THE PAPUA NEW GUINEA
UNIVERSITY OF TECHNOLOGY

RESEARCH REPORT 2021

COMPILED & EDITED

BY

PROFESSOR SHAMSUL AKANDA

THE PAPUA NEW GUINEA

UNIVERSITY OF TECHNOLOGY

RESEARCH REPORT

2021

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Contents

FOREWORD

It is a great pleasure and delight to write about the PNGUoT Annual Research Report 2021 under the flagship of the Postgraduate Studies, Research and Innovation Committee. With the change of time, university functions, complexities, need, and technologies, PNGUoT Academic Board (AB) Committee's structure and operations came under review to make them efficient, dynamic, and robust to fulfill the needs of the present day with an eye to the future. All the AB committees realigned with the PNGUoT Strategic Plan 2020-2024 to accomplish the vision "to grow world-class technocrats by 2024 and beyond". As per the decision of the Academic Board, Postgraduate Committee, Research Committee, and Publications Committees were merged into a single committee, the Postgraduate Studies, Research and Innovation Committee (PSR&IC). The new committee renewed its commitment to realize the vision of the University in terms of PG studies, research culture, innovation, and publications to benefit the University and establish it as the technological knowledge hub so that the whole country can reap the benefit of research and innovation.

This is the first time the Annual Research Report contains the academic departments' research activities and the associated institutions and centres, which is a positive development to bring all the research, innovation, training, and dissemination of technologies/information under one platform. The academic Departments are contributing immensely to research, innovation and publications. Their contributions are well acknowledged. I also take this opportunity to thank all the research institutions/centres for their research and community engagements despite various challenges to bring real change to the PNG community. The research institutions/centres are also expected to bring the community problems back to the University to find solutions.

The presence of robust postgraduate programs stimulates research activities at PNGUoT. Supervision of postgraduate students and doing research go hand in hand. The PNGUoT has the most extensive postgraduate program in Papua New Guinea, with more than 200 students in 2021. Most of the students are from Papua New Guinea, but we also attract postgraduate students from other Pacific Islands and other parts of the world. For example, in 2021, we had one Master of Engineering in Mechanical Engineering student from Nigeria, Africa, under the Queen Elizabeth Commonwealth Scholarships Program. The presence of research students creates an atmosphere that is conducive to research.

Almost two-thirds of the postgraduate students are self-sponsored, which demonstrates the interest of the students in the community to upgrade their qualifications to gain new knowledge and improve their skills to cope with the current changes. With technological change and global competition, postgraduate studies are not a luxury but a necessity. Many of the students come from the industries on employers' sponsorship. However, one of the common challenges, particularly for self-sponsored students, is the university fees. The government had scholarship programs for undergraduate study (HECAS – Higher Education Cost Assistance Scheme - and AES – Academic Excellence Scholarship), but such schemes were in place for postgraduate studies. We are pleased to see that now there is a Higher Education Loan Program (HELP) that is accessible to both undergraduate and postgraduate students. This is a step in the right

direction. In 2021, 26 students from PNGUoT benefited from the HELP fund. I would expect the Government's HELP program to be simplified and further strengthened to meet the needs of a large number of aspiring PG students.

In 2021, the University allocated a budget of **K507,000** to PSR&IC, which is **44%** higher than that of 2020. The continuous higher allocation for research, innovation, and publications demonstrate the commitment of the University to support cutting-edge research and innovation toward sustainable national development. In 2022, the budget is expected to be about **1 million** Kina, which is quite generous but also challenges the academic staff and PG students to do more.

I would like to take this opportunity to thank all Heads of the Department, team leaders of research institutions/centres, and members of the Postgraduate Studies, Research and Innovation Committee for their fruitful work during the year 2021. I also wish to thank the Vice-Chancellor, Dr. Ora Renagi, and his Management Team for their continued support and commitment to funds. A special thanks to the staff and the students who published their research findings in academic journals and other communication media. Above all, I thank the Dean of Postgraduate School and Chairman, Postgraduate Studies, Research and Innovation Committee, Professor Akanda, for his unwavering commitment and effort in compiling and editing the 2021 PNGUoT Annual Research Report.

Associate Professor Garry Sali, PhD
Deputy Vice-Chancellor

STATEMENT FROM THE CHAIRMAN, PSR&IC

It is a great honour and pleasure to present the PNGUoT Annual Research Report 2021 as the Chairman of the Postgraduate Studies, Research and Innovation Committee PSR&IC). This is the first report under the flagship of the new Committee. The PSR&IC combines the functions of the former Postgraduate, Research, and Publications committees. It was a challenging year; however, due to the steadfastness and resilience of the academic staff and PG students, the academic year was completed on a high note. As a result, for the first time, research activities and publications from the academic departments and the research, training, and community engagement activities of the PNGUoT research Institutions/Centres reported their activities in one consolidated platform. In addition, a large volume of research is also reported from the final-year student projects.

Despite all these challenges, the departments, Institutions/Centres showed their resilience and steadfast commitment to research by publishing in various academic journals and other communication media. The staff and students published 89 peer-reviewed journal articles, several book/book chapters, conference presentations, and other publications. The Committee is also doing its best on all fronts. This is a remarkable achievement for the academic Department, Institutions/Centres, and we CONGRATULATE them all.

The PSR&IC allocated K501,102.54 to the staff and PG students from a budget of K507,000. This budget allocation from the University was about 44% higher than that of 2021, which is a demonstration of promises to support PG studies, research, and innovation for the University to become a technological knowledge hub. The budget for 2022 is expected to be about **one million Kina** to support staff and students' research and innovation. This generous budget also challenges the staff and students to do more to bring sustainable socio-economic development to PNG.

In 2021, a total of 40 students graduated with various PG degrees, including three (3) PhDs. This is the largest PhD cohort to graduate in a single academic year. The graduands also include five students from the Applied Physics Department in the Master of Technology in Exploration Geophysics program, the pioneering group. All the PG students are PNG nationals, except one student from Nigeria, Africa, who graduated with a Masters of Engineering in Mechanical Engineering. He was a scholar of the Queen Elizabeth Commonwealth Scholarships program of the Associations of the Commonwealth Universities (ACU). The presence of students from different parts of the world provides the students the opportunity to learn from each other beyond classroom teaching to enrich their culture. The PNGUoT is a proud member of ACU. CONGRATULATIONS to all the graduands, and we are proud of them.

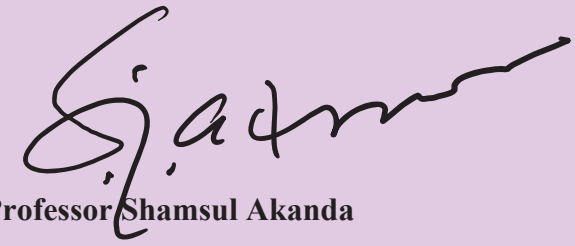
Realizing the importance of research and innovation in sustainable social development, the PSR&IC constituted a sub-committee on Innovation to:

i. Conduct a thorough baseline review and reporting of the current state of research and innovation.
ii. Develop an institutional register and inventory of all patents, copyrights, and notaries on research and innovation.

iii. Develop a roadmap and strategic framework for cutting-edge research and innovation and a plan for leveraging this to provide solutions for society at large.

Research publications are of immense value to the career of the academic. To accelerate academic publications, particularly for encouraging young academics, the PSR&IC is now working with the academic departments having in-house academic journals to find or extend ways to improve their quality and make them more sustainable. In addition, the Academic Board has also decided to introduce another multidisciplinary journal to further encourage publications from the University toward building career academics as a part of succession training.

I would like to take this opportunity to thank all the Heads of the Department, Directors of Research Institutions/Centres for their help in making this Research Report 2021 a reality. I also thank the Vice-Chancellor, Dr Ora Renagi, and his Senior Management Team for the continuous enhanced financial commitment and other necessary support to the PSR&IC. The Committee also acknowledges the contributions of Dr Augustine Moshi, Pro Vice-Chancellor (Academic), who left the University in December 2021 after more than 27 years of service. Furthermore, I am grateful to the members of the PSR&IC for their time and unwavering support for all the success we have made. Finally, I am also thankful to all the staff members of the PG Office who are working tirelessly behind the scenes to keep us moving.



Professor Shamsul Akanda

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Postgraduate Studies, Research and Innovation Committee (PSR&IC)

Responsibilities: The responsibilities of the PSR&IC fall under three categories postgraduate study and research and publications. They are:

1. To formulate or review the postgraduate admission policy of PNGUoT at least once every three years.
2. To vet appointments of supervisors and thesis examiners of each postgraduate student.
3. To consider and approve examination arrangements and results for each postgraduate program and student.
4. To organize an annual postgraduate students' research presentation.
5. To ensure compliance of postgraduate programs with the PNG NQF.
6. To recommend to the Academic Board names of students who are eligible to graduate with postgraduate qualifications.
7. To formulate or review the research polices of PNGUoT at least once every three years.
8. To consider and approve or reject applications for research funding
9. To consider and approve or reject applications for conference funding
10. To edit and publish PNGUoT Annual Research Report
11. To consider and approve the objectives of all academic publications produced under the auspices of the university for dissemination beyond the university
12. To consider and approve the terms of reference of the editorial board for each academic publication of the university
13. To call for and receive reports from each editorial board for academic publications of the university
14. To consider and recommend to the Vice Chancellor's Committee for approval an annual maximum amount of funding for each editorial board.

Constitution of the PSR&IC

Membership of the PSR&IC will consist of the following:

Ex Officio Members:

1. Vice Chancellor
2. Deputy Vice Chancellor
3. Pro Vice Chancellor (Academic)
4. Pro Vice Chancellor (Administration)

5. Dean of Postgraduate School
6. Dean of Engineering
7. Chairman, Academic Ethics and Integrity Committee

Appointed Members:
1. One person appointed by the Vice Chancellor who will be Chairperson
2. Two Heads of Department
3. Two Professors
4. One academic staff with a strong background in research from each of the Natural Sciences, Natural Resources, Engineering, Business Studies and Environment groups.
5. A postgraduate student elected by the postgraduate students.

Membership: Members of the PSR&IC for the period January 1, 2021 – December 31, 2022, are:

Ex Officio Members:
1. Dr Ora Renagi – Vice Chancellor
2. Dr Garry Sali – Deputy Vice Chancellor
3. Dr Augustine Moshi –Pro Vice Chancellor (Academic)
4. Professor Kaul Gena – Pro Vice Chancellor (Administration)
5. Professor Shamsul Akanda – Dean of Postgraduate School
6. Dr Moses Kavi – Dean of Engineering
7. Professor Osia Gideon, Chairman, Academic Ethics and Integrity Committee

Appointed Members:
1. Professor Shamsul Akanda – Chairman
2. Professor Jacob Babarinde
3. Professor Cletus Gonduan
4. Dr Mirzi Betasolo
5. Mr Anthony Anugu
6. Dr Patrick Michael
7. Dr Dapsy Olatona
8. Dr Ken Ail
9. Dr Rachel Aisoli-Orake
10. A Postgraduate Student elected by the postgraduate students (TBA)

Executive Officer: Mr. Gabriel Paul, Senior Assistant Registrar (Academic)

Executive Summary

The Annual Research Report is a comprehensive compilation of ongoing and completed research from all the 13 academic departments at PNGUoT each year. However, for the first time in 2021, research conducted by the various research institutions and centres within PNGUOT is also included in the report. Despite the continued challenges of the COVID-19 pandemic, the university completed the 2021 Academic year on a high note. The ***Annual Research Report 2021*** contains the research priorities aligned with "Unitech 2030" and PNGUoT Strategic Plan 2020-2024; national priority areas, ongoing and completed research and publications by the staff and postgraduate students. In 2021, academic staff members published **89** peer-reviewed research articles in reputed indexed and non-indexed journals and conference publications, books, and book chapters. This number is almost like last year's numbers (92), despite the in-country and overseas conference attendances and other restrictions. This result shows our faculty members' strong commitment and resilience in research and publication activity, despite funding limitations, heavy teaching loads, disruptions due to the COVID-19 pandemic, and other challenges. The in-depth research conducted by the PG students, in turn, generates a large volume of peer-reviewed publications in national and international journals.

In 2021, 40 students graduated with different postgraduate degrees, including three (3) PhDs. The number of PhDs who graduated in a single academic year is a record for PNGUoT. The graduands also included five (5) students of the pioneering program in Master of Technology in Exploration Geophysics under the Applied Physics Department. Among the graduands, one student from Nigeria under the Queen Elizabeth Commonwealth Scholarships graduated with a Master of Engineering in Mechanical Engineering. CONGRATULATIONS to all the graduands.

Research conducted by the final year undergraduate students also constitutes a large proportion of academic departments' research. Many of the research outputs are important and of immense value for tackling Papua New Guinea's problems. In addition, many of these initial studies may lead to in-depth future research to solve complex issues in PNG.

In 2021, the Postgraduate Studies, Research and Innovation Committee allocated **K501,102.54 from a total budget of K507,000** compared to K349,067 in 2020 to support staff and student research. It is an increase of about **44%** over 2020. Most of the funds went to the postgraduate students' research. No fund was allocated for conference attendance due to travel restrictions

for the COVID-19 pandemic. The generous allocation for 2021 demonstrates PNGUoT's ongoing solid commitment to Postgraduate studies, research, and innovation to develop the scholarship and research culture required to fulfill the goal to become the technological knowledge hub for the country and the South Pacific. The funding increase aligns with the PNGUoT Strategic Plan that emphasizes academic excellence, conducting innovative research in national priority areas of high potential and relevance, and outreach activities. Postgraduate studies are the global conduits for universities to develop research programs to be creative and solve complex problems through innovations leading to sustainable national developments. The PSR&IC also constituted a Sub-Committee on Innovation to:

i. Conduct a thorough baseline review and reporting of the current state of research and innovation.
ii. Develop an institutional register and inventory of all patents, copyright, and notaries on research and innovation.
iii. Develop a roadmap and strategic framework for cutting-edge research and innovation and how this can be leveraged to provide solutions for society at large.

The PNGUoT Research Institutions and the Centres also submitted their research/training activities for the 2021 academic year. This is the first time the research/training activities are reported to the PNGUoT Annual Research Report. These institutions/centres are doing their best to fulfill their university and the country's obligations. However, almost all these institutions/centres have the human capacity challenge. Therefore, the university should look at the staffing issue as a matter of urgency so that it can work towards fulfilling its vision and mission for the benefit of the Papua New Guineans.

Due to the COVID-19 restrictions on gatherings, social distancing, and travel, in-country and overseas conference attendance was on hold. These restrictions also affected the "PNGUoT Postgraduate Studies, Research and Innovation Committee Seminar Series" – a hallmark of PNGUoT. This weekly seminar series running for the last nine years brings the academics, staff, and students together in a common platform to share and disseminate research findings to the broader university community. This seminar series is the best forum for publicizing research outcomes to the broader community and training young academics and postgraduate students in presentation and communication skills. Despite all the challenges, the seminar series resumed in 2022 with some exciting and positive words from the Vice-Chancellor, Dr Ora Renagi.

SUMMARY OF RESEARCH OUTPUT 2021

Name of the Department/Institution/Centre	Journal Articles	Conference Papers/ Seminars	Book/Book Chapters	Reports/ Other Publications	Patents	PG Student Graduation		
						PG Certificate	Masters	PhD
Agriculture	19+2*	03					02	
Applied Physics	08	02		01			08	
Applied Sciences	01						01	01
Architecture and Construction Management	-							
Business Studies	6+1*	04	06	14			04	
Civil Engineering	02							
Communication and Development Studies	08+1*	03				11	04	
Electrical and Communication Engineering	11+1*							
Forestry	02							
Mathematics and Computer Science	02	06						
Mechanical Engineering	17+2*	01	01		02		03	
Mining Engineering		02		01				
Surveying and Land Studies	09	01					04	02
Department of Distance Learning	01							
Teaching and Learning Methods Unit	02	01						
Appropriate Technology and Community Development Institute (ATCDI)	01							

Sustainable Energy Research Institute (SERI)		04						
South Pacific Institute of Sustainable Agriculture and Rural Development (SPISARD)	[1]							
Environmental Research and Management Centre (ERMC)								
PNGUoT Biotechnology Centre (UBC)	[1]							

Note: *co-authored paper, counted to the department based on authorship ranking.

[1] Reported in Agriculture Dept

Departmental Research Reports

Agriculture

Applied Physics

Applied Sciences

Architecture and Construction Management

Business Studies

Civil Engineering

Communication and Development Studies

Electrical and Communication Engineering

Forestry

Mathematics and Computer Science

Mechanical Engineering

Mining Engineering

Surveying and Land Studies

Reports from the Research Institutions

- Appropriate Technology and Community Development Institute (ATCDI)

- South Pacific Institute of Sustainable Agriculture and Rural Development (SPISARD)

- Sustainable Energy Research Institute (SERI)

Reports from the Research Centres

Environmental Research and Management Centre (ERMC)

PNGUoT Biotechnology Centre (UBC)

DEPARTMENT OF AGRICULTURE

Head of Department: Dr Macquin Maino

The Department of Agriculture is one of the 13 Academic Departments in Papua New Guinea University of Technology (PNGUoT). Department offers undergraduate and postgraduate degree programs in Agriculture, conducts agricultural research, and disseminates new insights to the community. At the undergraduate level, a four-year study program- the Bachelor of Science in Agriculture [B.Sc.(Ag)] and a hybrid Open model, and Distance mode, a two-year degree, Bachelor of Agriculture and Rural Development (B.Ag.&R.D), are on offer. In addition, the Department also offers three postgraduate degree programs, namely Master of Science in Agriculture (MScAg), Master of Philosophy (MPhil), and Doctor of Philosophy (PhD). The MSc in Agriculture program combines course work and research, while the PhD and MPhil studies are full-time research-based degrees.

The Department has 15 qualified academic staff members (11 with PhDs, 3 with Masters, and one on study leave pursuing PhD studies overseas). In 2019, three students graduated with postgraduate degrees (1 with MPhil and 3 with MSc). Due to COVID-19, the 53rd and 54th graduation ceremonies are yet to be conducted. The Department of Agriculture is committed to delivering quality teaching, research, outreach activities, and postgraduate studies. The Department's activities are well guided by the Department's Five-Year Strategic Development Plans (2005 – 2010, 2011 – 2015, and 2016-2020). With Unitech's Strategic Plan 2020-24, an implementation plan has been prepared to carry forward research activities. The curriculum of the Department's academic programs is enhanced through regular and periodic reviews in consultation with stakeholders and industries in the public and private sectors. The Department has established strong collaborative research links with international developmental partners and stakeholders, including the Australian Centre for International Agricultural Research (ACIAR) and New Zealand AID. Regular publication of the scientific journal '*Niugini Agrisaiens*' and academic staff publishing scientific papers confirm the Department's strong commitment to research activities at PNGUoT. The Department has strong research collaborations with the PNG National Agricultural

Research Institute (NARI), University of South Pacific (USP), Fiji, Charles Sturt University (CSU), Australia, National Research Institute (NRI) of Greenwich University (U.K.), South Australian Research and Development Institute (SARDI), Australia, University of Canberra, Australia, Curtin University, Australia and many other NGOs, industries, and institutions. These research collaborations signify our strong leadership in agricultural research. Other publications, a compilation of abstracts of research done by the postgraduate students, Annual Reports, Farm Report and Strategic Plan on an annual basis also strengthens the Department's research capacity. In 2016, Unitech Biotechnology Centre was amalgamated to the Department of Agriculture for administrative oversight.

PNG University of Technology is an Associate Member of Asia- the Pacific Association of Agricultural Research Institutions (APAARI) through the Department of Agriculture. The APAARI located in Bangkok, Thailand, aims to strengthen research and innovations for sustainable agricultural development in Asia and the Pacific.

The following research focus areas have been identified, and much of the staff and student research are conducted in these thematic areas:

AREAS OF RESEARCH

Research Focus Area – 1: Crop Sciences

- Evaluation of promising rice varieties for Papua New Guinea
- Crop improvement and adaptation to stress environments caused by climate change
- Use of *Trichoderma* spp. as a biocontrol agent against some selected soil-borne pathogens
- Study of the production technology and practices of selected crops by farmers in different agro-ecological regions of Papua New Guinea
- Study of the production technology and practices of selected vegetables by farmers in different agro-ecological regions of Papua New Guinea
- Soil N and composting in sweet potato-based farming systems
- Symbionts as a potential biocontrol agent for cocoa pod borer
- Development of a maize seed system for PNG

- Gene discovery in PNG wild rice: seed and grain characteristics
- Genetic transformations of taro, rice, and sweet potato.
- Quantification of greenhouse gases (GHG) emissions from soils under major cropping systems of Papua New Guinea
- Development of fungal inoculum for artificial agarwood production in PNG

Research Focus Area – 2: Livestock Sciences

- Conservation of farm animal genetic resources
- Utilization of crop wastes and agro-industrial by-products for feeding livestock and poultry
- Determining digestibility of locally available feed and fodder
- Determination of anti-nutritional factors in the fodder crops of PNG
- Development of suitable weaner piglets diet
- Smallholder Aquaculture development in PNG

Research Focus Area – 3: Agricultural Economics

- Economic efficiency of small-scale rice farming
- Technical efficiency of smallholder coffee farming
- Resource use efficiency among small-scale peanut farmers.

Research Focus Area – 4: Agricultural Extension and Rural Development

- Evaluation of on-going extension approaches in PNG and their effectiveness in rural livelihood improvement
- Problems and prospects of retaining youth in agriculture in PNG
- Identifying the present farming systems in different regions of PNG and scope for improvement
- Examining household food security in peri-urban settlements
- Livelihoods of settlers in peri-urban settlements
- Return from Investment in Higher Education, Extension and Innovations
- Entrepreneurship Development among Rural People
- Women in Agriculture for Food Security

- Diffusion of Agricultural Innovations among Rural Community

Research Focus Area – 5: Post-Harvest Technology

- Survey on the current status of mechanization in PNG: impact study of mechanization on rural livelihood and environment
- Development of postharvest technology and postharvest management systems for horticultural crops in PNG.

RESEARCH INTERESTS OF ACADEMIC STAFF MEMBERS

No	Academic staff	Areas of research interest
1	Dr Macquin Maino	Plant Pathology, Nematology, Biocontrol agents, Plant Physiology, Plant Virology
2	Mr Nick Kewa	Agricultural economics, climate change, and supply chain management
3	Professor Shamsul Akanda	Plant Pathology, Integrated disease management, Research methods
4	Professor Gariba Danbaro	Animal breeding, Animal management systems, Research methods
5	Professor Tom Okpul	Plant breeding and genetics, Tissue culture, Biotechnology
6	Dr Jayaprakash	Veterinary Science, Animal Nutrition, Animal health and diseases
7	Dr Peter Manus	Agricultural economics, Agribusiness management
8	Dr Rajashekhar Rao B.K.	Soil Science, Soil quality, Soil fertility, Soil pollution, Agricultural Chemistry
9	Dr Veronica Bue	Agricultural extension, women in agriculture, rural sociology
10	Dr Patrick Michael	Natural resource management, field crops, agriculture, and environment
11	Dr Ronnie Dotaona	Agricultural entomology, Integrated pest management, Biocontrol agents
12	Dr Gwendolyn Ban	Plant pathology, Biocontrol agents
13	Mr William Nano	Agricultural extension, Animal nutrition, Aquaculture, On-farm training
14	Mrs Betty Tiko Motoro	Agricultural extension, rural sociology
15	Mr Frank Vidinamo (Study leave)	Agricultural Engineering, Postharvest technology

LIST OF JOURNAL PUBLICATION

The publication list contains articles from the research work of staff and students of the Department of Agriculture. In addition, the publication list includes the articles published in the *Niugini Agrisaiens*, volume 11, 2020, as the issue came out later in the year 2021. The papers in this issue were not reported in the departmental/University report 2020. Hence they are included as part of this report.

1) Ban, G., Maino, M.K. and Akanda, S. (2021). Growth and shelf-life of *Trichoderma harzianum*. *Niugini Agrisaiens,* **12**, 50-56.

2) Batisarisari, N., Manus, P., and Bue, V. (2021). Attitude and technical efficiency of commercial taro farmers of Taveuni, Fiji. *Niugini Agrisaiens,* **12**, 42-49.

3) Beko, J., Mulung, K. and Okpul, T. (2020). The recalcitrant nature of *Gyrinops ledermannii* seeds: Notes on desiccation tolerance and longevity in storage. *Niugini Agrisaiens,* **11**, 7-13.

4) Botu, A. A., and Danbaro, G. (2021). Evaluation of physical properties of Tilapia (*Oreochromis niloticus* L.) feeds made from local ingredients in Papua New Guinea**.** *Niugini Agrisaiens,* **12**, 26-33.

5) Davis, A., Maino, H., Uakai, M., Saese, H., Quirk, C., Wamala, M., Gendua, P. and Okpul, T. (2020). AMMI Analysis for yield stability of 37 promising rice varieties in preliminaries for multi-environment testing in Papua New Guinea. *Niugini Agrisaiens,* **11**, 14-23.

6) Divuniwaqa, C. and Rajashekhar, R.BK. (2021). Biochar application alters soil Ni fractions and phytotoxicity of Ni to pakchoi plants. *Environmental Technology and Innovation* **23**: 101751. https://doi.org/10.1016/j.eti.2021.101751

7) Kamang, D. and Manus, P. (2021). Attitude, profitability and resource use efficiency of smallholder rice farmers in Sumkar District of Madang Province, Papua New Guinea. *Journal of Austrian Society of Agricultural Economics,* **17**(10), 721-731.

8) Kewa, N., Wairiu, M. and Michael, P.S. (2021). Evidence and impact of climate change of crop production in the Highlands of Papua New Guinea: A Review (2021). *Niugini Agrisaiens,* **12**, 1-12.

9) Maino, L., Sar, L. and Maino, M. (2020). Effectiveness of information delivery through the AKIS/RD agriculture extension model: A preliminary case study in rice farming systems in two districts of the Morobe Province. *Niugini Agrisaiens,* **11**, 1-6.

10) Manus, P. (2021). Productivity and technical efficiency of smallholder coffee farming without agricultural extension services in the Nebilyer District of Papua New Guinea. *Niugini Agrisaiens,* **12**, 13-25.

11) Manus, P., Batisarisari, N. and Kewa, N. (2020). Soil productivity and resource use efficiency of smallholder taro farmers in Taveuni Island, Fiji. *Niugini Agrisaiens,* **11**, 34-41.

12) Manus, P., Degamba, M., Parau, T. and Halim, A. (2020). Determinants of beneficiary knowledge and attitude to leatherback turtle conservation in Lababia, Morobe Province, Papua New Guinea. *Niugini Agrisaiens,* **11**, 42-48.

13) Manus, P and Kamang, D. (2021). Attitude, profitability and technical efficiency of smallholder rice farming in Bogia District of Madang Province, Papua New Guinea. *Journal of Austrian Society of Agricultural Economics,* **17**(09), 661-671.

14) Manus, P. and Kamang, D. (2020). Determinants of technical efficiency of smallholder rice farming in Madang District of Madang Province, Papua New Guinea. *Niugini Agrisaiens,* **11**, 24-33.

15) Michael, P.S. (2021). The role of biofertilizers in the management of nutrient deficiency, acidity, and toxicity in acid soils – A review. *JOGAE* **12**, 19-30.

16) Michael, P.S. (2021). The positive and negative effects of addition of organic carbon and nitrogen for management of sulfuric soil acidity under general soil use conditions. *Polish Journal of Soil Science* **54**, 78-87.

17) Michael, P.S. (2021). Popularity of online and curiosity of on-campus learning among distance education students of PNG University of Technology, Papua New Guinea. *IJMRAP* **11**, 46-57.

18) Parau, T., Bue, V., Sengere, R. and Manus, P. (2021). Responses of smallholder coffee farmers to the incursion of coffee berry borer (CBB) in a selected village in the Eastern Highlands Province of Papua New Guinea. *Niugini Agrisaiens,* **12**, 34-41.

19) Sawang, L., Ikati, H. and Michael, P.S. (2021). Phytoextraction of selected heavy metals by Ipomoea aquatic and Pteridium aquilinum from contaminated soils under humid lowland tropical climatic conditions. *Asian Journal of Plant and Soil Sciences* **6**, 245-254.

20) Timi, D., Gopalakrishnan, S., Hombhanje, F. and Maino, M. (2021). Antimicrobial effect of green synthesized silver nanoparticles using aqueous extract of *Peperomia pellusida*. *Australian Journal of Science and Technology*, **5**(1), 470-474.

21) Vidinamo, F., Fawzia, S. and Karim, M.A. (2021). Investigation of the effect of drying conditions on phytochemical content and antioxidant activity in pineapple (*Ananas comosus*). *Food and Bioprocess Technology,* **15**, 72-81.

WORKSHOPS/CONFERENCES/SYMPOSIUMS

Akanda, S. (2021). Research and Innovation in PNG –Collaboration with stakeholders. Seminar Presented at PNGNRI, Port Moresby. Papua New Guinea.

Danbaro, Gariba (2021). Agriculture, Livestock & Fisheries Sector TWG 'Farm to Fork' Antimicrobial Resistance Workshop. Held at the Papua New University of Technology, 31 August 2021.

Maino, M., Akanda, S., and Danbaro, G. (2021). Attended the *Heads of Departments' Strategy Tier II & III Workshop* held at the Cross Road Hotel, Lae on 3 September 2021.

UNDERGRADUATE STUDENT PROJECTS

YEAR 3 STUDENT PROJECTS			
No.	**Names**	**Topics**	**Supervisor**
1	Erica AMBA	Assessing the marketing cost and margin for full time peanut sellers at the Lae City main market	Mr Kewa
2	Jonathan DREKORE	Assessing the marketing cost and margin for full timepotato sellers at the Lae City main market	Mr Kewa
3	Jerina TIKEPO	Assessing the marketing cost and margin for full time brocoli sellers at the Lae City main market	Mr Kewa
4	Jacklyn HIANU	Assessing the marketing cost and margin for full time sweet potato sellers at the Lae City main market	Mr Kewa
5	Ferry KOMAX	Assessment of pytotoxicity of Ni-Co mine waste	Dr Rao
6	Vanessa JACOB	Physicochemical characterisation of Co, Ni in mine waste	Dr Rao

7	Kate Ricky	Estimation of Zinc fertilizer requirement in some Markham soils	Dr Rao
8	Jerry MARIGITA	Morphological identification of parasitic fungi on native plant hopper	Dr Dotaona
9	Paul McDale	Effect of *Metarhizium* on *O.* weevil	
10	Nathan NATHANIEL	Biology of *oribus cracialus* on malva plants	Dr Dotaona
11	Geyamsau PEP	Response of taro planthopper *Tarophagus* spp to indeginous strains of entomopathogenic fungi	
12	Isabel DAVID	Morphological identification of native leaf hopper	Dr Dotaona
13	Germaine TIMAN	Endophytic behaviour of enthomopathogenic fungi on crop plants	Dr Dotaona
14	Elizah KUNA	Perceptions of PNGUoT 1st year students regarding their accommodation on campus	Dr Bue
15	Sipa NIPE	Perceptions of PNGUoT 4th year students towards Lecturers' delivery of lectures and its impact on their studies last year	Dr Bue/Ms Parau
16	Weblyn BAURE	Opinion of 4th year agriculture students regarding the number of subjects taken in the final year of their study	Dr Bue
17	Gilbert SEHO	Assessment of security issues at PNG UoT campus in 2020	Dr Bue/Ms Parau
18	Tracelie NIELSON	Performance of broiler chicken fed with Leuceana	Prof Danbaro
19	Philomina MOFENO	Modelling the lactation curve of Holstein Friesian cows in PNG	Dr JP
20	Mugua URAME	Factors affecting milk quality of local goats	Prof Danbaro
21	Sola PERI	Taking body measurement of indigenous sheep in Unitech farm and NARI to predict the body weight	Prof Danbaro
22	Jeffery KUMAN	Study the effects of *Trichoderma* on the germination of rice seed	Prof Akanda
23	Raylin PURING	Study the effect of Trichoderma on some soil borne pathogens through dual culture	Prof Akanda
24	Kingsford BINO	Effects of drying method on the quality of sweet potato	Ms Konts
25	Valentine SIMBIWA	Effects of salinity on germination and early seedling growth in different rice varieties	Dr Maino/Mr Poloma
26	Corrick KONIE	Assessment of nutrient status from a cocoa agro-ecosystem under humid lowland tropical climatic conditions	Dr Michael
27	Gim SHONG	Effects of manure application at different soil profiles on selected soil properties and aibika production under tropical conditions	Dr Michael

28	Serah TEMAI	Effects of wild rice plants on selected soil properties under humid climatic conditions	Dr Michael
29	Joel BOB	Soil nutrient dynamics of rubber agro systems under humid lowland tropical climatic conditions	Dr Michael
30	Gideon WIYAP	Sugarcane biochar application and nutrient (NPK) uptake by sugarcane plant under humid lowland tropical climatic condition	Dr Michael
31	Shirley WAHAMU	The effect of *Trichoderma* on the yield of sweet potato under greenhouse conditions	Dr Ban
32	Damaris AME	Postharvest decay control of banana using *Trichoderma*	Dr Ban
33	Joseph UPA	Developing cross-compatibility between 8 varieties in a poly-cross nursery of purple fleshed sweet potato	Prof Okpul
34	Jefulu REID	Evaluating combining ability of 2x and 4x watermelons	Prof Okpul
35	Pipi YAGAMINDI	Crossibility study between *Zea mays* (corn) and Job's tears	Prof Okpul
36	Jathniel TAMATOA	Crossibility study between Ipomea batatas (sweet potato) and Ipomea aquatica (Kangkong)	Prof Okpul
37	Moses MADASURU	Farmers' knowledge and perception of Fall army worm	Dr Manus
38	Jacobeth NAKAYUWI	Constraints faced by vendors of fruits and vegetables at Sogeri market, Unitech	Dr Manus
39	Gabriel BALIK	Optimum planning for selected livestock at Unitech Farm (Pigs, Layers, Broilers, Rooster Ducks)	Mrs Motoro

YEAR 4 STUDENT PROJECTS			
No.	**Names**	**Topics**	**Supervisor**
1	Abraham H Dingua	Nutritional quality of natural forages eaten by goats in Chimbu province	Prof Danbaro
2	Priscah Hapowo	Comparison of broiler chicken growth performances on diets containing fermented, roasted and germinated sorghum grain	Prof Danbaro
3	Walter Simi	Effect of heat stress on smallholder broiler farming in Markham valley	Mr. Nano
4	Felicity Wohuienen	Use of Agro-byproducts as feed for fish in Aqua fish farming at Unitech, Morobe Province	Mr. Nano

5	Paulyn Win	The attitude of the village people to gravity fed water system in Yalu, Morobe Province, PNG	Mr. Nano
6	Charles Walando	Effects of Brooder on Smallholder Broiler Chicken farming in Markam Valley	Mr. Nano
7	Junis Ivelo	Screening of rice varieties/lines against Sheath blight disease	Prof Akanda
8	Kiak Kowane	Effect of Trichoderma spp. on the growth of tomato seedling in the greenhouse	Prof Akanda
9	Tiniboy Otume	Metarhizium-sweetpotato pests associations	Dr Dotaona
10	Othniel Eraone	Using *Tephrosia vogeli* hook. F: to control weeds in sweet potato	Dr Dotaona
11	Franky Sirifave	Regeneration of plants from K9 sweet potato callus	Dr Maino/Mr Poloma
12	Napoleon Kandi	Investigation into the endemic nature of mycorrhiza fungi on Piper aduncum	Dr Maino/Mr Poloma
13	Lance Maina	Uptake of heavy metals using species of *Trichoderma* and mycorrhiza.	Dr Maino/Mr Poloma
14	Wilson Timbing	Effects of mycorrhiza inoculation on germination and seedling growth of Theobroma cacao L. under nursery conditions	Dr Maino/Mr Poloma
15	Cybill Poiya	Assessing the Genetic Relationships among sampled wild relatives of rice from PN	Prof Okpul
16	Foodie Pamaraka	Collection, conservation and herbarium presentation of wild rice, *Oryza schlechtori* Pilgor	Prof Okpul
17	Cindy Caleb	Sequencing the shattering gene of wild rice, *Leersia hexandra*	Prof Okpul
18	Aniyo Erain	Biochar prepared at different temperature and nutrient uptake by various crops	Dr Michael
19	Leonilda Kaluwin	Availability of zinc in South Markham	Dr Rao
20	Mark Frank	Availability of zinc in North Markham	Dr Rao
21	Christy Mek	Assessing time allocated to studies and other activities by agriculture students at PNGUOT	Dr Bue
22	Moses Wani	Opinion of agriculture students at Papua New Guinea University of Technology regarding the free mobile data supplied by Digicel towards their studies during the lockdown in 2021	Dr Bue
23	Peter Kerowane	Assessing profitability of potato retailers at Lae main market	Mr Kewa
24	Rendel Nantop	Assessing probability of sweet potato retailers at Lae main market	Mr Kewa
25	Towa Drima	Optimum plan for crops	Dr Manus

26	Annette Lebong	Perceptions of students online teaching and learning in Papua New Guinea University of Technology during the COVID-19 period	Mrs Motoro
27	Emmanuel Yamasombi	Identifying the household characteristics of financial vulnerable small-scale coffee farmers of Kuli Gap Community in Jiwaka Province	Mrs Motoro
28	Faye Waranaka	Testing of shelf life of *Trichoderma* on grown on coffee pulp	Dr Ban
29	Josemy Konoly	Testing the effect of *Trichoderma* against plant parasitic nematodes	Dr Ban

POSTGRADUATE STUDENT PROJECTS

No	Student	Research Title	Supervisor
		MSc 1	
1	Inia Bunsa	Investigating the endemic nature of mycorrhiza fungi on Piper aduncum	Dr M Maino
2	Powae Gossie	The effects of afforestation with Eucalyptus pellita plantations on the soil carbon, nitrogen and phosphorous stocks in Papua New Guinea	Dr Rao
3	Kayman KIWA	Resources efficiencies of smallholder coffee farmers within and outside of the Warena Coffee Project in the Lapure and Kapena Areas of PNG	Dr Manus
		MSc 2	
4	Gerry FAURE	Genetic barcoding of Cocoa (Theobroma cacao L) and related genotypes.	Professor Okpul
5	Dollah INAPO	Biodiversity and Phylogeny of *Trichoderma* Isolates in Papua New Guinea.	Dr Ban/Prof Akanda
6	Roberta SIO	*Metarhizium* as a potential biological control agent for Coconut Rhinoceros Beetle in PNG.	Dr Dotaona
7	John KOMEK	Assessing the effects of marketing decisions by the contact and non-contact smallholder coffee growers of Quepunung village in Morobe Province"	Mrs Motoro/Mr Kewa
8	Rebecca IMBOK	Constrains faced by smallholder coffee farmers in accessing coffee specialty markets: A case study of	Dr Bue

		Wawin/Erap smallholder coffee farmers in Nawaeb District, Morobe Province.	
9	Laura VOLA	Molecular Characterization of ASF Virus of Pigs in the Highlands Region of Papua New Guinea	Dr M Maino
		MPhil 2	
10	Vincent Koddy	Concentration of alkaloids, arecoline, arecaidine and guvacine in Areca nuts from Papua New Guinea	Dr Maino
		PhD 1	
11	Sinafa Robby	Characterization of *Leptopirosis* spp. (bacteria) in Cattle	Dr M Maino Co-supervisor
		PhD 2	
	Michael Gaoma	Cultural intelligence and transitional physics education in Papua New Guinea	Dr M Maino Co-supervisor
		PhD 1	
12	Francis N'Drewel	Examining the perception of extension officers and cocoa farmers on the effectiveness of the cocoa extension approaches implemented by Manus Provincial Division of Agriculture and Livestock: A case study of cocoa farmers of Lele Bupi Chupeu Rural Local Level Government and Balopa Rural Local Level Government areas.	Dr V Bue & Dr P Manus
		PhD 4	
13	Benson Mirou	Development of e-crop disease app for farmers in Papua New Guinea	Dr M Maino Co-supervisor
14	Spencer Poloma	Effects of mychorrhizal symbiosis on macronutrient absorption, physiological parameters and yield of rice (Oryza sativa)	Dr M Maino

DEPARTMENT OF APPLIED PHYSICS

Head of Department: Dr. Gabriel Anduwan

The Department of Applied Physics is relatively small compared to other academic departments, but it serves many students just like other service departments. The Department used to have two courses: the Bachelor of Science in Applied Physics with Electronics and Instrumentation (BSAP) and the Bachelor of Science in Radiation Therapy (BSRT). However, the BSRT program is temporarily shelved until the Health department submits further needs of graduates for the country in the coming years. While running the BSAP program, the Applied Physics provides service courses to 10 other academic departments of the 13 departments in this University. Two years ago, a Bachelor of Engineering in Biomedical Engineering (BEBE) was introduced as a new program. The program initially started with only fifteen (15) students. This year the second and third batches of students are doing the Biomedical Engineering program.

The Applied Physics course with Electronics and Instrumentation emphasizes the principles of application to Physics. The students are well equipped with analytical skills and all the applications to Physics principles. The Applied Physics graduates are working all over the country and also overseas. They are employed in any work related to Physics. Some are working in the Airline industry, education, mining industry, PNG Power, and some are doing private consultancy work.

The new Biomedical Engineering graduates will find employment in the Health Department. As soon as they graduate, the Health Department will employ them in all the general hospitals across the country. Their job is basically to ensure all types of equipment in the hospital is up and running for the services needed almost every day by health workers and sick patients.

The Department of Applied Physics has four Postgraduate programs; research-based Doctor of Philosophy (PhD), Master of Philosophy (MPhil), and course-based Master of Science (MSc) in Electronics and Instrumentations, and Master of Technology (MTech) in Exploration Geophysics

There is enormous interest among the students in the course-based Master's program. In 2021, eight (8) students graduated with a Master’s degree, including five (5) under Exploration Geophysics, the pioneer group. The Department is proud of all the graduands. This year, the Department had 3 PhD students, including two staff members and eight (8) Master’s students. The Department is committed to strengthening the PG programs and research further.

Research Areas of the Academic Staff

No.	Name of the Academic Staff	Area of Research
1	Prof Manoj Mukhopadhyay	Applied Geophysics: Geophysical Modeling, Earthquake Seismology, Crustal Geophysics
2.	A/Prof Felix Pereira	Astrophysics, Atmospheric physics, Radiation physics and Electronics.
3.	A/Prof Dapsy Olatona	Energy and spectroscopy
4.	Dr. Velusamy Senthikumar	Energy nanomaterials, 2-D materials, Solar cells and Oxide resistive memories
5.	Dr. Gabriel Anduwan	Energy applications, Geophysics, Nanotechnology, Environmental Physics, Physics Education, Condense Matter and other applications of Physics using Microcontrollers and Electronics.
7.	Dr. Ali Mohamad	Applied Geophysics in Oil, Gas, and minerals
9.	Mr. Suame Ampana	Applied Geophysics and Non-Destructive Test (NDT)
10.	Mr. David Kolkoma	Medical Physics, Radiation Physics
11.	Mr. Michael Gaoma	Education
12.	Mr. Sylvester Tyrones	Microcontrollers and Microprocessor applications
13.	Mr. Kenson Tonny	Microcontroller based projects, Smart Hybrid Renewable Energy Systems, Data Acquisitions and smart monitoring mechanisms for Renewable Energy Systems and Aircraft Tracking Systems in PNG.

A. Research Publications (Journal)

1. Dasgupta, Sujit, Mukhopadhyay, Basab, Mukhopadhyay, Manoj and Pande, Prabhas. (2021). Geo- and seismo-tectonics of Eastern Himalaya: Exploring earthquake source zones from foredeep to Tibetan hinterland. *Physics & Chemistry Earth*, (Elsevier). https://doi.org/10.1016/j.pce.2021.103013

2. Mogren, Saad, Mukhopadhyay, Basab, Mukhopadhyay, Manoj, Nandi, Bijay Krishna and Ibrahim, Elkhedr (2021). Spatial distribution of the rheological heterogeneities at crustal depths underneath the Harrat Rahat, western Saudi Arabia and their correspondence to Bouguer anomalies. *J. Volocanology Geothermal Res.* (Elsevier), 419. https://doi.org/10.1016/j.jvolgeores.2021.107387

3. Mukhopadhyay, Manoj, Mukhopadhyay, Basab; Elawadi, Eslam; Venkatesh, Durga and Al-Arifi, Nasir, (2020). Crustal structure beneath the volcanic field in the Tihamat Plains, Saudi Arabia: An integrated model constrained by gravity modelling and receiver function results. *J. Asian Earth Sciences* (Elsevier), Special Volume on the Arabian Shield, pp. 16, Oct. 2020. https://doi.org/10.1016/j.jseaes.2020.104614. (*Not included in 2020 Research Report)*

4. Mukhopadhyay, Manoj, Elawadi, Eslam; Mukhopadhyay, Basab; Venkatesh, Durga and Al-Arifi, Nasir, (2020). Geophysical constraints on a modified crust below the Rayn Anticlines, Eastern Saudi Arabia. *J. Asian Earth Sciences* (Elsevier), vol. 188, 104105, pp. 12. https://doi.org/10.1016/j.jseaes.2019.104105 (*Not included in the 2020 Research Report)*

5. Mukhopadhyay, Manoj, Mogren, Saad; Mukhopadhyay, Basab; Venkatesh, Durga and Eslam Elawadi, Eslam. (2020). Crustal control on basement uplift beneath the Ghawar Anticline, Saudi Arabia—gravity modeling with receiver function constraints. *Arabian J. Geosciences* (Springer), 13: 463, pp.17. https://doi.org/10.1007/s12517-020-05433

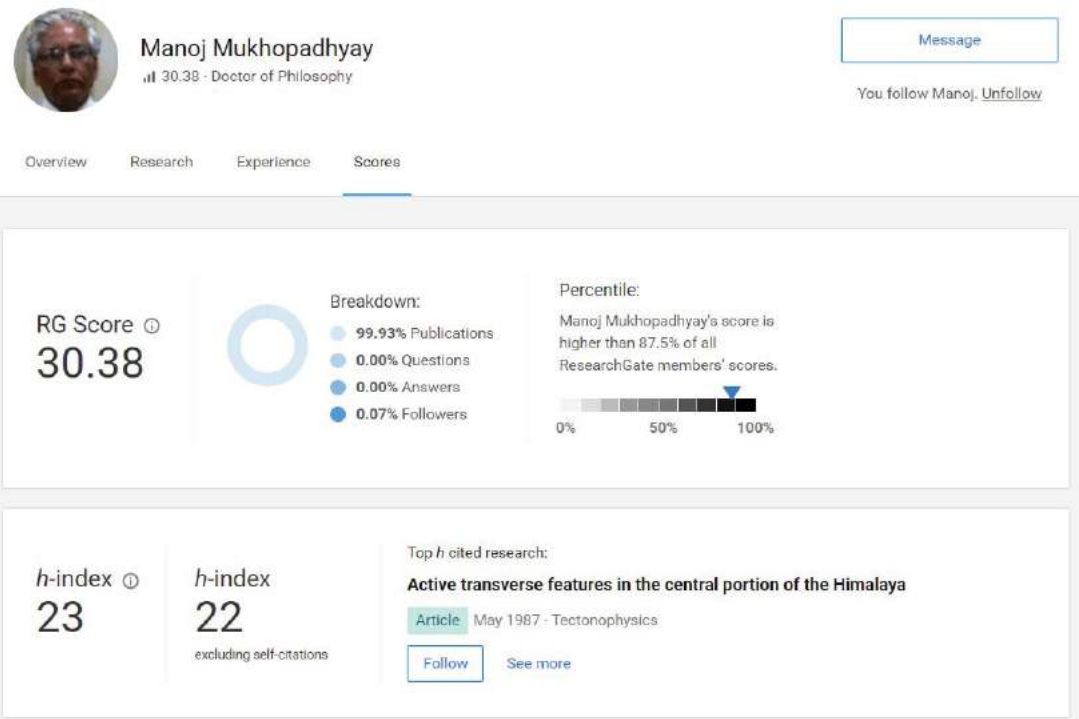
6. Noho, George, Mukhopadhyay, Manoj, Mukhopadhyay, Basab, and Sengupta, Diptansu. (2021). Characteristics of the Seismic Clusters Bounding the Ramu-Markham Fault Zone, Eastern Papua New Guinea. *J. Geological Society of India* (Springer), Vol. 97, pp. 9-20.

7. Mukhopadhyay, Manoj, Saibi, Hakim, Elawadi, Eslam, and Al-Arifi, Nassir. (2021). Pulsed emplacement under the Uyaijah granite ring structure, Eastern Saudi Arabia – Results from 3D gravity-magnetic joint inversion. *Arabian J. Geosci.* (Springer), 14: 2199 https://doi.org/10.1007/s12517-021-08647-2

8. Pereira, Felix Beslin, Gabriel Anduwan and T. E. Girish, (2021). On the association of predominant polarity of north-south component of IMF in the GSE system near 1 AU with solar polar magnetic fields during 1967-2020. *New Astronomy*, doi: 10.1016/j.newast.2021.101723. **Publishers: Elsevier**

Pre-prints:

1. Felix Pereira and Jessy Sekere (2021). Analysis of Ionospheric disturbances associated with earthquakes in Papua New Guinea. *Research Square*, doi: 10.21203/rs.3.rs-641915/v1



B. Conference

1. Mukhopadhyay, Manoj and Ampana, Suame, 2020. The Insar Data Detect Shallow Dyke Intrusion at the Rabaul Volcano, Papua New Guinea - Potential Site for Caldera Geothermal Field. Proceedings VI - World Geothermal Congress 2020, Reykjavik, Iceland, pp. 11. *[World Geothermal Congress is held every three years]*

2. Haripriya, Kadam; Radhakrishna, Munukutla and Mukhopadhyay, Manoj, 2020. Crustal Model for the Andaman Outer Arc: Constraints from Earthquake, Gravity and Receiver Function Data. In: XXXVI - International Geological Congress, New Delhi, India. The Andaman Islands and Adjoining Offshore: Geology, Tectonics and Palaeoclimate, Society of Earth Scientists Series, Springer Nature Switzerland AG 2020. https://doi.org/10.1007/978-3-030-39843-9_8 *[International Geological Congress is held every four years]*

C. Post Graduate Projects

1. David Kolkoma - Radiometric Dose Profiling of Mineral Rich Regions of Papua New Guinea. (For PhD)
2. Michael Gaoma (PhD) - Cultural Intelligence and Transitional Physics Education in Papua New Guinea

3. Helen Osora Herivi (PhD) - Synthesis and Characterization of Metal Oxide with Graphene Nanostructures for Pseudocapacitor Electrode Applications
4. Nathan Randa – Microcontroller-based Automatic control of firefighting system Lae, Papua New Guinea.
5. Tonny Kenson – Ground-based Microcontrol-based Data Acquisition (DAQ) and transfer for Renewable energy systems in PNG.
6. Malcolm Dopaim – On the study of Atmospheric properties of Papua New Guinea based on Statistical and Wavelet analysis technique.
7. Blasius Sine John, 2021. Lithostratigraphic well correlation and well log analysis for Raptor-1 Well, Gulf Province, Papua New Guinea. M. Tech. (Exploration Geophysics).
8. Tochukwu, Ngene Cyril, 2021. An appraisal of geothermal resources in the Middle Benue Trough Nigeria using remote sensing and geophysical methods. M. Tech. (Exploration Geophysics).
9. Mathew Waimbo - Synthesis and photocatalytic studies of metal tungstate nanoparticles for dye degradation applications
10. Issac Maip Pendikali – Stress Analysis from Petrophysical Data for drilling Horizontal Well and Optimum production of Coal Bed Methane (CBM).
11. Michael Teamau – Essentials of Natural Gamma Ray Spectrometry (NGS) Interpretation in Petrophysical Analysis

D. Undergraduate Projects

1. Physics Teachers Professional Development Needs Analysis: Case Study – Morobe Province
2. Physics Teachers Isolation and Cross Teaching in Physics Teaching and Learning: Case Study – Morobe Province
3. Saonu Munsun and Naba Jimmy – Design and implementation of Automatic Solar power irrigation system at NARI.
4. Bono Lionel and Vanua Joshua – Design and implementation of Traffic light system at Eriku round about.
5. Lais Tevita, LAMI Joel, KIVANG Jason - Fabrication & Electrical characterization of heterostructure thin film solar cells

DEPARTMENT OF APPLIED SCIENCES

Head of Department: Dr. Lydia Rubiang-Yalambing

Introduction

The Department offers two (2) degree programs; a Bachelor of Science degree in Food Technology and a Bachelor of Science degree in Applied Chemistry.

Our Vision: "To become a quality department that produces intellectual manpower for Papua New Guinea's development and sustenance".

Our Mission: "To focus on high-class teaching and quality research, continuously striving to produce future leaders rich in intelligence and innovations in the field of Applied Chemistry and Food Technology and simultaneously concentrate in strengthening and enlightening the community".

The Department has a strong emphasis on research. Our target is to publish one paper in an international journal annually. To encourage research activities and eventual publication, the Department has taken on a new initiative to reward those who publish internationally with a cash prize of K200 per publication and K100 for national journal publication.

The Department has actively engaged industries through Industrial Advisory Committee (IAC) for their input on curriculum review and a few industry-based research projects undertaken through the final year research projects and MPhil projects.

Broad Research Interest Areas of the Department:

(a) **Chemistry:** Environment, material science, water, and organic chemistry-related research.
(b) **Food Technology:** Food processing, clean energy, quality control, and nutrition-related research.

Research Interest Areas of academic staff members of the Department

Applied Chemistry Section

No.	Name	Research interests
1	Prof. Subramaniyam Gopalakrishnan	Organic chemistry, medicinal chemistry, petroleum chemistry, nanotechnology, and Spectroscopy
2.	Associate Professor William Modey	High Resolution chromatographic separations; Air pollution research; Ambient particulate sampler design and evaluation; Determination of trace contaminants in aquatic media (particularly heavy metals, and the global emerging issues on pharmaceutical contaminants); Determination of toxic organic pollutants in the air and aquatic media; Supercritical fluid technology for extractions and chromatographic separations; Environmental and social impact assessment (ESIA) for regulatory assessment.
3	Dr. Srikanth Bathula	Chemical Speciation and Bioavailability, Environmental studies, Geomorphological impact assessment on groundwater quality, Coastal Ground-waters–A Geo-hydro Chemical Exploration, photocatalytic activity and degradation, synthesis and characterization of nanomaterials. Investigation of Oil samples at seawater sources.
4	Dr. Sivakumar Balakrishnan	My research interest falls on five main themes – Metal-Organic Frameworks (MOFs), Porous silicon, Carbon materials, Ceramics, and Phosphors. All of these materials find applications in a variety of fields. I am mainly interested in exploring the composite materials made out of these materials. For example, one of the projects that I am investigating is the anchoring of MOFs onto porous and crystalline silicon. It is envisaged that this will create new materials with added properties from their individual starting materials.
5	Dr David Timi	Organic chemistry, phytochemistry
6	Mr. Justin Narimbi	Analytical chemistry, environmental chemistry, instrumental methods for analysis, Water quality assessment and monitoring, Laboratory quality management.

Food Technology Section

No.	Name	Research interests
1	Mr. Reilly Nigo	Renewable and Clean Energy, Animal Feed Development, Thermal Processing, Food Drying Studies Using Solar and Clean Energy Systems, Food Product Development Processes.
2	Dr. Lydia Yalambing	Nutrition intervention studies, compliance studies in food fortification and food nutrition labels; Complementary/supplementary food development and Food Composition studies.
3	Mrs. Sogoing Denano	Food safety and food security; compliance studies.
4	Mr. Nigel Kiaka	Industrial solid and liquid waste management
5	Mrs. Rag Gubag-Sipou	Food microbiology, microbial quality of food and water, medicinal studies of indigenous plants.

Research Output: Peer Reviewed Journals

David Timi, Subramaniyam Gopalakrishnan, Francis Hombhanje and Macquin Maino. (2021). Antimicrobial effect of green synthesized silver nanoparticles using aqueous extract of Peperomia pellucida, Australian Journal of Science and Technology, vol. 5(1): 470 - 474.

Post Graduate projects (2021)

No.	Student	Degree	Topic	Principle Supervisor
1	Justin Narimbi	PhD	Synthesis and applications of novel zeolite imidazolate framework (ZIF) hybrid materials.	Dr. S. Balakrishnan
2	Sogoing Denano	PhD	Ecological risk assessment of selected rivers in Papua New Guinea: A case study in relation to heavy metals contamination, severity of sediment perturbation, and food safety.	Dr. W. Modey
3	Nigel.K.Kiaka	MPhil	Designing a Suitable Drying System for Higher Altitude Conditions: Using Gembolg District, Chimbu Province as a Model	Mr Reilly Nigo
4	Ben Paul	MPhil	Verification study into how histamine (scrombrotoxin)	Mr. Reilly Nigo

			formation is prevented in Tuna onboard Purse Seiners in PNG	
5	Salvina Ku	MPhil	Analytical Capillary Electrophoresis for Environmental applications in Papua New Guinea	Dr W. Modey
6	Ruthia Kisi	MPhil	Quality Evaluation of commodity products from PNG using HPLC and ICP-MS	Dr W. Modey
7	Nadia Tiaga	MPhil	Fermentation and Quality Studies of Cocoa	Mrs Rag G. Sipou
8	Dilkay Bau	MPhil	Macro Nutrient Profiling and Product Development Studies of Sweet Potato In PNG	Dr L. Yalambing
9	Esther D. Tuweyo	MPhil	The determination of optimum methane generation from the co-digestion coffee pulp and treated chicken manure – a BMP analysis.	Dr S. Bathula

Completed Undergraduate (Final Year Students) Research Projects (2021)

Chemistry Section

Student Name	Project Title	Supervisor
Ben Bare	Determination of organic contaminants, chloride, and sulphate from fine construction aggregates and mixing water for concrete.	Dr. William K Modey
Chelsea Mangaea	Phytochemical screening, green synthesis, and antimicrobial activities of silver nanoparticles from the alcohol extract of red algae, *Chondrus Crispus.*	Professor Subramaniyam Gopalakrishnan
Clement Roger	Determination of Vanillin in cured Vanilla pods	Dr. David Timi
Clive Wakuri	Investigation on the capacity of *Bettle nut* shells as Bio-adsorbent for heavy metals in water through pseudo-first order and pseudo-second order kinetic studies.	Mr. Kaupa Philip

Cynthia Alloy	Determination of the pH of Soft Drinks and Fruit Juices available in Papua New Guinea and the health effects associated with excessive consumption.	Dr. Srikanth Bathula
David Bong	Magnetic luminescence characteristics of Europium-based composite materials.	Dr. Sivakumar Balakrishnan
Floyd Bala	Quantitative verification of heavy metals in a freshwater sediment Certified Reference Material by inductively coupled plasma-mass spectrometry.	Dr. William K Modey
Isabellah Apuai	Evaluation of the synergistic effects between photosynthesized silver nanoparticles and selected antibiotics.	Dr. David Timi
James Yambuahen	Evaluating the synergistic effects between Phyto-synthesized silver nanoparticles, Gentamicin, and Chloramphenicol.	Dr. David Timi
Jeffrey Elai	Wood and carbon-based material for water purification application	Dr. Sivakumar Balakrishnan
Linda Yatu	Phytochemical screening, green synthesis of silver nanoparticles and comparison of antimicrobial activities using marine plants, *Codium* and *Enhalus*.	Professor Subramaniyam Gopalakrishnan
Michael Nihara	Gravimetric and Volumetric analysis of Portland cement.	Dr. Srikanth Bathula
Nelson Tong	Evaluation of antimicrobial activity of green synthesized silver nanoparticles from brown marine algae, *Dictyota crenulate and Cladostephus songiosus*, by diffusion disc method.	Professor Subramaniyam Gopalakrishnan
Nolai Kawale	Equilibrium adsorption studies: Investigation on the heavy metal	Mr. Kaupa Philip

	removal by bio-adsorption using *Betel nut* husk.	
Raymond Philip	Investigation of factors affecting pressure drop through an activated carbon packed bed in a small water treatment system.	Mr. Kaupa Philip
Robbie Tonny	An investigation into the role of carbon material in Lanthanum phosphate ceramic material.	Dr. Sivakumar Balakrishnan
Shekina Wani	Assessment of elemental contamination in commercial toys using wet acid digestion and inductively coupled plasma-mass spectrometry (ICP-MS) instrumentation.	Dr. William K Modey
Sumbaro Sarigari	Functionalisation of Silicon materials using organic polymers	Dr. Sivakumar Balakrishnan

Food Technology Section

Completed Undergraduate (Final Year) Research Projects, 2021

No.	Student	Project Tile	Supervisor
1	Philomena Ndrasal	Further studies on antibiotic resistance of *Escherichia coli* isolated from fresh poultry and meat.	Mrs Rag Gubag Sipou
2	Garry Steven	Fruit Drink Product Development Studies Using the Three Popular Cocoa Hybrids of PNG.	Mr Reilly Nigo
3	Marisha Kawas	Gas Production Profiling of Cow, Chicken, Fish Pig and Fish Waste Using a Continuous Biogas System.	Mr Reilly Nigo
4	Connie Tuvui	Drying and Sorption Studies of Morobe Cocoa and Coffee using Locally Developed Solar Drying System.	Mr Reilly Nigo
5	Young Kalip	Design and Fabrication of a Spray Dryer for use in Product Development Studies of Morobe Coffee.	Mr Reilly Nigo
6	Waine Sam	Cost Benefit Studies on Animal Feed System Using Different Plant Trees as Protein Sources.	Mr Reilly Nigo

7	Noel Ena	Further Studies on heavy metal and mineral profile of commercial rice sold in the shops in and around the city of Lae.	Dr Lydia Yalambing
8	Othniel Beuve	Further Studies on product formulation and development.	Dr Lydia Yalambing
9	Tahe Theo	Dietary assessment of meals served by the Unitech mess.	Dr Lydia Yalambing
10	Aileen Patari	Assessing and developing relevant community nutrition awareness materials	Dr Lydia Yalambing
11	Baru Riu	Further Studies on analysis of heavy metals in the plants and food crops along Markham River.	Mrs Sogoing Denano
12	Gillian Jombert	The effect of packaging materials on the environment.	Mr Nigel Kaimur Kiaka
13	Benjamin Tikepo	The effect of different drying techniques on the functional properties of flour made from a chosen Starchy staple in PNG.	Mr Nigel Kaimur Kiaka
14	Bridgit Griffin	Studies into Drying of Onion Flakes	Mr Nigel Kaimur Kiaka

Research projects with External Stakeholders:

Dr. David Timi is a collaborating partner in a PIURN (Pacific Islands University Research Network) project. Co-ordinated by the University of New Caledonia in collaboration with James Cook University, Australia and PNG University of Technology, Lae. The project involves chemical and biological examination of the volatile oil composition (beta-triketone) of leaves of the species of Xenthostemon in the Pacific region. Leaves of species of the Genus, Xenthostemon is a good source of biologically active volatile oil. Main objective is to find out if there are any novel oil that could have some promising antibiotic and insecticidal activity.

1. **NFA–Unitech – Laboratory Accreditation** – Proficiency testing has been done for certain analysis methods in both the microbiology and chemistry laboratories and is ongoing. Certain progress has been done in relation to getting documents ready for PNGLAS

visitation scheduled for 2022. NFA continues to provide yearly budget available for continuity of the work.

2. **Food Safety Courses / Training for Industries** – Coordinator: Mr. R. Nigo. This is a program running in three stages annually. Conducted by the senior Food Technology staff of the Department. The team has written modules and delivered training to various food Industries. The training is becoming popular in food and allied industries and government / semi-government organizations like NAQIA and Department of Health.

3. 2017-2021 Dr. Bathula is a research team member, collaboration project, Pacific Island universities network (PIURN): Towards National drinking water standards in Vanuatu: applied research and capacity building.

4. 2018-2021 Dr. Bathula is a co-investigator, collaboration project, University South Pacific Theme (SRT): Enhancing USP's Emalus Campus building in Learning and Teaching Research and consultancy.

5. 2018-2021 Dr. Bathula is a Co-Investigator, in the collaboration project; Impact Assessment of Monaro Volcano Eruptions on Water Quality in Ambae Island alongside with Building the Capacity of National Water Quality Monitoring in Vanuatu (upcoming project). External collaborative consultancy activity refers to ongoing and upcoming projects listed above (collaborators from USP Vanuatu, Dept. of Water Resources, Govt. Vanuatu, Oceania Water Research Consortium, The University of Auckland, and University of New South Wales).

6. 2021 -2022 Dr. Bathula is involved in a collaborative project with the National Maritime Safety Authority, Papua New Guinea, on the investigation of oil samples collected from spills at sea to link with possible sources and oil content in water and sandy substrates.

DEPARTMENT OF ARCHITECTURE AND CONSTRUCTION MANAGEMENT

Head of Department: Professor Cletus K. Gonduan, PhD

Introduction

Several research projects were undertaken in the subjects: AR491, AR492, and AR591 under the *Design Research Agenda*. In addition, a number of architecture and urban design development scenarios in the 4th and 5th year of the Architecture undergraduate program under supervision and co-supervision by staff who had both research and professional expertise in many development scenarios in the fields of architecture, building, and Urban Planning/ Development and Urban Design.

Similarly, the 5th year Bachelor in Building students also conducted their research on AR 591 Research Projects (Special Study).

Research undertaking is for the current 5-year Bachelor Program in Architecture is introduced in the first Semester of the 4th year and is conducted over three semesters into the first semester of the 5th year program. The Bachelor in Building Program has only one semester in the 5th year, because the 4th year students are taking a year out in the Industry. Because of these arrangements, research interests and topics are chosen every semester and/or, - topics are selected in the 1st Semester of the 4th year and are conducted in the three-semester segments into the 1st Semester of the 5th year. A Design Thesis outcome follows this in the 2nd semester of the 5th and final year for Architecture Students. This is an undergraduate degree prerequisite set by the Commonwealth Association of Architects (CAA) Accreditation Requirement in which the current 5-year undergraduate architecture program was designed and accredited from 1997 – 2010.

Design Research

Design Research is a 'way of enquiring on producing knowledge; this means it is a way of researching.' It is emphasized that Architectural Design is to Architecture what Research is to Science, and the 'process of architectural design is close to the process of knowledge creation in the sciences.

On this note, design research is often a prerequisite to any design outcome. It enables architects in practice to conduct every design project in making an 'informative' investigation into new and/or a retrofitting design project. This research looks into many design issues, variables, constraints, physical, social, cultural, behavioral, geotechnical, lateral and horizontal forces and superstructure consideration, material science, economic, ecological consideration, climate change impact and building design expectations, energy rating, green energy rating and other 'built environment 'issues' in which the building will be subjected to in the building use lifespan.

Well research and published documents are then captured in a Research Report (DESIGN BRIEF) which gives credibility and added value to the end product (the Building Types and Scales). Over two semesters, all the above is addressed and captured in the DESIGN RESEARCH PROCESS. A detailed Design Brief is developed and documented in AR591 in the third semester. This is then utilized in the final ***Design Thesis Production*** by each student under close supervision and advised by Thesis Supervisors meeting all expectations captured in the - Final Assessment Rubrics that captures the knowledgebase *required and addressed in the Design Thesis.*

Undergraduate Research Undertake in 2021

Staff and Student	**Research undertaken & Subject Code**	**Design Thesis 2021**
	Research was conducted over three Semesters in AR 491, AR492 and AR 591 to Documentation of Thesis in ***AR502 Design Thesis****.*	*All completed Design Thesis are held as record and are published the dated Departmental undergraduate Design Thesis Publication Series****. The Architectural Concept – Digital Thesis Publications 2021***
Supervising Staff	**ARCHITECTURE PROGRAM**	
Professor C. Gonduan	The premise of this research and investigation is to explore and capture the idea of the New Nadzap City Development. **This was undertaken under the New Urban Design Theme: The *Superblock Commercial Development Zone,*** and the ***New Nadzab Airport***	

	Terminal; and The Smart City Development Approach; the cities of the 21st Century.	
Students		
David Apisai	*The Mix-Use Airport Transit Residential Apartment Design: The sustainable design and development of affordable residential apartments for transiting passengers out and in from the Nadzap Airport.* ***The Architectural Concept – Digital Thesis Publications 2021***	Design Thesis - Completed
Anne M. Bakoles	*The PNG Cultural Centre Design: A cultural center that has a multiple-use outcome for cultural exhibitions – display and live performance.* ***The Architectural Concept – Digital Thesis Publications 2021***	Design Thesis - Completed
Ron Gua	*A 3.5 Star 15 Storey Nadzab Hotel-Motel Development: An alternative hotel accommodation for transiting travelers to and from Nadzap.* ***The Architectural Concept – Digital Thesis Publications 2021***	Design Thesis - Completed
Philan Gwand	*The New Nadzab International and Domestic Terminal Design: An alternative design of the new Nadzap airport terminal with a Cultural Interphase.* ***The Architectural Concept – Digital Thesis Publications 2021***	Design Thesis - Completed
Frank Kandai	*The Nadzab Hospital Design: The Gapsongkec District Hospital.* ***The Architectural Concept – Digital Thesis Publications 2021***	Design Thesis - Completed
Romanus Maleo	*The Nadzab Shopping Mall Design: The Nadzap City Shopping Center.* ***The Architectural Concept – Digital Thesis Publications 2021***	Design Thesis - Completed
Karl Zume	*Mix-use 12 Storey Residential Apartment Design: A High-Density Residential Design with a variety of residential make-up – 2-bedroom – 3-bedroom rental apartments.* ***The Architectural Concept – Digital Thesis Publications 2021***	Design Thesis - Completed
Supervising Staff	**ARCHITECTURE PROGRAM**	
Dr. W. Petilani		
Students		
Mack Oti	The Central Government Administration Building. ***The Architectural Concept – Digital Thesis Publications 2021***	Design Thesis - Completed

Honnel Hosea	Proposed Redevelopment of Kavieng General Hospital. ***The Architectural Concept – Digital Thesis Publications 2021***	Design Thesis - Completed
Koyange Yuke	National Office Complex Evangelical Lutheran Church of PNG. ***The Architectural Concept – Digital Thesis Publications 2021***	Design Thesis - Completed
Helen Tata	Kalabond Stadium Development Kokopo, ENB. ***The Architectural Concept – Digital Thesis Publications 2021***	Design Thesis - Completed
Gaona Gwaibo	New Port Moresby Airport on Reclaimed Land, NCD. ***The Architectural Concept – Digital Thesis Publications 2021***	Design Thesis - Completed
Supervising Staff	**ARCHITECTURE PROGRAM**	
Dr. A. Sariman		
Students		
James Alois	Mt Hagen Shopping Mall. ***The Architectural Concept – Digital Thesis Publications 2021***	Design Thesis - Completed
Emmanuel Bonny	Lae Lagoon Entertainment Centre. ***The Architectural Concept – Digital Thesis Publications 2021***	Design Thesis - Completed
McKaylah Kalogo	Waga Waga Hotel Resort. Alotau ***The Architectural Concept – Digital Thesis Publications 2021***	Design Thesis - Completed
Johanes Kisokau	Oncology Hospital. Lae ***The Architectural Concept – Digital Thesis Publications 2021***	Design Thesis - Completed
Obed Mandani	University of Natural Resources and Environment (UNRE) Academic Library. ***The Architectural Concept – Digital Thesis Publications 2021***	Design Thesis - Completed
Patterguy Menda	Morobe Provincial Government Office Building. ***The Architectural Concept – Digital Thesis Publications 2021***	Design Thesis - Completed
Thomas Nombo	Regional Contemporary Art & Cultural Centre. Lae ***The Architectural Concept – Digital Thesis Publications 2021***	Design Thesis - Completed
Supervising Staff	**BUILDING PROGRAM**	
Dr. J. Walliah	*The research was conducted during the 4th Year Industrial Training Period Semesters 1 & 2 and documented in AR 591 as Research Report under Supervision in the 5th and final year of studies.*	Completed Research Reports are cataloged and kept in the Departmental Research Report Collection**:**

		The Building Concept – Building Research Report Publications 2021
Students		
Carlos SHANKEI	Addressing Construction Site Safety in PNG rural projects (Case Study: Manus Provincial Government funded projects) ***The Building Concept – Digital Thesis Publications 2021***	Research Project - Completed
Daniel Waiange	Factors Causing Employee Absenteeism in Construction Industry (Study Area - Lae). ***The Building Concept – Digital Thesis Publications 2021***	Research Project - Completed
Emmanuel Bob	The effect of Construction delays on the construction cost of minor building works. (Case study - PNGUoT Project Office). ***The Building Concept – Digital Thesis Publications 2021***	Research Project - Completed
Moses Wai	The Influence of applying Teamwork concept towards construction projects participants in addressing delay delivery of projects within Papua New Guinea - (Case Study: PNG Construction Limited - Lae Base) ***The Building Concept – Digital Thesis Publications 2021***	Research Project - Completed
Nigel Wabat	Impacts of Cultural Barrier in Construction Industry in Papua New Guinea. ***The Building Concept – Digital Thesis Publications 2021***	Research Project - Completed
Saro Isaro	Factors Affecting Construction Project Delays in Lae, Papua New Guinea. ***The Building Concept – Digital Thesis Publications 2021***	Research Project - Completed

DEPARTMENT OF BUSINESS STUDIES

Dead of Department: Anthony Anugu

1 Introduction

The Department of Business Studies (DBS) is the largest department among the thirteen academic departments of the Papua New Guinea University of Technology (PNGUoT), with approximately 700 undergraduate and postgraduate students, including Ph.D. students each year. The DBS is a multidisciplinary department with a proven track record of producing national and Pacific regional leaders who have been instrumental in leading the private and public sectors for many years.

The DBS undergraduate programs consisting of Bachelor of Business in Accounting (BBAC), Applied Economics (BBAE), Information Technology (BBIT), and Management (BBMA) are designed to equip students to integrate the knowledge, skills, and values in their four years of study with the actual business practices. The DBS also offers postgraduate programs, including Ph.D. programs in Information Technology, Economics, Finance, and Banking; Master of Philosophy in Information Technology, Economics, Finance, and Banking; Master's in Business Administration (MBA), and an Executive Masters in Business Administration (EMBA) program. In addition, the DBS is developing comprehensive postgraduate programs, including Masters in IT, Accounting and Economics, and Ph.D. programs in Accounting and Management, which will be rolled out soon. All the programs of DBS are designed to drive PNGUoT's strategic visions and the government's development efforts and push for regional and global competitiveness, innovation, and entrepreneurship in an increasingly complex business environment.

The DBS comprises both national and international academics dedicated, motivated, and committed to ensuring that quality standards are maintained with a focus on continuous innovation, entrepreneurship, and digital technology-centered teaching and learning through active participation in relevant industries and supporting memberships with professional associations. Research has been the cornerstone of the department's commitment and continues to be the driving force in producing quality graduates. This has cultivated a competitive research environment that complies with national and international research standards.

The DBS currently has the Research Centre of Big Data Analytics and Intelligence Systems (BAIS) (founded in 2015) and the Centre of Innovation and Entrepreneurship (CIE) (founded in 2019). Both centres provide the platform for research collaboration among national and international colleagues in big data, big data analytics, AI, business intelligence, intelligent systems, innovation, and entrepreneurship. BAIS circulated the ITCS-BAIS Vol 6, Issues 1-11 to its members and beyond to share the state-of-the-art big data analytics, data science, AI, and intelligent systems in 2021. BAIS has its presence at https://www.researchgate.net/lab/Zhaohao-Sun-Lab. In 2021, BAIS published 11 Preprints (Working papers) on big data, AI, big data analytics, business intelligence, and intelligent systems at https://www.researchgate.net/profile/Zhaohao-Sun/publications, 10 of which have

been indexed by Google Scholar. BAIS has drawn increasing attention in international academia.

The DBS is working on building a PNG–China Centre of Business Studies, a PNG-Australia Centre of Governance and Policy Development, and a Student Centre of Digital Innovation.

The DBS's commitment to our students is evident in providing excellent learning opportunities aided by state-of-the-art ICT technology and support infrastructure. The department strives for excellence in teaching/learning, research, consultancy, and services to the community combined with innovation and interaction technological expertise necessary for progress. Our faculty is fully committed and engages in research and development, focusing on understanding the dynamics and innovations that shape the volatile business environment.

The DBS has close cooperation with many overseas universities, including Federation University, Charles Sturt University, James Cook University of Australia; Handong University of Korea; Hebei University of Science and Technology, and the Chongqing Normal University of China.

Research across the four main disciplines of the DBS, viz. Economics, Management, Information Technology, and Accounting is highly encouraged. The following research activities were undertaken by academic staff members in the Department of Business Studies during the 2021 Academic year: The report demonstrates that the number of peer-reviewed publications has increased generally. The report includes the publications of journal articles, books, book chapters, conference papers, and working papers (preprints). Almost all of them have been indexed by SCOPUS, ERA, ISI (SCI), or Google Scholar. The main contributors to the DBS research outcome are six academic staff members, more than those in 2020. However, many academic staff at the DBS have no record of publications, attending national and international academic conferences, or delivering any research seminar presentations in the past four years (2018-2021). Therefore, activating, reactivating, and encouraging the academic staff's research passion and increasing the outcome of quality research taking into account SCOPUS, ERA, and SCI (WoS) is still a significant and lasting challenge for the DBS. Academic staff's research performance is an essential index for international or national accreditation of undergraduate and postgraduate programs, not only for teaching at universities.

2 Research of DBS

This section consists of

3.1 Priority Areas of Research for Business Studies
3.2 Current ongoing Research Topics and Areas
3.3 Research Interests of DBS Staff

2.1 Priority Areas of Research for Business Studies

Below are the potential priority research areas for the Department of Business Studies (DBS). Topics are focused on all the four Sections provided by individuals within the Section.

1. Agricultural Economics as one of the subjects needs to be given importance in the DBS curriculum.
2. Equally important is the development of the Economics and Financing of the Agro-based industries.

3. Developing the skill base of the informal workers, predominantly women in rural areas, through an on-line/off-line instead in a blended mode.
4. Developing Good Infrastructure: How the absence of it is a barrier for development?
5. Examining Women entrepreneurship more through co-operatives set up by augmenting the development through the Self-Help groups with seed money coming from the National Banks.
6. Gender Violence and Relations in the Development Process: An Eye Opener
7. ICT enabled education and services: How to strengthen this at the UNITECH and PNG as a whole?
8. Financial Literacy and Financial Inclusion: The Way Forward
9. The Socio-economic status of the Working Population in the UNITECH settlement area
10. Education and Employment: How is it linked in the PNG context?
11. Human Capital and National Development
12. Marketing Management
13. Human Behavior Management
14. Leadership Management
15. Sustainable practices for Small Business Management (SME)
16. Chain Management
17. Green Marketing
18. Green HRM
19. Carbon Emission and its impact on Cost of Capital on Mining industries in Papua New Guinea
20. Smart Beta Strategies as a driver/tool to reducing investment risks and performance on different investment portfolios
21. Passive and Active Stock analysis
22. Black Market Economy
23. Tax as a catalyst to drive Papua New Guinea Economy- A Case study on Formal & Informal Sector
24. Resources Curse Nation – Papua New Guinea
25. Income Inequality in Papua New Guinea
26. Poverty in Papua New Guinea
27. Economic Development in Papua New Guinea
28. Big Data Analytics and Intelligent Systems
29. Big Data Analytics for SME Enterprise Services
30. Big Data Driven Socioeconomic Development
31. ICT (Mobile Devices, E-Commerce, Web, Cloud Computing, etc.) for SME Enterprise Services
32. Business analytics intelligence: Foundations and Applications

2.2 Current ongoing Research Topics and Areas

The DBS academic staff members are undertaking the following research projects (Scholar name, research project).

1. Adimuthu, R., A Study on Quality of Work-Life (QWL) and its Influence on Job Satisfaction., Organizational Commitment, and Overall Organizational Performance in the Premier Universities in PNG.
2. Adimuthu, R., A Comparative Study on Factors Influencing Sustainable Change Management Practices in Private and Public Sector Organizations in PNG
3. Adimuthu, R., Emotional Intelligence and its Factorial Influence on Effective Leadership in Improving Organizational Performance in Private Sector Organizations in PNG.
4. Adimuthu, R, A Study on the Factorial Influence on Sustainable Small Business Enterprises (SMEs) Practices in PNG
5. Adimuthu, R., Combating COVID-19 Pandemics: Lessons for Developing Countries. A research paper will be published in 2022.
6. Bomoteng, B., Financing in Tertiary Education in PNG
7. Bomoteng, B., Managerial Accounting for Socio-Economic Development in PNG
8. Gipe, G., Key Measures and Trends in Economic Development in Papua New Guinea
9. Gipe, G., Key Opportunities, Challengers and Enablers for Economic Development in PNG
10. Kuusa, M., The Impact of Tax Evasion on Revenue Collection Performance in PNG.
11. Naro, R., Digitisation of PNG's Informal Economy: Table Markets and SMEs;
12. Naro, R., Preservation of Cultural Inheritance Through Digital Rights Management (DRM): Distributed Ledger Technology (DTL) Smart Contracts.
13. Naro, R; Feasibility Analysis of Policy Draft Via Datafication: PNG Context (Public Sector)
14. Paul, T., A Study of Inflation in Papua New Guinea. This study tries to model inflation in Papua New Guinea using the recent times series technique of Cointegration and error correction models finding the money supply and exchange rate depreciation very important in explaining inflation.
15. Paul, T., The Effect of Exchange Rate Depreciation and Variability of Exchange Rates on the Exports from Papua New Guinea.
16. Sun, Z, Driving Socioeconomic Development with Big Data. This is a book under contract, to be released by IGI-Global at the end of 2022 or early 2023 see HTTPS://WWW.IGI-GLOBAL.COM/PUBLISH/CALL-FOR-PAPERS/CALL-DETAILS/5830.
17. Sun, Z, Big Data Analytics Driven Socio-economic Development in Papua New Guinea. This is a national research project granted by PNG Science and Technology Secretariat for at least 2 years since November 2021.
18. Sun, Z. & Strang K., Big Data Driven Socio-economic Development: A Unified Approach. This is book chapter to be submitted for protentional publication.
19. Sun, Z., Intelligent Big Data Analytics = Artificial Intelligence + Big Data Analytics. submitted to a journal for publication.

20. Sun, Z., Big Data Analytics for Enhancing Digital Services. This is a journal paper for publication soon.
21. Yamarak, L., Acceptance, Perspectives, and Attitudes toward COVID-19 Vaccines in Papua New Guinea.
22. Yamarak, L., Strengthening Capacities to Investigate and Prosecute Trafficking Offences and Improve Protection and Direct Assistance for Victims of Trafficking.
23. Yamarak, L., "Pacific Perspectives on the World" project, which aimed "to learn from a cross- section of Pacific islanders about their perspectives on the world and their place in it and how other countries (notably Australia) can best contribute to their future." A DBS scholar is a lead researcher here at PNG University of Technology. This is research sponsored by Western Sydney University, with all the universities in PNG.
24. Yamarak, L., An Investigation of the Impacts of COVID-19 in Urban Squatter settlements on livelihoods, food security and poverty: A Perspective from Port Moresby and Lae City, Papua New Guinea
25. Yamarak, L., A Mining Perspective and a Case in Point of Porgera Mining Review
26. Project Appraisal of the One Hectare Model Nuclear Family Hybrid Cocoa Projects of the Yekora People in Morobe Sub-District, Huon District, 2022-2027

These ongoing research projects will lead to corresponding research outputs for DBS in 2022.

2.3 Research Interests of DBS Staff

The following table lists the current research interests of DBS Staff. Each of the DBS Staff is requested to list up to research interests.

Academic Staff	Research Interests
Pinjik, Paul	Organizational ICT Security Policy, Cyber Security
Cosmas, Ian	Cyber Security, Artificial Intelligence, Cloud Computing
Abraham, Lulu Bokutoai	Education and Labour Economics, Fiscal Policy, Governance, Development Economics
Adimuthu, Ramasamy	Human Resource Development and Organisational Behaviour Management, Leadership Management, Management of SMEs and Change Management
Ambelye, John A.	Supply Chain challenges of Fresh food marketing in PNG, Manufacturing in PNG - supply chain challenges, Labour Productivity of Factory workers in Lae, PNG, Billboard advertising in PNG: effectiveness and challenges.
Bomoteng, Bapa	Financing in Tertiary Education, Accounting in Government, Managerial Accounting and Decision Making.
Gipe, Gomi J	Economic Development in PNG, Development Economics, GDP and National Public Expenditure and their Impacts on Poverty in PNG, Income and Expenditure and their Impacts on Weight, Height and Body Mass Index (BMI)
Konafo, Ken	Small and Medium Enterprises, Online Marketing, Fresh Produce Marketing

Kuusa, Matthew	Black Economy, Accounting and Auditing Standards, Differential Reporting, Accounting Education, Training Needs of Accountants
Mali, Anna	Intangible assets, Managerial Accounting, Intelligent and Agile Risk Management, Aligning Technology, and Business Strategic Investments
Naro, Rodney	Cyber Security, Artificial Intelligence, Cloud Computing, network engineering, and management
Pambel, Francisca	Applied Artificial Intelligence, Data Science, Big Data Analytics, Big Data-driven Community Development, Digital Services.
Paul, Thomas Muthucattu	Economics, Monetary Economics, International Finance, Banking and Finance, Applied Econometrics
Geetha Rani Prakasam	Development Economics, Economics and Financing of Education, Digital Marketing; Gender Economics, Education and Development
Zhaohao Sun	Business Analytics and Big Data Analytics, Cyber Security, Data Science, Artificial Intelligence, Cloud Computing
Tange, Jeffrey	Small and Medium Enterprises, State-Owned Enterprises, Economic Development and Livelihood
Tiki, Samson	Forensic Accounting and Investigation, Anti-money Laundering and Regulation, Financial Inclusion and Sustainability, Financial Forensic and Business Intelligence
Vishwanadham, Nadiminti	Normalisation of FS, GREEN ACCOUNTING, Behavioural Finance, Corporate Finance, Strategic Management
Yamarak, Londari	Population Growth and its impacts on Economics Development in PNG, Covid19 and Gender Inequality: Economics and social impacts. Impacts of gender discrimination on gender development and poverty in PNG, Mining Impacts in PNG, 2022 National Elections.

3 Research Publications of DBS

In 2021, the DBS published seven peer-reviewed (refereed) journal articles, two books, four book chapters, two peer-reviewed international conference proceedings papers, and 14 working papers (or preprints), 11 of them are published at Researchgate (researchgate.net) with global visibility.

3.1 Journal Articles Publications

1. Geetha Rani, P. and Ravindranath, A. (2021) Mothers' Education, Employment and Access to Childcare Facilities in Kerala. *Journal of Educational Planning and Administration* (Niepa), 36 (3), pp.217-238, ISSN 0971-3859.

2. Ramasamy, A., Muduli, K., Mohamed, A., Biswal, J. N., and Pumwa, J. (2021). Understanding Customer Priorities for Selection of Call Taxi Service Provider. Journal of Operations and Strategic Planning, Vol. 4 (1): 52-72.

3. Sun, Z. and Huo, Y. (2021) The spectrum of big data analytics. *Journal of Computer Information Systems* 61(2): 154-162. DOI. 10.1080/08874417.2019.1571456.
4. Sun, Z., Pinjik, P. and Pambel, F. (2021) Business case mining and E-R modeling optimization, *Studies in Engineering and Technology*. 8(1): 53-66. doi:10.11114/set.v8i1.5288.
5. Tiki, S., Luke, B., and Mack, J. (2021). Perceptions of bribery in Papua New Guinea's public sector: Agency and structural influences. *Public Administration and Development*. https://onlinelibrary.wiley.com/doi/abs/10.1002/pad.1913
6. Tombele, H., Mohamed, A., Adimuthu, R. (2021). Impact of Technology on Learning and Development of Students' at International Training Institute Lae Campus Morobe Province, *Empirical Economics Letters*, Vol. 20 (1): 1-12.
7. Yamarak, L. and Parton, A.K. (2021) Impacts of Mining Projects in Papua New Guinea on Livelihoods and Poverty in Indigenous Mining Communities. *Journal of Mineral Economics*. **https://link.springer.com/article/10.1007/s13563-021-00284-1**

3.2 Book and book chapter publications

1. Sun, Z. (2021) Intelligent Analytics with Advanced Multi-industry Applications. IGI-Global, USA, editor and author, available at https://www.igi-global.com/book/intelligent-analytics-advanced-multi-industry/244632
2. Sun, Z. & Wang, P.P. (2021) The Scientification of China. Cambridge Scholars Publishing, UK, 360 pages. available at https://www.cambridgescholars.com/product/978-1-5275-7447-2
3. Narongou, D. & Sun, Z. (2021) Big data analytics for smart airport management, in Sun Z (2021) Intelligent Analytics with Advanced Multi-industry Applications. IGI-Global, USA.
4. Stranieri, A. & Sun, Z. (2021) Only AI Can Understand Me?: Big Data Analytics, Decision Making, and Reasoning. in Sun, Z. (2021) Intelligent Analytics with Advanced Multi-industry Applications. IGI-Global, USA.
5. Sun, Z. (2021) Preface, In Sun Z (2021) Intelligent Analytics with Advanced Multi-industry Applications. IGI-Global, USA.
6. Sun, Z. & Stranieri, A. (2021) The Nature of Intelligent Analytics. in Sun, Z. (2021) Intelligent Analytics with Advanced Multi-industry Applications. IGI-Global, USA. pp.1-22.

3.3 Conference paper publications

1. Sun, Z. & Wu, Z. (2021). A Strategic Perspective on Big Data-Driven Socioeconomic Development. In 2021 the 5th International Conference on Big Data Research (ICBDR 2021), September 25–27, 2021, Tokyo, Japan. ACM, New York, NY, USA, 7 pages. https://doi.org/10.1145/3505745.3505751.
2. Sun, Z. & Vajjhala, N.R. (2021) Responsible Big Data Analytics for e-Business Services. In 2021 the 5th International Conference on Big Data Research (ICBDR 2021), September 25–27, 2021, Tokyo, Japan. ACM, New York, NY, USA, 7 pages. https://doi.org/10.1145/3505745.3505750.

2.5. Working papers (Preprints) publications

14 working papers (preprints) have been published by DBS scholars. 11 of which were published at https://www.researchgate.net/profile/Zhaohao_Sun/publications (accessed 12 March 2022). 10 of them have been indexed by Google Scholar. Each of these has received a number of Reads by researchers worldwide. This is a new form of contribution to academia and industries of ICT and beyond globally (see the (m Reads) below, as of 12 March 2022).

1. Sun, Z. (2021) An Introduction to Intelligent Analytics; PNG UoT BAIS 6(1): 1-6. DOI: 10.13140/RG.2.2.32783.71843, published 22 01 21. https://www.researchgate.net/publication/348663778_An_Introduction_to_Intelligent_Analytics; (738 Reads)
2. Sun, Z. (2021) An Introduction to Intelligent Business Analytics. PNG UoT BAIS 6(2): 1-5. Google Scholar, 17 02 22. DOI: 10.13140/RG.2.2.19361.94562. published 08 02 21 https://www.researchgate.net/publication/349106222_An_Introduction_to_Intelligent_Business_Analytics; (1,939 Reads)
3. Sun, Z. (2021) An Introduction to Intelligent Analytics Ecosystems. PNG UoT BAIS 6(3): 1-11. Google Scholar, 25 03 21. DOI: 10.13140/RG.2.2.32783.71843; published 14 02 21; https://www.researchgate.net/publication/349426318_An_Introduction_to_Intelligent_Analytics_Ecosystems. (245, Reads)
4. Sun, Z. (2021), The Rebalancing World. PNG UoT BAIS 6(4): 1-6. DOI: 10.13140/RG.2.2.19711.74402 Published 16 04 21; https://www.researchgate.net/publication/350854296_The_Rebalancing_World. (38 Reads)
5. Sun, Z. (2021) Ten Challenges and Opportunities of Intelligent Big Data Analytics 21005 PNG UoT BAIS 6(5): 1-6. Google Scholar, 28 05 21; DOI: 10.13140/RG.2.2.25886.46403, Published 20 04 22 https://www.researchgate.net/publication/350994242_Ten_Challenges_and_Opportunities_of_Intelligent_Big_Data_Analytics. (146; Reads)
6. Sun, Z. (2021) The Art of Reading: Reading as a Research; PNG UoT BAIS 6(6): 1-5. Google Scholar, 28 05 21, DOI: 10.13140/RG.2.2.33654.11841, Published 13 05 21 https://www.researchgate.net/publication/351547550_The_Art_of_Reading_Reading_as_a_Research; (205, Reads)
7. Sun, Z. (2021) An Introduction to Data Intelligence. PNG UoT BAIS 6(7): 1-5. Google Scholar, 08 11 22. DOI: 10.13140/RG.2.2.17604.55684; Published 24 10 21. (266; Reads)
8. Sun, Z. (2021) The Age of Metaintelligence: Competing in the Digital World. PNG UoT BAIS 6(8): 1-11. Google Scholar, 08 11 23; DOI: 10.13140/RG.2.2.23279.97449; Published 31 10 21 https://www.researchgate.net/publication/355788448_The_Age_of_Metaintelligence_Competing_in_the_Digital_World. (66; Reads)
9. Sun, Z. (2021) Not Only Data Intelligence: A Unified Approach; PNG UoT BAIS 6(9): 1-11. Google Scholar, 10 11 21; DOI: 10.13140/RG.2.2.34362.11204, Published 04 11 21; (183; Reads)
10. Sun, Z. (2021) Science and Intelligence: An E-R Approach; PNG UoT BAIS 6(10): 1-5. Google Scholar, 21 11 21, DOI: 10.13140/RG.2.2.28263.98729, Published 13 11 21

https://www.researchgate.net/publication/356185011_Science_and_Intelligence_An_E-R_Approach; (43, Reads)

11. Sun, Z. (2021) Meta-analytics: An Emerging Frontier for Revolutionizing the Digital World PNG UoT BAIS 6(11): 1-6. Google Scholar, 27 12 21; DOI: 10.13140/RG.2.2.19855.71848 Published 23 11 21; https://www.researchgate.net/publication/356458902_Meta-analytics_An_Emerging_Frontier_for_Revolutionizing_the_Digital_World; (161, Reads)
12. Geetha Rani, P. (2021) Family Spending on Education in India: Pattern and Determinants, NIEPA Occasional Paper, No.55, NIEPA, New Delhi.
13. Thomas M PAUL & Inore, I, (2021) An Empirical Study of Inflation in Papua New Guinea employing Cointegration and Error Correction Times series models, PNGUOT.
14. Thomas M PAUL & Inore, I. (2021) The effect of the Kina exchange rate variability on Macroeconomic variables such as exports in Papua New Guinea using GARCH and Cointegration methods. PNGUOT.

4 Research Grants Received

1. Geeta Rani, P, 2022-2022, Research Project: Women's Access to Online Marketplaces in Papua New Guinea: An Effort to Explore their Participation, Challenges, and Prospects, approved by the PNGUOT in 2021.
2. Sun Z., 2022-2023 Research Project: Big data Analytics-Driven Socio-Economic Development in PNG, National Science and Technology Secretariat (PNG STS). It is the most significant research grant from PNG STS compared with the other few successful research grants. PNG STS approved it in November 2021.
3. Yamarak, L., 2022-2022, Research Project: An investigation of the impacts of COVID-19 in urban squatter settlements on livelihoods, food security, and poverty: A Perspective from Port Moresby and Lae City, Papua New Guinea. Approved by PNGUOT in 2021

5 HDR Student' Achievements and Supervisions

5.1 HDRs Achievements

Naro, R., Master of Information Technology, Southern Institute of Technology, NZ. Masters Thesis (MIT): Online Education in Papua New Guinea, Papua New Guinea University of Technology (PNG Unitech): Challenges and Opportunities.

5.2 HDR Students

Mr. Bapa Bomoteng, A Ph.D. Student. His Principal Supervisor is Prof. Paul Thomas.

Mr. Desmond Narongou and Mr. Philip Fukatine, M.Phil. students. Their principal supervisor is Prof. Zhaohao Sun. The Academic Board Meeting approved their applications for studying M. Phil program in IT of UNITECH in November 2021.

Mr. Gipe, Gomi's application for a Ph.D. program was approved in the Academic Board meeting in 2021.

6 Seminar Presentations

1. Professor Geetha Rani, P. did a series of DBS seminar presentations on the STATA statistical package in the first semester of 2021. Unfortunately, DBS organized no other seminar presentations in 2021 because of the pandemic of COVID-19.
2. As an adjunct professor of Hebei University of Science and Technology China, Prof Zhaohao Sun was invited to deliver a Big Data-driven Digital Service Development presentation to Hebei University of Science and Technology on December 18, 2021. As a result, 65+ attendees (including academic staff, postgraduate and undergraduate students) joined his presentation on that day.

7 National and International Outreach

1. As an adjunct professor of Chongqing Normal University, China, Prof Zhaohao Sun collaborated with Professor Zhiyou Wu, the Director of Chongqing Key Lab of Intelligent Finance and Big Data Analytics, and participated in the Lab annual research meeting in December 2021. He was invited to be a member of the Key Lab Research Committee. Prof. Sun also worked with Prof Wu to publish a research book on intelligent business analytics, to be released in March 2022.
2. Prof Zhaohao Sun collaborated with Professor Andrew Stranieri of Federation University Australia and developed several research papers on intelligent analytics and knowledge discovery in 2021. A few of them have been published in 2021.
3. Prof Zhaohao Sun has been working on the Editorial Board of International Journals.

- Editor of Journal of New Mathematics and Natural Computation (http://www.worldscientific.com/worldscinet/nmnc). (SCOPUS, WoS indexed)
- Editorial Review Board of Journal of Computer Information Systems (SCOPUS, WoS (i.e., SCI) indexed)
- Associate Editor of Journal of Intelligent and Fuzzy Systems (SCOPUS, WoS indexed)
- Associate Editor of International Journal of Systems and Service-Oriented Engineering (IJSSOE). (DBLP, ACM indexed)
- Associate Editor of International Journal of Business Intelligence Research (http://www.igi-global.com/journal/international-journal-business-intelligence-research/1168).
- Associate Editor of International Journal of Risk and Contingency Management (IJRCM).

4. As a member of PC, Prof Zhaohao Sun has been actively engaged in organizing international conferences, including ICBDSC 2022 (Tokyo, Japan) 2022, ICE-B 2021, I3E2021 (Ireland), SMC 2021, ICAART 2021, ACSW (and HIKM) 2022, 2021, ITS 2021, 2020, etc. He has reviewed several papers for each of them in 2021.
5. Reviewers. Prof Zhaohao Sun reviewed several papers in 2021 for the following journals and international conferences. Journal of Systems and IT (SCI), IJSSOE (IGI), J of Big Data (Springer), European J of Education Research, IJCRM (IGI), JCIS (Taylor & Francis), IJBIR (IGI), BMC, ICE-B_2021, I3E2021, ICAART 2021, and ACSW-HIKM 2022
6. Memberships of Professional Associations. Prof Zhaohao Sun is a senior member of ACS, Australia, a member of IEEE, and a member of AIS.

DEPARTMENT OF CIVIL ENGINEERING

Head of Department: Dr. Revanuru Subramanyam

INTRODUCTION

The Civil Engineering Department offers a four-year undergraduate degree (UG) program, a two-year postgraduate program either by coursework or research, and PhD program within the campus. The UG program in the year 2021 was its third year of the accreditation process to the Washington Accord accrediting body through Engineers Australia. The postgraduate programs offered by course work in the Department are Master of Engineering in Civil and Master of Science in Solid Waste & Resource Management. The Department contains well-equipped laboratories and modernizing with the latest equipment and software.

The Department had 7 full-time academic staff (2 with PhDs, 2 doing part-time PhD, 2 with Master's Degree, and 1 doing MPhil) and 5 part-time faculties. In addition, there were 2 part-time PhD, 4 MSc in Solid Waste & Resource Management degrees, 2 MEng (Civil Engineering) degrees, and 190 (48 in year 1, 52 in year 2, 53 in year 3, 37 in year 4) undergraduate students.

The PNGUoT Department of Civil Engineering's priority research areas are as follows:

- **Environmental Engineering**
  - Solid Waste Management
  - Water & Wastewater Testing and Treatment
  - Sediment Analysis to know Pollution Status of Rivers
  - Design of water/sewage treatment systems
  - Design of air pollution control systems
  - Anaerobic Treatment

- Environmental Impact Assessment

- **Structural Engineering**
  - Engineering properties of steel, concrete, gravel, cement, timber, etc.
- **Transportation Engineering**
  - Traffic surveys & Design of roads
- **Geotechnical Engineering**
  - Engineering properties of soils

A) Final Year Undergraduate Research Projects.

Fourth-year BECV students undertake research work for partial fulfillment of the Bachelor's degree program in 2021 as is shown in Table below:

GROUP NO.	PROPONENTS	TOPICS	SUPERVISORS
1	Michael Lucas Hossy Paul Steven Sauka	Production of Coconut Timber in PNG	Mr. Chris Kobal
2	Karafa Hawa Don Jovahime Jeremiah Todi	Road Bypass Study of Main Wharf, Okuk Highway, and Taraka Industrial Area	Mr. Konzang
3	Sebastian Semdip Jerome Opi	Mini-Hydro System Design & Development in Rural Marapul Community	Mr. Micah Nosere (ATCDI)
4	Philip Koroats Nickson Koms Kawili Yakura Sylvester Moria	Traffic Survey Analysis and Design of Signalised Intersection	Mr. Konzang
5	Natasha Polin Hezron Apio Enoch M. Paekera Lois Job	Feasibility and Preliminary Design of Elevated Freeway	Mr. Konzang
6	Fred Kandiu Freeman Ken Nathan John Mitchele Zuke	Rehabilitation and Development Plan for Powkap Dumpsite in Lae	Dr. Betasolo
7	Dwight Y Thomas Moses Boko Delphnie Sundie	Traffic Survey Analysis and Design of Signalised Intersection	Mr. Konzang
8	Lyne Atsimb Arebil Bare	Geotechnical Investigation and Foundation Design	Mr. Konzang
9	Nickson Pundu Napthali Tabali	Traffic Management Scheme and Design of CBD area Top Town	Mr. Konzang
10	George Jonathan Roger Kiviso	Proposed design of a suspension footbridge linking Lapilo village and Gosuroka village.	Mr. Kobal
11	Jahmmy Ombiolu Israel Pope (exempted) Jordan Miakin	An Investigation of Design Issues Related to Seismic Performance of Pile-to-Pile cap connection for Bumbu Bridge.	Mr. Roboam Pebuar

12	Russell Waim	Investigation of Pavement Failure and Re-design with Drainage for Sepik drive junction in PNG Unitech.	Mr. Konzang
13	Robin Baru Lincoln Sauwa	Assessment of Lae City Seismic Vulnerability of High Rise Buildings	Dr. Betasolo
14	Patrict Rotoitau	Design and Analysis of Engineered Drainage Nets to Filter Discharge of Plastics in Stormwater to Drainage System	Dr. Betasolo

B) List of Postgraduate students and their research topics.

Name	**Supervisor**	**Program**	**Research Title**
Esther Dujambi	Dr. R. Subramanyam	MPhil/2 (Applied Science Deptt.)	Production of electricity from chicken waste.
Melvin Minala		Master of Science in Solid Waste & Resource Management	Assessment of heavy metals concentrations in sediments along the Lagaip-Strickland River system in Papua New Guinea.
Maryanne Ambane	Dr. Mirzi Betasolo		Second Seventh Landfill Rehabilitation and Final Waste Disposal Design using the Fukuoka Method
Unaro Yauo			Valorization of Human Organic Waste for sustainable domestic biogas and manure synthesis for use in bioconcrete
Noel Martin	Dr. Aezedeen Mohammed	Master in Engineering (Civil Engineering)	Improved Structures from Corrosion Using Impressed Current and Sacrificial Anode Cathodic Protection System

C) List of PhD students and their research topics.

Name of Student	**Research Title**	**Supervisor**
Mr. Chris Kobal	Failure Modes in Wood Structures with Coconut Timber	Prof. Nicholas Lambrache & Dr. Mirzi Betasolo

Mr. Murray Konzang	Optimization of Road Infrastructure in Momase Region (as an economic zone) by Econometrics Modelling	Dr. Mirzi Betasolo & Dr. Subruto

D) List of Journal Publications in Indexed journals.

1) Subramanyam, R**.** (2021). Solid waste management in Lae city, Papua New Guinea. *Journal of Solid Waste Technology and Management*, 47(2), 371-382.
2) Willie Doaemo, Sahil Dhiman, Alexander Borovskis, Wenlan Zhang, Sumedha Bhat, Srishti Jaipuria, and Mirzi Betasolo (2021). Assessment of municipal solid waste management system in Lae City, Papua New Guinea in the context of sustainable development. *Environment, Development and Sustainability, 23, 18509–18539.*

DEPARTMENT OF COMMUNICATION AND DEVELOPMENT STUDIES

Acting Head of Department: George Wrondimi

The Department offers a 4-year professional program that has two sections: A service-course sequence in English for Academic Purposes (EAP) for students across all disciplines of the University; and, a professional Communication for Development (C4D) degree program to train liaison and community development and public relations officers for resource development companies, government departments and non-government organizations. It also presently administers the Postgraduate Certificate Course in Student-Centered Teaching for the further specialized training of academic staff at PNGUoT.

In 2009, the Department began offering a Masters in Communication Studies (MCS) program. This program has both course work and a dissertation component, where the students write a research paper on an appropriate topic in their final semester of the second year. In addition, a Masters of Arts in Organizational Leadership is periodically offered in cooperation with Development Associates International (DAI), The Christian Leadership Training College of Papua New Guinea (CLTC), and the Pioneers of Australia.[1] Furthermore, the PhD and MPhil programs continue, with one graduate to date and two currently enrolled.

As concerns *research activities*, the Department of Communication and Development Studies at the Papua New Guinea University of Technology is a department that blends three broad academic strands (Language and Communication Studies, Sociology, and Communication for Development). Through its individual members of staff, research is conducted under general umbrellas (Linguistics and Culture, English for Academic Purposes/EAP, English for Special Purposes/ESP, Sociology, and Communication for Development). General and sub-topics include:

[1] Now in suspension because of funding issues, currently undergoing revisioning with an eye to make its sustainable.

In Linguistics and Culture, the focus is on PNG national languages, comparative linguistics, and the interface between society and language across time. In EAP or ESP, research topics include Classroom research, EAP/ESP methodology, course design, material design, genre analysis, rights analysis, critical EAP/ESP, reading and writing, testing and evaluation, computer-mediated language learning, EAP/ESP research, and socio-linguistic influences on the teaching and learning of EAP/ESP.

In the general area of Sociology, research foci include fieldwork, health, corrections, communication theory and practice, media studies, critical-cultural studies, and comparative higher education studies. Another thread is concerned with the problems of youth in society, especially on topics such as integration, sex education, and social behavior.

In the Communication for Development (C4D) area, the sub-topics of research interests include communication in education, communication and gender, communication in resource management, conflict resolution, negotiation skills, partnership building, communicating development in such sectoral contexts as economic industries, healthcare, agriculture, etc., as well as democracy and human rights, and HIV/AIDS.

Both empirical (quantitative) and qualitative approaches to relevant topics are employed by our academics, with trans-disciplinary innovations (such as action research) encouraged. In addition, the Department publishes an international peer-reviewed organ, the *JCDS: Journal of Communication and Development Studies* under the editorship of Professor Gilder, in cooperation with the UNESCO Chair of Quality Management of Higher Education and Lifelong Learning of "Lucian Blaga" University of Sibiu, Romania, and its Director, Prof *habil*. Dr Silvia Florea.

Name of the Faculty Member/Position/Research Interests

Name of the Faculty Member	**Position**	**Research Interests**
Prof Dr *habil*. Dr Eric Gilder	Professor, Editor-in-Chief, *JCDS*	Higher education policy, scientific communication, technology and society, communication theory and practices

		across intercultural contexts, radio-TV history and legal aspects of broadcasting, and the socio-psychological aspects of the communication process
Dr Garry Sali	Associate Professor	Sociology of crime and deviance, prison systems, crime and development, and law and order problems in PNG
Dr Rachel Aisoli-Orake	Senior Lecturer	English as a Second Language writing, Education/English curriculum and pedagogy, English for Academic Purposes, Cross-Cultural communication, development and responsibility, and participatory research
Mary Kunenda Aisi ┼ (passed away, 21 February)	Lecturer II	Development communication, gender and leadership, and mass media
Michael Winuan	Lecturer II	English for Academic Purposes, Farming and community/national development
George Wrondimi	Lecturer II	Social work; social policy and planning; social mapping; community development
Imelda Ambelye	Lecturer I	Education and community empowerment (women and youth), natural resources (mining and other extractive industries) in PNG
Joshua Frank Kuri	Lecturer I	Language development and practices via bilingual education; practices and effects of communication across developing societies, Disaster and Risk Management, and Workplace Safety and Risk Management
Nagiob Jesse	Lecturer I	Engineering & Sustainable Development Practices, Research Methods & Skills, Workplace/Business Communication, Development Studies, Communication for Development. Socioeconomic Development Research, Strategic Planning, Implementation, Monitoring & Evaluation
Lucy Maino	Lecturer I	Participatory Development Communication (PDC) for engaging stakeholders (individuals, groups, and

		institutions) in socio-economic change processes, Participatory Social Mapping for community development, environment and agricultural innovation, and English for Academic Purposes(EAP)
Sheryl S. Makara (on study leave)	Lecturer I	Emotional intelligence and leadership, critical thinking, communication in crime and sociology with relations to development, community development and participation
Ruth Moka	Lecturer I	English for Academic Purposes, community development, Secondary education in PNG
Wilma Molus (on study leave)	Lecturer I	Sociology of children, sociology of deviance and crime
Adrian Sangundi	Lecturer I	English for Academic Purposes, collegiate debate
Joel Sefo	Lecturer I	English for Academic Purposes, student pedagogy
Starza Paul	Lecturer I	Journalism theory and practice; national development
Ngawae Mitio (retired 8 February)	Technical Instructor	Local community affairs/local governance

Ongoing Community Partnership Projects:

Beginning in January 2020, the CDS Department at PNGUoT began a cooperation with the Wesleyan Bible College (WBC) in Mt Hagen, focusing on developing the (English-Language) Academic Writing Skills of theological instructors at WBC and partner theological schools, including Christian Union Bible College (CUBC), Christian Leaders Training College (CLTC) and others. From the beginning, Professor Eric Gilder, Dr Aisoli-Orake, and Ruth Moka have been involved in this program, which started as a conversation of missionary Cheri and Don Floyd asking for specialist expertise in developing the program. The Department is engaged and committed to continuing this project as part of its community outreach and development mission, and trusts that sound, and applicable action-research can be generated by it.

In May 2021, the CDS Department participated in a ground-breaking ceremony in Hamara Village at Kokoda (Oro Province) to establish a Community Resource Centre. This new partnership is another community outreach project of the Department jointly with the Agriculture Department at PNGUoT. It will enable our final-year students to do their practical field attachments there to learn about the people's social/cultural activities, general way of life, and give something back to the community by performing various activities for the village. These include naming a few: Engaging in participatory social mapping, resource and environment mapping, community needs analysis for development efforts (all done under the close supervision of the subject co-ordinators in consultation with the village leaders and elders).

Peer-Reviewed Publications:

Edited Journal:

Gilder, E. and Ciocoi-Pop, M., et al. (2020-2021). *JCDS: Journal of Communication and Development Studies*, VII-VIII (pp. v-181) ISSN 1992-1322. Published in cooperation with UNESCO Chair in Quality Management of Higher Education and Lifelong Learning, "Lucian Blaga" University of Sibiu, Romania.

Journal Articles:

Aisi, M. K. ┼ (2020-2021). Effective Strategic Management: Catalyst for Organizational Efficiency and Accountability in Educational institutions in Papua New Guinea, *JCDS: Journal of Communication and Development Studies*, VII-VIII: 129-59.

Ambelye, I., Foale. F, and Dyer. M. (2021) Educated Young Women and the Challenges of Reintegration in Rural Villages of Papua New Guinea. *Directions: a Journal of Education Studies*, 35 (2): 57-69.

Avram, S. and Gilder, E. (2021). Analogue Humans Facing Increasing Threats in a Digital Mass Global Future: Modelling Policy Exchange Responses in the EU Space to Achieve Sustainable Integrative Development. *Romanian Journal of Political Science and International Relations*, XVIII (2): 69–87.

Gilder, E. (2021). Is the Past a Prologue? Construing Future Possibilities amidst Present Perditions in a Continuing Time of Crisis. *Logos Universality Mentality Education Novelty: Philosophy & Humanistic Sciences*, 9(1): 64-82. https://doi.org/10.18662/lumenphs/9.1/58

Gilder, E. (2021). Is Applied Human Justice Possible in a Meritocracy? A Comparison/Contrast of Answers from Rawls and Perelman, in "JOHN RAWLS – 100 de Ani de la Naştere o Teorie a Dreptăţii – 50 de Ani de Provocări Intelectuale," *Studii de Epistemologie și de Teorie a Valorilor*, Vol. VII (Coordonatori: M. A. Drăghici & M. G. Panait). Bucharest: Editura Academiei Române (pp. 23-32).

Maino, L. Sar, L. and Maino. M. (2020).[2] Effectiveness of Information Delivery Through the AKIS/RD Agriculture Extension Model: A Preliminary Case Study in Rice Farming Systems in Two Districts of the Morobe Province. *Niugini Agrisaiens*, 11: 1 - 6.

Nuru, T.S., Gilder, E**.** and Tindi, M. A. (2020-2021). Online Learning and Institutional Support Experiences Under COVID-19 at PNGUOT, Papua New Guinea, *JCDS: Journal of Communication and Development Studies*, VII-VIII: 109-16.

Paul, S. (2020-2021). The Emerging of a New Trend of Warfare in Enga Province of Papua New Guinea. *JCDS: Journal of Communication and Development Studies*, VII-VIII: 88-99.

Wrondimi, G. (2020-2021). A Service Centre Development Model for Papua New Guinea – Cascading Communication Gaps and Pathways for Efficient Delivery of Services at the Ward Level, *JCDS: Journal of Communication and Development Studies*, VII-VIII: 160-77.

Scholarly Presentations:

Avram, S. and Gilder, E**.** (2021). Is the Pursuit of Well-Being and Happiness Possible in Organizations Under Stress Using the Hybrid Communication Format? International conference COMMUNICATION VS HYBRIDIZATION. LSP Unit, Faculty of Economics and Business Administration, "Alexandru Ioan Cuza" University of Iași, Romania, 13 November (online participation).

Gilder, E. (2021). Plenary Speech Title| Is the Past a Prologue? Construing Future Possibilities amidst Present Perditions in a Continuing Time of Crisis. World Lumen Congress 2021,

[2] While dated 2020, the article was published in 2021.

Iasi, Romania, May 26-30 (online participation). https://lumenconference.com/wlc2021/plenary-speakers/eric-gilder-papua-new-guinea/

Nuru, T.S., Gilder, E. and Tindi, M. A. (2021). Online Learning and Institutional Support Experiences Under COVID-19 at PNGUOT, Parallel regular virtual session # P20, World Lumen Congress 2021, Iasi, Romania, May 26-30.https://www.facebook.com/watch/live/?ref=watch_permalink&v=191842456148225

Gilder, E. (2021). Is Applied Human Justice Possible in a Meritocracy? A Comparison/Contrast of Answers from Rawls and Perelman. Tribute Colloquium to John Rawls: The Institute of Philosophy and Psychology "Constantin Rădulescu-Motru" of the Romanian Academy, Department of Epistemology and Ethics, Bucharest, 10-11 September (online participation).

Post Graduate Certificate in Student Centred Teaching (PGCSCT) 2021

Taught at the TLMU Center under the supervision of Prof Eric Gilder, the PGCSCT consisted of the following modules, offered to registered staff members at the University as an after-hours instructional course to the full-time academic staff of the University: CD511: LMS and Flipped Classroom (Dr Shoeb Ahmed Syed); CD512: Project/Problem Based Learning (Ms Dora Kialo); and, CD513: International Trends In Higher Education Teaching and Learning (Dr Tindi Nuru). Fifteen (15) enrollees completed all requirements for the course, and will obtain a PG Certificate in June 2022:

1. ALES, Steve K.
2. ALIS, Koniel
3. AUAKAI, Dore
4. GEBIA, Olo
5. GUSAMO, Benson
6. KAMIT, John
7. KULUWAH, Magdelyne
8. KUUSA, Mathew
9. MENIN, Priscilla
10. MOKA, Ruth
11. PEBUAR, Roboam
12. PETILANI, Winter

13. SEKAC, Tingneyuc
14. VEISAMI, Lous
15. WANTEPE, Grace

Postgraduate Research Supervision/Examining

External

Year	PhD Candidate	Research Title	Commission Member	Institution
2021	Scott EASTMAN (Year IV)	Standardized Methodology for Implementing Applied Critical Geopolitical Discourse Analysis to Improve Forecast Accuracy	Prof Eric Gilder	"Lucian Blaga" University of Sibiu (Romania)
2021	Ecaterina Lia ILIȘ (Year III)	The Pandemic and the Infodemic: A Critical Discourse Analysis of Coronavirus-Related Fake News Published in English-Language Mass Media between January-May 2020	Prof Eric Gilder	"Lucian Blaga" University of Sibiu (Romania)
2021	Adina-Florina MILEA (Year III)	Language and Identity in American Sitcoms: Language and Culture	Prof Eric Gilder	"Lucian Blaga" University of Sibiu (Romania)
2021	Iulia Sărbătoare STĂICUȚ (Year III)	Discourse Analysis of Radical Muslim Clerics and its Role in the Online Era (European Impact: 2016 - 2020)	Prof Eric Gilder	"Lucian Blaga" University of Sibiu (Romania)
2021	Andreea Cotîrlea DIETRICH (Year II)	Theories of Politeness in Chinese and English PhD Thesis Acknowledgments	Prof Eric Gilder	"Lucian Blaga" University of Sibiu (Romania)
2021	Isabelle Nicole VOICU (Year II)	A Discourse Analysis of Paraphrasing.	Prof Eric Gilder	"Lucian Blaga" University of Sibiu (Romania)
2021	Nassir MORADI (Year II)	An Investigation of Metadiscourse Markers in "Suggestions for	Prof Eric Gilder	"Lucian Blaga" University of Sibiu (Romania)

		Further Research" Sections of PhD Theses		
2021	Daniela Lazăr DĂLĂLĂU (Year II)	A Literature Review of Metaphor Translation Studies	Prof Eric Gilder	"Lucian Blaga" University of Sibiu (Romania)
2021	Crina-Bianca MIJA (FRĂȚILĂ) (Year I)	A Critical Discourse Analysis of Media Portrayals of Military Leadership	Prof Eric Gilder	"Lucian Blaga" University of Sibiu (Romania)

Internal

CDS Department Postgraduate Supervision

Candidate	Program	Year	Supervisor(s)	Research Topic
David GELA	PhD	2	Prof Gilder/Dr Aisoli-Orake	Effective Organizational Communication is a Tool to Drive Efficient Services: A Case Study of Simbu Province in Papua New Guinea.
Ngawae MITIO (retired 8 February)	MPhil	3	A/Prof. Sali, Prof. Gilder	An Investigation of Challenges of Sustainable Development in Bulolo District: A Case Study of Seven Biangai Villages of the Wau Rural LLG of the Bulolo District.
Desley ALU	MCS	2	Dr Aisoli-Orake, Prof Gilder	Communication in the Division of Education of Morobe Needs Improvement for Development in this Technology Era.
Chevelyne ANTONIMBI ┼ (passed away, 9 July)	MCS	2	A/Prof Sali, Ms Ambelye	Cultivating Students' Deviant Behaviors in Educational Institutions in Papua New Guinea through Communication. A Case Study of Secondary Schools In Lae City, Morobe Province.
Kimson LAZARUS	MCS	2	Prof Gilder, Ms Ambelye	Impact Of Ineffective Communication On Social And Economic Development For Logging Industries In

				Papua New Guinea: A Case Study Of Amanab Forest Management Agreement (FMA) Project In Vanimo, West Sepik Province From 2018-2021.
Hendrix NEKI	MCS	2	A/Prof Sali, Prof Gilder	Impacts of Tribal Fights on Development in the Eastern Highlands Province: A Case Study of Kainantu District From 2020-2021.
Rebecca N POMAT	MCS	2	Dr Aisoli-Orake, A/Prof Sali	Investigation into the Newly Introduced Degree Program in Primary Teachers College to Develop an Understanding of its Effective Implementation in 2020-2021.
James YAWING	MCS	2	Ms Ambelye, Dr Aisoli-Orake	Effects of High Illiteracy Rate of School-Age Children in the Rural Areas of Mumeng, Bulolo District, Morobe Province, 2020: A Case Study.
Jacob ZUA	MCS	2	A/Prof Sali, Dr Aisoli-Orake	The effectiveness of Developing English (L2) Competency using Four Communicative Approaches in the Standard-Based Curriculum: A case study of students in the remotest Primary Schools in Kabum District.
Derrol BUGEN	MCS	1	Ms Ambelye/ Dr Aisoli-Orake	Communication Barriers between Rural Communities and NGO Project Interventions and how it hinders Sustainability.
Bethelle KASIR	MCS	1	Prof Gilder/ Dr Aisoli-Orake	A Communication Approach to Challenges in the Capabilities of the PNGDF Engineer Battalion on Troop Deployment at Local and Regional Fronts, 2022.
Noah KILIP	MCS	1	A/Prof Sali/ Prof Gilder	A Study on White-Collar Crime as a Challenge towards Morobe Provincial

				Government Development Strategies: The Case of Governor's Office in 2020.
Jacquline OMBEBA	MCS	1	Dr Aisoli-Orake/ Ms Ambelye	An Exploratory Approach to Use Social Media for Blended Learning for Upper Secondary Schools During the COVID-19 Pandemic In Morobe Province.
Jairus ORERE	MCS	1	Prof Gilder/ Dr Aisoli-Orake	The Effects of Communication on Good Governance: A Case Study on Oro Bay LLG area in Ijivitari, Oro Province in 2022.

Notes:

1. For MCS research students, the principal supervisor is primarily responsible for the research outcome; the co-supervisor is available for student consultation.
2. For MPhil and PhD scholars, both principal supervision and co-supervisor are responsible but the former directs the research project.

Undergraduate Supervision

CD 472 – DISSERTATION: Communication in Resource Development

Research Topics & Supervisors - 2021

Student	Supervisors	Research Topic
1. ADE, Joel	Prof Gilder	The Impact of Accommodation Facilities on Students' Academic Performance and Achievement: A Case study of the PNG University of Technology, Lae, Morobe Province.
2. AGOROFA, Hadasha	Dr Aisoli-Orake	The Impacts of Gambling on PNG's Development: A Case Study of Health Workers in Kainantu, EHP in 2021.
3. ALAUNG, Annalis	Mr Milba	The Effect of increasing Unemployment Rates in Lae City. A Case Study on Ward 1, Kapiak Settlement and Ward 16-Kamkumung Settlement.
4. ALIKANG, Charles	Mrs Maino	Quality Educational Programs and Policies: An Investigation on the Performance of Higher Education Loan Program (HELP) to the Students at the PNG University of Technology Between 2020 and 2021. A Case Study.
5. AVI, Betty	Mr Jesse	An Investigation to Identify the Impact of Water Supply Problem in Groroka Urban Area, EHP.

6. BENENG, Brendon	Mr Kuri	Negative Effect of Lae's Second-Seven Dump on Surrounding Communities' Children, Ages 1-10 [*Note*: No consultation sought by student].
7. EDNA, Julien	Mr Sefo	Measures to Minimize the Petty Crimes in the Urban Centres of PNG: A Case of Lae City (Market,Eriku & Town), Morobe Province, PNG.
8. GABI, Getrude	Mr Sangundi	Social Media's Role in Disseminating Information in Papua New Guinea: A look at Facebook's Role in Disseminating Information on COVID-19.
9. GENEWA, Chris	Mr Paul	Assessing the Effectiveness of Online Learning on Students' Performances with Contrast to Traditional Classroom Learning: A Case Study of PNGUoT, 2021.
10. JAMES, Casmia	Mrs Moka	Assessing the Effectiveness of Online Teaching and Learning at PNG University of Technology: A Case study of the Dept. of Communication Development Studies.
11. KAEOK, Jonah	Mr Jesse	An Investigation to Understand the Underlying Factors Causing Police Brutality in PNG. The Case of Lae City.
12. KEMA, Jamystan	Mr Wrondimi	The Impact of Crime on Socioeconomic Development in Lae City. A Case Study of Awagasi Suburb (2017-2021).
13. KEPEI, Roslyn	Mrs Maino	The Impact of Intimate Partner Violence by Men: A Case Study of Kamkumung Suburb.
14. KONJIPOL, Cloudia	Ms Ambelye	A Case Study: The Negative Impacts of Polygamous Marriage in the Behaviours, Emotions and Academic Performances of Teenage Children in Kapiak Street, Ward 1, Lae, Morobe Province in 2021.
15. KOP, Elizah	Mr Sefo	A Need for Foster Care Home Centre to Shelter Homeless and Helpless Children. A Case Study in Eriku, Lae, Morobe Province in 2021.
16. LOKES, Channellie	Mr Sangundi	Addressing the Effects of Unemployment on Individuals at East Taraka.
17. MALAHA Raymond	Mr. Kuri	Accessible Building and Infrastructure Promotes Inclusive Education: A Case Study of Assessment on Accessibility of Building & Infrastructure in PNG University of Technology by Students and Staff with Mobility Limitation, 2021[*Note*: No consultation sought by student].
18. MANA, Michael	Mr Winuan	Effective Communication Strategy Required to Address Poor Water and Sanitation at Uni Block Settlement in Lae, Morobe Province.
19. MEALO, Paina	Mr Starza	Underserved Urban Communities in PNG: A Case Study of Ward 2, Lae ULLG, Morobe Province.
20. OBU, Rick	Mr Sangundi	The Negative Effect of Marijuana: A Case Study of Kainantu Urban Local Level Government in 2020.

21. OSO, Lisa	Mrs Moka	Impacts of Ethnic Conflict on students' Academic and Social Development: A Case Study of Unitech Students from the Highlands region.
22. PUY, Peggy	Mr Jesse	The Impact of Ineffective Communication Between the Leader and Communities that Affect Development programs LULLG – Ward 1.
23. SENES, Elizabeth	Mr Winuan	An investigation on the Issue of Interpersonal Communication to Address Water Supply and Sanitation Issues. A Case Study of Gabensis Villages in Morobe Province.
24. TAILAM, Esther	Dr Aisoli-Orake	Negative Influence of Social Media on Undergraduates' Academic Learning: A Case Study of Students of the PNG University of Technology, Taraka Campus, Lae – 2021
25. TAPIT, Hedwig	Mr Wrondimi	Effective Communication Strategy in Resolving Squatters Eviction at Portion 50 in Kavieng Town: A Case Study of Portion 50 in New Ireland Province.
26. TOKUNAI, Joanne	Mrs Maino	The Impact of Clustered Housing on Public Health: A Case Study of Talair Compound.
27. TERIKIAN Abraham	Mr Paul	COVID-19 Fostering Rise to Crime and Substance Abuse. A Case Study of the Igam Block.
28. KAKINORU, Nigel	Prof Gilder	[Never submitted a document]
29. LUPISA, Raymond	Mr Sefo	[Unofficially withdrew from studies]
30. SENGI, Alexius	Prof Gilder	[No research title; very late submission]

DEPARTMENT OF ELECTRICAL AND COMMUNICATION ENGINEERING

Head of Department: Dr Joseph Fisher

Introduction

Electrical and Communications Engineering is a science-oriented field concerned with many disciplines, such as power systems engineering, electronics, communications engineering, electromagnetics, control systems engineering, and computer engineering. In addition, it covers many other sub-disciplines, such as electric machines, power electronics, antennas and propagations, instrumentation and process control, mechatronics and robotics, industrial electronics, automation biomedical engineering, consumer electronics, sensors and measurements, and computer networking. The electrical engineering curriculum is built around a robust essential core of mathematics, physics, and engineering provides teaching and training activities in the classroom and the laboratory exercises. Engineers Australia has granted the current curriculum Provisional Accreditation status. Recent progress in gaining full accreditation status is ongoing.

Further, the Department offers postgraduate degree programs leading to Master of Philosophy (MPhil) and the newly approved Master's by course work leading to the Master of Science (M.Sc.) in Communications Engineering. The Department also offers a PhD program in Communications or Power Engineering.

The courses taught in Communications Engineering are aimed to deepen the knowledge and skills of students on the basic concepts and theories to equip them in their professional work involving analysis, systems implementation, operation, production, and maintenance of the various technologies, such as computer network, the cellular services that include the Global System for Mobile (GSM) communications, Code Division Multiple Access (CDMA) protocols used in 2G and 3G wireless communication, and the Long Term Evolution (LTE). The LTE is a high-speed wireless communications technology that many modern cell phones and cellular devices use as 4G and 5G. Further, the students also broaden their knowledge in other technologies such as radar and sonar, which are detection systems that use radio waves

to determine the range, angle, or velocity of objects in air or water. For example, radar systems can be used to detect aircraft, ships, spacecraft, guided missiles, motor vehicles, weather formations, and terrain. The students also study computer networking and intelligent electronics devices that drive the Internet of Things (IoT). IoT is simply a network of devices such as vehicles and home appliances containing electronics, software, sensors, actuators, and connectivity, allowing these things to connect, interact, and exchange data.

Similarly, power systems engineering is a discipline of Electrical Engineering that deals with the interconnections of generation, transmission, distribution, and utilization of electric power and electrical equipment. It is an electrical grid that delivers electricity from producers to consumers. The electrical grid is currently going through a drastic transformation into what is known as a Smart Grid. The shift in traditional power systems grids to integrate renewable distributed generations significantly reduces carbon dioxide emissions and provides a secure and resilient power supply. In addition, the development of smart grid systems allows for two-way communications between the electric utility and its customers, and the sensing along the transmission lines makes the grid more efficient, more robust, and more resilient to disruptions.

The PNG University of Technology is the only University in Oceania apart from the universities in Australia, New Zealand, and Hawaii (a State of USA) specializing in Engineering and Technology. Its research plan focuses on producing undergraduate and postgraduate students who are competent to be top-class engineers and managers. In addition, the graduate engineers, should position themselves as advisors and wealth generators for the country and the region. Moreover, recognizing the importance of both research and research-intensive universities to developing knowledge economies, it is pertinent that the university generates new knowledge and new technology relevant to national needs. This will alleviate dependence on hiring expertise from abroad, enabling national engineers and researchers the needed technical and research expertise to attract foreign industries to invest in Papua New Guinea and produce a local job market that is of economic benefit to the nation.

The undergraduate program covers mathematics and physics in addition to the core curriculum in either power engineering or communications engineering and other required electives. The program enables students to specialize in any one of the following two areas: Communications and Power Engineering. In the final year of their studies, students undertake research projects on various topics in Electrical Engineering. The students show their ingenuity and innovation

in researching different prototypes, undertaking simulation models, and presenting their work at the end of the academic year. The research projects are designed to trigger students' engineering curiosity and find new methodologies to foster innovative design that employ the synergistic effect between design and innovation as the key in promoting engineering ingenuity.

The postgraduate research activities are ongoing, with four (4) candidates now enrolled in the PhD programs and 7 students undertaking master's degree. One of the key priority areas is the implementation and sustainability of staffing. The Electrical Engineering Department plans to have about 70% of the entire academic cadre arder filled by national staff members. The Department is focused on the next 10 years to have a minimum of 90 % of national PhD degree holders who will be able to work together, giving significant research leadership in the global scenario. A list of postgraduate candidates is provided in Table 1.

Table 1 List of 2021 Postgraduate Research within the Department

	Researcher's Name	Degree	Research Title	Status
1	Mr. David Chen	PhD	Robotic Arm on Open Source Platforms	On going
2	Mr. Sammy Aiau	PhD	Renewable Energy Sources for Morobe Province and Future National Smart Grid for PNG	On going
3	Mr Gibson Kupale	PhD	Challenges in PNG Electricity Network Security and Reliability Trends	On going
4	Mr. Herman Kunsei	PhD	Using Perception ANN with Different Triggering Functions for Linear and Non-linear Array Arrangements	On going
5	Mr Sylvester Tyrones	MPhil	Design of Microcontrollers Based Smart Battery Management System Enhancement for Off-grid Remote Homes	To graduate
6	Charlie Urame	MPhil	Design and Implementation of Hybrid Pico-hydro –Photovoltaic Solar Power Plant in Massy-Gahuku LLG.	To graduate
7	Mr Mathew Pua	MPhil	Rural District Electrifications with PV/Diesel Integrated System.	To graduate
8	Mr Issiah Koldai	MPhil	Design of Renewable Energy Based Micro-grid for Rural Electrification: A case study on Salamua LLG Centre.	To graduate
9	Mr. Wilson Kepa	MPhil	Design of GSM Based Remote Distribution Transformer Condition Monitoring System	To graduate
10	Ms Serah Mako	MPhil	Analysis of Signal Strength and Bandwidth for Enhancement of Quality	On going

			of Service in PNG University of Technology	
11	Jacqueline Tantapua	MPhil	Interference Mitigation in Wireless Networks Coordinated MultiPoint Transmission Techniques(CoMP)	On going

Vision

To be at the cutting edge in teaching and research in the generation and application of electrical engineering knowledge in graduating globally competent professional electrical engineers of high ethics and human values.

Academic Priorities and Basic Commitments

The primary **academic priorities** for **phase one (2020-2021)** of the research plan was the following:

1. Integrate Research with Teaching and Learning
2. Connecting the academics with the community for its service
3. Make teaching and learning process compatible with industry
4. Recruitment and retainment of the best talents nationally and internationally academic staff.

Staff Research Areas

Professor Paul Hoole	Artificial Intelligence in engineering systems, Sensors including antennas, Lightning engineering, electromagnetic signals in safety and security systems, 5G/6G wireless technology for smart cities.
Dr Moses Kavi	Hybridizing and Control of Different Renewable Energy Technologies, Fuzzy and Expert System based controller Design, High Efficiency Solar/Wind Power System Design, Micro Hydro Power System Design and Implementation, Grid Connection of PV system, Design of High Precision and High Sensitivity Sensors, Real Time Computing and Control.
Dr Ashish Luhach	Soft Computing, Networks, Sustainable Computing, and Cyber Physical systems.
Dr Joseph Fisher	Interactions of Lightning with Aircraft and Structures, Power System Analysis, Power Electronics and Machines, Wind Energy Design, Photovoltaic Systems Design, Micro/Mini-Hydro Electric Power Design, Transmission/Distribution Line Design, Energy Audit and Energy Efficiency Technologies

Mr Sammy Aiau	Control Systems Engineering, Industrial Process Control, Electrical Power Systems, Renewable Energy (hydro, solar & wind), Smart Grids Energy Management, Virtual (Smart) Instrumentation Systems
Mr Herman Kunsei	Adaptive Array Antenna Systems for 5G and 6G Networks, Electromagnetic Health Hazard, Propagation Measurements for Wireless Systems, Computer Network Security, Reliability in Networks, and Data Security
Mr Gibson Kupale	Technical & nontechnical losses in Power Systems, Power System Protections, Renewable energy systems, Distributed Renewable Energy Generation. System Reliability & Security, and Field Excitation & Governor Control
Mr David Chen	Big Data Processing, Compiler Design, Internet of Things Wireless Networking and Signal Processing, Hardware Design, Data and Network Security, Business Process Modelling, Knowledge Management, and e-Learning.
Mr Joshua Yuanko	Optimization and Auto Scheduling Algorithms, Power Flow Control and Automatic Topology Reconfiguration, Power Systems Static and Dynamic Reliability, Grid Connected PV Plant Design and Modelling, Instrumentation and Microcontroller electronics.

Postgraduate Research Areas

The major research areas undertaken at the postgraduate level are:

(i) Electric Power Systems,

(ii) Renewable Electric Energy Sources, and

(iii) Advanced Wireless Technology.

Electric Power Systems

The Department is making significant in electric power systems through inter-disciplinary areas, including wireless technology applied to power system monitoring, renewable energy generators such as micro-hydroelectric generators and DC grids. In addition, research on lightning protection measures for transmission and distribution systems is being undertaken.

Renewable Electric Energy Sources

The Department is assessing the national grids from the perspective of systems reliability and contingency and improving systems reliability. The research assesses the reliability of the Ramu, POM, and Gazelle grids in PNG. The work will also consider the system performance from a reliability and sustainability perspective when grid extension is undertaken and the possible interconnection of renewable energy DC/AC systems to the main power grid.

Advanced Wireless Technology

The Department is undertaking research in improving the wireless systems in Lae City and within the University campus. The study involves the design of better data capacity and speed at economical costs and the possible use of the 5G system to replace the present system. Further, research work on the Port Moresby Jackson Airport for aircraft and tower communication and signaling systems, particularly addressing single glitches or interruptions, is underway.

List of Publications

1) Agarwal, R., Shekhawat, N. S., and Luhach, A. K. (2021). Automated classification of soil images using chaotic Henry's gas solubility optimization: Smart agricultural system. Microprocessors and Microsystems, 103854.
   Automated classification of soil images using chaotic Henry's gas solubility optimization: Smart agricultural system - ScienceDirect
2) Agha, A., Attar, H., and Luhach, A. K. (2021). Optimized Economic Loading of Distribution Transformers Using Minimum Energy Loss Computing. Mathematical Problems in Engineering, 2021.
   Optimized Economic Loading of Distribution Transformers Using Minimum Energy Loss Computing (hindawi.com)
3) Gopi, R., Sathiyamoorthi, V., Selvakumar, S., Manikandan, R., Chatterjee, P., Jhanjhi, N. Z., and Luhach, A. K. (2021). Enhanced method of ANN based model for detection of DDoS attacks on multimedia internet of things. Multimedia Tools and Applications, 1-19.
   Enhanced method of ANN based model for detection of DDoS attacks on multimedia internet of things SpringerLink
4) Kumar, P. M., Babu, G. C., Selvaraj, A., Raza, M., Luhach, A. K., and Díaz, V. G. (2021). Multi-criteria-based approach for job scheduling in industry 4.0 in smart cities using fuzzy logic. Soft Computing, 25(18), 12059-12074.
   Multi-criteria-based approach for job scheduling in industry 4.0 in smart cities using fuzzy logic | SpringerLink
5) Sahoo, K. K., Muduli, K. K., Luhach, A. K., and Poonia, R. C. (2021). Pandemic COVID-19: An empirical analysis of impact on Indian higher education system. Journal of Statistics and Management Systems, 24(2), 341-355.
   Pandemic COVID-19: An empirical analysis of impact on Indian higher education system: Journal of Statistics and Management Systems: Vol 24, No 2 (tandfonline.com)
6) Sahoo, K. S., Tiwary, M., Luhach, A. K., Nayyar, A., Choo, K. K. R., and Bilal, M. (2021). Demand-Supply Based Economic Model for Resource Provisioning in Industrial IoT Traffic. IEEE Internet of Things Journal.

Demand-Supply Based Economic Model for Resource Provisioning in Industrial IoT Traffic | IEEE Journals & Magazine | IEEE Xplore

7) Sahu, S. K., Mohapatra, D. P., Rout, J. K., Sahoo, K. S., and Luhach, A. K. (2021). An Ensemble-Based Scalable Approach for Intrusion Detection Using Big Data Framework. Big Data, 9(4), 303-321.
An Ensemble-Based Scalable Approach for Intrusion Detection Using Big Data Framework | Big Data (liebertpub.com)
8) Shao, T., Yang, X., Wang, F., Yan, C., and Luhach, A. K. (2021). Trusted Service Evaluation for Mobile Edge Users: Challenges and Reviews. Complexity, 2021.
Trusted Service Evaluation for Mobile Edge Users: Challenges and Reviews (hindawi.com)
9) Shen, X., Yu, H., Liu, X., Bin, Q., Luhach, A. K., and Saravanan, V. (2021). The optimized energy-efficient sensible edge processing model for the internet of vehicles in smart cities. Sustainable Energy Technologies and Assessments, 47, 101477.
The optimized energy-efficient sensible edge processing model for the internet of vehicles in smart cities - ScienceDirect
10) Wang, B., Shen, Y., Saravanan, V., and Luhach, A. K. (2021). Workplace safety and risk analysis using Additive Heterogeneous Hybridized Computational Model. Aggression and Violent Behavior, 101558.
Workplace safety and risk analysis using Additive Heterogeneous Hybridized Computational Model - ScienceDirect
11) Yang, F., Wen, X., Aziz, A., and Luhach, A. K. (2021). The need for local adaptation of smart infrastructure for sustainable economic management. Environmental Impact Assessment Review, 88, 106565.
The need for local adaptation of smart infrastructure for sustainable economic management - ScienceDirect
12) Zhao, W., Zou, Z., Wei, Z., Gong, W., Yan, C., and Luhach, A. K. (2021). Coauthorship Network Mining for Scholar Communication and Collaboration Path Recommendation. Security and Communication Networks, 2021.
Coauthorship Network Mining for Scholar Communication and Collaboration Path Recommendation (hindawi.com)

DEPARTMENT OF FORESTRY

Head of Department: Late Dr. Mex Peki

The Department of Forestry at the PNG University of Technology is the only institution in the South Pacific region that offers training in tropical forestry at the professional level. The Department has integrated Degree and Diploma curricula offered at the Taraka and Bulolo campuses. The *three-year* course leading to Diploma in Forestry is completed at Bulolo, while the *four-year* course leading to Bachelor of Science Degree in Forestry is completed at Taraka campus.

The Mission Statement of the Department is: *Recognizing the capacity of forests to generate large number of jobs for a given level of investment, the Forestry Department at Unitech was established to produce professionals, both men and women, with technical production skills and expertise needed to manage PNG's forest resources sustainably. A well-managed forest is an asset to local and national economies and the well-being of current and future generations.*

Education is the University's principal mission. The Forestry Department aims to provide high-quality academic and administrative support services not only for undergraduates but with an increasing focus on the training of postgraduate students. Our postgraduate program continues and further develops research skills that our undergraduate students began learning through Year 3 courses (especially 'Experimental Design'), culminating in Year 4 (Final Year Research Project).

Our overall educational challenge in forestry is to produce professionals, both men, and women, with the necessary technical skills. Foremost amongst these is the ability to solve problems. Our Department's research activities fundamentally fit into our educational mission to develop this problem-solving capacity. Achieving this goal requires the faculty to be well-versed in research and apply that knowledge through active research projects and programs.

The University's 2021 academic year has been affected by the ongoing impacts of the Covid-19 Global Pandemic, associated restrictions, and the National Government imposed State of Emergency (SOE). Progress of research activities at the Forestry Department in the 2021 academic year has been limited but guided by our Department's Five-Year Strategic Plan. This Plan is our first departmental articulation of the strategies and mechanisms by which we hope

to enhance our Department's research activity component. The Plan also points out significant current constraints in attaining our objectives that must be overcome at the university level. While most of our Department's research activities in 2021 have been affected by the ongoing impacts of the Covid-19 Global pandemic and the associated uncertainties, overall, the Department's ongoing research activities have been maintained throughout the 2021 academic year. Regardless of the tensions and set-back due to Covid-19, the Forestry Department still recognizes the University's overall Vision "*To* Grow *World-Class Technocrats for the Real World by 2024 and Beyond,"* in line with the implementation of the University's Strategic Plan 2020-2024. The Forestry Department will continue to implement its academic and research activities at the departmental level, contributing to the University's overall Strategic Plan in 2021 and beyond.

FOREST/FORESTRY RESEARCH THEMES

The Forestry Department has long recognized the multi-faceted value of Papua New Guinea's forests and, over the years, has woven this into its academic and research programs. Sustainable forestry in PNG requires a cross-disciplinary approach, which means blending aspects of the economy, social features, environment services, and climate change.

The Department structures its Research Development Plan and Post Graduate Study Program around several specific research themes as follow:

- ✓ Ecosystem and Environmental Services
- ✓ Sustainable Forest Management
- ✓ Forest Biology, Ecology& Biodiversity
- ✓ Forest (health) Protection
- ✓ Wildlife Management, Community-Driven Forest Conservation.
- ✓ Role of Forests In Climate Change
- ✓ Silviculture, Including Reforestation and Plantation Management
- ✓ Agro-forestry/ Social and Community Forestry and Multiple land-use
- ✓ Wood Science and Technology; Timber Products and Industries/Utilization
- ✓ Forest Engineering
- ✓ Forest Policy, Economics and Forest Product Marketing

- ✓ Appropriate Technology
- ✓ Remote Sensing and GIS
- ✓ Biomass Energy

SUMMARY OF FACULTY MEMBERS 2021

In the academic year 2021, Forestry Department had a total of 20 Academic Staff (Table 1).

Table 1: Academic Staff at Forestry Department (Taraka Campus and BUC)

Name	Position	Research Interests
Late Dr. Mex Peki *(Passed-on in October 2021)*	HOD & Senior Lecturer	Forest inventory including measurements and estimation of timber volume, biomass and carbon in plants (above ground).Sustainable Forest Management and Planning
Dr. Osia Gideon *(Retired in November, 2021)*	Professor	Present interests in research are broad, but can be grouped into the following broad areas: Plant systematics (specialist in the families Rubiaceae, Costaceae, Zingiberaceae, Portulacaceae & Begoniaceae); Plant diversity and Conservation; Reproductive ecology of PNG Plants; New Guinea Biogeography; History of New Guinea Botany (exploration and biographies of botanists); Sustainable use of biodiversity (traditional and contemporary uses); Forest Policy for responsible sustainable development.
Dr. Mohammed Jashimuddin *(Sabbatical contract expired in June 2021)*	Professor	Wood Science and Technology; Climate Change; Land-use Change and Classification; Forestry and Livelihoods; Co-management of Forest; Forest and Environmental Economics; and Ecosystem Services.
Dr. Cossey Yosi	Senior Lecturer	Tropical Forests Dynamics; Natural Forests Management; Forest Policy, Law and Legality; Natural forest Silviculture; Forest sampling; Payment for Forest Ecosystem Services; Climate Change and REDD+; Social and Community Forestry; Forest certification; Environmental impact studies
Mr. Peter Edwin	Lecturer 2	Wood science and technology; Forest management (Currently on PhD study leave at University of Melbourne)
Mr. Haron Jeremiah	DHOD & Lecturer 2	Forest Economics and marketing
Mr. Diaiti Zure	Lecturer 1	Natural forest Silviculture; Forest Genetics; Soil-plant-microbial interactions and nutrient dynamics under changing environmental conditions; Ecological and molecular

		responses of plants and trees (crops) to climate change; and Evolution, phylogenetic, and diversity of secondary medicinal plant metabolites (Currently on PhD study leave in Taiwan)
Mr. Leonard Wana	Lecturer 1	Forest Inventory & GIS
Mr. Billy Bau	Lecturer 2 Curator – Herbarium	Plant Botany; Herbarium Curation; Plant Taxonomy; Botanical Collection; and Ecological and Biodiversity studies.
Mr. Eko Maiguo[1]	Principal Bulolo University College & Lecturer 2	Silviculture and Forest Management
Mr. Louis Veisami[1]	Lecturer 1	Forest Mensuration and Inventory
Mr. Benson Gusamo[1]	Lecturer 2	Wood Science & Technology, Forest Products and Industries, Non-timber Forest Products, Bio-energy, Forest Protection, Timber Business, and SMEs
Mr. Bazakie Baput[1]	Lecturer 1	Community Forestry, Agroforestry and Forest Ecology
Mr. Olo Gebia[1]	Lecturer 1	Forest Ecology and plant biology; Forest biodiversity
Mr. Tombo Warra[1]	Technical Instructor 1	Plant Ecophysiology and Conservation Ecology
Mr. John Beko[1]	Lecturer 1	Silviculture and Plant Propagation
Miss Pricilla Menin1	Technical Instructor 1	Community Forestry, Communities response on forest plantation and projects
Mr. Leonard Hansutan1	Technical Instructor 1	Phytoremediation - plant/soil and toxic chemical relationship
Mr. Samson Aguadi[1]	Lecturer 1	Forest Enumeration through Imagery, Forest App Development and Forest Harvesting Operation Planning.
Mr. Koniel Alis[1]	Lecturer 1	Bio-energy and Sawmilling
Mr. Ryan Dagoro[1]	Technical Instructor 1	Modelling and Developing Web-based Geospatial Decision Support System Solutions for Sustainable Plantation Forests Management, Digitalizing and Automating Forest Management Tasks, Modelling Forest Management related Spatial Information Systems through integration of GIS/ Remote Sensing technologies with Artificial Intelligence Algorithms, Computer Programming and Data Science Technologies.

Gibson Sosanika[1]	Lecturer 1	Plant morphology and physiology, Plant Botany, Herbarium curation, Forest Ecology and Ecosystem functions, Forests seed conservation and species restoration, Forest ecosystem management.

Note: [1] Faculty member based at Bulolo University College (BUC)

ONGOING RESEARCH PROGRAMS IN THE DEPARTMENT - 2021

The Forestry Department has several ongoing research activities. However, most of those had been affected by the lasting impacts of Covid-19 and the associated restrictions of the Global Pandemic. Therefore, the Department's ongoing research activities are segregated according to general themes and briefly described in Table 2, noting the principal investigators involved.

The details of the ongoing research programs in the Department include the general themes of the research study, research project or topic, name of the principal investigator, and the research status in 2021 (Table 2).

The 2021 status indicates whether the particular research activity was active as of 2021 or an ongoing research study. Ongoing research studies are mainly undertaken as long-term, most of which are collaborative research projects funded by external agencies.

Table 2: On-Going Research Programs in the Forestry Department - 2021

GENERAL THEME	RESEARCH PROJECT / TOPICS	PRINCIPAL INVESTIGATOR	2021 STATUS
1. Ecosystem and Environmental Services	1. Estimating CO_2 sequestration from permanent sample plots: an investigation to inform the potential of payment for environmental services (PES) for Papua New Guinea communities.	**C. Yosi**	Completed, paper revised and submitted to Pacific Science.
2. Sustainable Forest Management	1. Estimating Exploitations Factors associated with Annual Allowable Cut (AAC) in timber concessions in PNG.	**C. Yosi**	Started in 2021. Work still in progress
3. Forest Biology, Ecology & Biodiversity	1. New Guinea species of Ficus in section Malvanthera (Moraceae).	**B. Bau**	Unpublished
	2. Floristic inventory of the Forestry Department Arboretum at the PNG University of Technology	**B. Bau**	Work still in progress
	3. Investigating Dynamics and Characterization of Biodiversity, Ecology, and Soil physical attributes within the natural green break forests of Bulolo Plantation, Morobe Province in PNG.	**O. Gebia, S. Aguadi and M. Karikara**	Work still in progress. Preliminary results presented in BUC internal Seminar.
	4. Fern Species Richness and Diversity in the Forest Ecosystems of Papua New Guinea.	**G. Sosanika**	Paper submitted to CASE STUDIES IN THE PRESS

	5. Seed Conservation of trees in Papua New Guinea Tropical Rainforests	**G. Sosanika**	Online database established in 2018. Work still in progress.
7. Silviculture, including Reforestation and Plantation Management	1. Validating model developed to estimate volume from the weight of Klinkii logs in Bulolo pine plantations.	**L. Veisami & E. Maiguo**	Work still in progress
8. Wood Science and Technology; Timber Production/Utilisation.	1. Physical, Mechanical and Wood Working Properties of *Trema orientalis* (L) Blume in PNG.	**S. Komut & B. Gusamo**	MPhil/2 Work still in progress
	2. Evaluating treatability of 28 plantation and secondary forest wood species of Papua New Guinea	**B. Gusamo**	Completed. Paper submitted to *Madera Ciencia y Technologia* for publication

POSTGRADUATE RESEARCH PROJECTS IN 2021

In 2021, the Department had eight (8) postgraduate research studies undertaken either as an ongoing program, in the final stages of thesis submission, corrections being carried out; or candidates being graduated (Table 3). Most of these studies were undertaken by students from other organizations outside the University, including PNG Forest Authority, PNG Forest Research Institute, New Guinea Binatang Research Center, and Ramu Agribusiness-ENBPOL. Seven (7) of these researches have been undertaken at MPhil levels, while one (1) had been upgraded to PhD level.

Towards the end of 2021, two (2) Mphil students have qualified to submit their final theses, and recommendations have been made to graduate, while one (1) MPhil student did not submit his final thesis.

The other postgraduate research studies will continue into the 2022 academic year (Table 3).

Table 3: Postgraduate Research Projects - 2021

#	STUDENT NAME	PG CODE	THESIS / RESEARCH TOPIC	PRINCIPAL SUPERVISOR	EXTERNAL SUPERVISOR	2021 STATUS
1	Nathan WAMPE	MPhil/2	Causes and motivation of Anthropogenic Grassland Fires in the Ramu-Markham valleys	Dr. Cossey Yosi		Proposal submitted. Student not communicating with Supervisor
2	Ben RULI	Mphil/2	Interlinkages between logging, forest conservation, health, well-being, and livelihoods in PNG and tropical forests globally	Dr. Cossey Yosi	Dr. Jo Middleton Prof. Vojtech Novotny	Research continuing into 2022
3	Steven KOMUT	MPhil/2	Physical, Mechanical and Wood Working Properties of *Trema orientalis* (L) Blume in PNG	Late Dr. Mex Peki	Professor M Hossain	Did not submit Thesis
4	Miller KAWANAMO	MPhil/2	Tree species diversity and forest structure in different vegetation types and disturbance levels	Prof. OG Gideon	Prof. Novotny	Study Terminated
5	Daniel OKENA	MPhil/2	Ecology of Mammal Communities Along Altitudinal Gradient in Papua New Guinea	Prof. O.G. Gideon	Prof. Novotny	Thesis submitted
6	Gabriel PETUAL	MPhil/2	Ecological role of alien species in early successional vegetation along a rainforest altitudinal gradient in Papua New Guinea	Prof. O.G. Gideon	Prof. Novotny	Thesis submitted
7	Alfred MANI	MPhil/2	Ecology of Plant-insect food webs in tropical forests of PNG	Dr. Cossey Yosi	Prof. Novotny	Did not submit Thesis
8	Hayden WAGIA	MPhil/2	The effect of 20-years El Nino extreme on the dynamics of lowland tropical rainforest in Papua New Guinea.	Late Dr. M. Peki	Prof. Novotny	Study incomplete. Upgraded to PhD

UNDERGRADUATE RESEARCH PROJECTS IN 2021

Table 4: Final Year Student Research Projects

No.	Student Name	Title	Principal Supervisor(s)	External Supervisor
1	AIPE, Robert	The economic importance of Non-Timber Forest Products in Mani forest communities in Jiwaka Province, PNG	Mr. Haron Jeremiah	
2	AMPAR, Samuel	Preliminary Survey on insect pest infestation on young *Eucalyptus pellita* plantations and their control measures in Markham Valley, Papua New Guinea.	Mr. Benson Gusamo	
3	ARINGA GARAP, Yureh	Identification of Common Medicinal Plants and their Use at the Png Unitech Taraka Campus	Prof. O. Gideon	Mr. Billy Bau
4	BOBO, Nicole	An assessment of indigenous tree species as potential seed sources within the National Botanical Gardens in Lae, Morobe Province	Mr. Billy Bau	
5	DAU, Jerrylyne	Effects of rooting media and indole 3-Butyric concentration on leafy stems cutting of Eagle wood (*Gyrinops ledermmannii* using misting propagation	Mr. Haron Jeremiah	Mr. Anton Lata
6	DOBU, Frank	Sawing properties of Rosewood and Hoop pine	Dr. Mex Peki	Mr. R. Iru
7	DONGO, Tracey	Herbarium based study of the reproductive phenology of 10 commercial tree species in papuasia (New Guinea to Solomon islands).	Prof. O. Gideon	Mr. Billy Bau
8	DUMA, Imelda	Natural resistance of ten Papua New Guinea secondary forest woods against subterranean termite using an accelerated field test.	Benson Gusamo	
9	ELPIS, Gilbert	To investigate the growth Performance of Pometia Pinnata under different Canopy cover	Mr. Billy Bau	
10	FANAMU, Rachel	Effect of ploughing on the growth and yield of Eucalyptus pellita in Dabua Markham Valley'.	Mr. Billy Bau	
11	GEREMBA, Stanley	Assessing productivity of Juncao mushroom in various coastal environment	Mr. Haron Jeremiah	Mr. Billy Bau
12	GWASO, Nakikus	Determination of the Volume of Commercial Logging Waste relative to terrain and initial Assessed Volume	Mr. Louis Veisami	Dr. Mex Peki
13	JOEL, Polin	Biodiversity Studies (Survey of Insects in the Lae Botanical Garden)	Prof. O. Gideon	

14	KALE, Carolyn	A Comparative Soil Seed Bank Study of Disturb and Undisturbed Area of the Lae Botanical garden	Prof. O. Gideon	Mr. Billy Bau
15	KAMBULIAGEN, Sonia	Assessing the Impacts of Land Use Change on Soil Carbon and Associated Nutrients in Morobe Province	Mr. Leonard Wana	Mr. Leroy Moripi
16	KAUT, Elijah	Influence of Rooting Media and Indole-3-Butyric Acid (IBA) concentration on adventitious root formation of *Cryptocarya massoy*	Mr. Haron Jeremiah	Mr. Anton Lata
17	KUK, Joshua	Comparing the heat capacity(Calorific Value) of Coconut shell and Husk with *Eucalyptus pelita* (wood chips)	Mr. Benson Gusamo	Mr. Koniel Towalis
18	KUNJIP, Amanda	Determining the optimum and toxic rate of fertiliser on *Eucalyptus pelita* seedlings	Mr. Leonard Wana	Dr. Desmond Stackpole
19	LOE, Timothy	Assessing Impacts of Natural Forest Gap Size on Major Soil Organic Nutrient Concentration at Topographical Grading in a Lowland Rainforests	Mr. Bazakie Baput	Mr. Leroy Moripi
20	MAIGUO, Natasha	Decomposition Rate of Waste & Used A4 papers in Unitech Dump Site	Dr. Mex Peki	Prof. Jashimuddin
21	MEIMBA, Daniel	Eucalyptus and the Environmental Implications	Prof. Jashimuddin	Dr. Cossey Yosi
22	NANDI, Joel	Change detection studies in the Kaiapit District of Morobe Province	Mr. Leonard Wana	
23	REI, Cholai	An Examination of Mechanical Properties of *Eucalyptus torrelliana* and its Potential End-use.	Mr. Benson Gusamo	
24	ROLAND, Moses	Studying of the C-Factor in the Revised Universal Soil Loss Equation (RUSLE)	Mr. Leonard Wana	
25	SAMSON, Mekeny	Testing the mechanical strength of PNG Timber species (*Calophyllum Inophyllum*) for slow growth and fast growth levels at Bumsis, Morobe Province, PNG.	Prof. Jashimuddin	Mr. Benson Gusamo
26	SOKO, Terryman	Investigating Human Encroachment on Ramu Agri Industries Limited Forest Rehabilitation Sites in Ramu Valley, Papua New Guinea.	Dr. Cossey Yosi	

ONGOING RESEARCH COLLABORATION WITH EXTERNAL PARTNERS

Apart from internally funded research programs, the Forestry Department has been conducting several collaborative research studies with external partners. However, the Department's 2021 research year has been terrible because of the uncertainties created by the Covid-19 Global Pandemic and the National Government imposed SOE restrictions and rules.

As of 2021, Forestry Department had one (1) research collaboration with external partners. This research project has been supported by the Australian Center for International Agricultural Research (ACIAR) Alumni Research Support Facility (ARSF) through a research grant awarded to Dr. Cossey Yosi.

The details of this internationally supported research project in the Forestry Department in 2021 are given (Table 5).

Table 5: Research Collaboration with External Partners

RESEARCH PROJECT TITLE	SPECIFIC RESEARCH TOPIC / PRINCIPAL INVESTIGATOR	COLLABORATION PARTNERS	FUNDER / SPONSOR	2021 STATUS
1. Sustainable levels of timber harvesting in PNG	Estimating Exploitation Factors associated with Annual Allowable Cut (AAC) in Timber Concessions in PNG. Dr. Cossey Yosi – Principal Investigator	Professor Rodney Keenan, University of Melbourne, Australia.	ACIAR Alumni Research Support Facility (ARSF)	Grant awarded in December 2020 and research started in September, 2021

PUBLICATIONS IN JOURNALS / PUBLISHED PROJECT REPORTS - 2021

Little progress has taken place at our Department in terms of involvement of our academic staff in the publication of scientific articles in the 2021 research year. This has been mainly due to limited participation of our academic staff however, one (1) scientific paper has been published by an academic staff of our Department and two (2) manuscripts have been submitted to international journals for consideration for publication. The details of these manuscripts are contained in Table 6.

Table 6: Forestry Department Publication Details in 2021

STAFF NAME	MANUSCRIPT DETAILS / TITLE / STATUS
1. Leroy Moripi	1. Moripi, L. 2(021). Modeling Soil Carbon Stocks in Morobe Province, PNG. ***Case Studies in the Environment*** **(2021) 5 (1): 1426687.** **https://online.ucpress.edu/cse/article-abstract/5/1/1426687/118299/Modeling-Soil-Carbon-Stocks-in-Morobe-Province-PNG?redirectedFrom=PDF** 2. Sam, N., Nimiago, P., Gaima, T., Gamung, M., **Moripi, L.**, Matsuura, Y., Sumareke, A., Walters, J., Haraguchi, M., Abe, H., and Mcintosh, P. (2021). How much Carbon Do the Soils of Papua New Guinea Forests Contain?: A Preliminary Assessment Based on the Multipurpose National Forest Inventory Soil Survey. ***Case Studies in the Environment*** **(2021)** https://online.ucpress.edu/cse/article-abstract/5/1/1424133/118395/How-Much-Carbon-Do-the-Soils-of-Papua-New-Guinea?redirectedFrom=fulltext
2. Dr. Cossey Yosi	1. Yosi, C. (2021). Estimating CO_2 sequestration from permanent sample plots: an investigation to inform the potential of payment for environmental services (PES) for Papua New Guinea communities. Manuscript revised and re-submitted to *Pacific Science.*
3. Mr. Benson Gusamo	1. Gusamo, B. (2021). Evaluating treatability of 28 plantation and secondary forest wood species of Papua New Guinea. Manuscript submitted to *Madera Ciencia y Technologia* for publication.

	2. Gusamo, B. & Towalis, K. 2021. Comparative evaluation of combustion characteristics of *Araucaria cunninghamii, Intsia bijuga* and *Pometia pinnata* for bio-energy source. Manuscript submitted to *Forest Journal MDPI* for publication.

SEMINAR /WORKSHOP AND CONFERENCE

FORESTRY DEPARTMENT SEMINARS HELD IN 2021

The Forestry Department Seminars for 2021 have been affected dramatically by the uncertainties associated with the Covid-19 Global Pandemic and the associated restrictions. The Department could not get seminar presenters outside the University to present their research studies. However, the Department maintained the ongoing research by our postgraduate and undergraduate students and our academic staff at both the Taraka and Bulolo campuses. Considering the restrictions associated with the National Government imposed SOE, the Department had the opportunity to have a seminar delivered by two (2) of our Department postgraduate students undertaking their Mphil studies. Table seven (7) gives details of the seminar presented by our postgraduate students in 2021.

Table 7: Forestry Department Seminar Conducted in 2021

DATE	PRESENTERS NAME	ORGANISATION	PRESENTATION TITLE	SUPERVISOR	2020 STATUS
10/03/2021	Daniel OKENA	Forestry Department, PNG Unitech	Ecology of Non-volant Mammal Communities along altitudinal gradient in Papua New Guinea	Prof. O.G. Gideon	Seminar delivered
10/03/2021	Ben RULI	Forestry Department, PNG Unitech	Interlinkages between logging, forest conservation, health, well-being, and livelihoods in PNG and tropical forests globally.	Dr. Cossey Yosi	Seminar delivered

STAFF SEMINAR PRESENTATIONS OUTSIDE THE FORESTRY DEPARTMENT

While our ongoing research at the Department have been maintained throughout 2021, staff were unable to present some of their work outside of the University in conferences, seminars and workshops. This was mainly due to the Covid-19 Global Pandemic and the associated restrictions of the National SOE imposed by the Government. However, a few staff members had opportunities to attend, participate, and present papers online in workshops and conferences via Zoom Meetings organized outside the University.
The details of the online meeting attendance and participation by the Forestry Department staff in 2021 are given below;

Presentation of Research Papers:

1. Online Research Paper Presented by Gibson Sosanika in 2021.

a) Attended and presented an online paper titled *Fern Species Richness and Diversity in the Forest Ecosystem of Papua New Guinea.* Zoom meeting funded by AusAID – Australian High Commission Lae on Australasian Systematic Botany Society Annual Conference 2021, held in Australia in July 2021.

Workshop, Seminar, and Conference Attendance:

1. Online Meetings attended by Dr. Cossey Yosi in 2021.

a) Attended online zoom meeting funded by UNDP GEF Small Grant Program, National Steering Committee Meeting, held on 02 March 2021.
b) Attended an online zoom meeting for the ACIAR ARSF Research Project with Professor Rodney Keenan of the University of Melbourne, held on June 2021.

1. Online Conference attended by Gibson Sosanika in 2021.

a) Attended as a panelist to discuss Seed Conservation (Seedbank Development) in tropical rainforest in Papua New Guinea. Online Zoom Meeting funded by Kew Gardens, UK, on Australasian Seed Science Conference in September 2021.

CONSTRAINTS

World-competitive research today occurs only when specific, mandatory infrastructure is present. Because forestry relies so much on fieldwork, reliable personal transport (4-wheel drive vehicle) is our foremost constraint. While lab space and overall research funding are general issues at PNGUoT, high-quality research is often possible in forestry at a surprisingly low cost. In addition, our lab space is good compared to other departments.

Less mentioned but probably the most fundamental to achieving world-competitive research, however, is access to relevant primary literature. This is woefully inadequate at PNGUoT: we rely on limited antiquated interlibrary loan hardcopies, plus a few free access journal networks provided by non-profit institutions that do not access many forestry journals. In contrast, researchers overseas enjoy electronic access via an appropriate level of subscription to the Web of Science that would include a spectrum of high calibre Forestry and related journals. Expatriate faculty and certain senior national faculty suffer less from this deficiency if they have library connections (via overseas schools they attended, overseas advisors they studied under, etc.), or can pull in literature during overseas annual leaves (i.e. Expatriates). Faculty lacking such connections are at a disadvantage within the Forestry Department and more generally in the University. Currently, it is the national faculty who have not recently gone on overseas study leave who suffer disproportionately; it is essential that this inequality be recognized and addressed through much-improved university-wide access to the primary literature.

Generally, the major constraint for research in the Department in the academic year 2021 was the restrictions and rules imposed by the National Government under the SOE as part of the control measures of the Covid-19 Global Pandemic.

The Forestry Department hopes that as the Global Community and PNG are adapting to the new normal resulting from Covid-19 and the vaccination program rolled-out throughout the country, academic life at Unitech and the associated activities including research will return to normal in 2022, if not soon, so that activities at our Department will operate smoothly without disruption.

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

Head of Department: Dr. Mohsen Aghaeiboorkheili

The Department of Mathematics and Computer Science is one of the largest Departments of Papua New Guinea University of Technology, with 23 academics and six support staff. The Mission of the Department of Mathematics and Computer Science is: To produce quality research and graduates in Computer Science and to give suitable Service Courses in Mathematics and Computing, to all other Departments at the University. In addition, the aim is to produce graduates in Computer Science of a high standard and comparable with similar graduates from other Universities in the Pacific Region, and who can provide the development, critical evaluation, and application in their field for Papua New Guinea, and the Pacific.

This Department focuses on the training of graduate in Computer Science/IT and is located within the Taraka campus. The Department offers a four-year degree program leading to a Bachelor of Computer Science Degree, and in 2022, the Department is also embarking on introducing the new Mathematics Program. This Mathematics Program – Bachelor of Science in Applied Mathematics (BSAM) is not yet online and awaiting applications from candidates who wish to do this program. It may be starting in 2022 or will come online for students to apply in 2023. The DHERST has already approved this program, and the Department will accept applications from both School Leavers and Non-School Leavers manually but not online.

The world is accelerating with cutting-edge and innovative technologies, with the Internet proving to be of greater importance in everyday life – making information accessible instantly on media, such as smartphones, enabling us to access emails and social networks anywhere. To keep pace with technological development, the Department is committed to producing quality Computer Science graduates at the national and international level to be part of the wider community in designing and developing systems in the Tech industry. Our graduates are at par with other graduates from around the country and the Pacific because we train them to be the best they can be in their roles as IT Specialists.

Education is the University's principal mission. The Mathematics & Computer Science Department aims to provide high-quality academic and administrative support services not only for undergraduates but with an increasing focus on the training of postgraduate students. Our postgraduate programs will continue to strengthen and develop research skills that our undergraduate students learn through Year 4 (Final Year Research Project).

All in all, the educational challenge in Mathematics & Computer Science is to produce professionals, both men, and women, with the necessary technical skills, up-skilling its students to have the ability to analyze and solve problems. With this Department's interest in developing its problem-solving capacity, the Department's research activities fit into its education mission statement: producing professionals who can best critically analyze and evaluate to solve problems that need solving. To achieve the Department's aim, the Department themselves are not only are they well vested in research, but they apply that knowledge through active participation in research projects and programs.

The academic year 2020 – 2021 has been badly affected by the COVID-19 and the pandemic controller imposing stricter laws. However, the Mathematics & Computer Science Department embarked on precautionary approaches to allow research projects and programs to continue despite these limitations brought upon by this Pandemic (COVID – 19).

PRIORITY RESEARCH AREAS OF THE MCS DEPARTMENT

The UNITECH Department of Mathematics and Computer Science priority research areas are as follows:

1-**Numerical Analysis and Scientific Computing**

Many practical problems in science and engineering cannot be solved completely by analytical means. Research in the area of numerical analysis and scientific computation is concerned with the development and analysis of numerical algorithms, the implementation of these algorithms on modern computer architectures, and the use of numerical methods in conjunction with mathematical modeling to solve large-scale practical problems.

Key research includes: PDEs, ODEs, boundary value problems, integral equations

2-**Theoretical Mathematics**

Theoretical mathematics is the study of abstract mathematical structures which form the basic framework for the rest of the mathematical sciences. In large part, theoretical mathematics is inspired by intellectual curiosity. Theoretical mathematics provides the tools for scientific discoveries in the future, often in unexpected ways.

Key research includes: Discrete Mathematics, Analysis, Geometry and Topology, Number Theory

3-**Curriculum Management System (CMS)**

A Curriculum Management System (CMS), in its broadest sense, is an automated system which supports the entire curriculum process from planning to implementation to assessment.

Key research includes: Curriculum Design, Curriculum Mapping, Curriculum Collaboration, Curriculum Publishing

4-**Software Engineering**

Software engineering is the application of engineering concepts to software development. Its main goal is the creation, improvement, and maintenance of software. Software engineering takes into account engineering aspects like the hardware and software environment when working on a program.

Key research includes: Data mining semantic-web-mining, distributed computing, Database, Distributed system, Data warehousing, Green computing, GUI-graphical-user-interface, Mobile computing.

5-**Statistical Science**

The central purpose of Statistical Science is to convey the richness, breadth and unity of the field by presenting the full range of contemporary statistical thought at a moderate technical level, accessible to the wide community of practitioners, researchers and students of statistics and probability.

Key research includes: inter alia, the disciplines variously known as Statistics(and all sub-disciplines such as Biostatistics, Biometrics, Econometrics), Operations Research, Management Science, Quantitative Methods, Decision Science, and Analytics and for the application of the Statistical Sciences in all areas of human endeavor.

SUMMARY OF FACULTY MEMBERS 2021

In 2020, Mathematics & Computer Science Department had 21 Academic Staff. Two went away for their studies overseas, while four new staff joined this year in 2021, bringing the total to 23 Academic Staff (Table 1).

Name	Position	Research Interests
Dr. Mohsen Aghaeiboorkheili	HOD & Senior Lecturer	Numerical Methods, PDE, Boundary Value Problems.
Dr. Ursul Mihail	Professor	Topological Groups, Modules and Rings.
Dr. Chris Wilkins	Senior Lecturer	Programming Languages, Statistics, Probability Models.
Benson Mirou	Senior Lecturer	Software Engineering, Computer Networks, e-Agriculture.
John Lanta	Lecturer	Differential Equations, Statistical Modelling, Topological groups and rings.
Yaling Tapo	Lecturer	Computer Networks, Data Science
Lenz Nerit	Lecturer	Software Engineering, Reverse Engineering, Artificial Intelligence.
Peter Helebi	Lecturer	Big Data and Analytics, Machine Learning, Predictive Modelling, Data Science, Artificial Intelligence.
Raymond Kuna	Lecturer	Mathematical Modelling, Differential Equations, Topological groups and rings.
Doris Benig	Lecturer	Statistical Modelling, Probability Methods.
Sankwi Abuzo	Lecturer (TI)	Internet Programming, Online Examination Systems.
Bobby Angopa	Temporary Full Time (STI)	Applied Statistics.

Nicholas Puy	Lecturer (STI)	Image Processing, Machine Learning, Deep Learning, Data Science. Internet of Things (IoT)
Joel Tahie	Lecturer (STI)	Discrete Mathematical Structures, Graph Theory, Differential Equations.
Vincent Mbuge	Temporary Permanent Lecturer 1	Artificial Intelligence & Statistics.
Boas Andrew	Senior (TI) – Temporary	Statistics & Probability, Boolean Algebra, Algebraic Systems applied in Informatics.
Issac Angra	Part-Time Tutor	Linerisation of Nonlinear Systems using Numberical Approximation Techniques, Mathematical Modelling, Differential Equations, Complex Analysis.
Luke Kolalio	Temporary Full Time – Technical Instructor	Cyber Security, Computer Networking, Database, AI.
Malcolm Dopaim	Temporary Full Time – Technical Instructor	Data & Statistical Analysis using wavelength techniques, Differential Equations.
Samson Tom	Part-Time Tutor	Ordinary Differential Equations (ODE) with initial Conditions, Boundary Value Problems.
Alois Wemin	Part-Time Tutor	Differential Equations, Topological Groups, Semi-Groups.
Elis John	Part-Time Tutor	Internet Programming, Database.
Gordon Pogla	Part-Time Tutor	Cyber Security, Internet Programming.

POSTGRADUATE RESEARCH PROJECTS IN 2021

In this year 2021, the Department has on record thirteen (13) postgraduate research studies undertaken here at this University either as an ongoing program, in the final stages of thesis submission, corrections being carried out, or candidates awaiting graduation (Table 2). All of the studies are undertaken by students from within the Department (Mathematics and Computer Science) of this University. However, two of these students are studying outside of this University. They are studying overseas in India doing Master of Science (MSc) and Master of Philosophy (MPhil) by course work. In addition, these researchers have undertaken PhD, MSc, MPhil levels. Of these 13 postgraduate students, two (2) undertaking PhD, two (2) MSc (1 overseas and 1 in PNGUOT), nine (9) MPhil levels (8 in PNGUoT, and 1 overseas).

Table 2: Postgraduate Research Projects - 2021

#	STUDENT NAME	PROGRAM	THESIS / RESEARCH TOPIC	PRINCIPAL SUPERVISOR	2020 STATUS
1.	Benson Mirou	PhD 3	e-Agriculture	Dr. Kavi, Dr. Maino	Study in progress
2.	John Lanta	PhD 1	Bohr compactification of Alternative and Jordan rings	Prof. Ursul	Study in progress
3.	Boaz Andrews	MPhil/2	Least Squares Method: Linear and Non-Linear Regressions.	Prof. Ursul	Completed and awaiting process.
4.	Issac Angra	MPhil/2	Differential Equations.	Dr. Mohsen	On hold
5.	Raymond Kuna	PhD 1	Economic Modelling with Fractional PDEs	Dr. Mohsen	Yet to register.
6.	Luke Kolalio	MPhil/1	Cyber Security – How to detect intrusion in a network.	Dr. Ashish Kumar Luhach	Applied but Yet to register
7.	Malcolm Dopaim	MSc	On the study of Atmospheric Properties of Papua New Guinea based on statistical and Wavelet Analysis Techniques.	Dr. Felix Beslin Pereira	Study in Progress
8.	Alois Wemin	MPhil/1	Topological Ring	Prof. Ursul	Applied but Yet to register
9.	Gordon Pogla	MPhil/1	Cyber Security in FinTech	Dr. Ashish Kumar Luhach	Applied but Yet to register
10.	Nicholas Puy	MSc	Image Processing with Deep Learning.	Dr. Chandra Mouli P.V.S.S.R	Study in progress
11.	Sankwi Abuzo	MPhil/2	Online Learning System	Dr. Wilkins	Study in progress
12.	Joel Tahie	MPhil/Course Work	Discrete Mathematical Structures, Graph Theory, Differential Equations.	No supervisor yet	Study in progress. Generally covering the contents
13.	Bobby Angopa	MSc	Applied Statistics: Use of time series methods to determine a model to forecast Immigration rates into the capital city of PNG, Port Moresby.	Mr. Wamil	Yet to register

UNDERGRADUATE RESEARCH PROJECTS IN 2021

Table 3: Final Year Student Research Projects

No.	Student Name	Title	Principal Supervisor(s)
1	Esther Ameta	Implementation of English/Tok-Pisin translator.	Sankwi Abuzo
2	Noah Waima	Implementing a database system for the constitution of Papua New Guinea.	Sankwi Abuzo
3	Samuel Kenjau	Offline virtual assistant.	Sankwi Abuzo
4	Emmanuel Keslep	Balus Bus – A web-based app that facilitate airport transport assistance for passenger within Lae city.	Luke Kolalio
5	Joe Goma	Interactive Learning Management System.	Raymond Kuna
6	Glenmore Arava	Online Car Registration System (MVIL).	Yaling Tapo
7	Steward Kalan	Water Monitoring System Sensors.	Yaling Tapo
8	Rayven Wanmut	Western Province scholarship student Database System.	Yaling Tapo
9	Kuasmapa Noel	Packet Detection System	Yaling Tapo
10	Victor Daniaba	Wifi Infrastructure	Dr. Chris Wilkins
11	John Warisa	Speech Transcriptor	Dr. Chris Wilkins
12	Max Todol	Student Notice System	Dr. Chris Wilkins

13	Wendy Athlon	VPN on Public Network	Dr. Chris Wilkins
14	Paul Nimiago	Secure Data Transfer over Internet using Image Steganography.	Benson Mirou
15	Raphael Arpa	Implementation of Dual Stack (IPv4 and IPv6) on a local server in MCS department.	Benson Mirou
16	Carlos FaiParik	Automated Pay as you go Service.	Benson Mirou
17	Dulcie Sangin	Biometric Authentication System using Finger-Print technology for an online payment gateway.	Benson Mirou
18	Ramanga Harinke	UOT Maintenance Management System.	Peter Helibi
19	Simon Kunai	Software defined Security	Peter Helibi
20	Billy Rua	Crime Detection and Analysis using Machine Learning.	Peter Helibi
21	Garry Yasa	Online Application for Insurance services.	Peter Helibi
22	Yasmine Tabogani	Use of Machine Learning to monitor and detect when students are using anonymous proxy servers and VPNs to by-pass Wi-Fi restrictions.	John Lanta
23	John Kiaga	Crypto Currency	Dr. Chris Wilkins
24	Yrannittiah Pangu	Plagiarism	Prof. Ursul

PUBLICATIONS IN JOURNALS / PUBLISHED PROJECT REPORTS - 2021

Our Academic staff in the Department have been involved in publishing scientific articles in 2020 and 2021 this year. The details of these publications are contained in Table 4 and Table 5, respectively.

Table 4: Mathematics & Computer Science Department List of Publication in 2021

STAFF NAME	PUBLICATION DETAILS
Dr. Mohsen Aghaeiboorkheili	Aghaeiboorkheili, Mohsen, and Aezeden Mohamed 2021). Applications of mechanical engineering mathematics: Solving Neumann problem with discontinuous coefficients. Journal of Interdisciplinary Mathematics. 24 (5): 1429-1439.
Prof. Dr. Ursul Mihail	Mihail Ursul (2021). Continuum Nonisomorphic Rational Groups. Top. Proc. 58 (2021) pp. 125-129. (E-published on October 1, 2020).

SEMINAR /WORKSHOP AND CONFERENCE

MATHEMATICS & COMPUTER SCIENCE DEPARTMENT SEMINARS HELD IN 2021

The Mathematics & Computer Science Department Seminars for 2021 has been significantly affected by the uncertainties associated with the COVID-19 global pandemic. However, though it was tough to have someone from outside to make a seminar presentation, we could have one of our staff members, who is on study leave in India, do his presentation. The presentation was titled; ***"Water Billing System (Inventory System)"***. Nevertheless, of all these instances, the staff members (Mathematics & Computer Science) were able to present seminars at the Department's seminar presentations.

The details of the seminar presented by the Mathematics & Computer Science Department's staff this year 2021 are provided in Table six (6) below;

Table 5: Mathematics & Computer Science Department Seminar Conducted in 2021

DATE	PRESENTER'S NAME	ORGANISATION	PRESENTATION TITLE	TARGET AUDIENCE	2021 STATUS
17/02/2021	Dr. Mohsen Aghaeiboorkheili	MCS	JAB Ref (For Academic writing)	MCS Staff and other departments	**Done (Presented)**
10/03/2021	Dr. Mohsen Aghaeiboorkheili	MCS	Wolfram Mathematical tool	MCS Staff and other departments	**Done (Presented)**
24/03/2021	Mr. Lenz Nerit	MCS	tSMAS	Department Staff with two reps from other dept attended.	**Done (Presented)**
14/07/2021	Mr. Lenz Nerit	MCS	tSMAS	Department Staff with a rep from other dept attended.	**Done (Presented)**
25/08/2021	Mr. Lenz Nerit	MCS	tSMAS	Other departments	**Done (Presented)**
03/09/2021	Mr. Nicholas Puy	MCS	Water Billing System (Inventory system).	Housing and Estates.	**Done (Presented)**

STAFF SEMINAR PRESENTATIONS OUTSIDE THE MATHEMATICS & COMPUTER SCIENCE DEPARTMENT

While there was a talk of doing research work and presenting those research papers at the ***International Conference on Pure and Applied Mathematics*** to be held at Pacific Adventist University, due to the prolonged restrictions imposed due to the COVID-19 pandemic, the presentation is on hold.

CONSTRAINTS

Good and well-researched papers can be produced here at the Department should we have the necessary infrastructure and more-so the people needed for this to occur. This Department is understaffed; it has only one Professor and two Doctors (PhD). The only Professor that the Department has will leave at the end of November 2021. Therefore, the University administration should step in to help the Department bring in two or more Professors and boost what we have on the ground now. The other academics either have a Masters level or Under Graduate (Bachelor's) level, which makes it hard too as a department to establish most of what it can establish; however, the Department can do better given the need areas are addressed. The academics that the Department has on the ground are very hardworking. It just needs the igniting part where we have more Professors and Doctorate (PhD) holders are employed at this Department soon. The university can look into the required areas and sponsor more of our Master's and Bachelor's degree holders to further their studies and upgrade their qualification one level up. Until this is done, the Department can only do well in its research findings and etcetera. However, having said all this, this Department has recruited two senior lecturers in Mathematics. Job offers have already been sent to them, and they will join the Department at the beginning of 2022. They are joining us next year, and they are from Iran and Australia, respectively. The table below, Table seven (7) indicates how many positional vacancies the Department has on offer for the next year 2022. The positions have been advertised already this year for next year.

Table 6: Current positions on offer at the Department of Mathematics & Computer Sciences.

Position	Area/Field of Profession	Quantity	Position ID	Status
Lecturer I/II	Mathematical Statistics	x1	MA0 – 013	Open
Professor/Associate Professor or Senior Lecturer	Mathematics	x2	MA0-022 & MA0-023	Open
Professor	Computer Science	x1	MA0-021	Open
Senior Lecturers	Computer Science	x2	MA0-008 & MA0-009	Open

DEPARTMENT OF MECHANICAL ENGINEERING

Head of Department: Dr. Shoeb Ahmed Syed, Ph.D.

1. Introduction

The Department of Mechanical Engineering considers engineering research to be significant as it expands knowledge and discoveries of new products and services. Furthermore, it is research that leads to breakthroughs in engineering and technology. Research and experimental development comprise creative work undertaken systematically to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications.

Engineering research is the systematic investigation and study of materials and sources to establish facts and reach new conclusions, shaping peoples' understanding of the world around them. Research involves testing hypotheses and predictions using testable data and various scientific and engineering tools and methods.

2. Focused Research Areas

The department has decided to concentrate and focus on the following areas of research in mechanical engineering:

a) Design and Manufacturing
b) Energy and Environment
c) Materials Characterization
d) Engineering Education and Management

The department encourages faculty to conduct their research concentrating on the above areas.

3. Research Seminars

Departmental staff and postgraduate students are encouraged to present seminars regularly and often. In addition, the research coordinator is encouraged to schedule regular research seminars based on the above areas of research interest.

4. Faculty Research Interests

The following Table provides research areas of interest for the current faculty members:

Academic Staff	Research Areas
Dr. Shoeb A Syed, PhD	Numerical Modeling, Computational Fluid dynamics and Heat transfer, Combustion, Fluid-Structure Interaction, Turbulence, 2 or 4 stroke reciprocating engines, Renewable energy, Engineering Education, Design and Finite element modelling
Prof. N. Lambrache, PhD	Feature-Based 3D Computer-Aided Design, Finite Element Modeling, Vibration Analysis, Control Engineering, Robotics and Mechatronics, Mathematical Modeling of Dynamic Systems, Anisotropic Engineering Materials
Dr. K. Muduli, PhD	Operations Management, Decision Sciences, Supply Chain Management, Sustainable Development, Health Care, Waste Management, Ergonomics.
Dr. S. Wahid, PhD	Research in the Broader Area of Energy, Renewable/Sustainable Energy, Environment and Pollution, Heat Exchangers, Behavior/Control of Heat Flow at the Interface of Materials, Tribology, MEMS in Energy Exchange Applications.
Dr. G M. Arshed, PhD	Numerical Analysis, Fluid Dynamics
Dr. A. Mohamed, PhD	Biomedical, Corrosion, Failure Analysis, Materials and Manufacturing Processing, Non-Destructive Testing, Engineering Education.
Dr. R. Fono, PhD	Design and Manufacturing, Materials Development Characterization, Tribology.
Mr. J. Khallahle	On Study leave
Dr. Steve Korokan, PhD	Friction Stir Welding (FSW) Al-Al and Al-high Temperature Alloys; Smart Materials and other Alloys; Design and Manufacturing; Production of Fiber-reinforced Polymer (NFRP) Composites; Renewable Energy (Geothermal, Bio, Wind and solar) and Energy Policy
Mr. B. N'Drelan	Renewable energy – use of solar to provide power, efficiency management of renewable energy, Statistical analysis of Failure of mining equipment – the study of the properties of the mineral being mined and the effects on the life expectancy of equipment components, Safety Analysis of Causes of Accidents leading to analysis of design and even management of existing practices – looking at ethical implications, Water Supply for Coastal Villages; Municipal waste management and Unitech Campus as an experimental site.

5. Undergraduate Research Projects

The following are final year Mechanical Engineering Students projects offered in 2021 as part of the partial fulfillment of their degree:

No.	Suggested Description	Suggested by Lecturer	No. of Students
1	Waste Plastic Pyrolysis	Dr. S. Shoeb	1
2	Biodiesel Production Using Waste Cooking from Papua New Guinea University of Technology Mess	Dr. S. Korokan	2
4	Design of A Bio-Waste Digester at PNG Unitech	Dr. S. Shoeb	2
5	Implementation of FMEA of fire hydrant in UNITECH Campus	Dr. R. Fono	1
7	Reconnection of Urr Water Supply to Kundiawa Town, Kundiawa-Gembogl District, Simbu Province	Dr. G. Arshed	2
8	Design of Solar-Powered Water Purification System for Use at Villages in PNG	Dr. G. Arshed	2
9	Development of a Smart Warehouse Inventory Management Framework	Dr. K. Muduli	2
10	Micro-Hydro Power Scheme	Dr S. Wahid	2
11	Designing a Parabolic Solar Cooker for Practical Household Usage in Alukuni and Keapara in the Central Province	Dr. S. Shoeb	2
12	Design, Evaluation and Fabrication of Flat Rotating Die Household Pellet Mill for The PNG Unitech Agricultural Farm	Dr. S. Shoeb	2
13	Simple Affordable Water Pump	Dr. R. Fono	1
14	Mitigation of Corrosion on Mild Steel Structure near a Stagnate Pool of Water from Air Condition.	Dr. R. Fono	2
15	Design, Analysis, and Costing of The Api650 Welded Vertical Storage Tank in Loloho, Arawa.	Dr G. Arshed	2
16	Water Supply for Coastal Villages affected by high tides and lack of freshwater sources	Mr. B. N'Drelan	2
17	Municipal waste management and Unitech Campus as an experimental site	Mr. B. N'Drelan	1
18	Design and Fabrication of a safe and hazardous less flue gas/ smoke incinerator for the PNG Unitech Campus	Mr. B. N'Drelan	1

19	5 Degrees of Freedom Robot on Arduino Platform	Prof. N Lambrache	1
20	Production of Biodiesel from Used Cooking Oil	Dr. S. Korokan	3
21	Design Implementation of Existing Anode system	Dr. Mohamed	1
22	Designing of SACP System for Anti-Corrosion Coated Underground Carbon- Steel Pipeline with Span Length of 100 Meters and Burial Depth of 1 Meter	Dr. Mohamed	2
23	Design Cathodic Protection to Suit Existing Underground Storage Tanks	Dr. Mohamed	1
24	Determining Life of Existing Anode for the Cathodic Protection System for Puma Energy's Lae Aircorps & Speybank Terminal	Dr. Mohamed	2
25	Alcohol Detection and Vehicle Ignition Locking System (ADVILS)	Dr. Mohamed	2
26	Investigating Corrosion on Carbide Lime Storage Tanks	Dr. Mohamed	2
27	Modeling of Corrosion Under Insulation of Carbon Steel Insulated Underground Pipes Using Fuzzy Logic	Dr. Mohamed	2
28	Root Cause Failure Analysis & Maintenance of Regrind 3C Sump Distribution Box Dislodge at Ok Tedi Mine Processing and Milling	Dr. Mohamed	2
29	Design for Mini Hydro Power Plant in Matehau Village, Eastern Highlands Province	Dr. Mohamed	1
30	Designing and Fabrication of An Improved Sago Starch Extractor for Local Sustainability	Dr. Mohamed	1

6. Postgraduate Student Research

The following projects are being conducted by our Postgraduate Students:

Item	Research Projects	Status	PG student
1	Failure of Components and Systems in Alluvial Mining Engineering – Impact on Inventory Management	Dissertation Submitted for Review	Brian N'Drelan (PhD)

2	Improve Established Sacrificial Anodes of Reinforced /Steel Structures to Impressed Current CP System in Puma Energy Throughout PNG	Finished (Graduating in 2022)	Noel Martin Id No. 20800513 (Master's)

7. List of Publications

Journal Papers:

1. Aghaeiboorkheili, M., and Mohamed, A. (2021). Applications of mechanical engineering mathematics: Solving Neumann problem with discontinuous coefficients, *Journal of Interdisciplinary Mathematics,* Vol. 24 (5): 1429-1439.
2. Behera, R. K., Samal, B. P., Panigrahi, S. C., Muduli, K., Mohamed, A., and Samal, A. (2021). Evaluation of magnesium recovery in Al-Mg alloys produced by modified stir casting method using genetic algorithm optimisation technique. *International Journal of Materials Engineering Innovation*, Vol. 12 (2): 134-148.
3. Ben, J., Mohamed, A., and Muduli, K. (2021). Effect of Preventive Maintenance on Machine Reliability in a Beverage Packaging Plant. *International Journal of System Dynamics Applications* (IJSDA), Vol. 10 (3): 50-66.
4. Bihari, A., Dash, M., and Mohamed, A. (2021). Behavioral Finance and Prediction Modelling for Sustainable growth of Investment Decisions Using Multiple Regression Analysis, Empirical Economics Letters, Vol. 20, (1), 23-33.
5. Dash, M., Shadangi, P. Y., Muduli, K., Luhach, A. K., and Mohamed, A. (2021). Predicting the motivators of telemedicine acceptance in COVID-19 pandemic using multiple regression and ANN approach. *Journal of Statistics and Management Systems*, Vol. 24 (2): 319-339.
6. Kelvin, D., and Mohamed, A. (2021). Improving Quality of Work-Life Programs Increases Organizational Performance: A Case of National Academics at PNG University of Technology, *Empirical Economics Letters,* Vol. 20 (1): 13-22.
7. Khan, O.U., G.M. Arshed, and M.J. Khan. (2022). Three-Dimensional Numerical Modeling of Flow Upstream of a Symmetric Streamlined-Body Mounted Over a Flat Plate with Tip Gap, *Proceedings of the I Mech E Part C, Journal of Mechanical Engineering Science*, January 4, 2022. https://doi.org/10.1177/09544062211047073.
8. Kumar, S., Raut, R. D., Narwane, V. S., Narkhede, B. E., and Muduli, K. (2021). Implementation barriers of smart technology in Indian sustainable warehouse by using a Delphi-ISM-ANP approach. *International Journal of Productivity and Performance Management*, Vol. 71 (3): 696-721.
9. Maran, F., Mohamed, A., (2021). Barriers in Growth Prospects of Small Business due to Macro and Micro Environment, *Empirical Economics Letters, Vol.* 20 (1): 35-46.
10. Miaka, N., and S M S Wahid (2021). Implementing Gravitational Vortex Hydro Power Plant: Case Study. *J. Inst. Eng. India Ser. C* (23 September 2021). https://doi.org/10.1007/s40032-021-00754-z.

11. Muduli K., Kusi-Sarpong S, Yadav D.K., Gupta H., and Jabbour C.J.C (2021). An Original Assessment of the Influence of Soft Dimensions on Implementation of Sustainability Practices: Implications for the Thermal Energy Sector in Fast Growing Economies, *Operations Management Research*, Vol. 14 (3): 337-358.
12. Oyekola, P., Muduli, K., Ngene, T. C., and Syed, S.A (2021). COVID-19 Ventilator a Variable Compression Model, *International Journal of System Dynamics Applications*,11(5):1-12. http://doi.org/10.4018/IJSDA.20220901.oa2
13. Ramasamy, A., Muduli, K., Mohamed, A., Biswal, J. N., and Pumwa, J. (2021). Understanding Customer Priorities for Selection of Call Taxi Service Provider. Journal of Operations and Strategic Planning, Vol. 4 (1): 52-72.
14. Ray, M., Ray, M., Muduli, K., Banaitis, A., and Kumar, A. (2021). Integrated Approach of Fuzzy Multi-Attribute Decision Making and Data Mining for Customer Segmentation, *E&M Economics and Management*, Vol.24 (4):174-188.
15. Romeo S Fono Tamo, Hazel A Ejodakemen and Brian Ndrelan (2021). Design and Construction of a High-Frequency Electrosurgical Unit for Rural Application, *International Journal of Research in Engineering and Science (IJRES)*, Vol. 9 (2): 07-12
16. Romeo. S. Fono Tamo, Peter Oyekola, Nwaneri Clinton and Karo Komuna (2021). Performance Evaluation of an Automated Whiteboard Cleaner, *International Journal of Research in Engineering and Science (IJRES)*, Vol. 9 (2): 01-06
17. Sahoo, K. K., Muduli, K., Luhach, A. K., and Poonia, R. C. (2021). Pandemic COVID-19: An empirical analysis of impact on Indian higher education system. *Journal of Statistics and Management Systems*, Vol. 24, (2): 341-355.
18. Shanker, S., Barve, A., Muduli, K., Kumar, A., Garza-Reyes, J. A. and Joshi, S. (2021). Enhancing resiliency of perishable product supply chains in the context of the COVID-19 outbreak, *International Journal of Logistics Research and Applications*, pp. 1-25. DOI: 10.1080/13675567.2021.1893671
19. Tombele, H., Mohamed, A., Adimuthu, R. (2021). Impact of Technology on Learning and Development of Students' at International Training Institute Lae Campus Morobe Province, *Empirical Economics Letters*, Vol. 20 (1): 1-12.

Conference Papers:

1. Oyekola Peter Oluwatosin, Shoeb Ahmed Syed, Owen Apis and Somade Kolawole (2021). Application of Computer Vision in Pipeline Inspection Robot. *Proceedings of the 11th Annual International Conference on Industrial Engineering and Operations Management*, Singapore, March 7-11, 2021.

8. Book Chapters

1. Swain, S., Peter, O., Adimuthu, R., and Muduli, K. (2021). Blockchain technology for limiting the impact of pandemic: Challenges and prospects. In Computational Modeling and Data Analysis in COVID-19 Research (pp. 165-186). CRC Press.

9. Patent

1. Muduli, K; Mohamed, A; Das, R; Dash, M. The Smart Medical Waste Management System and Process, Patent number: 2021103226, *Granted by IP Australia*.

2. Avinash, L; Manickam, A; Muduli, K; Mohamed, A. The Smart Factory Controlling System, Patent number: 2021102649, *Granted by IP Australia*.

DEPARTMENT OF MINING ENGINEERING

Head of Department: Dr Gabriel Arpa

The Mining Engineering Department is one of the 13 academic Departments in Papua New Guinea University of Technology. The Departments offers two Degrees programs - Bachelor of Mining Engineering and Bachelor of Mineral Processing Engineering. In addition, it also offers postgraduate degree programs in Mining (B.Eng.Mining) and Mineral Process Engineering (B.Eng. Mineral Process). The postgraduate program has a robust Master of Philosophy (MPhil) and started enrolling Doctor of Philosophy (PhD) candidates. The MPhil and the PhD programs are entirely research-based degree programs.

The Department has 13 academic staff (6 with PhD, 1 enrolled in PhD here in the Department (Mary Kama), and our staff enrolled in Queensland University of Technology (Wilson Kobal) has completed his studies this year 2021. We have 4 Technical staff, 2 Administrative staff and two auxiliary staff. One of our Mining engineering staff members, Mr. Gideon Yowa has rejoined Department after a brief stint with Porgera Underground Mine. He graduated with a Master of Science in Mining Engineering under the Australian Awards Scholarship at the James Cook University, Australia. Three (3) of the academic staff are currently on study leave doing their MPhil studies here in the Department.

Currently, we have 6 students enrolled in Masters of Philosophy in the Department embarking on research in Mining and Mineral Processing field and one staff enrolled in PhD. The Department is committed to delivering quality teaching, research, and outreach activities, including Government and Industry based projects and postgraduate research and development studies. The Department established a five-year Strategic Development Plan (2016 -2024) and another Development Strategic Development Plan in alignment with the University's Strategic Plan (2020- 2025) and the long-term plan. As all Engineering Departments are undergoing International Accreditation of their Degree program in line with PNG National Qualification Framework Level 8 and Washington Accord for a four-year degree, the Department has been continuously reviewing its programs for each year level since 2017. Its curriculum is reviewed annually in consultation with international standards and key national stakeholders, government, industry, and other national and international institutions and private partners. As a result, the Accrediting body (Engineers Australia, EA) assessed our programs and granted Provisional Accreditation of our two programs in 2019.

The Department has a robust Industry partnership and collaboration, which resulted in staff and students engaged in real-industry-based research projects and providing research-based

consultancies, particularly in the Mining Industry. The Department signed MoUs with K92 Mine, University of Queensland (Australia), Mineral Resources Authority (MRA), and local resource landowners. A major project undertaken by the Department was the " Development of alluvial gold resources evaluation model" in partnership with the Mineral Resources Authority (MRA).

RESEARCH THEME AND FOCUS AREAS

The Department's research focus and interest are resource exploitation and extraction techniques, environmental solutions to mining-related waste, and safety. The main focus areas are;

Mining Engineering

- Environmental engineering
- Mining production optimization
- Geological modelling and evaluation of uncertainties
- Engineering geology
- Geomechanics and rock mass deformation and behavior
- Alluvial mining techniques and resources evaluation
- Optimization of gold recovery system
- Innovative solution to Acid Rock Drainage (ARD) problems from mine waste.
- Mineral Economics
- Mineral Taxation Policy
- Underground Mining Methods and Optimization
- Ore Reserve Estimation
- Rock Slope Stability Analysis

Mineral Process Engineering

- Hydrometallurgy of gold and base metals – copper, nickel, chromium, cobalt 2.
- Process mineralogy, plant optimization & design.
- Froth flotation of base metal sulphides and gold

- Froth flotation of ilmenite.
- Optimization of alluvial gold extraction with focus on elimination of mercury (Hg)
- Flotation characteristics of sericite.
- Effect of clayey minerals on gravity concentration of gold
- Pyrometallurgy

INDUSTRY FUNDED AND INDUSTRY BASED RESEARCH COLLABORATIVE PROJECTS

1. HIDDEN VALLEY MINE CLOSURE PLANNING PROJECT: TSF LEACHATE QUALITY ANALYSIS. *Dr. G.Arpa, Dr. J. Lem, Dr. J. Witne & Dr. W. Kobal (2021 -2022)*

   Since commencement of the trial, the Morobe Consolidated Goldfields (MCG) Environment Team have undertaken routine monitoring to:

   - Record the total leachate volume
   - Conduct field measurements of DO (mg/L), EC (us/cm), temperature (deg C), pH and ORP (mV)
   - Collect leachate water to test the analytical suite presented in Table 1 (analysis is performed by ALS, Australia). Monitoring had been conducted at weekly intervals for the first month of the trial and then undertaken monthly after that. In addition, monthly rainfall data is also recorded from the nearby Hamata TSF weather station. The scope of this project is to evaluate the available data (as described above) to provide an indication of:
   - Changing leachate volumes as a function of climatic conditions
   - Temporal trends in key leachate parameters (particularly, pH, SO4, cyanide, and dissolved metals).
   - Any correlations between pH and other key parameters, i.e., SO4 and dissolved metals (i.e., is pH (or some other function) the driver of the observed changes to water quality

2. **Process Mineralogy of fluorine in K92 Gold Ore.** *Jim Lem (2020-2021)*

   Process Mineralogy of fluorine in K92 Gold Ore A potential metallurgical issue at the K92 Gold Mine related to the undesirable accumulation of fluorine, a penalty element in the Au-Ag-Cu Concentrate, was investigated by the Mining Engineering Department. The research aimed at identifying the gold-bearing minerals, the distribution and association of gold minerals across the size range, the major F-bearing minerals, the association of F-bearing minerals with gold minerals, and eventually establish the potential mechanism promoting F

recovery. Ultimately devise potential strategies to reduce F recovery with the caveat that gold-silver-copper recovery is not impacted negatively. This work is complete, and the findings were presented at K92 Gold mine site on February 12, 2020. The investigation established the following; (i) Chief gold-bearing mineral is calaverite, AuTe2 (ii) Major F-bearing mineral is sericite, KAl2(AlSi3O10)(OH,F)2 (iii) Talc does not contain F (iv) The plant is recovering high amount uneconomic pyrite which can be rejected. **Action was taken by the mine: Stopped application of carboxymethyl cellulose – a depressant for talc**

3. **Third-Party Independent Peer Review Project for Tailings Management Support and Stake Holder Engagement. Wafi/Golpu Project.** *(Gabriel Arpa & Ora Renagi. 2020 to 2021)*

   The PNG Unitech is appreciative of the continued opportunities provided by WGJV in fully supporting CEPA's proposal for the inclusion of the Unitech-led IPR team (first of its kind), as this supported the PNG Unitech mission and vision to grow world-class technocrats through high-quality experimental teaching, research and ardent application of science, technology and innovation **through industry-based projects**. It Also supports WGJV's longer-term vision to encourage and develop local scientific capacity within PNG. The WGJV has a particular interest to engage and further develop PNG expertise and advocacy relevant to DSTP, and this forms the basis of this Scope of Work (SOW) with a view to this becoming a long-term scientific external advisory and advocacy role on matters related to DSTP, together with future research and monitoring collaboration opportunities.

4. **Optimization of Gold Recovery in the Carbon-in-Leach circuit of Hidden Valley Au-Ag-Cu Mine.** *Jim Lem. (2020-2021)*

   Silica factor determination This Harmony Hidden Valley Mine project is currently being carried out at the Department. The work aims at defining the best approach to carry out sand factor determination in the carbon-inleach tank. Carbon-in-leach (CIL) refers to a gold leaching (cyanidation) system whereby the leaching of gold by cyanide and adsorption of the gold solution by activated carbon occurs simultaneously in the same tank. In the Hidden Valley operation, the increased silica content in the leach feed results in sand build-up or clogging of inter-tank screens. This gives rise to an overflow of CIL tanks resulting in low carbon inventory and high losses of gold in solution.

   The work being done at the Department involves sizing, gravity concentration using Shaking Table, and muffle furnace roasting.

5. K92 Mine Grindability Test Work (*Francis Kisai 2019 – 2021*)

Supervised to completion of this test in the Mining Department Kainantu Laboratory. Ore Grindability results were obtained and would help the company select optimum liberation Grind Size and increase Tonnage in its mill upgrade operations.

STAFF RESEARCH ACTIVITIES, ABSTRACT

Formation Mechanism, Ore Genesis and its Implication on the Milling and Recovery Processes, and the Environment, of the Mt Bai Porphyry Copper Gold Deposit in Rai Coast, Madang Province, Papua New Guinea. (*Yawas Dekba & Gabriel Arpa*) *2019 to --- ongoing research*.

The Mt Bai Porphyry Copper Gold Deposit is situated approximately 40 kilometers due Southwest of the township of Madang and 8 kilometers inland from Astrolabe Bay (Melanua Harbour) along the Rai Coast. The deposit was recently discovered within an area that was not previously covered (interpreted) by a geological survey of Papua New Guinea (Regional Geology Map of PNG 1:250K, Madang Sheet).

The Mt Bai Intrusive complex intrudes the recent Pleistocene to middle Miocene sediments, and the mineralization is generally hosted within an older metadiorite stock to late diorite and porphyry stocks. The deposit is longitudinal and runs northwest to the southeasterly direction having a strike length of 7km by 1km wide. From recent fieldwork done so far (Dekba Y, Neinen E, Sumaiang R, Unpublished, 2019), mineralization is from the surface down to about 700m (from first-pass surface mapping with variation in (RL) relative to sea level) and still open down the depth and along strike length. The mineralization comprises an earlier phase of quartz + pyrite + chalcopyrite with a later multiple phases overprinting of massive chalcopyrite bornite + quartz + carbonate + (bms) galena + sphalerite replacing the earlier mineralization.

This study aims to determine and understand the fluid chemistry (magma source), formation mechanism, i.e., structural setting and interaction of magmatic fluids, and the emplacement of different intrusive phases of mineralization events that will characterize the different ore types. Understanding these parameters will help determine the milling and recovery process in terms of mining purposes and handling and discharge of tailings into the environment when the project is developed into the mining stage. Also, on a regional scale, the outcome of the study will help to try to explain why most of the island arc magmatism and volcanism in the Bismarck seas, New Ireland and New Britain Island, etc. are Rhyolitic in composition (felsic-intermediate) in nature (continental crust) than mafic in nature (Oceanic crust). These will strengthen the idea that part (or fragmented parts) of the Australian Craton still extends further out than initially thought and may give weight to the notion that the collision margin between the Australian and Pacific Plates may in fact, be further out along the Ontong Java Plateau and the Pacific Plate boundary than initial thought (On mainland PNG)

RESEARCH/PROJECT REPORT

Lem.J., (2021) **Optimization of Gold Recovery in the Carbon-in-Leach circuit of Hidden Valley Au-Ag-Cu Mine.** A report on test work for the Hidden valley Gold and Silver Mine

WORKSHOP/CONFERENCES/MEETINGS ATTENDED

● In partnership with Papua New Guinea Mineral Resources Authority, the Mining Engineering Department hosted the 5th National Alluvial Mining Convention here in Unitech. The Theme of the convention was: "**INCORPORATING A SAFER, SUSTAINABLE AND FORMALIZED ALLUVIAL MINING SECTOR IN PNG AS AN SME ACTIVITY" 21st to 22nd September 2021.** https://postcourier.com.pg/lae-hosts-alluvial-miners/

● Arpa, G., 5th National Alluvial Mining Convention. "***Modelling and classification of Alluvial Resources in PNG for commercial purpose"*** 21st -22nd Sept. 2021

● Lim, J., Mineralogical analysis of K92 Gold Ore: Aspects Promoting Fluorine Accumulation Presentation of findings at the K92 Gold Mine. *December 12, 2021*

POSTGRADUATE RESEARCH

Below is the list of postgraduate students registered for the year 2020. The research topics, supervisors, sponsors, and funding sources are presented.

Student	Research Topic	Funding Source	Supervisor
Mr. Manau Saki	Metallurgical Characterization of Crater Mountain Gold ore	Private	Dr. J. Lem
Mr. Yawas Dekba	Genetic Modeling of the Bauxite Deposit, Manus Province, PNG	Private	Dr. G. Arpa

Mr. Mondu Akura	The effect of copper minerals in gold cyanidation. A case study on Ore from Kainantu	GAP	Dr. J. Lem
Mr. Hans Matarab	Innovation Mine Design and Production Scheduling of Industrial Minerals – Case study on the Bauxite Deposit in the Manus Province, PNG	Private	Dr. G. Arpa
Mrs Chinta Kasendimi	Process Mineralogy of fluorine in K92 Gold Ore.	Private	Dr. J. Lem
Ms Marry Kama	Production of ferrochromium from Hessen Bay chromite ore in Papua New Guinea	CDO	Dr. J. Witne
Mr. Wilson Tengen	Deformation behavior of Rock mass and its implications on rock slope design- Applications in Civil roads and Mining activities	GAP	Dr. G. Arpa

FINAL YEAR UNDERGRADUATE STUDENTS' RESEARCH PROJECTS

MINING ENGINEERING

K92 MINE INDUSTRY-BASED PROJECT FOR OUR FINAL YEAR MINING ENGINEERING STUDENTS. TWO STUDENTS ARE WORKING ON ONE PROJECT, AND MORE THAN ONE STAFF MEMBER IS SUPERVISING THE PROJECT. (2021)

#	TOPIC/TITLE	STAFF	STUDENTS
1	Time study analysis of production mucking. *(K92 Mine)*	Dr Arpa, D Pakne & Hans Matarab	1. Emoni Hadassha 2. Kamare Gomez
2	Ground water modeling *(K92 Mine)*	Dr Arpa, Y.Ramsey & D. Yawas	1. Kongo Fabien 2. Kuk Jason

3	Ulternative Open pit mine design for Irimufimpa. *(K92 Mine)*	Mr Pakne, Dr Ail, Dr Arpa, Hans Matarab	1. Morehari Gilmore 2. Nonah Nonah
4	Optimization of Mine ventilation network analysis. *(K92 Mine)*	Dr Arpa & Philip Rimits	1. Paia Joel 2. Pim Joshua
5	Economic analysis of proposed twin incline design. *(K92 Mine)*	Dr Ail & Mr Pakne	1. Rumints Jordan
6	Equipment Selection. *(K92 Mine)*	Dr Ail and Mr Pakne	1. So-onwai Henry
7	Strength of Rockmass model. *(K92 Mine)*	Dr Arpa, D. Yawas and Y. Ramsey	1. Wilson Toros
8	Stability analysis of Dam extension design. *(K92 Mine)*	Dr Arpa, Dr Ail & H. Matarab	1. Taimi Sedrick
9	Swell Factor and Rock Density. *(K92 Mine)*	Dr Arpa, D. Yawas, and Ramsey Y.	1. Salvado Leonie

MINERAL PROCESS ENGINEERING

Final year students research projects. 2021

#	**TOPIC/TITLE**	**STAFF**	**STUDENTS**
1	Leaching of Simberi Gold Ore: Investigating the Effect of Grind Size on Gold Recovery.	Dr. J. Lem Mr. F. Kisai	1. Amarea Florida 2. Ap Peter
2	Hydrometallurgical Investigation of Kainantu ore: Cyanidation	Dr. J. Lem Mrs. M. Kama	1. Deasi Jason 2. Deko Alois
3	Grindability of Busu and Bumbu gravel. by Mr. Peter Rylie	Dr. J. Witne Mr. M. Saki	1. Itang Rueng 2. Kapia Jakay
4	Effects of Other Metal Ions in the Gold-Silver	Dr. J. Lem Dr. J. Witne	1. Kongo Haris 2. Kopeap Steve

	Cyanidation of Kainantu Ore.		
5	Atmospheric pressure leaching of nickel laterite	Dr. W. Kobal Mrs. M. Kama	1. Kopono Glad 2. Kula Molly
6	Effect of density of hydrocyclone classification	Mr. F. Kisai Dr. J. Lem	1. Loi Finay 2. Naki Godfrey
7	Application of DETA in treatment of mill tailings	Dr. J. Lem Dr. J. Witne	1. Pasal Medleen 2. Stanley Jimmy
8	Optimization of gold recovery in in porphyry copper ore	Mr. F. Kisai Dr. J. Witne	1. Tabul Nigel 2. TineGoro Racheal
9	Investigation of an environmentally benign chemical to replace cyanide in pyrite depression	Mr. F. Kisai Dr. J. Lem	1. Tovo Branden 2. Undi Tracy
10	Effect of copper on gold cyanidation	Mr. M. Saki	1. Wamuni Desmond

DEPARTMENT OF SURVEYING AND LAND STUDIES

Head of Department: Professor Jacob A. Babarinde

A. Priority Research Areas of the Department

The research activities of the Department of Surveying and Land Studies revolve around the pivot 'Land and Allied Resources' optimum utilization, management, and valuation; Climate studies, Disaster Risk Reduction and Disaster Risk Management. The Department is primarily involved in developing human resources adept in the holistic management of land resources and eking out the best value out of them in a sustainable manner through coordinated research activities. It is also actively involved in finding Disasters, Risks, Disaster Management, Disasters linked to climate change, tectonic activities. The human resources developed in the Department have broad exposure to the state-of-the-art technology, e.g., recent developments in Remote Sensing, Geographic Information Systems, Photogrammetry, Global Positioning System / GNSS, use of latest Total Stations and allied implements of the digital era.

The Department is also involved in many research programs, including densification of Benchmark points for PNG using the latest GPS / GNSS technology, GIS, remote sensing, and cartographic communication through thematic maps, property valuation, land management research programs, and student projects.

Some specific areas are given below:

1) Climate change studies
2) Land suitability for rice cultivation in PNG using Remote Sensing and GIS
3) Forest Biomass monitoring using Remote Sensing and GIS
4) Forests and Societal management
5) Inventorying Environmental Resources
6) Disaster Risk Reduction / Disaster Risk Management (DRR & DRM)
7) Urban sprawl detection
8) Groundwater mapping
9) Land use planning and management
10) Land Administration studies
11) Migration studies
12) Asset valuation studies
13) Cadastral Data Modeling
14) Management of incorporated land groups (ILG)
15) GNSS Survey and Vertical Adjustment of Madang Network
16) GIS In Customary Land Tenure Investigation
17) RS & GIS in Urban and Regional Planning
18) Mining and Its Impacts on Property Market
19) Residential Property Management
20) Public Educational Facility Management

21) Property Development Process in Papua New Guinea
22) Low Income Housing in PNG: Challenges and Opportunities
23) AHI land mobilization policy
24) Impacts on customary landowners under Plantation Redistribution Scheme
25) Impacts & effects of special agriculture and business lease (SABL) on customary landowners
26) Causes and effects of urban land values
27) Road Alignment (Horizontal/Vertical)
28) Drainage Design
29) Subdivision Design
30) Control Surveys using GPS/GNSS
31) Local Geoid study using GPS heightening on heighten MSL Benchmarks
32) GPS/GNSS to Cadastral Surveying in PNG
33) Infrastructure Development Surveys
34) Geodetic Control Surveying using GPS/GNSS
35) ILG (Integrated Land Groups) Customary Land Registration,
36) Renewable energy needs Feasibility study, etc.

B. Name of the Faculty Member/Position/Area of Specialization/Research interests

Name	Position	Area of Specialization
Professor. Jacob Babarinde	Professor and Head of Department	Asset Valuation/Appraisal & Estate Agency, Property Management & Development, Land Management/Administration, Urban & Regional /Rural Planning, Land Use & City Sustainability, Project Viability & Feasibility Studies, Intra-Urban Industrial & Residential Relocation/Mobility, Urban Policy Analysis, Environment & Energy Policy
Dr. Sujoy Kumar Jana	Associate Professor	Hazard and Disaster Management, Resource Planning and Management, Geography and Management
Dr. Sailesh Samanta	Associate Professor	Remote Sensing, GIS, Climatology, Geography, Natural Disaster, Disaster management, Site Suitability, Environment, Renewable energy
Mr. Job Suat	Senior Lecturer	Remote Sensing, GIS, Cartography, Survey, Infrastructure Development Surveys, Cadastral Data Modelling, Survey Practice -Laws & Regulations.
Mr. Wycliffe Antonio	Lecturer	GIS, Cartography, Geospatial Database modeling and development
Mr. Suman Holis	Lecturer	Property Valuation, Property Development, Land Administration
Mr. Samudra Gupta	Lecturer	Physics of Remote Sensing, Digital Image Processing, Photogrammetry / Drone, Global Positioning System, Geoinformatics, Geodesy, Spatial Analysis in GIS, Critical Pedagogy in

		classroom learning
Dr. Andrew Pai	Lecturer	Property Valuation, Land Administration
Dr. Cathy Koloa	Lecturer	Planning, Spatial Modeling, Hazard Management, Hydro geomorphology
Mr. Lewi Kari	Lecturer	Vegetation monitoring, Remote Sensing, GIS, Digital Image Processing, Manual Image Processing, Aerial Photogrammetry, Geography, Cartography, CAD, ILG. Web Mapping, Route Analysis
Mr. Jerry Mille	Lecturer	Land Administration, Social Mapping, ILG Creation, Land Disputes & Settlement
Dr. Tingneyuc Sekac	Lecturer	Renewable and Clean Energy, Disaster Management, Climatology, Rural Development Planning, Urban Planning, Remote Sensing, GIS, GPS, and GNSS
Mrs. Rosemary Adu	Lecturer	On study leave
Mr. Navua Kapi	Lecturer	Engineering Surveys and Designs, Lease Surveys, Remote Sensing & Photogrammetry, Urban and Regional Planning & Subdivision, Mine Survey, Geodesy and GPS, Hydrographic Surveying, UAV Surveying, and Mapping, Deformation monitoring, Underwater Lease Surveys, Construction Surveys, Rural, and Urban Valuations, Survey Hardware and Software Maintenance and technician, Claims and BOQ for any Engineering and Construction services
Mr. James Seniala	Lecturer	Property Valuations, Property Management
Mr. Lepani Karigawa	Lecturer	Rural Valuation, Urban Valuation, Incorporated Land Groups, Property Management, Customary Land Registration
Mr. Clifford Jr Mespuk	Lecturer	Engineering Survey, ID Survey, Drainage Hydrology
Mr. Paulus Motoro	Lecturer	Property management, Property Valuation, Property Economics/Finance
Mr. Glan Yali	Lecturer	Remote Sensing, Geospatial Tropical Forest Carbon Assessment for REDD+, Spatial Analysis, Spatial Data Science & Modelling, Satellite Vegetation Monitoring, GPS Tracking & Telematics, and Development Planning
Ms. Camilla Yanabis Kwaudi	Principle Technical officer	Cartography, GIS DBMS, Web mapping
Mr. Heva Honeaki	Senior Technical Instructor	Hydrographic Surveying, Computer-Aided Drafting, EDM Calibration, GPS GNSS, Cadastral Surveying, Automated Surveying
Mr. Adward Buidal	Principle Technical officer	Certified UAV Pilot (Drone Pilot), Surveying Profession, specifically Mining and Civil

		Engineering Survey with a fair bit of Cadastral Surveying.
Mr. Joe Yapakae	Senior Technical officer	Cadastral Surveys and Engineering Surveys

C. List of Scientific Paper Publications in Peer-Reviewed Journals

1. Akinbola, K. B., Musibau L., and Babarinde, J. A. (2021). Non-Inclusive Regulo-Administrative Ergonomics of Land Management System and Its Impacts on Sustainability of Nigeria's Land Markets, *Melanesian Journal of Geomatics and Property Studies*, Vol. 7, pp. 1-17, ISSN 2414-2557. Google Index

2. Kwaudi, C., Kari, L., Napitalai, A. (2021). Crime Mapping System for Papua New Guinea University of Technology Campus, Lae. *Melanesian Journal of Geomatics and Property Studies*,Vol. 7, pp.18-30. Google Index.

3. Papa, I. I., and Babarinde, J. A. (2021). Sustainability Assessment of Land Transactions and Project Benefits Sharing in Papua New Guinea, *Journal of Land Management and Appraisal, Academic Journals (AJ),* www.academicjournals.org, DOI: 10.5897/JLMA2021.0022, Vol. 8 (1), pp. 13-27, ISSN 2354-1741. Google Index.

4. Poi, N., Samanta, S., and Sekac, T. (2021). Site Suitability Analysis for Road in Mountainous Terrain Region of Papua New Guinea (A Case Study of Salt Noname Karimui District of Simbu Province). *International Journal of Geoinformatics*, 17(2), 9–20. Scopus Index.

5. Sekac, T., Jana, S., Sutherland, M., and Samanta, S. (2021). Spatio -Temporal Assessments of Rainfall Variability and Trends in the Highlands to Coastal Regions of Papua New Guinea. *International Journal of Geoinformatics*, 17(3), pp.23–38. Scopus Index.

6. Sinin, E., Kari, L., Napitalai, A., and Kwaudi, C. (2021). Integration of Web-GIS and Remote Sensing in Power Pole / Line Asset Management System for PNG Unitech Campus. *Melanesian Journal of Geomatics and Property Studies*, Vol. 7, pp. 31-47. Google Index.

7. Oboko, H., Jana, S.K, and Sekac, T., (2021). Spatial Assessment of Groundwater Potential Zones of East New Britain province, Papua New Guinea. *PalArch's Journal of Archaeology of Egypt/Egyptology,* Vol. 18 (4), pp, 6021-6042. Scopus Index.

8. Varo, J., Sekac, T., Jana, S.K., and Pal, I. (2021). GIS perspective hazard risk assessment: A study of Fiji Island. *Disaster Resilience and Sustainability, Elsevier, Pages 197-238.* Scopus Index.

9. Wake, Z., Sekac, T., and Jana, S.K (2021). Spatial analysis of soil suitability for plantation development for suitable tree species in Markham Valley, Morobe Province. *Melanesian Journal of Geomatics and Property Studies*, Vol. 7, pp. 48-63. Google Scholar.

D. List of Conference Proceedings/Workshop/Seminar

1. Sekac, T., Jana, S., Sutherland, M., and Samanta, S. (2021). Spatio-temporal vegetation cover analysis to determine climate change in Papua New Guinea. 2nd Virtual International Symposium on Disaster Resilience and Sustainable Development 24th – 25th June 2021, Organized by Asian Institue of Technology and ProSPER.Net, Thailand.

E. Winning Project

Ongoing collaboration research Project: PIURN

Project Title

Towards National Drinking Water Standards in Vanuatu: Applied Research and Capacity Building

Research Team Members and Affiliations

Ø Dr Krishna Kumar Kotra, Lecturer, School of Biological and Chemical Sciences, FSTE, The University of the South Pacific (USP) – Principal Investigator

Ø Dr Sailesh Samanta, Associate Professor, Dept. of Surveying and Lands, PNG University of Technology (PNGUNITECH) – Co-Investigator / Co-funder

Ø Dr Srikanth Bathula, Senior Lecturer, Dept. of Applied Sciences, PNG University of Technology (PNGUNITECH) – Co-Investigator

Ø Mr Erie Sammy, Hydrogeologist, Dept. of Water Resources, Govt. of Vanuatu – Co-Investigator / Co-funder

Ø Dr Lokesh Padhye, Senior Lecturer, Oceania Water Research Consortium (OWRC), Dept. of Civil and Environmental Engineering, University of Auckland, New Zealand – Co-Investigator / Co-funder

Ø Dr Martin S. Andersen, Senior Lecturer, School of Civil and Environmental Engineering, and director of Connected Waters Initiative (CWI), University of New South Wales, Sydney, Australia – Co-Investigator / Co-funder

Budget: 43,311 Fiji Dollars

Project Duration: On going

F. Undergraduate Research Projects

Year 4 BTSR Research Project 2021

SURNAME	NAME	Topic	Supervisor
Wai	Mackenzie	Photogrammetric survey- UAV monitoring_sediment displacement	Mr. Edward Buidal
Yambaki	Pora Wesly	Restructure of the existing drainage system along the speed way road, from Kuima security base to Lae Snax Factory	Mr. Mespuk Clifford
Tola	Issac	Establish boundaries and distribute land parcels into subordinate sections using GPS and conventional survey techniques or total station.	Mr. Joseph Yapakae
Para	Joe	Road Alignment Design Along Southern Part of Unitech, Portion 425.	Mr. Mespuk Clifford
Kopaya	Noel	Expanding and reconstruction of Applied Physics old car to a parking lot and give faculty members, students and guest/visitors a decent parking space.	Mr. Mespuk Clifford
Sangu	Freddie	Mine Pit Design & Optimization	Mr. Edward Buidal
Melep	Junior	Design a Stadium at the Unitech sporting Field	Mr. Edward Buidal
Yak	Samuel	Identification of Old Cement Pegs	Mr. Mespuk Clifford
Hape	Eddie	Design of Tailing Dam	Mr. Edward Buidal
Manape	Dwight	Determining the volume of Land loss where the dump of UNITECH is and calculate the required volume of land that will be deposited to meet the land surface which can be ready for future developments	Mr. Heva Honeaki
Kerenga	Arnold	Proposal of Road Alignment connecting Fly Drive and Sara waged Road Linking Bomatau EDA drive and Sogeri Drive	Mr. Heva Honeaki
Pokolou	Jacob	Drill ad Blast Patten Design	
Thoke	Dickson	Designing of Unitech Drainage structure from Post Graduate students' residential area (Emara Ibu), to first year male's residential area, (color lodges) following the current drainage system outflowing using DTM survey and levelling	Mr. Mespuk Clifford
Graham	Kennedy	Converting Y-Intersections to Single Lane Roundabouts.	Mr. Mespuk Clifford

Kasiman	Kene	Proposing proper Car Parking for Unitech Academic Area SUSCEPTIBILITY ASSESSMENT AREA OF KEMP WELCH CATCHMENT, CENTRAL PROVINCE.	Mr. Joseph Yapakae
Joe	Stanley	Drainage Design of Drain running from the Markham drive junction through Uni-Block	Mr. Joseph Yapakae
Godfred	Kunda	Structural Monitoring of Sandover Building	Mr. Edward Buidal
Wambie	Repson	Subdivision Design for Unitech Staff Residential Area.	Mr. Joseph Yapakae
Pewefa	Alfred	Planning and Designing of Mini-Multipurpose Recreational Area	Mr. Navua Kapi

Year 4 BGIS Students Research Project 2021

SURNAME	NAME	Topic	Supervisor
Keai	Addie	Application of GIS and Remote Sensing Technology in Identifying Change Detection in Sea Level Rise and Future Relocation of Togo Village, Western Province	Dr Cathy Koloa
Oli	Diandra-Joy	An Investigation into the Implementation of Green Storm Water Infrastructure for Storm Water Management using GiIS and RS Techniques: A Case Study in Lae Urban Area, Morobe Province, PNG.	Mr. Lewi Kari
Den	Einstein	Solid Waste Management and Site Suitability Analysis Using GIS and Remote Sensing Technique in Lae City.	Dr Sailesh Samanta
Tarabu	Elizabeth	Using Geospatial Technologies to Plan a Cost-Effective Water Distribution System for Igam Blocks, Lae City.	Mr. Wycliffe Antonio
Nickson	Runitha	Urban Planning in Lae City Using Geospatial Approach (A Case Study of Eriku and The Surrounding	Dr. Tingneyuc Sekac
Alk	Laura	Mapping & Monitoring Water Distribution Networks Using GIS & RS Techniques in Lae Urban Area-Case Study: Unitech	Mr. Wycliffe Antonio
Utah	Solomon	Determining The Optimal Route Using Least Cost Path Analysis: A Case Study From Kabwum District, Morobe.	Mr. Lewi Kari
Vinzingu	Vincent	Upgrading of Road along Second Seven Junction to Bumayong Market involving the Application of GIS and Remote Sensing	Mr. Samudra Gupta

Alphonse	Jill	Using Remote Sensing Techniques in Assessing and Monitoring the Environmental Changes, Extent of Water Overflows and Affected Vegetation along Ok Tedi Mine Affected River Systems (Ok Tedi and Fly Rivers) in Papua New Guinea.	Mr. Glan Yali
Wake	Zillah	Soil Mapping Using GIS and Remote Sensing for Selection of Suitable Tree Species for Plantation Development in Markham Valley (Umi and Dabua), Morobe Province	Dr. Tingneyuc Sekac
Steven	Bessie	Using Remote Sensing and GIS Tool to Map Flood Paths in Order to Carry Out Mitigation Measures. Case Study: Maiwara Village, Alotau District.	Dr Sujoy Kumar Jana
Ilwais	Samuel	A Spatial Analysis of Rural-Urban Migration and its Impact: Case Study of Lae City, Morobe Province	Mr. Wycliffe Antonio
Sime	Pangiau	Detection of Water Leakage in Buried Pipes Using Integrated GIS and Thermal Remote Sensing Technology.	Mr. Glan Yali
Akena	Marcia	Using GIS and Remote Sensing To Locate Suitable Sites for Potential Solar Photovoltaic Implementation in Unitech Campus	Dr. Sailesh Samanta
Tundu	Nigel	Using Multi-Criteria Decision Making and Machine Learning Supported By Remote Sensing And Gis Techniques In Flood Susceptibility Assessment Area Of Kemp Welch Catchment, Central Province.	Dr. Sailesh Samanta
Kahai	Mary	Integrating GIS and Remote Sensing to Design a Potential Water Pipeline Replacement System in PNGUoT Campus.	Mr. Wycliffe Antonio
Rodney	Anna	Utilizing GIS and RS Techniques to Map and Assess Coverage and Interference of Telecommunication Network Signal Specifically Mobile Phone Cellular Network Signal Within Lae, Morobe Province.	Mr. Samudra Gupta
Baru	Jobby	Using Geographic Information Science And Remote Sensing Applications to Find the Shortest Route Path from Wau to Malalawa (Missing link) As a Part of Papua New Guinea Development Strategic Plan 2010 – 2030 by Department of National Planning & Monitoring.	Mr Lewi Kari

Nick	Ronica	Using GIS and Remote Sensing to do a Feasibility Study on Power Supply in Dei Council District, Western Highlands Province	Dr. Tingneyuc Sekac
Nelson	Jonathan	Agriculture Management; Using Remote Sensing to Monitor the Health of Crops.	Mr. Glan Yali
Petali	Bobby	Using Remote Sensing &Amp; GIS to do Zonation for Areas that are Prone to Landslide in Morobe Province (Bulolo District) Using Frequency Ratio Method.	Dr. Tingneyuc Sekac
Sunnie	Salmond	Using RS & GIS Approach to Determine the Quality of Surface Air on a Typical Hot Day at Main Market in Lae City; and to Point Out Its Effect on Environment and People's Health	Dr. Sailesh Samanta

Year 4 Property Studies Research Project 2021

STUDENT NAME	TOPIC	SUPERVISOR
Juwie Jirabili	An assessment of ILG performance in Morobe Province	Mr. Suman Holis
Thompson Kange	An analysis of the impact of Coronavirus pandemic on the residential property market prices in Papua New Guinea: A case study of Port Moresby	Prof. Jacob Babarinde
Amos Tatius	Development control as an antidote to urban sprawl: A case study of Lae city	Prof. Jacob Babarinde
Abigail Gisegise	The impact of Covid-19 on demand, supply and prices of residential properties in Papua New Guinea: A case study of Lae, Morobe Province	Mr. Suman Holis
Elizabeth Wrakonei	Special Agriculture Business Lease (SABL): The socio-economic impacts	Mr. James Seniela
Rachel Mungore	Analysis of the land use in the campus of the Papua New Guinea University of Technology	Mr. Suman Holis
Olape Hongai	The role of infrastructure in urban development: A case study of Tari urban	Mr. Paulus Motoro
Terry John	Effects of title registration on smallholder oil palm blocks: A case study of Land Settlement Scheme blocks in Kimbe, West New Britain Province	Dr. Andrew Pai
Ananias Kawasa	The urban informal housing market in the city of Lae: A case study of West Taraka	Mr. James Seniela
Ramsy Hondole	Commercial property supply in Papua New Guinea: A case study on the shortage of State land for commercial land use in Lae city	Mr. Lepani Karigawa
Jerris Samal	Evaluating the urban changes on customary land in the Bumayong area, Lae city	Mr. Jerry Mille

Faith Raitano	Facility management option for students dormitories at the Papua New Guinea University of Technology	Mr. Paulus Motoro
Wana Raita	Analysis of macroeconomic factors affecting commercial property development in Lae city, Papua New Guinea	Dr. Andrew Pai
Immaculate Andy	Mine tailing disposal causing land contamination: A case study of Ramu Nickel Mine, Papua New Guinea	Prof. Jacob Babarinde
Paias Miamel	The use of urban planning to improve living standards in squatter settlements in Mt. Hagen, Western Highlands Province	Dr. Andrew Pai
Leonard Kalate	Conveyance of customary land ownership in a matrilineal society in Papua New Guinea: A case study of Pomio District, East New Britain Province	Prof. Jacob Babarinde
Samuel Siri	Physical planning perspective of customary land in peri-urban areas of towns and cities in Papa New Guinea: A case study of Igam Settlement. City of Lae, Morobe Province	Mr. Lepani Karigawa
Tope Jornal	Challenges facing customary land development in Lae city: A case study of Nadzab Area	Prof. Jacob Babarinde
Ruga Maino	Hospitality Property Performance measurement during pre-COVID-19 pandemic: A case study of hotels in Port Moresby	Mr. Jerry Mille
Daniel Etape	Impacts of land disputes on customary land ownership in Lae, Morobe Province: A case study of Butibam Village	Dr. Andrew Pai
Kulu Nathan	The impact of building facilities on key facilities at the Papua New Guinea University of Technology	Prof. Jacob Babarinde
Daryll Tagai	Assessing the impacts of facility management on tertiary institutions: A case study of Papua New Guinea University of Technology	Mr. Paulus Motoro
Peter Kape	Factors affecting tenants' choice of renting of retail space in commercial property (shopping mall): A case study of Lae city	Mr. Paulus Motoro
Torove Makali	Urban planning and development impact on residential property market value: A case study of Goroka town	Mr. Jerry Mille
Natalie Maira	Challenges of urban planning in informal settlements: A case study of Goroka block, Tensiti, Lae	Mr. Suman Holis
Axel Vela	The influence of the central business district on residential values: A case study of Lae city, Papua New Guinea	Prof. Jacob Babarinde

Rex Villah	A study of the factors promoting informal settlements on State owned land in Lae urban	Mr. James Seniela
Dickson Karie	Impact of verbal or traditional land dealings in Papua New Guinea: A case study of Porgera Gold Mine Lease Area	Mr. James Seniela

G. Postgraduate Students Research Project, 2021

PG Student Research Project 2021.

SL No	Name of the Student	Course	Title of the thesis	Supervisor (S)
1.	Jerry Paraka	M. Phil in Surveying /2	Upgrading PSM infrastructure of Lae city	Mr. Navua Vali Kapi
2.	Lennie Dimo Kiap	Ph. D in Geomatics/3	Remote Sensing and GIS Application in Crude Oil and Ground Water Pre-Exploration Analysis and Mapping: A Case Study at Okapa- Wanikanto and Ebigo Village & Rainforest, Eastern Highlands Province, PNG	Dr. Sujoy K. Jana Dr. Sailesh Samanta
3.	Nebare Poi	Ph. D in Geomatics/3	GIS and Computer Based Spatially Connected GeoInformation System for Resources Management and Rural Development Planning at Micro Level	Dr. Sujoy K. Jana Dr. Tingneyuc Sekac
4.	Clifford Mespuk Jr.	Ph. D in Geomatics/1	The application of unmanned Aerial Vehicles (UAV Drone Technology) for Remote Sensing as a tool for Rural and Urban Development in PNG: A case study of Wapenamanda town planning	Dr. Sujoy K. Jana Dr. Tingneyuc Sekac
5.	Ashemah Malagh	MPhil/1	Determination of a Feasible Road Alignment from Erap to Lowai and Dinangat as an Economic Corridor (Morobe Fisika Road) Using Engineering Survey & GIS Techniques - A Case Study of Erap/Lowai/Dinangat	Mr. Navua Vali Kapi Mr. Lewi K Kari

			Economic Corridor, Morobe, PNG.	
6.	Edwin Nidkombu	MPhil/2	Upgrading Settlement to a proper subdivision	Mr. Navua Vali Kapi Dr. Tingneyuc Sekac
7.	Resila Karipal	MPhil/2	Using GNSS & GIS Applications combined with UAV technology to create a Digital Cadastral Database for a Peri-Urban settlement - A case study of Igam -Block, Lae City	Mr. Navua Vali Kapi Mr. Lewi K Kari
8.	Heva Honeaki	Mphil/1	The Importance of Identification Surveying Identify Encroachment; Case Study of Encroachment to the Boundary of PNGUOT Taraka Campus	Mr. Navua Vali Kapi Mr. Job Suat
9	Noel Paya	MPhil/1	Application of UAV Technology In Cadastral Surveying in Papua New Guinea: A comparative study of UAV Survey and PNGs conversional survey in Cadastral Survey Applications – A case study at PNG University of Technolgy and other Selected Sites	Mr. Navua Kapi.

Reports from the Research Institutions

- Appropriate Technology and Community Development Institute (ATCDI)

- South Pacific Institute of Sustainable Agriculture and Rural Development (SPISARD)

- Sustainable Energy Research Institute (SERI)

APPROPRIATE TECHNOLOGY AND COMMUNITY DEVELOPMENT INSTITUTE (ATCDI)

Director: Andrew Puy

The Appropriate Technology & Community Development Institute (ATCDI) is located at the PNG University of Technology (PNGUoT) in Lae, Morobe Province. Its purpose is to conduct research and develop technologies appropriate to Papua New Guinea communities' needs and provide technical assistance and information to these communities. The projects are identified through requests from stakeholders.

The Institution aims to assist the rural communities within Papua New Guinea through technical advice and training. Its operations are financially supported by internal revenues and university funds, donor funding, and recurrent salaries. There are five program areas of focus: Energy, Water and Sanitation (WaSH), Appropriate Technology (Small Industry), Food and Downstream Processing, and Community Information. In addition, the Community Information Centre responds to community requests for information on a wide variety of development issues.

ATCDI is driven by the vision be a leading Institute in the country providing innovative development services. Its mission is to improve the living standards of local communities through research, development, application, training, and dissemination of information to address the needs of the communities. And its core value is to ensure quality services are delivered to the less developed communities.

Objectives

- Identify problems affecting the communities and initiate the application of relevant, appropriate technologies for socio-economic development aimed at improving the living standards of the people
- To demonstrate and popularize effectively the usefulness of various appropriate technologies which have successfully been experimented at the PNG University of Technology through relevant training avenues and workshops
- To provide the opportunity for student engagement in research activities and as well as to expose the local people to various scopes for employment generation through Science & Technology.

Highlights and Achievements

No.	Projects Title	Programs	Team leader	Achievements
1	Testing and evaluation of a 2kW Vortex hydro turbine using site river specific conditions	Energy	**Nosare Maika**, Acting Director, and Senior Energy Engineer BEng in Mechanical Engineering, PNG University of Technology Master of Technology (Energy), PNG University of Technology nosare.maika@pnguot.ac.pg	A 2-kW hydro turbine was tested in a laboratory using intervals of increasing rotational speed until 800 RPM. The corresponding average power output was 5 kW. The same turbine was installed in a river with a site condition of 1.8 m static head and a river flow rate ranging from 60 l/s to 90 l/s. An average power output of 800 W was revealed. Laboratory tests proved that power could exceed 2 kW with increasing speed as the main dependent variable. The river test proved that river flow rate significantly affects the power output at the given head. The average efficiency was 63 %, which was considered a good improvement. The project further confirms that power output can be maximized using high flows without increasing the head. The project is funded by the university. A Journal publication is in progress.
2	Hydro potential study of Lake Trist	Energy	**Nosare Maika**, Acting Director, and Senior Energy Engineer BEng in Mechanical Engineering, PNG University of Technology Master of Technology (Energy), PNG University of Technology	Lake Trist is considered one of the largest natural dams in the region and located near Wau area. The surface area of the lake is 5.5 km x 1.5 km x 60 m depth and a total volume of 330 MM^3 of water capacity. The river exits at a flow of 7 m^3/s. An installed power of 100 MW can be realized at a head of 1.5 km downstream. Thus, a great hydro potential exists. Detail

			nosare.maika@pnguot.ac.pg	study is in progress. The study was funded by the local people.
3	Comparative performance tests of 2 x water electric ramp pumps	Appropriate Technology	**Robert Kipong**, Appropriate Technology Engineer BEng in Mechanical Engineering, PNG University of Technology robert.kipong@pnguot.ac.pg	Comparative discharge tests for 2 types of ramp pumps were conducted at 4 m head, namely the Billabong and GI ramp pumps. Billabong pump showed no discharge whilst GI pump delivered 0.03 l/s of the required 2 l/s capacity. Thus, the output efficiency for the GI pump was very low at 1.6 %. Tests are continuing with an objective to improve efficiency.
4	Salamaua communal gravity and pumped water supply	Water and Sanitation	**Sona Anegi,** Water and Sanitation Engineer BEng in Mining Engineering, PNG University of Technology sona.anegi@pnguot.ac.pg	Funding was secured from the Salamaua LLG. A communal water supply project was designed to utilize both gravity and solar submersible pump systems. The site conditions included a stream flow of 20 l/s, a static head of 40 m and reticulation over a distance of 3 km to the village of 400 people. Construction has just started and completion is expected in May 2022.
5	Downstream processing of food and soap products	Food and Downstream Processing	**John Tenakanai**, Scientific Officer BSc in Food Technology, PNG University of Technology MSc of Leadership (Business Administration), Divine Word University john.tenakanai@pnguot.a.c.pg	Noni juice of 200 Liters was extracted and bottled for consumers. Turmeric powder and coconut oil were processed and sold, the total amount of 3.5 kg ad 20 liters, respectively. Various soap sizes numbering 15 batches were produced and sold to clients. Funding is derived from internal revenues.

Research Publications and Training

Undergraduate student final year research projects

No	Name	Supervisor/ Co- supervisor	Title of the research project	Department
1	Alfred Kumis & Jeremy Kunjil	Dr Shoeb Syed/ Mr Nosare Maika	Kananga Mini Hydro Project	Mechanical Engineering
2	Sebastian Sendup & Jerom Opi	Mr Nosare Maika	Design of a sustainable micro-hydro system for Nile Village in Nawaeb LLG, Morobe Province	Civil Engineering

Collaborative Research Publications

1	Maika, N, and Wahid, S. (2021). Implementing Gravitational vortex hydropower plant: Case Study. Springer Journal of The Institute of Engineers (India), Series C 102 (6), 1565-1570.

Staff Training

1	Nosare Maika	Australian Award Scholarship, PhD study in Mechanical Engineering, James Cook University, 2022 – 2026.
2	Robert Kipong	Advanced electronics Trouble shooting Training [2 days]
3	Robert Kipong	Introduction to Teaching at PNG UoT [2 days]

Research Interests

	Researcher	Research Interests
1	Mr Nosare Maika	PhD Thesis, Development and Design Optimization of High capacity Gravitational Vortex Hydro Power Plant (GVHPP) for High and constant Flowing River Conditions Employing Computational Fluid Dynamics and Modelling
2	Mr Robert Kipong	Humanitarian Engineering: Innovative approaches and interactions in crisis management

SOUTH PACIFIC INSTITUTE OF SUSTAINABLE AGRICULTURE AND RURAL DEVELOPMENT

Acting Director: Dr Veronica Bue

1. Brief introduction

The South Pacific Institute of Agriculture and Rural Development (SPISARD) has been operating for almost 18 years. However, for the last 7 years, the SPISARD was not able to conduct any research and outreach activities primarily due to lack of funding. This year (2021), the Vice-Chancellor through the University allocated one hundred-thousand-Kina (K100, 000.00) to SPISARD to carry out its outreach activities. As highlighted below, several SPISARD program activities were conducted with this funding.

2. Activities conducted

2.1. Preliminary Observations

Two (2) preliminary observations were conducted to identify training needs in Kompri, Eastern Highlands Province, and Kapari in the Central Province. One baseline study was conducted during the training.

2.1.1. Kuli Gap Village

No preliminary observation was conducted at Kuli Gap before the life skill training was conducted. However, the information presented was collected through observation when the officers were on the ground to deliver the training. Kuli Gap is situated at the border of Jiwaka and Western Highlands Province. The village has education facilities (elementary school to high school), a church, access to electricity and water from streams, and groundwater. Villagers earn their income from coffee and food gardens, especially sweet potatoes.

2.1.2. Kompri Village

The Kompri area in the EHP is notorious for law-and-order problems. As a result, SPISARD felt the need to reach out to this particular community with the anticipation that the presence of the University of Technology in the community through the SPISARD's outreach program would evoke a sense of value and inclusion among the inhabitants of this community. Therefore, the baseline study was conducted to identify training needs for the community resource availability and establish a working committee. Unfortunately, due to Covid-19 restrictions in 2021, SPISARD could not conduct training in the needs areas identified.

2.1.3. Kapari Village

The second preliminary observation was conducted in Kapari, Central Province. This baseline study was conducted to identify the potential for cocoa development establish cocoa development requirements and other associated needs about the development of cocoa farming in Kapari.

2.2. Training Activities

Two (2) training were conducted, one at Kuli Gap, Jiwaka Province, and the other at Kapari, Central Province in 2021. Although SPISARD planned to run six (6) training annually, it conducted only two pieces of training. This happened because members of the SPISARD team were also the Agriculture Department's teaching staff. They were tied up with teaching responsibilities with little time available to complete the planned training programs.

2.2.1. Kuli Gap Life Skill Training

The Life Skill Training Kuli Gap was conducted in July 2021. About 120 participants attended the training. The Training was conducted in stock feed making, soap making, floral arrangements, and drape decoration.

2.2.2. Kapari Cocoa Nursery Training

The Kapari Cocoa Nursery Training was conducted in December 2021. About 69 participants attended the training. The Training was conducted in cocoa nursery and soap making. The Training participants acknowledged the initiative of Kapari Development Corporation in introducing and developing cocoa farming in the area.

2.3. Infrastructure Development

A Farmer Training Centre is currently being built in Popondetta, Oro Province, by the people of Kokoda LLG (Ward 14). The community funded and built the training center. This reflects the community's desire for change. SPISARD assisted in funding roofing irons for the building to motivate continued participation.

2.4. Agriculture Development

In the same period, cocoa development projects has been started in Kapari Central Province. The project will assist households in Kapari to set up their cocoa blocks. The project is facilitated by the SPISARD and Kapari Development Corporation (KDC).

3. Training Evaluation

3.1. Kuli Gap Life Skill Training

Pre- and post-training evaluations were conducted before and after the training. A follow-up study is yet to be undertaken.

Surveys were conducted during the training and after graduation to get participants' feedback on the training. Ninety-five percent (118 participants) participated in the pre-training evaluation survey while 96 % (119 participants) participated in the post-training evaluation survey.

A. Pre-training evaluation

3.1.1. Extent of knowledge on training subjects.

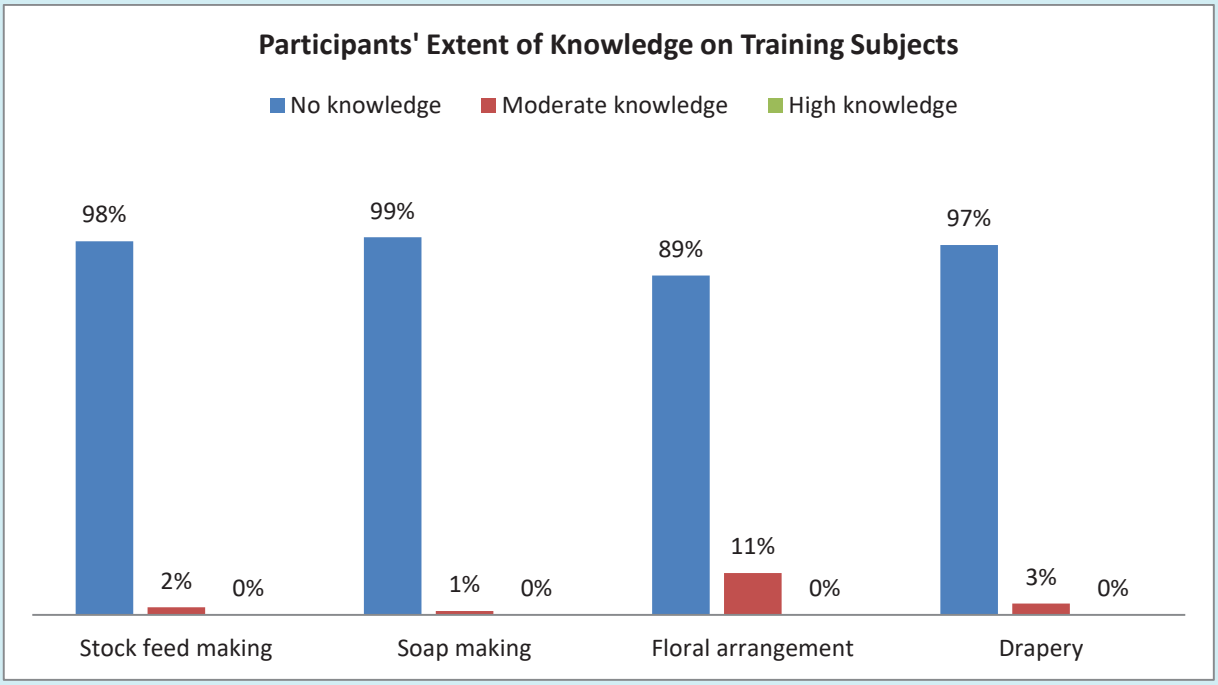


Figure 1. Graph showing participants' extent of knowledge about the training subjects (n=118)

- Almost 100 % of the participants did not know about stock feed making, soap making (bath and dish soap), floral arrangement, and drapery.
- Eleven percent of the participants had moderate knowledge about the floral arrangement. These participants were primarily women who actively participated in church decorations in preparation for church gatherings.

3.1.2. Previous training on training subjects

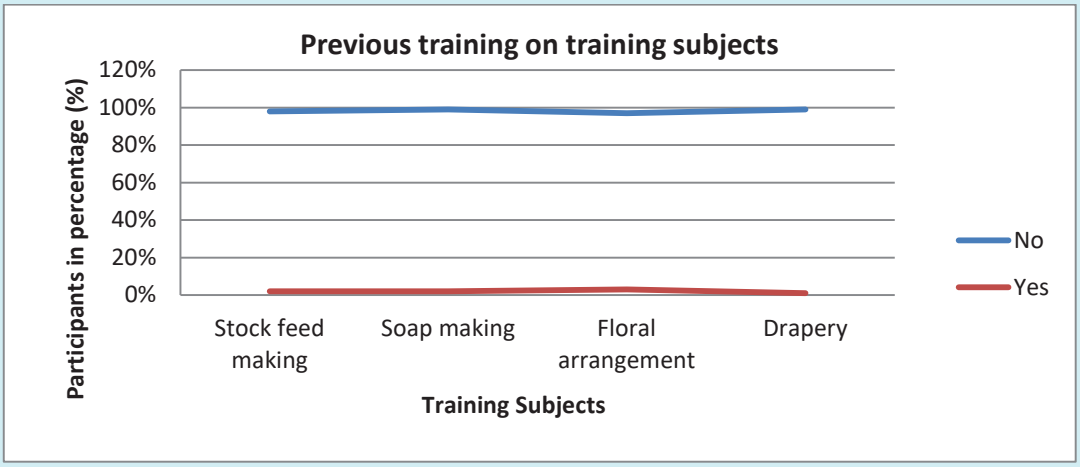


Figure 2. Graph showing participants' previous training on training subjects (n=118)

- Almost 100 percent of the participants had no previous training in stock feed making, soap making (bath and dish soap), floral arrangement, and drapery.

3.1.3. Participants' expectations for the training.

Table 1. Participants' expectation for the training (n = 118)

Responses (interested to learn about)	Percentage (%) of participants
Stockfeed	22
Stockfeed + Soap	18
Stockfeed + Soap + Floral Arrangement + Drapery	30
Stockfeed + Soap + Floral Arrangement	11
Stockfeed + Floral Arrangement + Drapery	3
Stockfeed + Floral Arrangement	4
Floral Arrangement + Drapery	5
Soap + Flower arrangement	1
soap + Flower arrangement + drapery	2
Soap	3
Others	1

- The majority of the participants were interested to learn about one training subject or a combination of the training according to their interests and how they perceive the training will or will not serve them.
- From the table above, the highest number of participants (30 %) was interested in learning about all four training subjects (i.e., stock feed, soap, floral arrangement, and drapery), 22 % were interested in Stockfeed 18 % were interested in Stockfeed and soap.

B. Post-training evaluation

3.1.4. Participants' opinion on the delivery of training subjects.

Table 2. Participants' opinion about the delivery training (n=119)

Topic	Percentage (%) of participants			
	Simple and easy to understand	Moderate (sometimes easy and sometimes hard)	Hard to understand	Missing data
Stockfeed	88	9	1	2
Bath soap	76	17	3	4
Dish soap	92	1		7
Floral arrangement	47	33	7	13
Drapery	47	30	9	14

- The majority of the participants found stock feed making (88 %), bath soap (76 %), and dish soap (92 %) to be simple and easy to understand.
- The results were expected because you're just measuring ingredients and mixing them up, and you're done.
- Almost 50 % found the delivery of floral arrangements simple and easy to understand, and 30 % – 33 % found it moderate. Some found it hard to comprehend floral arrangement and drapery. Those who found it difficult to understand the training was primarily male participants. The missing data mainly were male participants, as observed in their lack of interest in the subject.
- All training required ample time for participants to understand fully

3.1.5. Participants' opinion on the usefulness of the training

Table 3. Participants' opinion on the usefulness of the training (n=119)

Topic	Percentage (%) of participants			
	Not useful	Useful	Very useful	Missing data
Stockfeed		5	92	3
Bath soap	1	20	76	3
Dish soap		9	85	6
Floral arrangement	1	17	68	14
Drapery	3	21	63	13

- The majority of the participants found the training to be very useful
- The missing data were from male participants who were not interested in floral arrangement and drapery training.

3.1.6. Participants' opinion on the timing of the training

Table 4. Participants' view on the timing of the delivery of training (n=119)

Topic	Percentage (%) of participants			
	Too short	Good timing	Too long	Missing data
Stockfeed	20	80		
Bath soap	13	64	17	6
Dish soap	17	75	2	6
Floral arrangement	17	60	8	15
Drapery	17	62	8	13

- The majority of the participants think that the time taken to deliver the training was good.

3.1.7. Participants' level of confidence in putting to practice what they learned

Table 5. Participants' confidence level (n =119)

Topic	Percentage (%) of participants			
	No, I need further training	Not confident	Yes	Missing data
Stockfeed	6	3	90	1
Bath soap	6	11	81	2
Dish soap	3	4	83	10
Floral arrangement	9	11	66	14
Drapery	9	17	60	14

- The majority of the participants were confident about putting to practice what they had learned.
- A small number of the participants were not entirely confident about practicing what they had learned.

3.1.8. Participants' satisfaction with the training

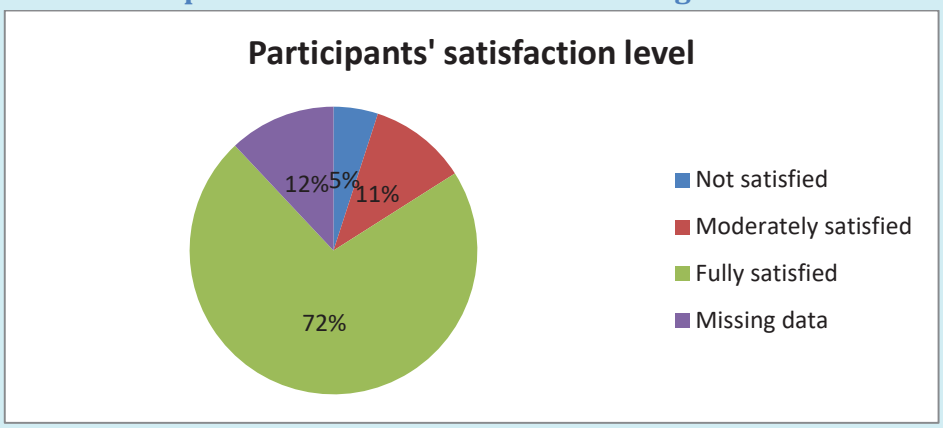


Figure 3. Graph showing participants' satisfaction level (n=119)

- Seventy-two percent of the participants were fully satisfied with the training, while 11 % were moderately satisfied
- Only a small number of participants were not satisfied with the training.

3.1.9. Participants' training interests

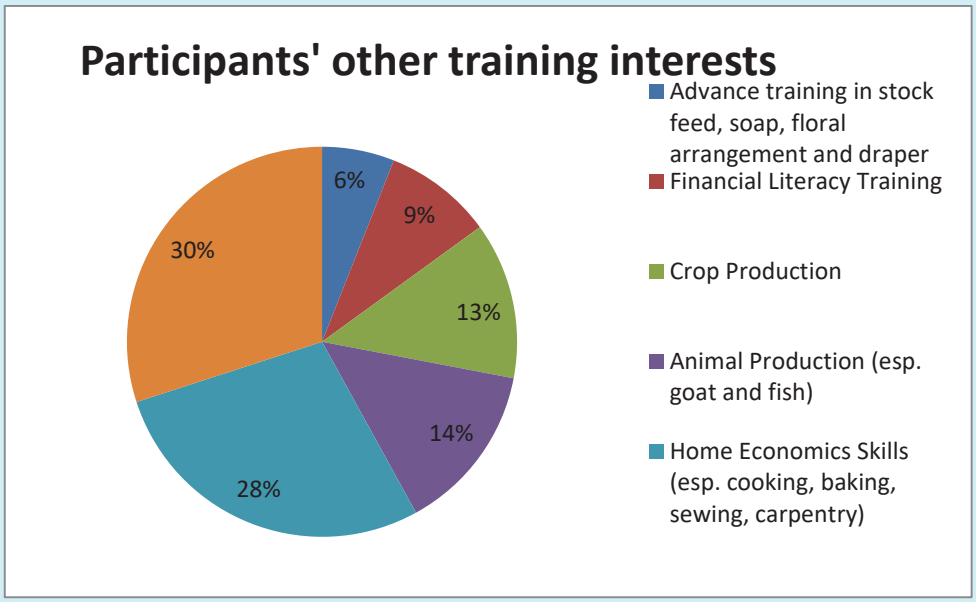


Figure 4. Graph showing participants' other training interests (n=119)

- The majority (30 %) of the participants did not indicate what other training they would be interested in participating.

- Twenty-eight percent of the participants indicated that they would be interested to learn home economics skills. These participants were mostly women and some men.

- Some were interested in receiving training in crop (13 %) and animal (14 %) production. It was noted that all training participants from Kudjip were fish farmers. They were initially informed that the training was on fish farming. However, they were pleased to attend the training and hoped that similar training would be conducted on fish farming.

3.2. Kapari Cocoa Nursery Training

Like the life skill training conducted in Kuli Gap, pre- and post-training evaluations were conducted before and after the training. However, a follow-up study is yet to be conducted to determine if the participants are putting to practice the knowledge and skills they acquired from the training, especially in soap making. For the cocoa nursery, it is anticipated that all the participants will implement what they learned as they all work together to establish the cocoa nursery which will supply the needed seedlings to plant in their cocoa blocks.

A. Pre-training evaluation

3.2.1. Extent of knowledge on training subjects.

All of the participants didn't have any knowledge on neither soap making nor cocoa nursery. Understandably, cocoa is a new crop that was introduced to the community.

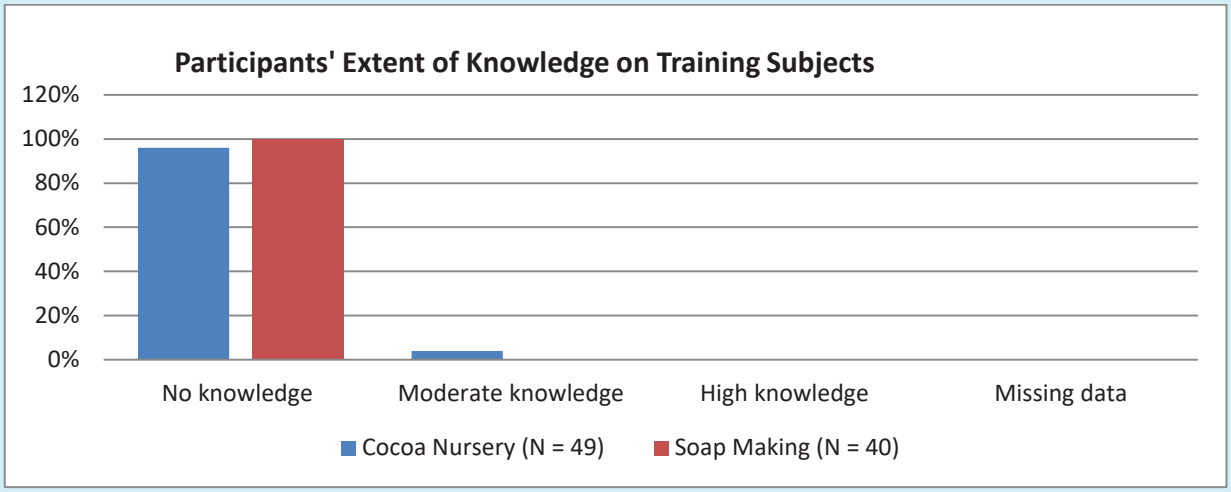


Figure 5. Graph showing participants' extent of knowledge about the training subjects.

3.2.2. Previous training on training subjects

None of the participants attended previous training on soap making and cocoa nursery training.

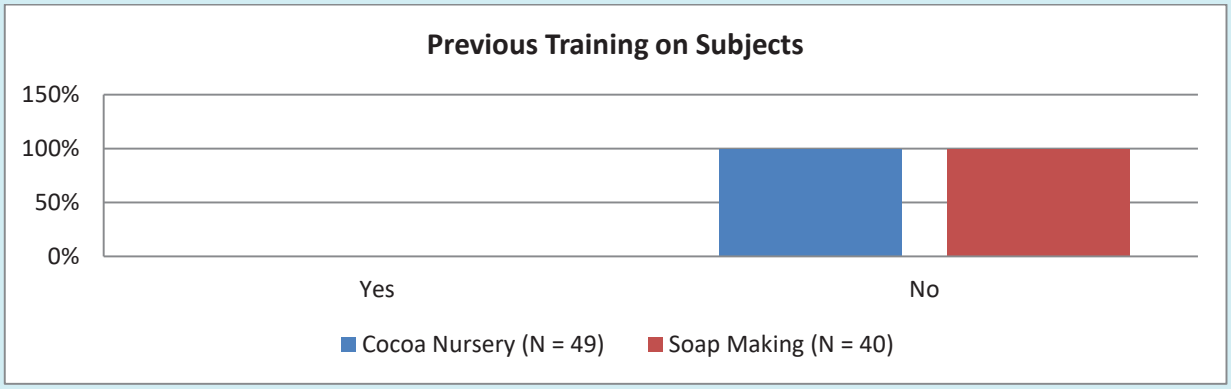


Figure 6. Graph showing participants' previous training on training subjects.

3.2.3. Participants' expectations for the training.

All of the participants' expectation was to learn about cocoa and know how to grow cocoa.

B. Post-training evaluation

3.2.4. Participants' opinion on the delivery of training subjects.

The majority of the participants stated that both pieces of training were easy to understand.

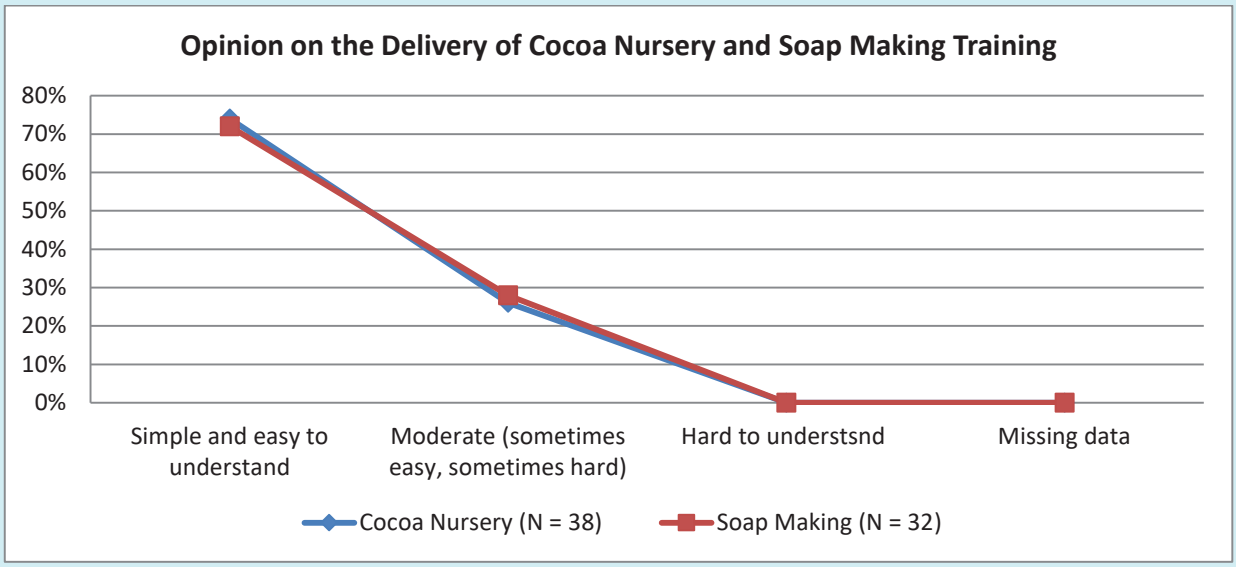


Figure 7. Graph showing participants' opinions on the delivery of the training.

3.2.5. Participants' opinion on the usefulness of the training

The majority of the farmers stated that both pieces of training were very useful to them. Cocoa nursery training was conducted to prepare the participants to establish the cocoa nursery in Meithe village. The soap-making training was also noted to be useful because one of the most basic needs among the participants is soap. Soap is used explicitly for laundry. However, the trainer only prepared training material for bath soap. At the end of the training, the participants requested for training to be done in laundry soap making and laundry powder.

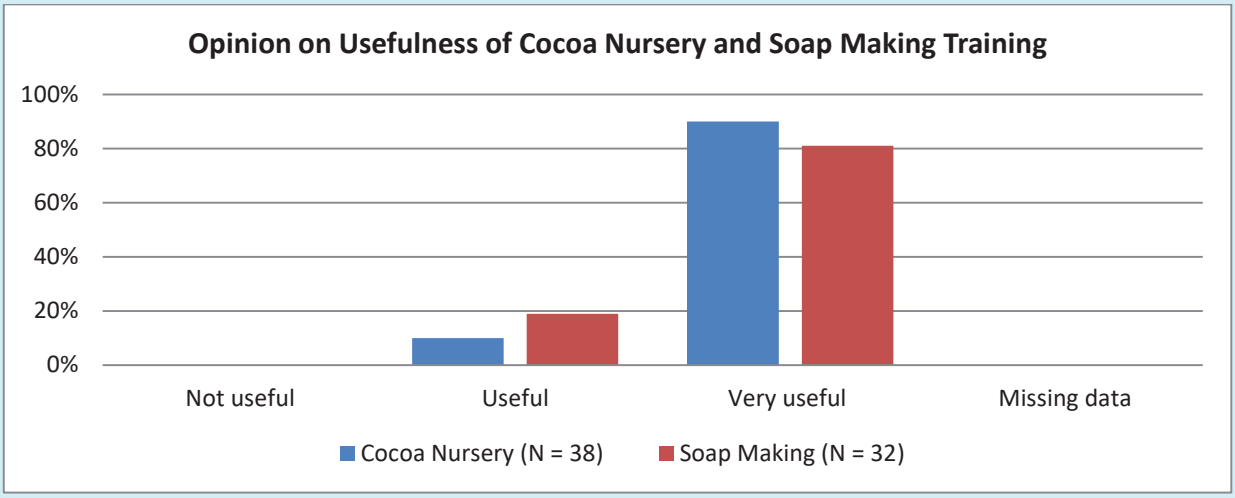


Figure 8. Graph showing participants' opinion on the usefulness of cocoa nursery and soap-making training.

3.2.6. Participants' opinion on the timing of the training

The majority of the farmers stated that the time taken to deliver the training was good.

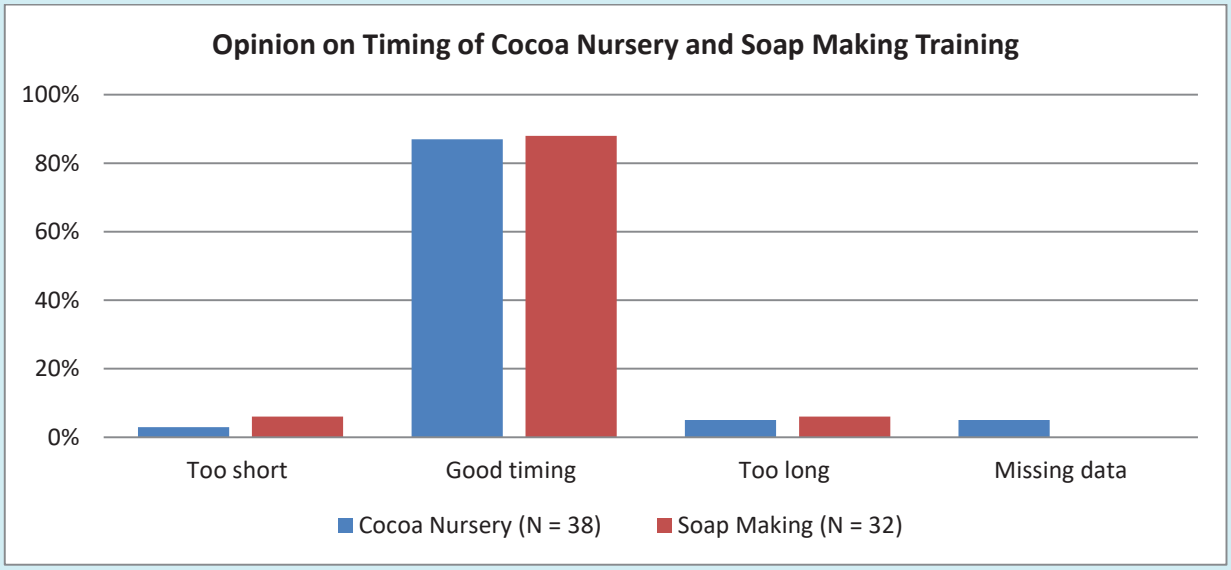


Figure 9. Graph showing the opinion of participants on the timing of cocoa nursery and soap-making training.

3.2.7. Participants' opinion on whether the training met their expectations or not

Since the training was simple and easy to understand, the participants stated that it met their expectations. They were happy to learn how to fill poly bags with soil and line them up in rows. They were also happy they learned how to make soap.

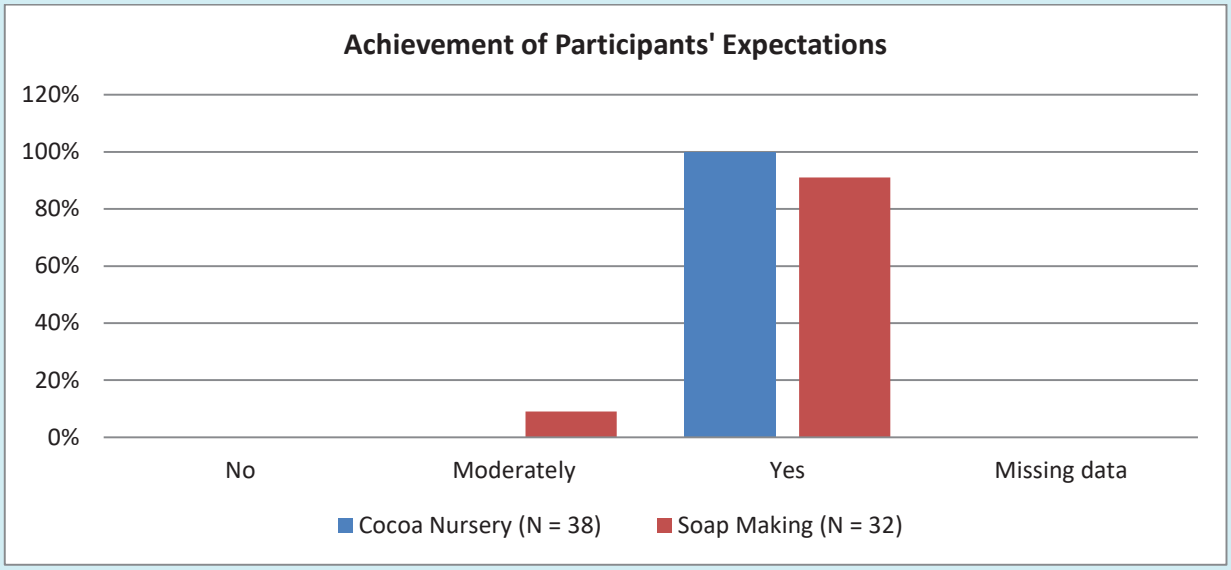


Figure 10. Graph showing the participant's satisfaction with the training.

3.2.8. Achievement of Training Objectives

A hundred percent of the participants stated that they had achieved the objectives of coco nursery training, and 91 % said the same for soap-making training.

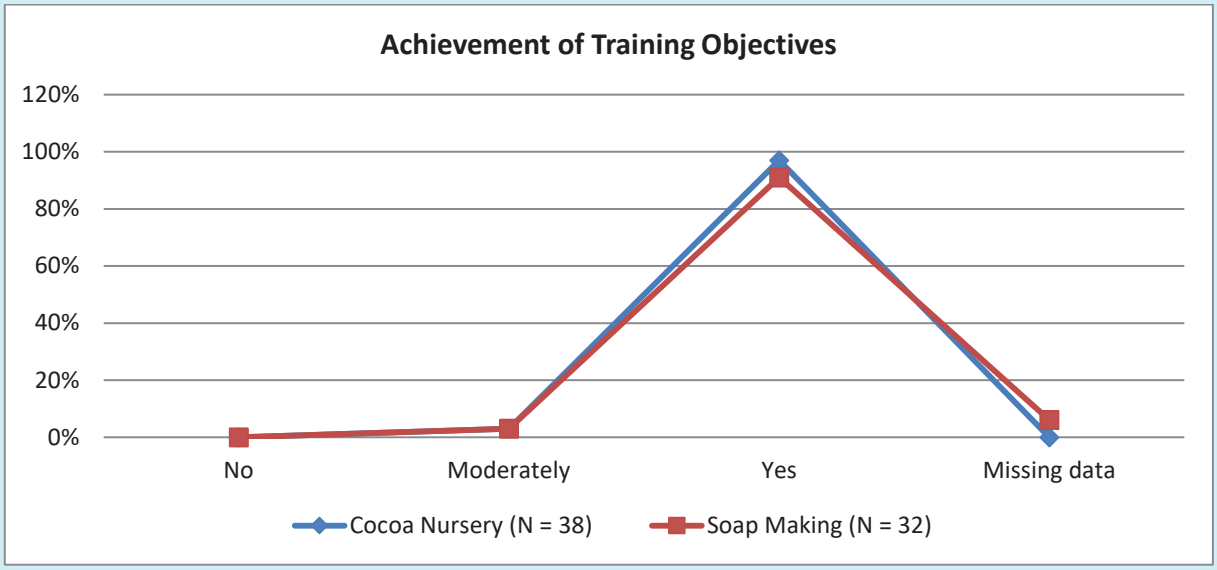


Figure 11. Graph showing participant's opinion about the achievement of training objectives.

3.2.9. Participants' other training needs

The following table shows training needs indicated by participants who attended cocoa nursery training. The two main training needs indicated were seed germination and cocoa block establishment. This data indicates that the participants are eager to get the cocoa project up and running.

Table 6. Training needs as indicated by participants who attended cocoa nursery training.

Training Needs	Number of Participants
Seed germination	9
Poultry	2
Piggery	2
Food processing	3
Create hybrid clones	2
Cocoa block establishment	8
Scent for soap making	4
Butter making	1
Sugar making	5
Dishwashing paste	1
Rice farming	1
Vegetable farming	1
Fish farming	2
Other	7

4. Financial Report

In April 2021, the University allocated K100, 000.00 to SPISARD. The following table shows the break-up of the K100, 000.00 that has been used.

Table 7. Break-up of K100, 000.00 allocated to SPISARD

No	Activity	Cost
1	Kuli Gap Life Skill Training	K13, 108.09
2	Kompri Baseline Survey	K1, 950.00
3	Kapari Baseline Survey	K2, 957.70
4	Kapari Cocoa Nursery Training	K26, 677.05
5	SPISARD Uniforms	K2, 197.34
6	Camera	K3, 253.90
7	Petty Cash	K500.00
8	Consultant Payment SPISARD Model House	K3,000.00
9	Balance	K53,644.08

5. Conclusion

Finally, we sincerely acknowledge the University's decision to fund SPISARD's outreach programs.

SUSTAINABLE ENERGY RESEARCH INSTITUTE

Director: Dr Dapsy Olatona

The Sustainable Energy Research Institute (SERI) is a Private-Public-Partnership (PPP) organization owned jointly by Papua New Guinea University of Technology (PNGUoT), the Government of PNG, and start-up collaboration with Mayur Power Generation (MPG Ltd).

Dr Ora Renagin, the Vice Chancellor of the PNG University of Technology, inaugurated the SERI in 2017 with a mandate to initiate, participate, collaborate and enhance PNGUoT staff and student-inclusive research activities in the area of sustainable (renewable and non-renewable) energy **research**, energy **technology development,** and **deployment**, for the benefit of the University, our collaborators, the Government and People of PNG, and entire humanity. The SERI was inaugurated secondarily to be the custodian and the 'library' of all credible information and a comprehensive database on all forms of energy, energy research, energy development technology, and policy in PNG. The portrait of our knowledge-based blueprint is to be a student and community-focused entity.

The SERI Energy Expert Groups are made up of PNGUoT Lecturers, University Technical Staff, and Students; subdivided into the following climate-friendly energy teams.

1. Solar and Wind Energy Group
2. Hydro &Tidal
3. Geothermal
4. Bio-Energy
5. Energy Storage
6. Energy Policy
7. Atomic & Nuclear Energy
8. Energy Management, Efficiency & Green Construction

9. Hybrid & Multi-Fuel Power
10. Energy Transmission & Distribution
11. Climate Change, Energy Pollutions & the Environment
12. Sustainable Energy Planning & Feasibility Studies
13. Alternative Energy
14. Consumers Group: (Safe, Affordable & Reliable Energy Advocates)
15. SERI Volunteers group (mainly students)

Overview of Non-Commercial Activities

Conscious of the fact that PNGUoT is the principal trainer of Energy Engineers in PNG, PNGUoT-SERI's primary objective is to assist our main sponsor (the Government of PNG) to achieve the climate-friendly renewable energy goals as outlined in the government energy policy. Our secondary goal is to reach out to the community and find ways to use our members' skills and knowledge to improve PNG citizens' quality of life, especially the large population in rural communities. We pursue our goals by conducting renewable energy research, feasibility studies, funding applications, equipment development, and appropriate technology deployment for local and overseas interest groups. We play an active role in the ongoing reform in the energy sector by participating in the regulation and policy meetings and discussions. We provide free advice and information to energy stakeholders upon request, and we maintain professional relationships with other local and international Research and Educational Institutions (with similar interest), including but not restricted to:-

Industries and Businesses

Relevant Arm of Government and Non-Government Organizations (NGO's) to include but not restricted to;-

State Owned Enterprises (SOE)

Independent Public Business Corporations (IPBC)

Conservation and Environmental Protection Authority (CEPA)

Department of Petroleum and Energy (DPE)

Mineral Resources Authority (MRA)

Chamber of Mines

World Health Organization (WHO)

United Nations

World Bank and

Other Relevant Regional and Global Entities

Relevant Pre-Existing Charters and Terms of Reference

UNITECH Vision 2050

PNGUoT Charter

Energy Plan 2050

Mayur-PNGUoT Terms of Reference

Other WHO, UN, and World Bank Sustainable Energy/Millennium Development Goals

Overview of SERI Commercial Activities

In addition to our research and product development activities, we participate in Renewable Energy Infrastructure contracting, deployment, and the Professional Training of Renewable Energy Practitioners such as Electricians, Renewable Energy Installers, and Company Design Engineers.

Although we charge a fee for some of these activities, our rates are generally “means-tested” and negotiable because we are a not-for-profit organization. In the last two years and ongoing, the

SERI and its members have been commissioned to carry out over 20 large-scale feasibility studies of Solar and Hydro energy infrastructures in Momase regions of PNG. However, apart from members designated to install micro-hydro by charity and church organizations, the SERI has not been contracted to install any significant hydro- and geothermal power grid.

The SERI commercial activities are usually in partnership with external companies, and the sources of contract and consultancy awards are generally from overseas grants and donors. We select and focus on areas such as Hydro and geothermal where there is local expertise.

In collaboration with an ongoing contract with UNDP, the SERI was hired to train selected PNG Power Staffs from Morobe and Sepik provinces in Solar Installation Best Practice. The SERI, in collaboration with an American Based Company, has just been contracted to digitize the operations of an IPP in 7 provinces of PNG. The contract details are being drawn up but not yet finalized due to the complex scope of the project

Areas of Research

The areas of research interest of our members constitute the areas of interest of the institute. The SERI encourages and assists individual researchers and teamwork formation, especially in research areas where the multi-disciplinary skills of members and overseas collaborators can be effectively put to use.

In the last two years, the focus of the SERI members' research has been in the areas of

Solar Energy Access and Demand in Rural Areas of PNG

Longevity issues and causes of frequent breakdowns in solar and hydro energy installations

Hydro Energy feasibility studies of various waterfalls and rivers in the rural areas of PNG

Conversion of small scale flowing rivers into micro power using vortex technology

Wind Energy research in the Markham Valley

Agricultural photovoltaic

Energy Turbines research

Biogas Digester using Unitech mess waste

Renewable energy as agents of combating Climate change

Ozone depletion and renewable refrigerants

In addition to initiating, facilitating, and assisting members in attending relevant energy-related meetings and seminars, the SERI Secretariat has participated as invited keynote speakers at local and oversea conferences and symposiums in China, Malaysia, Fiji, and Moresby concerning renewable energy and climate change. Below are four widely referenced (pre-covid) published conference and journal papers by SERI members:

Renewable energy technologies as "saving graces" for Pacific Island nations fighting climate change *(Sciendo, international conference Journal; KBO Vol XXV; No3 pg 117, 2019)*

An Appraisal of PNG National Energy Policy 2018-2028
(*International Journal of Energy and Environmental Research Vol.7, No.2, pp.1-18, October 2019*)

Adaptation of Agricultural Photo Voltaic Technology for PNG Rural Household Energy Supply and Farm Land Preservation. (*Kuala Lumpur, Malaysia, 18th International Conference on Sustainable Energy Technologies Jan 2020*)

Failure of Francis Water Turbines due to Flow Variations in Papua New Guinea (*Proceedings of the International Conference on Industrial Engineering and Operations Management Paris, France, July 26-27, 2019)*

Reports from the Research Centres

Environmental Research and Management Centre (ERMC)

UNITECH Biotechnology Centre (UBC)

Environmental Research and Management Centre

Acting/Director: William Kojo Modey, PhD.

EXECUTIVE SUMMARY

The Environmental Research and Management Centre (ERMC) was mandated to conduct environmental research and environmental management programs involving faculty and research affiliates working across disciplinary lines. The major challenge for the Centre continues to be equipping its laboratories to undertake research, consultations, and postgraduate training. Papua New Guinea (PNG) is facing environmental problems, which are, in most cases, inevitable outcomes of major development projects and resulting anthropogenic effects on water quality control and water supplies, and other related industries. On its establishment in 1993, the Centre was tasked to develop, coordinate, and oversee environmental research and conservation efforts in alignment with the national goals and strategies, such as that enshrined in the PNG National Constitution on the issue of sound and wise utilization and management of the country's natural resources. The Centre has since 2009 been working in four main research program areas (seeking future research in those areas and prospecting for funding in research fields where there is little or no research efforts in PNG) across the academic and research institutions. The multidisciplinary character at PNGUoT allows ERMC to focus on four multidisciplinary thematic areas of research: Biodiversity Conservation & Community Development; Herbal Medicine & Natural Products Development; Mined Environment & Industry Waste Management, Monitoring, and Rehabilitation; and Technology Immitation and Development.

VISION & MISSION

The ERMC strives *"to be a leader in the development and use of science and technology in relation to the understanding, stewardship, and conservation of PNG's natural systems"*. The mission is to coordinate and solicit support (from natural science and technological sciences here at the University of Technology) to set up multidisciplinary research and development centre of excellence in PNG and the region.

STRATEGIC GOALS AND OBJECTIVES

a) To acquire, install and initiate accreditation of the research facilities at the ERMC centre, with reliable electricity and air conditioning systems
b) To recruit and train postgraduate students to gradually take up positions of responsibility in relevant areas of research and development in the country
c) To carry out research that produces results that convince government endorsements and support
d) To institute professionalism (ethical and unbiased) in research and development at the PNG University of Technology and elsewhere

MAJOR ACTIVITY AREAS

The above objectives complement the major activity areas of the Environmental Research and Management Center. The ERMC was established to focus its activities in the following areas: environmental management problems; mining waste disposal problems; rehabilitation of old Mine sites; air pollution; water pollution; soil degradation; destruction of natural ecosystems; sustainable agricultural developments; sustainable forestry development; and now, climate change.

FUNDING & OPERATION BUDGET

Since 2014, ERMC has not received any recurrent funding from the University or any major external source. It may have been expected that certain administrative decisions were to be implemented to propel the Center to take an entrepreneurial approach to contribute towards financial sustainability for the Papua New Guinea University of Technology. Seed money was required to be available to jump-start the Centre and become financially sustainable and serve the country's environmental monitoring needs. So, since May 2019, the following proposals were submitted seeking external funding, but to no avail:

- Establishment of a complete air pollution monitoring station in the city of Lae, in Papua New Guinea, for ambient gases and fine particulates. Research Proposal submitted to China

National Cleaner Production Centre (CNCPC) & Chinese Research Academy of Environmental Sciences (CRAES). **Budget**: 523,000 AUD;

- Establishment of an Air and Water Pollution Research Centre in Papua New Guinea. Research Proposal submitted to Wellcome Trust. **Budget**: 1, 588,292.00 USD**;**
- Capillary Electrophoresis for Environmental Applications in Papua New Guinea. Research Proposal submitted to Canada Fund for Local Initiatives (CFLI). **Budget**: 49,440.61 CAD;
- Screening and Evaluation of Potential Medicinal Plants in Papua New Guinea Using Supercritical Fluid Technology. Research Idea submitted to Research Grants 2020, Merck Pharmaceuticals, under Drug Discovery category. **Budget**: 1,500, 000 USD;
- Environmental Education on the Ecological Evaluation of Air, Water Bodies, and Sediments in Papua New Guinea. Research proposal submitted to Spencer Foundation. **Budget**: 495,000 USD.

This year, 2021, the ERMC was blessed with a budget of Kina 100,000, from a Vice-Chancellor's vote, to help develop the Centre after many years of neglect. Further, an amount of Kina 88,000 was secured through a research proposal (for the training of a female postgraduate student) submitted through the Research Committee to refurbish a neglected analytical instrument with potential application for monitoring environmental cyanide in contaminated water bodies for compliance.

The Analytical instrument has been fully refurbished and is currently in use by the postgraduate student. The budgeted amount (K100,000) has been wisely utilized to upgrade the Center's basic facilities and support the purchase of laboratory consumables for the analytical instrument and other environmental projects soon to take off, or for projects already ongoing involving other postgraduate students.

FACILITIES, RESEARCH DEVELOPMENT, AND PLANNED ACTIVITIES

- The Centre has laboratory spaces, workstations for staff and postgraduate students, a library space, a conference room, an administration office, and a staff coffee room.
- The laboratory rooms are empty, except for the newly refurbished and fully automated Agilent 7100 Capillary Electrophoresis (CE) analytical instrument.

- The laboratories must be fully operational to undertake serious analytical research and consultancy projects.
- An ERMC Board meeting was held on 3rd November 2021 in the ERMC Conference Room to address issues concerning the ERMC and the way forward.
- The newly reconstituted Board had a meeting involving the following persons:
    - Dr. Garry Sali – Deputy Vice Chancellor
    - Professor Kaul Gena – Pro-Vice Chancellor Administration, and Board Chair
    - Professor Tom Okpul – Acting Director, Biotechnology Centre
    - Dr. William Kojo Modey – Acting Director, ERMC
    - Dr. Macquin Maino – Head of Agriculture
    - Dr. Gabriel Arpa – Head of Mining and Mineral Processing Engineering
    - Dr. Gabriel Anduwan – Head of Applied Physics
    - Dr. Lydia Yalambing – Head of Applied Sciences
- In the Academic Year 2021, no consultancy work was carried out through the ERMC and so several resolutions were tabled during the meeting to address the current situation
- The following are some of the relevant resolutions tabled at the meeting:
    - A revised structure of ERMC to comprise of a substantive Director with sufficient time and resources to travel and market the ERMC; three Technical Officers with specializations in Applied Chemistry, Environmental Science, and Biology; one Administrative staff; and one Janitor. See Figure 1, below
    - A need to verify if the ERMC Director position is on the establishment or borrowed from another department
    - ERMC Board resolved that Rainforest Habitat (RFH) should be transferred back to ERMC so that it can be managed as part of its conservation programs
    - On Environmental initiatives, the ERMC should establish contact with the Environment Compliance unit at the Conservation and Environment Protection Authority (CEPA) to seek assistance and funding so that ERMC can do independent monitoring for environmental permit compliance points in mining sites such as Hidden Valley, Wafi Golpu, K92 Mine and Ramu Ni-Co Mine. Professor Gena

pledged to provide contact information for the CEPA officers in charge of monitoring

- A need to verify the Terms of Reference (TOR) and existing policies on ERMC
- Review the existing Memorandum of Understanding (MOU) with CEPA
- ERMC Director must come up with relevant research topics and discuss with relevant HoDs so that postgraduate students who are eligible for the Graduate Assistantship Programme (GAP) can be identified and selected to pick up those proposed ERMC research projects and benefit from any privileges the ERMC can afford under its budgetary allocation and additional research proposals. To ignite this objective, the Director has proposed the following postgraduate students who are currently embarking on Environment-related projects to be embedded in the ERMC's agenda:

Student Name/Degree Level	**Project Title**	**Supervisor**
Salvina Ku/MPhil.	Analytical Capillary Electrophoresis for environmental applications in Papua New Guinea.	Dr. William K Modey
Ruthia Kisi/MPhil.	Quality evaluation of commodity products from Papua New Guinea using ICP-MS and HPLC**	Dr. William K Modey
Anne Anonga/MPhil.	Determination of WAD and Free Cyanide, and environmental assessment of selected water bodies in Papua New Guinea.	Dr. William K Modey

Sogoing Denano/Ph.D.	Ecological risk assessment of selected rivers in Papua New Guinea: A case study in relation to heavy metals contamination, severity of sediment perturbation, and food safety.	Dr. William K Modey

**HPLC may be changed to Capillary Electrophoresis, as there have been challenges securing a dedicated HPLC instrument.

- A need to increase the budget for ERMC in the Year 2022 following the successful acquittal of all expenditure from the 2021 budget
- ERMC must have direct contact with the Office of Climate Change so that upcoming proposal can be accessed timely and conveyed to the University community

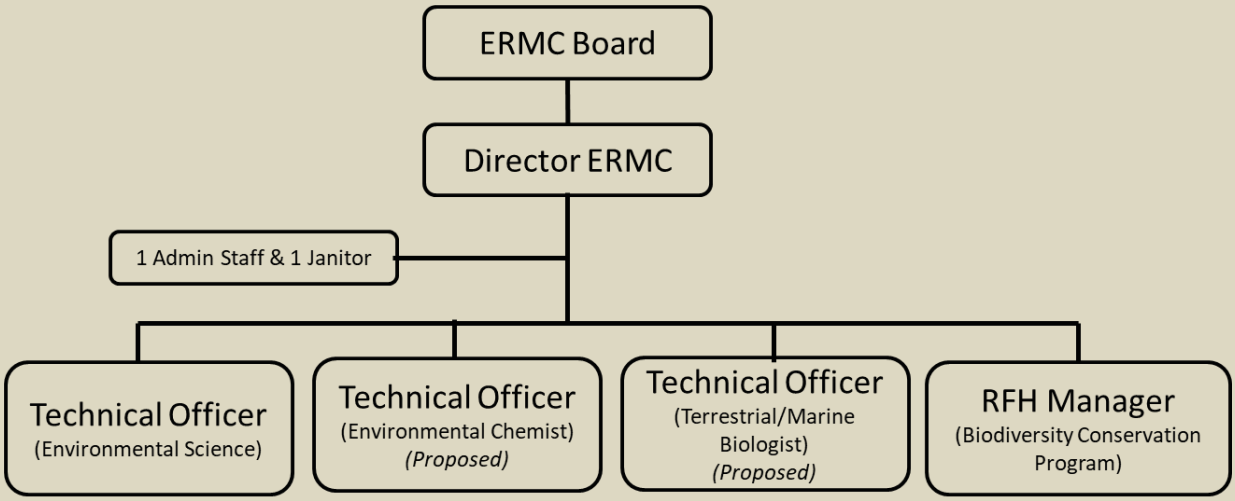


Figure 1: Proposed organization structure for ERMC starting the year 2022, pending approval by the University's SEMT.

TERMS OF REFERENCE (TOR) FOR THE ERMC BOARD

The Board members are drawn from Engineering, Forestry, Agriculture, Applied Physics, Applied Sciences, plus selected ex-officio members from the University's Senior Executive Management Team (SEMT).

The Board's main role is ensuring and supporting the leadership provided by the Director, by ensuring that programs presented by the Director are in line with the objectives of the ERMC and Papua New Guinea University of Technology.

The Board does not set Terms and Conditions for the Director to follow, as he/she (the Director) receives directives from the Vice Chancellor and the Deputy Vice Chancellor. The Board does not receive any monetary reward for being involved with the ERMC.

UNITECH BIOTECHNOLOGY CENTRE

Acting Director: Professor Tom Okpul, PhD

EXECUTIVE SUMMARY

This report covers research and development work in modern biotechnology that is being undertaken at the UNITECH Biotechnology Centre (UBC). The Centre aims at using biotechnology tools to enhance agricultural production to alleviate poverty and improve livelihoods in Papua New Guinea (PNG). The laboratory facilities are also used for undergraduate and postgraduate teaching and research. The research and development objectives, current and potential research, and developmental opportunities are outlined. Collaborations between Academic Departments and Research Centres of the PNG University of Technology (PNGUoT) and other government Departments and Institutions in research and national issues are highlighted. The UBC Technical Advisory Committee (UTAC) was drawn for deliberation in the first UTAC meeting in 2014. Numerous challenges that should otherwise give UBC a competitive edge in research and development and self-sustenance are acknowledged. As they are pivotal in setting the impetus to venture into collaborative R&D projects with various stakeholders such as the Fresh Produce Development Agency and the revenue generation activities, the PNG Cocoa Board and Ok Tedi Development Foundation, to name a few.

1. PREAMBLE

The UNITECH Biotechnology Centre (UBC) was established by the Council of the Papua New Guinea (PNG) University of Technology (PNGUoT) in 1997 in recognition of the immense role that modern biotechnology could play in contributing to national development. The UBC became an independent entity as a Centre of the PNGUoT on the 29th of November 2013. Administratively, the UBC is managed by the Director who reports directly to the Pro-Vice Chancellor (Academic). The focus of the UBC is on modern biotechnology.

Biotechnology is a broad term for a group of technologies based on the application of biological processes. It has diverse applications in medicine, agriculture, food processing, manufacturing and environmental management. The term "modern biotechnology" is used to distinguish recent, research-based activities from traditional fermentation technologies such as bread, cheese or beer making, and animal and plant breeding, which were the first examples of biotechnology. Modern biotechnology includes a range of techniques from recombinant DNA technology, molecular and cellular biology, biochemistry and immunology through to information technology. Gene technology is a specific subset of biotechnology, based on the manipulation and modification ("recombination") of the genetic material of living organisms to develop new characteristics, processes and products.

Biotechnology is a powerful enabling technology, with applications that have the potential to revolutionise many industry sectors including agriculture, forestry, fishing, pharmaceuticals and health, chemicals, textiles, food processing, environmental industries, energy and mining.

2. VISION

An appropriate vision for the UBC that encompasses the nation's current developmental issues in the face of the changing climate is *"to be leaders in the use of agricultural biotechnology to improve livelihoods"*.

3. MISSION

The UBC strives to accomplish high quality research, training and development outcomes with an entrepreneurial characteristic that emphasises the application of agricultural biotechnology in addressing issues associated with food and livestock production, forestry, and the environment in PNG.

2. ORGANISATIONAL STRUCTURE

The UNITECH Biotechnology Centre (UBC) was established by the Council of the Papua New Guinea (PNG) University of Technology (PNGUoT) in 1997 in recognition of the immense role that modern biotechnology could play in contributing to national development. The UBC is a Centre that is housed at the Agriculture Department of the PNGUoT. Administratively, the UBC is governed by a Technical advisory Committee (UBCTAC), and is managed by the Director who reports directly to the Head of Agriculture Department and the Deputy Vice Chancellor.

3. THE UBC TECHNICAL ADVISORY COMMITTEE (UBCTAC)

Taking a new form as an independent entity of PNGUoT, a revised UBCTAC is proposed for 2015 and beyond to include relevant university officials, Centre and Departmental representatives, and representatives from relevant government departments and institutions (Table 1).

Table 1. Current membership to the UNITECH Biotechnology Centre's Technical Advisory Committee

No.	Representative	Department/ Centre/ Institution[a]
1	Dr. Macquin Maino	Chairman-UBC-Committee

2	Prof. Tom Okpul	UBC – A/ Director
3	Prof. Gariba Danbaro	Agriculture Department, PNGUoT
	Dr. Ronnie Dotaona	Agriculture Department, PNGUoT
4	TBA	ERMC, PNGUoT
5	TBA	National Agricultural Research Institute
6	Mr. Elias Taia	Department of Agriculture and Livestock
7	TBA	Conservation & Environment Protection Agency

[a]PNGUoT = PNG University of Technology; ERMC = Environmental Research and Management Centre; and UBC = UNITECH Biotechnology Centre.

4. PERSONNEL

The current staffs who are directly engaged at the UBC include the A/ Director, and a Senior Technical officer, and other Departmental staff and postgraduate students (Table 2).

Table 2. List of staffs and current postgraduate research students who were directly engaged in research and teaching at the Unitech Biotechnology Centre in 2021

Name	*Position*	*Qualification*	*Research Interest*
Prof. T. Okpul	A/ Director	PhD (UQ)	Plant genetics & breeding
Prof. S. Akanda	Plant Pathologist	PhD (OSU)	Plant pathology
Prof. G. Danbaro	Animal Breeder	PhD (Kobe)	Animal genetics & breeding
Dr. P. Michael	Crop Physiologist	PhD (UA)	Plant physiology/ environm't
Dr. M. Maino	Crop Protection	PhD (PNGUoT)	Plant virology/ nematology
Dr. R. Dotaona	Entomologist	PhD (CSU)	Insect pathology
Dr. Gwendolyn Ban	Plant Pathologist	PhD (PNGUoT)	Plant pathology

Mrs Totave Kamen	Senior Technical Officer	Diploma	Laboratory management
Ms Melanie Pitiki	Research Officer	MSc.	S/potato weevil bio-control
Ms Emmie Mauligen	Research Officer - FPDA	BTA	Potato micropropagation
Mr. S. Poloma	PhD Student	MSc.	Mycorrhizal symbiosis in rice
Ms Lisa Paskalis	MSc. Student	BSc.Ag	Plant breeding
Mr. Gerry Faure	MSc. Student	BSc.Ag	Plant breeding
Mr. R. Manus	MSc. Student	BSc.Ag	Genetic diversity
Ms Dolla Inapo	MSc. Student	BSc.Ag	Plant Pathology
Ms. Roberta Sio	MSc. Student	BSc.Ag	Entomology

5. STRATEGIC OBJECTIVES

The strategic objectives that the UBC aims to achieve are:

i) Transfer and develop cutting edge biotechnologies.

ii) Provide an environment that encourages creativity and investment in the field of biotechnology.

iii) Direct applications of biotechnology to achieve health and food safety.

iv) Use biotechnology to achieve food and health security.

v) Protect the environmental resources of PNG through the development of appropriate biotechnology applications and products.

vi) Strengthen the relationship between the biotechnology program and society.

6. SPECIFIC OBJECTIVES

i) To facilitate high quality human development in the field of biotechnology at undergraduate, postgraduate, short courses and on-the-job training levels;

ii) To facilitate high quality research, and provide a conducive environment for institutional collaborations, in the fields of microbial, agricultural, forestry, industrial and environmental biotechnology;

iii) To provide quality scientific advisory support to the PNGUoT, and the government of PNG on issues pertaining to biotechnology and bio-safety; and

iv) To promote and create awareness on biotechnology issues by hosting visits for any interested individuals or groups and carry out educational programs especially during school visits.

7. FACILITIES AT UBC

i) Plant tissue culture area

ii) Portable growth chambers (needs to be checked)

iii) Containment-1 laboratory with capacity to undertake basic nucleic acid (DNA/RNA) assays involved in genotyping, disease diagnosis, paternity testing, gene transformation (gene technology) and gene expression analysis. The most important equipment required to undertake these molecular tasks include; thermocycler or polymerase chain reaction machine, electrophoresis apparatus, gel documentation system and accessory computer (yet to acquire), bio-safety cabinet (yet to acquire), fume hood (yet to acquire), Enzyme linked immunosorbent assay reader and accessory computer (yet to be acquired), -20°C freezers, -80°C Freezer (faulty power) and incubators.

iv) FACILITY RENOVATION AT UBC

The renovation work, particularly for ceiling replacement and painting of all walls and the exterior wall has been scoped and is pending the engagement of the contractors.

v) NEW EQUIPMENT

The Centre acquired a new Autoclave through the support of the ACIAR Sweetpotato Weevil project headed by Dr. Ronnie Dotaona.

8. FEASIBLE RESEARCH AREAS

i) Agriculture

a) Disease diagnostics (plant and animal)

b) Pathogen-tested plant production

c) Genotyping and Gene discovery

d) Biodiversity assessment (plant and animal)

e) Germplasm conservation

f) Genetic manipulation (plant)

ii) Forestry

a) Clonal propagation

b) Disease diagnostics

c) Biodiversity assessment

d) Genotyping and Gene discovery.

9. FINANCIAL REPORT

Since the termination of the MOA with the OTDF in 2018, and the last funding received from the Department of Public Enterprise and the FPDA, no other support was established which led to account going into the red. This was overcome by support from two sources:

i) Income generated in 2021:

- Consultancy on ESP Vanilla Disease survey with FAO-STREIT Program - K22, 000.

ii) **Internal Support funding 2021:**

- The Vice Chancellor, A/ Prof. Ora Renagi committed K100, 000 to drive R&D in agricultural biotechnology.

10. CURRENT RESEARCH AND DEVELOPMENT ACTIVITIES

Faced with immediate challenges especially that surrounding accreditation of the laboratory, staffing, and essential equipment, the Centre is taking a

proactive approach in addressing these issues whilst performing its mandated role. The current and proposed research & development (R&D) opportunities for the UBC (and potential commercial opportunities) cover a broad range of areas including plant disease diagnostics and assessment of biodiversity using DNA-based techniques, pathogen-tested plant production, clonal forestry, and gene discovery.

The Centre's activities to date can be categorised into the following areas:

a) Industry-oriented research and development
b) Student research projects
c) Other research studies
d) National participation on biotechnology-related issues

a) Industry-oriented research and development

i) A collaborative R&D project on the "Development of eaglewood in the Western Province - Ok Tedi Development Foundation (OTDF). Proposed budget: K343,000.00.

Expected outcomes:

- ❖ Identification of fungal species infecting eaglewood species in PNG
- ❖ Develop fungal inoculum packages for commercialisation
- ❖ Contribute towards diversifying income generation sources for the rural populace, and
- ❖ Discourage harvesting from the wild to conserve this endangered species.

iii) Potato plantlet production – Potato Seed Scheme – Fresh Produce Development Agency.

- ❖ Studies on microtuber production *in vitro* (Fig. 1) have been conducted with an initial funding of K50, 000 by FPDA.
- ❖ This project will be reviewed this year for continuation into 2023.

iv) Genetic Barcoding of the 18 cocoa hybrids released by PNG Cocoa Board (PNGCB. Proposed budget: K30, 000.

Expected outcomes:

- ❖ Establish genetic identity of the selected cocoa hybrids
- ❖ Enable PNGCB to register their hybrids.

v) Clonal propagation of coconut. This was one of the proposed areas identified by the Kokonas Indastri Koporesin (KIK) MOU that signed in 2021. Preliminary studies are underway and awaiting call from KIK.

Fig. 1. Potato plantlet growing in vials and microtubers produced in aconical flask.

vi) East Sepik Vanilla disease survey – Under the auspice of FAO-STREIT Program, a survey of vanilla diseases (Fig. 2) infecting vanilla plantations was conducted in three major vanilla growing areas of Maprik, Wosera and Drekikier, with a funding of K22,000 by FAO STREIT Program.

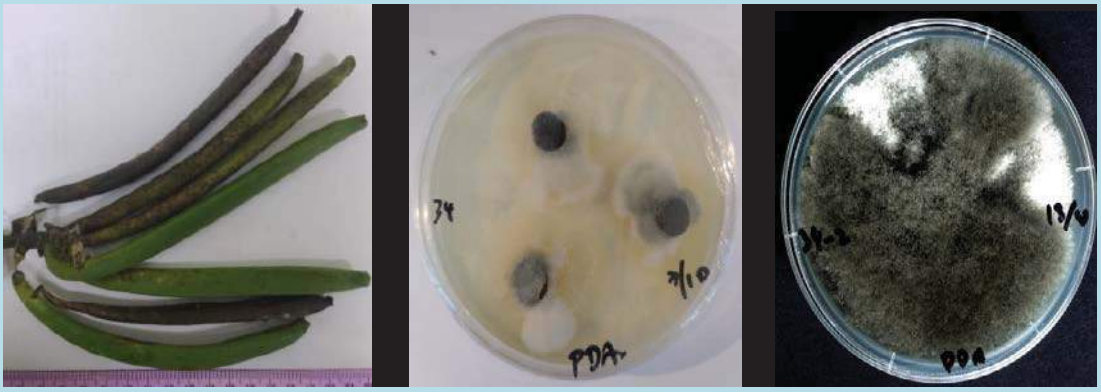


Fig. 2. A sample of pathogen isolated from diseased vanilla beans.

b) Student research projects

Promising research projects conducted by students (Fig. 3) are being conducted at the UBC laboratory that has commercial potentials ranging from potential bio-pesticides to genetically modified plants (Table 3). These student projects are supported by various institutions and donor agencies, including the University's Graduate Assistance Program and collaborating stakeholders.

c) Other research studies

Other promising research studies initiated by UBC include:

i) PNG Wild rice germplasm collection. Fifteen accessions of *Oryza* and *Leersia* spp. are currently maintained in ceramic pots. A recent collection was conducted together with researchers from Hirosaki University in Madang Province where several wild rice were collected.

ii) Screening for insect resistance in local corn. A population of 23 inbred lines are being monitored for the genetic study of the observed resistances.

11. IMMEDIATE CHALLENGES FACING UBC

The immediate challenges facing the UBC include;

i) Accreditation of the laboratory;

ii) Lack of staff (Research and technical) in certain fields of biotechnology; Limited funding support, and seed money to establish commercial projects;

iii) Lack of equipment and other facilities. Several equipment and computer software (Table 4) are urgently needed to give the UBC its independence and competitive edge in biotechnology research and development.

iv) Renovation (funded) of the Sir Julius Chan Building will be made to improvise the current setup to cater for an incubation room and staff office spaces and working benches and shelves; and

v) Development of research proposals and training programs.

Fig. 3. Students conducting molecular lab experiments.

12. COLLABORATIONS ON CURRENT RESEARCH ACTIVITIES

The numerous researchers from various academic Departments PNGUoT and other collaborating institutions are involved in the several identified research areas (Table 4). Such collaborators include:

i) Agriculture Department, PNGUoT;

ii) Forestry Department, PNGUoT;

iii) Mining Engineering Department, PNGUoT;

iv) National Agricultural Research Institute (NARI);
v) Fresh Produce Development Agency;
vi) Ok Tedi Development Foundation (OTDF); and
vii) PNG Cocoa Board (PNGCB)
viii) Binatang Research Centre (BRC)
ix) Kokonas Indastri Koporesin (KIK).
x) Hirosaki University, Japan.

13. PARTICIPATION AT THE NATIONAL/ INTERNATIONAL LEVEL

i) Alternate Focal Point for Genetic Modified Organisms (GMO) Issues for PNG through the Department of Agriculture and Livestock to the Food and Agriculture Organisation – *T. Okpul*
ii) National Bio-safety Committee through the Department of Environment and Conservation – on the safe handling of GMOs and products thereof –*T. Okpul, M. Maino*.
iii) IUCN SSC Crop Wild Relatives Specialist Group (Member, 2021-2025) – *T. Okpul*.
iv) Niugini Biotechnology Network (Member, 2020-) - *T. Okpul*

Table 3. Essential equipment listed in order of priority that are needed to be acquired at the UNITECH Biotechnology Centre

Equipment/ Tool	Qty	Use	Supplier	Estimated Cost (K)
1. Tuttnauer Vertical Autoclave	1	Sterilization of equipment	EBOS	70,000
2. NanoDrop	1	Nucleic acid quantification	Thermo Fisher	10,000
3. DNAStar® Software	1	software for sequence analysis, bioinformatics	Achema Pte Ltd	6,000
4. Millipore	1	Water sterilisation	Fisher Scientific	12,000
5. Incubator Std 300L	1	Microbial culture	Thermo Fisher	70,000
6. Fume Hood	1	Safe handling of volatile chemicals & gases	Alibaba	15,000
7. Air condition (temperature controlled)	2	Tissue culture growth room environment	Local	6,000
8. Tissue culture racks	6	Tissue culture	Alibaba	20,000
9. Real Time Thermal Cycler		Quantitative PCR	BioRad	30,000
10. ELISA reader		Virus testing	EMax Devices	15,000
11. Computer sets	2	RT-PCR and Gel Doc system	Datec	10,000
Total				**264,000**

Table 4. Current biotechnological researches conducted at the UNITECH Biotechnology Centre and potential commercial opportunities

Research topic	Funding source[a]	Researcher	Commercial opportunity
i) Plant disease diagnosis			
a) Molecular identification for East Sepik Vanilla Disease Survey	EU-STRET Program	Deane Woruba, Melanie Pitiki, Malcolm Kabiwaga, Cybill Poiya, Cindy Caleb, Nanda Siri, Rabi and T. Okpul	None
ii) Pathogen tested plant production			
a) Micro-propagation of plantlets and micro-tubers for seed potato production	UBC/ FPDA	Emmie Mauligen, T. Kamen and T. Okpul	High
iii) Biodiversity assessment			
a) Assessing the extent of its genetic diversity *Leersia hexandra* in Papua New Guinea	UBC	Cybill Poiya, M. Kabiwaga, R. Manus, Chris Bugajim & T. Okpul	None
iv) Genetic manipulation			
a) Standardising protocols for rice plant regeneration and transformation	UBC	Cybill Poiya and T. Okpul	Long-term
v) Gene and gene product discovery			
a) Identification of gene(s) controlling shattering in the wild rice, *Oryza schlechteri* Pilg.	UBC/PNG Cocoa Board	Cybill Poiya and T. Okpul	High
b) Identification of DNA barcodes for elite cocoa lines from Papua New Guinea.	PNGUOT-GAP	Gerry Faure, Melanie Pitiki, M. Kabiwaga, Donald Sogoware, Peter Epaina and T. Okpul	
c) Investigating the use of colloidal nano particles as gene carriers to increase the efficiency of gene transfer by particle bombardment	UBC/ Applied Sci. Dept.	Justin Narimbi, Srikanth Bathula and T. Okpul	High
vi) Clonal forestry			
a) Micro-propagation of the eaglewood species, *Aqualaria crasna*.	UBC	M. Kabiwaga and T. Okpul	High
b) Identification of plant pathogens associated with agarwood formation in *Gyrinops ledermanii*.	UBC/ OTDF	M. Pitiki, M. Maino, J. Beko and T. Okpul	High
c) Production of fungal inoculum for agarwood formation in *Gyrinops ledermanii*.	UBC	M. Kabiwaga, M. Pitiki, M. Maino, J. Beko, K. Mulung and T. Okpul	High
v) Environmental research			

a)	Investigating heavy metals in water, soil, sediment and plants along the Markham river system and its tributaries.	UBC/ Applied Sci. Dept.		Sogoing Denano, William Modey and T. Okpul	High
b)	Assessing the potential of endemic wild rice species in bioaccumulation of heavy metal, and their use in mitigating environmental pollution from landfills.	UBC/ Applied Sci. Dept.		Sogoing Denano, William Modey and T. Okpul	
c)	Investigating cyctein protease as defence mechanisms of tropical trees against insect herbivores	BRC/GAP		Samson Hege, David Timi, BRC Researchers, T. Okpul	High

[a]Funding sources: PNGUOT-GAP = Papua New Guinea University of Technology – Graduate Assistance Program, AD = Agriculture Department, UBC = UNITECH Biotechnology Centre, BRC = Binatang Research Centre; NARI = National Agricultural Research Institute, EU = European Union, CIC = Coffee Industry Corporation, Private = Self-sponsored student research, FD = Forestry Department, MED = Mining Engineering Department, [b]Commercial opportunity available to UBC; Proposals refer to projects that are to be undertaken by postgraduate students in 2014.

Table 5. Essential equipment listed in order of priority that are needed to be acquired at the UNITECH Biotechnology Centre

Equipment/ Tool	Qty	Use	Supplier	Estimated Cost (K)
12. Tuttnauer Vertical Autoclave	1	Sterilization of equipment	EBOS	70,000
13. NanoDrop	1	Nucleic acid quantification	Thermo Fisher	10,000
14. DNAStar® Software	1	software for sequence analysis, bioinformatics	Achema Pte Ltd	6,000
15. Millipore	1	Water sterilisation	Fisher Scientific	12,000
16. Incubator Std 300L	1	Microbial culture	Thermo Fisher	70,000
17. Fume Hood	1	Safe handling of volatile chemicals & gases	Alibaba	15,000
18. Air condition (temperature controlled)	2	Tissue culture growth room environment	Local	6,000
19. Tissue culture racks	6	Tissue culture	Alibaba	20,000
20. Real Time Thermal Cycler		Quantitative PCR	BioRad	30,000
21. ELISA reader		Virus testing	EMax Devices	15,000
22. Computer sets	2	RT-PCR and Gel Doc system	Datec	10,000
Total				**264,000**

14. MAJOR MILESTONE FOR 2022

i) Submission of the UBC Strategy to the Vice Chancellor's Committee.

ii) Complete renovation of the laboratory in preparation for accreditation.

iii) Submission of a funding proposal for laboratory equipment to the Secretary of the Public Enterprise Department as invited.

iv) Finalize the MOA and proposal for collaboration with OTDF on the collaborative partnership on developing eaglewood in Western Province.

v) Participate in developing collaboration with Corteva – a subsidiary of Dow-DuPont.

vi) Continue renovation of the laboratory in preparation for accreditation.

vii) Review the MOA for the extension of collaboration with the Fresh Produce Development Agency on its potato seed scheme.

viii) Finalize collaborations with KIK and PNGCB on coconut clonal propagation and genetic barcoding of the cocoa hybrids, respectively.

15. CONCLUSION

The Centre is focused on turning the challenges it faces into milestones that needs to be achieved in 2022 and onwards, and fully equipping the laboratory in the process towards developing an enabling Centre of PNGUoT**.** A Centre that can enable us *"to be leaders in the use of agricultural biotechnology to improve livelihoods"* in PNG.

POSTGRADUATE STUDIES, RESEARCH AND INNOVATION COMMITTEE

ALLOCATION OF RESEARCH FUND, 2021

No.	Applicant/Supervisor	Sponsor	Department	Approved Amount (K)
1	**Rebecca Imbok, MSc/2** Dr Veronica Bue	**Self**	Agriculture	K4, 260. 00
2	**John Komek MSc/2** Mrs Betty Tiko	**Self**	Agriculture	K3, 895.00
3	**Spencer Poloma, PhD/3** Dr Maquin Maino	**Self /Agric Dept.**	Agriculture	K4, 508.00
4.	**Kenson Tonny, MSc/2** Dr Felix Pereira	**GAP**	Applied Physics	K5,434.09
5	**Nathan Randa, MSc/2** Dr Felix Pereira	**GAP**	Applied Physics	K1,777.70
6	**Malcolm Doaipam, MSc/2** Dr Felix Pereira	**Self**	Applied Physics	K3,795.10
7	**Hendrix Neki, MCS/2** Prof Erick Gilder	**GAP**	Applied Physics	K5,120. 00
8	**John Kilna, M.Eng/1** **Mr. Ernest Pokau, MPhil/1** *Dr. Ashish L. Kumar*	**Self**	Electrical & Communication Engineering	K18, 000.00
9	**Tingneyuc Sekac**	**Staff**	Surveying & Land Studies	K12, 050.00
10	**Ruthy Kisi – Mphil/2** *Dr. William K. Modey*	**GAP**	Applied Science	K20, 000.00
11	**Justin Narimbi, PhD/1** *Dr. S. Balakrishnan*	**LNSDC**	Applied Science	K34,983.00
12	**Unaro Yauo M.Eng/2** *Dr. M. Betasolo*	**Self**	Civil Engineering	K7, 000.00
13	**Kenson Tonny, MSc/2** *Dr F. Pereira*	**Self**	Applied Physics	K3, 976.00
14	**John S. Blasius, MTech/2** *Prof. M. Manoj*	**GAP**	Applied Physics	K7,305.00

15	**Serah Mako, MPhil/2** *Prof. Paul Hoole*	**Self**	Electrical & Communication Engineering	K1,000.00
16	**Jeffery Luke, MSc/1** *Dr P. Michael*	**Self**	Agriculture	K7, 000.00
17	**Peter Topas, MSc/1** *Dr P. Michael*	**LNSDC**	Agriculture	K6, 000.00
18	**Gloria Hombunaka (MSc/1),** *Prof Gariba Danbaro*	**GAP**	Agriculture	K19, 854.56
19	**Laura Vola, MSc/1** *Prof Gariba Danbaro*	**Self**	Agriculture	K7, 000.00
20	**Monare Mathew, MSc/1** *Prof Gariba Danbaro*	**GAP**	Agriculture	K19,942.32
21	**Elisha Napu, MSc/1** *Dr Patrick Michael*	**GAP**	Agriculture	K15, 440.00
22	**Levy Kasa, MSc/1** *Dr Patrick Michael*	**Self**	Agriculture	K7, 000.00
23	**Kayman Kiwa, MSc/1** *Dr Peter Manus*	**Self**	Agriculture	K7, 000.00
24	**Gossie Powae, MSc/1** *Dr Rajashekhar Rao*	**GAP**	Agriculture	K12, 496.00
25	**Helen Osora, PhD/2** Dr Senthil Kumar	**Self**	Applied Physics	K25, 000.00
26	**Miriam Otto, MSc/1** *Nick Kewa*	**GAP**	Agriculture	K6,011.20
27	Prof Gariba Danbaro	**Staff**	Agriculture	K2,300.00
28	Dr Maino, Staff	**Staff**	Agriculture	K57,988.40
29	**Sogoing Denano, PhD/1** *Dr William Modey*	**LNSDC**	Applied Science	K60,600.00
30	Prof Geetha Praksam	**Visiting Professor-Staff**	Business Studies	K20,050.00
31	Londari Yamarak	**Staff**	Business Studies	K8,800.00
32	**Bomai Kobil, MSc/1** *Dr Revanuru Subramanyam*	**Self**	Civil Engineering	K7,000.00
33	Dr Joseph Fisher	**Staff**	Electrical Engineering	K78,516.12

Total Allocated for 2021 **K 501,102.49**

Total Budget for 2021 **K507,000.00**

The Papua New Guinea
UNIVERSITY OF TECHNOLOGY

Research Report

2021