PROCEEDINGS

of the 2nd Graduate Research Showcase

GRS 2022

Impactful research through an interdisciplinary approach

FACULTY OF LIVESTOCK, FISHERIES AND NUTRITION
WAYAMBA UNIVERSITY OF SRI LANKA

GRS

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Second Graduate Research Showcase

GRS 2022

Organizing Commitee

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Message from the Chairman – Faculty Higher Degree Committee

It is with great pride, pleasure and honour that the Higher Degree Committee in the Faculty of Livestock, Fisheries and Nutrition have been successful in organizing the second graduate research conference named "Graduate Research Showcase (GRS-2022)" at the Wayamba University of Sri Lanka. The GRS earned its credit as the first-ever graduate research conference organized by a Faculty and be remembered in the history of the Wayamba University of Sri Lanka. Presently, whatever challenging situations we are facing in the country, we have to keep running, therefore, GRS-2022 will be held as a virtual event.

The GRS provides a supportive environment for graduate students to showcase their preliminary research work. Sametime, GRS provides the students with useful feedback and guidance on various aspects of their research from participants from a wide spectrum of audiences, including members of academia, research institutions and industries. In particular, we also invited students who have already settled on a specific research topic and have produced limited preliminary results, but who still have enough time remaining before their final defence to benefit from GRS discussions. We hope that they will receive useful guidance for their experimental designs, data analysis, completion of their dissertation and the potential initiation of their research careers.

The research culture at the Wayamba University of Sri Lanka is deeply entrenched, and as a result, student enrolment in research-based postgraduate programs is rapidly increasing and the Faculty of Livestock, Fisheries and Nutrition (FLFN) is privileged to have researchers of a high calibre to guide these students in their chosen fields. As a result, the faculty is gaining significant recognition as a hub of applied research and even most of the research outcomes presented at GRS-2022 have resulted from multi-disciplinary research. Therefore, I believe it is high time that the FLFN supports the university to establish a Postdoctoral Fellowships Program to attract outstanding recent doctoral graduates to the university from around the world to build and lead interdisciplinary collaborative research activities. Accordingly, the FLFN can offer a leading and lively research environment that is internationally engaged, public-spirited and has many outstanding areas of research strength.

This year, we selected 15 graduate students to make presentations under the theme "Impactful research through an interdisciplinary approach". As most of these postgraduates are presenting their ongoing research findings we provided a platform for them to snapshot their research highlights.

On behalf of the Faculty Higher Degree committee, I wish to thank all the authors for their contributions. Finally, I wish to thank the Vice Chancellor of Wayamba University, the Dean of the FLFN and the Organizing Committee of GRS-2022.

Professor MDST de Croos
Chairman
Faculty Higher Degree Committee – 2022

5th August 2022

Message from the Dean,

Faculty of Livestock, Fisheries and Nutrition

It is pleasure to write this message for the 2nd Graduate Research Showcase of the Faculty of Livestock, Fisheries and Nutrition, which offers the platform to our postgraduates to showcase their research findings, innovations and inventions.

Faculty of Livestock, Fisheries and Nutrition is the leading faculty of offering Master of Philosophy and Doctor of Philosophy Degrees of Wayamba University of Sri Lanka. At present, FLFN has >25 students registered for both degrees. Importantly, this year's Graduate Research Showcase comes at a time when the faculty envisions expanding the degree programmes for graduates with diplomas and Masters without restriction to MPhil and PhDs. Therefore, I would expect the vibrant faculty research culture to further evolve.

I would like to take this opportunity to congratulate all postgraduate students and academics for their continuous research and inventions focusing on finding novel solutions for current national issues and mitigating the socioeconomic and food security crisis.

I admire the Chairman of the Faculty Higher Degree Committee and GRS 2022 Organizing Committee for their untiring efforts to make the GRS 2022 a success under the prevailing economic and social constraints. I wish "Graduate Research Showcase 2022", on the theme of "Impactful research through an interdisciplinary approach", would inspire faculty postgraduates to be lifelong learners and leaders in their respective disciplines.

I wish every success to the postgraduates who are going to showcase their research and innovations at "GRS 2022".

Senior Professor (Mrs) CVL Jayasinghe
Dean, Faculty of Livestock, Fisheries and Nutrition
Wayamba University of Sri Lanka

Message from the Vice-Chancellor

Wayamba University of Sri Lanka

I am pleased to write this message to mark the "Graduate Research Showcase 2022" conducted by the Faculty of Livestock, Fisheries & Nutrition, on the theme, "Impactful research through an interdisciplinary approach".

This is a great opportunity offered by the Faculty for their postgraduate students to explore new avenues, networking with professionals in different disciplines and improving their knowledge and experiences. The contribution from the Faculty towards research will greatly enhance the research culture of the University.

I wish all success to the 15 presenters in this event not only in showcasing their research in front of an elite audience, but for their future aspirations in research as well.

I appreciate the efforts of the Dean, Faculty of Livestock, Fisheries & Nutrition, the organizing committee and other academic and non-academic staff involved in the 2nd holding of the GRS.

Senior Prof. Udith K Jayasinghe
Vice-Chancellor
Wayamba University of Sri Lanka

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Keynote Speech

Impactful Research through Interdisciplinary Approach

By
Mrs Nayana Perera
R&D and Innovations Manager | Fonterra Brands Lanka Pvt Ltd

An impactful research can be defined as a research producing an output that influences further action in a meaningful way. A research is absolutely impactful when the knowledge generated by our research contributes to, benefits and influences society, culture, our environment and the economy. The impact could be theoretical or practical, or it could be based on the Return on Investment (ROI); or it could support policy making. Also there could be instances where we witness either technological impacts or cultural and social impacts through research outcomes.

Working together is a key part of solving challenges in science. Now, more than ever, researchers are collaborating in teams bringing together diverse groups of experts to find answers to contemporary local or global problems.

Interdisciplinary is a means of solving problems and answering questions that cannot be satisfactorily addressed using single disciplinary methods and approaches. It is basically Involvement of two or more academic, scientific or artistic disciplines that work together to create a powerful learning experience. It enhances Integrative learning, Critical thinking and creative problem solving, integrating ideas with others to form an effective end product.

Impactful research through Interdisciplinary approach allows for the synthesis of ideas and the synthesis of characteristics from many disciplines. At the same time, it addresses the researcher's individual differences and helps to develop important, transferable skills. These skills, such as critical thinking, communication, and analysis are important and continually developing at all stages of life. It enables to conquer most challenging problems through appropriate, sustainable, and resilient technologies and implementation strategies. Also it enhances Collaborative skills while working with others who have different perspectives where research becomes meaningful, purposeful and deeper resulting in learning experiences that stay with the researcher for a lifetime.

Interdisciplinarity research therefore creates something new and unique beyond the sum of its parts. It can thereby generate excitement as a potential means for promoting innovation and creativity in research and in learning and teaching, or beyond!

Technical session 1

GRS-01

Extraction and characterization of chitosan from shellfish waste for product development

Liyanage C.S.[a], Gonapinuwala S.T.[a], Fernando C.A.N.[b] and de Croos M.D.S.T.[a]*

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Key-highlights

- Shellfish processing waste has drawn considerable scientific attention as the largest source of chitin, a well-known natural biopolymer, and chitosan.
- As 1.6 million kg of shell waste was estimated to be discarded annually from Sri Lankan processing plants, the traditional chitosan extraction protocol was modified to a reliable and effective protocol to utilize this accumulating waste.
- White-leg shrimp shell waste was identified as the best shellfish waste in extracting chitosan, which resulted in 33% (DW), over the shell wastes of blue swimming crabs (11% DW) and giant freshwater prawns (10% DW).
- The modified method confirmed that the extracted chitosan structure has been well preserved and resulted semi-crystalline structure with thermal stability up to 300-315 °C.
- The modified method saves 8.10% of chemicals and 13% of energy indicating its high potential to be executed at the industrial level.

GRS-02

Evaluation of physicochemical and functional properties of some underutilized cereals and yams for functional food formulation to reduce the risk of metabolic syndrome

NNG Chiranthika[a], KDPP Gunathilake[a], and A Chandrasekara[b]

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Key-highlights

- Selected underutilized millets (*Panicum millaceum*, *Paspalum scrobiculatum*, *Setaria italica*) and root crops (*Lasia spinosa*, *Nelumbo nucifera*) flours were successfully incorporated into functional food products.
- Incorporation of 20 and 40 % mixture of millet and root flours into functional bread and functional noodle respectively was selected as the most effective and sensory acceptable incorporation levels.
- Determination of polyphenolic compounds in selected millets and root flours were conducted using the liquid chromatography mass spectrometry (LC-MS) technique.
- Major polyphenolic compounds such as chlorogenic acid, myricetin, kaempferol-3-o glucoside, apigenin, lutein, alpha tocopherol were analyzed in millets and root flours.

GRS-03

Enhancement of bioavailability of phosphate by microbial methods to sustainable utilization of Eppawala rock phosphate

Aberathna A.A.A.U.[a], Premarathne J.M.K.J.K.[a*], Jayaweera B.P.A.[a], Prathapasinghe G.A.[a], Liyanage J.A.[b], Fernando C.A.N.[c], Satharasinghe D.A.[d], Jayasooriya A.P.[d] and Jinadasa R.N.[e]

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Key-highlights

- Phosphate solubilizing fungal and bacterial species were isolated from soil samples.
- Solubilizing ability of Eppawala Rock Phosphate (ERP) of isolated microorganisms was studied qualitatively.
- Genus of the phosphate solubilizing fungi were morphologically identified and the genus of the bacterial species was biochemically characterized.
- The phosphate solubilizing ability of one fungal species was quantified.

GRS-04

Development of tools to assess the food literacy level of secondary school children and teachers' confidence in teaching food literacy

Rathnayake M.P.S.[a]*, Nanayakkara J.[b], Perera T.[a], Worsley T.[c], Booth A.[b] and Silva K.D.R.R.[a]

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Key-highlights

- The objectives of the studies were to assess the food literacy level of the school children and teachers' confidence in teaching food literacy.
- The food literacy competencies (knowledge, skills, and behavior) of school children were identified in consultation with a group (n=17) of food and nutrition experts.
- The tool with a set of questions was tested for its content and face validities and piloted in 8 schools in Bandarawela Education Zone to test the construct validity and reliability.
- A questionnaire tool was constructed and validated to test the confidence of teachers in teaching food literacy.
- Both tools will be used in a nationally representative sample of students and teachers.

GRS-05

Value addition to Omega-3 polyunsaturated fatty acid (PUFA) concentrates extracted from fish processing waste

Lakmini K.P.C.[a], Gonapinuwala S.T.[a], Fernando C.A.N.[b], Wijesekara I.[c] and de Croos M.D.S.T.[a]

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Key-highlights

- Fish waste is a rich source of PUFA which is still not utilized in Sri Lanka due to technological constraints.
- In our study, different waste components from different fish species were tested for the highest availability of oil and the heads of Yellowfin tuna (*Thunnus albacares*) were found to be producing the highest lipid content (7.70%).
- A method was modified to extract fish oil from tuna heads by changing the parameters and conditions of the standard wet reduction process.
- The crude fish oil extracted from this modified method was within the limits of quality standards and contained omega-3 PUFA, especially DHA (C22:6, n-3).
- This process is being further improved to concentrate omega-3 PUFA to suit the industrial scale.

GRS-06

Enhancing the bioavailability of Eppawala rock phosphate by chemical and physical method to be used in poultry rations

Manopriya S.[a], Premarathne J.M.K.J.K.[a*], Jayaweera B.P.A.[a], Prathapasinghe G.A.[a], Jayasooriya L.J.P.A.P.[b], Satharasinghe D.A.[b], Fernando C.A.N.[c], Mantilaka M. M. M. G. P. G.[d], Liyanage J.A.[e]

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Key-highlights

- Calcination of ERP after fusion with electrolytes such as sodium carbonate improves the defluorination of ERP only up to 0.1% and does not improve the solubility.
- Calcination after acidification does not improve the defluorination of ERP.
- Solely calcination cannot be used to improve the properties of ERP.
- Wet precipitation techniques can be used to treat ERP for better optimization of Phosphorus.

GRS-07

Cardio-metabolic risk and its dietary determinants among adult men

Perera U.L.D.S. [a]*, Jayathilake M.A.R.M.P. [a], Chandrasekara A. [a] and Rathnayake K.M. [a]

[a]Department of Applied Nutrition, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), Sri Lanka

Key-highlights

- Two hundred and nine healthy adults (30-60 years) were studied for their cardiovascular disease (CVD) risk and associated dietary determinants.
- CVD risk was assessed based on their vascular function assessment and serum lipid and anthropometric parameters.
- Vascular function (arterial stiffness-(PWV)) assessment revealed that 20% of participants were at risk of CVD disease in which the population mean was 6.7± 1.0 m/s.
- Higher proportion of participants 57%, 78% and 82% had higher BMI (>23.5 kgm-2), elevated Total cholesterol (TC) and LDL Cholesterol (LDL –C) accordingly as per CVD risk cut offs established by WHO.
- None of the dietary factors were significantly associated with arterial stiffness or serum lipid parameters except dietary polyunsaturated fat intake which showed a significant association with TC levels (P=0.013).

GRS-08

Population dynamics of giant freshwater prawn (*Macrobrachium rosenbergii)* and other constituent finfish species in selected irrigation reservoirs of Sri Lanka, and strategies for enhancing yields

Pilagolla S.A.S.[a], Amarasinghe U.S.[b], Perera H.A.C.C.[b], Clive J.[c] and de Croos M.D.S.T.[a]

[a] *Department of Aquaculture and Fisheries, Faculty of Livestock Fisheries and Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila, 60170, Sri Lanka,* [b] *Department of Zoology and Environmental Management, Faculty of Science, University of Kelaniya Sri Lanka,* [c] *Centre for Sustainable Tropical Fisheries and Aquaculture, College of Science and Engineering, James Cook University, Australia*

Key-highlights

- The recent addition of Giant Freshwater Prawn (GFP) *(Macrobrachium rosenbergii)* has a greater economic and social benefit in Culture-based fisheries (CBF), but the potential of CBF for GFP in Sri Lanka has not yet been investigated.
- Further, GFP yields were low due to poor recovery rates (<3%) of stocked post larvae and ineffective fishing methods while a significant proportion of GFP caught by gillnets is damaged by the net rendering resulting in low profits.
- Therefore, this study is trying to develop a new fishing trap to minimize physical damage to the GFP during harvesting and to improve catchability to obtain high harvest and profit.
- The optimal fish yields and landing sizes will be stimulated for finfishes and GFP based on length-based stock assessments and growth models for 10-12 perennial reservoirs in Sri Lanka under three categories: major, medium, and minor.
- In addition, the effect of refuge and night stocking will be tested to monitor the survival rate to evaluate the effectiveness of stocking time.

Technical session 2

GRS-09

Adding value to fish waste: Development of an economically feasible protocol to extract collagen

Ampitiya A.G.D.M.[a], Gonapinuwala S.T.[a], Fernando C.A.N.[b] and de Croos M.D.S.T.[a*]

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Key-highlights

- Collagens from the skin off-cuts of three commercial fish species were extracted and the skin of Yellowfin tuna was identified as the most suitable raw material for collagen extraction.
- The traditionally used costly, lengthy, laborious, purification step and expensive acid extraction step was replaced by the inexpensive, short and simple steps of our modified method.
- Collagen yields were high and varied between 55-62% on a dry weight basis.
- All extracted collagens were type I, highly pure and preserved the native triple helical structure.
- This study highlighted skin off-cuts as an abundant collagen source and the modified method as a potential industrially-applicable protocol.

GRS-10

Identification and Characterization of Bioactivity of Selected Under-utilized Fruits, Vegetables and Legumes Grown in Sri Lanka for the Formulation of Functional Food Products

Hettiarachchi H.A.C.O.[a], Gunathilake K.D.P.P.[a] and Jayatilake S.[a]

[a] *Department of Food Science & Technology, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila, 60170, Sri Lanka.*

Key-highlights

- Methanolic extracts of selected crops: *Elaeocarpus serratus*, *Phyllanthus emblica*, *Pouteria campechiana*, *Mucuna pruriens* and *Canavalia gladiate* were analyzed using HPLC-MS to assess the phenolic compound profile.
- Underutilized fruit crops: *Elaeocarpus serratus*, *Phyllanthus emblica* and *Pouteria campechiana* were combined in formulating a frozen probiotic dessert with antioxidant properties.
- *Mucuna pruriens* and *Canavalia gladiate* were selected from underutilized legume crops and incorporated in formulating a Legume-based instant soup mix for treating obesity and related disorders.
- Legume-based instant soup mix is currently subjected to Human Clinical Trials with over-weight and obese human subjects.

GRS-11

Taxonomic identification and present status of jellyfish resources in coastal waters of Sri Lanka

Karunarathne K.D and de Croos M.D.S.T.

Department of Aquaculture and Fisheries, Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP) 60170, Sri Lanka.

Key-highlights

- The "*Waya-Jel*-Servey", the first ever systematic jellyfish survey conducted in Sri Lanka under this study, reported one new species; 22 first records; an updated full checklist of jellyfish.
- The effect of physicochemical parameters of coastal waters on the diurnal and seasonal abundance and variations of jellyfish were identified and mapped along the Sri Lanka coastal waters.
- The opinions of stakeholders were analysed in recognizing the strengths, weaknesses, opportunities and threats in expanding the Sri Lankan jellyfish fishing industry.
- The ecological and economical importance of jellyfish were described based on their status; interactions with other fauna and flora and usefulness of live bait for some fisheries.
- Scientific literature from 1900 to 2022 was tabulated in contrasting the broader spectrum of species-wise jellyfish usage and highlighting how Sri Lankan industries could tap those potentials.

GRS-12

Development of a Culture Based Fishery for Giant Freshwater Prawn in Sri Lankan Reservoirs

Digamadulla D.S.[a], Wijenayake W.M.H.K.[a], Jayasinghe J.M.U.K.[b] and Amarasinghe U.S.[c] and de Croos M.D.S.T.[a]*

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Key-highlights

- The pre-designed opinion survey was conducted among the systematically-random sampled stakeholders of giant freshwater prawn (GFP) culture-based fishery (CBF) in the selected 24 reservoirs.
- Survey questions were mainly focused on their interest in GFP stocking, participation in GFP CBF, and the pros and cons of post-stocking.
- The responses were analyzed qualitatively and a specific weighted method was used for lateral analysis.
- Responses are perceptive to the perspective of stakeholders, similarly we identified several contradictions in interest among the stakeholders.
- Higher positivity in opinion is correlated with higher monetary realization, while negative opinions have resulted from their resource conservative behavior and being less or indirectly involved in CBF.

GRS-13

The microplastic pollution in surface water of Kalaoya Estuary, SriLanka: occurrence and characterization by FTIR

A.P. Abeygunawardana[a]*, Sevvandi Jayakody[b], Eric Wikramanayake[c], Suranjan Fernando[d] and Chathurangi Wickramarathne [e]

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Key-highlights

- An emerging risk of Plastic pollutants is recorded from the Kalaoya estuarine Ecosystem in Sri Lanka.
- The plastic filaments were the most abundant (more than 90%) microplastic type in this estuarine surface waters.
- The origin of the plastic filaments could be attributed to fishing nets, but needs further investigation.
- Outcomes highlight either to unknown threats to this estuary that should be considered in the assessment of ecosystem vulnerability.

GRS-14

Reproductive biology and population dynamics of slipper lobster off the eastern coast of Sri Lanka

I U Wickramaratne, R.M.G.N Thilakarathne[b] and M.D.S.T. de Croos[c]

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Key-highlights

- As the stock status of slipper lobster *(Thenus orientalis)* resource in Sri Lanka had not been evaluated before, this study explores the reproductive biology and population dynamics of the resource for its sustainable utilization.
- The total mortality (Z) and natural mortality, which were estimated by using length frequencies, were 1.82 yr^{-1} and 1.17 yr^{-1} respectively while the carapace length at first capture was 88.66 mm.
- Though the length frequency data were fitted to the von Bertalanffy growth model, the further analysis based on ELEFAN routine indicated the long-term data requirement for a reliable estimate hence year-round data will be collected.
- Time-sequential analysis of ovary weight indicates the month of January as the potential spawning season as it resulted in the highest ovarian weight (11.82 ± 10.56 g).

GRS-15

Production trends and yield predictive models for culture-based fisheries in irrigation reservoirs of Sri Lanka.

A.M.A.N.[a] Adikari, Amarasinghe U.S.[c], Perera H.A.C.C.[c], Clive J. [d] and de Croos M.D.S.T.[b]

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Key-highlights

- Culture-based fisheries (CBF) in perennial irrigation reservoirs are a recent development in Sri Lanka and the prediction of reservoir yield is important for implementing appropriate scientific management practices.
- Thus, the possibility of developing suitable yield predictive models will be tested in 48 perennial irrigation reservoirs in Sri Lanka under three categories: major, medium, and minor reservoirs.
- Hydrological, morphometric, limnological, and biological parameters will be collected from the relevant authority during the study period.
- Shoreline development, reservoir level fluctuation, hydraulic retention time, catchment area, capacity, morpho-edaphic and trophic state indices will be considered as predictor variables.
- It is expected to develop models to describe the relationship between predictor variables and yield for each category of reservoirs.

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