

# NEWSLETTER

## NATIONAL RESEARCH COUNCIL

VOLUME 01 | ISSUE NO 2 | SEPT 2022 | ISSN NO 2950-7464



### SRI LANKA

## NRC LAUNCHED ITS OFFICIAL LOGO & FIRST NEWSLETTER

NRC launched its official logo and the inaugural issue of its newsletter at a staff gathering held on 14.09.2022. The Chairman, Prof. Hemantha Dodampahala launched the official logo for the first time on the NRC website.

The newsletter which is a new initiative from the NRC Outreach Program, made its first appearance to the public via the NRC website, while the first hard copy was handed over to the Chairman-NRC, commemorating the inaugural issue. The newsletter will be issued at the end of each quarter, highlighting the functions performed by the NRC.



### EDITORIAL TEAM

Prof. Hemantha Dodampahala  
Prof. Thakshala Seresinhe  
Dr. Shanika Jayasekera

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# SOME HIGHLIGHTS OF ACHIEVEMENTS OF NRC RESEARCH PROJECTS

Highlights of achievements of few research projects are presented in this newsletter and in, each Newsletter, NRC will present to the reader a few more outputs of research projects funded by the NRC.

## *How to diagnose a plant disease?*

### **Achievements in Public Private Partnership Research Projects**

#### **NRC PPP 17-01**

A question people often ask is that “Their plants are dying and what was wrong with them?” They also want to know “What can they do to save them?”

Any plant, fruit, vegetable, ornamental, forest or way-side or even their freshly harvested produce, can be vulnerable to disease. The most important thing here is to get to know what the problem is or in otherwards to “diagnose the disease”.

Fungi, bacteria, viruses and nematodes etc. are major plant pathogens causing diseases. Viruses are also common but are not considered living when they are outside the host plant. Since there are hundreds and thousands of them, one has to be open minded until sufficient information is gathered. For anyone to be a disease diagnostician, good observation skills are required.

Identity of the plant: Scientific and common name/s of the diseased plant, and even the cultivar and the part of the plant affected, must be known as they would allow access to a list of diseases recorded and even to rule out certain diseases.

Importance of symptoms: People often rely on “symptoms” and the morphological characteristics of the causal agent/s, for disease diagnosis.

Accurate description of symptoms expressed by the diseased plant is important though it is a quite difficult task. For an example, knowing the reason for “wilting” of a tomato plant, could be straight forward, as the possible reason for wilting is either rotten roots or blockage of vascular tissues. But there can be difficult situations where more investigations are needed for diagnosis of a disease. Types of plant disease range from leaf spots (a), blights, rusts, mildews (b), scabs, stem-end rots, anthracnose (c) etc. to smuts. These are generally caused by fungi or bacteria.

Disease types: Certain diseases, like rusts, powdery mildews, Sclerotinia stem-rot and root knot nematode etc. can easily be diagnosed in the field by visual symptoms that are distinct and obvious to the unaided eye.

However, there are many diseases that have similar and non-specific symptoms (e.g. stunting and leaf - yellowing). Some of these can be accurately identified by examination of samples under light microscope. Successful management of disease depends on accurate identification. Plant disease diagnosis is just like a detective investigating a murder case, the victim in this case, is a plant. All clues should be investigated.



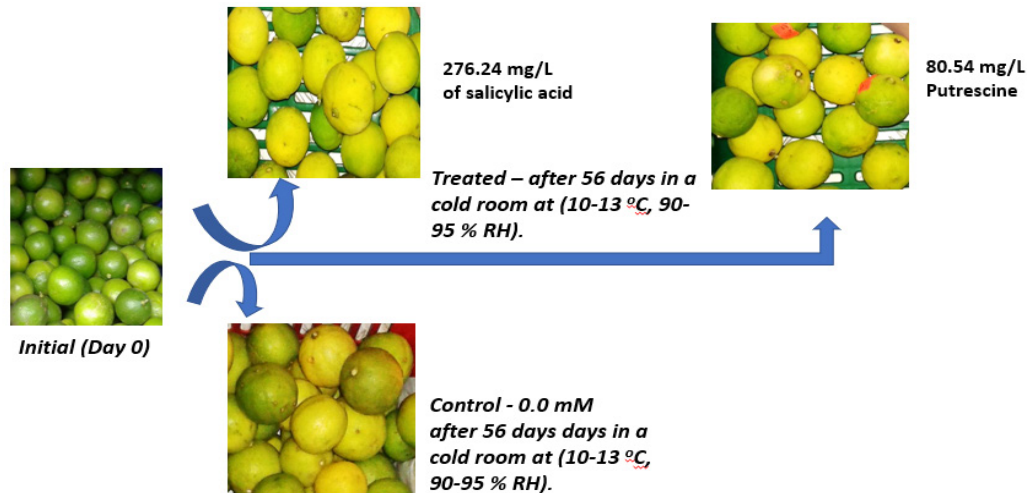
The figures above represent some diseases showing common symptoms which would be useful for diagnostic process or narrowing down the list of potential diseases, (a) Capsicum leaf spot, (b) Powdery mildew of carrot leaf, (c) Banana anthracnose, (d) Leaf curl.



**Prof. N.K.B. Adikaram**

National Institute of Fundamental Studies,  
Hantana Road, Kandy

***A new way to make available Nutritious Fresh Limes year-round***  
***Achievements in Agriculture Research***  
***NRC Grant No: IDG15-154***



## Introduction

Lime (*Citrus aurantifolia*), which belongs to family Rutaceae, has a good economic significance, thus, it has been identified as one of the high priority crops by the national committee of postharvest technology and value addition of where (SLCARP). In Sri Lanka, lime second only to oranges, in terms of area (10,798 ha) and production (4,124 MT) where the total export reported in 2017 was 598 MT which valued US\$ 647,000. (FAOstat 2019). Lime is a seasonal crop, and the peak season lasts for about four months period from mid-April to mid-July. As a result, during the off season the price per kg of lime rises to a level that is unaffordable ( $\approx$  Rs. 600.00-1000.00) by the consumers. On the other hand, during peak time, the price drops to a level ( $\approx$ Rs. 20.00) that lime growers leave the crop without harvesting as it is insufficient to recover the cost of production.

Hence, to prevent the market surplus and to ensure its year around availability, limes that are picked in the peak season were treated with two plant growth regulators namely putrescine and salicylic acid with the intention of extending the postharvest life. Postharvest dip treatment of 276.24 mg/L of salicylic acid or 80.54, mg/L of putrescine for 15 minutes was similarly effective in extending the postharvest life of lime up to 56 days (approximately 2 months) with better physical and chemical qualities compared to the control which was commercially acceptable for 42 days.



**Dr. W.A. Harindra Champa**  
 Senior Lecturer,  
 Bio Statistics Unit  
 Faculty of Livestock, Fisheries and  
 Nutrition  
 Wayamba University of Sri Lanka

## Outputs

- Postharvest dip treatment of 276.24 mg/L of salicylic acid for 15 minutes extended the postharvest life of lime up to two months
- Putrescine at the dose of 80.54 mg/L for 15 minutes extended postharvest life of lime up to two months
- For longer postharvest life, it is mandatory to store limes at 10-13 °C and 85-95% relative humidity after doing the treatments.
- It is recommended to use 276.24 mg/L of salicylic acid to extend the postharvest life of lime successfully because putrescine was more expensive than salicylic acid.

## Outcomes

- Prevention of market glut thus reduce price fluctuations
- Year-round availability of fresh limes for the fresh and processed/value added markets
- Availability of raw materials for the lime-based industries
- Employment generation because availability of fresh limes for the lime-based industries ensures their sustainability
- Increased income of lime growers thus improved livelihood
- Reduction in postharvest losses of limes

## Way forward

- Establishment of low-cost cold storage facilities at rural level
- Make available the successful treatments for the potential users
- Conduct technology awareness workshops in major lime producing areas

## ***Development of a herbal capsule of *Coccinia grandis* L. for type 2 Diabetes mellitus*** **Achievements in Nutraceutical Research** **NRC Grant No: 17-029**

### **Introduction**

Type 2 Diabetes mellitus is a major global health epidemic in the present century, which has increased its incidence rapidly over the past ten years. The unmet solutions for high mortality and morbidity rates due to complications associated with diabetes mellitus, and side effects associated with the prolonged use of oral hypoglycaemic agents in current clinical practice have necessitated the demand for safe and effective drugs, especially of ethnobotanical origin. *Coccinia grandis* (Linn.) Voigt (Cucurbitaceae), Kowakka or Kem vel (in Sinhala), Ivy gourd/ scarlet gourd/tindora and kowai fruit (in English) is an edible perennial climber commonly found in Sri Lanka and in tropical Asia. Based on the findings of extensive preclinical studies conducted by our research group, the project was designed to investigate the antidiabetic efficacy and safety of the herbal capsule of *C. grandis* through a randomized double-blind, placebo-controlled clinical trial in newly diagnosed type 2 diabetic patients. The project aimed to develop a commercially viable phytomedicine/herbal nutraceutical targeting the effective dietary management of diabetes in clinical practice.

The objectives of the project were to determine the proximate and nutritional profile of the standardized herbal capsule *C. grandis*, investigate the effect of the herbal capsule *Coccinia grandis* on metabolic profile in newly diagnosed patients with type 2 diabetes mellitus, and isolate antidiabetic compounds from the leaves of *C. grandis* using bioactivity guided isolation principle.



### **Research outcomes**

The proximate and nutrition profile analysis on the herbal capsule *C. grandis* demonstrated the desirable quantity of moisture, total ash, acid insoluble ash, water soluble ash, carbohydrate, protein, fat, fiber, vitamin B1, B2, and minerals of Ca and Mg. Administration of the herbal capsule *C. grandis* (500 mg/day) for three months was able to improve glycemic control,

with well-tolerated safety in patients with newly diagnosed patients with type 2 diabetes mellitus as the primary endpoint. In addition, the administration of herbal capsule *C. grandis* was able to improve the altered serum lipid profile parameters, atherogenic, cardio-protective, and coronary risk indices, reduce oxidative stress, and chronic inflammation in the patients. Fucosterol and coccinoside C were isolated as  $\alpha$ -amylase,  $\alpha$ -glucosidase and DPP-IV inhibitors from the most active ethyl acetate sub-fraction of *C. grandis* leaves.



**Prof Anoja Attanayake**

Professor in Biochemistry  
 Department of Biochemistry  
 Faculty of Medicine  
 University of Ruhuna

### **Outcomes**

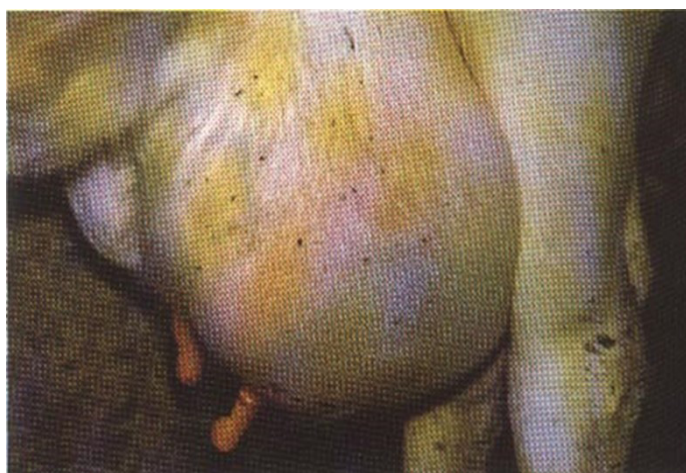
This is the first research project conducted on the efficacy and safety of the herbal capsule of *C. grandis* in newly diagnosed patients with type 2 diabetes mellitus. The method of preparation of the herbal capsule has been patented (Patent No 21885). The project offered a Ph.D. for a young scientist in the field of Biochemistry. Many research awards, and medals have been won by the research team and Dr. K.G. Piyumi Wasana, the post-graduate candidate who worked on this project, won the Vice Chancellor's Gold Medal for the best post-graduate student, University of Ruhuna 2021 for her performance in generating internationally accepted research publications. The findings were disseminated via publications in high-impact factor journals, media briefs, newspaper articles, television programs, etc.



### **Way forward**

Commercialization of the herbal capsule *C. grandis* as a nutraceutical to the local community has been initiated, with an industry partner. The product will be available for the general public in near future.

***Identification of Prevalence and Pathogens of Subclinical Mastitis, Development of an Enzyme Assay System Based on Enzymes Found in Milk for Early Detection of Mastitis Achievements in Livestock Sector***  
**NRC Grant No: IDG 15-087**



Sub-clinical mastitis adversely affects milk quality and production of dairy animals and constitutes a reservoir of microorganisms that can affect other animals within the herd. A few studies have shown the high prevalence of sub-clinical mastitis among lactating cows in Sri Lanka

The assay procedure for N-acetyl- $\beta$ -D-glucosaminidase (NAGase) is considered to be the most reliable, simple, and rapid enzymatic method for estimating the severity of udder damage. One objective of this study was to find the relationship among the California mastitis test (CMT), somatic cell counts (SCC) and activity of NAGase in the milk of a group of crossbred lactating cows in Sri Lanka.

The other objective was to find the influence of breed, parity and age of a cow on somatic cell count. N-acetyl-beta-D-glucosaminidase (NAGase) activity showed the positive correlation with CMTs. The age and parity showed a positive correlation with enzyme activity and crossbred animals did not show a significant correlation with SCC and enzyme activity but mean value of SCC and enzyme activity were higher when an animal showed more phenotypically related to European cross breeds cows than Sindhi or Sahiwal crosses. SCC in milk did not show a significant correlation with milk yield. Correlation between mean enzyme activity and mean SCC is higher than correlation between CMTs and mean SCC. Therefore, detection of sub-clinical mastitis by enzyme assay has high accuracy than the CMTs method. This enzyme assay system is an alternative method to trace subclinical mastitis.



**Prof. R. M. C. Deshapriya**  
 Head Department of  
 Animal Science  
 Faculty of Agriculture  
 University of Peradeniya

***Development of eco-friendly farming technologies for paddy cultivation***  
***Achievements in Biofertilizer Research***  
***NRC Target Oriented Project 16-07***

The broad objective of the study was to develop eco-friendly farming technologies to increase the use efficiency of chemical fertilizers in rice cultivation of Sri Lanka and thereby to reduce the chemical fertilizer usage in the country. The multidisciplinary study was carried out in several institutions (University of Peradeniya, Wayamba University of Sri Lanka and Department of Agriculture), through seven different work packages. In work package two, research studies aimed to produce a cyanobacteria-based nitrogen biofertilizer that could be applied to rice cultivation to reduce the urea fertilizer usage.

Biofertilizers are formulated with living microbial cells which can mobilize plant unavailable nutrients through microbial-driven processes and are beneficial in improving soil nutrient and overall soil health in various

ways. Indirect benefits of the biofertilizers include improving soil structure and water holding capacity. Nitrogen-fixing biofertilizers have the ability to supply nitrogen, which is a key nutrient that determines plant growth and yield. Nitrogen-fixing microorganisms can convert atmospheric nitrogen to plant usable forms using a specialized enzyme (nitrogenase) via the process of biological nitrogen fixation. Symbiotic Nitrogen fixers are mostly bacteria from the Rhizobiaceae family e.g., Rhizobium which form associations with leguminous plants. On the other hand, free-living and endophytic microorganisms such as Azotobacter sp., Azospirillum sp., and Cyanobacteria species are mostly found as non-symbiotic diazotrophs. These Nitrogen-fixing organisms are developed and applied as biofertilizers in different countries for cultivating a range of crops e.g.,

paddy, legumes, and vegetables. In Sri Lanka, at present there is no recommendation on integration of biofertilizers in nutrient management program for rice cultivation and other crops. Through the study we were able to develop a farmer friendly biofertilizer technology, which will be effective in a range of rice growing environments.

## Research Findings:

### Isolation of Cyanobacteria

Cyanobacteria were isolated from surface soil samples collected from 23 paddy growing areas in IL1, IM3, DL1b and DL1c agro ecological regions falling under Kurunegala, Matale, Anuradhapura and Polonnaruwa districts in Sri Lanka using culture-based techniques. Eighteen cyanobacteria (unicellular - *Chroococcus*, *Aphanocapsa*, *Aphanothece*, *Synechococcus*, *Johannesbaptistia*, *Microsystis*, *Synechocystis*, and *Gleocapsa* and filamentous - *Lyngbya*, *Oscillatoria*, *Leptolyngbya*, *Pseudanabaena*, *Anabaena* sp.1, *Spirulina*, *Nostoc*, *Anabaena* sp.2, *Calothrix* and *Phormidium*) were identified based on their morphological characteristics. Ten species were developed as pure cultures and identified by molecular analysis and added to the culture collection of cyanobacteria established at the Biotechnology Department, Wayamba University of Sri Lanka.

### Greenhouse studies with Inoculants:

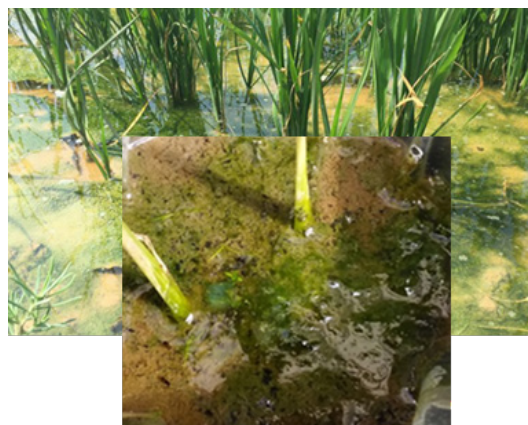
Preliminary screening experiments found five species of cyanobacteria with higher prevalence in the paddy fields sites, nitrogen fixing ability, biomass growth rate and compatibility with other cyanobacteria species and these were prepared as mix culture biofertilizer inoculants. The inoculants showed high adaptability in five different soils originated from Kurunegala, Anuradhapura and Polonnaruwa sites and under wetting and drying conditions determined via greenhouse pot experiments based on plant growth, yield and soil analysis. Developing the technologies for mass culture of inoculants and formulation as a biofertilizer (BG Nitrogen Biofertilizer) were achieved at the Department of Biotechnology, WUSL (TO grant and NRC-17-058 and SRHDC 15/18, 18/13). Molecular analysis using PCR with specific primers for microcystin production confirmed that none of the cyanobacteria inoculants have genetic potential for producing microcystin, which is a main group of cyanotoxins. Testing shelf life indicated that BG biofertilizer remained effective for three months after production under room temperature and inoculants can be kept longer time under refrigerated conditions.



*BG Nitrogen Biofertilizer*

### Efficacy of Cyanobacteria Nitrogen Biofertilizer in the Field

Preliminary field trials conducted at the Rice Research and Development Institute (RRDI) with BG Nitrogen biofertilizer integrated with 50% reduced amount of Urea recommended by the Department of Agriculture resulted a comparable harvest to that in fields which received 100% DOA Urea. Subsequent field experiments were conducted at Mahaweli Authority fields in Aralaganwila and Dehiattakandiya with two treatments (25% reduced Urea with BG biofertilizer and 100% DOA Urea). In most of the fields, comparable yields were obtained in response to BG biofertilizer + reduced Urea compared with 100% DOA Urea. In some fields at Dehiattakandiya, BG Biofertilizer treated fields resulted significantly higher yields than that in field supplied with DOA Urea. Paddy yields obtained with BG biofertilizer varied from 4.2 to 8 Mt/ha. Further field trials are in progress to assess the BG biofertilizer, as an Eco-friendly fertilizer package combined with other project outputs (slow-release urea fertilizer, Phosphorus solubilizing biofertilizer with reduced chemical fertilizers according to Nutrient Expert decision support tool) at fourteen locations (RRDI research stations in Mahailuppallama, Pranthan, Amabalanthota and Samanthurai and selected farmer fields in Kurunegala and Polonnaruwa). The available data clearly indicated that 30 % of the DOA recommended rates of chemical fertilizers could be reduced by applying BG Nitrogen biofertilizer with slow-release urea and Phosphorus solubilizing biofertilizer.



This eco-friendly package including BG Nitrogen fertilizer revealed significant potential for sustainable paddy production in Sri Lanka. The findings of BG Nitrogen biofertilizer were disseminated via journal publications, MPhil and undergraduate theses, conference presentations, training sessions and awareness sessions for research officers, agricultural instructors, paddy farmers and relevant industries. The developed research capacity at the Department of Biotechnology will be harnessed for further research on other applications

of cyanobacteria and microalgae for sustainable development.



**Dr. Wajira Balasooriya**  
 Department of Biotechnology  
 Faculty of Agriculture and  
 Plantation Management  
 Wayamba University of Sri Lanka  
 Co-Investigator, NRC-TO-16-07

## EVENT HIGHLIGHTS

### Webinar on INTELLECTUAL PROPERTY RIGHTS (IPR) AND WHAT YOU SHOULD KNOW ABOUT IT

The National Research Council was organized a webinar on IPR in collaboration with Sri Lanka Association for the Advancement of Science. in 29th July 2022 at 1:30 p.m. to 3:30 p.m. The resource person was Prof. M. N. Kaumal from the General Research Committee of Sri Lanka Association for the Advancement of Science.

The webinar was conducted in English and Mr. A. S. R. Nonis, Assistant Director, Scientific Affairs, of the NRC moderated the session. There were 40 participants including researchers, academics, and University undergraduates and postgraduate students.

Organized by Sri Lanka Association for the Advancement of Science (S.A.A.S) and National Research Council of Sri Lanka (NRC)

**INTELLECTUAL PROPERTY RIGHTS (IPR) AND WHAT YOU SHOULD KNOW ABOUT IT**

Intellectual property is the product of the human intellect, including scientific research, inventions, designs, trademarks, copyrights, literary, artistic, scientific, and technical creations. It is the right of the creator/owner of the work to control its use and to benefit from it.

**Prof. M. N. Kaumal**  
 Professor in Chemistry, Department of Chemistry, CID, Colombo Science and Technology Park, Faculty of Science, Director, University Business Linkage, University of Colombo

**29th July 2022 @ 1:30PM - 03:30 PM**

**AIM**  
 Provide an awareness on how to create, protect and manage IPR

**OUTPUT**  
 Identify possible IPR in the research, decide the best way to protect IPR created from the research, and manage and commercialize the IPR created from research work.

**Registration Fee**  
 LKR 500/= **REGISTER NOW!** For Registration

**MODERATOR**  
 Mr. A. S. R. Nonis, Assistant Director (Scientific Affairs), National Research Council

**REGISTER NOW**

For Academics and Researchers, University Undergraduate and Postgraduate Students

### Research Skills Strengthening Workshops Series - Building a research idea and proposal writing

The National Research Council of Sri Lanka will be organizing a series of workshops to strengthen the research skills of researchers, postgraduates and university students and the first workshop was held on 30th September 2022 at 9.30 a.m. on "Building a research idea and proposal writing".

The resource person was Prof. Ajith de Alwis, former head of the department of chemical and process engineering at University of Moratuwa Dean Faculty of Graduate Studies, University of Moratuwa and Chief Innovation Officer National Innovation Agency Sri Lanka. There were 64 participants including researchers, academics, and University undergraduates and postgraduate students participate the above session.

**RESEARCH SKILLS STRENGTHENING WORKSHOP SERIES: BUILDING A RESEARCH IDEA AND PROPOSAL WRITING**

**SPEAKER**  
 PROF. AJITH DE ALWIS  
 Professor of Chemical and Process Engineering of University of Moratuwa  
 Dean Faculty of Graduate Studies, University of Moratuwa  
 Director, ESI - Engineering Research Unit  
 Former Head of the Department of Chemical and Process Engineering,  
 Faculty of Engineering, University of Moratuwa  
 Chief Innovation Officer / National Innovation Agency Sri Lanka

**30th SEPTEMBER 2022 @ 9.30 A.M. - 11.00 A.M.**

**MODERATOR**  
 Mr. A. S. R. Nonis, Assistant Director (Scientific Affairs), National Research Council

**SKILL DEVELOPMENT ON BUILDING A RESEARCH IDEA**

- FINDING PROBLEMS WORTH SOLVING
- FRAMING (AND THEN RE-FRAMING) RESEARCH QUESTIONS
- TOLERATING AMBIGUITY
- PROTOTYPING AND ITERATING IN SCIENTIFIC RESEARCH
- VISUAL THINKING FOR RESEARCHERS
- PROACTIVELY (RE)DESIGNING YOUR RESEARCH JOURNEY
- BUILDING RESILIENCE
- LITERATURE SURVEY
- DEVELOPING A METHODOLOGY
- WRITING A WINNING PROPOSAL

**Registration Fee**  
 Rs. 1000/- (Rs. 500/- for university students) **REGISTER NOW!** For Registration

**REGISTER NOW**

ORGANIZED BY NATIONAL RESEARCH COUNCIL OF SRI LANKA

### Webinar on "Can We Reduce Chemical Fertilizer Use in Paddy Cultivation?"

As a part of outreach program the NRC organized a webinar on "Can We Reduce Chemical Fertilizer Use in Paddy Cultivation?" which presented the findings of a research project carried out by Dr. R. S. Dharmakeerthi

of the University of Peradeniya funded by the National Research Council (NRC). The above webinar mainly focused to disseminate the results and the key messages of the research towards strengthening the national

economy and the well-being of the people while maintaining resource sustainability. The webinar was held on the 29th of September 2022, started at 10.00 a.m. The speaker was Dr. R. S. Dharmakeerthi, Professor in Soil Fertility and Nutrient Management Department of Soil Science, Faculty of Agriculture, University of Peradeniya. Dr. (Mrs.) Shanika Jayasekera, Chief executive Officer of the NRC moderated the session. The webinar was conducted in English. There were 64 participants which comprised of representation from the Department of Agriculture, investors, communities, researchers, academics, students and private companies.



## EVENT CALENDAR & EVENT HIGHLIGHTS

10<sup>th</sup> November 2022  
 Celebrating World  
 Science Day  
 2022

14<sup>th</sup> & 15<sup>th</sup> November  
 2022  
 1<sup>st</sup> Research  
 Symposium

24<sup>th</sup> & 25<sup>th</sup>  
 November 2022  
 Workshop on statistics  
 Part I

08<sup>th</sup> & 09<sup>th</sup>  
 December 2022  
 Workshop on statistics  
 Part II

Compiled By  
 Nadeeka Dissanayake  
 Scientific Research Officer /National Research Council