residential buildings alone consumes almost half of the world's resources in energy, water, prime agricultural land and timber. This has led to creating a global shift towards partnering cross disciplinary expertise as solutions to mitigate Climate Change impacts through Green Architecture and Sustainable construction advocating high performance residential design and structures, materials and resources efficiency, water management and energy efficiency. Fiji is not only committed to transitioning towards low or net-zero carbon by

2050 through the 5-Year and 20-Year National Development Plans but to also develop sustainable building materials that are affordable, enhances alternative natural resources, has good thermal insulators and are post disaster build back solutions.
This research investigates the potential production and integration of green building materials into the construction practices in Fiji to offset harmful impacts to the environmental. Key sustainable design and construction practices that can be developed to strengthen Residential Buildings in Fiji include a low carbon cement to produce green concrete made of agro-waste products, compressed fibred reinforced earth blocks, bamboo culms and its Engineered bamboo wood products. Hypothetically, local clay with high concentration of Kaolinite blended with agro-waste, supplementary cement materials and less portions of clinker and limestone produces a perfect low carbon cement (LC3) that are environmentally friendly. The LC3 also becomes the stabilizer for compressed earth bricks constructing the foundations and floor of a proposed sustainable low-cost residential housing model. In addition, bamboo culms and engineered woods replaces timber posts and structural framings of beams, walls studs and roof framings. Laminated veneered bamboo boards retrofit into both walls, ceilings and roof claddings after proper treatment to avoid insect and fungi attack. The 6-12 months monitoring and evaluation of the modelled residential house using hygro-thermal toolkits will prove it's environmentally friendly in many ways.
Picture:

2.
Name: Jreeta
Programme: Master by Research
Thesis Title: Investigating the Nutritional Significance of Fish in Enhancing Children's Dietary Intake in Fiji
Principal Supervisor: Dr. Ravinesh Ram
Co-Supervisor: Dr. Visheshni Chandra
Abstract: Fish consumption is crucial for providing dietary protein in Fiji, particularly in rural areas where subsistence fishing is prevalent. However, fresh fish consumption among school children is limited due to processed food choices. Public health campaigns can promote the

nutritional benefits of fish and educate individuals on incorporating fish into children's meals. Fish is an inexpensive and easily accessible source of animal protein, especially for children and expectant mothers, and is highly recommended for normal growth and development. This study aims to address this knowledge gap and contribute to existing literature on fish consumption and nutrition among school students in Fiji.

Picture:

3.

Student name: Ms. Anshiu Kumar

Programme name: Master by Research

Thesis title: Assessment of the Ecological and Socio-Economic Impacts of Co-Occurring Invasive Tree Species on Native Forests and Communities in Fiji

Principal Supervisor: Dr. Shipra Shah

Co-Supervisor: Dr. Rupantri Raju

Summary: Invasion by multiple non-native plants is common in forest ecosystems. However, a single Invasive Plant Species (IPS) is often □ampanulate in management and research due to its expected greater impact. The impact of the multiple plant invasive species can be greater, neutral, or less than the single IPS, depending on the type of interaction between the co-occurring invaders. Assessment and management of only a single IPS can be biased leading to inadequate IPS management. Effective management of IPS requires adequate knowledge of their impacts as both individual invaders and co-occurring invaders to target resources towards the management of sites with the highest impact. Limited research is on the impacts of co-occurring IPS in forest ecosystems and local communities, however, remains a key challenge in invasion science. This study will investigate the combined and single impacts of *Spathodea* □*ampanulate* (African tulip) and *Acacia* spp. On the structure and composition, regeneration, soil physicochemical properties, and litter mass of native forests in Bua, and Macuata province, Vanua Levu, Fiji. It will also examine local communities' perceptions, attitudes, and understanding of Acacia spp. And African tulip and identify policy interventions for IPS management. A systematic sampling method using nested plots will be used to collect data on trees, saplings, seedlings, and soil and litter mass. A semi-structured questionnaire will be used to collect socioeconomic data via household surveys from affected farmers and landowners, and key informant surveys with the affected communities and staff of Fiji Pine Limited. The findings from this study would have implications for the management and control of multiple species invasions on other island ecosystems across the Pacific and worldwide.

Student Picture:

4.
Student name: Mr. Krishneel Sundar
Programme name: Master by Research
Thesis title: Design and Analysis of Machine Learning for Proactive Cyber Threat Prediction and Prevention.
Principal Supervisor: Dr. Pritika Reddy
Co-Supervisor: Dr. Kaylash Chaudhary
Summary:
In today's digital world, cyber threats are a growing concern, even in regions like the South Pacific. The South Pacific faces significant cybersecurity challenges due to limited infrastructure and a growing threat landscape. Although the organizations and cybersecurity experts have implemented various strategies to mitigate cybersecurity risks and challenges, the underdeveloped frameworks, scarce resources and a shortage of skilled professionals makes organizations vulnerable to cyberattacks. While much research has been done globally on predicting and preventing these threats using advanced technologies, the research on mitigating cybersecurity risks in the South Pacific is in its infancy stage. Researchers and cybersecurity experts in the South Pacific are still working towards developing cybersecurity frameworks and working together with the government of the Pacific Island Countries (PICs) to devise strategies in which cybersecurity policies and frameworks can be implemented. One major drawback for the PICs is the lack of cybersecurity policy as such many attacks are not recorded and the data on cybersecurity intrusion for organizations for the PICs is missing. Cybersecurity risks and challenges are becoming more complicated with the incoming of new and advanced technologies such as artificial intelligence (AI). Therefore, this research aims to identify the most effective machine learning algorithm/model for proactive prediction and prevention of cyber threats that can later be used by organizations in the South Pacific region's digital ecosystem, aiming to enhance cybersecurity by identifying potential risks and challenges.
While the absence of local data is a challenge for the researchers, thus, this study will adopt external source datasets like Kaggle to ensure extensive testing and evaluation is carried out on machine learning algorithms for their prediction capabilities of cyber threats. The research will include the use of a wide range of tests from algorithm selection to model comparison and

hyperparameter tuning, to determine the optimal algorithm for threat detection. By employing robust evaluation metrics such as accuracy, F1 score, and AUC-ROC, the research aims to identify the best-performing algorithm that can be readily adapted to local environments. Additionally, the research methodology, results, and insights will be actively shared with local organizations via conferences, workshops, and online forums. Such an approach will motivate organizations in the South Pacific to engage with the research team and allow them to test and validate the model in real-world environments, thereby enhancing the region's cyber resilience. The outcomes of this research will not only advance the use of technology in cybersecurity in the South Pacific but also contribute to a safer digital environment. The research team hopes that the outcomes of this research will be used by relevant stakeholders to protect their environment from AI-driven cyberattacks in future.

Student Picture:

5.

Student name: Mr. Nischal Chandra

Programme name: Doctor of Philosophy

Thesis title: Design and Analysis of Control Strategies for Power Quality Improvement in Grid-Connected Systems

Principal Supervisor: Dr. Ronesh Sharma

Co-Supervisor:

Prof. Alok Sharma

Dr. Rahul Kumar

Summary:

The energy demand is directly linked to development and modernization, as we adapt to modern infrastructure and technology. Thus, there is a demand for clean renewable energy. The most accessible form of energy is solar; however, it is inconsistent due to varying sunlight intensity during the day. Integrating a battery energy storage system extends the reliability of solar energy by storing excess energy generated during peak sunny periods. The power grid has been the primary source of energy due to its ability to provide a consistent power supply. However, relying solely on the grid to power nonlinear load is not ideal. The unpredictable nature of the load feeds harmonic current into the grid. Over time, this degrades the grid's performance. Therefore, integrating renewable energy sources alongside advanced power

management systems is essential, to prevent further deterioration of power quality. While there are multiple solutions for managing power flow between Solar PV, batteries, and grid, these systems face several challenges due to nonlinear loads causing harmonic currents and voltage distortion. The unexpected behavior of solar irradiance and load profile often cause grid instability, offering rapid changes that the state-of-the-art control system struggles to handle, affecting the quality of electricity. The traditional resolution of passive filters results in increased losses, harmonics, and resonance issues, while modern control techniques based on active power filters still struggle with inadequate performance under unbalanced grid conditions. This highlights the need for more advanced control strategies.

This research will investigate the development of advanced adaptive control algorithms that can operate in real-time, managing energy flow between solar PV, batteries, and the grid. Novel control algorithms will be designed to adapt to the changes in solar power generation and energy demand, ensuring stability and efficiency in the grid. Advanced tools including RT-LAB, MATLAB, and hardware-in-the-loop (HIL) systems will be used to simulate, test, and experiment control algorithm's performance under various scenarios, such as power fluctuations or grid disturbances. The design, development, and testing of the advanced control strategies in this research will offer a more reliable and efficient system for distributed generation grid-connected systems. The proposed system will ensure stable voltage, reduce power fluctuations, and enhance the overall quality of electricity delivered to homes and industries. The investigation and analysis in this study will strengthen the integration of renewable energy sources into the power grid, thus, contributing to a more sustainable and cleaner energy.

Student Picture:

Table 6 - Completion Seminar

1.
Name: Shahil Sharma
Programme: Master by Research
Thesis Title: Early detection of NCD's in Fiji. A machine-learning based approach.
Principal Supervisor: Dr. Rajnesh Lal
Co-Supervisor: Dr. Bimal Kumar

Abstract: This dissertation focuses on tackling the endemic issue of noncommunicable diseases, particularly cardiovascular diseases (CVD), which contribute significantly to premature deaths in Fiji. The main aim is to develop a prototype CVD risk prediction system using machine learning algorithms to detect signs and symptoms before they manifest. The thesis outlines the construction of this system, incorporating mobile, cloud, and machine learning technologies, emphasizing its practical application over traditional research approaches. Rigorous testing confirms the system's effectiveness, making it a valuable tool for healthcare in Fiji, aiding in early CVD detection. Furthermore, this innovative approach presents a noteworthy advancement in applied machine learning for addressing similar health challenges globally.

Picture:

2.

Name: Shiloh Sylvia Narayan

Programme: Master by Research

Thesis Title: Modelling Geographic Range, Habitat Suitability, Climate-Induced Extinction Risk of Fiji's National Flower, the Tagimoucia

Principal Supervisor: Dr. Visheshni Chandra

Co-Supervisor:

Prof. Todd Dennis

Advisor:

Dr. Velazco Santiago José Elías

Abstract: The research aims to predict the potential current and future geographic ranges of endemic tagimoucia under conservative and extreme climatic scenarios, assess the species extinction risk by estimating the percentage loss in its area of occupancy (AOO), and determine its conservation status via the IUCN (International Union for Conservation of Nature) red list criteria. Her research presents new baseline data for future research on tagimoucia and introduces new modeling techniques to monitor climate-change impacts on Fiji's endemic cloud forest plant taxa.

Picture:

3.

Student: Malakai Tuinasau Tadualala
Programme: Masters by Research
Research Title: Groundwater Exploration Using an Integrated Approach of Remote Sensing, GIS - Artificial Intelligence (Machine Learning), And Geophysics Survey - Demarcation of Potential Groundwater Zones: Case Study of Nadi, Viti Levu Island, Fiji
Principal Supervisor: Dr. Satyanarayan Shastri
Co-Supervisor:
Dr. Joeli Varo
Dr. Ulukalesi Tamata
Advisors:
Prof. Todd Dennis;
Dr. Nicholas Rollings
Abstract:

The study focuses on the tailored groundwater (GW) solutions to address emerging water crisis on a disadvantaged communities that live within proximity of the Nadi, Momi, and Sabeto rivers watersheds with total surface area of 730 km2. Hence the hydraulic continuity of pressurised water supply to such locations proves insufficient to bring water supply in the said study area. Thus, categorised as a non-metered water reticulation coverage region, by the main Water Authority of Fiji (WAF) is in Nadi City, Western Viti Levu Island, Fiji. In response, the newly delineated mapped AHP-GM groundwater potential zone area shows promising results, showing high to moderate (0.52%), moderate (70.50%), localised to moderate (27.02%) and low to negligible (1.96%) groundwater potential zone area (GWZPA) for future water security. Thus, such a process entails the selection of new, low-cost technologies and techniques, the collection and collation of remote sensored datasets, and the analysis of those datasets in GIS and geophysics surveys. Thus, by creating a rigorous conceptual framework model, developed using credible sources from axillary field ground truthing and collated semi-paid open sources platform Google Earth Engine (GEE) remote sensored datasets and other available conventional ways. Cascading down from environmental, hydrological, and geological to a total of eighteen thematic layers.

Photo:

4.
Student: Deepti Darshani Devi
Programme name: Doctor of Philosophy
Research Title: Analysis of Kavalactone Content of Roots and Rhizomes of Fiji Kava
Principal Supervisor: Prof. Tibor Pasinszki
Co-Supervisor: Dr. Visheshni Chandra
Abstract:

Kava is the traditional intoxicating beverage of the Pacific with mild sedative and muscle relaxant effects, which are attributed to a group of compounds known as kavalactones. This PhD work aims to evaluate the quality of kava cultivated in Fiji by determining the kavalactone content and profile of the six major kavalactones in roots and rhizomes of kava plants collected in Bua, Kadavu, Ovalau, Taveuni, Qamea, Rabi, Rotuma, Sanqani, and Savusavu. In addition, the work also aims to measure kavalactone contents in kava sold in the local markets of Fiji through the quantification of the six major kavalactones in kava root bundles and powdered kava packages. The quantification of kavalactones is performed using ethanolic extracts of kava products and High Performance Liquid Chromatography (HPLC) as the instrumental technique.

The PhD project involves farm visits in targeted areas, uprooting kava plants, drying and grinding plants, extracting kavalactones, and quantifying lactone content using reversed-phase HPLC. The aim of the project is to explore the idea of being able to establish a kava 'fingerprint' – which would link a particular variety and area with certain a combination of kavalactone levels and associated strength, effect, or other distinguishing qualities. The project aims to assist farmers in selecting plant variants with the highest lactone content and most favorable lactone profile to increase income, as well as consumers to select the healthiest kava products.

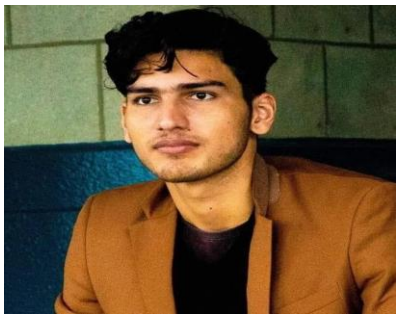
Photo:

5.0 Scholarship recipients 2024

Two recipients received Master by research scholarship to study at CETVET (Table 7).

Table 7 - Scholarship recipients

Name: Krishneel Sundar
Programme: Master by Research
Thesis Title: Use of Machine Learning for Cyber Threat Prediction
Picture:



Name: Roneel Prasad
Programme: Master by Research
Thesis Title: Determination of Pesticide Residues in Selected Local Vegetables Along Suva-Nausori Area
Picture:

6.0 Graduations

One student graduated in this annual year with Master by Research Degree, Mr. Shahil Sharma with Thesis Title "Early detection of NCD's in Fiji. A machine-learning based approach". Dr. Rajnesh Lal and Dr. Bimal Kumar supervised this student for his research thesis.

7.0 Seed Grants

Four seed grants were active during the year 2024 (Table 8), with completion report submission in process for GS018. In addition, GS060 being newly initiated in 2024.

Table 8 – Seed grant summary

Code	Approved Budget	Project Title	Investigators
GS051	$14,650.00	Enhancement of the efficiency and stability of low-cost paintable carbon-based planar perovskite solar cells with engineered perovskite/carbon interface using multi-walled carbon nanotubes (MWCNTs) and carbon quantum dots (CQDs)	Dr Kiran Kumar Kondamareddy, Mr Ashneel Avishek Prasad - FNU, Dr Changlei Wang-Soochow University, China (PRC
GS018	$15,000.00	Clean Cooking Energy Project for Kavewa Island (Macuata) in Fiji	Dr. Ravita Prasad, Ashmit Kumar, Naveendra Reddy, Jreeta, Dr. Constantinos Vassiliades, Dr. Ogheneruona E. Diemuodeke, Eric Yiadom, Dr. Wassim Dbouk, Ms. Roselene Dayal
GS047	$10,000.00	Quantifying Bio Methane Production & Co-generation Potential at Natabua wastewater treatment plant in Fiji	Ashmit Kumar, Dr. Ravita Prasad
GS060	$14,985.70	Comprehensive Analysis of Fijian Honey Composition and Antimicrobial Activity - A multi-parameter approach	Dr. Visheshni Chandra, Ms. Regina Nand

8.0 Research student grants

A total of 10 student grants were active in 2024 (Table 9), with GS031, GS032 and GS044, near completion to close the project. The newly initiated student grants in 2024 were GH007, GH003, GH011, GH010, GH005.

Table 9 – Student grant summary

Code	Approved Budget	Research Title	Student
GS031	$15,000.00	Analysis of Kavalactone Content of Roots and Rhizomes of Fiji Kava	Deepti Devi (PhD)
GS032	$8,984.00	Modelling Geographic Range, Habitat Suitability & Climate-induced Extinction Risk of Fiji's National Flower, the Tagimoucia	Shiloh Narayan (Masters by Research)
GS034	$15,000.00	Intelligent Transportation systems for smart Cities	Ronal Chand (PhD)
GS053	$6,652.00	Modeling and Analysis of Automated PlantSpecies Identification Systems Using Computationally Intelligent Methodologies	Mr. Ram Singh JNR (Masters by Research)
GS044	$9,937.97	GROUNDWATER EXPLORATION USING AN INTEGRATED APPROACH OF REMOTE SENSING, GIS - ARTIFICIAL INTELLIGENCE (MACHINE LEARNING), AND GEOPHYSICS SURVEY - Demarcation of Potential Groundwater Zones: Case Study of Nadi, Viti Levu Island, Fiji	Mr. Malakai Tadulala (Masters by Research)
GH007	$10,000.00	Assessment of the Ecological and Socio-Economic Impacts of Co-Occurring Invasive Tree Species on Native Forests and Communities in Fiji	Ms. Anshiu Kumar (Masters by Research)
GH003	$10,000.00	An investigation into the nutritional Significance of the locally sourced Fish for School students in Fiji.	Ms. Jreeta (Masters by Research)

GH011	$5,000.00	The use of Machine Learning for Cyber Threat Prediction and Prevention	Mr. Krishneel Sundar (Masters by Research)
GH010	$15,000.00	Design and Analysis of Control Strategies for Power Quality Improvement in Grid-Connected Systems	Mr. Nischal Chandra (PhD)
GH005	$14,913.00	Integrating Green Local Materials on Low-Cost Housing Design and Construction Practices in Fiji	Mr. Viliame Garau Sakiti (PhD)

9.0 Industry collaborative grants

A total of 3 Industry collaborative grants were active in 2024 (Table 10), with GI001 and GI009 near completion to close the project.

Table 10 – Industry collaborative grant summary

Code	Approved Budget	Research Title	Investigators
GI001	$42,714.00	Fuel level monitoring system for Telecom Fiji Limited (TFL) Industry Partner: Telecom Fiji Limited (TFL)	Dr Satyanand Singh, Dr.Ronesh Sharma, Dr. Shiu Kumar, Professor Tibor Pasinszki, Dr. Kajal Kothari, Dr. Bhanu Pratap Soni, Mr. Nauneet Menon, Mr. Nischal Chandra, Mr. Shamal Chand, Mr. Shivneel Chand, Mr. Pranid Reddy, Mr. Vinay Maharaj
GI009	$25,000.00	Kavalactone Content of Fiji Kava and Its Relationship with Plant Type, Plant Age and Nutrient Content of the Soil Industry Partner: Phama plus	Prof. Tibor Pasinszki,Dr. Visheshni Chandra, Ms. Deepti Darshani Devi,Ms. Shilvee Shobhna Prasad Industry Partners:Mr. Navi Tuivuniwai, Dr. Rohit Lal
GI008	$25,000.00	Analyzing potential mangrove blue carbon in an equatorial archipelago (Indonesia-Fiji) as a means of sequestering atmospheric carbon pollution from maritime vessels Industry Partner: Udayana University	Dr. Ravita D. Prasad and Dr. Shipra Shah Project Leader - Industry Partner: Dr. Abd. Rahman As-syakur Dr. Ida Bagus Mandhara Brasika

10.0 Workshop and seminars

CETVET hosted 10 days' workshop on Regional Cold Chain Equipment (CCE) Management Training. UNICEF Pacific coordinated and managed the workshop logistics and supported participants from around the pacific. Facilitators were from the EAC Regional Centre of Excellence for Vaccines, Immunization, and Health Supply Chain Management. Participants were from Fiji, Kiribati, Samoa, Tonga, Tuvalu, Solomon Islands, Micronesia, Palau, Marshall Islands and Vanuatu (Table 11).

CETVET also hosted a workshop, that was facilitated by Dr Ellen Robson from Durham University UK and Dr. Gangadhara Reddy from FNU. Participants were from FNU, Water Authority of Fiji, Global Green Growth Institute (GGGI), FRA, USP, Jokhan Realtors, Ministry of Public Works, Institute of Technology India, Department of Roads Government Of Nepal, Sustainable Future Consultancy, China Railway, ENTEC Pte Limited, Durham University, Erasito Consultants Ltd and Fiji Airways (Table 12).

In addition, a two-day strategic planning workshop was organized at CETVET. Participants included Dean, ADs, Managers, EOs, HOSs, HODs, Administrators and OAs of the college. The discussion and presentation were based on annual reports, college progress, achievements and challenges. School action items for 2025 was planned and aligned to FNU Strategic Plan 2024–2026.

Table 11 – Cold Chain Equipment (CCE) Management workshop

Short Course on Regional Cold Chain Equipment (CCE) Management Training workshop
Date: 04/11/2024 to 15/11/2024
Location: ERDC Building, Teaching Lab, Derrick Campus, Samabula.

Table 12 – Workshop on Enhancing the Climate Resilience of Fiji's Road Network

Workshop on Enhancing the Climate Resilience of Fiji's Road Network
Date: 10/12/2024
Time: 9am to 4pm
Location: ERDC Building, Teaching Lab, Derrick Campus, Samabula.

11.0 Awards and recognition

To acknowledge excellence in research, CETVET hosted the annual staff award night 2024. Staffs were recognized with researcher of the year, Excellent Teaching of the year, Excellent Service of the year and best performing school of the year was announced (Table 13). CETVET Annual Award for excellent research went to Dr. Bimal Kumar from School of Mathematical and Computing Sciences.

Table 13 – CETVET College Awards 2024

Theme: CETVET Glitz & Glamour Night. Date: 28/11/2024 Time: 6pm to 9.30pm, Thursday 28th November 2024. Venue: Central Cuisine Damodar.

12.0 Conclusion

In 2024, the college made significant strides in advancing its research, innovation, and graduate studies programs. The increase in publications, research student enrollments, and successful collaborations with industry partners highlights the institution's commitment to fostering academic excellence and addressing global challenges. With continued alignment to Sustainable Development Goals (SDGs) and a focus on cutting-edge research, the college is well-positioned to maintain its momentum and achieve further growth in the years ahead. As we move forward, the college will continue to build on these accomplishments, strengthening its reputation as a leader in research and higher education.