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அடிப்படைக் கற்கைகளுக்கான தேசிய நிறுவகம்  
**NATIONAL INSTITUTE OF FUNDAMENTAL STUDIES**



වාර්ෂික වාර්තාව  
வருடாந்த அறிக்கை  
**ANNUAL REPORT**  
**2021**

නිපුණතා සංවර්ධන, වෘත්තීය අධ්‍යාපන, පර්යේෂණ හා නව නිපැයුම් රාජ්‍ය අමාත්‍යාංශය

மாநில திறன் மேம்பாடு, தொழிற்கல்வி, ஆராய்ச்சி மற்றும் கண்டுபிடிப்புகள் அமைச்சகம்

State Ministry of Skills Development, Vocational Education, Research & Innovation



THE STATE MINISTRY OF SKILLS DEVELOPMENT, VOCATIONAL  
EDUCATION, RESEARCH AND INNOVATION

## **National Institute of Fundamental Studies**



**ANNUAL REPORT**

**2021**

Compiled by: Science Education & Dissemination unit (SEDU)

NIFS Cover Design: Mr. Gayan Bandara, Technical Officer/ NIFS

**\*\* Please consider the English Medium document as the Main Report (section 1-9), since the working medium of the Institute is English Language**

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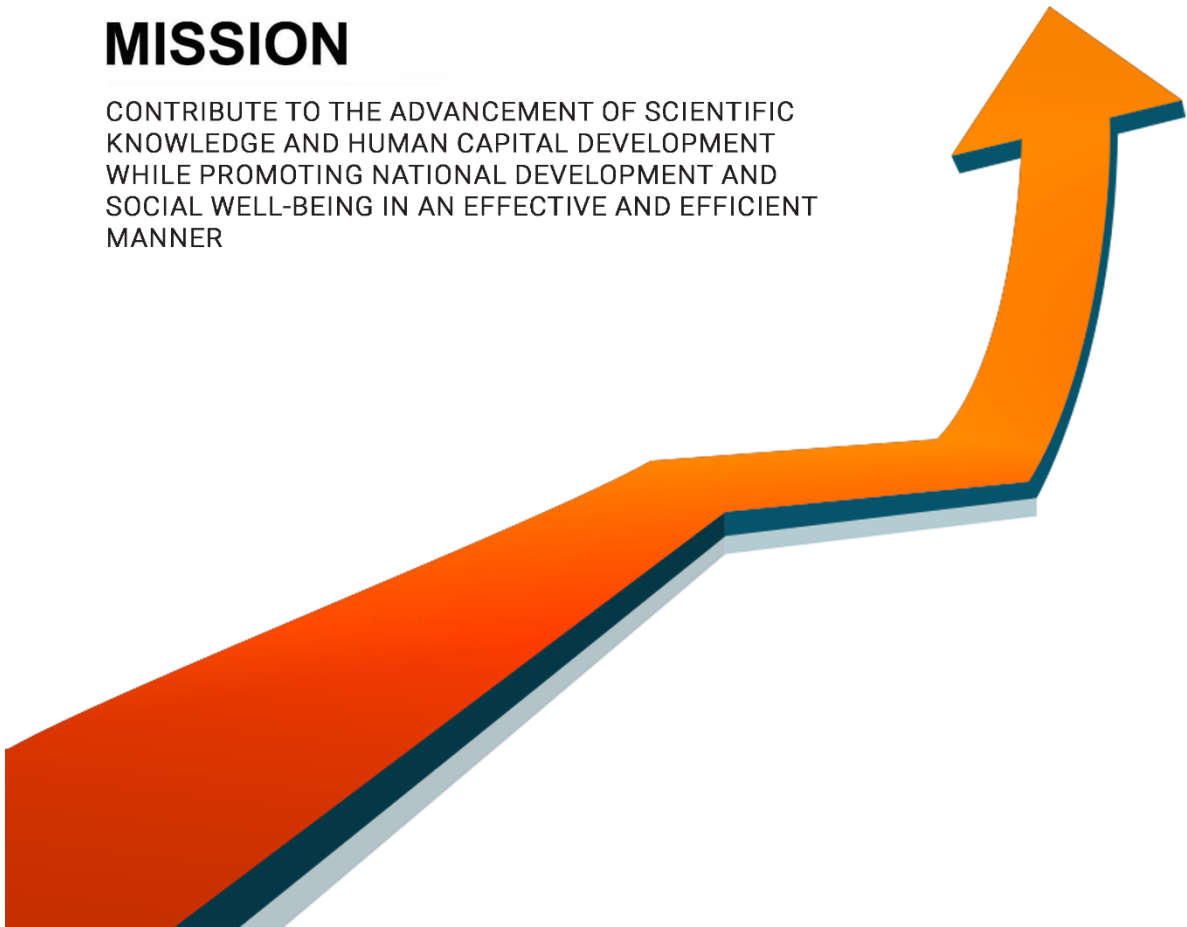
**WE ARE THE PREMIER INSTITUTE FOR  
ADVANCING FUNDAMENTAL SCIENCES**

## **OUR VISION**

TO BE A MODEL INSTITUTE FOR RESEARCH IN  
FUNDAMENTAL STUDIES SERVING BOTH NATIONAL  
AND GLOBAL COMMUNITY.

## **OUR MISSION**

CONTRIBUTE TO THE ADVANCEMENT OF SCIENTIFIC  
KNOWLEDGE AND HUMAN CAPITAL DEVELOPMENT  
WHILE PROMOTING NATIONAL DEVELOPMENT AND  
SOCIAL WELL-BEING IN AN EFFECTIVE AND EFFICIENT  
MANNER



## OBJECTIVES OF THE INSTITUTION

- Initiate, promote and conduct research and original investigations in fundamental studies in general with particular emphasis on mathematics, physical and chemical sciences, life sciences, social sciences and philosophy, taken in the broadest sense; to collaborate with public and private institutions as may be necessary to develop applications relevant to the studies conducted.
- Arrange lectures, meetings, seminars, and symposia in pursuance of its research work and for the dissemination of scientific knowledge;
- Invite scientists from Sri Lanka and abroad, actively engaged in research and creative work to deliver lectures and participate in NIFS activities;
- Establish and maintain liaison with scientists and scientific institutions in other countries and promote international co-operation in matters relating to the aims and objects of the Institute, while taking care to protect and promote the national interest;
- Provide training, guidance, and assistance for research studies leading to the award of postgraduate degrees by institutions recognized by the University Grants Commission of Sri Lanka established by the University Act, No.16 of 1978.
- Do such other acts and things as may be necessary to promote the aims and objectives of the Institute.

The institutional research objectives were met through six research divisions and the technical and administrative staff ensured the smooth operation of the Institute.

## RESEARCH DIVISIONS

- ❖ **Biological Sciences**
- ❖ **Chemical and Physical Sciences**
- ❖ **Earth and Space Sciences**
- ❖ **Environment Sciences**
- ❖ **Mathematics and Computer Science**
- ❖ **Philosophy and Social Sciences**

## RESEARCH PROGRAMMES

1. Condensed Matter Physics and Solid State Chemistry Research Programme  
*Discovery of simple and profitable methods to meet mankind's energy demands*
2. Earth Resources and Renewable Energy Research Programme  
*Using energy sources and geothermal resources for national development*

3. Energy and Advanced Material Chemistry Research Programme  
*Renewable energy for the future of the world*
4. Environmental Science Research Programme  
*Research on the fundamental aspects of pressing environmental problems*
5. *Evolution, Ecology and Biodiversity Research Programme*  
*Understanding the processes that form and maintain biodiversity*
6. Food Chemistry Research Programme  
*Protect the public from health risks brought upon by food*
7. Material Processing and Device Fabrication Research Programme  
*Utilization of locally available materials for energy conversion, storage and other electronic devices*
8. Microbial Biotechnology Research Programme  
*An eco-friendly approach to soil and human health*
9. Microbiology and Soil Ecosystems Research Programme  
*Explore the microbial flora and the soil ecosystems of Sri Lanka*
10. Molecular Microbiology and Human Diseases Research Programme  
*For a disease-free nation*
11. Nanotechnology and Physics of Materials Research Programme  
*Technological advancement through Sri Lankan minerals*
12. Natural Products Research Programme  
*Using natural products to improve the quality of human lives*
13. Nutritional Biochemistry Research Programme  
*Understanding the nutritional requirements of Sri Lankans at a cellular and molecular level to make our country more nutritionally sufficient*
14. Plant and Environmental Sciences Research Programme  
*Protecting the environment and human health through science*
15. Plant Stress Biology and Molecular Genetics Research Programme  
*Designing and helping plants to better adapt to climate change*
16. Plant Taxonomy and Conservation Research Programme  
*Protecting the flora and fauna of Sri Lanka*
17. Primate Biology Research Programme  
*Conserving primates and other organisms through new discoveries and disseminating knowledge*
18. Rhizobium Research Programme  
*Rhizobial biofertilizers for agriculture and pasture*

## 2. BOARD OF GOVERNORS 2021

NIFS is administered by an eleven-member Board of Governors with Prof. Athula Sumathipala, as the Chairman. The institute is administered by the board. The Board makes rules and procedures in the conduct of its affairs.

**Chairman** -Appointed by H.E the President

- **Prof. A. Sumathipala**, Faculty of Health Keele University, United Kingdom

### Members

*Ex-Officio members*

- **Prof. N. Kottegoda**, The Advisor to the President on Scientific Affairs
- **Prof. S. Amaratunge**, Chairman/ University Grants Commission
- **Prof. Saman Seneweera**, Director/ NIFS up to 30<sup>th</sup> April 2021
- **Prof. Ranjith Premalal De Silva**, Acting Director/NIFS from 1<sup>st</sup> May 2021

*Appointed by H.E the President*

- **Prof. M.A.K.L. Dissanayake**, Research Professor/NIFS
- **Prof. Nishantha Perera**, Department of Mathematics, University of Colombo

*Appointed by the Minister*

- **Eng. N. Rupasinghe**
- **Dr. Udaya Kalubowila**

*Elected by the Research Council*

- **Prof. Deepal Subasinghe**, Associate Research Professor/ NIFS
- **Prof. M.C.M. Iqbal**, Associate Research Professor/ NIFS, up to 30<sup>th</sup> November 2021

### Treasury Representative

- **Ms. Shiranthi Ratnayke**,  
Additional Director General, Department of National Planning

### Secretary to the Board of Governors/ NIFS

- **Dr. P.S.B. Wanduragala**, up to 12<sup>th</sup> August 2021
- **Prof. Lalith Jayasinghe**, Acting Secretary from 13<sup>th</sup> August 2021

### 3. RESEARCH COUNCIL 2021

The Research Council whose membership comprises university academics and researchers of the NIFS, served as an advisory body. The Research Council has control over the general direction of research and forwards its recommendations to the Board of Governors.

#### Chairman

- Prof. Saman Seneweera, Director/ NIFS up to 30<sup>th</sup> April 2021
- Prof. Ranjith Premalal De Silva, Acting Director/NIFS from 1<sup>st</sup> May 2021

#### Members

##### Appointed by H.E the President

- Prof. R. D. Jayasinghe, Department of Oral Medicine and Periodontology Faculty of Dental Studies, University of Peradeniya (up to 07<sup>th</sup> October 2021)
- Prof. D.M.D. Yakandawala, Department of Botany, Faculty of Science, University of Peradeniya (up to 07<sup>th</sup> October 2021)
- Prof. W.C.S.J. Wickramasinghe, Department of Parasitology, Faculty of Medicine, University of Peradeniya (from 01<sup>st</sup> December 2021)
- Prof. W.A.J.M. De Costa, Department of Crop Science, Faculty of Agriculture University of Peradeniya (from 01<sup>st</sup> December 2021)

##### Ex-Officio:

Senior Research Professors, Research Professors, Associate Research Professors and Senior Research Fellows of National Institute of Fundamental Studies

- Prof. J. Bandara, Senior Research Professor
- Prof. U.L.B Jayasinghe., Senior Research Professor
- Prof. G. Seneviratne, Senior Research Professor
- Prof. M.A.K.L. Dissanayake, Research Professor (on contract)
- Prof. G.R.A. Kumara, Research Professor (on contract)
- Prof. R. Weerasooriya, Research Professor (on contract)
- Prof. D. S. A. Wijesundara, Research Professor (on contract)
- Prof. S.P. Benjamin, Associate Research Professor
- Prof. M.C.M. Iqbal, Associate Research Professor
- Prof. D.N. Magana-Arachchi, Associate Research Professor
- Prof. R.R. Ratnayake, Associate Research Professor
- Prof. N.D. Subasinghe, Associate Research Professor
- Prof. N. Marikkar, Associate Research Professor (on contract)
- Dr. R. Liyanage, Senior Research Fellow
- Dr. H.W.M.A.C. Wijayasinghe, Senior Research Fellow

##### Elected by the Research Fellows of National Institute of Fundamental Studies

- Dr. I.P.L. Jayarathna, Research Fellow

##### Nominated by the University Grant Commission

- Prof. P. Ravirajan, Department of Physics, Faculty of Science, University of Jaffna
- Prof. M. Vithanage, Office of the Dean, Faculty of Applied Sciences, University of Sri Jayewardenepura
- Prof. K.N. De Silva, Department of Chemistry, Faculty of Science, University of Colombo (up to 19<sup>th</sup> December 2021)
- Prof. A. Senaratne, Department of Geology, Faculty of Science, University of Peradeniya (up to 19<sup>th</sup> December 2021)
- Prof. Chandana P. Udawatte, Vice-Chairman, University Grant Commission, (from 20<sup>th</sup> December 2021)
- Prof. Saluka R. Kodituwakku, Dean, Faculty of Science, University of Peradeniya (from 20<sup>th</sup> December 2021)

## **4. AUDIT & MANAGEMENT COMMITTEE 2021**

### **Chairman**

Ms. J.M.S.D Rathnayake

(Treasury Representative)

Additional Director General, Department of National Planning, Ministry of Finance

### **Committee Members**

- Eng. N. Rupasinghe (Board Member)
- Prof. M.A.K.L. Dissanayake (Board Member)

### **Secretary to the Committee (Convener)**

- Dr. P.S.B. Wanduragala, up to 12<sup>th</sup> August 2021
- Prof. Lalith Jayasinghe, Acting Secretary from 13<sup>th</sup> August to date

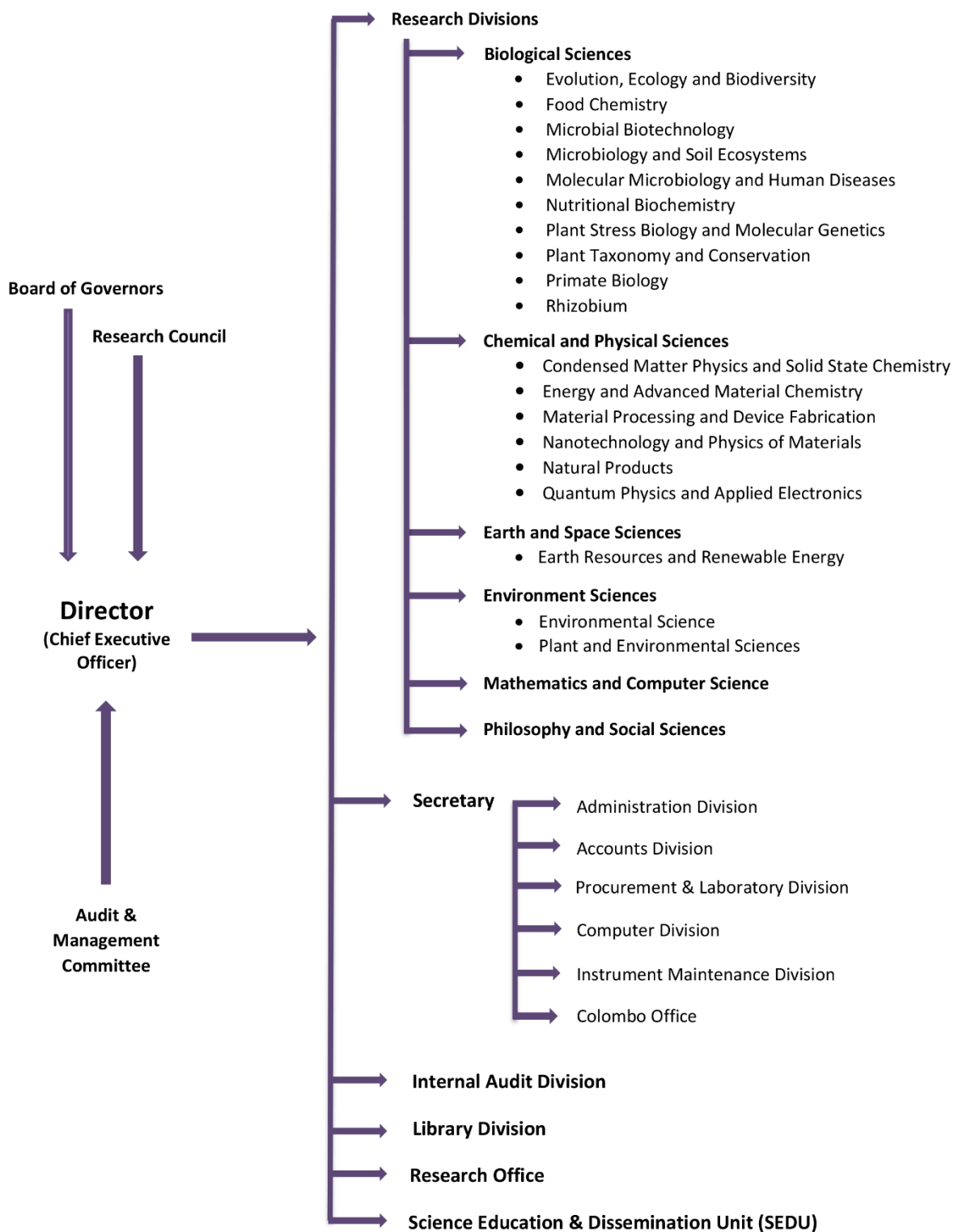
### **Observers**

- Mr. S. W. D. N. Wickramasinghe  
Audit Superintendent, National Audit Sub Office, University of Peradeniya
- Mrs. H. D. Anuruddhika  
Chief Internal Auditor, Ministry of Science, Technology and Research

### **By invitation**

- Prof. Saman Seneweera, Director/ NIFS up to 30<sup>th</sup> April 2021
- Prof. Ranjith Premalal De Silva, Acting Director/NIFS from 1<sup>st</sup> May 2021 to date
- Mrs. P. S. S. Samarakkody, Accountant, National Institute of Fundamental Studies

## 5. NIFS ORGANIZATIONAL CHART & STAFF REVIEW



## 5.2 Staff review

The NIFS functions with a cadre of 140.

Table 1. staff distribution based on staff level

Staff Level	Positions	Cadre	Year			
			As at 2020.12.31		As at 2021.12.31	
			Existing	Vacant	Existing	Vacant
Senior Level	Director	01	01	-	-	01
	Deputy Director	01	-	01	-	01
	Research staff	26	16	10	16	10
	Secretary	01	01	-	-	01
	Coordinator/SDU	01	01	-	01	-
Middle level	Accountant	01	01	-	01	-
	Chief Technical Officers	11	11	-	11	-
	Laboratory Manager	01	01	-	01	-
	Senior Assistant Librarian	01	01	-	01	-
	Senior Personal Secretary to the Director	01	01	-	01	-
	Scientific Officer	01	01	-	01	-
Tertiary level	Accounts Officer	01	01	-	-	01
	Administrative Officer	01	01	-	-	01
	Communication & Media officer	01	-	01	-	01
	Internal Audit Officer	01	-	01	-	01
Secondary Level	Senior Staff Assistants	09	09	-	09	-
	Technical Officer Grade III	05	03	02	02	02
	Library Assistant Gr. III	01	01	-	01	-
	Management Assistant Gr. III	10	10	-	10	-
	Personal Assistant to the chairman	01	-	01	-	01
Primary level	Driver- Special Grade	03	03	-	03	-
	Machinist – Special Grade	01	01	-	01	-
	Mason - Special Grade	01	01	-	01	-
	Laboratory Attendant- Special Grade	02	02	-	02	-
	Record Keeper - Special Grade	01	01	-	01	-
	Audio Visual Assistant	01	01	-	01	-
	Driver Gr. III	05	02	03	02	03
	Lapidarist Gr. III	01	01	-	01	-
	Machinist Gr. III	01	01	-	01	-
	Electrician Gr. III	01	01	-	01	-
	Office Aid	03	02	01	02	01
	Primary Level -Unskilled	03	03	-	03	-
	<b>Research Assistants (contract)</b>		<b>41</b>	<b>30</b>	<b>11</b>	<b>35</b>
<b>Total</b>		<b>140</b>	<b>109</b>	<b>31</b>	<b>110</b>	<b>30</b>

## 6.1. MESSAGE FROM THE CHAIRMAN

As the Chairman of the National Institute of Fundamental Studies, I am delighted to deliver this message to the Annual Administrative Report 2021.

The Annual Administrative Report provides an opportunity to identify our strengths and to strengthen them further and also to minimize our weaknesses or limitations as well as to follow up on what we have been doing in the previous year. Further, it is very important to share this follow-up with policy makers, planners and administrators as it would provide a good opportunity to revise our strategies, operations and directions. Strategy means grasping the opportunity which is a dynamic process and not a static one. This follow-up is even more important in light of the new and unexpected challenges we have to face.

Despite Sri Lanka's relative success in controlling the epidemic and introducing vaccines in an unprecedented global pandemic of COVID 19, these ongoing challenges will remain for quite some time. In addition to that fact, today we face issues directly related to COVID-19 as well as issues that are not directly related. We are facing two major issues i.e. energy and the issue related to agriculture. Our institution is engaged in research in these two fields. Therefore, we have a moral responsibility to see how our research can make culture shift in ways that benefit the public. We are accountable to people and society as we are products of free education and we utilize public money and public knowledge. As such, we will have to review not only our research, but also the context in which the research should be conducted.

It is manifest that there is a close correlation between today's post-industrial knowledge, economy, economic growth, innovations and indigenous research capacity. University-based research has been the most effective factor in such economically relevant innovations.

Research universities work on basic and applied research to create and disseminate knowledge, and institutions like ours are capable of developing mechanisms to effectively use this knowledge in collaboration with industry for generation of intellectual property and for knowledge/technology transfer for commercialization. Therefore, through technology transfer, research knowledge should be converted into products that benefit the people. We now have to make a significant effort in our journey to make a decisive contribution towards it.

I am sure we are able to do that in the near future especially in our work related to energy, power and agriculture.

***Professor. Athula Sumathipala***  
***Chairman/National Institute of Fundamental Studies***

## 6.2. REVIEW BY THE DIRECTOR/CEO

I am very pleased to forward a comprehensive review of our activities to the NIFS Annual Report 2021. As the leading fundamental research institution of the country and also as a premier research establishment, I take pride in presenting the achievements and the of progress our Institution during 2021.

NIFS is administered by an Eleven-member Board of Governors led by Prof. Athula Sumathipala as the Chairman. Within the powers vested on the Board by the NIFS Act, the Board made rules and procedures in conducting the affairs. The institute was successfully managed by the Board during the year 2021 even amidst the restrictions posed by the pandemic. The Research Council which is the research management arm of the institute comprises of researchers of the NIFS and university academics served as an advisory body directing research and forwarding its recommendations to the Board of Governors.

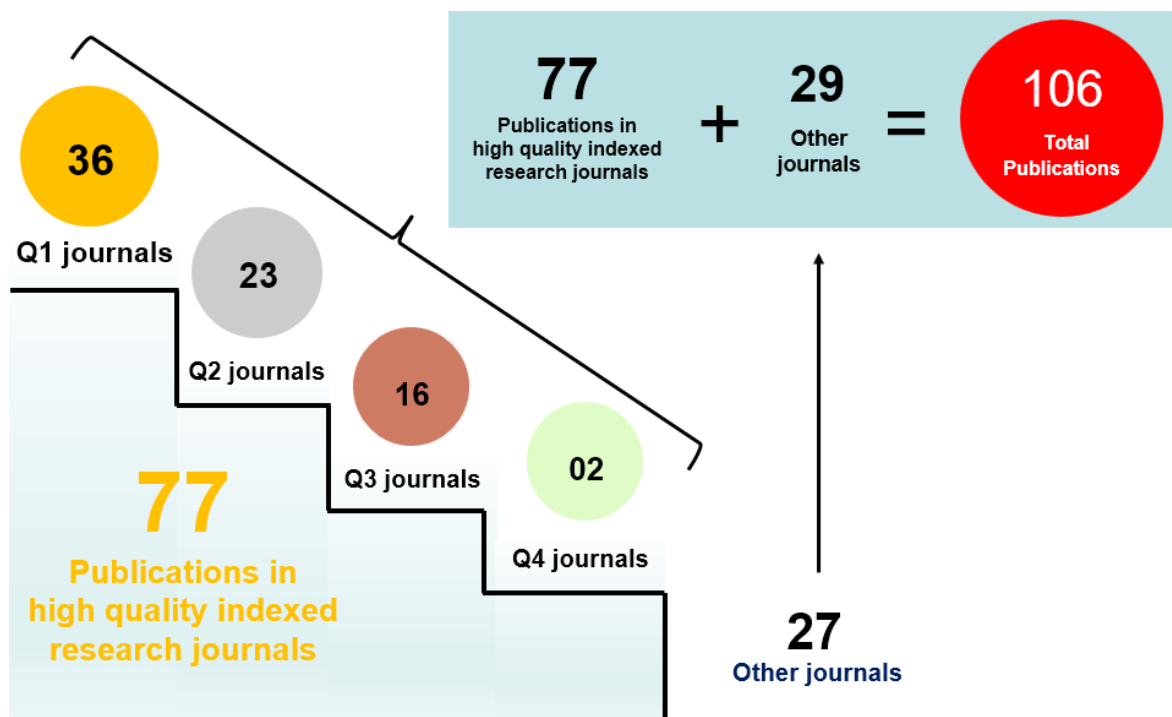
In the year 2021, the Institute was served by three (03) Senior Research Professors, five (05) Research Professors, five (05) Associate Research Professors, two (02) Senior Research Fellows, and one (01) Research Fellow. A total of eighty-five (85) postgraduate research students conducted their research under these scientists. Scientists at NIFS have published 106 research papers in refereed journals including 77 publications in high quality indexed journals, and 116 conference papers/ abstracts in the year 2021 in addition to the two patents obtained within the year. Eleven (11) research assistants obtained their postgraduate degrees, in addition to the two (02) PhD degrees and six (06) M.Phil. degrees. Further, several M.Sc. students (06) and undergraduates (10) completed their research projects at NIFS in 2021 under the supervision and guidance of our research staff. Further, several prestigious research Excellence awards and the International Young Scientist Award were received by NIFS staff. In addition, Prof. MAKL Dissanayake was recognized to be in the top 2% of world scientists.

At NIFS, we focus our attention on government priorities, ministerial commitments, institutional interests, and societal needs in formulating our research programs. Our research programs are evaluated using a wide spectrum of indicators highlighting the contribution to science, innovation profile, and the impacts on various sectors and society in general. A panel of research reviewers assists us in evaluating ourselves and identifying the gaps that need to be filled in our proposals for future research. In line with the Vistas of Prosperity and Splendor and UN SDG goals, NIFS continues to offer professional expertise in fundamental research to the Government of Sri Lanka in solving national problems. Furthermore, we have successfully launched several science popularization programmes for the benefit of the school children and the society. We conducted several special programmes to mark our existence for 40 years as the premier fundamental research institution of the country.

In the final words, I must appreciate and thank the research support, administrative, accounts, maintenance, and other staff of NIFS, the staff of the Ministry of Skills Development, Research and Innovation and the Hon. Minister Dr. Seetha Arambepola for their invaluable support extended to make our journey successful in 2021.

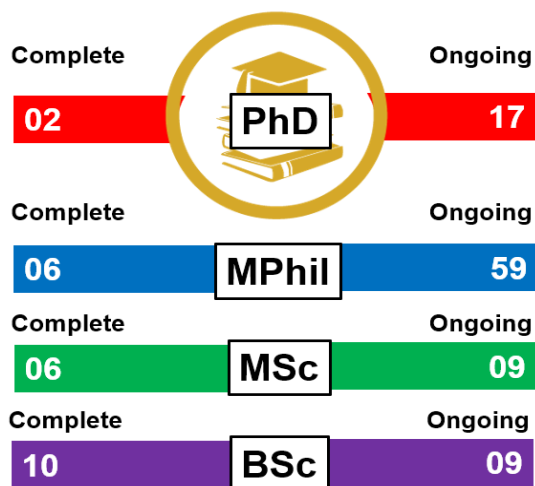
**Senior Professor Ranjith Premalal De Silva**  
**Acting Director/CEO**  
**National Institute of Fundamental Studies**

## 7. SUMMARY OF THE PERFORMANCES OF INSTITUTE IN THE YEAR 2021



\*According to the NIFS act it is mandatory and important to publish the research findings in high quality indexed research journals.

### Post Graduate Degrees



#### NOTE:

- Q1 is occupied by the top 25% of journals in the list
- Q2 is occupied by journals in the 25 to 50% group
- Q3 is occupied by journals in the 50 to 75% group
- Q4 is occupied by journals in the 75 to 100% group.

The most prestigious journals within a subject area are those occupying the first quartile, Q1. The importance of the other journals decline as we move down through the quartiles.

### Research Grants



### Research Collaborations



### Abstracts & Proceedings



### Books & Monographs



### Magazines & Newspaper Articles



## **7.2 Progress of Research**

### **7.2.1. Condensed Matter Physics & Solid-State Chemistry research programme**

*Project Leader – Prof. M.A.K. Lakshman Dissanayake*

#### **Introduction**

During the year 2021, research work was focused on the synthesis and characterization of technologically important novel solid state and quasi-solid state (gel) materials for energy generation and utilization. During this period, the group completed several sub-projects on enhancing the efficiency of low-cost dye-sensitized solar cells by (a) designing and fabricating novel TiO<sub>2</sub> based photoanodes incorporating quantum dots, plasmonic effect, and by nano-structural modifications to TiO<sub>2</sub> layer, (b) synthesizing and characterizing novel electrolytes and (c) fabricating novel carbon and graphite-based low-cost counter electrodes to replace expensive platinum metal generally used in dye solar cells.

#### **Activities carried out during the year 2021**

The following dye-sensitized solar cell systems were fabricated and characterized and results were published in SCI and SCI (Expanded) international journals. Also, the training of ONE MPhil student was completed and the degree was awarded by PGIS. FOUR more Ph.D./MPhil research students continued their full-time training under this project.

- Low cost, platinum free counter electrode with reduced graphene oxide and polyaniline embedded SnO<sub>2</sub> for efficient dye-sensitized solar cells.
- A low-cost, vein graphite/tin oxide nanoparticles-based composite counter electrode for efficient dye-sensitized solar cells.
- Effect of electrolyte conductivity, co-additives, and mixed cation iodide salts on efficiency enhancement in dye-sensitized solar cells with acetonitrile-free electrolyte.
- Effect of polyaniline (PANI) on efficiency enhancement of dye-sensitized solar cells fabricated with poly (ethylene oxide)-based gel polymer electrolytes.
- Solid-state solar cells co-sensitized with PbS/CdS quantum dots and N719 dye and based on solid polymer electrolyte with binary cations and nanofillers.

In addition, the research group participated and contributed immensely to the International Conference on Multidisciplinary Research held at NIFS on 21st October 2021.

### **7.2.2. Earth Resources and Renewable Energy research programme**

*Project Leader- Prof. N.D. Subasinghe*

#### **Introduction**

Finding new energy sources as well as better utilizing the existing resources are of utmost importance at the face of escalating energy needs. Several research programs have been designed with the above objective in mind. This concept has not been limited to the energy sources but also extended to other earth resources including mineral resources and geothermal resources.

The following three projects were conducted:

- Mapping geothermal resources in Sri Lanka with a view to utilizing them for national development,

- Mineralogy and Petrology of Sri Lankan Rocks, and
- Thermoelectricity.

#### **Activities carried out during the year 2021**

- Geophysical, geochemical and geological studies on geothermal resources of Sri Lanka
- Field trips to Kapurella, Nelum Wewa, Padiyathalawa, and Maha Oya areas
- Investigating the subsurface structures of the areas around hot springs using geophysical techniques: One-D and 2-D resistivity profiling and magnetic mapping
- Collecting and analysis of rock samples from pegmatites and associated rocks
- Developing low-cost thermoelectric modules using low-cost material
- Use of local graphite to produce thermoelectric material
- Developing new materials with higher *Figure of Merit*
- Modelling the thermoelectric output using mathematical models and testing the
- Dissemination of knowledge (publications, public lectures, and conferences)

### **7.2.3. Energy & Advanced Material Chemistry research programme**

*Project Leader – Prof. J. Bandara*

#### **Introduction**

The Energy & Advanced Material Chemistry project conducts renewable energy research, with a particular emphasis on the chemistry and physics of new materials for the conversion of solar energy into chemical and electrical energies. The project has several sub-projects under the broad theme of converting solar energy into useful energy, including photocatalysis/catalysis, solar cells, and environmental remediation. Extending and adapting current photovoltaic technology, primarily dye-sensitized, Q-dot, and polymer solar cells, to generate electricity directly from solar radiation; building artificial chemical devices mimicking photosynthesis to collect, direct, and apply solar radiation, for example, to split water, convert atmospheric CO<sub>2</sub>, and thus produce various forms of environmentally clean fuels; and chemical, electrochemical, and photochemical research. Additionally, the group is actively carrying out research on environmental remediation where we investigate novel low-cost water and air purification methods for abatement of industrial pollutants by using sunlight.

#### **Activities carried out during the year 2021**

Although photocatalytic water splitting is one of the most important renewable energy sources, a reliable hydrogen production system has yet to be developed. The most significant issues in photocatalytic water splitting systems are the poor response of most stable photocatalysts to visible light and the difficulty in achieving efficient separation of excited charge carriers, i.e., electrons and holes. We have created various photocathodes for the use of visible solar energy and the application of photochemical devices for water splitting reactions. Additional research is being conducted. Ions

Antimony sulfide (Sb<sub>2</sub>S<sub>3</sub>) solar cells are being studied to improve their efficiency as an alternative to the more expensive Si solar cell.

#### **7.2.4. Environmental Science Research Programme**

##### **A. NIFS Water Quality Research Project**

*Project Leader – Professor Rohan Weerasooriya*

##### **Introduction**

Recently Government of Sri Lanka has advanced the accomplishment of UN SDG 6 by five years, or the provision of safe drinking water for the entire nation requires accomplishing by the year 2025. The acute drinking water issue in the dry zone in Sri Lanka is mainly due to high salinity. We addressed the missing basic scientific problems associated with current technology. We proposed examining ion pairs association in saline waters. The information will be used in proposing appropriate desalination methods to the partner implementing organization (NWSDB). An integrated water quality index is also developed. In addition, the work on the development of metal ion buffers for in situ detection of free metal ions species is continued. This is important for the rapid detection of toxic metal ion species in the field. Most of the treatment technologies installed in the dry zone of Sri Lanka suffer maintenance problems due to a lack of expertise. We also initiated developing a mobile phone-based maintenance application remotely (this work is carried out by a foreign postgraduate registered for an M. Phil at the University of Peradeniya).

##### **Activities carried out during the year 2021**

1. Develop possible ion-pairs in saline water by theoretical calculations.
2. Develop a simulation model to selectively remove chemical species from graphene-based membranes (these membranes were fabricated using Sri Lankan vein graphite).
3. Development of tuneable membrane combinations using the commercial products for water desalination without adding external chemicals.
4. Development of metal ion buffers for the copper ion for in situ detection of free metal ions.
5. Development of SMART phone application for remote operation of the treatment facility is completed (at laboratory scale). The research results of the SMART phone data are specifically published in the Ceylon Journal of Science.– National Water Supply Board, University of Peradeniya, Rajarata University, and Jayawardhanapura University collaborated in the research.

##### **B. Materials development & pollution remediation**

*Project Leader – Dr. Lakmal Jayarathna*

##### **Introduction**

Environmental Science research program has been considered as an area of both basic and applied science. However, at NIFS it takes a different perspective in setting up environmental research programs. In essence, the **NIFS Environmental Science Research Program** focused on addressing the fundamental scientific aspects of pressing environmental problems in Sri Lanka with global interest. Environmental pollution is one of the major results of modern development. Remediation of pollutant materials from water, soil, and air is the most focused. Monitoring and understanding the basic and fundamental mechanisms of the pollutant materials in nature is much more important. Advanced materials such as nanomaterials and composite materials play a vital role in various applications.

The goals & objectives of the project are the development of smart nanomaterials for pollution control and remediation employing zeolites, composite materials, Sri Lankan vein

graphite, and solid wastes and value addition to local materials by converting them to high demanding end products. For that, under-utilized and cheaper raw materials, waste products are utilized to develop new materials.

#### **Activities carried out during the year 2021**

- Activity I: Zeolite-based sensor materials for gas sensing
- Activity II: Synthesis, characterization, and determination of the catalytic activity of Fe and Cu modified zeolite catalysts.
- Activity III: Zeolite based catalyst for NO<sub>x</sub>, SO<sub>x</sub> reduction
- Activity IV: Catalytic degradation of VOC by Zeolite based catalyst
- Activity V: Iron Oxide coated super-sand for fluoride removal in drinking water

### **7.2.5. Evolution, Ecology & Biodiversity research programme**

*Project Leader - Prof. Suresh P. Benjamin*

#### **Introduction**

Studies of this research programme is currently on terrestrial and freshwater ecosystems worldwide, however, with a special focus on the Western Ghats-Sri Lanka biodiversity hotspot. The primary focus is the largely uncharted fields of invertebrate biodiversity. Our findings are shared through papers published in international peer-reviewed journals.

#### **Activities carried out during the year 2021**

The study of the biodiversity of the jumping spiders of the genera *Epidelaxia*, *Carrhotus*, *Telamonia* of Sri Lanka using molecular phylogenetics and external morphology was initiated. Taxonomic revisions of the jumping spiders of the genera *Ballus*, *Colaxes*, and *Marengo* and placement of these genera in the salticid tree of life, description of new species of these three genera were undertaken. Phylogenetic placement and taxonomic description of the Sri Lankan endemic genus *Flacillula* with provisional descriptions of new species including notes on their distribution was completed and published in an international journal. Distributional records of Sri Lankan species of the Jumping spider genera *Brettus*, *Cocalus*, *Cyrba*, *Gelotia*, *Phaeacius*, and *Portia* were completed. Further, the molecular phylogeny of *Ballus*, *Marengo*, and *Colaxes* is based on a combined molecular data set of H3+CO1+28S target gene fragments. The phylogenetic analyses were conducted separately for *Ballus+Marengo+Colaxes* and *Flacillula*. The relevant publication is in preparation.

### **7.2.6 Food Chemistry research programme**

*Project Leader – Prof. J.M. Nazrim Marikkar*

#### **Introduction**

Food Chemistry research work focuses on exploring the anti-diabetic potentials of the under-utilized bioresources in the country. There are several edible plants that are native to Sri Lanka and the country's agro-industrial sector generates several by-products, which are left over after processing. Systematic investigations are, therefore, needed to find out their food and nutritional potentials as well as therapeutic uses.

#### **Activities carried out during the year 2021**

Ms. K.M.R.U. Gunarathna, research assistant, presented a paper at the International Conference on Applied and Pure Sciences 2021, held on 29<sup>th</sup> October 2021. She again presented a poster at the 33<sup>rd</sup> Annual Congress of PGIA 2021, Peradeniya, 17 November 2021. Ms. B.S.K. Ulpathakumbura, research assistant, presented a paper at the 1<sup>st</sup> International Conference on Science & Technology, Southeastern University of Sri Lanka, held on 27<sup>th</sup> July, 2021 and won the best presenter award.

Prof. Nazrim Marikkar presented a webinar on Challenges in Food Authentication to commemorate the National Science Week 2021. He chaired the Technical Session on Food Quality and Processing at the 33<sup>rd</sup> Annual Congress of the PGIA, University of Peradeniya, held on 17<sup>th</sup> November 2021. In addition, Prof. Nazrim Marikkar chaired the Technical Session on Food Technology at the 1<sup>st</sup> International Conference on Science & Technology, Southeastern University of Sri Lanka, held on 27<sup>th</sup> July, 2021

The project has provided placement to Ms. S.A.F. Rushda of Faculty of Agriculture, Jaffna University to conduct her final year project from 25<sup>th</sup> April to 5<sup>th</sup> September 2021. In addition, Ms. J.M.P.D. Jayasundara of Faculty of Agriculture, University of Peradeniya was given the opportunity to undertake her final year project from 2021-04-03 to 2021-07-28.

During the year, research focus was given to utilize coconut testa left as by product of coconut processing industries in Sri Lanka. As there is a dearth of nuts to produce sufficient amount of coconut oil for local consumption, it is worth to exploit coconut testa for oil production. As wet coconut testa constitutes around 18% of the kernel weight, an estimated 6,500 kg of testa would be produced out of 100,000 nuts of Sri Lankan tall variety. It has been already known that coconut oils of various grades exist in the markets across the coconut growing countries. As such there might be some confusion regarding the identity characteristics of coconut testa oil (CTO) in the oil trade and business. Thus, there is a pressing need to authenticate CTO from other types of coconut oil to serve the customers with genuine product. In this regard, characterization of CTO from different coconut cultivars has been completed using differential scanning calorimetry and gas liquid chromatography.

### **7.2.7. Material Processing & Device Fabrication research programme**

*Project Leader – Prof. G. R. A. Kumara*

#### **Introduction**

This research involves experimentation and basic studies in the areas of material processing and device fabrication, emphasizing on energy conversion and storage, attempting to utilize locally available raw materials. Coconut charcoal and graphite are being innovatively developed as electrodes for solar cells and supercapacitors. Exfoliation and purification of Sri Lankan graphite will be continued with a view to producing oil absorbents and graphene. Also, project plan to conduct research in the area of thin film perovskites solar cells.

### **Activities carried out during the year 2021**

Transparent conductive oxides (TCOs) are a key component in many optoelectronic applications such as solar cells, flat panel displays, sensors, touch screens, light-emitting diodes, frost-resistant surfaces, and smart windows. The high electronic conductivity and high optical transmission are essential properties of TCOs for these applications. F-doped tin oxide (FTO) films have much demand in a variety of electrochemical devices. We have developed transparent and electrically conductive FTO thin films on soda-lime glass substrates. The films are fabricated by sequential nebulized spray pyrolysis with the help of a homemade low-cost spray gun. This FTO film shows sheet resistance  $15 \Omega \text{ cm}^{-2}$ .

The effect of 4-*tertiary*-butylpyridine in improving the performance of electrolytic dye-sensitized solar cells is well known. It is found that when 4-*tertiary*-butylpyridine is introduced to a dye-sensitized solar cell using the ionic liquid electrolyte 1-methyl-3-propylimidazolium iodide, both short-circuit current density and the open-circuit voltage are significantly increased. The result is a consequence of the increase in ionic conductivity of the electrolyte due to 4-*tertiary*-butylpyridine. We have proposed the most plausible mechanism for the increase in ionic conductivity of the ionic liquid due to 4-*tertiary*-butylpyridine.

This work constitutes the first report on the simple eco-friendly activation process of carbon issues from coconut shell-based waste which has a potential for mass production. Further, these carbon electrodes provide high-performance supercapacitors employing solvent-free ionic liquid electrolytes, low-cost expanded graphite, and stable polymer type separator. These findings pave the way towards the production of efficient supercapacitors from biomass renewable resources.

A novel and simple flotation technique have been developed to prepare high-purity graphite from impure graphite. In this method, a suspension of pristine powdered graphite (PG) is dispersed and stirred in water without adding froth formers or supportive chemicals. This makes fine particles of graphite move upwards and floats on water. X-ray diffraction (XRD) analysis reveals that the floated graphite (FG) has a lower c-axis parameter, indicating the removal of interlayer impurities. Therefore, the technique is helpful for the value enhancement of graphite, the reduction of the chemical cost of the conventional techniques, environmental friendliness, and improvement of its applications.

### **7.2.8. Microbial Biotechnology research programme**

*Project Leader – Prof. Gamini Seneviratne*

#### **Introduction**

The NIFS started research on biofertilizers in the early 1980s i.e., over 35 years ago. The dedicated research of the NIFS first yielded a biofertilizer for legumes called Rhizobial biofertilizer. Then, by 2003, the NIFS invented another product called Biofilm biofertilizer (BFBF) for non-legumes. For paddy, this can cut down up to 50% of all three major chemical fertilizers (NPK) under farmers' practices and can increase yields by about 20% on average. Field-based research trials have been done by the NIFS in collaboration with the RRDI (DOA), Bathalagoda from 2015 onwards. BFBF for paddy has been used commercially from 2016 onwards.

### **Activities carried out during the year 2021**

Rhizobium biofertilizer is now being used in about 15,000 acres of soybean, mung bean, vegetable bean, and groundnut cultivations. Up to now, we have successfully cultivated over 100,000 acres of paddy with BFBF coupled with reduced doses (up to 50%) of chemical fertilizers NPK and about 20% grain yield increases in Polonnaruwa, Ampara, Kurunegala, Galle, Colombo, Hambantota, Trincomalee, Batticaloa, and Monaragala were obtained. It was also observed that soil carbon sequestration is significantly increased with the BFBF practice, which has implications in carbon trading. During Maha 2021/2022 season, the BFBF has also been introduced to over 100,000 acres of paddy cultivation in the government's organic agriculture program. In addition, Biofilm-treated ERP as a source of P is being tested in some of the above districts.

### **7.2.9. Microbiology & Soil Ecosystems research programme**

*Project Leader –Associate Research Prof. Renuka Ratnayake*

#### **Introduction**

The main objective of this research is to determine soil Carbon(C) sequestration potential, its dynamics, and the method of improvement in different major vegetation types of Sri Lanka such as natural and plantation forests, wetlands, agricultural plantations, farm lands, home gardens, and small holder cultivations etc. The potentiality of coastal ecosystems such as mangroves and intertidal saltmarshes will be studied for capturing and storing of atmospheric carbon as aboveground and belowground biomass and in sediments. As the first step mangroves and saltmarsh ecosystems located in Northern Sri Lanka are under investigation. A study has also been initiated to develop a baseline soil information system for soil C and other nutrients for paddy growing soils in Sri Lanka. Estimation of C stocks in soil and preparation of GIS based maps are the main outcome of this project. Kandyan home garden systems have also been studied for soil C sequestration potential. Microbial cellulases have shown potential application in a wide range of industries including biofuel, pulp, and paper, textile, laundry, food and feed industry, agriculture, etc. The present project focused on studying the potential applications of enzyme extracts obtained from locally isolated cellulolytic microorganisms in different value-added products and processes. Research conducted so far indicated that locally isolated microorganisms and their enzymes can be effectively used in industrial processes to replace commercially available, high-cost enzymes. Another study has been initiated to investigate the genetic diversity of cyanobacteria in different water bodies of Sri Lanka with their taxonomical identification, nutrient profiling, and toxin analysis. The project also focuses on the establishment and maintenance of cyanobacteria culture collection which facilitates the preservation and conservation of pure cyanobacteria strains present in different types of water bodies and stress conditions in Sri Lanka not only for the academic and industrial research but also for future reference.

### **Activities carried out during the year 2021**

#### **Soil Ecosystems- Projects**

Project 01: Field soil sampling was carried out as a cover-up paddy growing area of the whole Sri Lanka. The collected soil samples were analysed for the soil carbon content

and other macro/ micronutrients. Soil carbon content was mapped across Sri Lanka using statistics of the data in remote sensing and GIS environment.

#### Project 02:

Soil sampling at Mannar Island, Northwestern to the northern coastal belt until Punarin representing mangrove forests, saltmarshes, sand, dunes and proximal littoral woodlands. Laboratory analysis to measure soil physio-chemical parameters including Soil organic carbon fractions and available nutrients. Vegetation samples identification and data analysis for Vankalai sanctuary to discuss the current status with respect to carbon fractions and available nutrients.

#### Microbiology- Project

Sample collection from the extreme ecosystems; salt marshes, mangroves, hot water springs and lagoons, Sample preparation, isolation, and purification of cyanobacteria. Morphological characterization based on microscopic observations and photographs. Establishment of biological growth chamber and its regular maintenance. Long-term preservation of isolates using cryopreservation. Mass culturing to obtain biomass for further analysis. Analysis of total carbohydrate and total protein contents of dry biomass.

### **7.2.10. Molecular Microbiology & Human Diseases research programme**

*Project Leader – Prof. D. N. Magana-Arachchi*

#### **Introduction**

Our research focuses on microbial ecology in different environments and the effect of microorganisms on human diseases. We concentrate on both communicable diseases (CDs) and non-communicable diseases (NCDs) that affect humans globally and nationally and try to understand these scientific problems on a molecular microbiological scale.

#### **Activities carried out during the year 2021**

The main research activities of the year 2021 were based on the genetic characterization of drug-resistant *Mycobacterium tuberculosis* (Mtb) isolates from Sri Lankan and Pakistani tuberculosis (TB) patients and, the identification of associated biomarkers for TB, the diversity and distribution of thermophilic microorganisms in hot springs of Sri Lanka: metagenomics approach, epidemiological study on Asbestos-related occupational health problems among Asbestos industry workers in Sri Lanka. The other five subprojects included; enrichment mechanisms of CKDu-risk factors in groundwaters, their uptake pathways, and potential remedies, transcriptome analysis of mycobacteria in serum exosomes of latent tuberculosis patients for candidate biomarker identification, characterization of antibiotic resistance in geothermal springs of Sri Lanka, identification of urinary biomarkers for diabetic and hypertensive Chronic Kidney Disease (CKD) in Sri Lanka, and conducting balloon flights over Sri Lanka to detect possible ingress of cometary microorganisms & particulate matter.

#### Key findings:

This study is the first attempt at the comprehensive identification of drug-resistant *Mycobacterium tuberculosis* strains using whole-genome sequencing (WGS) in Sri Lanka. According to the study, a quarter of the isolates were at least resistant to one first-line anti-tuberculosis drug with both globally well-known and lesser-known mutations.

A study on hot springs revealed vast diversity of thermophilic bacteria and archaea in the hot springs of Sri Lanka, which included a total of 25 bacterial and 03 archaeal phyla. The most abundant bacterial & archaeal phyla were Proteobacteria and Euryarchaeotic respectively. A study on asbestos-related occupational health problems among 264 asbestos industry workers revealed 1/4<sup>th</sup> of workers showed abnormal lung function conditions.

### **7.2.11. Nanotechnology & Advanced Materials research programme**

*Project Leader – Dr. H.W.M.A.C. Wijayasinghe*

#### **Introduction**

Our country possesses a large variety of economically useful minerals that are still exported as cheap raw materials. Though they have the potential to play a major role in global nano-tech and other high-tech industrial applications, proper value addition to our minerals, by upgrading for these applications, is lacking.

This project highly emphasizes performing fundamental, but target-oriented, advanced scientific investigations through developing our mineral resources for those highly profitable technological applications. Investigation on novel advanced semiconductors for energy conversion and storage applications, mainly for novel rechargeable batteries, is another important research area carried out by this project. Under that, investigations are being carried out to develop novel semiconductors by introducing modern nanotechnological techniques and processes.

#### **Activities carried out during the year 2021**

Development of low-cost and performance enhanced advanced materials for energy conversion using low-cost and nanomaterial synthesis techniques. Under that, investigations were carried out an aim of introducing novel materials developed, through novel/nanotechnological methods, with the ultimate target for rechargeable battery applications

Value addition to Sri Lankan minerals and related materials for advanced/high-tech/nano-technological applications. This was carried out through upgrading Sri Lankan minerals and related materials with the ultimate aim of introducing them for novel/potential industrial applications. The development of Sri Lanka Graphite for rechargeable batteries is a major research area carried out under this project.

Further, the National Center for Advanced Battery Research (NCABR.) is operated under this project. The NCABR is a national facility open to research groups related to local material development for energy-related applications. Under this, a number of research projects are carried out in collaboration with local universities

### 7.2.12. Natural Products research programme

Project Leaders – Prof. U.L.B. Jayasinghe

Prof. N.K.B. Adikaram

#### Introduction

The overall objective of this research work is the identification of bioactive extracts and compounds from natural sources, as potential resources for control of human and plant diseases. Research activities have been focused on the chemistry and bioactivity of secondary metabolites from plants, fungi (including endophytic fungi), and edible fruits of Sri Lanka. Another area of research has been the identification of polyphenols found in tea, medicinal plants, edible fruits, and spices using Liquid Chromatography-Mass Spectrometry (LC-MS) and also studies on the cause and control of postharvest fungal diseases, including the Stem-end Browning, and three physiological disorders, Fruit pitting, Lenticel Darkening and the Internal Pulp Browning of mango var. TomEJC, an export-oriented fruit crop.

#### Activities carried out during the year 2021

Project work at the NIFS involves mainly the following areas:

Investigation of extracts from plants and, metabolites of epiphytic and endophytic fungi, as potential sources for the use in agriculture and human health; Chemistry and bioactivity of edible fruits, Plant secondary metabolites and LC-MS profiling of bioactive extracts and Study of the cause/s and management of postharvest diseases and disorders that adversely affect the export potential of mango var. TomEJC.

##### A. Chemistry and bioactivity of fungi associated with medicinal plants, & edible fruits:

Currently we are studying the chemistry and bioactivity of secondary metabolites produced by endophytic fungi isolated from some medicinal plants. Several secondary metabolites with interesting structural features and some useful bioactivities have been isolated.

##### B. Enzyme inhibitors from plants:

Of the secondary metabolites isolated from *Myristica fragrans*, malabaricone C (**1**), 3-(3-methyl-5-pentyl-2-furanyl)-2(*E*)-propenoic acid (**2**), licarin A (**3**), maceneolignan B (**4**), and elemicin (**5**), the Compound **1** showed the highest AChE inhibitory activity and antioxidant activity while the Compound **2** displayed the most potent  $\alpha$ -glucosidase inhibitory activity. This is the first report of  $\alpha$ -glucosidase inhibitory activity of Compound **2**. Results indicate that the aril of *M. fragrans* showed good anticholinesterase and  $\alpha$ -glucosidase inhibitory activities and antioxidant effect *in vitro* that have the potential to be used as a treatment for Alzheimer's disease.

C. Fungal Metabolites: Secondary metabolites were isolated from an endophytic fungus *Biscogniauxia capnodes* and identified, by Chromatographic separation of the extract which furnished 2 isocoumarins, reticulol (**1**) and 6-*O*-methyl-reticulol (**2**), and two dihydroisocoumarins, 5-methylmellein (**3**) and 7-hydroxy-5-methylmellein (**4**). Compound **1** showed moderate antioxidant activity against DPPH radicals. This is the first report of the isolation of *B. capnodes* as an endophyte, as well as the compounds **1** to **4** from *B. capnodes*.

D. Postharvest diseases and disorders of mango var. TomEJC: Eleven fungi were shown to be associated with the Stem-end Browning (SEB) which were subject to molecular identification and confirmation of pathogenicity. Pre- and postharvest management strategies were determined and recommended. Fruit pitting was shown to be due to deficiency of some elements through ICP analyses. Lenticel Browning (LD) results from the entry of excess water into lenticels and could be reduced by altering certain postharvest handling practices. The development of Internal Pulp Browning (IPB) was shown to be related to some physiological and weather factors.

### **7.2.13. Nutritional Biochemistry research programme**

*Project Leader –Dr. Ruvini Liyanage*

#### **Introduction**

Food is one of the basic needs of a human being. Consumption of unhealthy, unsuitable food is one of the main causes of disease and disorders amongst Sri Lankans. By understanding the nutritional requirements of Sri Lankans at a cellular and molecular level this project aims to make our country healthier and more nutritionally sufficient. To achieve this objective Nutritional Biochemistry project focuses on several areas of research, including functional and nutritional properties of food, the bioavailability of nutrients and bioactive compounds in food, assessing the nutritional status of people to improve their health and well-being.

#### **Activities carried out during the year 2021**

In the year 2021, Nutritional Biochemistry research was focused mainly on two projects as described below.

- A) Functional and nutritional properties of food:** Under this research theme, the study was done to assess the nutritional properties and bioactive active compounds in raw and processed *Artocarpus nobilis* seeds. In addition, *in vivo* study was also done using Wistar rats for further confirmation of functional properties.
- B) Bioavailability and bio accessibility of food bioactive compounds:** One of the important characteristics of classic foods and, in particular, functional foods is efficiency, which is the ability of food to meet the metabolic needs of the consumer. Quantitative expression of food efficiency is done using other concepts, such as bioavailability, bio accessibility, and bioactivity of food components. These concepts can be studied by *in vivo*, *ex vivo*, and *in vitro* methods, and can be expressed quantitatively by different units of measurement. In this study, the bioavailability and bio accessibility of nutrients and antioxidant compounds in legumes were studied.

**Relationship between dental caries and nutritional status of children:** In Sri Lanka, a considerable number of children below age 5 suffer from malnutrition. One of the main unidentified reasons for the higher prevalence of stunting and wasting among them could be the higher prevalence of dental caries among them. This study investigates the association of early childhood dental caries with nutritional status, oral health status, and oral health-related quality of life in a sample of Sri Lankan children aged 4-5 years. The findings of this study will pave the way to improve the knowledge and awareness among the people to prevent these health issues among children and will help relevant authorities to make correct policy decisions.

### **7.2.14. Plant & Environmental Sciences research programme**

Project Leader –Prof. M.C.M. Iqbal

#### **Introduction**

The major focus of this group is on environmental remediation of hazardous materials polluting our waterways, particularly by heavy metals, textile dyes, fertilizers (nitrates, phosphates), and toxic organic and inorganic wastes.

Under the project, research on the removal of nitrate and fluoride was done by using Metal-Organic Frameworks (MOFs) due to their high efficiency in the adsorption process. Besides, aquatic weeds were used for phytoremediation of nitrate and phosphates which is an environmentally friendly method.

The plant tissue culture project is investigating the protocols for the micro-propagation of *Madhuca longifolia* and *Manilkara hexandra*, two selected species from the dry forests. Since natural propagation through seeds is not adequate and contained with dormancy, for large-scale propagation, plant tissue culture can enhance the reforestation programs in the dry zone.

#### **Activities carried out during the year 2021**

Removal of nitrate and fluoride anions from an aqueous solution by three selected synthesized metal-organic frameworks [MIL 53(Fe), MIL53 (Al), and MOF71 (Co)] prepared by microwave-assisted hydrothermal method and characterized by using P – XRD and FTIR and adsorption experiments.

Recycling of Phosphorus using *Salvinia molesta* an aquatic weed that can store a high amount of phosphorus. Analyzed the enhancement of yield and growth of *Oryza sativa* using cattle farm effluent treated *Salvinia molesta* as a Phosphorus fertilizer.

Protocols were optimized for micropropagation of *Madhuca longifolia* and *Manilkara hexandra*, two dry forest tree species through apical shoot and auxiliary buds. Dormancy associated with the seeds of two species was identified. Pre-treatments to break the dormancy under *ex vitro* condition and conditions for *in vitro* culturing was identified.

### **7.2.15. Plant Taxonomy & Conservation research programme**

Project Leader - Prof. D.S.A. Wijesundara

#### **Introduction**

Main activities of this research programme are: a) Taxonomic and Biogeographical Studies of the flora of Sri Lanka, b) Restoration Ecology, c) Sustainable Use of Sri Lankan Plants, d) Factors affecting the conservation of the flora of Sri Lanka including Invasive Alien Species, and e) Preparation of the National Red List for flora.

Sri Lanka is a country blessed with unique biodiversity. However, due to several factors, much of the natural vegetation cover has got destroyed during the recent past. The government of Sri Lanka is planning to increase the natural forest cover from the current 29.7% up to 32%. Assisted natural regeneration (ANR) is one of the important methods selected for restoring forest cover in degraded areas. NIFS-Sam Popham Arboretum (NIFS-SPA) is considered the

best site in Sri Lanka for ANR. On account of its significance as a benchmark site for Assisted Natural Regeneration, many forest ecologists and botanists use NIFS-SPA as a research site. It is also a popular tourist destination owing to the presence of unique fauna with rich birdlife and some unique animals such as Slender Loris and Pangolin. NIFS-SPA also has dry evergreen rich vegetation consisting of over 200 species of trees. One of the main tasks of this project is to develop this important arboretum. Research activities on natural products from medicinal and invasive plants carried out in collaboration with the University of Peradeniya were continued. The compilation of the National Red list for flora was completed with the assistance of expert teams conducting meetings at the National Herbarium and the National Red List 2020 (flora) was launched.

#### **Activities carried out during the year 2021**

Developing the NIFS-Popham Arboretum is one of the main tasks of the Plant Taxonomy and Conservation project. The research on soil microbiology was completed. The entrance gate, bridges, and footpaths were upgraded.

Taxonomic research on two important genera, *Syzygium* and *Strobilanthes* is continued. During the field visits several unique *Syzygium* species were located. All the collected specimens were prepared as voucher specimens and deposited in the National Herbarium. A new species *Strobilanthes medahinnensis*, was described and a paper was published. A research paper was published on the DNA analyses conducted in collaboration with the biotechnology center of the University of Peradeniya on Sri Lankan Cinnamon. Work related to the compilation of the National Red list for flora was completed and the book was launched.

Research activities on natural products from medicinal and invasive plants were continued in collaboration with the University of Peradeniya and two abstracts were presented at national symposia. Two research papers on the impact of invasive plants were published in international journals

### **7.2.16. Plant Stress Biology & Molecular Genetics research programme**

*Project Leader –Prof. S. Seneweera*

#### A. Creating global benchmark yields in paddy and minor crops

##### **Introduction**

The current national average rice yield is close to 4.2 MT per hectare which increased from around 2 MT/HA in the 1970's to 4.2 MT/HA by the early 2000s. The current average yield remains stagnant despite 95 percent of Sri Lanka's rice crop extent being brought under improved cultivars. Traditional cross-hybridization and selection is still a widely used strategy for developing cultivars with a higher yield in Sri Lanka. The already low yield potential of Sri Lankan rice is further challenged by the increased production cost and inevitable climate change. The key traits and genetic components contributing to rice yield and how physiological and molecular traits interact with the environment to maintain the yield potential are not well understood. In the developed world, advanced plant breeding techniques like gene mapping, high throughput phenotyping, and gene editing-based crop improvement are widely used, making significant progress in yield enhancement. In this

project, we expect to identify key physiological and biochemical traits associated with rice yield in Sri Lankan rice varieties through genome mapping and transcriptome comparison.

#### **Activities carried out during the year 2021**

A collection of 96 rice accessions including traditional, hybrid, and international varieties were grown in the yala season and their yield parameters were collected. DNA has already been extracted from the same 96 varieties and is being genotyped using a high-density rice array (HDRA) that consists of 700,000 SNPs to utilize them for high throughput genotyping. Association mapping will be employed to identify specific functional genetic variants linked to phenotypic differences in a trait to facilitate detection of trait causing DNA sequence polymorphisms.

#### **B. Develop plant demand-based nitrogen fertilizer using hybrid nanomaterial**

##### **Introduction**

Nitrogen (N) is the element that plants require in the highest quantity. Availability of N is one of the key limiting factors in crop productivity in agricultural systems. Uptake, assimilation, translocation, and remobilization are the main steps involved in the use of N by plants. Plant N uptake from the soil depends on environmental conditions, soil type, and plant genotype. Approximately, 50-70% of N applied to the soil is lost, mainly due to surface run-off, leaching of nitrates, volatilization of ammonia, etc. Extensive use of N fertilizers results in excessive emission of N<sub>2</sub>O which is one of the major greenhouse gases that largely contributes to global warming. Therefore, one of the major research challenges today is to improve the nitrogen use efficiency of crop plants. Nanotechnology is being identified as a new avenue to improve nutrient use efficiency. Fertilizers can be designed in a way that releases nutrients in a controlled manner that synchronizes with the needs of plants. Therefore, we are aiming to develop an environmentally friendly, cost-effective, biodegradable, controlled-release nano fertilizer system with high nitrogen use efficiency.

##### **Activities carried out during the year**

Synthesized the desired fertilizer systems. Molecular structures of the materials were characterized by using FTIR, XRD, XPS, PSA, TGA, and TEM techniques. Proper analysis of the surfactant modifications was carried out and proven the sorption mechanism using Langmuir sorption theory. Different fertilizer applications are tested in the greenhouse using the selected rice variety

#### **7.2.17. Primate Biology research programme**

*Project Leader –Prof. W. Dittus*

##### **Introduction**

This research program involves observational studies of monkeys (primates) in their natural forest habitats. Our “laboratory” is the Polonnaruwa Nature Sanctuary (cum Archaeological Reserve) where we have established the empirical foundations for our research over several decades. The research subjects involve mostly the endemic toque macaques (*Macaca sinica*)

but also the purple-faced langur (*Semnopithecus vetulus*), gray langur (*S. priam*) and slender loris (*Loris lydekkerianus*) Our aims are: (1) to contribute new knowledge to the understanding of the evolution of social behavior in primates (and by extension in humans); (2) to provide a scientific basis for the effective management and conservation of primates and other organisms; and (3) to disseminate new knowledge through scientific publications as well through professionally produced documentary films with an eye towards - not only educating and entertaining but also gaining public support for conservation efforts in the local and international communities. Our films contribute a positive image of Sri Lanka as a tourist destination, some appear on YouTube. Our research results are published mostly in quality SCI journals.

### **Activities carried out during year 2021**

1. Observational field research aims to clarify comparative demography and behavioral ecology of four species of sympatric primates at Polonnaruwa: toque macaque *Macaca sinica*, gray langur *Semnopithecus priam*, purple-faced langur *S. vetulus* and nocturnal loris *Loris lydekkerianus*. Routine monitoring for rates of birth, death, dispersal, and group fission in relation to socio-ecological variables. Long-term data are needed for analyses of highly variable trends that are applied for testing hypotheses of behavioral ecology and evolutionary adaptation as well as conservation strategies.

Research staff: Mr. Chameera Pathirathna, Mr. Sunil Rathnayake, certified naturalist staff of the Association for the Conservation of Primate Diversity (ACPD), assisted by Kapila Hewananda. Data compilers: Madushani Jayalath, Vatsala Dittus, Sunil Gunathilake, Thamila Abeysinghe, Tharangi Hettiarachchi (NIFS volunteer research assistant).

2. Primate phylogeny studies involve field monitoring the socioecology and demography of hybrid primates between *S. priam* and *S. vetulus*, and the collection of DNA samples for phylogenetic analyses.

Researchers: ACPD staff in collaboration with Prof. S. Benjamin (NIFS) and Prof. P. Karanth (Indian Institute of Science).

3. Dissemination of science to the general public by way of scientific consultancy and logistic support of a professional film crew in March 2021 for the development of documentary films (Born Wild) that are broadcast internationally (HumbleBee Films, UK).

4. Editorial Consultancy. Peer review of scientific articles submitted to SCI journals: *International Journal of Primatology* (x1), *Journal of Threatened Taxa* (x1), *American Journal of Primatology* (x2), *Journal of Medical Primatology* (x1), *Journal of Biodiversity* (x1). Book by Theodore Grand.

5. Data analyses. (a) Data management by scanning long-term records into digital format for cloud storage. (b) Analyses of cheek-pouch use (an anatomical adaptation unique to cercopithecoid primates) in relation to ecological and social variables. (c) Analyses of 1,200 records of dental development and health in wild toque macaques (d) Submission of a review publication (SCI) regarding the human-monkey conflict in Sri Lanka. (e) Compilation of patterns of monkey injuries from inter-monkey aggression.

6. Consultant to the Ministry of Environment regarding (a) National Red Listing of mammals, (b) Forestry Sector Master Plan, (c) Environmentally Sensitive Area Identification.

### **7.2.18. Rhizobium research project**

*Project Leader –Prof. S. A. Kulasooriya & Prof. Gamini Seneviratne*

#### **Introduction**

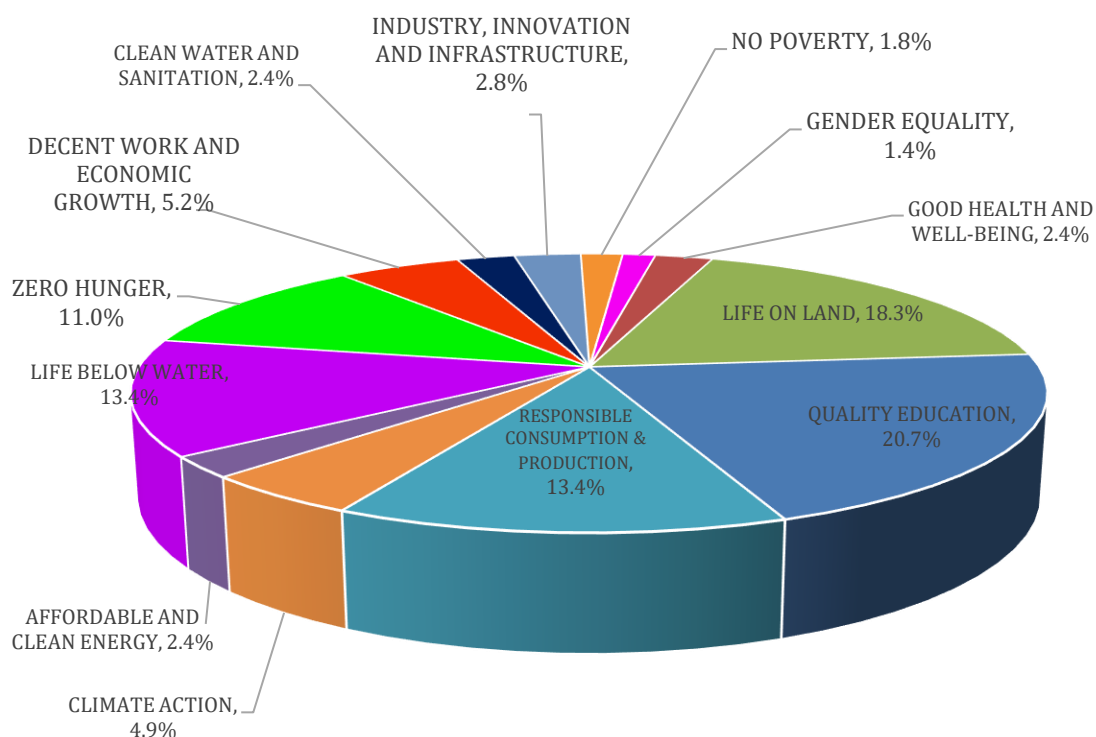
Rhizobia are soil bacteria that form endosymbiotic root nodules in leguminous plants which fix atmospheric nitrogen and provide it to the host plants. A number of food legumes like soybean, mung bean, groundnut, vegetable bean, etc. are common food legumes grown in Sri Lanka. In this project we isolate, characterize, identify and authenticate rhizobia from different food crops, screen and select the efficient strains and prepare carrier-based inoculants with them. These inoculants are supplied to crop cultivators to improve nitrogen fixation in these crops and minimize the application of N-fertilizers (urea) to them. These inoculants are capable of completely replacing the addition of urea without any reduction in yields.

#### **Activities carried out during the year 2021**

For the year 2021 (up to the 9<sup>th</sup> of December), rhizobial inoculants were supplied to cultivate 8,939 acres of soybean, 5,277 acres of green gram, 250 acres of groundnut, and 290 acres of vegetable beans. These inoculants supplied were conducted in collaboration with the Department of Agriculture, Provincial Agricultural Departments, Mahaweli Authority, and Plenty foods Pvt Ltd. A new rhizobial formulation was prepared and field-tested with the central government agriculture department. Farmer demonstrations and extensions were held jointly with the Central Provincial agriculture department to expand bean cultivation with Rhizobium inoculation.

### 7.3 Contribution towards National Development

In consonance with the Vistas of Prosperity and Splendours and UN SDG goals, NIFS continues to offer professional expertise in fundamental science research to the Government of Sri Lanka in solving national problems.



**Figure 1. Achieving Sustainable Development Goals (SDGs) in 2021**

Developed Solutions to address current issues in the country by NIFS research programmes are given below;

### **7.3.1. Condensed Matter Physics & Solid-State Chemistry research programme**

Project Leader, Prof. M.A.K.L. Dissanayake, continued as a Deputy Director of the National Solar Panel project of the Ministry towards R&D for locally manufacturing thin-film solar panels and the training of Solar Technicians at NVQ 4/5 levels. This project is in line with the government plan to increase the contribution of renewable energy utilization to about 70% by 2030.

Sri Lanka has not yet reached a critical number of trained scientists. Our project continued to develop these human resources by providing much-needed research training to students at PhD, MPhil, MSc and undergraduate levels.

### **7.3.2. Earth Resources and Renewable Energy research programme**

Evaluated the possibilities of developing Geothermal energy as a renewable energy source and discussed with the relevant authorities.

Produced a Power-on-demand mobile phone charger that can charge a mobile device using a candle or any other heat source. This can be used where and when the grid electricity is not available. This can be improved to produce electricity using waste heat or solar energy.

Produced graphene-based thermoelectric materials. This is a value addition to Sri Lankan graphite while improving the *Figure of the Merit* of thermoelectric material.

### **7.3.3. Energy & Advanced Material Chemistry research programme**

We developed a laboratory-scale reactor for the treatment of service station wastewater, and the laboratory scale reactor was further developed and scaled up to treat service station wastewater. However, due to the current pandemic situation in the country, testing of these reactors in service stations has been further delayed, but trials will be conducted in the coming months.

### **7.3.4. Environmental Science Research Programme**

#### A. NIFS Water Research programme

a. Concept development of appropriate technology for water desalination (NWSDB) is currently using the methodology in Wilgamuwa.

b. Development of integrated water quality index for rapid demarcation of the status of a water body (this index is checked at Rajarata University and a village in Mihintale).

#### B. Materials development & pollution remediation

Development of zeolite-based catalyst for environmental applications.

### **7.3.5. Evolution, Ecology & Biodiversity research programme**

During the past year, through the research efforts of all project members, 119 species of spiders new to science was discovered. This highlights the biological heritage of Sri Lanka.

Further, biodiversity is negatively impacted by climate change, with negative consequences for human wellbeing. Biodiversity can also be an important contributing factor in climate-

change mitigation and adaptation. Biodiversity estimates can be used as indirect assays of ecosystem function or productivity or as direct estimators of ecosystem responses to human-induced climate change. Thus, the study and conservation of biodiversity are critical to addressing climate change affecting Sri Lanka.

#### **7.3.6. Microbial Biotechnology research programme**

The expansion of BFBF use up to 100,000 acres of paddy cultivation during this year saved imported chemical fertilizers worth ca. 200 million rupees by cutting them down, and also provided farmers an additional income of ca. 1.5 billion rupees through the yield increases. This saved foreign exchange spent on importing chemical fertilizers, which could be used for other important matters during this crisis period. Also, the increased income for the farmers helped increase their economic status.

#### **7.3.7. Microbiology & Soil Ecosystems research programme**

- A cyanobacteria culture collection has been established for the purpose of research, education and industrial purposes.
- Collection of baseline information for future C trading programmes
- GIS-based map has been prepared to show the distribution of soil C and other nutrients in Knuckles Forest region
- Nine agricultural land uses in Northern Sri Lanka has been covered for soil fertility and biological parameters. This is the first detailed soil survey conducted in the Northern part of Sri Lanka after 1987

#### **7.3.8. Molecular Microbiology & Human Diseases research programme**

A low-cost real-time PCR kit to diagnose Multidrug-resistant tuberculosis (MDR-TB)

#### **7.3.9. Nanotechnology & Advanced Materials research programme**

Some of the key innovations/out comes so far developed/at the developing stage, by this project is stated below. These highly value-added products/processes are expected to contribute to national economic development. Already, the Line ministry together with the institute has started processes leading for commercializing these patented/innovated products.

Ultra-pure graphite from Sri Lankan vein graphite (Sri Lankan Patent number: 18729). Battery grade graphite” from Sri Lankan vein graphite (Sri Lankan Patent numbers: 18728 and 18730). The technology know-how developed on Li-ion coin cell batteries fabricating with our developed battery grade graphite and locally developed nano-materials.

#### **7.3.10. Natural Products research programme**

Proper understanding of the cause of postharvest disease and disorders help the development of appropriate management practices. Overall, the outcome of the project significantly reduced the loss of good quality fruits to be harvested, increasing availability of exportable mango fruits.

#### **7.3.10. Plant & Environmental Sciences research programme**

- Environmental remediation using MOF's and aquatic weeds can be considered as an environmentally friendly method in water purification processes. It might be more helpful to get rid of different diseases caused by the consumption of high fluoride-containing water.
- *Salvinia molesta* can be used as an alternative for Triple Super Phosphate (TSP). Identification of restrictions in plant propagation of native species having abundant benefits support in popularizing the native species in Sri Lanka than the exotic plants. Improved technologies such as plant tissue culture can increase the number of plants produced per year per explant in large quantities.

#### **7.3.11. Plant Taxonomy & Conservation research programme**

Assisted taking a decision on saving the critically endangered tree, *Crudia zeylanica* on the Northern expressway at Daraluwa, Gampaha as a member of the committee appointed by the Secretary, Ministry of Highways.

#### **7.3.12. Primate Biology research programme**

In Sri Lanka (and globally) wildlife is subject to many threats arising from the conversion of natural environments for human use. As a first step towards finding a solution to these current issues in Sri Lanka, we need to identify the species of primates, other mammals, and the habitats that are critical to their survival. To this end, I have participated as an invited consultant to the Ministry of Environment to assess the degree of threat, by internationally accepted IUCN criteria, to different species of primates and habitat areas (Environmentally Sensitive Areas) that are of high priority for conservation. In a similar vein, I have contributed to the revision of policies with respect to forestry (natural habitats for animals) action plans.

#### **7.3.13. Rhizobium research project**

The application of urea to legume crops can be replaced completely by the use of rhizobial Inoculants without any reduction in yield. The widespread use of our inoculants not only save foreign exchange in urea import but also minimize environmental pollution.

## **7.4 Progress of the Office for Research Support (OFRS)**

### **Introduction**

The Office for Research Support (OFRS) was first established on the 1st of April 2019 and now it functions as the supportive arm of the NIFS in delivering research support services related to research grants, research development, research education and research collaborations with other institutes. We work closely with the academics, research assistants, and the Science Education and Dissemination Unit (SEDU) of NIFS to provide high level administrative support to manage their research activities. The services of the division are currently carried out by Dr. Shalini Rajakaruna (Scientific Officer- the Head of the Division) and Mrs. Thamara Wijewickrama (Senior staff Assistant), under the supervision of the Director NIFS.

### **Performances of the Division**

The OFRS reviewed and coordinated submission of the research grant proposals submitted by the scientists of NIFS to different funding agencies and an archive of the submitted grant proposals are maintained by the OFRS. OFRS coordinated the review progress of two patent applications and Dr. Rajakaruna obtained a training in intellectual property rights (IP) by participating in a three-month course in IP rights conducted by Osaka Institute of Technology, Japan.

The OFRS prepared annual and quarterly reports on the research progress of the institute to be submitted to the line – ministry. The OFRS also prepared a detailed report on research grants received by the NIFS scientists from 2011- 2021 with the physical progress achieved through every grant. The OFRS keeps the scientists informed about the funding opportunities throughout the year.

The OFRS was granted the responsibility in coordinating the initiation of a Technology Transfer Unit (TTU) for the institute and the proposal was submitted to the Board of Governance (BOG) and obtained the board approval to initiate the unit. As the initial step, the board suggested to form a Technology Transfer Policy for the Institute and now, the OFRS is coordinating the committee appointed by the BOG to form an Institutional Technology Transfer Policy.

The OFRS provided support and guidance to the Young Scientists Association in organizing the Three Minute Thesis Competition 2021 and International Conference on Multidisciplinary Research 2021 and was involved in 40<sup>th</sup> anniversary collaboration activities. Other than that, as a contribution to the institutional development, coordinating the development of the Action Plan for 2022 was done by, the OFRS and addition to that, Dr. Rajakaruna actively participated in a few internal committees appointed by the Research Council and Board of Governors. Dr. Rajakaruna also continues to collaborate with the SEDU in “NIFS research talks” as the presenter of the Youtube program, by the SEDU.

## 7.5 Progress of the Science Education & Dissemination Unit (SEDU)

### Objectives:

Foster the exchange of technical and scientific information for the scientific community & promote the public understanding of science.

### Forums for the scientific community:

- Special lectures: intended to provide a quick forum for the NIFS scientists and Research Assistants with the eminent scientists visiting the institute and the country
- International/National Workshops, symposia and conference

### Promotion of public understanding of science:

To build up a scientific culture and to enhance the science tempo of the school community workshops, science camps, and training sessions were conducted. In addition, the SEDU conducts programs for the popularization of science through electronic media as well as printed media. SEDU is engaged in the popularization of science and disseminating research findings of NIFS in different ways of communication. It holds and daily updates social media networks of NIFS and SEDU such as Facebook, Twitter, and LinkedIn which easily enable science communication and dialogue and official websites.

Main activity	Activity organized
<i>Organize National and International conference and workshops with NIFS Scientists</i>	NIFS Annual Research Review 2020(in situ & Online) Date: 2021-04-06, Participation: 80 researchers
	Young Scientists' Conference on Multidisciplinary Research (YSCMR) 2021 This year's conference was an international conference and was held virtually on 2021-10-21. The technical sessions of the Conference were held in six parallel sessions that brought together an attractive number of both local and international participants. Session I      Physical Science had 57 participants with 23 presenters Session II      Social Science had 40 participants with 16 presenters Session III      Chemical Science had 88 participants with 32 presenters Session IV      Biological Science-A had 53 participants with 22 presenters Session V      Biological Science-B had 60 participants with 28 presenters Session VI      Biological Science-C had 51 participants with 21 presenters
	The National Research Council of Sri Lanka has organized a World Water Day seminar based on the research results of one of its target-oriented research grants led by the National Institute of Fundamental Studies in collaboration with the National Water Supply and Drainage Board, University of Peradeniya, University of Sri Jayawardhanapura, Rajarata University, Chinese Academy of Sciences and Hefei University of Technology. Date: 2021-03-19, Participation: 60 researchers
	Three Minute Thesis (3MT) competition – 2021 Date: 2021-12-21

Main activity	Activity organized
Seminars & special lectures	<ul style="list-style-type: none"> <li>● Benjamin, S.P. (2021). <i>Serendipity is the taxonomist's strongest ally: the discovery of spiders trapped on mountains trapped in a tropical island</i>. Keynote, Kochi, India.</li> <li>● Bopearachchi, D.P., and Benjamin, S.P. (2021). <i>Molecular and morphological species delimitation suggest a single species of the beetle-spider genus Ballus in Sri Lanka (Araneae: Salticidae)</i>. Presentation, Virtual Conference.</li> <li>● Dissanayake, M.A.K.L. (2021). <i>Directing Scientific Research, Innovation, and Human Resources Towards Sri Lanka's Economic Development</i>. Convocation Address(invited), The Open University of Sri Lanka, Nawala, Nugegoda.</li> <li>● Dissanayake, M.A.K.L. (2021). <i>Effect of mixed cations in efficiency enhancement in dye-sensitized solar cells</i>. Keynote, University of Pune, India (Virtual Conference).</li> <li>● Dissanayake, M.A.K.L. (2021). <i>Importance of renewable energy and solar energy - Why we need to develop research skills for fabricating solar cells and solar panels in Sri Lanka</i>. Invited address on the Wold Science Day event, University of Kelaniya, Sri Lanka.</li> <li>● Dittus, W.P.J. (2021). <i>Inspired by Adventure Podcast: Dr. Wolfgang Dittus</i>. Invited Speech, USA.</li> <li>● Dittus, W.P.J. (2021). <i>The Monkey Kingdom in Peril: &amp; solutions to conservation</i>. Invited Speech, Sri Lanka.</li> <li>● Dittus, W.P.J. (2021). <i>Primates of Sri Lanka: their biology and conservation</i>. Special Lecture, Kandy.</li> <li>● Dittus, W.P.J. (2021). <i>Red List Assessment for Toque Macaques (Macaca sinica)</i>. Presentation, Sri Lanka.</li> <li>● Dittus, W.P.J. (2021). <i>Shields on electrical posts prevent primate electrocutions</i>. Special Lecture, Kandy.</li> <li>● Prof. L. Jayasinghe (2021). Delivered the C.L De Silva Gold Medal Lecture 2021 at Annual sessions, Institute of Chemistry Ceylon</li> <li>● Kumari, J.M.K.W., Dissanayake, M.A.K.L., and Senadeera, G.K.R. (2021). <i>Development of counter electrode materials for dye-sensitized solar cells using Sri Lankan natural vein graphite</i>. Poster, Virtual Conference, Mallorca, Spain.</li> <li>● Magana-Arachchi, D.N. (2021). <i>Cyanobacteria, Cyanotoxins and Human Health</i>. Invited Speech, Virtual.</li> <li>● Magana-Arachchi, D.N. (2021). <i>Tuberculosis (TB) Research</i>. Invited Speech, Environmental Health Australia.</li> <li>● Marikkar, J.M.N. (2021). <i>Challenges in Food Authentication</i>. Special Lecture, NIFS Kandy.</li> </ul>

Main activity	Activity organized
	<ul style="list-style-type: none"> <li>● Satkunanathan, A. (2021). <i>Multilocus genetic and morphological phylogenetic analysis of the jumping spider tribe Nanneni with the description of one new genus and four new species (Araneae: Salticidae)</i>. Presentation, Virtual Conference.</li> <li>● Tharmarajan, M., and Benjamin, S.P. (2021). <i>Molecular phylogenetic origin and conservation of Argyrodines, cobweb spiders (Araneae: Theridiidae) of Sri Lanka</i>. Presentation, Virtual Conference.</li> <li>● Weerasooriya, R. (2021). <i>Extend JRDC facilities beyond the water environment</i>. Invited Speech, Zoom</li> <li>● Weerasooriya, R. (2021). <i>How to make an effective presentation</i>. Invited Speech, virtual</li> <li>● Wijesundara, S. (2021). Bio piracy and conservation of plants at the Webinar on “<i>Bio Piracy: A Pervasive Threat to Biodiversity and Human Security</i>”, organized by the Regional Centre for Strategic Studies</li> <li>● Wijesundara, S. (2021). Key note address on <i>Montane ecosystems in Sri Lanka</i> at Wildlanka International symposium organized by the Department of Wildlife Conservation</li> <li>● Wijesundara, S. (2021). 24<sup>th</sup> S.R. Kottegoda Memorial Oration organized by the Sri Lanka Association for the Advancement of Science on <i>Ethics in Biodiversity Conservation</i></li> <li>● Wijesundara, S. (2021). Key note address on <i>Environment Assessment and Management</i> at the International Conference on Environmental Governance (ICEG 2021) Organized by the Central Environmental Authority</li> </ul>
<p><i>Make aware the general public on the research conducted by NIFS</i></p>	<p>40th Anniversary Commemoration of the NIFS A series of public talks were organized.</p> <p><i>"History of National Institute of Fundamental Studies"</i> (via zoom on 2021-09-27 with 55 participants). Resource Person: Prof. Kirthi Tennakone Former Director / NIFS.</p> <p><i>"Introduction to Gene Therapy"</i> (via zoom on 2021-11-11 with 30 participants). Resource Person: Dr. Priyantha Herath Neurologist and the Executive Director of Clinical Development at Capsida Biotherapeutics, USA.</p> <p><i>"Our Place in the Cosmos: the role of culture and colonization"</i> (via zoom on 2021-11-17 with 28 participants). Resource Person: Prof. Chandra Wickramasinghe, Astronomer, Astrophysicist, and a Pioneer of Astrobiology Founding Director, National Institute of Fundamental Studies.</p> <p><i>"Solar Energy for sustainable development, reduce poverty and mitigate damaging effects of climate change"</i> (via zoom on 2021-12-15 with 79 participants). Resource Person: Prof I.M. Dharmadasa, Professor of Electronic Materials &amp; Devices at Sheffield Hallam University.</p>

Main activity	Activity organized
	<p><i>NIFS Research Talks</i>; Aiming to create a knowledge-based society, the NIFS initiated a series of discussions on “Science Research that will win the world tomorrow”</p> <p><i>Episode 04</i>, Resource Persons: Dr. R. Liyanage, and Dr. S. Rajakaruna  <i>Episode 05</i>, Resource Persons: Prof. S. Seneweera, and Dr. S. Rajakaruna</p> <hr/> <p>Series of short videos were produced in parallel to World Science week</p> <ul style="list-style-type: none"> <li>● ශ්‍රී ලංකාවේ කඳුකර පරිසර පද්ධති (montane ecosystems of Sri Lanka)  Prof. Siril Wijesundara - <a href="https://youtu.be/fSke9wSctEw">https://youtu.be/fSke9wSctEw</a></li> <li>● Challenges in Food Authentication  Prof. Nazrim Marikkar - <a href="https://youtu.be/bAyggW7Ka-w">https://youtu.be/bAyggW7Ka-w</a></li> <li>● ශ්‍රී ලංකාවේ ගංගා පරිසර පද්ධති වල වැදගත්කම සහ ඒවායේ අනාගතය  Dr Shalini Rajakaruna - <a href="https://youtu.be/KWVGJqjEFD14">https://youtu.be/KWVGJqjEFD14</a></li> <li>● කියවීම තවදුරටත් ප්‍රගුණ කළයුතු විද්‍යාත්මක හේතු  Mrs. Chandrika Tilakarathna - <a href="https://youtu.be/xXpl63F0KAq">https://youtu.be/xXpl63F0KAq</a></li> <li>● Primates of Sri Lanka  Prof Wolfgang Dittus - <a href="https://youtu.be/aZhfV7rUaJE">https://youtu.be/aZhfV7rUaJE</a></li> <li>● Cyanobacteria, Cyanotoxins &amp; Human Health  Prof. Dhammika Magana-Arachchi - <a href="https://youtu.be/YCFMOOKclGE">https://youtu.be/YCFMOOKclGE</a></li> <li>● Utilization of coconut testa for edible oil and flour  Ms. Rasika Gunarathna - <a href="https://youtu.be/qGkgNC_5r00">https://youtu.be/qGkgNC_5r00</a></li> </ul> <hr/> <p>Improved the NIFS Research Information Repository</p> <hr/> <p>Increase the content of the NIFS website and publish research achievement and ongoing research programmes on NIFS Social Media Accounts, Increase the blog articles on NIFS website</p>
<p><i>Inculcate scientific literacy among the school community</i></p>	<p>47<sup>th</sup> Annual School Science Programme was scheduled to be held in August. Due to the corvid 19 pandemic this programme was cancelled</p> <hr/> <p>Science Short Video Competition - 2021</p> <p>The NIFS together with the State Ministry of Skills Development, Vocational Education, Research and Innovation organized a short video competition to promote scientific knowledge and to attract the general public for science through social media. We have received entries from various parts of the island for this competition, 125 video entries</p> <hr/> <p>All-Island competition – Understanding World through Science - 03</p> <p>The NIFS together with the State Ministry of Skills Development, Vocational Education, Research and Innovation organized an all-island competition to promote science concepts among the school students to enhance their curiosity to explore their surroundings and understand the science behind what they experience in their day-to-day lives.</p>

**E-programs:**

Programme	Performance in the year 2021	
	(Performance Indicators)	Number benefited
NIFS e-outreach <i>(Status: Ongoing)</i>		
Facebook page	Post Reached	380159
Google My Business	Views on Google Maps & Search	64941
LinkedIn	Post Reached	2255
Twitter	Post Reached	15715
Instagram	Post Reached	1328
Web site	Page Views	274650
YouTube	Views for videos	22259
Science Message Service <i>(Status: Uploading currently on hold)</i>		
Blog	Page Views	4059
Facebook Page	Post Reached	11556
Twitter (Sinhala & English)	Post Reached	8265
Website (Sinhala & English)	Page Views	44826
Science YouTube Channel <i>(Status: Uploading currently on hold)</i>	Views for videos	89912
Mobile Apps for Science Students <i>(Status: Uploading currently on hold)</i>		
Periodic Elements game App	Downloads	93
Sinhala Science Glossary App	Downloads	5675
Sinhala Science Website <i>(Status: Currently On hold)</i>	Page Views	19131
<b>Total benefited</b>		<b>944,824</b>

## 7.6. Progress of the Library

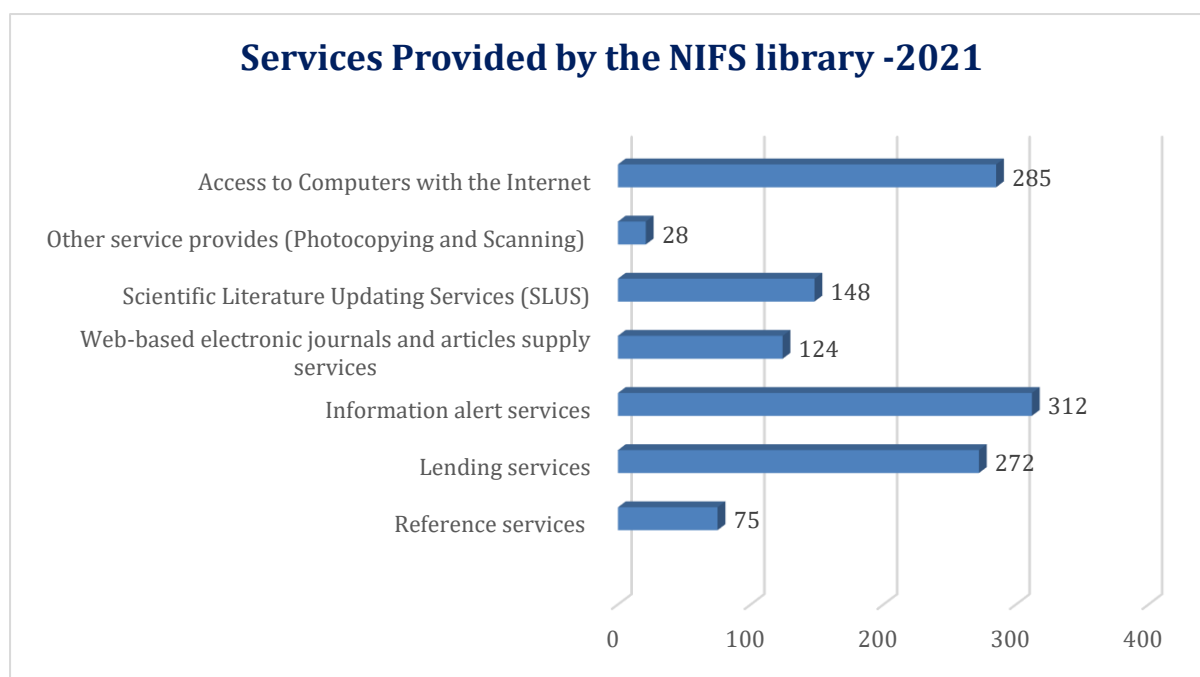
The Library of the NIFS continued to provide information and reference services to its research staff and permitted scientific community on their inquiry.

The library was engaged in the following services during the year.

Services provided are reference and lending, document delivery, resource sharing, inter-library loan facility, information alert services, new item arrivals alert service, sourcing web based electronic journals, and articles, Scientific Literature Updating Service (SLUS), access to computers and internet, provision of updated and necessary information to the NIFS administration such as government circulars, E-code, etc., access to the internet using updated computers and facilitating library users with photocopying and scanning facilities.

We were able to continue many of the above services throughout the year, even during the lockdown period of the pandemic.

We have been providing information resources digitally for a long time. We have answered readers' questions by email during the lockdown period. The library will continue to be a collection of physical and digital services.



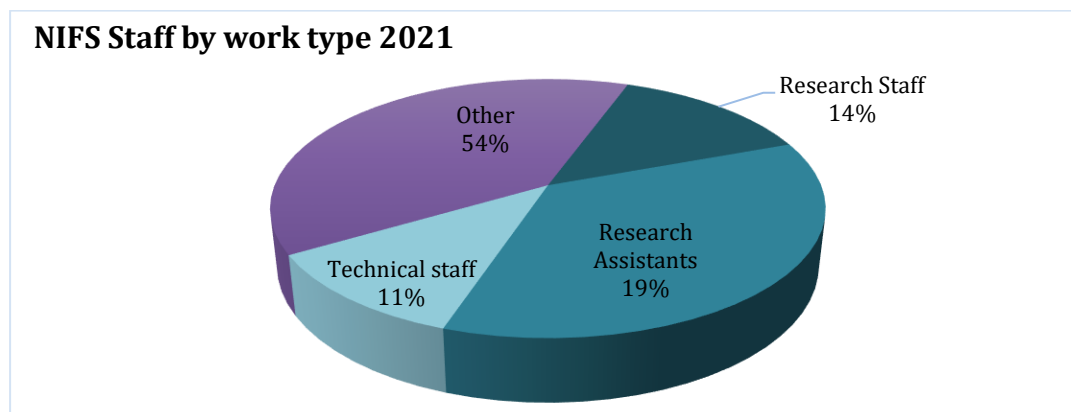
## 7.8 Infrastructure Developments & Major instruments purchased

Due to the financial constraints no major infrastructure developments were made.

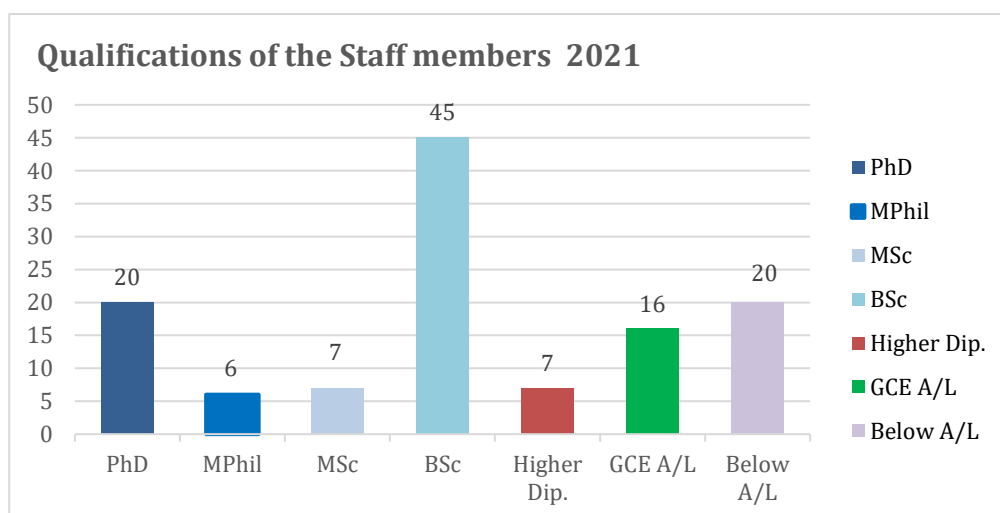
## 8. Human Resources

### 8.1 Summary of NIFS Staff

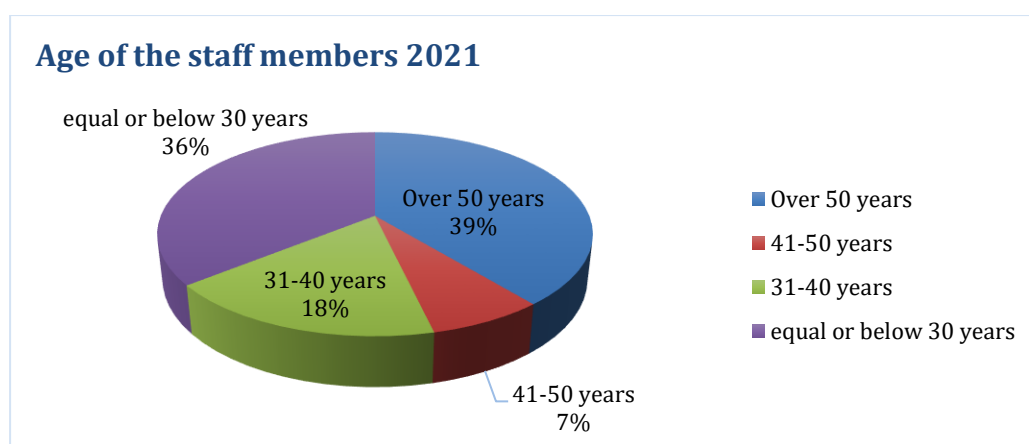
NIFS staff mainly comprises Research staff, Research supportive staff,, and Administration & Finance,, Staff. The following figure represents staff distribution based on the work type (as at 31/12/2020).



We have a well-qualified staff where over 65% are graduates. The following figure represents the staff distribution based on the qualification level (as at 01/12/2021).



In addition, we have an energetic staff. 60% of the staff is below 50 years of age. Hence the following figure shows the age distribution (as at 01/12/2021).



## 8.2 NIFS Staff 2021 by service Level\*

\*based on 2/2016 circular sub schedule III-as at 01/12/2021

Service Level*	Category		Number of employees
Senior Level	Research staff	Director	01 (vacant)
		Deputy Director	01 (vacant)
		Senior Research Professors	03
		Research Professors	05 (contract basis-04 nos.)
		Associate Research Professors	05 (contract basis-01)
		Senior Research Fellows	02
		Research Fellow	01 (contract basis)
		Research staff (vacant)	03 nos. -contract basis 07 nos.-permanent basis
	Senior Managers	Secretary	01 (vacant)
		Coordinator/SDU	01
Middle-level	Middle Managers	Accountant	01
		Chief Technical Officers	11
		Laboratory Manager	01
		Senior Assistant Librarian	01
		Senior Personal Secretary to the Director	01
		Scientific Officer	01
Tertiary level		Accounts Officer	01 (vacant)
		Administrative Officer	01 (vacant)
		Communication & Media officer	01 (vacant)
		Internal Audit Officer	01 (vacant)

Secondary Level	Senior Staff Assistants	09
	Technical Officer Grade III	05 (vacant 02 nos.)
	Library Assistant Gr. III	01
	Management Assistant Gr. III	10
	Personal Assistant to the chairman	01 (vacant)
Primary level	Driver- Special Grade	03
	Machinist – Special Grade	01
	Mason - Special Grade	01
	Laboratory Attendant- Special Grade	02
	Record Keeper - Special Grade	01
	Audio Visual Assistant	01
	Driver Gr. III	05 (vacant 03 nos.)
	Lapidarist Gr. III	01
	Machinist Gr. III	01
	Electrician Gr. III	01
	Office Aid	03 (vacant 01 no.)
	Primary Level -Unskilled	03
		Research Assistant ( <i>contract basis</i> )

### **8.3 Staff Recruitments & end of service**

#### **8.3.A. Staff recruitment 2021**

##### Research Assistants (Gr.II)

Ms. A.E. Amarasekara  
Ms. A.M.N.A. Atapattu  
Mr. R.M.D. Bandara  
Ms. E.M. Herath  
Mr. A.T.D. Medagedara  
Ms. V.H.H. Nadeeshani  
Ms. K. Theivendrarajah  
Ms. M.P. Thilakarathna  
Ms. B.S.K. Ulpatha Kumbura  
Mr. A.G.C.N. Wijerathna

### **8.3.B. End of service 2021**

Secretary/NIFS

Dr. P.S.B. Wanduragala (Retired)

Administrative Officer

Mr. K.A.S.D. Kurupparachchi (Resigned)

Communication & Media Officer

Mr. R.M.D. Bandara (Resigned)

Accounts Officer

Ms. P.H. Wijesuriya (Resigned)

Research Assistants

Mr. P.N. Dissanayake (Resigned)

Ms. S.W. Meepegamage (End of contract)

Ms. N.D.U.S. Nakandala (Resigned)

Ms. K.D.M.S.P. K.Kumarasinghe (End of contract)

Ms. H.G.D.P. Ubeysekara (Resigned)

Ms. M.A. Farhana (End of contract)

Ms. D.D.M.O. Dissanayake (Resigned)

### 8.4 Capacity Building / Skill Development Programs

Name	Name of the Training Program	Institute / Training Provider	Time period
Mr. K. Umair	International Programme on e-ITEC International Training Programme on the Solar Energy Technologies	National Institute of Solar Energy, Gurugram, Haryana, India.  (Online)	2021-03-15 to 2021-03-19
Prof.D.N. Magana-Arachchi	WORLD ACCREDITATION DAY - 2021 (Virtual)	Sri Lanka Accreditation Board (SLAB)  (online)	2021.06.09
Prof.D.N. Magana-Arachchi	The role of basic sciences in the innovation process	El club of University of Colombo and General Research Committee of SLAAS  (online)	2021.06.11
Prof.D.N. Magana-Arachchi	The Public Healthcare System and COVID-19 in South Asia (Virtual)	Regional Centre for Strategic Studies  (online)	2021.06.16
Ms. D.D.M.O. Dissanayake	International Programme on the 6th Ewha-Luce International Seminar: Expanding Horizon	Ewha Woman's University, South Korea and Henry Luce Foundation  Seoul, South Korea. (Online)	2021-06-02 to 2021-07-14
Ms. T.M. Paranavithana	International Workshop on Spatial Data Analysis and Mapping with Super Map (Student Forum Sri Lanka)	Sabaragamuwa University of Sri Lanka.  (Online)	2021-07-26 to 2021-08-05
Mr. R.A. Rathnayake	International German Summer School on Hydrology (IGSH) 2021	Department of Applied Geology, Ruhr-Universität Bochum, Germany	2021-09-08 to 2021-09-22
T.M. Paranavithana	"Workshop on Statistical Modelling with R"	Institute Applied Statistics Sri Lanka	2021-09-17 to 2021-09-19
Prof.D.N. Magana-Arachchi	Transition training on ISO 50003:2021(Virtual)	Sri Lanka Accreditation Board (SLAB)  (online)	2021-09-27
Prof.D.N. Magana-Arachchi	GLP and R& D Laboratories-Registration for Awareness (Virtual)	Sri Lanka Accreditation Board (SLAB)  (online)	2021-09-28

Name	Name of the Training Program	Institute / Training Provider	Time period
Prof.D.N. Magana-Arachchi	World Standards Day (WSD) Webinar	SLSI (online)	2021-10-15
Prof.D.N. Magana-Arachchi	Accreditation on Bio Banking ISO 20387(Virtual)	Sri Lanka Accreditation Board (SLAB) (online)	2021-10-26
Ms. W.B.U.A. Bandara, Ms. S. Saseevan, and Ms. K.D.H.S.M.S. De Silva	Workshop on Scientific Writing for PGIS students registered for Master's Degree Programmes	Postgraduate Institute of Science, University of Peradeniya. (online)	Part I- 2021-10-02 to 2021-10-03, Part II-V  2021-10-09 to 2021-10-10
T.K. Bowange	'The Beginners' Field Workshop on Plant Identification	Beddagana Wetland Park	2021-11-20
Ms. S. Saseevan	Workshop on Application of Molecular Techniques in Vector-borne Disease Research	Postgraduate Institute of Science, University of Peradeniya. (online)	2021-12-18 to 2021-12-19

### **8.5. Awards:**

#### **Degree of Doctor of Science (D.Sc.) from The Open University of Sri Lanka**

Prof. M.A.K.L. Dissanayake

#### **International Award for Young Scientist Award (Engineering, Science and Medicine)**

Ms. J.M.K.W. Kumari

#### **International Award for Flash Talk prize in Zoology, Young Systematists' Forum 2021**

Ms. A. Satkunanathan

#### **Presidential Award**

*For the invention of clay filter for removal of Fluoride, Arsenic, and Cadmium from drinking water*

Dr. L. Jayarathna

#### **Presidential Award for Scientific research**

Prof. Suresh P. Benjamin

#### **National Award (Dr. C.L. de Silva Gold Medal), Institute of Chemistry Ceylon**

Prof. L. Jayasinghe

**National Award (Research Award OUSL)**

Prof. G.K.R. Senadeera

**NRC Merit Award for Scientific Research**

Prof. M.A.K.L. Dissanayake

Prof. L. Jayasinghe

Prof. G.K.R. Senadeera

Dr. T. Jaseetharan

Dr. C.A. Thotawatthage

**NRC Merit Award for Journal**

Prof. M.C.M. Iqbal

**Certificate of successful completion of Competitive Research Grant/NSF**

Prof. L. Jayasinghe

Prof. N.S. Kumar

**Best Presenter:**

Best oral presenter award from Southeastern University

Ms. B.S.K. Ulpathakumbura

2<sup>nd</sup> best presenter award in YSF-3MT competition from Young Scientists Forum Sri Lanka

Ms. K.M.R.U. Gunarathna

1<sup>st</sup> runner up award for final year presentation, at Dept. of Animal Science, Uni. of

Peradeniya

Ms. K.G.K. Kathyana

**Most Outstanding Researchers/NIFS**

Prof. L. Jayasinghe- Senior Research Professor Category

Prof. M.A.K.L. Dissanayake- Research Professor Category

Prof. R.R. Ratnayake-Associate Research Professor Category

Dr. R. Liyanage- Senior Research Fellow Category

**NIFS Three minutes Thesis competition**

Winner: Ms. Jayani Kalinga

1<sup>st</sup> runner up Ms. V.H.H. Nadeeshani & Ms. T. Kulangana

Merit: Ms. K.D.P. Upesha Siriwardana and Ms. B.S.K. Ulpathakumbura

**Gold Medal for Best Performance in Final Year Research Project-2020 from Sabaragamuwa University of Sri Lanka**

Ms. M. A. Wickramasinghe

## 9. AUDITED FINANCIAL STATEMENT 2021

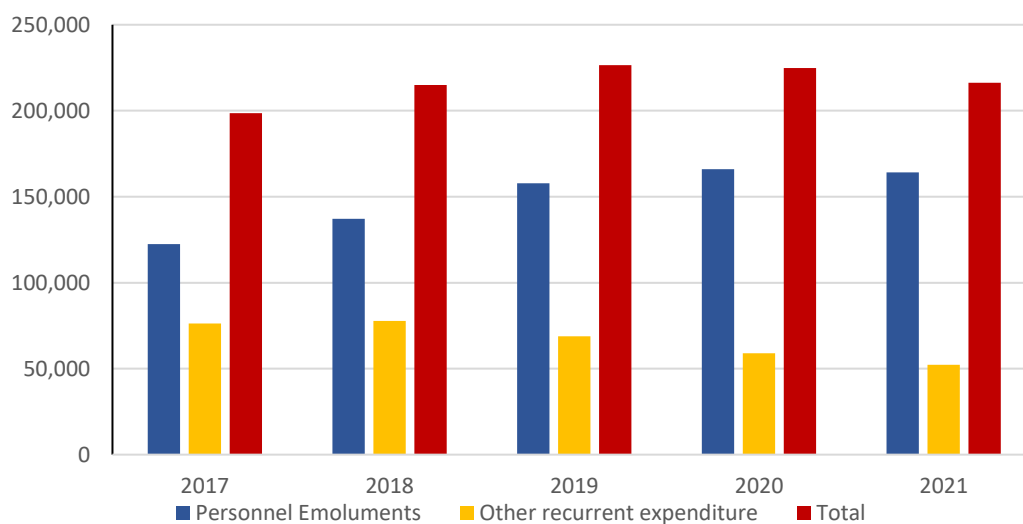
### 9.1 Summary of Financial Results

#### 9.1.1 Comparison of Expenditure with previous years

##### *9.1.1.1 Recurrent Expenditure comparison- five years*

Rs. '000

	2017	2018	2019	2020	2021
Personnel Emoluments	122,430	137,186	157,735	165,931	164,140
Other recurrent expenditure	76,188	77,800	68,817	58,981	52,206
<b>Total</b>	<b>198,618</b>	<b>214,986</b>	<b>226,552</b>	<b>224,912</b>	<b>216,346</b>



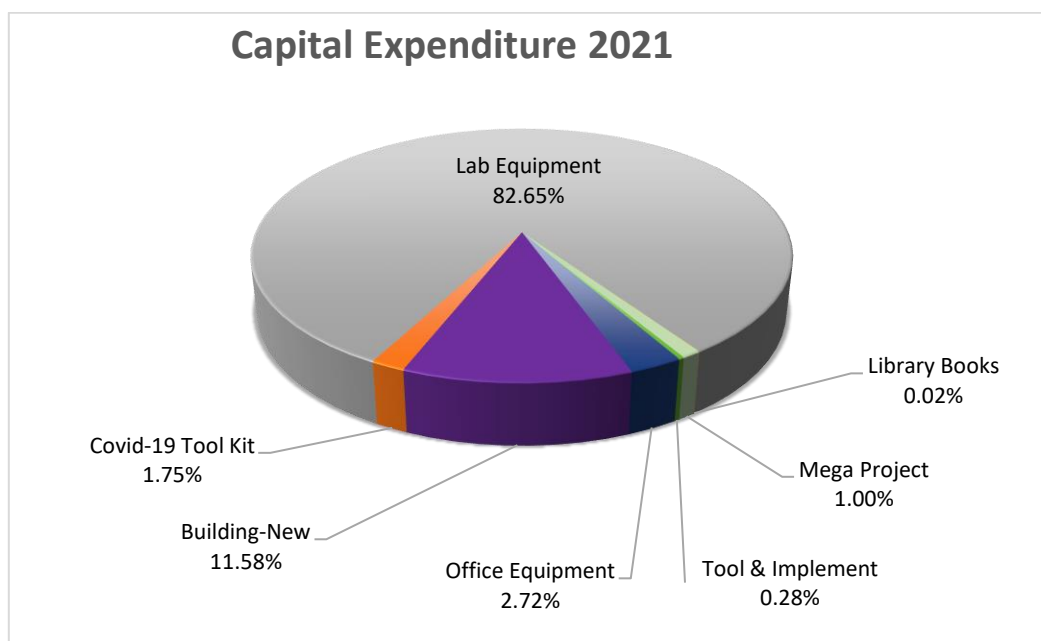
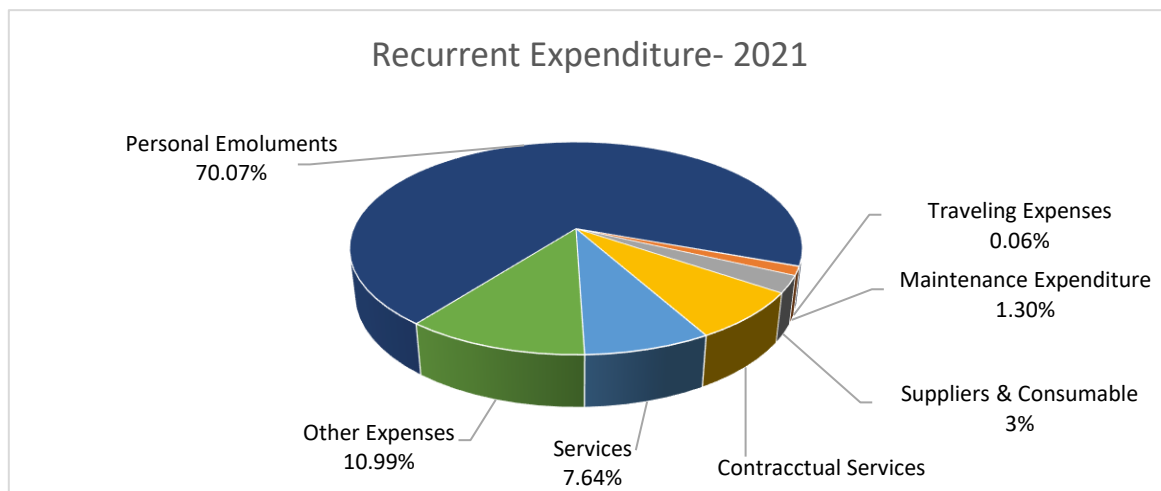
##### *9.1.2. Capital Expenditure comparison- five years*

Rs. '000

Year	2017	2018	2019	2020	2021
Acquisition of fixed assets	99,355	57,931	62,802	15,160	9,789
Building Construction	17,193	19,561	19,036	2,252	1,250
Research & Development	-	15,458	3,135	3,589	108
<b>Total</b>	<b>116,548</b>	<b>92,950</b>	<b>84,973</b>	<b>21,001</b>	<b>11,147</b>

## 9.2 Summary of financial results for the year ending 31.12.2021


	Recurrent Amount (Rs. '000)	%	Capital Amount (Rs. '000)	%
2020				
Budgeted	330,434	100	166,950	100
Approved	210,500	63.70	38,000	22.76
Released	208,860	63.21	358,000	22.76
2021				
Budgeted	366,415	100	237,930	100
Approved	238,000	64.59	75,000	30.68
Released	194,500	53.08	37,350	15.96



### 9.3 Statement of Financial Position

#### NATIONAL INSTITUTE OF FUNDAMENTAL STUDIES SRI LANKA STATEMENT OF FINANCIAL POSITION AS AT 31.12.2021

	NOTE	SLRs 2021	(RESTATED) SLRs 2020
<b>ASSETS</b>			
<b>CURRENT ASSETS</b>			
CASH AND BANK BALANCES	1	172,967,099.08	134,640,276
DEPOSITS PREPAYMENTS & ADVANCES	2	3,763,001.58	6,061,626
DISPOSAL OF FIXED ASSETS		59,669.77	59,670
FESTIVAL ADVANCE FUND INVESTMENT		300,000.00	300,000
CONSUMPTION LOAN FUND INVESTMENT		667,089.35	556,916
INTEREST RECEIVABLE FOR FIXED DEPOSITS		5,998,394.43	7,351,566
STAFF CONSUMPTION LOAN	3	5,072,947.00	4,954,731
ADVANCE AND OTHER RECEIVABLE	4	123,110.32	205,066
STOCKS	5	1,690,439.52	1,444,711
		<b>190,641,751.05</b>	<b>155,574,562</b>
<b>NON-CURRENT ASSETS</b>			
WORK IN PROGRESS	6	3,208,002.20	-
PRELIMINARY EXPENSES FOR CONSTRUCTION		332,319.49	332,320
PROVIDENT FUND INVESTMENT	7	185,748,941.41	153,276,302
TRAINING CAPACITY		949,197.40	949,197
MEGA PROJECT- RECHARGEABLE BATTERIES		2,235,341.75	2,145,542
COVID 19 -TOOL KIT		2,842,350.00	2,438,892
PROPERTY, PLANT AND EQUIPMENT	8	456,508,150.85	543,185,623
		<b>651,824,303.10</b>	<b>702,327,876</b>
<b>TOTAL ASSETS</b>		<b>842,466,054.15</b>	<b>857,902,438</b>
<b>LIABILITIES</b>			
<b>CURRENT LIABILITIES</b>			
ACCOUNTS PAYABLE	9	2,568,276.95	3,346,867
ACCRUED EXPENSES	10	2,536,122.32	2,428,588
		<b>5,104,399.27</b>	<b>5,775,455</b>
<b>NON CURRENT LIABILITIES</b>			
SPECIFIED FUNDS & GRANTS	11	219,154,498.22	183,399,212
DEFERRED LIABILITIES	12	202,149,787.74	214,164,155
		<b>421,304,285.96</b>	<b>397,563,367</b>
<b>TOTAL LIABILITIES</b>		<b>426,408,685.23</b>	<b>403,338,822</b>
<b>NET ASSETS</b>		<b>416,057,368.92</b>	<b>454,563,617</b>
<b>NET ASSETS/EQUITY</b>			
CAPITAL FUND - SPENT	13	657,115,449.90	655,584,259
- UNSPENT		115,803,308.84	80,864,120
PRESIDENT'S FUND - SPENT		7,078,501.15	7,078,501
ASSET REVALUATION RESERVE		118,388,385.47	118,388,386
INSTITUTE FUND		(482,328,276.44)	(407,351,649)
<b>TOTAL NET ASSETS/EQUITY</b>		<b>416,057,368.92</b>	<b>454,563,617</b>

  
 Senior Professor Ranjith Premalal De Silva  
 Actg. Director and CEO  
 National Institute of Fundamental Studies  
 Hanthana Road  
 Kandy

  
 Secretary  
 Sagarika D.K. Mediwaka  
 SLAS  
 Secretary/ Secretary to the Board of Govern  
 National Institute of Fundamental Studier  
 Hanthana Road, Kandy

  
 Accountant  
 S. Samarakkody  
 ACCOUNTANT  
 National Institute of Fundamental Studies  
 Hanthana Road,  
 Kandy.

## 9.4 Statement of Financial Performance

### NATIONAL INSTITUTE OF FUNDAMENTAL STUDIES SRI LANKA STATEMENT OF FINANCIAL PERFORMANCE FOR THE YEAR ENDED 31.12.2021

			(RESTATED)
		SLRs	SLRs
	NOTE	2021	2020
<b>OPERATING REVENUE</b>			
RECURRENT GRANT		194,500,000.00	208,860,000
OTHER INCOME	14	43,515,729.11	47,032,885
		<b>238,015,729.11</b>	<b>255,892,885</b>
<b>EXPENDITURE</b>			
PERSONAL EMOLUMENTS	15	164,139,470.40	166,002,032
TRAVELLING	16	152,108.00	302,398
SUPPLIERS & CONSUMABLE	17	6,054,351.82	2,904,114
MAINTENANCE	18	3,046,465.94	3,379,899
CONTRACTUAL SERVICES	19	17,208,580.63	17,842,025
DEPRECIATION		96,646,434.40	96,327,000
OTHER EXPENSES	20	25,744,945.09	34,495,099
<b>TOTAL OPERATING EXPENSES</b>		<b>312,992,356.28</b>	<b>321,252,568</b>
DEFICIT FROM OPERATING ACTIVITIES		(74,976,627.17)	(65,359,683)
<b>FINANCE COST</b>			
PROFIT/(LOSS) ON DISPOSAL OF FIXED ASSETS		-	54,217
<b>NET DEFICIT FOR THE YEAR</b>		<b>(74,976,627.17)</b>	<b>(65,305,466)</b>

## 9.5 Statement of Cash Flow

### NATIONAL INSTITUTE OF FUNDAMENTAL STUDIES SRI LANKA STATEMENT OF CASH FLOW FOR THE YEAR ENDED 31.12.2021

	REFERENCE	SLRs. 2021		(RESTATED) SLRs. 2020
<b>Cash-Flow from Operating Activities</b>				
Deficit for ordinary activities	Page 5	(74,976,627)	<b>(74,976,627)</b>	(65,305,466) <b>(65,305,466)</b>
<b>Non Cash Movements</b>				
Depreciation	Page 19 - Note 8	96,646,434		96,327,000
Amortization of the Deferred Liability	Page 26 - Note 14	(24,739,586)		(22,170,566)
Profit on Disposal of Capital Assets	Page 5	-		(54,217)
Provision for Gratuity	Page 29 - Note 20	3,245,937		6,951,566
Capital Expenditure incurred by Outside Projects	Page 6	5,492,039		-
(Increase)/Decrease Staff Consumption Loan	Page 4 - Note 3	(118,216)		60,878
(Increase)/Decrease Stocks	Page 4 - Note 5	(245,728)		356,049
(Increase)/Decrease Advance and other Receivable	Page 4 - Note 4	81,956		5,611
(Increase)/Decrease Deposits, prepayment and Advances	Page 11 - Note 2	2,298,624		21,546,631
Increase/(Decrease) Accounts Payable	Page 4 - Note 9	(778,590)		(5,296,759)
Increase/(Decrease) Accrued Expenses	Page 4 - Note 10	107,535		(518,646)
Gratuity Paid		(489,680)		(2,090,128)
Foreign Currency Exchange Gain		-		(643,173)
Donations of Consumable items		-		6,686
Movement of Fund Account		-		3,836,392
			81,500,725	98,317,325
<b>Net Cash flow from Operating Activities</b>			<b>6,524,098</b>	<b>33,011,859</b>
<b>Cash Flow from Investing Activities</b>				
(Increase)/Decrease Working in progress	Page 4 - Note 6	(3,208,002)		5,567,761
Purchase of Property Plant & Equipment	Page 19-Note 8	(6,371,659)		(43,551,841)
Sale of Property Plant & Equipment		-		54,217
(Increase)/Decrease Int.rec.for Fixed Deposits	Page 4	1,353,172		463,158
(Increase)/Decrease Preliminary Expenses for Construction	Page 4	-		-
Investments made- Provident Fund	Page 4 - Note 7	(32,472,640)		(30,539,765)
- Consumption Loan Fund	Page 4	(110,174)		(253,436)
-Mega Project	Page 4	(89,800)		(29,116)
-Covid 19-Tool Kit	Page 4	(403,458)		(2,437,892)
<b>Net Cash Flow from Investing Activities</b>			<b>(41,302,561)</b>	<b>(70,726,913)</b>
<b>Cash Flows from Financing Activities</b>				
Government Capital Contribution	Page 6	37,350,000		38,000,000
Specific Funds and Grants	Page 4 - Note 11	35,755,286		25,365,080
Assets purchases from Other Grants				
<b>Net Cash Flow from Financing Activities</b>			<b>73,105,286</b>	<b>63,365,080</b>
Net increase/ (Decrease) in cash and cash equivalent			38,326,823	25,650,025
<b>Cash and cash equivalent at beginning of period</b>	Page 11 - Note 1		<b>134,640,276</b>	<b>108,990,251</b>
<b>Cash and cash equivalent at the end of the period</b>	Page 11 - Note 1		<b>172,967,099</b>	<b>134,640,276</b>

## 9.6 Statement of changes in net assets/equity

**NATIONAL INSTITUTE OF FUNDAMENTAL STUDIES SRI LANKA**  
STATEMENT OF CHANGES IN NET ASSETS/EQUITY FOR THE YEAR ENDED 31.12.2021

<b>ATTRIBUTABLE TO OWNERS OF THE CONTROLLING ENTITY</b>					
	<b>CONTRIBUTED CAPITAL</b>	<b>PRESIDENT FUND</b>	<b>REVALUATION SURPLUS</b>	<b>INSTITUTE FUND</b>	<b>TOTAL NET ASSEST/ EQUITY</b>
<b>BALANCEAS AT 31 DECEMBER 2020</b>	736,448,379.22	7,078,501.15	118,388,385.47	(407,339,628.61)	454,575,637.23
PRIOR YEAR ADJUSTMENT	-	-	-	(12,020.66)	(12,020.66)
<b>BALANCEAS AT 31 DECEMBER 2020 (RESTATED)</b>	736,448,379.22	7,078,501.15	118,388,385.47	(407,351,649.27)	454,563,616.57
ADDITION DURING THE YEAR TO INSTITUTE FUND	-	-	-	-	-
DEFICIT FROM OPERATING ACTIVITIES	-	-	-	(74,976,627.17)	(74,976,627.17)
CAPITAL FUNDS RECEIVED FROM GOVERNMENT SOURCES	37,350,000.00	-	-	-	37,350,000.00
CAPITAL FUNDS RECEIVED FROM OTHER SOURCES	5,492,038.76	-	-	-	5,492,038.76
TRANSFER TO DEFERRED LIABILITY	(6,371,659.24)	-	-	-	(6,371,659.24)
<b>BALANCE AS AT 31 DECEMBER 2021</b>	<b>772,918,758.74</b>	<b>7,078,501.15</b>	<b>118,388,385.47</b>	<b>(482,328,276.44)</b>	<b>416,057,368.92</b>

## 9.7 Statement of comparison of budget and actual expenditure for 2021

### NATIONAL INSTITUTE OF FUNDAMENTAL STUDIES SRI LANKA Statement of comparison of budget and actual expenditure for 2021

EXPENDITURE CATEGORY	BUDGET ESTIMATES	ACTUAL EXPENDITURE
<b>RECURRENT EXPENDITURE</b>	<b>239,358,000.00</b>	<b>216,345,921.88</b>
<b>Personal Emoluments</b>	<b>180,500,000.00</b>	<b>167,385,407.40</b>
Salaries, Wages & Allowances	145,900,000	137,000,176.98
Overtime & Holiday payments	3,000,000	784,831.80
EPF Contribution	20,100,000	18,874,164.88
ETF Contribution	4,100,000	3,774,832.97
Gratuity Payments	2,900,000	3,245,937.00
Casual Staff Allowances	4,500,000	3,705,463.77
<b>Traveling Expenses</b>	<b>600,000</b>	<b>152,108.00</b>
Domestic	600,000	152,108.00
<b>Suppliers</b>	<b>15,300,000</b>	<b>6,054,351.82</b>
Stationery & Office Requisites	1,000,000	287,537.60
Fuel	4,000,000	319,720.36
Chemical, Glassware & Consumable	10,300,000	5,447,093.86
<b>Maintenance Expenditure</b>	<b>5,500,000</b>	<b>3,046,465.94</b>
Vehicle	2,000,000	754,743.46
Plant, Machinery & Equipment	2,800,000	2,013,106.00
Buildings & Structures	700,000	278,616.48
<b>Services</b>	<b>37,458,000</b>	<b>39,707,588.72</b>
Transport	2,300,000	1,571,267.75
Postal & Communication	3,000,000	1,263,749.84
Electricity & Water	5,500,000	3,034,124.14
<i>Other</i>	<b>26,658,000</b>	<b>33,838,446.99</b>
Security	4,500,000	4,841,350.00
Garden Maintenance & Janitorial Services	4,300,000	3,072,400.00
Catering Services	300,000	75,000.00
Internet Services	4,000,000	3,350,688.90
Printing & Advertising	1,000,000	567,048.40
Insurance - Building, Vehicle & Staff	3,000,000	2,370,675.52
Welfare	3,300,000	2,000,376.70
Arboretum & Woodland	-	-
Audit Fees	500,000	500,000.00
Legal Fees	100,000	35,000.00
Periodical & Journals	1,500,000	231,020.05
Miscellaneous	1,858,000	621,338.05
Subscription, Contribution, Membership	1,000,000	429,386.83
Local Registration fees	400,000	2,000.00
Bank Charges	-	48,200.00
Grant Expenses	-	15,446,012.05
Room Expenditure	100,000	72,482.49
Annual Review	800,000	175,468.00

Contd.

**NATIONAL INSTITUTE OF FUNDAMENTAL STUDIES SRI LANKA**  
Statement of comparison of budget and actual expenditure for 2021

EXPENDITURE CATEGORY	BUDGET ESTIMATES	ACTUAL EXPENDITURE
<b>CAPITAL EXPENDITURE</b>	<b>75,000,000</b>	<b>2,408,180.56</b>
<b>Rehabilitation and Improvement of Capital Assets</b>	<b>27,000,000</b>	<b>1,250,000.00</b>
Building & Structures	27,000,000	1,250,000.00
Vehicles	-	-
<b>Acquisition of Capital Asset</b>	<b>38,000,000</b>	<b>861,270.48</b>
Furniture & Office Equipment		
Fur. Off.- Equipment & Others <i>(New &amp; Old Building)</i>	4,000,000	290,351.00
Plant, Machinery & Equipment	-	30,020.00
(i) Pl., Ma.& Equipment-Lab Equip.	33,500,000	169,581.48
(ii) Pl., Ma.& Equipment-Accessories	-	-
(iii) Pl., Ma.& Equipment-Lib. Books	500,000	371,318.00
Building & Structures		
Lands & Land Improvements	-	-
Software Development	-	-
Capacity Building	-	-
<b>Mega Project proposal</b>	<b>10,000,000</b>	<b>296,910.08</b>
Development of Lankan graphite for rechargeable batteries	10,000,000	108,150.00
Development of a diagnostic test kit for identification of suspected COVID - 19 Patients	-	188,760.08
<b>Total Expenditure</b>	<b>314,358,000</b>	<b>218,754,102.44</b>

## 9.8 Accounting Policies Year - 2021

### NATIONAL INSTITUTE OF FUNDAMENTAL STUDIES - SRI LANKA SIGNIFICANT ACCOUNTING POLICIES - YEAR ENDED 31 ST DECEMBER 2021

#### (1) GENERAL ACCOUNTING POLICIES

- 1.1 The financial statements have been prepared on the basis of historical costs in accordance with the Sri Lanka Public Sector Accounting Standards for the accrual basis accounting and no adjustments have been made for inflationary factors affecting these accounts, instead of Motor Vehicle re-valuation according to the special Re-valuation committee.
- 1.2 Similarly Laboratory Equipment, Machinery Tools & Implements, Refrigerators, Air Conditioners, Communication Equipment, Office & Miscellaneous Equipment, Sports Items are re-valued by the Special Re-valuation Committee and there are no inflator factors affecting to the accounts.
- 1.3 The value of Revaluation of Fixed Asset in 2011 and the value of Motor Vehicle in 2015 and 2018 have been shown as Revaluation Reserve being adjusted fully at the time of disposal by Institute Fund Account. The Revaluation of Motor Vehicles has been done by Examiner of Motor Vehicles of Department of Motor Traffic, Kandy with effective dates of 16.02.2015, 20.02.2015 and 27.08.2018 at current market value.

#### Revaluation Reserve

##### A:

<b>Date of revaluation</b>	01.01.2012
<b>Valuer</b>	Institute Special-valuation Committee
<b>Method of Valuation</b>	
Estimated Value	Rs. 98,947,879.84

##### B.

<b>Date of revaluation</b>	27.08.2018
<b>Valuer</b>	Institute Special-valuation Committee Mortar car Examiner, District Valuer, CTB Engineer, Secretary NIFS, Accountant NIFS
<b>Method of Valuation</b>	
Fixed Current Market Value	Rs. 19,440,505.63

**Balance as per the Final Accounts 2021 Rs. 118,388,385.47**

- 1.4 Previous year figures and phrases have been re-arranged wherever necessary to confirm to the current presentation.

#### 1.5 CONVERSION OF FOREIGN CURRENCIES

All foreign exchange transactions are converted of the rate of exchange prevailing at the time the transactions were affected. Non-resident foreign currency account balance has been translated at the rate of exchange prevailing at the date of Statement of Financial Position.

#### 1.6 TAXATION

Under the provision of sections 8(a) (xxxix) and 42 (ff) of the Inland Revenue Act No. 28 of 1979 (as amended) the Institute is exempted from income tax in Sri Lanka.

## **(2) ASSETS AND BASES OF THEIR VALUATION**

### **2.1 STOCKS:**

Stocks have been valued at historical cost basis and all issues are valued at FIFO Basis.

### **2.2 FIXED ASSETS:**

- 2.2.1** The cost of fixed assets is the cost of purchase or construction together with any incidental expenses thereon. The fixed assets are recorded at cost and accumulated depreciation which is provided in the depreciation on the basis specified in 2.2.6
- 2.2.2** Acquired the Grid Tied Solar Net Accounting System, recognized as Building and Structures
- 2.2.3** The cost of Library Books includes a Heritage Asset (Mapping Report) amounting to Rs. 1,097,477.65 which is not depreciable.
- 2.2.4** The cost of Lab Equipment and Office & Miscellaneous Equipment includes Assets which are kept for display purpose and are represented at Written Down Value of Rs. 16,317,450.00 and Rs. 770,940.00 respectively.
- 2.2.5** Fixed assets acquired from the government grant, outside grants and the received as Donations, have been recognized as Deferred Liability from the year 2018 and recognized as Amortization income, which calculating according to the rates provided by specified in 2.2.6.

### **2.2.6 DEPRECIATION OF FIXED ASSETS**

The provision for depreciation has been calculated on the cost of fixed assets in order to write-off such costs over the estimated useful lives as follows:

Motor vehicles	20%
Library books	33.33%
Building	10%
Lab Equipment	10%
Sports goods	33.33%
Computers	25%
Computer Software	25%
Furniture & fittings	10%
Communication	10%
Air – Conditioners	10%
Refrigerators	10%
Machinery Tools & Implements	10%
<b>Office &amp; Miscellaneous</b>	
Room Linen	33.33%
Crockery Cutlery & Canteen Equipment	33.33%
*Safety Equipment	10%
Office Equipment	20%
Sundry Assets	10%
Expandable Assets	10%

\* Safety Equipment - Rate of depreciation had been changed from 33.33% to 10% with effect from 1999.

The depreciation of Fixed Assets is provided from the date of purchase to the date of disposal.

### **2.3 INVESTMENT**

Employer's and employees' contributions made towards the NIFS provident fund has been invested in fixed deposits at the National Savings Bank.

2.4 Contribution made towards Consumption Loan Fund has been deposited in Savings Account at the National Savings Bank.

**(3) LIABILITIES AND PROVISIONS**

3.1 All known liabilities and provisions as at the date of the Statement of Financial Position have been provided for in the accounts.

**3.2 RETIREMENT GRATUITY**

Provision is made in these Accounts for retirement gratuity payable under the payment of Gratuity Act No.12 of 1983 in respect of employees with 5 or more years of continued service in the Institute. This item is grouped under deferred liabilities in the Statement of Financial Position.

**3.3 NIFS PROVIDENT FUND**

Members' fund as at 31st December 2021 are shown under Specified funds in the Statement of Financial Position.

**(4) REVENUE RECEIPTS**

**4.1 GOVERNMENT GRANT**

Government grant received during the year under review towards the recurrent expenditure has been charged to the Statement of Financial Performance for the year. Total revenue and capital funds of the Institute accumulated from the previous years have been shown as Institute funds in the Statement of Financial Position.

**4.2 FOREIGN AND OTHER GRANTS**

All foreign and other monetary grants received during the year, are dealt with by charging to the Statement of Financial Performance to the extent of such grants recognized in the Financial Statements do match with the associated costs incurred during the year. Unspent grants during the year are shown under specified funds and grants in the Statement of Financial Position.

**4.3 RESEARCH GRANT FUND**

The unutilized specified grant balances have been shown as the Research Grant Fund under Specified funds & grants in the Statement of Financial Position.

**(5) UTILIZATION OF BUDGET ALLOCATION**

The Revised Budget Estimate has been shown in the estimation and the previous year Capital Funds have been utilized in the reporting year.

  
.....  
\*Accountant  
**P. S. S. Samarakkody**  
**ACCOUNTANT**  
National Institute of Fundamental Studies  
Hantana Road,  
Kandy.

## 10. Report of the Auditor General on the Financial Statement

My No. KDA/D/NIFS/2022/10

Date 31 May 2022

Director,  
National Institute of Fundamental Studies.

**Auditor General's Report in terms of Section 12 of the National Audit Act No. 19 of 2018 on Financial Statements and Other Legal and Regulatory Requirements of the National Institute of Fundamental Studies for the Year Ended as at 31<sup>st</sup> December 2021**

.....  
Above report is forwarded herewith.

W.P.C.Wickramaratne  
Auditor General

- Copies :- 01. Secretary – Ministry of Finance  
02. Secretary – State Ministry of Skills Development, Vocational Education,  
Research and Innovations

Director,  
National Institute of Fundamental Studies.

**Auditor General's Report in terms of Section 12 of the National Audit Act No. 19 of 2018 on Financial Statements and Other Legal and Regulatory Requirements of the National Institute of Fundamental Studies for the Year Ended as at 31<sup>st</sup> December 2021**

.....

**1. Financial Statements**

**1.1 Qualified Opinion**

The audit of the financial statements of the National Institute of Fundamental Studies for the year ended as at 31<sup>st</sup> December 2021 comprising the statement of financial position as at 31<sup>st</sup> December 2021 and the statement of financial performance, statement of changes in equity and cash flow statement for the year then ended, and notes to the financial statements, including a summary of significant accounting policies, was carried out under my direction in pursuance of provisions in Article 154(1) of the Constitution of the Democratic Socialist Republic of Sri Lanka read in conjunction with the provisions of the National Audit Act No. 19 of 2018 and the Finance Act No. 38 of 1971. In accordance with Article 154 (6) of the Constitution, my report will be tabled in Parliament in due course.

In my opinion, except for the effects of the matters described in the basis for qualified opinion section of this report, the financial statements give a true and fair view of the financial position of the Institute as at 31<sup>st</sup> December 2021, and of its financial performance and cash flows for the year then ended in accordance with Sri Lanka Public Sector Accounting Standards.

**1.2 Basis for Qualified Opinion**

(a) The useful life of non-financial assets had not been annually reviewed as per Paragraph 65 of Sri Lanka Public Sector Accounting Standard 7 and despite being fully depreciated, non-current assets costing Rs.62,452,454 were further in use. No action had been taken to revise the relevant estimated error in terms of Sri Lanka Public Sector Accounting Standard 03.

In preparing the financial statements, management is responsible for assessing the institute's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intend to liquidate the Institute or to cease operations, or has no realistic alternative but to do so.

Those charged with governance are responsible for overseeing the Institute's financial reporting process.

As per Sub – section 16 (1) of the National Audit Act No. 19 of 2018, the Institute is required to maintain proper books and records of all its income, expenditure, assets and liabilities, to enable annual and periodic financial statements to be prepared of the Institute.

### **1.5 Auditor's Responsibility for Auditing the Financial Statements**

My objective is to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes my opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Sri Lanka Auditing Standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with Sri Lanka Auditing Standards, I exercise professional judgement and maintain professional skepticism throughout the audit. I further:

- Appropriate audit procedures were designed and performed to identify and assess the risks of material misstatement in financial statements whether due to fraud or errors in providing a basis for the expressed audit opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- An understanding of internal control relevant to the audit was obtained in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the management.
- Conclude on the appropriateness of the management's use of the going concern basis of accounting and based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Institute's ability to continue as a going concern. In preparing the financial statements, management is responsible for assessing the institute's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of

accounting unless management either intend to liquidate the Institute or to cease operations, or has no realistic alternative but to do so.

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- An understanding of internal control relevant to the audit was obtained in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the management.
- Conclude on the appropriateness of the management's use of the going concern basis of accounting and based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Institute's ability to continue as a going concern. If I conclude that a

material uncertainty exists, I am required to draw attention in my auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify my opinion. However, future events or conditions may cause the Institute to cease to continue as a going concern.

- Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

I communicate with those charged with governance regarding, among other matters, significant audit findings, including any significant deficiencies in internal control that I identify during my audit.

## **2. Report on Other Legal and Regulatory Requirements**

2.1 The National Audit Act No. 19 of 2018 includes special provisions regarding the following requirements.

2.1.1 except for the effects of the matters described in the basis for qualified opinion section of this report , in accordance with the requirements of Section 12(a) of the National Audit Act No. 19 of 2018, I obtained all the information and explanations required for the audit, and proper financial records have been maintained by the Institute, according to my investigation.

2.1.2 According to the requirement of Section 6(1)(d)(iii) of the National Audit Act No. 19 of 2018, the financial statements of the institution correspond with the previous year.

2.1.3 In accordance with the requirement of Section 6(1)(d) (iv) of the National Audit Act No. 19 of 2018, the recommendations made by me last year are included in the presented financial statements.

2.2 On the basis of the proceedings followed and the evidence obtained and confined to the material facts, nothing has come to my notice to the extent of making the following statements.

2.2.1 According to the requirement of Section 12 (d) of the National Audit Act No. 19 of 2018, any member of the governing body of the institution has a relationship, directly or otherwise, out of the ordinary course of business in relation to any matter related to the institution.

2.2.2 In accordance with the requirement mentioned in Section 12 (E) of the National Audit Act No. 19 of 2018, that they have acted in a manner that does not comply with any relevant written law or other general or special directives issued by the governing body of the institution.

**Reference to Laws, Rules/Regulations**

**Observations**

(a) Guideline 2.8.4 of Government Procurement Guidelines, 2006

Without a recommendation of the Technical Evaluation Committee, agreements worth Rs.4,320,000 had been entered into for sanitary services and cafeteria activities for the year under review. Further, 08 electronic equipment to the worth of Rs. 451,679 had been purchased without a recommendation of the Technical Evaluation Committee.

(b) Treasury Circular No.842 dated 10<sup>th</sup> December 1978

A register of fixed assets had not been maintained in respect of the fixed assets costing Rs.1,083,853,325.

(c) Section 6.5.3 of the Public Enterprises Circular No. PED/12 dated 02<sup>nd</sup> June 2003.

Even though the Annual Report of the Institute inclusive of the performance of the preceding year should be tabled in Parliament along with the Audit Report of the Institute within 150 days from the expiry of the financial year, the annual performance report related to the previous year had not been tabled in Parliament even by 31 December 2021.

(d) Public Administration Circular No. 05/2015 dated 23<sup>rd</sup> October 2015

Even though the daily working hours of primary grade officers are from 8.00 a.m. to 4.45 p.m., they have acted in a manner that does not comply with the said rules, considering the daily working hours are from 8.30 a.m. to 4.15 pm for 14 primary grade officers.

2.2.3 In accordance with the requirements of Section 12(g) of the National Audit Act No. 19 of 2018, that they have acted in a manner that it does not comply with powers, duties and functions of the institution except the following observation.

Without obtaining the approval of the governing body as per Section 21 of the National Institution of Fundamental Studies Act No. 55 of 1981, they had employed two officers for 02 positions and paid Rs. 228,480 as wages and allowances since 20<sup>th</sup> April 2021 to 05<sup>th</sup> September 2021.

2.2.4 That resources of the Institute have not been procured and utilized frugally, effectively and productively within the periods of time as per the requirement stated in the section 12 (h) of the National Audit Act No. 19 of 2018.

### **2.3 Other Facts**

- (a) Since the scientist who was in charge of the research project titled "Quantum Physics and Applied Electronic" implemented at a cost of Rs. 47,485,576 by 31<sup>st</sup> December 2021 resigned from the Institute on 02<sup>nd</sup> September 2020 that research project had been abandoned without implementing furthermore.
- (b) Even though an electrician, two machine operators and 03 unskilled employees are employed as well as 03 security officers for the night time, the in charge of the canteen had been paid Rs.3,075,000 at Rs.25,000 per month since the year 2011 up to the year under review for opening water taps and to operate the electric generators when it occurs a power failure.
- (c) Although soil testing on the Institute premises had been carried out by paying Rs. 1,958,002 to the National Building Research Organization, about 03 years had been delayed to implement the recommendations given in that report and as a result, the safety of the buildings, staff of the Institute as well as surrounding properties and the people was at a risk.
- (e) The Bioreactor 300L purchased at a cost of Rs. 474,975 during the year under review had been given to a private institute free of charges without obtaining the approval of the Board of Management.
- (f) Even though the Board of Management had taken a decision on 31<sup>st</sup> December 2021 to stop the Integrated Software System that had been implemented without a proper feasibility study, action had not been taken to recover the advance of Rs. 660,000 paid to the contractor.
- (g) Out of the computers and computer accessories valued at Rs.6,864,960 purchased in the year 2018 for the installation of an Integrated Software System for efficient implementation of operating activities of the Institute, computer accessories worth Rs.1,680,560 had been remaining underutilized even by the end of the year under review.
- (h) During the year under review a sum of Rs. 558,672 had been spent to transport 09 officers from the government quarters situated in Digana to the Institute without having a formal approval.
- (i) The total amount of Rs. 36,166,934 received for 04 projects has been deposited in a savings account since the previous year without being used effectively for the relevant activities.

- (j) Since the files and documents related to 18 research projects being implemented as at 31 December 2021 were not furnished to audit, it was unable to obtain the details of the commencement, implementation, finance and administrative activities and the progress of the projects for auditing.
- (k) Although the post of Internal Auditor had remained vacant from the preceding year up to the year under review, no qualified officer had been recruited for the post and no internal audit had been carried out during that period.

W.P.C.Wickramaratne

Auditor General

## 11. OBSERVATIONS OF THE BOARD OF GOVERNORS FOR THE REPORT OF THE AUDITOR GENERAL

*(This is a translation. Please refer to the report in Sinhala for the original)*

Observations of the Board of Governors on 24<sup>th</sup> September 2022 with regard to the Report of the Auditor General issued on the Financial Statements and other Affairs of the National Institute for Fundamental Studies for the year ended on 31.12.2021 in terms of Section 13(7)(a) of the Finance Act No. 38 of 1971.

Inquiry No: KDA/D/NIFS/2022/10

### 1.2 Opinions on the Financial Statements

(a) Accepted

In terms of the Sri Lanka Public Sector Accounting Standards, action will be taken with regard to the audit surplus of Rs. 118,388,386 that occurred during the audit of fixed assets of the institute in the years 2012 and 2018.

(b) Accepted

Preliminary notes will be made on physical inspections of non-current assets of the institute as per the valuation reports completed and submitted by the Department of Valuation. The preliminary notes will be completed and the relevant adjustments will be made after receiving the other valuation reports. Accordingly, the values of the non-current assets to be further utilized will be revised.

(c) Accepted

In terms of Paragraph 71 of the Sri Lanka Public Sector Accounting Standard No. 01, action will be taken to mention the values of employees' loans as assets in the Statement of Financial Position.

(d) Accepted

In terms of Paragraph 88 (m) of the Sri Lanka Public Sector Accounting Standard No. 01, action will be taken to mention the provisions allocated in the front page of the financial statement separately.

(e) Accepted

Studies are being carried out to formulate the accounting policy related to accounting for research costs and the financial statements will be disclosed.

(f) Accepted

Discussions are being held with the relevant parties regarding the assets worth Rs.900,712 which do not belong to the institute and are being used by external parties and the relevant corrections will be made.

(g) Accepted

Expenditure incurred on training and development of human resources will be corrected after the policy being formulated.

(h) Accepted

The formulation of accounting policies related to accounting of costs for research activities will be corrected after the studies being finalized.

(i) Accepted

It is due to be referred to the Governing Board for further instructions regarding the professional services fees of Rs.332,319 paid in the year 2017 for the development of the Dambulla Arboretum.

(j) Accepted

Physical stock balance of Chemical Glass Ware and Lab Ware should be corrected as Rs.839,184. Instructions have been given to the respective parties to correct stock balance and it will be corrected in the future.

(k) Accepted

The Land and Building Accounts of the institute will be adjusted and corrected according to the valuation given by the Department of Valuation.

(l) Accepted

The amount is used to pay festival advances for the employees of the institute and this amount is maintained in the current account which is used to finance for external projects of the institute. A proposal is due to be submitted to the Governing Board to maintain it as a separate investment.

(m) Accepted

Action have been taken to take measures to account the value of the institute's patent license.

## **Reference to Laws, Rules and Regulations**

### **(a) Financial Regulations of the Government of the Democratic Socialist Republic of Sri Lanka**

#### **(i) Government Financial Regulations 751 (1)**

The stock books of receiving and issuing of goods for stationery, sundry, magazines and building maintenance activities of the institute are maintained from the year 2021.

#### **(ii) Government Financial Regulations 757 (2)**

Accepted

Action will be taken to submit Board of Survey Reports annually as scheduled.

#### **(iii) Government Financial Regulations 756**

(i) Accepted

Having the Board of Survey Committees been appointed in the year 2021 in terms of the provisions of the government Financial Regulations 756, the board of survey activities are being carried out.

(ii) Accepted

Board of Survey Activities of the library is being carried out pertaining to the year 2021.

### **(b) The Government Procurement Guidelines 2006**

#### **Guideline 2.8.4**

(i) This mistake is accepted and it is informed that arrangements have been made to carry out the procurement process properly from the year 2022.

(ii) This mistake is accepted and it is informed that arrangements have been made to carry out the procurement process properly from the year 2022.

### **(c) Circulars**

#### **(i) Treasury Circular No. 842 dated 10<sup>th</sup> of December ,1978**

Accepted

Computerized records are maintained regarding vehicles, lands and buildings of the institute from the year 2021. After completion of annual physical verification for the year 2021, preparation of documents for other fixed assets and documentation of computerized information are also in progress.

**(ii) The Public Enterprises Circular No. PED/12 dated 02<sup>nd</sup> of June, 2003**

**(i) Paragraph 5.1.3**

Accepted

The corporate plan has been prepared and approved by the Governing Board and has been submitted to the Auditor General, General Treasury, Line Ministry and the Department of Public Enterprises.

**(ii) Paragraph 6.5.3**

Accepted

As soon as the Tamil and English translations being received, the preparation of the Annual Report 2020 will be finalized and submitted to the Parliament through the respective ministry.

**(iii) Paragraph 9.10**

Accepted

In accordance with the Management Circular No. 02/2020, action have been taken to make the relevant recruitments as per the approval given by the Ministry to fill the essential vacancies.

**(iii) Public Administrative Circular No. 05/2015 dated 23<sup>rd</sup> of October 2015**

Accepted

Since the National Institute of Fundamental Studies is located far from the city and lack of transportation facilities, office transport service is available for the officers of the institute at 8.15 in the morning and 4.20 in the evening. Majority of the staff of the institute use this service and officers of primary grades are also among them. Further, the office keys are given to the security sections by the officers of the respective divisions and when the officers are not on duty, the officers of primary grades cannot perform their duties, so their services are ended at 4.15 p.m. as decided by the Head of Institute. Officials have been informed about the daily working hours.

**(iv) Paragraph 3.1 of the Public Enterprises Circular No. 30/2016 dated 29 December 2016**

Accepted

According to a request made by our letter No. TRA/NIFS/DMT/FUEL/2022, dated 18.01.2022, the fuel combustion test of all pool vehicles owned by the

institute is currently being carried out by the Department of Motor Traffic, Kandy.

**2.2.3 In accordance with the requirement mentioned in the Section 12 (g) of the National Audit Act No. 19 of 2018, the Institute has not performed according to its power, functions and duties, except for the following observations;**

**Acts**

Accepted

This has been brought to the attention of the Governing Board and it will be acted as per the instructions received and arrangements will be made to make aware the audit divisions in this regards in the future.

**2.2.4 In accordance with requirement mentioned in the Section 12 (g) of the National Audit Act No. 19 of 2018, the resources of the Institute have not been procured and utilized thrifty, efficiently and effectively within the time frames and in compliance with the applicable laws except for the following observations;**

(a) Accepted

The physical progress and achievements gained since the inception year of each research project are mentioned in the Annexure.

From the year 2012, identifiable financial expenses for research projects are mentioned under Project Recurrent Expenditure (Appendix 01) in the final accounts.

(b) Accepted

In 2021, the research staff of each research project was unable to engage in laboratory and field tests at its full capacity due to the pandemic situation of Covid 19. Therefore, some research projects could not meet the targets in respect of research outputs including research publications. However, some manuscripts submitted to journals in 2021 are still under review. Due to the completion of the term of office of the former director who was the research scientist of the "Plant Stress Biology" research project, the research program is no longer in operation. Therefore, there is no output from that research program in the year 2021.

(c) Accepted

Professor Asiri Nanayakkara, Research Scientist of the “Quantum Physics and Applied Electronic Research Project, resigned in September 2020. At the time of his resignation, there was not ongoing research project under that research program, and there was not a research assistant employed. Therefore, the program was not handed over to another scientist at the time of his resignation. However, the resumption of program activities will require the hiring of a new research scientist.

The ministerial approval has been sought for filling the relevant post, but it has not been received so far. These posts will be filled up after getting the necessary approvals.

(d) Accepted

The National Institute of Fundamental Studies has conducted official discussions with two industrial partner companies (Richard Pieris & Company PLC and Regen Renewable Pvt. Ltd) to commercialize the patents obtained in 2020 and 2021.

- National Institute of Fundamental Studies. (2021) A method of producing electrically conducting and highly porous, high-grade activated carbon from coconut shells using a simple procedure, Sri Lanka. **[Patent No: 19595]**
- National Institute of Fundamental Studies. (2020) A Method of Recovering Waste Graphite Attached to Wall Rock in Vain Graphite Mines, Sri Lanka. **[Patent No: 19596]**

Those discussions are currently in progress.

A Technology Transfer Unit is in the process of being set up at the National Institute of Fundamental Studies to manage the commercialization of research and a committee appointed by the Governing Board of the National Institute of Fundamental Studies has prepared a Technology Transfer Policy for the Institute of Fundamental Studies and submitted it for the approval of the Research Council and the Governing Board.

(e) Accepted

Necessary action will be taken with regard to the items identified by the Board of Survey reports as per the respective circulars. Goods identified as unserviceable goods by the Board of Survey are to be assessed by the Department of Valuation and action will be taken to auction them.

- (f) Accepted  
This is an equipment donated to the institute. The equipments have been issued on the instructions given by the donor institute. Equipment donated to the institute will be entered into a separate inventory after completion of surveys on goods in 2021.
- (g) Accepted  
When the newspaper advertisement for this tender is published in the following year, it is intended to enter into a proper contract by publishing the notice in a proper manner.
- (h) Accepted  
This land belonging to Hanthana Estate was acquired to the Institute but again acquired to the Land Reform Commission through a gazette. Furthermore, acquisition of this land has been an issue as another person has filed a case against the Land Reform Commission for his rights in respect of the land.
- (i) Accepted  
According to the report given by the National Building Research Organization (NBRO) based on the soil analysis, necessary action is being taken by the respective ministry with regard to construction of a retaining wall.
- (j) Accepted  
As the government had taken a policy decision to give priority to public institutes in the procurement of services for public institutes, the security services were obtained from the Department of Civil Security. This is no longer in operation and the procurement has been carried out and the tender has already been awarded to Vijaya Security and Investigation.
- (k) Accepted  
As per the Management Services Circular No. 02/2020, actions have been taken to recruit employees for essential vacancies.
- (l) Accepted  
According to the agreement prepared for the establishment of the integrated software system, it has been agreed to pay an advance amount before commencement of the work on it. Accordingly, the money was paid as per the agreement before the system being set up, and the advance payment had already been paid by the time when it was decided that the system was not functioning properly.

(m) Accepted

The computers and devices mentioned in the audit query were purchased not only for the integrated software system, but also due to the computer needs of various departments of the organization at that time, and those computers and devices have already been used for the computer needs of the respective departments.

(n) Accepted

The scientists lived in official residences at Digana and transport facilities were also provided for them. Later, as the scientists gave up living in those residences, they were given to other employees of the institute. Transportation facilities have also been provided to those employees. However, it is expected that this issue will be tabled to the Governing Board to decide on a proper method to revise the fares or to continue this transport service and the audit department will be informed about the decision taken.

(o) Accepted

Letters have been forwarded to the ministry with detailed information about the vacancies in the main positions of the institute and the need to create new positions for the Dambulla Arboretum, and no approval has been received for those recruitments either. A copy of the last letter forwarded to the Ministry is attached hereto.

(p) Accepted

GI and Chain Linked Fence - Rs. 2,590,837

This amount has been utilized to pay and settle the money due for the new building of the institute.

Construction of NIFS Plan - Rs. 26,689,472

Computers - NIFS Software Packages - Rs. 3,616,625

It is currently planned to be used for the construction of the retaining wall proposed to be constructed for the unstable slope of the institute.

Development of Lankan Graphite for Researchable Batteries - Rs. 3,270,000

It was not possible to carry out the research activities as planned due to the Covid 19 pandemic situation in 2021. However, by now the activities have been commenced according to the plans.

The balance of Savings Account as at 31.12.2020 and 31.12.2021 should be corrected as Rs. 38,18,522 and Rs. 36,359,328 respectively.

(q) Accepted

The actual cost has not exceeded the budget cost in comparison of budget cost with the actual cost, and should be correct as such.

Due to the Covid 19 pandemic situation, the target budgets of the institute could not be achieved. Therefore, the budgeted cost is much lower than the actual cost and is shown as variable surplus for each unit of cost.

(r) Accepted

It has been prepared for the future public auction.

(s) Accepted

The letter of the Department of Buildings dated 17.12.2019 has informed that the balance of an estimate paid for the repairs of the main auditorium of the institute should be Rs.88,443.69. Further, it has been informed by the letter dated 24.03.2022 to deduct that amount from the amount due to the Department of Buildings. Those adjustments have already been made and corrected.



# ANNUAL REPORT 2021

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அடிப்படைக் கற்கைகளுக்கான தேசிய நிறுவகம்  
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