

Feature Articles Inside

ANTIOXIDANT AND ANTI-INFLAMMATORY PROPERTIES OF SELECTED UNDER-UTILIZED GREEN LEAFY VEGETABLES GROWN IN SRI LANKA

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09TH ANNUAL GENERAL MEETING WAS HELD ON 18TH SEPTEMBER 2020



Series of webinars - 2020



COVID -19 AND SUSTAINABLE FOOD SYSTEMS: INNOVATIONS TO FACE THE 'NEW NORMAL'

Webinar conducted by
Prof. Rangika Halwatura
Commissioner,
Sri Lanka Inventors Commission

Date: On **13th of June** (Saturday)

Time: At **4:30 p.m.**

Register Now:
<http://bit.do/IFSTSL-Webinar-01>

Organized by:
Institute of Food Science & Technology Sri Lanka (IFSTSL)

Contact: Sandhya 077-1149397

IFSTSL
INSTITUTE OF FOOD SCIENCE & TECHNOLOGY SRI LANKA

Webinar 1- Covid-19 and sustainable food systems; innovations to face the “new normal” on 13th June, 2020

A webinar on “Covid-19 and sustainable food systems; innovations to face the “new normal” organized by IFSTSL on 13th June 2020. The speaker of the webinar was Professor Rangika Halwathura-Commissioner, Sri Lanka Inventors Commission. Prof. Halwathura highlighted research findings on gaps seen on sustainable food systems, and provided examples to participants based on his experience. This was held with 83 participants and IFSTSL wishes to thank the Speaker and all participants.



FREE WEBINAR

Chemical Hazards along the Food Chain (Farm to Fork)

Organized by
Institute of Food Science & Technology Sri Lanka

IFSTSL
INSTITUTE OF FOOD SCIENCE & TECHNOLOGY SRI LANKA

Speaker:
Prof. Upali Samarajeewa
Emeritus Professor in Food Science & Technology
University of Peradeniya

on 20th June 2020 (Saturday)
@ 4.30 p.m.
Through ZOOM

Registration Link: <http://bit.do/Webinar-02-IFSTSL>
Registered participants will be received the Zoom link
Contact: Ms. Sandya (+94771149397)

Webinar 2- Chemical Hazard along the Food Chain (Farm to Fork) on 20th June, 2020

The IFSTSL selects a current theme applicable for food industries, for the second webinar of IFSTSL, named “Chemical Hazard along the Food Chain (Farm to Fork)” held on 20th June 2020. Emeritus Prof. Upali Samarajeewa was the speaker of the webinar. Presentation was lined up to discuss various important aspects of Chemical hazards in agriculture, food processing and their impact, and efforts to be taken by industries to minimize the impact on the environment. At the end of the webinar Prof. Upali Samarajeewa moderated a Q & A session where the participants clarified several important aspects regarding the presentations made.

IFSTSL wishes to express gratitude to all 126 participants and the speaker Prof. Samarajeewa for the support extended to make the webinar successful.



Smart Foods for Preventive Healthcare During COVID Phase

Webinar Conducted By
Prof. Pratima Khandelwal
Founder 'FlyHigh' and Prof. & Head, TLC, GAT, Bangalore, India

Date: 28th June 2020

Time: 4:30 p.m. to 5:30 p.m.

Registration link:
<http://bit.do/IFSTSL-Webinar-03>

Organized by:
Institute of Food Science & Technology Sri Lanka (IFSTSL)

Contact: Ms Sandya +94771149397

IFSTSL
INSTITUTE OF FOOD SCIENCE & TECHNOLOGY SRI LANKA

Webinar 3- Smart Foods for Preventive Healthcare during Covid phase on 28th June, 2020

A webinar on “Smart Foods for Preventive Healthcare during Covid phase” organized by IFSTSL on 28th June 2020. The speaker of the webinar was Professor Pratima Khandelwal from Bangalore, India. Prof. Pratima highlighted importance of consumption of “life force'-natural fruits, vegetables and spices. She provided examples to participants based on her experience. The event also helped to promote IFSTSL as a large number of Indian participants attended the webinar. IFSTSL wishes to thank the resource person and all 65 participants.

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2020 ජූලි 11
සවස 4:30 - 6:00

**Webinar on
FOOD COLOUR CODING
(SUGAR, SALT AND FAT)
REGULATIONS**

11th July 2020
4:30 - 6:00 pm
(Through ZOOM)

Organized by:
IFSTSL
INSTITUTE OF FOOD SCIENCE & TECHNOLOGY SRI LANKA

Webinar 4- Food Color Coding on 11th July, 2020

A webinar on Food Color Coding (Sugar, Salt and Fat) Regulations organized by IFSTSL on 11th July 2020. The speaker of the webinar was Dr. Sujeewa Gunarathne- Senior Regulatory Advisor –Unilever Lipton Ceylon Ltd and also the Immediate Past President of IFSTSL. Dr. Sujeewa presented on color coding regulations, labelling requirements food regulations and their revisions and also, she provided guidance to participants based on her experience. Dr. Sujeewa Gunarathne and Prof. Upali Samarajeewa moderated a Q & A session where the participants clarified several important aspects regarding the presentations made. The webinar was attended by more than one hundred and fifteen participants and they successfully utilized the opportunity.

**Webinar on
Minimally Processed or Fresh-cut
Fruits and Vegetable Products Industry:
Overview and Challenges**

18th July 2020
4.30 pm - 5.30 pm
Through Zoom

Registration: <http://bit.do/IFSTSL-Webinar-05>
(Zoom link will be emailed to the registered participants)

Organized by:
**Institute of
Food Science & Technology
Sri Lanka**

Webinar 5- Minimally Processed or Fresh-cut Fruits and Vegetable Products Industry-Overview and Challenges on 18th July, 2020

A webinar on “Minimally Processed or Fresh-cut Fruits and Vegetable Products Industry-Overview and Challenges” organized by IFSTSL on 18th July 2020. The speaker of the webinar was Dr (Ms.) Ilmi Hewajulige Additional Director General –R & D at Industrial Technology Institute. The webinar was attended by more than one hundred and thirty participants and they successfully utilized the opportunity. IFSTSL wishes to express gratitude to all 135 participants and the speaker Dr. Ilmi Hewajulige for the support extended to make the webinar successful.

**Webinar on
PLANT PROTEINS
A multifaceted ingredient for food industry**

Date: 22nd August 2020
Time: 5.30 pm – 6.30 pm (SL)
Through Zoom

Speaker: **Dr. Janitha Wanasundara
(Ph.D., CFS)**
Research Scientist,
Saskatoon Research and Development Centre
Agriculture and Agri-Food Canada / Government of Canada

Organized By:
IFSTSL
INSTITUTE OF FOOD SCIENCE & TECHNOLOGY SRI LANKA

Register: <http://bit.do/IFSTSL-Webinar-06>
More info : Ms. Sandhya (+94771149397)
Zoom link will be emailed to the registered participants

Webinar 6- Plant Proteins –A multifaceted ingredient for food industry on 18th July, 2020

A webinar on “Plant Proteins –A multifaceted ingredient for food industry” organized by IFSTSL on 18th July 2020. The speaker of the webinar was Dr. Janitha Wanasundara- Research Scientist at Saskatoon Research and Development Centre-Government of Canada. Dr. Janitha presented on types of proteins, uses, nutritional value evaluation for food industry and also, she provided guidance to participants based on her experience. IFSTSL wishes to express gratitude to all 155 participants and the speaker Dr. Janitha Wanasundara for the support extended to make the webinar successful.

ANTIOXIDANT AND ANTI-INFLAMMATORY PROPERTIES OF SELECTED UNDER-UTILIZED GREEN LEAFY VEGETABLES GROWN IN SRI LANKA

Dr. Prasanna Gunathilake, Wayamba University of Sri Lanka
Prof. KKDS Ranaweera, University of Sri Jayewardenepura

The presence and diversity of phytochemicals such as polyphenols, flavonoids, and carotenoids in vegetables are important factors for human health. Many epidemiological studies have shown that the diet rich in antioxidants play an essential role in disease prevention and free radicals are known to be a significant contributor to many degenerative diseases such as cancer, cardiovascular diseases, inflammation and diabetes. Studies have shown that chronic inflammation also has a link with a wide range of progressive diseases such as cancer, neurological disease, metabolic disorder and cardiovascular disease. Dietary antioxidants protect against free radicals such as reactive oxygen species in the human body. Provision of dietary sources of antioxidants that could function to quench or neutralize the spectrum of oxidant sources in the body is important in the prevention of oxidative damage. Green leafy vegetables represent essential nutritional constituents in any balanced diet, and they contain a range of health-related phytochemicals and considered as valuable candidates to be rich sources of natural antioxidant.

Antioxidant properties

A study recently carried out at the Wayamba University of Sri Lanka on thirty four leafy vegetables revealed a remarkable variation in antioxidant activities. They were evaluated for total polyphenols, arytenoids, total antioxidant capacity, reducing power, inhibition of lipid per oxidation and DPPH radical scavenging. Among the leafy vegetables that were investigated, *Susana grandiflora* (Kathurumurunga), *Cassia auriculata* (Ranawara), *Passiflora edulis* (Passion fruit), *Gymnema lactiferous* (Kurinnan) and *Olox zeylanica* (mella), gave a higher antioxidant activities. In spite of the high consumer demand, the commercially grown and most common leafy vegetables like gotukola, mukunuwenna and Kankun have shown comparatively lower antioxidant activities. The free radical scavenging ability of soluble and bound phenolic fractions of the antioxidant rich leafy vegetables showed that both fractions exhibit the antioxidant potential towards free radicals and reactive oxygen species such as singlet oxygen, hydroxyl radical and nitric oxide radicals. However, soluble extracts showed a higher content of phenolics and flavonoids than in the bound fraction. Rutin is the common flavonoid found in Leafy vegetables and lutein and β -carotene are the commonly available carotenoids. Among the leafy vegetables studied, *C. auriculata*, (Ranawara) had the highest rutin, lutein and β -carotene content. The leaves of *P. edulis* (Passion fruit) showed the highest vitamin C content.

Anti-inflammatory Properties

Anti-inflammatory activity of six leafy vegetables, namely *Cassia auriculata*, *Passiflora edulis*, *Sesbania grandiflora*, *Olox zeylanica*, *Gymnema lactiferum*, and *Centella asiatica* (Ranawara, Passion fruit, Kathurumurunga, Mella, Kurinnan and Gotukola) were tested using four in vitro-based assays namely, hemolysis inhibition, proteinase inhibition, protein denaturation inhibition, and lipoxygenase inhibition. Cellular infiltration, mediated by leukocytes, is an important aspect of the inflammatory response. During inflammation, leukocytes release lysosomal enzymes, including proteases as a part of their defensive role. These proteases cause tissue damage and as a consequence trigger further the inflammation response. Damage to cell membranes will also make the cell more

susceptible to secondary damages by means of free radical-induced lipid peroxidation. Stabilization of the cell membranes may therefore, retard or inhibit the cell lysis and subsequent release of the cytoplasmic contents which, in turn, minimize the tissue damage, contributing to subside the inflammatory response. Therefore, substances that can protect the cell membrane against injurious cytoplasmic contents are important in inhibiting the progression of inflammation.

It was observed that the leaf extracts of the above mentioned six leafy vegetables inhibited the destruction of red blood cells and the release of their contents (Hemolysis). The percent inhibition of hemolysis by these leaf extracts with the concentration of 25-100 μ g/mL on dry weight basis was ranged from 4% - 14.9%. Leaves of *P. edulis* (passion fruit) and *O. zeylanica* (Mella) showed a higher inhibition levels. Denaturation of protein molecules due to inflammation process in conditions like arthritis is well documented. One of the main mechanisms of action of non-steroidal anti-inflammatory drugs (NSAIDs) is the protection against protein denaturation. Percent inhibition of protein denaturation by the six leafy vegetable types was ranged from 36% to 61%. The leaf extract of *C. auriculata* (Ranawara) showed the highest inhibition level of 61%. Furthermore proteinases of leukocytes play a significant role in the development of tissue damage during inflammatory processes and studied leafy vegetables showed a similar ability to inhibit proteinases up to 20.2–25.9%. Lipoxygenases are the key enzymes in the biosynthesis of leukotrienes and it play an important role in several inflammatory diseases, such as arthritis, asthma, cancer, and allergic diseases. The lipoxygenase inhibition by the leaf extracts of the six leafy vegetables was within the range of 3.7–36.0%. The leaf extract of *G. lactiferum* (Kurinnan) showed an improved ability to inhibit lipoxygenase activity.

Effect of cooking

Most leafy vegetables can be consumed in their fresh form, and some as a cooked food. However, cooking methods such as boiling, steaming and frying may cause deterioration of bioactive constituents. Generally, polyphenols, carotenoids and antioxidant capacity of green leafy vegetables are significantly altered during common cooking practices such as boiling, steaming, and frying. Among the cooking methods evaluated, frying reduces the polyphenols, flavonoids, carotenoids, and antioxidant activities in all leafy vegetables, whereas boiling and steaming have shown varying effects on polyphenols, carotenoids, antioxidant and anti-inflammatory properties.

Bioaccessibility and bioavailability

The bio-accessibility of phenolics, flavonoids, rutin, β -carotene and lutein and changes in antioxidant and anti-inflammatory activities in six edible leaves during simulating gastro-intestinal conditions has been investigated. It was found that the amount of dialysable phenolics, flavonoids and carotenoids which potentially available for further uptake varied depending on the leafy type. Bioavailable phenolics after the gastric-phase, intestinal-phase and in dialysable fraction were in the ranges of 13.9–71.8%, 14.4–77.4% and 3.1–12.3% respectively when compared with their fresh leaves. Bioactives of *Centella asiatica* (Gotukola) showed comparatively higher bioavailability in all phases with respect to its original content. β -carotene seems more dialysable than lutein in all leaves studied.

(This article is based on a research project funded by National Science Foundation (Grant Number: RG/2014/AG/04).

The 9th Annual General Meeting and Annual get together of the IFSTSL was held at 80 Club of Colombo, 25 Independence Ave, Colombo 07, Sri Lanka on 18 September 2020 at 6 pm. At the meeting Prof. Niranjala Perera was appointed as the president for the year 2021 and Dr. Eresha Mendis was appointed as the president elect. Following is the composition of the Board of Governors and the executive committee elected for the year 2021.



*Annual
General Meeting
&
get-together of the
IFSTSL
18.09.2020*

Members of the Board of Governors and the Executive Committee - 2021

Emeritus Prof. Gamini Fonseka
B.O.G - Chairman

Emeritus Prof. Upali Samarajeewa
B.O.G – Member

Mr. Rohantha De Fonseka
B.O.G – Member

Dr. D.B.T. Wijeratne
B.O.G – Member

Mr. Nishan Perera
B.O.G – Member
(as President of SLFPA)

Prof. Niranjala Perera
President

Dr. Eresha Mendis
President Elect

Dr. Sujeewa Gunaratne
Immediate Past President

Ms. Anjalee Omalka
Joint Secretary

Ms. Chamodika Senarath
Joint Secretary

Mr. Cyril Wickramaratne
Treasurer

Mr. Thusith Wijesinghe
Assistant Treasurer

Prof. Sandun Abeyrathne
Editor

Prof. K.K.D.S Ranaweera
Committee member

Dr. Niranjan Rajapakse
Committee member

Mr. Maliek De Alwis
Committee member

Mrs. Neranji Jayasinghe
Committee member

Mr. Dammika Gunasekara
Committee member

Dr. Rasanjali Samarakoon
Committee member

TWO MEMBERS OF THE IFSTSL HAVE BEEN RECOGNIZED AS THE TOP 2% RESEARCHERS OF THE WORLD



Drs. Eresha Mendis and Niranjana Rajapakse who have been serving in the executive committee of the IFSTSL from the inception have been recognized as the top 2% researchers of the world according to a recent article published in PLOS Biology journal¹ based on a study conducted by a group of researchers from the Stanford University, USA. The Stanford ranking was prepared according to subject-wise analysis conducted by the university, based on standardised citation indicators such

as citations, H-index, co-authorship and composite indicator. In this study, researchers in the world have been evaluated under two categories; ie., career-long citation impact and the citation impact in the year 2019. Drs. Mendis and Rajapakse have been filtered out as the top 2% researchers of the world under the category, citation impact in the year 2019 and fall within 15 researchers in the same category from Sri Lanka. This recognition of Drs. Mendis and Rajapakse was due to their research contribution and scientific publications in the sub-field of medicinal and molecular chemistry and they are currently serving as academics of the Department of Food Science & Technology of the Faculty of Agriculture, University of Peradeniya.

IFSTSL congratulates Drs. Mendis and Rajapakse for their achievement and wishes success in their future endeavours.

¹ <https://doi.org/10.1371/journal.pbio.3000918>



Webinar Calendar year 2021

A series of webinar is planned for the year 2021 starting from January up to December 2021. These webinars will focus on important areas in Food Science and Technology. Registration for IFSTSL members will be free and one-time payment of Rs. 500.00 will be for the non-members. University students will be given the concession of enrolling in IFSTSL for admission fee of Rs. 500.00 and they do not have to pay annual fee till they graduate. More details are available in the IFSTSL Website.

Webinar 01: January 16th - (16:00 hrs – 17:00 hrs)

Readiness of Sri Lanka to accept globally marketed GM Foods

Dr. Niranjana Rajapakse, Senior Lecturer, University of Peradeniya

Webinar 02: February 13th - (16:00 hrs – 17:00 hrs)

Important factors for establishing and maintaining a food industry

Dr. Ilmi Hewajulige, Senior Deputy Director, Industrial Technology Institute, Colombo

Webinar 03: April 10th - (16:00 hrs – 17:00 hrs)

What is good food?

Prof. Renuka Silva, Professor of Nutrition & Department Chair, Wayamba University of Sri Lanka

Webinar 04: May (Date to be announced)

Nanotechnology and food

Dr. A.N. Madushanka, Senior Lecturer, Wayamba University of Sri Lanka

Webinar 05: June (Date to be announced)

Water quality and best practices for secure water usage during the COVID 19 period

Dr. Meththika Vithanage, Senior Lecturer, University of Sri Jayewardenepura

Webinar 06: July 24th - (16:00 hrs – 17:00 hrs)

Validation and verification of test methods for foods

Emeritus Professor U. Samarajeewa, University of Peradeniya

Webinar 07: September 18th - (16:00 hrs – 17:00 hrs)

Scientific basis in setting food standards

Dr. Eresha Mendis, Senior Lecturer/Head (Dep. Food & Tech.), University of Peradeniya

Webinar 08: October 9th - (16:00 hrs – 17:00 hrs)

Novel food processing technologies

Prof. Niranjana Perera, Professor, Wayamba University of Sri Lanka

Webinar 09: November 20th - (16:00 hrs – 17:00 hrs)

Importance of animal proteins in human diet

Prof. Sandun Abeyrathne, Professor in Animal Science, Uva Wellassa University of Sri Lanka

Webinar 10: December 11th - (16:00hrs- 17:00hrs)

Starch modification technology

Dr. R. Samarakoon, Lecturer, University of Peradeniya

Shifting of Livestock to New Norms

M.H.U. Maggonage

Animal Science Degree Programme
Uva Wellassa University of Sri Lanka

COVID-19 is the most unexpected enemy for the livestock industry. It has caused ripples in production and supply process. Livestock industry has the most dynamic process. This process was negatively affected by the CoVid-19 pandemic. Livestock had to face stagnant situation which is the worst thing for a dynamic process. However, the livestock industry has to overcome many challenges at the present situation.

Livestock industry got affected in many ways. Lack of required inputs for the farms, inability to transport products and raw materials, lack of labor force due to the concept of social distancing, decrease of demands due to myth of spreading corona disease through meat and decline of processing activities were some of the problems faced by the livestock industry. Other than these problems, in global platform discussions are going on regarding diseases such as African Swine Fever. According to those discussions, it is also due to the loops in the biosecurity created during CoVid-19 pandemic. Retailers got the hardest hit due to lack of storage facilities. Culling processes were practiced to avoid overcrowding. Discarding of milk was also seen. Therefore, almost all production and supply chains got affected from this.

These conditions were also seen in Sri Lanka. During the process of avoiding corona disease, different restrictions were done. These restrictions directly affected for the livestock production of the island. Restrictions for importing live animals, animal products and byproducts were there. Other than that restriction on importing maize were also a main problem. These conditions have affected for the productivity within the country. Retailers were in difficult situation due to lack of storing facilities.

These problems which were aroused have caused for the thinking of different pathways for livestock industry to be fit



with the new norms of the world. New topics have started to discuss at present. Food security in livestock industry is one of them. Large number of awareness activities are disseminating through the virtual methods. Food safety is given an important place. Increasing of discussions regarding antimicrobial resistance and producing safe foods can be seen. According to new norms, small scale producers are given more consideration. At present, themes like "smaller, greener and healthier" has occurred within social platforms. These processes should be followed in Sri Lanka too.

However, Sri Lanka among this pandemic situation has taken an opportunity to enter in to markets such as Oman and Brazil. Supply of quality frozen broiler chicken to the world market has increased. This causes for the increase of foreign earnings to the country. Blending of Sri Lankan poultry industry with the new norms of the world is now occurring successfully. Increase of e-transactions also has increased in Sri Lanka. Promotion of health impacts on the meat, egg products and various dairy products has increased. Some private institutions used some delivery methods to reach for the customers directly during the pandemic. Therefore, in this way a rapid development can be seen in poultry and other livestock industries. The adaptability of Sri Lankan livestock sector to that of world condition is considerably high. According to the Department of Animal Production and Health, the contribution of livestock sector to the GDP is 0.6% by 2017. The contribution to the GDP can increase with the enhancement of the livestock production. There are many opportunities in the world market due to dawn of the concept of new norm. Therefore, introduction new solutions for the existing problems should be done immediately. This will increase the potential of the livestock industry in Sri Lanka.

During the shifting of our livestock industry, a solution should be finding for the scarcity of feed. Researches are conducting on non-conventional feed ingredients. These new findings can help regarding this. Other than that dissemination of new knowledge to small scale farmers can strengthen the potentials of livestock industry in Sri Lanka. Using efficient delivery methods, introduction of new value-added products is some of the solutions producers have already started. Awareness of people about the nutritional qualities of these value-added products should be done.

In this way when an unexpected pandemic causes negative impacts on economy of the country, livestock industry with available resources have provided the helping hand. Therefore, development of this industry is a must. It can cause a huge impact on economy. This industry can lead the country to attain success in all its goals and ultimately achieve self-sufficiency.

Global Warming is leading us to food crisis

Global Warming steals food



N.N.S. Kithmini

Department of Food Science and Technology
Wayamba University of Sri Lanka



Humans are keeping up with piling the atmosphere with junk which pollute the environment. It has a tremendous effect on weather conditions. Pollution created global warming that initiated several crises in the world. Global warming relates to the increases in the average temperature of the earth's surface that has been observed in recent years. Unfortunately, over the past 50 years the average global temperature has increased at the fastest rate. According to the recent research findings, today's temperature is about 1°C (1.8°F) higher than the 150 years. Global warming happens when carbon dioxide (CO₂) and other air pollutants and greenhouse gases collect in the atmosphere and absorb sunlight and solar radiation that have bounced off the earth's surface. Generally, this radiation would escape into the space: but these pollutants, which can last for years to centuries in the atmosphere, trap the heat and cause the planet to get hotter. Climate changes are mainly happened due to the global warming. When climate warms, it may cause to change the nature of global rainfall, evaporation, snow, stream flow and other factors that affect water supply and quality. Most of the additional heat generated by rising level of greenhouse gases in the atmosphere is absorbed by the oceans. So, sea surface temperature is rising and sea level is increasing while reducing land area.

Food crisis is the one of the main issues started with global warming. Simply, food crisis is a long term and extreme shortage of food. Overpopulation threatens the ability of the world to feed itself. Global warming is causing an additive effect on the food crisis. Global warming leads glacier layers to melt like the recent case Thwaites glacier in West Antarctica, Greenland melting which causes the sea water level to rise. Risen sea level causes land area to sink and this will reduce the agricultural area for cultivation. As backward results food shortages cause global warming by changes that happened in ecosystem as a result of trying too hard to feed

the world. Fertilizers, insecticides, gene modified organism cause imbalance in ecosystem. Deforesting to make agricultural lands and usage of chemicals to increase the harvest will feed only for a certain amount of period. After that the land will be dead and no longer will be productive. Then the people will again enter to food shortage.

Warming atmosphere accelerates droughts, flooding, heat waves, wildfires and other weather patterns. These climatic changes affect food security at the global, regional, and local levels. This limits food availability, reduce access to food, and affect food quality. The rate of soil loss and land degradation will be increased limiting the food production of these areas. Heat waves, which are projected to increase under climate change, could directly threaten livestock. Heat stress can increase vulnerability of livestock to disease, reduce fertility, and reduce milk production. Due to the changes in temperature, timing of reproduction and migration of marine fish is changed too. The acidity of marine water can be increased as a result of global warming and this could harm shellfish by weakening their shells. Due to the increased carbon dioxide levels in the atmosphere, quality of nutrients is lost in certain crops. For example, according to research on wheat that was grown in an environment with elevated concentrations of carbon dioxide, less amount of protein and iron could be observed. Other than that, as a consequence of climatic change food delivery will be interrupted leading to spikes in food prices.

Global warming has linked to food insecurity via interrupting food production in numerous ways. Climatic change which come along with the global warming cause an adverse impact on agriculture through changes in average temperatures, rainfall, climate extremes and atmospheric carbon dioxide level. Droughts have been occurring frequently due to global warming in Africa, Southern Europe, Middle East, Australia and Southeast Asia that result in crop failures and lack of grazing land for livestock. Heat waves in the summer of 2019 has caused lower average yield across the world, especially in Europe. Global wheat, rice and maize production failed to meet the demand last year forcing many governments to release their last stock. Researchers predict that food prices will rise by 80% by 2050. Food shortages are likely to occur affecting poorer parts of the world more than the richer due to unfavorable conditions being created for food production. Access to food has been limited due to thousands of crops being destroyed. Food utilization is affected by global warming as changing temperature create vicious stages and phases of disease. Food stability is in danger through increasing price range as food become scarce. Food insecurity affect different countries in different ways as a result of global warming International Rice research institute forecasts 20% reduction in rice yield per degree Celsius of temperature rise in Asia. Livestock production also has been limited in Bangladesh due to diseases, scarcity of forage and heat stress. The risk of hunger remains very high in several developing countries.

Prices for basic foods such as rice, wheat, and corn have risen 83% since 2005. Compared to the first half of 2007, food prices in 2008 have risen even more dramatically: 130%



increase for wheat and an 87% increase for soy. Between March 3rd and April 23rd, 2008, the price for a metric ton of rice rose from \$460 to \$1,000. This almost doubling in price caused riots in Egypt and Haiti. Other nations (Cameroon, Ivory Coast, Mauritania, Ethiopia, Uzbekistan, Yemen, the Philippines, Thailand, Indonesia, and Italy) have experienced violent protests in reaction to the increased cost of food staples.

During the summer months, twenty-nine countries have cut back on food exports to ensure their populations have enough to eat. India, Vietnam, China, and more have limited or banned exports of rice. Pakistan and Bolivia have severely capped wheat exports. Kazakhstan has even restricted exporting sunflower seeds.

However, 113 million people in 53 countries experienced high levels of food insecurity in the world's most severe food crises in 2018. However, the number of people in the world facing food crises has remained well over 100 million in the last three years, and the number of countries affected has risen. Moreover, an additional 143 million people in another 42 countries are just one step away from facing acute hunger. Nearly two-thirds of those facing acute hunger are in just 8 countries: Afghanistan, the Democratic Republic of the Congo, Ethiopia, Nigeria, South Sudan, Sudan, Syria and Yemen. These eight countries accounted for two thirds of the total number of people facing acute food insecurity – amounting to nearly 72 million people.

In 17 countries, acute hunger either remained the same or increased. Climate and natural disasters pushed another 29 million people into acute food insecurity in 2018. As in previous years, most of these individuals were in Africa, where nearly 23 million people in 20 countries were acutely food insecure due to climate shocks. Weather has also adversely affected agriculture in many parts of the world.

Climate change, associated with accelerated greenhouse gas emissions, is believed to have exacerbated water-supply problems, thus speeding up desertification and water stress, and worsening the unpredictability and severity of weather phenomena, such as the decade-long drought in Australia.

As to reduce the carbon emission necessary actions should be taken and these actions are taking money from a country's economy. The damages due to very long-term warming are estimated at 6 to 12% of GNP for United States. They suggest that global freeze on carbon emissions would cost about 1.5 to 2.5% of world GNP in the first half on the next century. This money can be used to feed people.

Long term goals can reduce 50% of these costs and increase

the productivity a mentioned by W. R. Cline. As long-term plans can introduce reforestation in possible areas. Can merge new technology to reduce burning fossil fuels. Another carbon emitting source is wastages from food industry. This waste can be from either livestock sector and agricultural sector. Gas emitting from these wastes can be used as energy source. Rules should be established to regulate the carbon emission. These steps can reduce carbon emission and reduce the green house effect. Think and use the resources efficiently to make available nutritious food for everyone in the world.

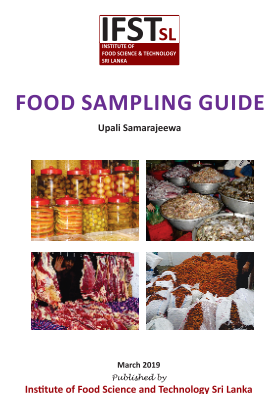
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FOOD SAMPLING GUIDE

A book titled 'FOOD SAMPLING GUIDE' authored by Emeritus Professor Upali Samarajeewa, and published by the IFSTSL is available for sale at a discounted price of LKR 500 at IFSTSL secretariat (No 21D, Wijaya Kumara thunga Mawatha, Polhengoda Gardens, Colombo 5).



It explains the applications of different food sampling plans, sampling tools and sample handling, required in the food industry. Please contact Ms. Sandhya at IFSTSL Secretariat (077 1149397) during office hours to obtain copies. Libraries or groups purchasing ten or more books are entitled for special offer of 10% off on total bill.

Act of Parliament to incorporate IFSTSL

We are happy to make a note that incorporation of Institute of Food Science and Technology of Sri Lanka (IFSTSL) under an Act of Parliament has been expedited. In this regard, approval of the Cabinet of Ministers has been taken on 27th September 2016. However, in view of the appointment of new Cabinet, the Attorney - General's Department has advised to obtain fresh cabinet decision to proceed with the draft bill. Ministry of Agriculture will submit the Cabinet Memorandum to the new Cabinet in due course in order to obtain fresh Cabinet approval. Following which the draft bill will be submitted to the Parliament soon.

Proposal Aiming Export Food Industry

A proposal was submitted to His Excellency the President of Sri Lanka providing technically sound mechanisms to produce fruits and vegetables of high-quality aiming export and also mechanisms to prevent current loss of up to 40% due to poor postharvest handling. The proposed long term and short-term measures would enable the farmers to get a higher price, move the produce to markets with least handling damage, produce compost from waste and avoid the need to further expand land allocations for fruits and vegetables and fertilizer use as what is produced is saved instead of producing more. Mechanism to provide continuous guidance with voluntary resources of the IFSTSL was proposed as a mechanism to continuously upgrade the production and processing systems. The proposal also gives mechanism to start processing of the produce at the collection centers instead of industries located around the capital, providing employment opportunities to rural youth. Implementation of this IFSTSL proposal possess potential to assist the economy of the country affected badly due to COVID 19.

The untiring support and guidance of the Emeritus Professor Upali Samarajeewa in this regard is greatly appreciated.

HOW TO APPLY FOR IFSTSL MEMBERSHIP

Persons interested in becoming the members of the IFSTSL are requested to obtain the application form from the office, official website or contact Ms. Sandya Ferenando (011- 7548770). Duly completed applications should be submitted to the IFSTSL office with hard copies of required documents

Entrance fee will be Rs. 1000.00 for individual members and Rs. 5000.00 for corporate members. Annual subscription is Rs. 2500.00 for Fellows and Associate members; Rs. 15,000.00 for Associate Corporate members.

Annual subscription for Interim members is Rs. 5000.00 for companies and Rs. 2000 for individuals.

No annual subscription is charged for student members.

Contact us :

No 21D, Polhengoda Garden, Colombo 05

Tel: 0117548770 Fax: 0117548771 Email: ifstslinfo@gmail.com