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TRC Sinha Lifetime Achievement Award was presented to Dr. Alok Adholeya, Programme Director, Sustainable Agriculture Division, IHC, TERI, New Delhi and Director, TERI Deakin Nanobiotechnology Centre, TERI Gurgugram by Honourable Shri Arjun Ram Meghwal Ji in the NESA 31st Annual Conference at Conference Centre, University of Delhi, Delhi on 15-16 December, 2018.

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PROCESSED PRODUCTS FROM FRUITS AND VEGETABLES FOR EMPOWERMENT OF RURAL WOMEN

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Food processing is defined as a set of economic activities concerned with conservation, handling and processing of agricultural products. The demand for readymade food items has increased. Due to globalization and higher exposure to the media, people have become aware of the nutritious and healthy diet. More and more people are inclined toward readymade food available in the market as they not only save time and efforts but choice available also increases. People choose to use readymade food items when no seasonal foods or food is unavailable in their own regional area. Foods which are prepared traditionally by women in groups are considered to be very close to homemade foods. Food processing industries have an important role in the growth of economy of developing countries as a source of income, employment and are linked with agriculture.

Food processing industry bring increased opportunities for employment of women as packaging , quality control and marketing operation especially suited to women. The food processing sector is critical to India's development, India is the world's second largest producer of food and food production in the country is expected to double in the next 10 years, while the consumption of value-added food products will also correspondingly grow. India is world's largest producer of Bananas, Papaya, Mangoes, Sapota, and Guavas, second largest producer of Potatoes, Green Peas, Cauliflower, Onion and third largest producer of Cabbage.

Fruits are rich source of vitamins and minerals and even the inedible portion of the fruit is rich in nutrients. In developed countries fruits and vegetable products account for 89% of all processed foods. However, in India less than 1% of the total produce of fruit is processed. With the shift in taste of Indian consumers towards fast and convenient foods, a number of food processing factories are coming up and are likely to get further boost. At present more than 1500 fruit and vegetable processing factories are there in India generating more than 1, 50,000 ones of products. Women have traditionally been playing very important role in all sectors of agriculture. The need of the hour is to strengthen their participation by empowering them with gender friendly technologies.

Women are the major contributor in fruit processing and preservation activities.Due to their inadequate knowledge and skills these losses are very high. To minimize these losses it is important to equip them with latest fruit processing and preservation technologies by providing adequate access to information. The critical gap in this area is poor or inadequate product quality, primitive processing techniques, high wastage and low level of processing. We need to go for secondary agriculture which means, adding value to the basic agro-commodities to allow farmers to get better returns from their harvest, create new jobs in the rural sector to grow rural economy which is entirely based on agriculture. There is a need for secondary agriculture due to declining share of agriculture in the national GDP (from 31% to 18.34% at present) while the number of people depending on it remains the same. Secondary agriculture can reverse this trend and add two to three-fold value to primary agriculture.

Horticulture is the best option for diversification and optimum utilization of resources as it is knowledge based enterprise. The creation of technology based and farmer centric science will lead to development. To strengthen the role of women, she should be involved in decision-making and financial processes, should be empowered and provided the space and opportunities to voice their opinions and children should be educated to better appreciate the roles of women and men. The availability of gender segregated data needs to be improved, the working conditions of women in processing plants should be investigated and documented, they should be encourage to ascertain their trade union rights and non-gender biased technologies should be developed and disseminated. Women's access to information should be facilitated, women protection bill should be enforced, industries should be equipped with basic infrastructure facilities and the importance of mobile phone technology as a market information tool should be emphasized. Fruit and vegetable processing can be a wise option for improving livelihood status of rural women.

Indirect solar drying of agriculture produce is an area in food processing, where entrepreneurships can be developed. The Solar drier has a temperature controller to regulate the temperature inside the solar air collector suitable for drying different crops, Blower at inlet to provide dry air at inlet for enhancing the collector efficiency and thermal storage consisting of mixture of gravel and iron scrap to increase efficiency of solar air collector and to radiate heat after sunset. Advantages of solar drying are- Natural quality of dried products is maintained and meets quality standard, products dried in solar drier contain higher quantities of phytonutrients as compared to drying in open sun drying, shelf life of dried products are higher as compared to open sun dried products. The drying time is reduced to 35 per cent and the solar dried products fetch higher market rates. During drying process in solar drier the products are protected from dust, wild animals, insects and pests and weather vagaries. The drying cost in solar drier is much less as compared to oven drying, apart from reduced labour cost. The carbon emission is also reduced as compared to oven drying. The solar dried products have higher sensory scores for colour, texture, flavor and overall acceptability.

Diagram Credit: **Dr. Neelima Garg**, CISH, Lucknow (U.P.)

ENVIRONMENT FRIENDLY MANAGEMENT OF SUBTERRANEAN TERMITES

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White, tan, or black orthopteroid insects known as "Termites" are highly socialized. They are primary consumers and most abundant soil invertebrate, belonging to order Isoptera, an ancient group that dates back more than 100 Myrs ago. Isoptera means "equal wing" and refers to the fact that the front set of wings on a reproductive termite is similar in size and shape to the hind set. The order Isoptera is divided into seven families (Mastotermitidae, Serritermitidae, Termopsidae, Termitidae, Rhinotermitidae, Kalotermitidae and Hodotermitidae) comprising more than 3000 species from different parts of the world. The most devastating species are distributed among last four families. About 75% of termite fauna in the world belong to family Termitidae alone.

These cryptic insects attack on annual and perennial crops (which form the basis of household nutrition in many countries) cause significant yield losses damaging the plants at all growth stages. In the field they also attack the crop left over (root stubble), fallen leaves twigs, bark etc. Termites also destroy wooden constructions greatly, as the main structural polymer of wood "lignocelluloses" is well digested by their symbiont in hindgut, protozoa/bacteria. These small insects however, greatly contribute to the world's ecosystems by recycling the wood and plant material.

Termites evolutionary success has been linked to their active (morphological, chemical and behavioural adaptations, present predominantly in soldiers) and passive (cryptic way of life and nest fortification, preventing attacks from non-specialist predators) defensive traits. Olfactory sense of termites is extremely well developed, they are highly sensitive to changes in light, temperature as well as humidity.

Based on habitat, termites can be grouped into different categories:

- **Subterranean termites;** live in soil and in wood that is in contact with soil (Figure 1).
- **Dry-wood termites;** live entirely in the wood, both nesting and feeding there.
- **Damp-wood termites;** live inside wood of varying levels of decay and moisture content.

Figure 1: Subterranean termite in natural habitat at Jazan, KSA.

Biology

A termite colony is usually founded by a pair of alates (winged), the primary reproductives, which produce all the nestmates. Inside termites complex society the individuals are morphologically, physiologically and behaviorally specialized into distinct castes (Workers, soldiers and reproductives). The queen lays about 3,000 eggs a day through her distended abdomen and may live up to 25 years. Workers and soldiers mature in a year and live up to 3–5 years. Foraging is usually performed by blind workers and the communication within individuals is mediated mainly by pheromones. Soldiers however, only defend the colony from intruders.

Most termite species build their own nests but few are obligatory inhabitants in other termite nest. A fully grown termite colony is acquired in approximately 4–5 years including 60,000 to 2,000,000 workers. Out of total individuals, the majority of termites are workers whereas soldiers comprise approximately 1–2% of total population. It may take 4–6 yrs for an incipient colony of subterranean termites like *Coptotermes formosanus* Shiraki to reach maturity (more than a million individuals) and produce alates. A colony of desert subterranean termite, *Heterotermes aureus* (Snyder) however, comprises as many as 300,000 individuals around structures in urban environments. They develop underground foraging galleries reaching up to 100 m, making detection and control difficult.

Distribution

Unwitting transport of termite infested material by human is the primary reason of termite expansion to nonendemic areas. Natural dispersal however, occurs slowly through the annual nuptial flights of alates. *C. formosanus* (Formosan subterranean termite), which is endemic to China and Taiwan, is reported to successfully spread to many temperate and subtropical regions. However, *Coptotermes gestroi* (Wasmann) (Asian subterranean termite), which is native to southeast Asia, has spread in many tropical regions.

Alates of *C. formosanus* generally swarm from April through June with average recorded alate flight 621m and the longest flight 1.3 km distant from the parent colony. The American Museum of Natural History contains over 80% specimens belonging to the world's termite species.

Economic Importance

The economic importance of termites is twofold, extremely beneficial and extremely injurious to man. These small creatures are a part of the natural ecosystem and contribute significantly to most of the world's ecosystems. Within tropical ecosystems, termites play a key role in modifying the biotic and abiotic environment. Those include major influence on soil chemical and physical structure, plant decomposition, nitrogen and carbon cycling and microbial activity. Their tunnelling efforts also help to ensure that soils are porous, contain nutrients, and are healthy enough to support plant growth.

Termites (only 10% of known species) cause great damage to agricultural and horticultural crops, agroforestry, stored timbers, books and records, woodworks in buildings and stored products containing cellulose. Exotic crops are more susceptible to damage than indigenous ones. Damage is more severe during droughts and dry season, compared to irrigated crops. In rain-fed crops the plants experience moisture stress which predisposes them to termite infestations. Though there are several ways in which the termites attack plants. Generally they made tunnels to the trees surface and built earthen runways on the surface (Figure 2) indicating that the tree had been infested.

Figure 2: Earthen runways of subterranean termites on live plants at Jazan, KSA.

The attack in most cases began from the root level and spread to the upper part. In older stem, the bark under lying tissue was eaten up gradually, reaching the pith hollowing out of the stem, resulting in the ultimate death of plant.

Termites activities also result in extensive damage to wood products and reduction of service life of timber structures (Figure 3). Building materials such as lumber, plywood, woodbased composites, paper, and textiles containing cotton are susceptible to their activity.

Figure 3. Heavy termite damage in commercial timber at Jazan, KSA.

According to United Nations Environment Program (UNEP) report, members of the following families are responsible for great losses in agriculture.

◎ Family	☉ Genus
Hodotermitidae	*Anacanthotermes, Hodotermes*
Kalotermitidae	*Neotermes*
Rhinotermitidae	*Coptotermes, Heterotermes, Psammotermes*
Termitidae	*Amitermes, Ancistrotermes, Cornitermes, Macrotermes, Microcerotermes, Microtermes, Odontotermes, Procornitermes, Syntermes*

One of the classical case of termite damage was reported from a Northern India town where termites ate through notes worth Rs. 10 million (about $222,000) stacked in a steel chest inside the State Bank of India. The bank was said to be housed in an old building infested with termites. In Taiwan a fatal train accident was reported when 100 years old oak tree, infested with termite, fallen upon. Investigating expert says that the hole in the tree was hidden from sight.

Economic losses associated with termite damage a year are around:

United States	1000 million US$
Japan	800 million US$
India	35.12 million US$
Malaysia	8–10 million US$
Globally	50 billion US$

Prevention and Control

- Avoid construction of granaries in places infested with termites or with a close proximity to termite mounds.
- Avoid plant stress caused by drought, as poorly drained soil favors termite attack.

Characterization of termite pest problem starts with identification of termite species, knowledge of basic biology and ecology of the species, and evaluation of the magnitude of the economic damage. Following types of management practices can be adopted.

Control / Management

- Chemical
- Cultural & Physical
- Biological
  - o Predators
  - o Botanicals
  - o Fungi
  - o Bacteria
  - o Nematodes

Chemical control

Traditional termite control method involves injecting hundreds of litres of synthetic insecticides to the soil or use of termite bait products containing insect growth regulators. These termiticides are broadly grouped as repellent and non-repellent. In the past, repellents were mainly used to protect wooden structures and buildings from termite attacks. Organochlorine, Organophosphate, Carbamate and Pyrethroid are categorized as repellents.

Termite management practices changed dramatically with the advent of newer molecules viz., Nenicotinoid (imidacloprid), Phenylpyrazole (fipronil), Pyrrole (chlorfenapyr), Oxadiazine (indoxacarb), Anthranilic diamide (chlorantraniliprole) etc. Majority of these compounds are of the slow acting and non-repellent type. The termites fail to detect these insecticides and continue to forage in the treated soil for longer period and carry lethal amount of the toxicant to be later transferred to their nest mates.

No doubt, indiscriminate use of pesticides has resulted in excessive environmental hazards. Due to the well understood and proven ill effects of synthetic pesticides on the environment, the United Nations Environment Program (UNEP) and the Food and Agriculture Organization (FAO) jointly made efforts to eliminate production and use of persistant organic pollutants. As a result, the focus on use of "greener" technologies increased tremendously.

Biological control

Termites have a wide variety of predators, both opportunist and specialist, vertebrate and invertebrate. Arthropod predators of termites include scorpions, spiders, centipedes, dragonflies, cockroaches, mantids, crickets, beetles, flies, ants and wasps. Of course ants are the greatest enemies of termites in all regions of the world. Vertebrate predators however, include reptiles, amphibians, birds and mammals like sloth bear, echidna, ant-eaters etc.

Potential use of entomopathogens has also been investigated. The first candidates evaluated for use in termite biological control were some bacteria. A few of them, responsible for termite mortality are mentioned below.

Bacillus thuringiensis, Serratia marcescens, Acinetobacter calcoaceticus, Aeromonas caviae, Alcaligenes latus, Arthrobacter

sp., Bacillus sp., *Chromobacterium* sp., *Corynebacterium urealyticum, Enterobacter gergoviae, Micrococcus, Neisseria, Rhizobium radiobacter and Pseudomonas fluorescens*.

Numerous fungal genera like *Baeuveria, Metarhizium, Paecilomyces, Termitaria, Neotermus, Metirolella, Laboulbenia, Antennopsis, Leboulbeniopsis* and *Coreomyceptosis* are parasitic to termites. *Metarhizium* causes "green muscardine" disease to its insect hosts, because of the green colour of its conidial cells. *Beauveria* however, causes "white muscardine" disease.

Entomopathogenic nematodes are important biocontrol agents for many insect populations. Two families, Steinernematidae (*Steinernema carpocapsae*) and Heterorhabditidae (*Heterorhabditis bacteriophora*) are obligate parasites of termites.

Plant derived pesticides deliver a potential alternative to highly hazardous synthetic pesticides for insect pest control. They can be derived by leaves, floral system, fruits or seeds, wood and/or roots. Over 2000 plants belonging to some 60 families are known to exhibit insecticidal activities. Some of the well-known botanical pesticides are Pyrithrin, Rotenone, Sabadella, Nicotine, Ryanodine etc. They work as insecticides, antifeedants, insect growth regulators (IGRs), repellents, attractants etc. Biologically active compounds, like Cnicin and Apiol, isolated from *Centaurea maculosa*, Asteraceae and *Ligusticum hultenii*, Apiaceae respectively, cause significant mortality to subterranean termites.

Cultural and Physical control

- As the removal of debris and mulches from the field reduces food supply of termites, field/orchards must be maintained clean, on the other end well decomposed farm yard manure be applied to the field.
- Termites mostly attack diseased and stressed plants and rarely healthy plants. The healthy plant growth must be sustained to avoid termite damage.
- In order to destroy the foraging tunnels deep summer ploughing is recommended. It also exposes the termites to desiccation and predators.
- Using sand and lahar aggregates in constructed areas is an alternative to non-chemical control method. It can be effectively used to prevent tunnelling and penetration of subterranean termites into wood structures. The installations of these barriers remain effective for an indefinite period of time against various species of termites. These methods offer a sustainable and environmentally friendly alternative but limited commercial applications of these techniques have been developed to date.

Inherent problems in termite management

- ❖ Termites are always hidden in galleries and nests.
- ❖ Termites are known to cordon off or block the contaminated/treated area.
- ❖ Termites are known to bury the diseased individuals or carry them out of their nests, or sometimes to eat away the dead ones.
- ❖ Termites are also known to produce certain antibiotics which allow only their beneficial fungi to grow in their colonies.

Conclusions

Optimal termite management still remains a challenge and depends widely on the type of termiticides available, soil type, cropping system, expertise available, type of structure/building and economics of the procedure. While developing a management strategy, the usefulness of termites must be kept in mind. They are the best decomposers and nutrient recyclers of dead plant material, and an indispensible member of the food chain. Termite control is a herculean task and their complete elimination or prevention in cropped areas is neither feasible nor advisible.

Photo credit: Author

PRIORITY CONSERVATION OF WETLANDS HABITATS FOR THE BIRD REFUGE IN THE YUCATAN PENINSULA, MEXICO

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The loss of biological diversity is a global environmental problem and among the anthropogenic factors responsible for this are pollution, trafficking, illegal hunting and the fragmentation and deforestation of prime habitats. These factors have been causing many species of birds to be placed under the categories of high conservation risk or extinction. In Mexico, during the last few decades the disappearance of key avian species has increased and has continued exponentially. The Mexican Section of the International Council for Bird Preservation (CIPAMEX) and the BirdLife International proposed Important Bird and Biodiversity Areas (IBAs) for the conservation of birds. In Mexico, there are 243 IBAs, where 94.53% of the avian population of the country can be observed; including 97.29% of current avian species placed under some risk categories according to NOM-059-SEMARNAT.

Among the prime areas for bird conservation include local wetlands that provide shelter, food and breeding areas for various indigenous as well as different migratory species. Mexico has a total of 142 Ramsar sites (wetland site designated to be of international importance under the Ramsar Convention, https://www.ramsar.org/) equivalent to a total of 8,657,057 hectares), which are of significant international importance for global bird conservation initiative. Ramsar sites have historically been winter refuge habitats for migratory birds in North America (CONABIO, 2008). Furthermore, Mexico is internationally recognized as one of the five countries with the largest mangrove

area, and is also classified as coastal habitats for local birds. In the case of the Yucatan Peninsula, there are a total of 17 IBAs and 23 natural protected areas (NPAs). However, some wildlife refuges at the same time represent IBAs or NPAs; as in the case of the Calakmul Biosphere Reserve, Petenes Biosphere Reserve, Alacranes Reef, Ría Lagarto and Sian Ka'an, etc. These IBAS or NPAs have different types of vegetation, such as low deciduous forests, medium stature tropical forests, low inundated tropical forests, savanna grasslands, coastal dunes, mangroves, Typha-swamp vegetation, and petenes, etc. The Yucatan peninsula is recognized as one of the globally important biogeographical areas with rich diversity of vegetation and endemic bird species. It also represents an important area of transition for Nearctic migratory species. Therefore, it is an area with an extensive biodiversity of ecosystems for tropical bird species.

Among the areas with a high diversity of bird species in the Yucatan Peninsula, are the local wetlands (recognized nationally and internationally as important conservation areas for biodiversity) that serve as prime nesting and breeding habitats for many bird species. However, these habitats are threatened or degraded by various human activities such as agriculture, livestock management, rapid urbanization and unregulated tourism. The presence of birds in wetlands is closely related to the health of ecosystems due to their high ecological sensitivity, being natural indicators of disturbance. Hence it is important to protect and conserve these unique habitats to conserve the unique natural biodiversity including avian diversity of the country many birds serve as flag ship species; hence their well being are good indicators of the general health of these fragile ecosystems. ***Photo credit***: **Authors**

FINLAND, A ROLE MODEL FOR BIODIVERSITY CONSERVATION AND NATURAL ENVIRONMENTAL PROTECTION

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Dynamic relationship between biotic and abiotic components of the ecosystem is very critical for the existence of life on earth. Biodiversity is thus a key feature of the blue planet earth for the survival of the species and for ecosystem functioning. But overexploitation of the biodiversity is a major concern of the modern society. It is believed that currently we are facing sixth mass extinction of species on earth mainly because of human activity. The major reason for decline in earths biodiversity are loss of habitat, release of toxic chemicals, pollutants, greenhouse gases in to the environment resulting in global warming and climate change which leads to decline in ecosystem functioning. Many countries in asia, african, south america, north america, and europeare facing biodiversity loss. Thus, biodiversity conservation is urgently needed to protect and maintain in order to safeguard the conditions for the survival of species. The main aim of this article is to create environmental awareness among individuals on current environmental issues faced by many countries in the world especially India.

Finland is a great example and a role model for many countries in the world because of their potential environmental protection policies and biodiversity conservation strategies. Finland is a Nordic county in northern Europe with an area 338, 424 km2 and sharing the border with Norway to the north, Sweden to the northwest and Russia to the east surrounded by Baltic sea, gulf of Bothnian, and Gulf of Finland.

The population of the country is 5.52 million (1), speaks Finnish and the national bird is whooper swan. Finland is the 8th largest country in Europe and it is one of the worlds healthiest and wealthiest country. Finland lies in boreal coniferous forest zone, characterized by warm summers and freezing longest winters season. The country is dominated by 179, 000 islands and 188, 000 lakes which give the country the name of land of the thousand lakes. Finland host approximately 45, 000 species of animals and plants, representing 29% of the total species described for Europe and 3% of the species in the world. Brown bear, grey wolf, Eurasian lynx wolverine, elk, beavers and endangered species Saimaa ringed seal found in the country. Finland's biodiversity is well documented because of high quality research by scientists and work of many keen amateur naturalists.

Finland has been rated among the world's leading countries in many international comparisons of environmental protection and conservation standards and Finland's potential strength in implementing highly effective environmental administration and legislation, and the ways environmental conservation is considered in all sectors of the society. Finland offers environmental outdoor education including social skills, experimental, hands on learning, and experience based. Developing a good relationship with nature is the first key step towards sustainable way of life.In Finland day care centers and schools play important role insustainable development. The experience that children and young generation have with the nature are linked with environmentally responsible behavior. When it is established in childhood, a potential positive relationship with nature affects environmentally responsible behavior also as an adult (3). This is why day care centers and schools in Finland provide environmental education in a natural environment and also schools in Finland are quite close to forest to promote health and well-being of children and young people. Thus, every

individual Finnish citizen plays key role in environment conservation and prtection.

The Finnish ecosystems face multiple different threats mostly caused by human activity. Lakes for example face problems with eutrification and acidity when excess nutrients and chemicals from different drainige basins reach the waters. Forests on the other hand are threatened by excessive forestry, intensive land use and the trenching of swamps. Finland has successfully tackled these problems by setting strict legislations on the fertilizers used by farmers, prohibiting farming too close to bodys of water, setting sustainability standards on forestry and fishing and campaigning foreconomical actions in general.The forests are the biggest concern as 36 % of the endangered species in Finland live in the forests.

Finland is working hard to reach the goal set by the United Nations of protecting 17 % of the country's forests. Finland is also committed to conservative and sustainable use of biodiversity especially maintaining the good state of rivers, lakes, ground water reservoir and Baltic sea.Many polluted lakes and rivers have been cleaned up, emissions from large industries have been curbed significantly and much efforts have been made in controlling emissions from agriculture, transport, industries and homes. Water quality is very excellent across 80% of the total area of Finland's lakes and rivers. Lakes near the industrial facilities are cleaner. Various international environmental agreements and development of cleaner fuels and great emission cleaning technologies in Finland contributed extensively to the cleaner environment specially in reducing soil acidification by nitrogen (NOx), Sulphur (SO2) and ammonia, and reducing the release of toxic chemicals to the environment including hazardous substances.

Population growth plays a key role in environmental sustainability. Increase in population leads to deforestation, industrialization, urbanization etc., all these causes negative impact and presure on environment. Thus, controlling population e xplosion is very critical to countries like India in maintaining sustainable environment.India ranks eighth among top ten biodiversity countries in the world because of its species richness especially in reptiles and birds. Butsecond most populated and one of the most polluted country in the world. Population explosion, air pollution, poor management of waste, drinking water scarcity, falling ground water table, water pollution, soil pollution, biodiversity loss, man-wild life conflict, climate change, drought, natural disaster are the major environmental problems in India. Although, India is having very impressive environmental regulations focused on biodiversity conservation and environmental protection. The real question is are these regulations functioning properly in India? is every citizen of India aware of these regulations? How Indian people behave and interact with the mother nature? All the sectors/components of the society are concerned with ecosystemimbalence?

Thus, predict risks and prevent damages before any serious threat to the earth's ecosystem is necessary. Country like India should implement and include Finlands biodiversity conservationand environmental protection strategies to protect and conserve countries rich biodiversity.

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GREEN AND CLEAN ENVIRONMENT AWARENESS

Plantation by
Shailvi Tiwari
Class III
DPS School, Gwalior
Madhya Pradesh

APPEAL TO LIFE MEMBERS

NESA Life Members are requested to submit short articles for the NESA e-Newsletter that are consistent with NESA's objectives to improve environment. The articles should focus on topics related to environment and facilitate communication and discussion among researchers, academicians and students. The articles for September edition can be submitted to nesapublications@gmail.com before **25th August, 2019**.

Dr. R.S.S. Tomar
Editor, NESA E-newsletter

From the Editor's

Dear Readers,

I wish my warm, heartiest and patriotic wishes on the glory of 71st anniversary and 72nd Independence Day and greetings on auspicious occasion of Raksha Bandhan.

In August issue, we recount the various projects and popular articles on Processed products from fruits and vegetables for empowerment of rural women; Environment friendly management of subterranean termites; priority conservation of wetlands habitats for the bird refuge in the Yucatan Peninsula, Mexico; Finland, a role model for biodiversity conservation and natural environmental protection. This issue also includes seven Annual awards by Academy for its members actively involved in their field or events and activities organised by the Academy. Furthermore, NESA is well known for the hard work, dedication and motive for its environmental awareness activities.

I humbly request to all the members of the Academy to please plant atleast a single tree on his/her birthday or any member of the family, friends and relatives and share the memorable pictures with us. We would like to include in our Newsletter and it will serve as an inspiration and motivation to many for making our Planet with the motto "Green and Clean Environment".

Once again, I express sincere and huge thank to all the persons who contributed writing the wonderful and inspiring articles, without which there wouldn't have been this newsletter issue. Please continue sharing such articles and share with your friends also.

I would like to thank President and General Secretary, NESA, New Delhi, and the Editorial team including Print, Designer and Publication committee for their nonstop support and efforts throughout this edition.

Hope this edition makes an interesting read. Please feel free to offer any suggestions for improvement.

Dr. R. S. Tomar
Editor-in-Chief

Dr. Sushma Tiwari
Associate Editor

3rd Global Meet
Science and Technology for Ensuring Food and Nutritional Security (GMST 2019)

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