PROCEEDINGS

of the 1st Graduate Research Showcase

GRS 2021

Research for sustainable development: evidence, engagement and polices

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

GRS

09th August 2021
Wayamba University of Sri Lanka, Makandura, Gonawila, (NWP)

Highlights of the First Graduate Research Showcase of the Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka. 9th August, 2021. The Research Showcase Conducted on Virtual Platform.

First Annual Graduate Research Showcase (GRS)

of the
Faculty of Livestock, Fisheries and nutrition
of the Wayamba University of Sri Lanka
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Message from the Editor-in-Chief

It is with great pride, pleasure and honour that we have been successful in organizing the first-ever graduate research conference named "Graduate Research Showcase (GRS-2021)" at the Wayamba University of Sri Lanka, even under the constraints of the Covid-19 pandemic. However, we have to keep running with whatever challenging situations we may face therefore, GRS 2021 will be held as a virtual event.

The research culture is deeply entrenched at the Wayamba University of Sri Lanka, and as a result, student enrolment in research-based postgraduate programs is increasing rapidly and the Faculty of Livestock, Fisheries and Nutrition (FLFN) is a privilege 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 today have resulted from multi-disciplinary research. As most of these postgraduates are presenting their ongoing research findings we provided a platform for them to snapshot their research highlights. Today twenty students will present their findings at this forum in two sessions in "How can we deal with environmental sustainability while achieving economic development?" and "How can we ensure that health, food systems, and sustainable food production systems?".

I am sure the GRS-2021 is a golden platform for the graduate students in the FLFN to exchange ideas, discover novel opportunities, networking with industry professionals and entrepreneurs to broaden their knowledge and experience.

On behalf of the editorial committee, I wish to thank all the authors and reviewers for their contribution. Finally, I wish to thank the Dean of the Faculty and the organising committee of GRS-2021.

Professor MDST de Croos
Chairman
Faculty Higher Degree Committee – 2021

9th August 2021

Message from the Dean, Faculty of Livestock, Fisheries and Nutrition

It is a great honour to write this message for the 1st Graduate Research Showcase of the Faculty of Livestock, Fisheries and Nutrition where we provide our postgraduates to showcase their vibrant research and Innovations while providing opportunities to capacity building, develop & sharpen their soft skills.

I congratulate to all postgraduate students and academics for their extended research work without limiting to undergraduate life and it will definitely contribute to the development of the academic sector as well as the country. Research teams of the Faculty of Livestock, Fisheries and Nutrition execute research studies focusing on current national problems and to provide resilience. I believe that all outcomes are embedded with new findings and innovations that can render an economic impact on national development. GRS 2021 is another step to reach this goal.

I highly appreciate the Chairman, members of the Faculty Higher Degree Committee and organizing committee for sailing the event even under the constraints of Covid-19 pandemic, which was an aspiration of the Faculty. I wish every success with "Graduate Research Showcase -2021, on the theme "Research for Sustainable Development: Evidence, Engagement and Policies" and very best wishes for faculty postgrad students who are going to showcase their research & innovations.

Professor CVL Jayasinghe
Dean, Faculty of Livestock, Fisheries and Nutrition
Wayamba University of Sri Lanka

Message from the Vice-Chancellor
Wayamba University of Sri Lanka

It is pleasure to write this message for the Graduate Research Showcase (GRS) 2021 of the Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka. This is the inaugural session of the Graduate Research Symposium in the Wayamba University of Sri Lanka and I extend my congratulations for the future sessions. This is a valuable opportunity for postgraduate students of the Faculty of Livestock, Fisheries and Nutrition to share their research findings.

I commend the Chairman and members of the Faculty Higher Degree Committee and the organizing committee of this event for their great contribution under Covid-19 pandemic. I congratulate all those who are making presentations today and wish them all success for their continued involvement in research and publication.

Professor JC Edirisinghe
Acting Vice-Chancellor
Wayamba University of Sri Lanka

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Keynote Speech

Research planning: A key to quality publications

by
Emeritus Professor Upali Samarajeewa
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Technical session 1

How can we deal with environmental sustainability while achieving economic development?

GRS-06

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

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Key- highlights

- Eppawala Rock Phosphate (ERP) primarily consists of Ca, P, Fe, Al, Zn and other micro minerals.
- The fresh primary apatite crystal of Eppawala Rock Phosphate (ERP) was identified as a suitable source to optimize phosphorus for poultry ration.
- Calcination in higher temperatures affects the physical and chemical properties of ERP.

GRS-07

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 (commercially available) solubilizing bacterial and fungal species were isolated from soil samples.
- Solubilizing ability of Eppawala Rock Phosphate (ERP) of isolated microorganisms were studied qualitatively.
- Two species of phosphate solubilizing fungi were morphologically identified by completing genus level characterization.
- The phosphate solubilizing ability of those two fungal species was quantified.

GRS-09

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

Karunarathne K.D.[a] and De Croos M.D.S.T.[a]

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Key-highlights

- A systematic jellyfish survey carried out in coastal waters of Sri Lanka, resulted in an updated full checklist for the country in the identification of the jellyfish diversity.
- The physicochemical factors contributing to the diurnal and seasonal variation of the jellyfish abundance were assessed and mapped.
- The strengths, weaknesses, opportunities and threats on the Sri Lankan jellyfish fishing industry were identified through a survey, carried out with the opinions of stakeholders.
- The local status of the ecological and socio-economic importance of jellyfish was studied: i.e., symbiotic relationships of jellyfish; adverse effects of jellyfish on human welfare.
- A comprehensive literature survey revealed that, there are significant global importance and emerging potentials of the common jellyfish species reported from Sri Lanka.

GRS-05

Improving the mineral nutrition of dairy cattle with special reference to cobalt and vitamin B_{12}

Weerathilake W.A.D.V.[a], Prathapasinghe G.A.[a*], Weerasinghe W.M.P.B.[b] and Sinclair L.A.[c]

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Key-highlights

- The effect of the dietary addition of Co, vitamin B_{12} or the injection of vitamin B_{12} in early lactation was evaluated on dairy cow metabolism, intake, performance and milk fatty acid profile.
- No any effect was observed of treatment on dairy cow metabolism, post-partum Dry Matter (DM) intake, milk yield or milk fat concentration ($p > 0.05$).
- Cows receiving IVB (Injected Vitamin B_{12}) had the lowest mean body condition score and DVB (Dietary Vitamin B_{12}) the highest ($p < 0.05$).
- The mean dietary macro mineral concentration of dairy cow feeds in Sri Lanka was below the NRC (2001) recommended levels, whereas micro mineral concentrations were above the recommended levels.
- Addition of Co to the diet increased intake but didn't affect performance, whole tract digestibility, plasma minerals, and plasma glucose or plasma vitamin B_{12} in dairy cows under tropical conditions.

GRS-17

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

Chiranthika N.N.G. [a], Gunathilake K.D.P.P. [a], and Chandrasekara A.[b]

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Key-highlights

- The highest significant dietary fiber and resistant starch contents were found in *Lasia spinosa* flour.
- Functional properties showed a correlation with carbohydrate composition starch granular morphologies of studied yam flours.
- Starch, amylose, amylopectin and resistant starch contents were significantly decreased with the effect of germination while dietary fiber content was significantly increased.
- Functional properties of studied millet flours were altered upon germination and peak gelatinization temperatures were increased.
- *In vitro* anti-diabetic activity was analyzed in selected cereals, yams and root crops. The inhibitory action showed a positive correlation with the dietary fiber contents of studied crops.

GRS-14

The level of integration of Nutrition in food systems in Sri Lanka

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Key-highlights

- National-level research studies in the recent past show that a considerable proportion of children under five years are undernourished while adults are overnourished.
- All categories of farmers (crop, livestock and aquaculture) were in inadequate nutrition literacy/knowledge and they had less motivation towards nutrition-sensitive farming and nutritious diet.
- Interventions were implemented in top levels but the transmission to the ground level (farmers) was ineffective. Therefore, resources transmission in the agriculture field was unsatisfactory.
- Farmers perceived that food safety and health outcomes of agrochemical usage should be considered in all the stages of farming. But practically, they did not follow Good Agricultural Practices (GAP).
- Food sellers and distributors perceived that nutrition is an important aspect in farming, selling and consumption although they did not give much attention on selling and promoting nutritious foods.

GRS-02

Extraction and characterisation of chitosan from shellfish waste for product development

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

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Key-highlights

- According to the study it was estimated that approx. 1.6 million kilograms of shell waste is accumulated annually from shellfish processing plants in Sri Lanka.
- *Litopenaeus vannamei* and *Penaeus monodon* shell waste were identified as the most potential marine waste sources for chitosan extraction among a variety of marine waste materials.
- Modified method of chitosan extraction from *Litopenaeus vannamei* shell waste yielded 33.34% of chitosan with 80% of the degree of deacetylation, 57% of solubility and good thermal stability up to 360°C.
- *Litopenaeus vannamei* shell waste can be used as a commercial chitosan source and further, it would be an alternative for waste accumulation issues in processing plants.

GRS-03

Value addition to omega-3 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

- Yellowfin tuna head was selected as the most viable fish waste among the variety of body parts in extracting fish oil as it contained 7.70% of the total lipid when analysed using Bligh & Dyer method.
- The wet reduction process was found as a feasible method for extracting oil from yellowfin tuna heads under the modified protocol.
- Different heating methods that can be used in the wet reduction process were evaluated to found the effect on extraction yield and it was varied between 1.70% - 5.38% of crude oil.
- The crude fish oil extracted from heads of yellowfin tuna was proven to be within the limits of quality standards for crude fish oil and was comprised of polyunsaturated fatty acids.

GRS-04

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 cut-offs of three commercial fish species were extracted and the skin of Yellowfin tuna was identified as the most suitable raw material for collagen extraction.
- Collagen yields were high and varied between 60-70% on a dry weight basis.
- All extracted collagens were type I and preserved the native triple helix conformation.
- The study highlighted the skin cut-offs as an abundant collagen source for industries.

GRS-08

Mapping of mangrove forest land cover change in KalaOya Estuary, using Landsat imagery in Google Earth Engine (GEE) cloud computing platform

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

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Key-highlights

- Extent of Kalaoya mangroves estimated at 2005 to 2021 in time using Multi-Temporal Landsat 8 imagery.
- NDMI (Normalized Difference Mangrove Index) and MNDWI (Modified Normalized Difference Water Index) used to differentiate the mangrove coverage.
- The total mangrove coverage recorded 416.859 ha, 496.497 ha, respectively in 2013 and 2021.
- This represents the increment of the mangrove vegetation 19% (2.375% yr^{-1}) in the 8 years between 2013 and 2021.

GRS-10

Reproductive biology and Population Dynamics of Slipper lobster species *Thenus orientalis* in the eastern coast of Sri Lanka

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Key-highlights

- Assess the abundance and distribution of slipper lobsters off the eastern coastal waters of Sri Lanka.
- Evaluate the reproductive biological aspects which are important for the management of the resource, so far monthly samples have been collected for a couple of months.
- Determine the population dynamics of the slipper lobsters in the eastern coast of Sri Lanka.
- Evaluate the market & socio-economical aspects of the fishers engaged in the slipper lobster fishery.
- Revisit the regulations and provide recommendations for effective slipper lobster fishery management strategies.

Technical session 2

How can we ensure that health, food systems, and sustainable food production systems?

GRS-11

Novel liquid detergent in hygienic milk production

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Key-highlights

- In warm water washed samples which were taken without washing with the detergent, were found with the colony-forming units (CFU) of total bacteria.
- Samples washed with dilution ratio 50:1, were contained nine culture-negative samples and only one sample was contained colony-forming units.
- All samples were cultured negative which were washed with a dilution ratio 25:1.
- From these dilution ratios, dilution ratio 25:1 would be the best ratio in the high-quality milk production process.

GRS-12

Effect of particle size and solvent type on the yield and volatile composition of oleoresins from different plant materials

Madhusankha G.D.M.P.[a], Perera O.D.N.A.[a], Jayasinghe C.V.L.[a]

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Key-highlights

- Oleoresins from several underutilized plant materials were extracted by different mechanisms and soxhlet extraction provided the highest yield.
- The oleoresin yield varied from 10 – 15% (w/w) and madan flesh exhibited the highest yield.
- The particle size was correlated with the oleoresin yield and a significant increment of the yield could be achieved by reducing the particle size below 0.6 mm.
- The polarity of the solvent significantly affected the composition and the yield of extracted oleoresins.

GRS-13

Coconut fat consumption pattern and prevalence of cardio metabolic risk factors among selected group of healthy adult men in Sri Lanka

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

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Key-highlights

- Findings of the ongoing survey indicated that the daily mean coconut fat intake among the study group was 46.7 g per day and it was about 84% of their total daily fat intake (55.4 g/day).
- The percentage daily intake of saturate fat (36.6g, 16%) among study participants were greater than the recommended intake (WHO recommendation for SFA intake is <10%).
- The mean BMI, waist circumference, systolic and diastolic blood pressure among selected individuals were 24.4 kgm^{-2}, 88.7 cm, 78 mmHg and 127 mmHg, respectively.
- In line with these findings, higher prevalence overweight and obesity (63%) as well as increase saturate fat intake could be the markers of cardio metabolic risk in the study group.

GRS-15

Dietary diversity, household food and nutrition security and community nutritional status

Thamilini J.[a], Silva K.D.R.R.[a] and Jayasinghe J.M.U.K.[b]

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Key- highlights

- A significant proportion of the households (HHs) in different sectors showed the perceived food insecurity.
- The price of rice, wheat and meat influenced the HHs food consumption. The effect was greater for increase in the price of rice and the impact is highest on the HHs in the urban sector.
- A substantial proportion of the studied population failed to achieve the recommended intake. The lack of diversity and the nutritional quality could explain the deficiency of many nutrient intakes.
- HHs with organized homegarden had greater dietary diversity compared with that of HHs with non-organized homegarden leading to better food and micronutrient intake and nutritional security.
- The nutritional vulnerability associated with food insecurity and the urgent need for policy responses and nutrition programmes to elucidate the food insecurity and its nutritional consequences.

GRS-16

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]

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Key-highlights

- Among the evaluated under-utilized crops, *Phyllanthus emblica, Elaeocarpus serratus, Solanum torvum and Basella alba* were recorded with remarkable antioxidant capacity, phenolics and flavonoids.
- *Pouteria campechiana* had the highest bioaccessible and bioavailable phenolics among the crops evaluated using *in-vitro* gastro-intestinal digestion and dialysis process.
- Both germinated and non-germinated *Mucuna pruriens* and *Canavalia gladiate* legume seed flour had high crude protein content (22.29-24.31%), glutamic and aspartic acid rich amino acid profile.
- Both germinated and non-germinated *Mucuna pruriens* and *Canavalia gladiate* legume seed flour had high contents of bioactive minerals (Fe, Cu, Zn, Mn, Se).
- Thus selected fruits, vegetables and legumes were incorporated in developing functional food product formulations for treating obesity and related disorders.

GRS-01

Habitat relations and conflicts with humans of Sri Lankan elephant (*Elephas maximus maximus*) in and around Maduruoya National Park, Sri Lanka

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Key-highlights

- During the dry season elephants roam outside the national park but less elephant numbers were recorded during the wet season.
- A total of six vegetation types were identified in and around Maduruoya National Park.
- It was found that most of the elephants are in shrub land during the wet season and they are in grasslands and Savanas during the dry season.
- Questionnaire survey is carried out around the villages of Maduruoya National Park. Available data analysis shows most visited were 1-3 male elephants and preferred the cover of night, and dusk and down.

GRS-18

Examination of the state of food literacy education and food environment in Sri Lankan secondary schools

Rathnayake M.P.S.[a], Silva K.D.R.R.[a], Nanayakkara G.J.M.[b] and Perera H.A.T.[a]

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Key-highlights

- Identified thirty-three sub-themes under three themes that are important in Sri Lankan secondary school food literacy education through a literature survey followed by an expert study.
- Food literacy-related learning outcomes in identified subjects were mapped against the identified list of themes and sub-themes to determine the extent of coverage of food literacy content in the existing Sri Lankan secondary school food literacy curriculum.
- Identified seven themes of competencies that are going to assess in terms of food literacy in grade 8, 9, and 10 students in Sri Lanka.

GRS-19

Generation of new knowledge for a sustainable industry: blue swimming crab fishery off northern Sri Lanka

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Key-highlights

- During the post-war context, open-access nature and increasing demand for fishery products have triggered drastic expansion of fishing efforts and use of some destructive and IUU fishing methods off waters in Northern Sri Lanka.
- Uncontrolled high fishing pressure, catching immature and berried individuals and illegal fishing were identified as the major reasons for present catch reductions.
- Proposed fisheries management strategies with equity sharing of social and economic returns will be useful for sustainable utilisation of *P. pelagicus* resources.
- Estimated parameters on the seasonal and temporal variations of male, female catches and catches in different maturity levels could be useful in setting the minimum harvestable legal size for the management purpose.
- The protocol developed for Branding Sri Lankan exports of BSC, as "Marine Stewardship Council (MSC)", will show the commitment of Sri Lankan industry for sustainable utilization of the resource.
- As preliminary analysis indicated that the large quantity of the exoskeleton (crab shell) of BSC which is wasted during the processing, could be used for extracting calcium.

GRS-20

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

- A significant correlation was depicted in the geographical patterns of production, using the IDW method in ArcGIS, accordingly consecutive to annual stocking strategies conducted.
- The model suggests that stocking has been arbitrary and predominantly conducted in minor reservoirs.
- The production and recapture efficiency were projecting various patterns due to *adhoc* stocking densities, which insists on the need for better stocking strategies in future.
- 3-Dimensional GAMs show production variation among the three hydrological regimes, we identified that major and medium reservoirs are underutilized, and more operational efforts could be productive.