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" Living through Economic Crisis"



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Editorial Brief

Economic crisis, inflation, devaluation of the rupee, food crisis, etc. are common words to all Sri Lankans and various definitions and explanations made it complex to understand. Living through complex situation which any ordinary citizen didn't understand the size and shape might be puzzling. Skyrocketing the prices of essentials, unavailability or none availability of gasoline, cooking gas, and especially medicine are common experiences to rich and poor. Further, UN and other international organizations, donors, and foreign governments are expressing their support to manage the crisis of essentials. In contrast, collapsed political landscape of the country fueling the issue and directing the nation toward its worst ever status. So, what is our duty, responsibility and accountability as a national university? AFQ magazine, the Department of Agribusiness Management's publication arm willing to provide a platform to academics, researchers, undergraduates, and policymakers to share their views, experiences and management measures on living through the economic crisis. Our effort, is strengthen with large number of communications

from academia, students and policymakers. This is not the beginning or end, systems need to explore, evolved and build to overcome the challenges we have today. This dialog will facilitate the most essential need of the nation.

Further, I wish to appreciate the great efforts of Ms. Sulochana Senevirathne for compiling the valuable issue which enriched with expert communications as well as provided space for the youth too. Very special thanks go to all contributors for their insightful communications. Finally, we all must appreciate and express our gratitude to Mr. Indika Bandara for his dedicated contribution on design of the magazine, an assortment of communications links us with the world.

Lessons learned will help us to stay strong, manage the crisis, and innovate solutions!

Prof. Achini De Silva
Editor

Living through Economic Crisis

Economic and Social Costs of Corruption



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What is corruption?

Amongst many definitions, one simple way to define corruption is *the abuse of entrusted power for private gains by political leaders, or public officials*. It is a form of dishonesty or criminal activity undertaken by a person or organization to acquire illicit benefits. Forms of corruption vary, but include bribery, extortion, cronyism, nepotism, parochialism, patronage, influence peddling, graft, and embezzlement. Corruption occurs in both the public and private sectors and media personnel and civil society actors can also be involved in corruption. Actors can be individuals, companies, or organisations such as a political party.

Sometimes the 'advantage' gained through corruption may not be 'undue' or clear-cut, but is nonetheless an advantage. For example, in some highly corrupt societies, people can only secure access to public health or education if they pay bribes. In this example, the bribe-giver's 'benefit' is merely his or her rightful due but without the bribe the public cannot exercise that right. The bribe-takers receive an advantage for carrying out functions that are anyway their duty. School admission is a clear example in Sri Lankan context where, those who can afford to pay have an advantage over others to get admissions in a few popular schools in the country. Here the bribe-taker's actions prevent the rightful students getting admitted to the nearest schools.

Types of Corruption

There are many different types of corruption. One useful way to classify corruption is to consider 'grand' and 'petty' or 'administrative' corruption. Grand corruption typically takes place at the public sphere's top tiers, and within the highest levels in private businesses. The well-known central Bank Bond Scam is an example of grand corruption. Grand corruptions are the acts by elite persons in the society who either make laws or responsible for implementing rules, policies and executive decisions. It often involves large sums of money. Grand corruption is also often called political corruption, highlighting the direct or indirect involvement of political leaders in such corruption. Grand corruption can also be acts of large private corporations. One good example is Volkswagen's violation of emission reductions rules.

Petty or administrative corruption is small-scale, everyday corruption at the interface between public institutes and citizens. The petty corruption is the bribery linked to the implementation of existing laws, rules and regulations. For example, public servants deliver services, only if they receive a private payment that is in addition to the institutionalized official price for this service. There are many examples of petty corruption in Sri Lanka. Bribery paid to get the house construction plans approved, to obtain the timber transport permits, to get school admissions, route permit for private bus, the driver's license, avoid

the delays in pension payments initiation are only few examples of a widespread petty corruption. Usually, modest sums of money change hands in each case. However, when petty corruption is widespread, it can create many inefficiencies, public nuisance and even discourage foreign investments in a country. Even if the payments are modest in petty corruption, the poor can be disproportionately affected by petty corruption.

Impact of Corruption on the Economy

Apart from the ethical and moral considerations, why should one be worried about corruption? Generally, corruption undermines economic development and threatens state security. It also undermines democratic values. UN member states acknowledged the threat of corruption to the development process and have included Goal 16 into the 2030 Agenda for Sustainable Development – calling on states to ‘substantially reduce corruption in all their forms.’ While this signifies the importance of reducing corruption, one may still argue that if the corrupt gains are being circulated within the economy, it may not affect economic growth in a country and it will only have distributional implications. Most often the corrupt gains may be circulating within the economy in petty corruption but in grand corruption, very often, ill-gained money flows out of the economy. There are proven cases such as Ferdinand Marcos in Philippines and many claim about Sri Lankan politicians syphoning ill-gained money to Dubai, Seashells and Uganda. Following are some economic and social impacts of corruption.

Public Spending on Wrong Projects

Priority in allocation of government or borrowed funds should be given to high development impact and quick return projects. Politicians distort the order of public spending, disregarding economic principles applied to prioritize projects and allocate budgets for activities that lead to larger bribes. Corrupt politicians’ love for some large infrastructure developments, such as roads, power plants, harbors, etc. are because of opportunities for larger bribes or personal political gains. The Lotus Tower, The Magam Ruhunupura International Convention Centre, the Mattala Rajapaksa International Airport, the Hambantota International Port, the Mahinda Rajapaksa International Cricket Stadium and the myriad of wide highways in the Southern Province are living examples of such worthless projects.

Amongst the many impacts of this practice, countries will experience debt traps such as the one we experience in Sri Lanka now due to inefficient allocation of borrowed funds prioritizing bribes and other political considerations, not the timeliness and the magnitude of the benefits. Such projects do not generate benefits even at a slow rate. Thus, the tax revenue attributed to these projects is not sufficient to repay the loans. Moreover, borrowing from more expensive commercial sources to avoid checks and balances of conventional donors like World Bank and Asian Development Bank exacerbate the debt crises. The current debt crisis which eventually led Sri Lanka to suspend the debt repayment is mainly due to borrowing from more expensive commercial sources and corrupt practice of allocation of borrowed resources for slow return or no return projects

Excessive Costs of Infrastructure

Grand corruption leads to higher cost for infrastructure development. It seems that escalated cost of a project allows collusion between contracting companies and politicians and top bureaucrats (P&TB) so that contractors gain excess profits even after paying bribes. This is win-win situation for contractors and the P&TB. The Central Highway segment between Rambukkana to Galagedara will illustrate the gravity of corruption and its economic implications. Based on the publicly available data on the per km costs of highways of ADB funded project in 15 countries, average of the cost of 33 projects was \$1.63 million per km with the range of \$0.94- 6.96 million. Some of the low values in the ADB project sample are because of two lane roads. The highest cost was recorded from a Sri Lankan Southern Highway Project (STDP) and my comparisons is based on the cost of STDP. Based on the contract value of \$1870¹ million, the proposed highway segment will cost \$93.5 million per Km. Compared to the STDP’s cost of 6,96 per Km, this road segment costs about 13.4 times. Even with the lower bid of \$1050 million, which was apparently rejected, per km cost is \$52.5 per Km. This difference cannot be explained by using higher resettlement cost or any technical reason like elevated highway and tunnels. Only logical reason is corruption.

Poor Quality Infrastructure

Higher costs of infrastructure can also be manifested in terms of poor-quality infrastructures. P&TB influence competitive bidding process, and contracts

¹ Based on an article in Sunday Times

are awarded to less qualified companies to receive bribes. Poor quality infrastructure, with huge maintenance cost and frequent repairs, is the end result.

Long Delays of Projects

Bidding process is sometimes delayed for years until the P&TB cut a lucrative deal from the contractor. There are reasonable suspicions that the delay in awarding contract for proposed gas fired power plant in Sri Lanka during the Yahapalanaya regime is due to the two topmost politicians favoring two different companies, no one having enough power to override the other. The end result is the delay in constructing the power plant and purchase of power with excessive costs. Sri Lanka was the only country in South Asia which got rid of power cuts. Now the power cuts are back. The current power cuts are due to this delay plus dollar shortage to import fuel. Power cuts affect every sector in the economy and ramification of this, in terms of Sri Lanka's appeal for much needed foreign direct investments, tourism, industry and agriculture, is enormous.

Good Project May Never Get Implemented

Some development projects with good development impacts are never implemented because of failure to agree on the bribe. Often, this happens when the P&TB requests a bribe that is too big given the project costs. Imagine a fish processing project that costs about \$ 100 million and requested bribe \$50 million for approving it. With this 50% cost escalation, the investing company cannot compete in the international market. The private investor who already spent couple of millions of dollars for feasibility studies had no option other than giving up the project. The country loses the opportunity to implement a good investment project that would have generated sizable employment.

Discourage Foreign Investments

Grand corruption discourages or even prevents foreign direct investments (FDI). Simply when the imposed bribes are so large, private companies cannot make a reasonable profit. Therefore, private investors avoid highly corrupt countries. In this era of global integration together with advanced information technology stories about corruption spread amongst potential investors very fast. Corruption indices of international development agencies such as World Bank confirms such high level of corruption in Sri Lanka. It is worthwhile to undertake a detail study as to why Sri Lanka failed to attract FDI despite comprehensive incentive package of Board of Investment. One of the obvious reasons for low FDI in

Sri Lanka may be that larger bribes unaffordable to investors. Even the conventional donors hesitate to work in highly corrupt countries. Once there was an attempt by JICA to finance a segment of the central highway. JICA wanted to have a clause in the loan agreement to the effect that if there are accusations of attempt of corruption in this project, it has the right to suspend or cancel the project. The government did not agree on this clause citing that it violates the sovereign rights of the country. The sovereign rights to play out public money !!!

Life Risks

When people cannot get access to healthcare, clean water, and safe places to live without paying bribes, their lives are at risk. Corruption in approving buildings eventually resulted in collapse of them killing many workers, for example in Bangladesh. In Nepal many buildings which had construction permits that certify as earthquake proofed, collapsed during the earthquake in 2015. These are good examples as to how the corruption put people's lives at risk.

Non-financial costs

Corruption has more than just financial and economic costs. It reduces public trust and citizens' willingness to participate in society. For example, citizens who perceive politicians as corrupt may not bother to vote in elections, get engaged in politics, or pay taxes. Revelation on corruption by the telephone records released by a former member of parliament had a highly significant impact amongst the public in Sri Lanka. At this extremely difficult time, where foreign remittance has been depleted, expatriate workers refuse to send money through official channels, initially due to lucrative black market and after floating the Rupee due to perception on corruption.

Perpetuates Inequality

As found in many countries, poor people suffer disproportionately from corruption. In middle income households, petty bribes to access a government service can cut deep into a family's disposable income. When access to good quality education is only limited to non-poor, poor peoples' only chance to improve their lives will be lost. In countries where corruption is widespread in getting access to health, education and other basic services can have long term negative impacts on economic growth.

Nurture Organized Crimes

Corruption is often linked to organized crimes. It thrives in conflict and war. High levels of corruption can make prolonged conflict more likely, and push post-conflict societies back into war. Wide-spread drug problem continues all over the world mainly because of collusion of law enforcement agency officials and political leaderships with organized crime syndicates.

Promote Environmental Degradation

Corruption can also undermine climate change and other environmental management initiatives, as powerful actors bribe their way out of environmental responsibilities in pursuit of profits. Moreover, corruption undermines the responsible management of natural resource. Depletion of forest resources despite heavy regulatory measures in Sri Lanka is a good example.

The Way Forward

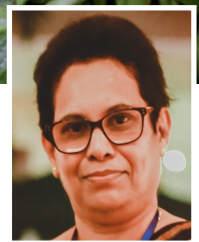
Corruption, which could derail entire development process, is a major challenge for Sri Lanka. In a broader sense, corruption is a characteristic of underdevelopment and many types of corruption disappear when countries develop. Unfortunately, corruption can also be a major constraint for development. Corruption, among other factors, has contributed significantly to the current economic crisis in the country. Sri Lanka faces the urgent need to undertake reforms to curb corruption to put the country to a sustainable path of economic growth. While there is a need to take vast array of measures to reduce corruption, which is well entrenched across all the layers in the Sri Lankan society, some quick and less cumbersome measures can be taken immediately. First, the electoral reforms to conduct presidential, parliament and provincial council elections in one day can reduce demand for grand corruption by politicians substantially. Second, the old, irrelevant and corruption enabling permit systems and regulations can be removed. Third, incentive structure of the SOEs should be studied and performance based incentives should be initially provided to the management. In the long run, all the public servants and politicians should be provided with reasonable salaries to ensure decent living. In order to achieve that, an efficient public sector with reasonable number of employees, commensurate to the size of the economy, should be maintained. The current practice of producing unemployable graduates from the public universities and dumping them in

the public services with low salaries should be stopped. Forth, the positive steps of providing right incentives should be complemented with better law enforcement. Ending the impunity enjoyed by the political leaders is the urgent and immediate need towards this end. Fifth, use of the information technology, which provides many more co-benefits should be given priority to curb corruption particularly in tax collection.





Economic Crisis and Food Inflation in Sri Lanka: A Research Agenda for Budding Agricultural Economists



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01. *Economic Crisis in Sri Lanka in 2022*

Sri Lanka is faced with the worst economic crisis since its independence in 1948. The macroeconomic conditions of the country, which have been deteriorating over time, culminated in a full-blown crisis in the aftermath of the Covid-2019 pandemic (Table 1) resulting in widespread shortages of essential food, fuel and medical supplies. The government’s reaction to the crisis not only is less effective but also in some instances contributed to aggravating the situation. The floating of the exchange rate and excessive money printing are examples of the latter. As the economic crisis extended into a political, social and humanitarian crisis, the government declared a ‘soft default’ of its international debt servicing in April 2022 (BBC, 2022), and requested a bailout from the International Monetary Fund (IMF). Discussions with the IMF are in progress at the moment.



Table 1: Macroeconomic indicators

	2014	2015	2016	2017	2018	2019	2020	2021
Government Revenue and grants (LKR billion) ^a	1204 (11.6)	1461 (14.2)	1694 (15.1)	1840 (14.7)	1932 (14.4)	1898 (13.6)	1357 (9.8)	1403 (9.1)
Tax revenue (LKR billion) ^a	1,050 (12.4)	1,356 (13.0)	1,464 (12.9)	1,671 (13.2)	1,712 (12.6)	1,735 (12.2)	1,217 (8.5)	1,298 (8.0)
Government Expenditure (LKR billion) ^a	1796 (17.3)	2290 (21.8)	2334 (20.4)	2573 (20.2)	2693 (19.7)	3338 (23.2)	3040 (20.9)	3521 (21.3)
Budget deficit (LKR billion) ^a	- 591 (5.7)	- 830 (7.6)	-640 (5.3)	- 733 (5.5)	- 761 (5.3)	-1,439 (9.6)	-1,668 (11.1)	2,058 (12.2)
Government debt (LKR billion) ^a	7,487 (72.3)	8,599 (78.5)	9,479 (79.0)	10,383 (77.9)	12,030 (84.2)	13,032 (86.9)	15,117 (100.6)	17,589 (104.6)
Remittances (US\$ billion) ^b	7.04	7.00	7.26	7.19	7.04	6.75	7.14	5.49
International Tourism receipts (US\$ billion) ^b	3.28	3.98	4.59	5.08	5.61	4.66	1.08	-
Imports (US\$ million) ^a	19.42	18.94	19.18	20.98	22.23	19.94	16.06	20.64
Exports (US\$ billion) ^a	11.13	10.55	10.31	11.36	11.89	11.94	10.05	12.50
Current Account deficit (US\$ billion) ^a	-1.99	-1.88	-1.74	-2.31	-2.79	-1.84	-1.18	-3.34
Gross official reserves (US\$ billion) ^a	8.21	7.30	6.02	7.96	6.92	7.65	5.66	3.1

Source: a: Central Bank Annual Report-, 2021; b: World Bank, 2022

The share as a percentage of GDP is given in parentheses

The macroeconomic shocks described above have been adversely impacting the performance of all sub-sectors of the economy of Sri Lanka, and the agriculture sector is no exception. The agriculture sector, however, suffers further owing to the stringent measures implemented by the government to make its agriculture systems toxin-free. Among them, the regulation imposed on chemical fertilizer imports has grabbed wide attention due to the potential harm it could create. Sri Lanka is a net-fertilizer importer and until May 2021, the government policy was to provide Urea, MOP and TSP to small-holder paddy farmers at subsidized rates. The Gazette No. 2226/48 of May 6, 2021, banned the importation of chemical fertilizers, and the subsidy was directed to organic fertilizers. Due to heavy protests by the farming community, the import ban was lifted in November 2021 and the subsidy on fertilizers was reinstated in March 2022. However, as shown in Figure 1, while the government of Sri Lanka was experimenting with different fertilizer policies, fertilizer prices in the world market rose sharply partly due to the supply disruptions and increase in prices of natural gases due to the Ukraine-Russia war (IFPRI, 2022). This resulted in shrinking opportunities to import fertilizers even after the removal of the ban and escalation of fertilizer prices to an unbearable level for small-holder farmers.

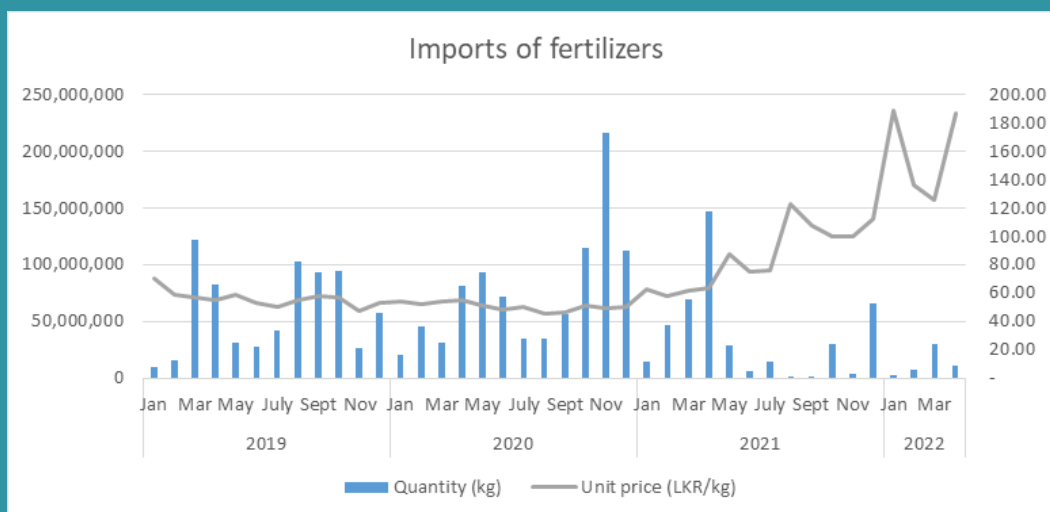


Figure 1: Imports and retail prices of Fertilizer to Sri Lanka
 Source: Sri Lanka Customs, 2022

Adding to the crisis, signs of a global food crisis emerge (FAO (a),2022). The world market prices of food items, wheat, in particular, have been rising (Figure 2) mainly owing to disruptions created by the Russia-Ukraine war, making net importing countries vulnerable. The response of some of the large suppliers of wheat and fertilizer to the crisis is to impose export bans or place restrictions on exports (e.g. India). These trade restrictions have further driven up food prices on the world market.

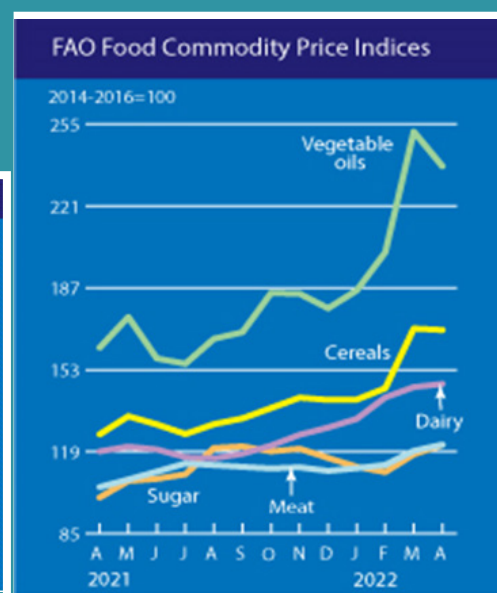
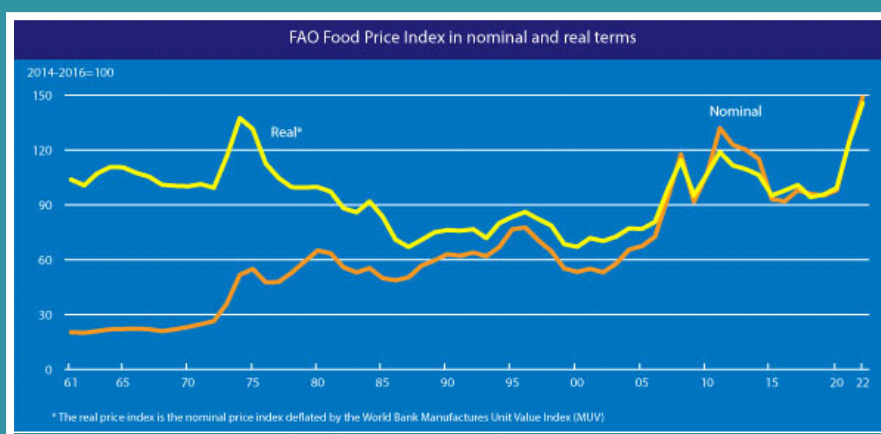


Figure 2: Movement of FAO Food Price Index and FAO Food Commodity Price Indices
 Source: FAO (b), 2022

From among the diverse effects of multiple crises, this article focuses on soaring food prices and their likely effects on the nutritional well-being of the poor and the vulnerable of Sri Lanka. It concludes with some implications for research.

02. *Effects of Economic Crisis on Food Prices*

Food prices are sensitive to changes in determinants of demand and supply of food. Government price policies also affect food prices. For tradable commodities, price levels are determined directly by world market prices, border policies of the governments of trading partners, freight costs and exchange rates (Huh & Park, 2013). Both import taxes imposed by importing countries and export taxes imposed by exporting countries increase the domestic price levels of an importing country for an importable. For non-tradable commodities, prices are determined by domestic supply-side factors such as input prices and technologies, and domestic demand-side factors such as prices of substitutes, income, tastes and preferences. Of domestic price interventions, price ceiling regulations help lower price levels while floor price regulations make price levels higher. Taxes increase consumer prices and lower producer prices allowing the government to earn revenue. Subsidies decrease consumer prices and increase producer prices, incurring a cost to the government.

As for Sri Lanka, the government's move to a floating exchange rate regime in March 2022 led to increased price levels across the importable food sector. The depreciation of the national currency (Figure 3) led to an increase in fuel and gas prices which ultimately increased the costs for harvesting, processing and the transfer cost of transporting the product to the market. The price levels in different markets however changed at different rates. The following section describes some of the key factors that contributed to the price increase of selected commodities.

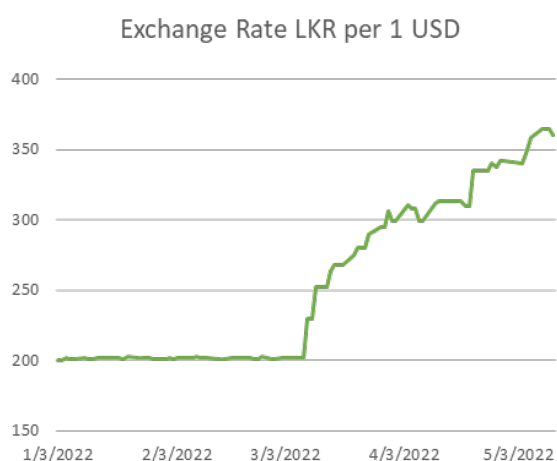


Figure 3: Movement of Exchange rate in Sri Lanka
Source: Central Bank of Sri Lanka, 2022

Paddy and rice market: As for local production, the 2021/2022 Maha harvest of paddy decreased by over 50% due to the shortfall of chemical fertilizer for the cultivation (). Consequently, the price of some rice varieties increased by 80% within one year (Figure 4).

Wheat flour: Sri Lanka imports the entire requirement of wheat flour, and prices have increased by 140% over a year due to the price increase in the world market, increase in freight costs and the depreciation of the Rupee (FAO (c),2022).

Maize: The maize yield in the 2021/2022 Maha season was reduced by 65% again due to the unavailability of chemical fertilizers.

Egg and chicken market: Due to the import ban on maize and shortage of fertilizer in the market, the animal feed industry has hit hard. Increased feed cost has compelled small-scale producers to exit the market, and resulted in a drop in supply and an increase in prices of eggs and chicken (Asian AgBiz, 2022).

Other importable food items: The price increase in the world market and the national currency depreciation have contributed to the price increase of imported food items such as powdered milk, processed milk products, potato and lentil. Import restrictions placed on food commodities, such as green gram, cowpea, powdered milk, yoghurt, and orange, to discourage import also added to the retail price surge of imported food commodities.

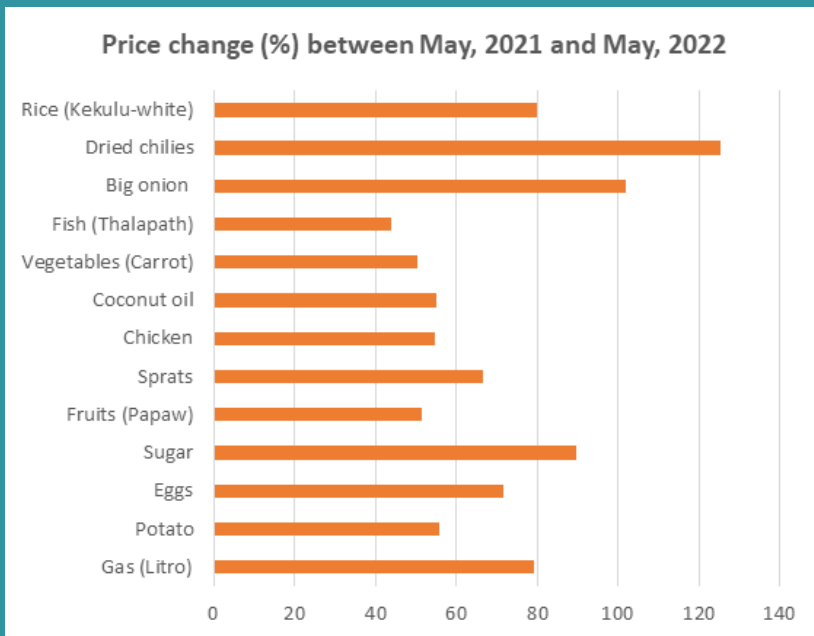


Figure 4: Percentage Change in price levels – May 2021 to May 2022
 Source: Department of Census and Statistics, 2022

The government of Sri Lanka attempted to keep prices of essential food items low for consumers through price ceilings until late 2021. This lowered the margin of traders and led to a shortage of these products in the retail market. To address the scarcity, the government declared an economic emergency at the end of August 2021. This unusual market intervention was proved ineffective, and thus the government removed all price controls on food in November 2021 (Central Bank, 2022). However, again in May 2022, the Government declared a maximum retail price for locally produced rice.

Owing to the above shocks, the general prices of food have increased in Sri Lanka by 57.4% in May 2022 compared to price levels that prevailed in May 2021 (Figure 5). The price of the main staple food of Sri Lankans, rice, increased by 73%-89% over a year. The prices of bread and powdered milk were more than doubled, and the prices of chicken and eggs have also increased by 55% and 72%, respectively.

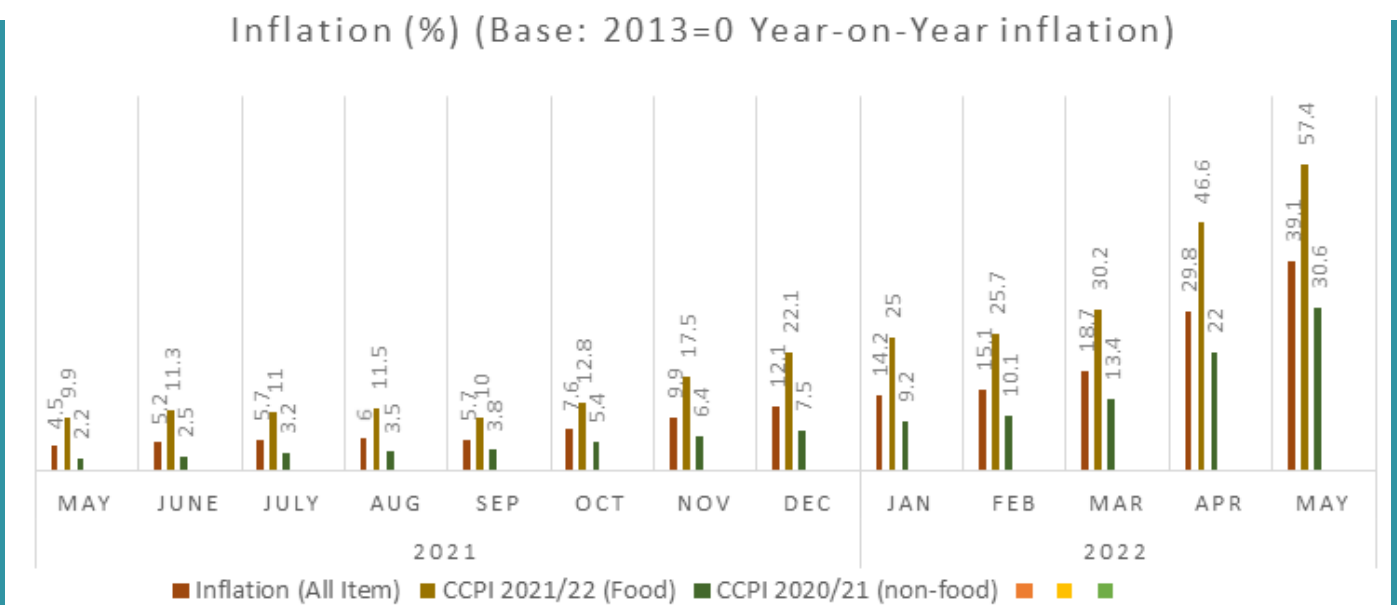


Figure 5: Movement of CCPI, food and non-food
 Source: Department of Census and Statistics, 2022

03. Likely effects of soaring food prices on food consumption

Food prices are key determinants of economic access to food. Increasing food prices lower the purchasing power and limits economic access to food. The escalation of food prices, for which the household heavily relies for their nutritional requirements, creates a greater impact on the food and nutrition security of people (Figure 6).

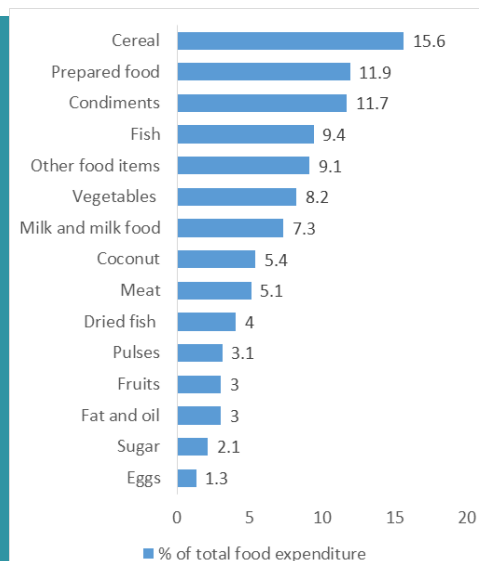


Figure 6: Expenditure on different food items as a fraction of total food expenditure

Source: DCS, 2019.

In response to price surges, households adopt several coping strategies which might or might not have nutritional implications. To smooth the food consumption, income earners tend to work longer hours (Ortiz et al, 2011), grow local foods in home gardens, or in extreme situations tend to engage in socially unacceptable activities such as begging and prostitution (Monlar, 2009). Households with higher incomes tend to adjust their non-food expenditure to channel extra money to fulfil the nutrient requirements. This includes cutting down the expenditure on entertainment activities. However, both the urban and the rural poor in Sri Lanka who are already constrained in terms of assets as well as money find it difficult to adjust their non-food expenditure in response to price hikes. As Figure 7 depicts, estate residents spend closer to 50% of their total expenditure on food. Taking money from non-food expenditures will leave them without access to basic non-food requirements, such as transport, health and education. During the 2008/09 global food crisis poorer communities in Sri Lanka borrowed from informal sources, turned to friends and relatives for food needs, shifted to locally available inexpensive food items, curtailed portion sizes, reduced the frequency of food consumption, changed the allocation of food within the households or changed their diets (Kodithuwakku & Weerahewa, 2011). If food prices further increase abruptly, the economic crisis may also lead to a food crisis where the change in food consumption could lead to a sharp increase in hunger and malnutrition (Timmer, 2010).

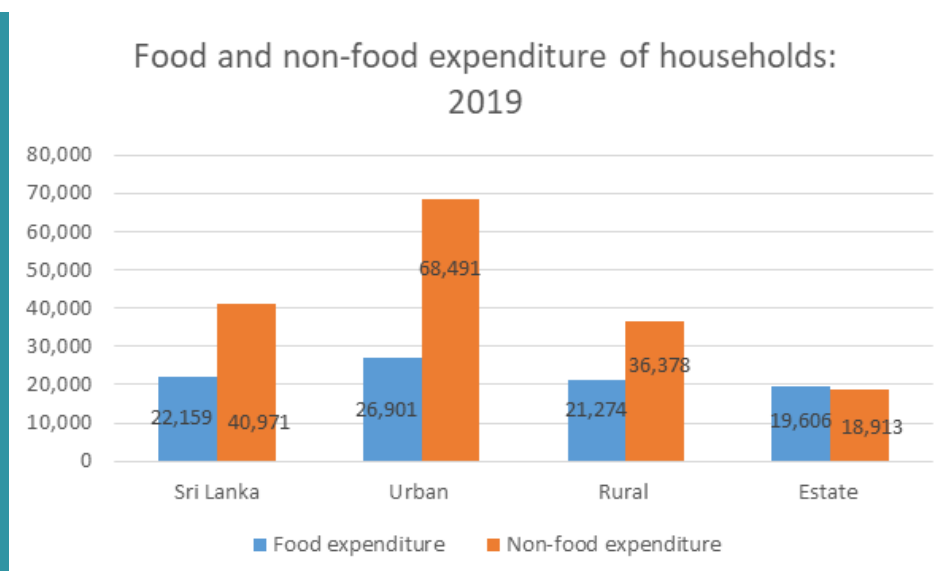


Figure 7: Household expenditure (LKR) and share of food and non-food expenditure
Source: Household Expenditure and Income Survey, 2019. Department of Census and Statistics.

Food price elasticities determine the extent of curtailing of food frequency or the portion sizes and the substitutions between commodities. Price elasticity of meat, fish, milk and vegetables is generally higher than cereals indicating that consumers tend to move towards cereal-based diets away from nutrition-rich meat, fish and vegetable diets (D'Souza & Jolliffe, 2012) Previous research done in Sri Lanka also indicates consumers reduce the consumption of rice, vegetables, fish, and powdered milk or they substitute consumption of rice with jak fruit, cassava, breadfruit due to price hikes (Kodithuwakku & Weerahewa, 2011). Trading off quality for quantity in response to food price hikes has also been evident. These changes in consumption can have short-term as well as long-term effects on many cohorts of society. Specifically, the nutrition security of preschool children, adolescent girls, lactating and pregnant women is to be threatened by such changes in food consumption patterns. Nutritional deficiencies of pre-school and school-going children could increase absenteeism, dropout rates, and hamper cognitive development, which ultimately will reduce the quality of future human capital. Nutrient deficiencies of adolescent girls and pregnant women could create an intergenerational effect by escalating the prevalence of low birth weight babies and increasing maternal and child mortality.

04. Implications for research for budding agricultural economists

To come up with a set of policies, strategies, and action plans to reduce the negative effects of food price increases, policymakers need to have a good understanding of the vulnerabilities of communities, the effectiveness of existing interventions to mitigate the effect of price escalation and optional instruments available to tackle the crisis better. Having this understanding enables policymakers to design appropriate interventions, which can address vulnerabilities efficiently and effectively. Accordingly, the generation of scientific evidence through research in the following areas is highly recommended:

- **Analysis of the structure of food trade, trade policies and price pass-through from global to local market of internationally traded commodities:** The outcomes of these studies can be used to inform policymakers on the vulnerability of local food markets to external shocks and barriers to price transmission from global to local market.
- **Determinants of prices of local food market:** The information will be useful in designing interventions to reduce food price escalation.
- **Assessing the impact of food price hikes on food demand:** This may involve estimating the own and cross-price elasticity of commodities. The outcome will enable the policymakers to understand commodity markets that need immediate interventions.
- **Assessing the impact of food price hikes on different population groups:** Impacts could vary depending on the level of income and assets, net-food production level, and labour market characteristics, which influence food security and vulnerability to shocks. Further, within households, some members are likely to be affected more by a crisis than others. Understanding these differences enables designing appropriate interventions.
- **Assessing the effect of price increases and policy response on the agriculture sector:** Price increases and responses to price increases may provide incentives for production and create opportunities or distortions in the agriculture sector. Understanding these effects and the mechanism, through which these effects are created, enables policymakers to design interventions to promote appropriate incentives.
- **Assessing Coping strategies adopted by vulnerable communities:** In response to food price hikes, communities adopt coping strategies. Understanding these coping strategies and their nutritional implications assists in identifying vulnerable communities and necessary interventions to reduce the impact on these communities.

- **Review of government responses to food price escalation in other Asian countries during previous food crises:** This lesson learning activity enables us to understand interventions that successfully reduce vulnerability to short term effects and provide long-term solutions. Furthermore, it assists in comprehending the context in which different interventions are successful.
- **Assessment of possible impacts of price intervention (ex-ante analysis):** Assessing the possible effects of tariff reductions, price ceilings and subsidies on food commodities on the demand and supply of commodities and related commodity markets, enables forecasting the positive and negative outcomes associated with each intervention.
- **Assessing the impact of policy interventions that target an increase in local supply such as subsidy on fertilizer and improved seeds, research and extension, grants and credits:** Comparing the effect of an intervention against the counterfactual situation enables understanding of the effectiveness of interventions. The outcome will guide the policymakers on the effectiveness of these medium and long-term interventions.
- **Assessing the feasibility of establishing food reserves, food banks and community-level support systems to support vulnerable communities:** The outcomes of the studies can be used to design project interventions to reduce the adverse effects of price hikes on food and nutrition security.
- **Comparison of food assistance programs (e.g. School Meal Program and Thripasha program) and social safety nets (Samurdhi program) for their cost-effectiveness, targeting and outcome of programs:** The outcome of the studies, efficiency and effectiveness of existing assistance programs enables policymakers to select the most appropriate food assistance programs and reduce inefficiencies in the existing programs.
- **Structure-Conduct-performance of different agri-food markets:** Enables understanding of food markets, their weakness and vulnerabilities to external shocks. The outcome will be useful in designing interventions to improve the efficiency of the agri-food sector.
- **Studies to assess technical efficiencies of agricultural production and factors affecting technical efficiency of production:** The outcome of these types of studies can be used to inform policymakers on necessary interventions in the agriculture sector in the long run.

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Economic Crisis and Education in Sri Lanka

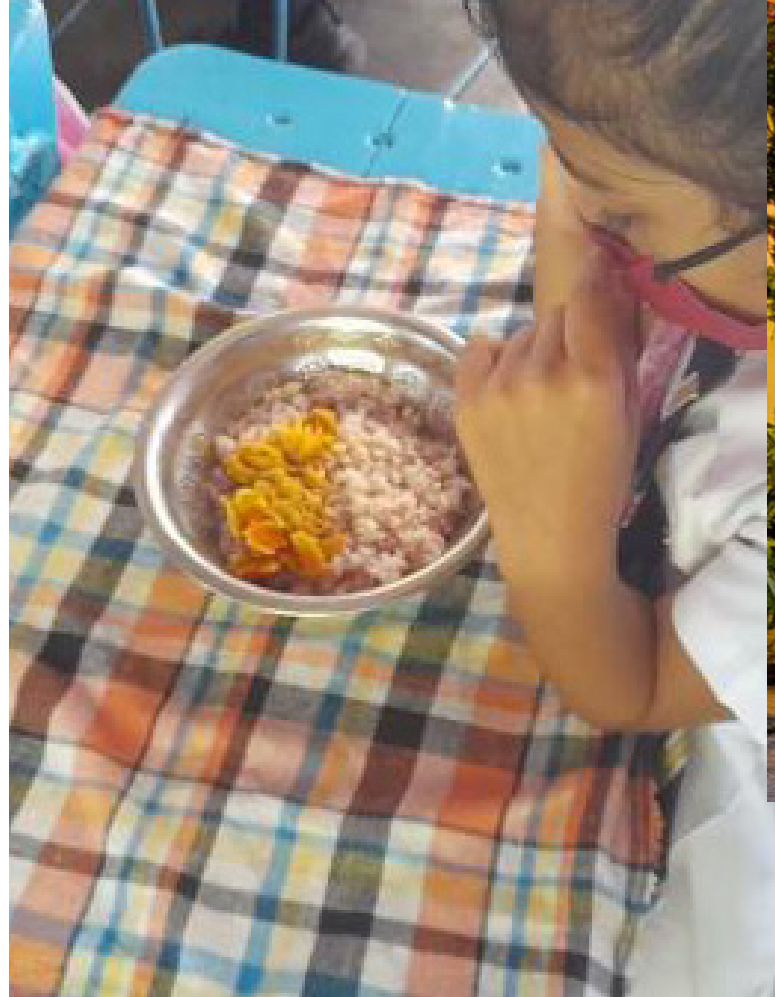
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Education is one of the crucial sectors in any nation. The education sector requires constant improvements as it affects the labour markets and the future of a country. However, with the recent Covid19 pandemic, the education sector faced a massive negative shock, especially in developing countries. This remains true for Sri Lanka as well. One of the major consequences of Covid19 is learning loss. The effectiveness and efficiency of online education is major problem, especially given the uneven accessibility and unequal distribution of resources within the country. Although the school activities continued online, the effectiveness of teaching-learning in school was much less compared to onsite classes with physical interaction between teachers and students. Moreover, the online classes created a new obstacle for the teachers and students who have limited access to the internet. This is especially true for students from rural and low-income households. Consequently, the learning loss has widened the inequality between low-income students and high-income students who have more access to resources. Moreover, regardless of the accessibility to education, the government-administered examinations i.e., GCE Ordinary Level Examination and GCE Advanced Level Examination were postponed due to the pandemic and increased Covid19 cases in Sri Lanka. An average Sri Lankan student sits for the GCE Ordinary Level examination and the GCE Advanced Level examination at the ages of sixteen and nineteen respectively. However, with the pandemic, students' examinations were postponed by at least six months depending on the cohort. For

instance, the GCE Advanced Level Examination, 2021 was intended to be held in August 2021, but in reality, it was conducted in February 2022. These types of changes obviously affect students' lives and increase their opportunity costs.

The matters have only worsened with the ongoing economic and political crisis in Sri Lanka. The national inflation rate of Sri Lanka increased from 17.5 percent to 21.5 percent between February 2022 and March 2022, with little or no increase in the real income of Sri Lankans. As a result, living costs in Sri Lanka have increased drastically, and so have the costs of education. One may argue that Sri Lanka provides free education to primary and secondary school students as well as tertiary students. However, the surging costs of transportation, food, and clothing certainly affect education. Moreover, the economic crisis has resulted in people's nationwide peaceful protests leading the government to make sudden decisions. Due to these uncertain circumstances, the public schools were given their April semester (Sinhala and Tamil New Year) break a week early and was planned to resume with an added hour to the standard number of school hours per day in order to recover from the learning loss caused by the pandemic. However, the plan for additional school hours was not implemented due to the prevailing nationwide power cuts in Sri Lanka. These power cuts lasted up to 13 hours on some days and consequently, the day-to-day lives of Sri Lankans,

especially students, were disrupted. When there are power cuts, some students, as well as teachers, face difficulties in joining their online classes. Thus, clearly, the effectiveness and efficiency of online classes at all educational levels are questionable. Moreover, the government does not appear to have a contingency plan for this prevailing situation. Tertiary education is being disrupted at another level, as students, as well as staff of universities, take an active part in peaceful protests. Clearly, the education sector in Sri Lanka is dealt with a massive blow, and the government is partially at fault here. The government has failed to come up with a contingency plan in order to tackle the learning loss from the Covid19 pandemic and the ongoing economic crisis. Education at this stage might not appear as the most crucial problem at hand given the skyrocketing cost of living and limited access to essential services in the country. Yet, the education sector should not be ignored for too long since the consequences of these learning losses will surface in a decade or two affecting the labor market outcomes at a higher scale.





Economic Crisis & Restaurant Industry in Sri Lanka

An economic crisis means a period in an economic cycle in which an economy faces difficulties for a long time. It is a fall in the economic performance of the country manifested in a decline in production and demand, rising unemployment, and bankruptcy of the business. This will automatically lead to high poverty levels in the country. Nowadays, Sri Lanka faces a huge economic crisis. The main reasons for this crisis are COVID-19 Pandemic, Political Corruption, and the Lack of Dollars. In April 2022, the country was left with only 1.4 billion dollars.

The restaurant industry is one of the main industries in Sri Lanka. “A Restaurant is an establishment which prepares and serves food and drink to customers in return for money, either paid before or after the meal, or with a running tab.” Before 2019, the Restaurant industry in Sri Lanka was well-established. There were many small-scale and large-scale restaurants at that time.

Nowadays, the Sri Lankan Restaurant industry is facing a lot of problems because of this economic crisis. The lack of raw materials and cooking gases, high inflations, and power cuts are the main issues in the restaurant industry in Sri Lanka. Further, rice and flour prices are high these days, too. Also, gas issues and power cuts also affect the efficiency of the restaurants. Some restaurants have been closed because of this gas issue and power cut. Generators could not be started due to a lack of fuel. Thus, restaurants increased their portion prices by more than 30%.



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Due to these problems, visitors' arrivals are declining rapidly. Food portions' prices are not affordable for customers. Also, people's purchasing power is decreasing. Therefore, they cannot spend money to take food items from restaurants. With the less number of customers, some restaurants could not survive. Lots of small-scale restaurants were closed in the past few weeks.

To overcome these problems, restaurants should introduce new portions at affordable prices. They can use cheap price ingredients (Pumpkin, Green Leaves, etc.) for new portions. Also, they should try to depend on renewable energy (Solar Panels) and use international payment methods with foreign customers. With these, restaurants can maintain their own USD Pool. They should also use firewood or charcoal for cooking and start a new promotion campaign through social media. The restaurant industry can play a major role to overcome the economic crisis in Sri Lanka. However, they have to work hard for it. If restaurants can attract more foreign customers to their restaurants, it is very helpful to our country.

Living through Economic Crisis



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The economy of Sri Lanka is in a precipitous decline, expressed by a drop in supply and demand, increasing unemployment, and business bankruptcy. This will inevitably result in the country's high poverty level. Sri Lanka is experiencing one of its most severe economic crises in decades, with rapidly increasing inflation, weak government finances, and COVID-19 wreaking havoc on the economy.

This severe financial crisis is mainly caused by shortages of essential items such as food, pharmaceuticals, fuel, milk powder, etc. in the country. The Sri Lankan government is optimistic that with the policy measures implemented thus far and the improvement in the COVID-19 situation, it will be able to overcome the crisis soon. The situation on the ground, as well as analyses of government policy measures, and global geopolitical-economic developments, including the fallout from the Russia-Ukraine war, all point to Sri Lankans not experiencing economic relief anytime soon. In Sri Lanka, opposition and public criticism of the government's handling of the crisis are increasing. COVID-19 has had an incredible effect on Sri Lanka's economy and livelihoods as it has in other countries in the world. The economy of Sri Lanka contracted by

3.6 percent in 2020, the worst growth performance on record. Simultaneously, increased expenses and lower-income as a result of the pandemic contributed to a worsening of the fiscal situation. The Sri Lanka development update notes that the country has experienced an unprecedented economic downturn as a result of the disease outbreak. The financial system of Sri Lanka is expected to recover to 3.4 percent in 2022, owing primarily to foreign investments and the normalization of tourism and other economic activities. However, the slow global recovery, combined with ongoing trade restrictions, economic scarring from the slowdown, and the high debt burden, may continue to weigh on growth. This pandemic situation is directly affecting the day-to-day life of people. It actually caused a drastic reduction in the tourism sector and lessees in foreign investments within the country. It may bring an indirect effect on people who depend on the tourism industry. An alight increase in unemployment in the country has resulted from this pandemic. In 2020, nearly 40% of families lost their income sources and had to find alternative income sources to sustain their daily lives. Because of that reason, the poverty level of Sri Lankan people further increased.



The crisis has turned Sri Lankans' daily lives into an endless cycle of waiting in lines for basic goods, many of which are rationed. Shops have been forced to close in recent weeks due to a lack of power to run refrigerators, air conditioners, or fans. Soldiers are stationed at gas stations to keep customers calm as they wait in line for hours in the sweltering heat to fill their tanks. Some have even died while waiting. The economic crisis has resulted in declines in electricity, fuel, and cooking gas consumption, resulting from shortages. Tax cuts, external debts, ban of the importation of chemical fertilizers, and hit on the tourism sector due to the pandemic were the devastating factors for the high rise of inflation in this country.

The increment in export including coconut, tea, and rubber will aid to earn foreign currencies for the country. Privatization of the companies is another appropriate solution to earn more money. Invitation of foreign entrepreneurs to Sri Lanka to initiate their own businesses will be suitable to overcome foreign currencies at this time. Much better control of a major source of business cycle fluctuations, sudden increases, and contractions of bank credit and of the supply of bank-created money, complete elimination of bank runs, dramatic reduction of the public and private debt, as money creation no longer requires simultaneous debt creation are another success suggestions to recover financial crisis.



IMF


and the future of Agribusiness in Sri Lanka

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The International Monetary Fund (IMF) is an international organization that provides financial assistance and advice to its member countries. The IMF was started in 1944 along with its sister organization, The World Bank. It was created to prevent economic crises in countries. The countries which are members of the United Nations can benefit from the IMF. Membership of the IMF is open to any country that conducts foreign policy and accepts the organizational structure. The IMF is responsible for creating and maintaining the international monetary system, through which international payments among countries take place. The mission of the IMF is to further international monetary cooperation, encourage the expansion of trade and economic growth and discourage policies that would harm prosperity. To achieve these goals, the IMF focuses on advice on the macroeconomic policies of a country, which impact its exchange rate, government budget, money, and credit management. The IMF is entrusted with nurturing economic growth and maintaining a high level of employment within countries. The IMF is funded by the quota subscription paid by member states. The size of the quota is determined by each member's economy. In 1969, IMF created Special Drawing Rights (SDRs), which are a kind of international reserve asset. They were created to supplement the international reserves of the time, which were gold and the U.S. dollar. The larger the country, the larger its contribution. Thus, the U.S. contributes 17.44% while Seychelles contributes only 0.005%.





The IMF offers its assistance in the form of surveillance, which it conducts on yearly basis for individual countries, regions, and the global economy as a whole. However, if a member country asks for financial assistance in the face of an economic crisis, whether caused by a sudden shock to its economy or poor macroeconomics planning, IMF lends funds to replenish international reserves, stabilize currencies and strengthen conditions for economic growth. An economic crisis results in the severe devaluation of countries' currency or major depletion of nations' foreign reserves. In return for IMF help, a country is usually required to embark on an IMF-monitored economic reform program, otherwise known as Structural Adjustment Program (SAPs).

After its independence, Sri Lanka is under the worst economic crisis. Therefore, the Sri Lankan finance minister discussed further details on the lending of money from IMF and put the economy back on a sustainable growth path as early as possible. IMF Sri Lankan mission Chief Masahiro Nozaki reported that IMF is very concerned about the current economic crisis in Sri Lanka and the hardships suffered by the people. However, IMF said that Sri Lanka needed to take steps to restore debt sustainability prior to any IMF lending.

Basically, IMF does not pay any special attention to the development of agriculture or agriculture-related businesses. However, if the country seeking help has a significant number of agriculture-related industries, they pay attention to the agriculture and food-related industries. IMF encompasses privatization of state-owned farms, liberalization of agricultural trade, and deregulation of agriculture sectors. As IMF lacks the expertise to engage in agricultural businesses, it will rely on the skills of the World Bank to avoid the missteps. According to the previous studies, 2% of all IMF conditions directly targeted food and agriculture issues. With these conditions, we can expect that in the future money that we receive from the IMF will be used to recover from this economic crisis and it will help re-establish the stability of the Sri Lankan agriculture and food-related industries.

Ban of imported Fruits and Increase the Market for Local Fruits



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We all are faced with a critical situation these days. Our country has been faced with a severe economic crisis since 2019. It is characterized by forex shortage, economic mismanagement and a rise of external debt, inflation, depleting foreign exchange, and many more. There are many reasons for this economic crisis such as the policy to shift to biological farming, the impact of the Covid-19 pandemic, the Easter Bombing attack, money creation, and many more.

Recently, the government has imposed import restrictions for 367 items such as milk products, fruits, and fish that have been dubbed “non-essential” as a part of the bid to tackle the ongoing economic crisis triggered by forex shortages. This import restriction directly affects fruits such as grapes (fresh and dried), apples, pears, types of berries, and oranges. The restriction causes a shortage of those fruits in the market and an increase in price. The value of fresh fruit imports has averaged US \$71M over the past five years, which is a massive amount of spending on imported fruits. As a tropical country, we are full of many tropical fruits including mangoes, pineapples, oranges, bananas, grapes, pears, papaws, and many more. Nevertheless, we are spending such a massive amount on importing fruits.

As we know, after the 30 years of war, farmers in Northern Province started again to cultivate grapes, mangoes, and papaws. However, we are still importing grapes and dried grapes from India, UAE, South Africa, and Australia. The reason for this situation is still there

are no proper markets and prices for Jaffna grapes. Also, due to the 30 years of war, grape cultivation areas have been reduced. On a positive note, locally grown grapes are cheaper than imported ones as a kg of Jaffna grapes costs 200 to 300 while Australian grapes cost 600 to 700 rupees. As a country, we have to get possible options to cultivate grapes that can compete with imported ones. We can increase the number of farms encouraging the new generation and giving them a good market and price for their grapes. Doing value addition for local grapes such as grape wines is another solution. Also, we have to change our minds because we all believe all imported fruits are very fresh and good in quality forgetting the fact that local fruits are better for health.

Not only grapes but also oranges, and strawberries also face the same problem. There are lots of local berry types in our country including Dan (දූ), Madan (මූ දූ), Weera (වීර), Ambilla (අඹිලිලි).



We can consume those local berries in a similar fashion to the imported ones by developing those berries as a commercial crop and adding value creation. We have a huge variety of oranges, island-wide. Biblia area is famous for citrus-type cultivation. However, we are more concerned about the color of the imported oranges than the good qualities of our local oranges. As we know, to keep the freshness of those imported fruits for a long time, they use a lot of chemicals that can harm the human body. However, we do not think about the higher level of freshness and nutrients of our local oranges than the imported ones because we believe that imported oranges are better than local oranges. These considerations will be good solutions for banning the imported fruits and they can help us move to the export market and get solutions to the economic crisis triggered by forex shortage.

Therefore, as a nation, we should not depend on only imported fruits. Our country is full of many varieties of fresh and nutrient fruits. We can consume those local fresh fruits rather than imported ones. Also, we can create a good name for Ceylon fresh fruits internationally like Ceylon Tea. Thus, banning imported fruits will be a good opportunity to establish a market for the local fruit industry. This will be one positive answer to the economic crisis we are facing these days.



Impact of the Economic Crisis on Agricultural Crop Cultivations

The agriculture sector is one of the major sectors in Sri Lanka's economy. The agricultural sector contributes about 7.8% to the national GDP of Sri Lanka. (Central Bank Report, 2021) This percentage comprises general agriculture including plantation crops and non-plantation crops, livestock, forestry, and fisheries sub-sectors. Out of these sectors, the forestry and fisheries sectors contribute around 6.1% percentage. (Central Bank Report, 2021) 41.8% of the land area is devoted to agriculture. When considering the agricultural crop cultivations, it can be divided into three main types. These are the food crops (rice, fruits, vegetables, field crops), plantation crops (tea, rubber, coconut, sugarcane, oil palm), and ornamental crops. When someone is doing agriculture crop cultivations they need fertilizer, agricultural equipment, and machinery as external factors.

Nowadays Sri Lanka has faced the worst economic crisis. Lack of foreign reserves hits the tourism industry, agri-sector crisis, tax cuts, and government mismanagement when repaying the debts, they used foreign reserves to repay debts. and Russia- Ukraine conflicts are the main reasons which are affect the Sri Lanka economic crisis. The lack of dollars caused by the economic crisis is having a severe impact on agriculture. Those effects can be summarized as follows;

1. Loss of dollars for import fertilizer and agrochemicals
2. Loss of dollars for import agriculture machinery and equipment.
3. Lack of fuel and power failure due to the failure of agricultural production process and transportation.

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In our country, most of the commercial crops depend on imported fertilizer and agrochemicals. The best example of that is during the chemical fertilizer banning time period average yield of crops were decreasing. Other than that, diseases were spread among some crops. Within this economic crisis lack of agrochemicals and fertilizers which are imported from foreign countries affects the decreased harvest. During the fertilizer banning period, some export crops' harvest quality was getting low. As an example, smallholder farmers who are doing tea and rubber cultivations faced this problem. According to that low quality and low productivity are due to declining imports. Not only the exports but also affects the local market. Nowadays most farmers use machinery for their agricultural purposes. Not only the urban are farmers but also rural are farmers used many newly introduced equipment and machinery. According to the central bank report in 2021, Sri Lanka imports agriculture inputs for US\$ 130.6 million and imports fertilizer for US\$ 97.5 million. Those expenditures depend on dollars. Lack of fuel and power failures mainly affect food processing and transportation. Due to this situation, the demand is agricultural product is high, but the supply is at low level. Therefore prices going up. Now it is becoming a food shortage.

The Roots of Sri Lanka's Debt Crisis



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Current status of external debt

To sustain its overdrawn government budget, Sri Lanka has historically loaded up on debt and borrowed huge sums to invest in massive infrastructure projects—such as the Chinese-funded Hambantota International Harbor, Maththala Airport, and High ways with the hopes that the end results would drive economic growth. Sri Lanka's current debt-to-GDP ratio has skyrocketed in recent years, increasing from 42% in 2019 to 104% in 2021. However, many of its costly infrastructure projects have been economic duds, and without any genuine source of revenue, the Sri Lankan government is left unable to repay the interest on its loans. A long-escalating fiscal crisis has forced Sri Lanka to announce a default on all its outstanding foreign debts, running to \$51 billion. Per capita external debt is around Rs 0.8 million (US\$ 2750) and per person monthly payment for external debt is around Rs 40,000.

Sri Lanka's crisis is due to a combination of external economic shocks and policy miss-steps. The severe economic shock from Covid-19 meant an economic contraction of 3.6% in 2020 and an additional half a million new poor (mostly in urban areas, among formal sector employees and informal sector workers) fell into poverty. As economic recovery began, the Russia-Ukraine conflict shock hit the economy through higher import bills for fuel and food leading to double-digit inflation and a 30% depreciation of the rupee against the US\$. These external shocks

hammered an already weak economy reeling from the economic costs of a thirty-year civil conflict which ended in 2009, persistent fiscal and current account deficits, excessive foreign borrowing for low return infrastructure projects and rising external debt service. A successful Covid vaccine rollout was overshadowed by recent policy miss-steps like comprehensive tax cuts which reduced government revenues, banning imports of chemical fertilizers without preparing farmers which prompted a surge in food prices, maintaining a highly expansionary monetary policy beyond its shelf life and persisting with a fixed exchange rate without the foreign reserves to support it.

Good History

During the early years of 1950, Sri Lanka had a large amount of foreign reserves accumulated due to the rubber and tea price boom with the Korean War. It declined from US Dollars 233 million in 1956 to US Dollars 90 million by 1960. Reserves declined further to US Dollars 42 million in 1970, which were sufficient to finance 2.1 months of imports. In 1975 reserves stood at US Dollars 57 million, which were sufficient to finance imports by 1.7 months. Reserves position of the country improved by 1976 to a level sufficient to cover 3 months of imports. In 1977, Sri Lanka unified



its exchange rate with a currency depreciation and moved to a system of managed floating with a partial liberalization of external trade and payments. In this environment during the post 1977 era, there was a substantial expansion and diversification in the country's external transactions. Sri Lanka diversified the currency basket of the reserves to include French Franc, Japanese Yen and Deutsche Mark. Further, it managed to increase its foreign reserves from US Dollars 278 million in 1977 to US Dollars 2,029 million by the end of 1997, which was sufficient to finance 6.4 months of imports. However, the external reserves declined continuously from 1997 to reach US Dollars 1,049 million by the end of 2000 largely owing to the escalation of war requiring higher expenditure on imports, higher petroleum prices and slowing down in export earnings. Reserves reached US Dollars 3,500 million in 2007 and the Bank commenced assessing alternative investment opportunities. However, reserves declined sharply to US Dollars 1,300 million by early 2009 as foreign investors in sovereign securities withdrew their investments. However, with the ending of war and Stand-By Arrangement (SBA) facility with IMF, reserves improved sharply and by October 2010 it stood at an unprecedented level of US Dollars 7 billion.

Present Strategies: Are they rational?

Export restriction

At the moment one of the biggest economic issues is foreign currency maintenance in the country. The government has proposed new policies to limit the ways of foreign currency outflow from the country. This is a possible short-term action in order to keep the currency within the country for gain short term economic stability. Due to the ongoing pandemic, the government was able to restrict a number of imports, including the halt on the vehicle import assisted in reducing the foreign currency outflow. Back in 2020 alone, this managed to reduce the outflow by \$3.9 billion, which is a 20% more reduction than the year before. This also resulted in a roughly \$2 billion drop in the trade debt. In 2020, fuel imports were reduced by \$1.35 billion, accounting for more than 60 percent of the trade deficit reduction. However, due to increase of oil prices in the global market, the fuel import bill has increased in 2021 and putting further pressure on foreign reserve in 2021. The strategy of managing foreign debt through curtailing imports is not a sustainable solution for our country since more than half of imports are intermediary and capital goods. The continuous restriction of imports will curtail economic growth, which is not something that Sri Lanka can afford right now.

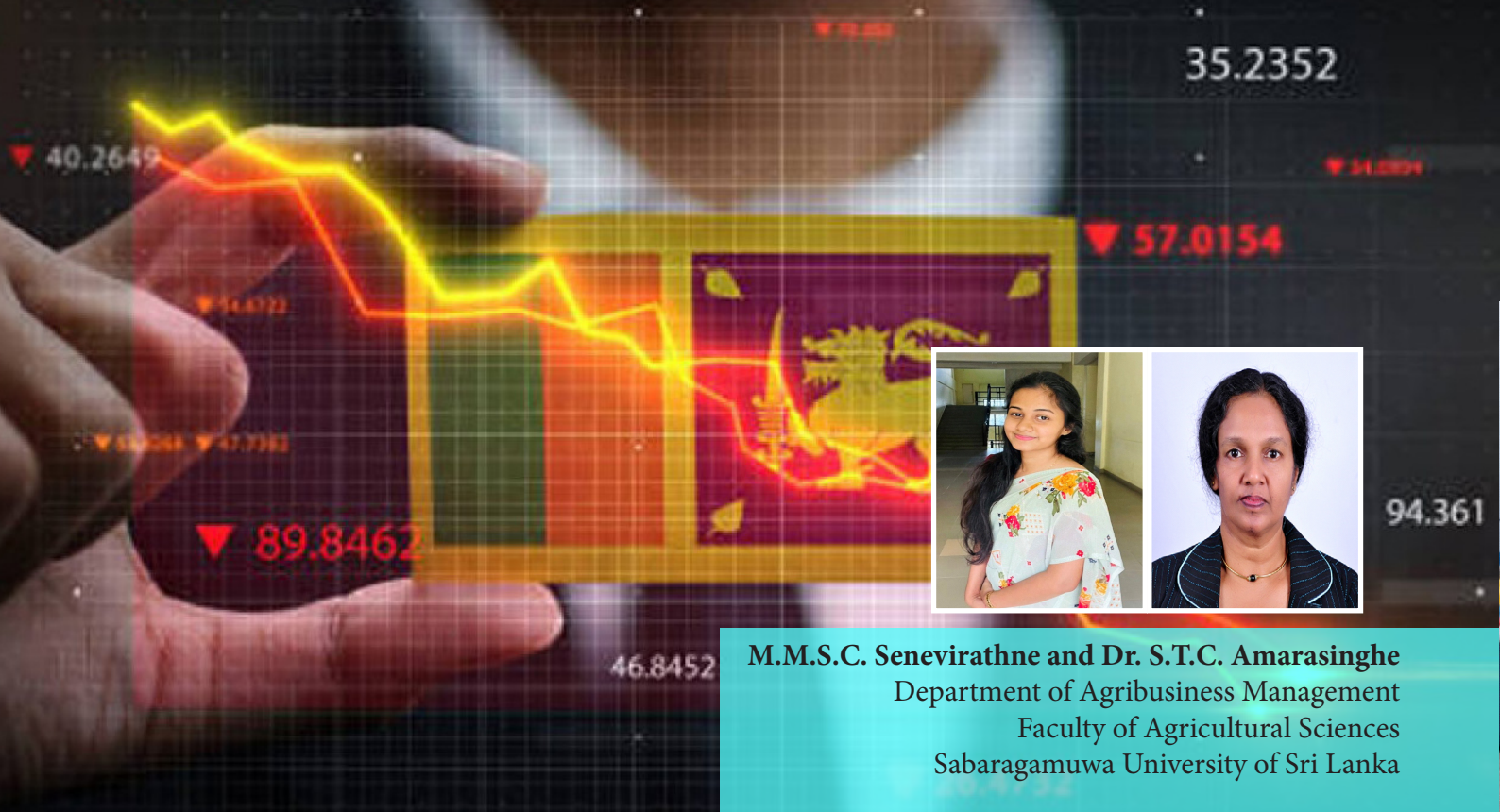


Modern Monetary Theory – Is slipping deeper into imbalance?

While looking at the whole situation with the eyes wide open and informed, the whole debt situation with Sri Lanka seems to be even more worrisome than it was in the 90s and is more hopeless than before. Since the country will have outstanding sovereign bonds reaching maturity every year up to 2030, the country will have to spend a significant amount of foreign currency earnings to repay these commercial loans. The only sustainable solution lies in addressing the structural weaknesses of the economy, which cannot be solved using short term solutions. To resolve the debt crisis, Sri Lanka needs a credible fiscal plan and monetary policy; taxes have to be hiked in order to repay debt, with interest rates and opening of imports allowing taxes to flow back to the Treasury. While it is possible to raise rates and generate dollars to repay foreign debt by curtailing domestic credit, it is not practical on an ongoing basis for many years. According to economist BellWether “To solve Sri Lanka’s ‘budgetary problem’ in repaying debt, Treasuries auctions have to succeed. When that is done, the ‘transfer problem’ of foreign exchange will be automatically solved. However, this is beyond the ken of Keynesians. Instead, with failed Treasury bill auctions filled with printed money Modern Monetary Theory (MMT), the country is slipping deeper into imbalances.” MMT says that governments create new money by using fiscal policy and that leads to inflation, which can be addressed by gathering taxes to reduce the spending capacity of the private sector. However, this leads to significant BOP vulnerabilities. Consequently, even if the foreign debt-to-GDP ratio is less than what it was two decades ago, Sri Lanka’s vulnerabilities are a lot more severe and alarming, because the debt dynamics of the country have completely shifted to a new paradigm.

Is that really a Crisis?

The primary problem Sri Lanka has is that everyone seems to agree the country is heavily in debt. Is that correct? The answer is not a simple ‘yes’ or ‘no’. The first thing to note is that there is internal debt denominated in Sri Lankan rupees (LKR) that is owed by the government, businesses and consumers to the Sri Lankan banking system. However, as we all know the real crisis is Sri Lanka’s external debt. The government has a total external debt of about \$50b USD which needs to be repaid over a period of time. About \$6b of that has to be repaid in 2022. Credit Suisse and McKinsey Global Institute publish a global wealth report for countries each year. Sri Lanka’s net wealth as a country is \$351b USD – which is the net wealth after the \$50b of external debt is deducted. So, our gross wealth is \$400b if you add back the debt, which creates a balance sheet for Sri Lanka of \$400b of assets and \$50b of debt. This view also answers the question about the United Kingdom’s external debt. The UK has an external debt of 345% of GDP totaling \$9.3 trillion. The UK’s net wealth according to Credit Suisse is \$15T which means its net assets are \$24T once you add back the debt. UK has \$24T of assets and \$9T of debt. In Singapore total external debt is US\$ 1670 billion, and it is 471% of GDP. Per capita external debt in Sri Lanka is US\$ 2750 while this value in Singapore is US\$ 231,000, in UK 60,256, USA, 127,000. Therefore, it is the mismanagement of external debt – not taking external debt – that is the root cause of present economic crisis. The Sri Lankan government has continuously taken the foreign loans for repaying the previous loans and more than 50% of total external debt has been taken after year 2014 for payment of previous loans. The external debt has not been properly used for income generation or wealth accumulation process.



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Why is Sri Lanka in an Economic Crisis, and How Has It Affected the Agriculture Sector?

Currently, Sri Lanka is caught in an acute economic crisis whose effect is percolated all the Sri Lankans and our day-to-day lives. The economic crisis resulted from different missteps taken by the current Sri Lankan government and those governed Sri Lanka so far. One of the main reasons behind the economic crisis is a drop in tax revenue resulting from the tax cut. Many economics specialists stated that the tax cut just after the election, which came as a surprise, reduced the tax revenue by a larger amount in the country. Most countries witnessed that cutting taxes is not a suitable strategy for economic development. If the government cut the taxes without deducting its expenditure, the tax increment can be surely experienced in the future.

Further, the tourism is one of the important sectors in the Sri Lankan economy that pump a huge sum of foreign exchanges into the country. Unfortunately, this sector is severely affected by the COVID- 19 pandemic and by the series of bomb blasts in the year 2019. Due to several circumstances, Sri Lanka's gross foreign reserves fell by 24% in January 2022, to 2,361 million US dollars, from 3,137 million in December 2021. The drastic loss of foreign reserves mainly due to the temporary standstill of the tourism sector and loss of migrant income during the COVID- 19 period is

directly related to the loss of foreign reserves to the country. It resulted in long queues at oil stations and food shops which resulted from the inability to pay back to the other countries. The government allowed the domestic currency to float in hope of encouraging the exporters to increase their exports. Further foreign direct investment can be facilitated by the government by better policies to solve this problem. In addition, the tourism sector also collapsed due to the covid-19 which resulted in these less foreign reservoirs.

Moreover, import expenditure is larger than the export revenue in Sri Lanka. During the peak of the COVID- 19 period, the government has taken different steps to reduce the government import expenditure. Nevertheless, still, Sri Lanka is under the burden of import expenditure which is larger than the export revenue. The massive import cost is mainly attributed to the higher purchase of the intermediary goods such as fuel, textile, medicine, etc., Rather than boosting the export sector performance, high attention was given to the import sector. Thus, the export revenue is also not increasing as a result of less value-added goods, less technology, fewer intensives to the exporters, etc.

Printing money is another reason behind the economic crisis resulting in the high inflation. It increases the money circulation in the economy and the demand for goods and services. Thereby, it causes the price of the goods and services to hit the top. Though money printing increases the money supply in the economy, it does not increase the country's outcome. As a short time strategy, money printing will be a good strategy



but in the Printing money is another reason behind the economic crisis resulting in the high inflation. It increases the money circulation in the economy and the demand for goods and services. Thereby, it causes the price of the goods and services to hit the top. Though money printing increases the money supply in the economy, it does not increase the country's outcome. As a short time strategy, money printing will be a good strategy but in the long run, things can be getting worse.

Moreover, the Sri Lanka government's debt has been rapidly increasing during the past years. The government's debt to the GDP is accounted for 101.0% which has been increasing rapidly over the past years. The Sri Lankan government has declared that repayment of foreign loans will be suspended pending the results of talks with the IMF. Refinancing the foreign debt by using a newly structured method is essential to go out of this vicious cycle. The devaluation of the currency also will worsen the debt problem.

Impact on Agriculture Sector by the Crisis

The agriculture sector plays a pivotal role in maintaining and achieving food security in the country. Currently, the country is experiencing high price hikes for goods and services including essential commodities like agricultural commodities which can have a direct influence on food security levels. Therefore, much attention has to be given to fulfilling the domestic requirement of the foods through the agriculture sector expansion. Agriculture might continue to provide a bountiful supply of food at reasonable rates in such a world. On the other hand, an adequate price control mechanism obviously needs to be exercised for agricultural commodities.

During the last year, the major concern of the agriculture sector has been the government's decision to ban fertilizer importation. It has become useless and harmfully affected the sector. At the moment, the farmers no longer receive the fertilizer subsidy and the prices of the fertilizer have gone seven-



fold (Press Conference by Acedemcs' Movement to Safeguard Agriculture in Sri Lanka). Further, the experts highlighted that most farmers temporarily abandon agricultural activities due to the high cost which will result in a food shortage in near future. We have to learn from such failures and implement appropriate strategies to get rid of the crisis.

The Agriculture sector is a key generator of the foreign exchanges, income, and employment in Sri Lanka. This sector in Sri Lanka has enormous potential to grow. In fact, it can play a vital role in a situation of economic crisis, and over the past years, unfortunately, the sector has not been much encouraged to boost. Much attention should be given to boosting the sector by increasing productivity, and calls have to be made for more investment in technological advancements in the the sector. With the onset of the economic crisis, the expansion of the sector will create more job opportunities for the citizens. Due to the current forex crisis, traders are experiencing a tough time acquiring letters of credit. Moreover, the agricultural trade should be promoted to explore new market destinations and the share of the market needs to be increased for more foreign exchange earnings as a solution to this economic downturn. In the long run, sustainable policy approaches have to be developed to address the current issues in the country.





Roots and Causes of the Crisis

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“Sri Lanka has the opportunity to emerge much stronger out of this crisis if the right lessons are being learned and if the new potentials that emerge are being unlocked”

- Hans Timmer, World Bank’s Chief Economist for South Asia, 2022-

As Timmer has explained about the crisis situation of Sri Lanka, the people of the country should have a clear understanding of the things which has led to the current economic crisis of the country and should exploit new potentials to get rid of the crisis.

As an introduction to this particular topic, let us turn back. The economic crisis is not just a fact that has emerged in the recent past in Sri Lanka. Since its independence in 1948, Sri Lanka has been experiencing an economic crisis although it has not been so severe at that time. With the civil war which lasted for more than three decades in the country, budgetary deficits and trade deficits have led to a twin deficits condition in the Sri Lankan economy. Such a twin deficit signals that

- The country’s national expenditure exceeds the national income.
- The country’s production of tradable goods and services is inadequate.

This means that the country is not in a favorable economic condition. When this kind of situation continues for a considerable period of time, the economic bankruptcy will happen in the country.

Therefore it is necessary for any country to turn back and identify the possible roots and causes of such a crisis and to take immediate actions to eliminate those facts and rebuild the economic condition of the country.

IMMEDIATE CAUSES FOR THE CRISIS

01 The economic mismanagement which prevailed for a longer period of time by the intervention of various political parties that came into power in Sri Lanka has contributed to the crisis to a greater extent. Irresponsible borrowings and expenditures and unbearable budgetary plans of the government have ended up creating a huge credit burden on the country

02 Since the civil war era, the government has continued to borrow credit from IMF to run the Sri Lankan economy which has resulted in the accumulation of an unbearable amount of external debts year by year. Borrowings from IMF have also resulted in contracting the freedom of the national economy as it imposed conditions such as requiring the country to keep its fiscal deficit under 3.5%. Therefore, Sri Lanka was unable to stimulate its economy during the world economic crisis in 2009. As a result, the global economic crisis has also affected badly for Sri Lankan economy.

03 During the latter part of the civil war, the government has spent more and more on defense, military, and

security purposes. These expenses were unbearable for a developing nation and also it has led to creating a budget deficit condition. This has resulted in going for IMF aid to run the economy which has led to the current economic crisis

04 The Sri Lankan economic fortunes are very limited as it has a limited diversified economy. It is heavily dependent on a few sectors like tourism, fisheries, export of tea, rubber, and garments, and foreign remittances as its revenue sources. Sri Lanka is gaining its forex reserves by exporting these few selected commodities and providing a few selected services.

05 Although it has been declared that these few sources are enough for the Sri Lankan economy for sustainability without excessive mobilization of forex reserves, in the current context, under the prevailing unbearable credit burdens and all, the forex reserves were mobilized to run the economy in excessive amounts. This has resulted in a drastic reduction of forex reserves of the country in the past few months.

RECENT SHOCKS TO THE SRI LANKAN ECONOMY

Easter Sunday Bomb Blasts

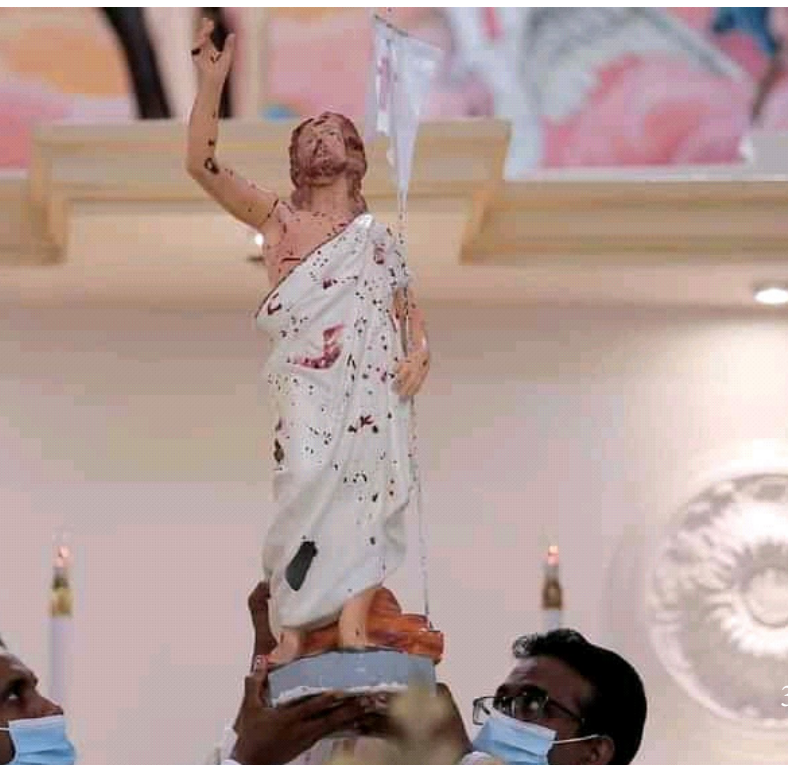
The Easter attack resulted in obstructing a major source of income for the country which is the tourism industry. Sri Lanka was considered to be an unsafe place for visits in the global tourism sector. The tourism industry has collapsed and the effect of that has been continued for more than a year leading to a great loss of revenue to Sri Lanka.

Deep Tax Cut

The current government has promised the people a deep tax cut during the election. They have done a deep tax cut to fulfill the promise when they came into power. This has resulted in the reduction of the income of the country to a greater extent.

Covid-19 Pandemic

The pandemic which affected globally for more than 2 years has created a greater shock to the Sri Lankan economy as well. It hits the tourism industry again and the tourism industry has totally collapsed due to travel restrictions. Not only that, the pandemic has collapsed the foreign remittances of the country by sending the foreign workers back to Sri Lanka during the pandemic period. Hundreds and thousands of foreign workers returned to the country by shutting down their jobs resulting in a drastic reduction of foreign remittance to the country.



Unbearable Government Expenditure

For the past 13 years, the Sri Lankan government has run under budget deficits as its expenditure was pretty much higher than its income due to unsuccessful and unnecessary development projects and luxury goods importations. Although the importations were controlled by the government, later on, the investments in unsuccessful development projects were in vain. These projects can be considered great losses to the Sri Lankan economy.

Ban on Chemical Fertilizer

The present government has also taken an overnight decision to ban the use of chemical fertilizers which has resulted in creating a massive shock in the Sri Lankan economy. This decision has hit the agricultural production of the country including tea and rice productions which are the role players of the Sri Lankan economy.

Russian-Ukraine conflict

Although this incident is out of our control, it has resulted in increasing the crude oil prices in the global market. This has also influenced the Sri Lankan economy and it has ended up with multiple hour power cuts, fuel shortages, gas shortages and many more problems leading to the downfall of the economic condition of the country

SRI LANKA'S OPTIONS

Based on economic analysis, the economists have proposed to go for IMF Vail-out package as the first option to get rid of this massive problem. Also, they have proposed Debt restructuring, loan deferment from India and China, and to take emergency assistance from India and China.

Together with these options, Sri Lanka should take action to increase their local production by motivating and facilitating entrepreneurs and by increasing exports and controlling imports for a better future. Also, the government should take necessary actions and should apply firmly grounded short-term interventions in long-term economic strategies to overcome this problem. In a broader sense, this should be done by focusing on long-term sustainability, equity, and adjusting to new demands not just supporting the old production lines.



Impacts of Floating Rupee



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Sri Lanka has faced a major economic crisis – possibly the worst in recent history. There are restrictions on imports impacting many people and businesses; also, there are severe food shortages, especially, essential food items, increase in the prices of the market goods and services to a level, difficult to afford. Also, the essential pharmaceutical stocks are rapidly depleting. This is a very huge problem for the economy and its consequences have severely affected every sector of the country.

As a solution, the government has taken some decisions including a floating exchange rate system. It is a huge decision for the country that may affect every sector of the economy. The importance of the exchange rate can be less to the closed economies, but it is very much important to small open economies such as Sri Lanka. It mainly affects the prices of exports and imports. Sri Lanka had a fixed exchange rate system from the start of a pandemic to 11th March 2022. Fixed exchange rate regime means Dollar should be bought according to the price issued by a government or central bank of Sri Lanka. Although a fixed exchange rate is great for the macroeconomy of a country, it has not changed according to the contrariety of the economy. As a result, the imbalance of the economy cannot be changed. A floating exchange rate occurs when governments allow the exchange rate to be determined by market forces (supply and demand) and there is no attempt to influence the exchange rate.

In the current situation of Sri Lanka, the rupee is depreciating because our foreign reserves have gone down and stuck in the long-term debt crisis and all avenues for our country to receive dollars have been blocked. The reason for this is the mismanagement of the economy, which is not promoting enough exports, reducing remittances, and failing to attract foreign direct investment. So, the devaluation of the Sri Lankan Rupee has both positive and negative impacts on a country when there is a floating exchange rate. When we consider the positive impacts, Sri Lanka is the cheapest tourism country for foreign tourists when there is a depreciation of the rupee. Also, exports can be boosted as exporters get more and additional revenue from selling their goods and services. With the depreciation of the rupee, foreigners will be able to buy goods that are exported by Sri Lanka at a lower cost of one dollar. Therefore, the demand for Sri Lankan export goods and services in the international market is increasing. Another fact is, that it is a great chance for new foreign investors to buy shares of Sri Lankan equity and bonds by

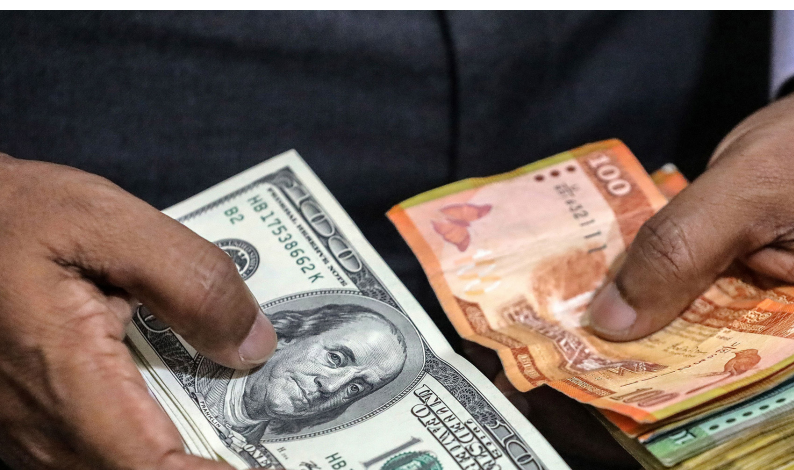


using a few dollars. It helps reduce the transaction of remittances through the black market. As a result, several avenues for dollars to flow into our country are being opened. It helps increase the foreign reserves in the country.

On the other hand, the amount to be paid for import goods and services has increased with the depreciation of the rupee. The price of all the imported goods and services has increased. Therefore, inflation and rapid inflation can happen. This has directly affected normal people's life. Due to the inflation, raw material costs and transactional losses are increasing, having an impact on the purchasing power of people with the increase in sales volumes and investment cost of existing foreign investors. So, inflation can severely affect people's day-to-day life, and finally, restrict their purchasing power. Another negative impact is the amount of rupee required to repay the loan is also high. As an example, the value of the US\$ 100 million taken in 2010 was 14 billion rupees at the then exchange rate, but if the debt is to be repaid in 2020, it amounts to 20 billion rupees without interest. Therefore, the country is in a very difficult position to repay the debt.



Considering all these factors, there are a number of side effects that can occur due to this economic crisis and is safe to say that, many of them have already impacted people's lives. Existing issues may worsen because our country is already suffering from economic issues such as unemployment and high inflation and many more. Thus, the floating rupee may intensify the existing problems. As an example, people are already suffering from the oil crisis and gas shortages. The oil crisis has made it difficult for people to get to their workplaces and for the children to get to school. Small-scale industrialists have been forced to abandon their industries due to a shortage of raw materials and rising prices. Employees are at a risk of losing their jobs as existing employers find it difficult to pay their salaries and wages due to declining production by large-scale industrialists. Also, the unemployment rate in the country is increasing due to the shortage of new job markets for graduates and youth.





Agriculture, Food Security, and Economic Crisis in Sri Lanka



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Sri Lanka is a lower-middle-income country with an estimated 22.36 million people. About 1.8 million agriculture holdings, a total of 1.5 million ha under cultivation, including 25% paddy, 40% plantation crops, and 30% horticulture. From independence, Sri Lanka was a low-income country, and in 1997 it became a low middle-income country. Sri Lanka has been an agricultural country since ancient periods. Although agriculture is the mainstay of the country's economy, the sector has been gradually declining. It continuously plays a dominant role in Sri Lanka's economy. Sri Lanka has a two-pronged agricultural policy for the plantation sector and for the non-plantation based on smallholder production of mainly basic foods. Imports are also afforded a reasonable level of protection. Subsidized inputs, notably fertilizer, seeds, and planting material, as well as additional support measures such as low-interest finance, assured marketing, and almost free irrigation water, are provided to these industries. Sri Lanka's horticulture policy is integrated into the National Agriculture Policy because it does not have a separate policy (NAP, 2007). It seeks a transition from subsistence farming to an agribusiness-based economy with export markets.

There are major socioeconomic goals that the agriculture sector is unable to meet in a timely manner. When living on a low budget and purchasing daily necessities to meet nutritional demands, food security is a top issue. The concept of food security was highlighted by the 2021 Global Food Hunger Index, which put Sri Lanka 65th out of 116 nations, with a "moderate" overall hunger rating.

Surprisingly, the country is currently experiencing an economic crisis that has resulted in calamitous food scarcity, with citizens being forced to pay exorbitant prices for food. It causes severe food scarcity and hunger. The government of Sri Lanka's capacity to account for imported food supplies has been hampered by the depletion of foreign reserves. Furthermore, the depreciation of the rupee and the Covid-19 pandemic issue are all contributing factors to the current economic situation. Financial mismanagement has a negative influence on the economy, which leads to an increase in food insecurity in the country.

Rather than starving Sri Lankans, the government should implement structural changes and increase taxes on those who can afford them. Despite prior judgments, Sri Lanka's worrying ranking on the size of food production can be explained by high rates of undernutrition, which include wasting, starvation, and being underweight. Sri Lanka is also subject to the effects of climate change, which include extreme weather events such as droughts, floods, and landslides in rural areas, all of which contribute to food insecurity. Those consequences must be mitigated as soon as workable.

Uncontrollable price increases in food have an influence on human nutrition. It is not always due to a lack of food, but rather to an unacceptably large price increase. One of the most important facts about food insecurity is that it is linked to economic changes. Sri Lankan officials have also admitted that food supplementation is becoming increasingly problematic across the country.

Chemical fertilizer import bans, together with prior year's restrictions, have played a significant influence in the country's agriculture sector breakdown. Farmers have encountered and continue to endure a difficult scenario in which agricultural harvests are lower than expected for the country's consumption. Furthermore, inorganic fertilizer prices are at an all-time high as a result of such ill-advised selections. The sad status of poor farming communities, along with waves of Covid-19 epidemic, has the potential to put food supply in threat in the next months. The worst-case situation to be concerned about is food insecurity.

Meanwhile, acquiring information and understanding of the effects of the economic crisis on food security necessitates the implementation of an effective way to address difficulties originating from depletion in the agricultural sector that addresses food security concerns. It is critical to have strategic plans in place to reduce the damage; it is necessary to increase domestic agricultural production in order to ensure the nation's food and nutrition security. Hyperinflation is expected in the next few months. As a result, strategic plans must be implemented. One of the best options will be to increase agricultural production and ensure long-term growth in line with sustainable development goals. Maximize advantages and limit negative impacts of the economic crisis by reducing undesired commodities such as automobiles on a daily basis and focusing more on importing food commodities such as dhal, rice, and even fuel. Increasing the amount of money allocated to essential food importation will be a solution for ensuring food security; including adopting productive agricultural techniques and enhancing agro-technology with the help of research professionals in Sri Lanka, in order to promote agro-based enterprises and expand job possibilities for qualified and informed individuals. On a national level, innovative methods with the respective parties and government policies on the farm sector must be undertaken in order to get through the crisis and reduce the negative influence on food security for a prosperous future.





Does Organic Farming Responsible for Sri Lanka's Economic Crisis?

April 29, 2021 brought a major agriculture policy shift to Sri Lanka with the government announcing that Sri Lanka would turn into the first organic-only economy in the world. In one fell swoop, Sri Lanka's government banned chemical-based farming in the country and farmers stood up against this unconditional hasty decision.

Sri Lanka is going through its worst economic crisis. There are protests, cabinet resignations etc. This mayhem has been squarely blamed on the shift to organic farming. However, is this the cause of the economy collapse? To tell the truth, it is rather the series of blunders going on for years that have been directly and indirectly caused it.

Let us rewind back to about 60 years ago when the green revolution first emerged in Sri Lanka; around 1965, Sri Lanka had been experimenting with synthetic fertilizers and hybrid seeds to increase its food production, especially rice. The result in Sri Lanka, like the rest of south Asia, was startling towards the end of 20th-century rice production had almost tripled. The country became secure in terms of food. In the



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meantime, the Export of tea and rubber became critical sources of foreign reserves. On April 29, 2021, the government kept a promise by ordering the country's two million farmers to go organic overnight, since the government believed organic farming feed Sri Lanka's population and will save foreign exchange bills on imported fertilizers. Sri Lanka imports all its fertilizer from China and India. At that time, the total cost of fertilizer imports and subsidies was also close to 500 million dollars. This may not look like a huge amount but according to the World Bank, Sri Lanka's foreign reserves stood at around 5.7 billion dollars in 2020, which meant that Sri Lanka was roughly spending 10% of its reserves in importing fertilizer. Then in 2020, while the bill was already straining the country's reserves, the covid19 pandemic broke out and almost emptied it out.



The tourism sector contributed close to 478 million dollars in 2018 which fell to 50 million dollars in 2020. Moreover, Sri Lanka's production became very low because the main income was covered by tourism and dollars sent by Sri Lankan workers employed abroad. Within the past two years, it completely collapsed. It is at this juncture, that the government's inadequate foreign reserves to import fertilizers coincide with the ban on importing chemical fertilizers to go for organic agriculture.

Sri Lanka's economic crisis was not a result of organic farming, but poor economic policies. When the government announced the shift to organic, less than 3% of Sri Lanka's farmland was farmed without chemicals. The country needed time to change and adjust to organic farming. Farmers also needed support and good organic substitutes to smoothen the transition.

Bhutan announced in 2008 that it would become fully organic by 2020. Bhutan is yet to achieve that target. In terms of Sri Lanka, the situation is the same. We need time. This would not be successful in a blink of an eye. As for Sri Lanka, the impact of a series of poor economic policies will hurt 20.1 million of the population for years to come. Sri Lankans could not at all suffer these dilemmas for ages. We need a well-planned systematic way to attract dollars through rich economic policies.

Strengthening Agro-tourism, expanding minor export croplands, introducing value additions for indigenous fruits and vegetables, and opening the door to foreign markets can be considered strategic movements in uplifting Sri Lanka in terms of Agriculture.



How Economic Crisis Affects Aquaculture in Sri Lanka

Aquaculture is the controlled cultivation of aquatic organisms such as fish, crustaceans, mollusks, algae, and other organisms of value such as aquatic plants. It is a major industry in Sri Lanka and has the potential to contribute significantly toward poverty alleviation in rural areas. The aquaculture sector is also important to the livelihoods of a large population of small-scale fish farmers and fishermen, who depend on the sector for their survival. It is therefore vital to support the development of this industry so as to boost economic development that promotes poverty alleviation in Sri Lanka.

The country faces several problems such as low production rates, lack of infrastructure, limited access to equipment and feed, ineffective processing systems, and environmental degradation.

The introduction of foreign species led to the development of poly-cultural practices as well as the use of modern techniques in hatcheries. This has helped raise production levels from around 469 tons in 1950 to 3 million tons in 2010 but there is still a large gap between local demand and supply. The industry also faces challenges due to a lack of infrastructures such as roads for transporting goods and poor quality control for processing facilities. A recent issue is environmental degradation due to overfishing and pollution from industrial farming practices which has damaged aquatic ecosystems around fisheries causing an imbalance in marine habitats where various species compete for food sources such as plankton.



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The government of Sri Lanka is taking a number of steps to develop these industries through public-private partnerships and better cooperation among stakeholders. In this regard, the government has established a Fisheries Development Authority which is responsible for providing support to the fisheries industry in areas such as marketing.

The goal of the FDI is to foster economic growth and sustainable development by creating employment opportunities and improving living standards, through the promotion of investment activities.

Aquaculture production has been growing steadily for the past three decades. Increased demand for animal protein, declining wild fish stocks, and a shortage of space to expand other types of agriculture have driven much of this expansion around the world. Aquaculture is also seen as a promising source of income and employment because it can be conducted at a small scale by an individual or family. However, in Sri Lanka aquaculture has not become the people's industry that it could be. This is due partly to the fact that low-income communities do not have access to freshwater resources, especially where these are privately owned. The poor tend to have limited knowledge about aquaculture operations and lack access to finance for start-up costs associated with building fish ponds and purchasing inputs such as fingerlings.

The development of the aquaculture industry may be affected due to the current economic crisis. The export of aquatic products including fish, prawns, and lobsters may be reduced. Therefore, the income of local farmers will reduce and this can be a threat to the national economy.

Moreover, the importation of live fish from neighboring countries to satisfy domestic demand may also be reduced. This is because the COVID-19 pandemic has affected almost all countries in the world – especially, European countries. In addition, domestic demand for fish and prawns may also reduce due to income reduction as well as the closure of restaurants during the curfew period.

Fuel costs are currently growing significantly in Sri Lanka due to rising inflation. The industry has been heavily hurt by rising fuel prices. This is especially true for enterprises that make feeds for the industry, as petroleum is used as a fuel, raising production costs. Transportation is also impacted by rising gasoline prices. As a result, increased transportation costs have a significant impact on feed prices. As a result, the economic crisis has resulted in an increase in fuel prices

Also, there is a scarcity of some equipment related to aquaculture and fish feed ingredient and there is an increase in their price because imports were limited with dollar crisis. Therefore, farmers are suffering from the lack of resources.

In addition, price hikes of feed materials such as soybean meal, corn gluten meal, fishmeal, etc., can increase total production cost. Due to the high cost of production farmers might try new species which require fewer feed inputs or they will use locally available raw materials such as dried leaves or rice bran etc. However, these are not nutrient-rich, so it will affect growth rate and health status. Thus, fish growth and quality may reduce and the demand for Sri Lankan fish in other countries will decrease.

In addition, there might arise some other problems such as the use of chemicals without proper knowledge. Therefore, quality should be examined before using these ingredients by scientific experts including biotech industries as well as Government institutes and private sector companies which produce animal feeds regularly.



Sri Lankan Entrepreneurship during the Economic Crisis



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An economic crisis occurs when a country's economy takes a sharp turn for the worse. It can last for a long time, from a few years to several decades. War, severe natural disasters, poor administration, short-lived legal systems, and excessive debts contribute to a country's economic crisis and cause it to develop. There is civil unrest, social instability, bankruptcies, lower trade volumes, price fluctuations, and a breakdown of laws during a country's economic crisis. Periods of occasional economic crisis have been reported since the "Great Depression" originated in the United States in the 1930s. The Suez Crisis of 1956, the International Debt Crisis of 1982, the East Asian Crisis of 1997-2001, the Russian Economic Crisis of 1992-1997, the Latin American Debt Crisis of 1994-2002, and the Great Recession of 2007-2009 were some of the events in which many countries were in crisis at the same time. Some of them are more or less affected by an economic crisis, and some of them are able to stabilize their economies, while others are unable to rebuild their economies.

Sri Lanka is burning with a severe economic crisis that was initiated in the year 2019. The economic crisis, which began about three years ago, is now at its worst, but has not yet reached its peak. Sri Lanka is suffering from a shortage of medicine, fuel, electricity, and essential commodities. The prices of essential commodities are rising. Sri Lanka is still a developing country, as it was earlier. Although Sri Lanka has been a developing country for a long time, what is happening now is finding ways to provide the basic necessities of life for the people,

not just development. This economic crisis began with the Easter bombings in April of 2019, exposing the shortcomings of Sri Lanka's defense system to the world. Sri Lanka's tourism industry has suffered a setback due to attacks on Catholic churches as well as leading hotels. According to the Annual Statistical Report of SLTDA, in 2018, the foreign exchange earnings were USD Mn 4380.6 million and in 2019, it decreased to USD Mn 3606.9. The devastating COVID-19 plague, which began in late 2019 in Wuhan, China, has been ravaging the world for nearly two years. In this situation, some countries have managed to control the disease while maintaining a resemblance of economic activity. The Sri Lankan health system was able to control the COVID-19 pandemic and restore normal life in the country with COVID-19. With the lockdown of the country, the GDP growth, which had been 3.3% in 2018, decreased to 2.3% in 2019. Most economic activity has come to a halt as a result of the lockdown. Apart from pandemics, economic mismanagement, the foreign exchange crisis, Central Bank money printing, the Russian-Ukraine war, chemical fertilizer restriction regulations, and prolonged periods of insufficient rainfall all contribute to the current economic disaster. Relevant authorities have failed to submit budget reports on loans taken by Sri Lanka from various countries. Meanwhile, the Central Bank has stated that due to a lack of required measures under the Foreign Currency Act, severe actions against money launderers and illicit foreign exchange dealers cannot be taken. Due to the implementation of the policy of banning chemical fertilizers without introducing suitable alternatives to chemical fertilizers, food production in the country is declining and the prices of food items



are fluctuating uncontrollably. Sri Lanka lacks the funds to release imported fuel and other goods. In such a fuel shortage, the national power grid has collapsed due to the lack of adequate water levels for the country's hydro power plants.

This crisis in Sri Lanka makes an unfortunate time for a large number of sectors. Frequent fluctuating commodity prices and shortages in the country are causing inconvenience not only to consumers but also to traders. Prolonged power cuts on a daily basis disrupt day-to-day operations as well as industry and services in the country. One incident of this is the loss of large quantities of fish to ornamental fish sellers due to prolonged power cuts. As a result of this crisis, employers are struggling to pay their current employees on time, and job seekers are reluctant to provide opportunities because of the inability to pay. Entrepreneurship is a concept that has been promoted in Sri Lanka for some time and is of great interest to many. Entrepreneurship can be defined as the process of starting a new business and taking on any associated risks in order to profit from it. It accounts for 1.5% of the total population in 2019, a very small number. Entrepreneurship is a key driver of the economy, according to award-winning business leader Dr. Nirmal De Silva, in order to boost it, education systems and policies should be regulated, national funds, banking and debt models should be created, and entrepreneurship centers should be established.

But the fact is whether, in the unstable situation in the country, the necessary arrangements are being made to promote entrepreneurship and whether there is a conducive environment for existing entrepreneurs. In this crisis, entrepreneurs are facing so many difficulties. Research by Alexander Newman, Deakin Business School, Deakin University, discussed three effects of the economic crisis that affect entrepreneurs and small businesses. They are financial, psychological, and social effects. In most cases, the entrepreneur is the owner of the business, and his income is the profit from the business. The crisis has effects on the wealth and income of entrepreneurs. Psychological effects are emotions, motivation, and wellbeing, and they can be affected positively or negatively. For some, the crisis is an opportunity to motivate and empower entrepreneurs, while for others, it may be a breakdown in their morale and entrepreneurship. In terms of social effects, some businesses effectively maintain the bonds between partners, stakeholders, and customers and remain stable in this crisis, while some are unable to manage them. Alexander Newman further says that, in his research, micro-business management and entrepreneurs have been able to adapt the business to the challenges posed by the global COVID-19 pandemic and keep it afloat rather than macro-business management.

The question is whether it is appropriate to be an entrepreneur, starting your own business at such a time. Despite the current economic crisis in Sri Lanka, entrepreneurs have the opportunity to run their own businesses and start new businesses. But more



energy and effort are required than in a normal environment. The first step is for the entrepreneur to build confidence in his abilities. They need to build a model that is adapted to the current crisis for their innovative business idea, and if it is an existing business, it needs an adaptation, not a termination. Conduct research on your own business idea and gather information needed for your business, such as successful businesses, their strategies and techniques. A SWOT analysis can be done to identify strengths, weaknesses, opportunities and threats. Rising interest rates on loans, legislation on imports, irregularities in government offices, energy and commodity shortages, and rising prices are just some of the weaknesses. Other entrepreneurs, enterprises, and products lack the interest of consumers are threats. When considering strengths, there are many experienced employers who have lost their jobs due to layoffs to minimize company costs in the face of the crisis. Entrepreneurs can link them to the business and get benefit from their valuable experience and ideas. And during this time, many inventors are introducing alternatives to the various shortages that exist in the country. Those innovations also have the opportunity to be used in an entrepreneur's manufacturing processes. Online shopping and marketing are a strength. Using these online methods effectively, increases your customer base and decreases the marketing cost. In the face of this economic crisis, it is an opportunity to provide a quality service or product

at an affordable price and take it to the international market. If quality and reasonable priced products can be provided, the consumer base will remain even after the crisis is over. Before investing your assets in financing, it is prudent to have your business strategy reviewed by experts and successful entrepreneurs. If you are applying for a loan, it is important to analyze the services provided by all the banks, as some banks may offer more attractive interest rates and services than well-known banks.

Instead of hoping for relief in the face of an economic crisis, it is appropriate to implement a business idea that will bring success to ourselves as well as the country. This is not an unfortunate time for entrepreneurs, as they are creative risk-takers, top management of their own businesses and job creators in a country. Many lost their jobs, and the unemployment rate is high due to the recession. The relevant authorities should pay attention to preparing a proper program for the entrepreneurs who can contribute to the economic condition of the country. FedEx, Kraft Miracle Whip, iPod, King Kullen, and General Motors are some of the products and businesses that were established in the recession periods and obtained great success. Although this is a difficult time, the entrepreneur who has a powerful mindset and the right strategy will definitely achieve the targets and goals

Food Insecurity in Sri Lanka – The Result of the Current Economic Crisis



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The recent political instability and economic crisis in Sri Lanka have resulted in severe food, fuel, and medicine shortage all over the country. In the context of serious food scarcity, the country's 21 million citizens now have to spend three times as much for essentials such as rice, sugar, dhal, and milk powder. The government's goal of banning chemical fertilizers has resulted in spending more money on food imports. Over the last two years, Sri Lanka's foreign currency reserves, which are the foreign assets held or controlled by the central bank have fallen drastically and by now the useful reserves were down to 50 million US dollars. As the consequence, Sri Lanka is unable to pay for its heavily reliant imports, and in this context, people in Sri Lanka are facing a huge threat of food insecurity.

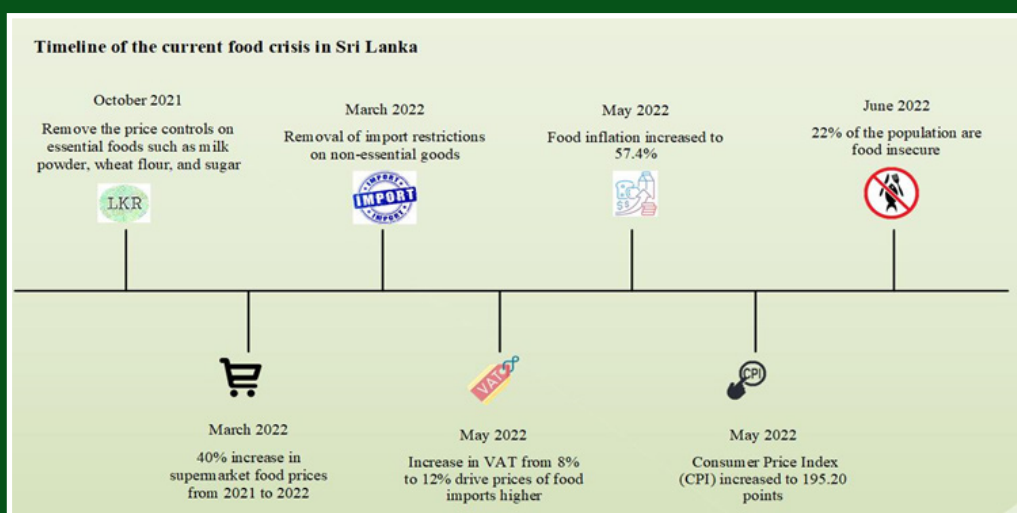
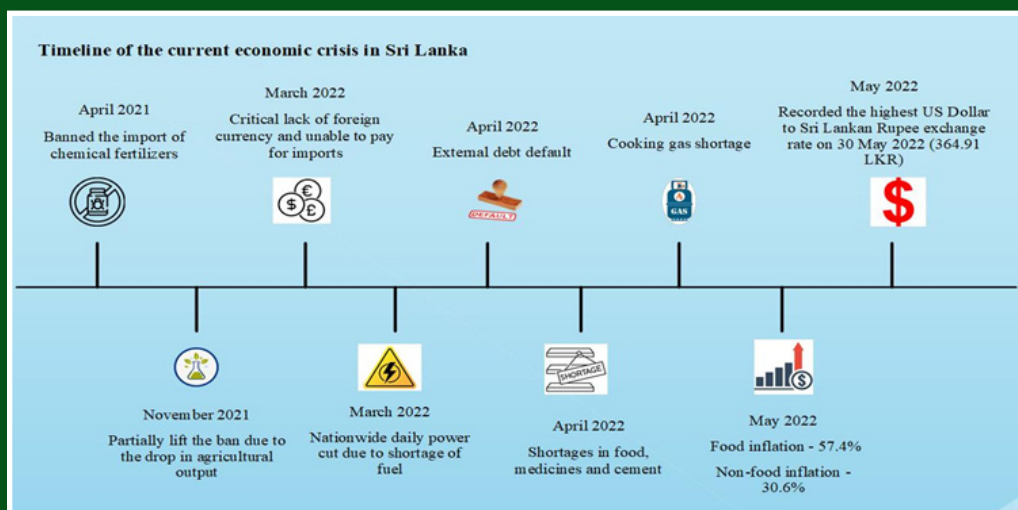
Food security, having access to a sufficient amount of nutritious food is considered the most fundamental of all human rights. However, in Sri Lanka, availability, accessibility, and affordability of food have fallen drastically. In February 2022, food inflation rose to 24.7%, due to significant price changes in rice, dhal, and milk powder, and marked the highest month-over-month food inflation. Furthermore, food inflation (Year on Year) increased to 54.7 in May 2022 from 45.1% in April 2022 as per the most recent data available from the Central Bank of Sri Lanka (Central Bank of Sri Lanka, 2022). The climbing price of rice, the

country's main staple food, recorded new highs in April 2022 with the weakening of the national currency, and concerns over the production of the "Maha" season. Sri Lanka is too mentioned as a country with unfavorable cereal production prospects in 2022 due to the shortages of agrochemicals and high prices of fuel (FAO, 2022).

As a result of the severe depreciation of the national currency, domestic prices of both imported and locally produced food staples skyrocketed. In addition to surging inflation pushing up the cost of living, Sri Lankans from all socioeconomic groups are increasingly having to change their regular consumption patterns, with food intake being one of the most urgent concerns. As the imports are stagnated with the deficit of foreign currency reserves, the availability of various imported essential food items mainly milk powder, wheat, sugar, legumes, and dhal is also declined. Food supply across Sri Lanka faces interruptions due to the fuel shortage, whereas the high prices have severely affected the accessibility of food for most areas of the country has reduced to a great extent. This economic crisis has resulted in widespread loss of income and livelihood, thus, significantly lowering the purchasing power of the people. As a result of reduced food consumption or switched to comparatively cheaper but less nutritious foods, concerns about nutritional imbalance and malnutrition among the population have grown (FAO, 2022).

In this scenario, households are facing an extreme consequence in terms of acquiring vital nourishment via meals as a family of three would have to spend more than Rs. 1,000 a day on meals without including fish or meat. This arises concerns about the most vulnerable elements of society, particularly pregnant mothers and children, as the escalation costs pushing Sri Lankan consumers to eat less or lose access to fundamental items. Even though there are no official data on how and whether current

food shortages are affecting the population, it is clear that restricting people's access to food and mothers' access to proper nutrition will have an impact on newborn babies, who will be at risk of developing Non-Communicable Diseases (NCDs) as they grow into adulthood. In these conditions, people's inability to receive the necessary intake of healthy meals may have far-reaching consequences, compromising the health and well-being of future generations of the country.



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ගෝලීය ආර්ථික අර්බුද හමුවේ අපේ ආහාර පුරුදු



එම එම සෙනෙවිරත්න සමාජ විද්‍යා කථිකාචාර්ය ඇන්ඩ්‍රියාස් විශ්ව විද්‍යාල ආයතනය, බොරැල්ල

‘සබ්බේ සන්නා ආහාරට්ඨිනිකා’ යන බුදු වදනට අනුව මිනිමත ජීවත් වන සෑම සත්ත්වයෙක්ම ආහාර මත යැපේ ආහාර ජීවියෙකුගේ පැවැත්මට අත්‍යවශ්‍ය සාධකයකි. ශරීරයේ පැවැත්මට අවශ්‍ය ශක්තිය ඒ මගින් සැපයෙන අතර, ශරීරයේ වර්ධනයට මෙන් ම මනා සෞඛ්‍යයක් පවත්වාගෙන යෑමටද උපකාරී වේ. එහෙයින් ආහාර පාන ජීව විද්‍යාත්මක අවශ්‍යතාවක් වන අතර ම ආර්ථික හැකියාව සහ සමාජ තත්ත්වය ප්‍රදර්ශනය කරන සංකේතයක් ද වෙයි. සත්ත්ව ලෝකයේ බොහෝ සතුන් තමා අවට පරිසරයේ ඇති දේවල් එලෙසින් ම පරිභෝජනය කරන නමුදු මිනිසා බුද්ධිමය වශයෙන් දියුණු නිර්මාණාත්මක සත්වයෙකු නිසා තම ආහාර පරිභෝජන රටා පාරිසරික සාධක අනුව ඒ ඒ සංස්කෘතීන්ට සාපේක්ෂව තාක්ෂණය මත හැඩගස්වාගෙන තිබෙන බව කිව යුතුයි. මානව ඉතිහාසයේ යුග හඳුනාගත හැකි වන්නේද ආහාර පාන නිෂ්පාදනය කර ගැනීම, රැස් කිරීම, ගබඩා කිරීම, ප්‍රවාහනය, පරිභෝජන රටා අනුවය. දඩයම් යුගය, එඬේර යුගය, කෘෂිකාර්මික සහ කාර්මික අවධිය යනාදිය ඊට නිදසුන්ය. වෛද්‍ය විද්‍යාව, ආර්ථික විද්‍යාව, ජීව විද්‍යාව, සමාජ විද්‍යාව, මානව විද්‍යාව, කෘෂිකර්මය හා සුප ශාස්ත්‍රය වැනි බහුවිධ විෂය ක්ෂේත්‍රයන් ඇසුරෙන් මේ සම්බන්ධයෙන් දැනුම් සම්භාරයක් ද ගොඩනැගී ඇති බව කිවයුතු ය.

එසේම, ආහාර පුරුදු පිළිබඳ සමාජ විද්‍යාව නමින් මිනිසාගේ ආහාර පුරුදු ඔහුට හා සමාජයට බලපාන ආකාරය පිළිබඳ ව සමාජ විද්‍යාත්මකව සලකා බලන උප විෂයක් ද ව්‍යවහාරයේ පවතී. මිනිසාගේ ආහාර පාන ජීව විද්‍යාත්මක අවශ්‍යතාවක් මෙන්ම සමාජ ජීවිතයට ද නිර්ණාත්මක ලෙස බලපාන බව කාල් මාක්ස් වැනි

ආර්ථික නියතිවාදීන් (Economic Determinism) න්‍යායාත්මකව පෙන්වාදී තිබේ. බුදුන්වහන්සේ ද සාගින්නේ පෙළෙන අයෙකුට ආහාර පානාදියෙන් නොසලකා ධර්ම දේශනා නොකළ යුතු බව දේශනා කළේ සෙසු සියලු අවශ්‍යතා බඩගින්නට දෙවන වන නිසා ය. පරාභව සූත්‍රය, සිගාලෝවාද සූත්‍රය වැනි මිනිසා නිෂ්පාදනය හා පරිභෝජනය කළ යුතු ආකාර පිළිබඳව සූත්‍ර ගණනාවකින් කරුණු පෙන්වා දී තිබේ. ලොව බිහිවූ සෑම ආගමික ශාස්තෘවරයෙකුම තම අනුගාමිකයන් හට ජීවත් වීම සඳහා අවශ්‍ය ආහාර පාන සපයාගත යුතු ආකාරය, එය පරිභෝජනය කිරීමේ රටා පිළිබඳ ව කරුණු දක්වා තිබේ. මිනිසුන් මෙන්ම සත්ත්ව ලෝකයේ සෙසු තිරිඟිවන සත්ත්වයින් ද අවදි වූ මොහොතේ පටන් නින්දට යන තෙක් ආහාර පාන සපයා ගැනීමට වැඩි කාලයක්, වැඩි ආයාසයක් යොදවන්නේ ද ආහාර පාන නොමැතිව ජීවත් විය නොහැකි නිසා ය. මිනිසාගේ ජීවය ආහාර පාන නිසා ඔහු තනි තනිවමත් සාමූහිකවත් ආහාර සපයා ගැනීම වෙනුවෙන් උනන්දුවෙයි. එක්සත් ජාතීන්ගේ කෘෂිකර්ම සංවිධානය පෙන්වාදෙන පරිදි පුද්ගලයෙකුට දෛනික ශක්තිය සඳහා අවශ්‍යය ආහාර පාන නොලැබීම දැනිබවයි යුධ ගැටුම් කෝවිච් 19 බලපෑම දැරිනික්ෂ ආන්තික කාලගුණ තත්වයන්, කෘමි උවදුරු සහ ආහාර අසමතුලිත බව හේතුවෙන් අද වන විට ලෝකයේ මිලියන 720 ජනතාව සාගින්නෙන් පෙළෙන බව පැවසේ ලෝක ආහාර සංවිධානය (WFO) සහ ලෝක බැංකුව කොරෝනා හේතුවෙන් පමණක් කෝටි 50 ජනතාවක් අන්ත දිලීන්දන් බවට පත්වී ඇති බවත් ඔවුන් එම තත්වයෙන් මුදවා ගැනීමට

ඇමරිකානු ඩොලර් බිලියන 07 අවශ්‍යබව ප්‍රකාශ කරයි 24 ජූනි 2022 දින පැවති United in the fight against hunger: An international conference on food security in Berlin සමුළුව පෙන්වාදෙන්නේ රුසියානු යුක්කේන්‍ය යුධ ගැටුම ද ලෝකයේ ආහාර අර්බුදය උග්‍රකරන බවයි තිරසාර සංවර්ධනය සහ සහභාගි සංවර්ධන අභිලාෂයන් වැනි ගෝලීය සංවර්ධන ව්‍යාපෘති මගින් ද බඩගින්න ලෝකයෙන් තුරන් කිරීමට ලෝකයම එක්ව උපාය මාර්ග සෙවීමේ කටිකාව කරලියට ගෙන තිබේ අන් කවර කලකටත් වඩා අද වන විට ලෝකයා ආහාර අර්බුදයකට මුහුණ දෙමින් සිටින බව පැහැදිලි කරන්නාකි වැඩි වන ජනගහන වර්ධනයට සාපේක්ෂව ආහාර නිෂ්පාදනය නොවීම මෙන්ම වෙනත් ආකෂමික හේතු සාධක මෙයට බලපා තිබේ.

ඉතිහාසයේ අන්කවර කාලයකවත් නොතිබුණ ආකාරයේ ආර්ථික අවපාතයකට ශ්‍රී ලංකාව මුහුණ දී සිටී. මෙම මානව කේදවාචකය හමුවේ ලෝක ආහාර සංවිධානය සමීකෂණයකින් පෙන්වා දෙන්නේ මිලියන 6.7 කට ඊලඟ ආහාරවේල අවිනිශ්චිත බවයි. ටීප්වේ ආර්යා ළමාරෝහල සිදුකළ නමනම අධ්‍යයනයකින් දෙමාපියන්ගේ දැනුවත්වය හා ආහාර පිලිබඳව ඇති අනවබෝධය හේතුවෙන් 20% ක් දරුවන්ට මන්දපෝෂණය බව අනාවරණය කරයි. සංවර්ධනය වෙමින් පැවති රටක් වූ මෙය අද වන විට අඩු ආදායම් ලාභී රටක් ලෙස ලෝකයා විසින් නම්කර ඇත. අතීතයේ සමෘද්ධිමත්ව පැවති රට යටත් විජිතකරණයන් සමග යැපුම් ස්වයංපෝෂිත කෘෂි ආර්ථිකය වෙළඳපල මුල්කරගත් ගෝලීය ආර්ථිකයකට සම්බන්ධ වෙයි. යටත් විජිත සෑම රටකටම පොදුවේ මුහුණ දීමට සිදුවන ගෝලීය ආර්ථික සුරාකරමේ ග්‍රහනයට හසුවන අප නව ලිබරල්වාදී ආර්ථික මොඩලයෙන් නවදුරටත් පීඩාවට පත්ව සිටීමු. නිදහසින් පසුව පාලකයන් අනුගමනය කරන ලද වැරදි ආර්ථික ප්‍රතිපත්ති හේතුවෙන් දේශීය නිෂ්පාදනය බිඳවැටී විදේශ මත යැපෙන රටක් බවට පත්වීමෙන් ඩොලර් හිගය හමුවේ අන්ත අසරණ තත්වයකට පත්ව තිබේ. වත්මන් මානව පැවැත්මට අවශ්‍යම බලශක්ති බෙහෙත් හේත් මෙන් ම ආහාර හිගය ඒ අතර කැපී පෙනෙයි. ලෝකයෙන් ණය හෝ අධාර ලබාගෙන මෙම අර්බුදයන්ට විසඳුම් සෙවීම නාවකාලික පැලැස්තරයි. අතීතයේ අප සතුව පැවති පරිසරයට සහ සංස්කෘතියට ගැළපෙන ආර්ථික ක්‍රමෝපායන් සහ ආහාර පුරුදු වෙන යාම දිගුකාලීන තිරසාර පිලියම් වෙයි. පුද්ගලයින්ගේ කුස ගින්න හා බැඳුණු ආහාර හිගය රට තුළ තේකවිධ ගැටලු ප්‍රශ්න නිර්මාණය කිරීමට හේතුවෙයි. මේ නිසා දේශීය ආර්ථිකය මෙන් ම ආහාර පුරුදු පිලිබඳ වූ දේශීය ඥානය (Indigenous knowledge) මගින් ඉක්මන් විසඳුම් සෙවිය යුතු කාලය එළඹ ඇත.

පැරණි ශ්‍රී ලංකාවේ ජන ජීවිතයේ සියලුම අංශයන් හැඩගැසී තිබුණේ ද ආහාර නිෂ්පාදනය මුල්කර ගනිමිනි. ගමයි-පන්සලයි-වැවයි-දාගැබයි යන පැරණි සංස්කෘතික තේමාවන් මගින් එම අදහස නව දුරටත් තහවුරු වෙයි. යැපුම් කෘෂිකර්මාන්තයට නැඹුරුව සිටි පැරණි ලාංකිකයින් ආහාර නිෂ්පාදනයට අවශ්‍ය ශ්‍රමිකයින් සපයා ගත්තේ ද නම පවුල මගින් හෝ අන්තම් ක්‍රමයට අසල්වාසින්ගෙනි. ගැමි ජීවිතය කුල ක්‍රමය, විස්තෘත පවුල් ක්‍රමය, එකගෙයි කෑම, ඇවැස්ස විවාහය වැනි විවාහ සම්ප්‍රදායන් ක්‍රියාත්මක වී තිබෙන්නේ ද සමකාලීන ආර්ථික අව්‍යයනා මුල්කරගෙනය. අතීත පාලකයන් රටේ භෞතික පිහිටීමේ යෝග්‍යතාවය හඳුනා ගනිමින් වැව් අමුණු හතලස් දහසකට ආසන්න ප්‍රමාණයක් ඉදිකළේ කෘෂි කර්මාන්තය තුළින් සංවර්ධනය කිරීමටය රට ආහාර පානයෙන් ස්වයංපෝෂිත කොට පෙරදිග ධාන්‍යාගාරය ලෙසින් හැඳින්වූයේ එහි ප්‍රතිඵලයක් වශයෙනි. විශාල වැව් අමුණු ඉදිකර කෘෂි නිෂ්පාදනවලට අවශ්‍ය ජලය සපයාදීම පාලකයින්ගේ ප්‍රධාන වගකීමක් වී තිබුණි. පැරණි ගම නිර්මාණය වී තිබුණේ ද ආහාර නිෂ්පාදනය කේන්ද්‍රකොට ගෙනයි. ගෙවත්ත, නිවසේ මූලික ආහාර පාන අවශ්‍යතා වෙනුවෙන් වෙන්ව තිබූ අතර කුඹුර, වී සහල් නිෂ්පාදනයට ද, ධාන්‍ය, එළවලු හා පළතුරු නිෂ්පාදනය කිරීමට ද යොදා ගෙන තිබේ. එකල සෑම පවුලක්ම සමෘද්ධිමත්, සශ්‍රීක, ස්වයංපෝෂිත පවුල් ඒකකයක් විය. වැඩිවසම් කුල ක්‍රමය ද නිෂ්පාදනය අරමුණු කරගත් ශ්‍රම විභජනයක් මත ගොඩනැගී තිබුණි. ඒ ඒ කුලයට පැවරුණු, පාරම්පරිකව පැවතගෙන එන කුල වෘත්තීන් සියලු සමාජ අවශ්‍යතා සපුරාලීම අරමුණුකොට ගෙන සංවිධානය වී තිබුණි. අතීත ලංකාව සමෘද්ධිමත්, සශ්‍රීක වූ නිවහල් දේශයක් ලෙස පැවතියේ එදා පාලකයන් භෞතික හා මානව සම්පත් මැනවින් කළමනාකරණය කළ නිසාය. මිනිස් සම්පත රටේ සංවර්ධනය සඳහා නිසි පරිදි ආයෝජනය කරන්නට පුද්ගලයා නිරෝගිමත් විය යුතුය. ඒ සඳහා පැරණි ආර්ථික ක්‍රමයෙහි පෝෂ්‍යදායී නිරෝගිමත් ස්වාභාවික ආහාර වේලක් මෙන්ම ගොවිතැනෙන් ප්‍රමාණවත් ව්‍යායාමයක් සිරුරට ලැබිණි. එසේම පැරණි මුතුන් මිත්තන් සිරුරේ වර්ධනයට හා සෞඛ්‍ය සංවර්ධනයට අවශ්‍ය සමතුලිත ආහාර වේලක් ලබා ගැනීම කෙරෙහි විශේෂ උනන්දුවක් දැක්වූ බවට සාක්ෂි හමුවෙයි. අවට පරිසරයේ ස්වාභාවිකව වැවෙන කොස්, දෙල්, අල, බතල, පලා වර්ග, ධාන්‍ය වර්ග ආහාරයට ගැනීම තුළින් එය සම්පූර්ණ විය. රටේ රජුගේ සිට සාමාන්‍ය පුරවැසියා දක්වා මිනිසුන් ආහාර පාන සඳහා දැක්වූ උනන්දුව උපයෝගී කරගත් දේවල් ආහාර පුරුදු පිලිබඳව රොබට් නොක්ස් ඔහුගේ එදා හෙලදිව නම් කෘතියෙන් පෙන්වාදෙයි, රජුගේ දෛනික ආහාර වේලට මාලු පිහි නිස් දෙකක් (32) ඇතුළත්ව තිබුණි.අද වන තුරු දළඳා වහන්සේට පුජාකරන්නේ ද එම මාලු පිහි වර්ග 32 යි.

පැරණි ශ්‍රී ලංකාවේ ආහාර පාන රටාව බෙහෙවින් සෞඛ්‍ය සම්පන්න විය. දේශීය ආහාර පිළියෙල කිරීමේදී කුළු බඩු භාවිතය, සෞඛ්‍ය සංරක්ෂණයට මහඟු පිටුවහලක් විය. ආහාර කල් තබා ගැනීම, රසකර ගැනීම, සුවදවන් කර ගැනීම ආදිය සඳහා උපයෝගී කරගත් රම්පෙ, කරපිංචා, එනසල්, කුරුඳු, ගම්මිරිස්, කොත්තමල්ලි, සුදුරු, මහදුරු, සාදික්කා, වසාවාසි, කරාබු, ඉඟුරු, සුදු එෂණු, කහ, මිරිස්, උළුභාල් ආදිය ආයුර්වේදයට අනුව මිනිස් සිරුරේ සෞඛ්‍ය සම්පන්න බව ආරක්ෂාකර ගැනීමට ඉවහල් වන ඖෂධීය ගුණයෙන් යුක්ත බව බව පිළිගැනීමයි. ආහාර පිළියෙල කර ගැනීමේ තාක්ෂණය උපයෝගී කර ගත් අමු ද්‍රව්‍ය, කුම ශීල්ප පරිසරය සමඟ බද්ධ වී ඇති අතර, සෞඛ්‍ය සම්පන්න ජීවිතයක් සඳහා සෘජුව හෝ වක්‍රව උපකාරී වී තිබේ. පැරණි ගමේ කුස්සිය සියලු ව්‍යායාම වලින් සමන්විත පිම් එකකි වසර දහස් ගණනක් තිස්සේ පැවති, අපට අවේණික වූ ආහාර පාන රටාව බටහිර ජාතීන්ගේ ආගමනයත් සමඟ වෙනස් වේ. බටහිර සංස්කෘතිය විසරණය වීමත් සමඟ දේශීය ආහාර පාන රටා වෙනුවට බටහිර කෂම බීම පරිභෝජනයට එකතු වේ. යැපුම් කෘෂිකර්මාන්තය වෙනුවට වෙළඳපල මුල්කර ගත් කාර්මික අර්ථ ක්‍රමයක් හඳුන්වාදීමත් සමඟ ශ්‍රී ලාංකිකයින්ගේ ආහාර පාන රටාවට නව අංග එකතු වේ. ආහාර පාන ප්‍රධාන ප්‍රධාන ව්‍යාපාරයක් වීම නිසා බහුජාතික සමාගම් අපේ කෂම වේල තීරණය කරයි. බන් මාලු, එළවළු, පළතුරු වෙනුවට මස් මාංශ පරිභෝජනය, නිරිඟු පිටි ආහාර වර්ග, හැමි බේකන්, ග්‍රයිඩ් රයිස්, බුරියානි වැනි ආහාර පාන වලට ජනතාව මාරු වෙයි. තාක්ෂණය දියුණු වීමත් සමඟ කෘෂිකර්මාන්තයට, ගෘහ කටයුතුවලට යාන්ත්‍රික මෙවලම් ආදේශ වේ. එසේම ආහාර බෝග වගා කටයුතු වලදී හරිත විජලවයන් සමඟ රසායනික බෙහෙත්, පොහොර භාවිතය ද වැඩි වියි වෙළඳපලේ ලාභය අරමුණු කරගෙන නිෂ්පාදනයට යොමු වීම නිසා ගුණාත්මක බවින් අඩු, ශරීර සෞඛ්‍යයට අහිතකර ආහාර පාන පරිභෝජනයට හුරු වෙයි. කාර්ය බහුලත්වය, වෙළඳපොල ආර්ථිකය හේතු කොට ගෙන ක්ෂණික ආහාර පාන පරිභෝජනයට ජනතාව නැඹුරු වීම විශේෂත්වයකි. ග්‍රාමීය පරිසරයෙන් දුරස්ථ නගර කරා ඇදී ඒම නිසා ජනතාවගේ ආහාර පාන පරිභෝජන රටාව වෙනස් වී තිබේ. බටහිර පන්තියේ ආහාර පාන පරිභෝජනය කිරීම සමාජ විලාසිතාවක් වශයෙන් සලකා කටයුතු කිරීම මගින් සමතුලිත සෞඛ්‍ය සම්පන්න ආහාර වේලක් කෙරෙහි අවධානය යොමු කරනවාට වඩා තමන්ගේ බල පුළුවන්කාරකම් ප්‍රදර්ශනය කරන ඉහළ සමාජ පංතිය නියෝජනය කරන, ආහාර පාන පරිභෝජනය කිරීම පේන්තූකාර විලාසිතාවක් බවට පත් වී ඇත.

අද වන විට ආහාර සඳහා එක් වී ඇති මස් මාංශ, නිරිඟු පිටි, අධික මේදය සහිත ආහාර, රසකාරක, සීනි හේතු කොටගෙන අධික තරබාරු බව දියවැඩියාව, කොලෙස්ට්‍රෝල, අධි රුධිර පීඩනය වැනි රෝගාබාධ බහුල වීමට හේතුව බව වෛද්‍ය විද්‍යාත්මක මතය වී ඇත. ආහාරයේ ගුණාත්මක භාවයට වඩා ප්‍රමාණාත්මක බව කෙරෙහි අවධානය යොමු කිරීමට හේතුව, ආර්ථික

අගතිගතම, නොදැනුවත් භාවය යි. රටේ ජනතාවගේ ආහාර පුරුදු පිළිබඳව පර්යේෂණාත්මකව අවධානය යොමු කර ජනතාව දැනුවත් කරන වැඩසටහන් රට තුළ ක්‍රියාත්මක නොවන තරම්ය. ජපානය, චීනය වැනි රටවල් ජනතාවගේ ආහාර පාන රටාව කලින් කලට වෙනස් කොට ඒ ඒ අවධියේ රටේ සංවර්ධන වේගය පරීක්ෂා කරන්නට පියවර ගෙන තිබේ. කිරි ආහාර, මස් මාංශ, ධාන්‍ය වර්ග, එළවළු පරිභෝජනය වැඩි අවධිවල ජනතාවගෙන් රටේ සංවර්ධනයට සිදුවිය යුතු සේවය ද වැඩි වී තිබේ. කාබෝහයිඩ්‍රේට් සහ පිෂ්ඨය අධික ආහාර පරිභෝජන කරන අවධිවල මිනිසාගේ කාර්යක්ෂමතාවයේ අඩු බවක් දක්නට ලැබෙන බව එම පර්යේෂණ තුළින් අනාවරණය කරගෙන තිබේ. මේ නිසා දියුණු ලෝකයේ බොහෝ රටවල් සෞඛ්‍ය සම්පන්න නිරෝගිමත් ජනතාවක් බිහි කරන්නට, එම රටවල් තුළ ජාතික ආහාර ප්‍රතිපත්ති අනුගමනය කරන බව පෙනේ. පුද්ගලයෙකු අසනීප වූ විට පමණක් ආහාර පරිභෝජනය කෙරෙහි අවධානය යොමු කරන නමුත්, දෛනිකව සමතුලිත ආහාර වේලක් පිළියෙළ කර ගැනීම කෙරෙහි ජනතාව දක්වන්නේ අඩු උනන්දුවකි. රටේ ජනතාවගේ පෝෂණ තත්වය සෞඛ්‍ය සම්පන්න බව මැනවින් පවත්වා ගෙන යෑම, පවුලේ දියුණුවට මෙන්ම රටේ සංවර්ධනයට ද ඉවහල්වෙයි.

කොරෝනා වසංගත තත්වය කෙටි කාලීනකින් පාලනය කර ගැනීමට හැකි වූයේ එන්නත් නිසාම නොව දූපත් රාජ්‍යයක් වීමත් ආයුර්වේදය දේශීය වෙදකම හා බැඳුණු දැනුම සමාජය සතුවීමත් සාම්ප්‍රදායික ආහාර පුරුදු රටා නිසා බව ද කිවයුතුය නව ලිබරල්වාදී ගෝලීය ආර්ථිකයක සිරවී සිටින වත්මන් ශ්‍රී ලංකාවේ ඩොලර් අර්බුදය ආශ්‍රිත ගැටලු ප්‍රශ්න වලට ද අපේ පැරණි යැපුම් කෘෂි ආර්ථිකය සහ ආහාර පුරුදු තුළින් විෂදුම් සෙවිය හැකිවෙයි. ජනතාව නැවත පැරණි ආහාර පුරුදුවලට හුරුකරන ආහාර ප්‍රතිපත්තියක් හඳුන්වා දීම ඒ සඳහා දේශීය කෘෂි ආර්ථිකය නගා සිටුවීමට ක්‍රියාකිරීම කාලින අවශ්‍යතාවකි වැඩිවන ජනගහනයට සාපේක්ෂව ආහාර නිෂ්පාදනය වේගවත් කිරීමට හරිත විජලවයන් සමඟ හඳුන්වාදෙන රසායනික බෙහෙත් පොහොර පරිසරයට මෙන්ම ශරීර සෞඛ්‍යයට අහිතකර වන නිසා ගෙවත්තෙන් කාබනික වගාව ආරම්භ කරවීම සෑම බිම් අගලකම තම පවුලට අවශ්‍ය දෑ වගාකරවීම පේන්තූකාර පරිභෝජන රටාවෙන් ජනතාව ඉවත්වීම වැනි ක්‍රියාමාර්ග වලට යොමු වීම කාලෝචිතය. අතීතයේ පැවති පවුලේ ස්වයංපෝෂිත බවමෙන්ම අපගේ පැවති ආහාර පුරුදු යලි ඇතිකර ගැනීමේ වැදගත්කම කොරෝනා වසංගතය සහ ඩොලර් අර්බුදය විසින් අප හට පෙන්වාදී තිබේ.



ආහාර පරික්ෂණය මගින් සුරක්ෂිතතාවට මගක්

ශ්‍රී ලංකාව යනු වසර පුරා ඉතා හොඳින් හිරු එළිය සහ වර්ෂාපතනය ලැබෙන නිවර්තන කලාපීය රටකි. කෘෂිකර්මාන්තය ප්‍රධාන ජීවනෝපාය ලෙස සලකනු ලබන අතර වසර පුරා නැවුම් පලතුරු සහ එළවළු දිවයිනේ නොයෙකුත් ප්‍රදේශයන්හි නිෂ්පාදනය කරනු ලබයි. නමුත් මෙලෙස නිපදවෙන නැවුම් කෘෂි නිෂ්පාදන සියයට නිහක් හතලිහක් අතර ප්‍රමාණයක් පසු අස්වනු හානිය නිසා මිනිස් පරිභෝජනයෙන් තොරව ඉවත දමනු ලබන අතර ලෝක ආහාර සුරක්ෂිතතා ඒකකයට අනුව ශ්‍රී ලංකාව ආහාර සුරක්ෂිතතාවයෙන් රටවල් 113 ක් අතරින් 66 වන ස්ථානයේ පසුවෙයි.

මෙය ඉතාමත් පහළ අගයක් වන අතර, ලාංකිකයින්ට ආහාර අවැසි ප්‍රමාණයට අවශ්‍ය කාලයට නොලැබීම, ආහාර මිල උද්ධමනය, ආහාරයන්ගේ අඩු ගුණාත්මකභාවය හා ආහාර වල අනාරක්ෂිත බව මෙයට හේතු ලෙස සැලකිය හැක. කොරෝනා වසංගත තත්ත්වය හමුවේ ආහාර අනාරක්ෂිතතාවය තවදුරටත් වර්ධනය වන බව පැහැදිලි වේ. මේ අනුව වගා කරන ලද අස්වැන්න පසු අස්වනු හානියට ලක් නොවී දිගු කාලයක් පුරා භාවිතයට ගත හැකි ක්‍රම සඳහා යොමු විය යුතු අතර මේ සඳහා සාම්ප්‍රදායික ක්‍රම සහ තාක්ෂණික වශයෙන් වැඩිදියුණු කළ ක්‍රම යන ක්‍රමෝපායන් භාවිත කළ හැක.



අතීතයේදී අතීරික්ත ආහාර ඉවත යෑම වළකනු වස් කල්තබාගත හැකි ආකාර වලට සැකසීම සිදු කරන ලදී එම නිසා ආහාර හිඟ කාල වකවානුවලදී එලෙස සකස් කරගත් ආහාර පරිභෝජනයට ගත හැකි වුණි. නමුදු සමාජ ආර්ථික තත්ත්වය වෙනස් වීම කරුණාකොටගෙන වර්තමානය වන විට බොහෝ ගෘහණියන් විසින් සාම්ප්‍රදායික ආහාර පරික්ෂණ ක්‍රම අතහැර දමා ඇති බව පිලිබිඹු වේ. කාර්ය බහුලත්වය නිසා කෘත්‍රීම ලෙස රසගැන්වූ ක්ෂණික ආහාර පරිභෝජනයට බොහෝ පුද්ගලයින් යොමු වී තිබේ. අප විසින් ගැමි නිවාස වල අනුගමනය කෙරෙන ආහාර පරික්ෂණ ක්‍රම හා එලෙස පරික්ෂණය කරන ලද ආහාර ද්‍රව්‍ය ගැන 2021 මුල් කාර්තුවේ දී අධ්‍යයනය කරන ලදී.

කොරෝනා වසංගතයත් සමඟ ශ්‍රී ලංකාවට මුහුණ දීමට සිදු වී ඇති බරපතළ ආර්ථික අවපීඩනයේ බලපෑම යම් ප්‍රමාණයකට හෝ අවම කර ගැනීමට නිවාස ඒකක යෙහි ආහාර සුරක්ෂිතතාව තහවුරු කළ යුතු අතර මේ අනුව බෙලිනුල්ඔය ආශ්‍රිත කොටගත් ගැමි නිවාස 10ක ඇති පරික්ෂණ ක්‍රම සහ එලෙස සකස් වූ ආහාර පිලිබඳ සවිස්තරාත්මක අධ්‍යයනයක් සිදු කෙරිණි. මෙහිදී පරික්ෂණය කරන ලද ආහාර කාණ්ඩ තුනක් යටතේ අධ්‍යයනය සිදු කෙරිණි.

- සකසන ලද ශාකමය ඖෂධ (ඡායාරූපය 1)
- සකසන ලද කුළුබඩු (ඡායාරූපය 2)
- පරිරක්ෂණය කරන ලද ආහාර (ඡායාරූපය 3)

විශේෂත්වය නම් මෙම සියලුම ආහාර ඔවුන්ගේ ගෙවත්තෙන් හා අවට ලදුකැලෑ වලින් නෙලාගෙන සකසා තබා ගැනීමයි. මේ නිසා වසංගත කාලයන්හි දී පවා මෙම ජනශාට ආහාර හිඟ වීම වැනි අර්බුදයන්ට මුහුණ දීමට සිදු නොවුණි. එසේම

අනවශ්‍ය ලෙස ආහාර මිලදී ගැනීම සඳහා අමතර මුදල් වැය වීමක් ද සිදු නොවුණිග මෙලෙස සම්ප්‍රදායික ආහාර කල් තබා ගැනීමේ ක්‍රම මගින් ආහාර අපතේ නොයෑම, වස විස නොයෙදූ ආහාර සපයා ගත හැකිවීම, කුඩා අසනීප තත්ත්වයන් වල දී සාම්ප්‍රදායික ඖෂධ භාවිතයට ගත හැකි වීම සහ කොරෝනා වැනි වසංගත කාලයන් තුළ දී නිවාස වල ආර්ථිකයට අවම බලපෑමක් ඇතිවීම යනාදිය වාසි ලෙස සැලකිය හැකිය.



ඡායාරූපය 1
වියලීම මගින් පරිරක්ෂණය කරන ලද ඖෂධ වර්ග



ඡායාරූපය 2
විවිධ ක්‍රම මගින් පරිරක්ෂණය කරන ලද කුළුබඩු



ඡායාරූපය 3 විවිධ ආකාර වලින් පරිරක්ෂණය කරන ලද ආහාර



ඒ අනුව ශ්‍රී ලංකාවෙහි 80% ක ජනගහනයක් ග්‍රාමීය පරිසරයක ජීවත් වන නිසා එම ජනයා විසින් ආහාර අතිරික්ත කාලවලදී වියලීම, ලුණු දැමීම, හා අව්වාරු දැමීම වැනි අඩු වියදමකින් සිදුකර හැකි පරිරක්ෂණ ක්‍රම භාවිතයට ගැනීමෙන් එම නිවාසයන්හි ආහාර සඳහා සිදුකෙරෙන වියදම අවම කරගත හැකි ඊට අමතර ව වර්තමානය වන විට ගෙවතු වගාව තුළින් ලබාගත් අස්වැන්න සඳහා දේශීය මෙන්ම විදේශීය වෙළඳපොළේ නව රැල්ලක් ඇතිවෙමින් පවතී. එම නිසා ගෙවතු වල තුළ වගා කරගත් අස්වැන්නේ අතිරික්තය නිවසේදී ම සකස් කර වෙළඳපොළට නිකුත් කිරීමෙන් අමතර ආදායම් මාර්ගයක් ද විවෘත කර ගත හැක. උදාහරණයක් ලෙස Goods Market (<https://www.goodmarket.global/info/srilanka/>) නම් ගොවි වෙළඳපොළේ දී ගෙවතු වල කාබනික ලෙස වගා කර සකස් කරගත් ආහාර සඳහා

ඉතාමත් හොඳ මිලක් ලබාගත හැකි අතර ඉන් ඔබ්බට ගොස් නම නිවාස/ගෙවතු තුළ එළවළු/පලතුරු හෝග වගා කිරීමට අපහසු පුද්ගලයින්ට වෙළඳපොළේ එළවළු/පලතුරු මිල අඩු කාලවලදී ඒවා මිලදී ගෙන පරිරක්ෂණ ක්‍රම මගින් මිලාධික කාලයන් වලදී භාවිතයට ගත හැකි පරිදි සකසා ගත හැක. එමගින් වෙළඳපොළ මිල උච්චාවචනය පාලනය වීම ද වක්‍රාකාරයෙන් සිදුවේ.

නිවාස බොහෝමයක මෙලෙස සිදු කිරීමෙන් රටේ ආර්ථිකයට විශාල ඉතිරියක් ලබාගත හැක. එලෙසම අවශ්‍ය කලට ආහාර පැවතීම, සුරක්ෂිතබව, ගුණාත්මක බව, මිල දරා ගත හැකි බව යනාදී ආහාර සුරක්ෂිතභාවයේ මූලික මිනුම් දැඩු සාර්ථක ව ලඟා කර ගත හැක.



ඒ.එම්.එස්.එම්.ආර්.එස්.පී. බණ්ඩාර ඩී.ඒ.එම්.ද සිල්වා එම්. එශාම් කෘෂිව්‍යාපාර කළමනාකරණ අධ්‍යයන අංශය කෘෂි විද්‍යා පීඨය ශ්‍රී ලංකා සබරගමුව විශ්වවිද්‍යාලය

සී.එල්. ලියනගේ ඇන්ඩ්‍රෘව් කාමසිකල් යූක්ලන් සරසවිය එක්සත් රාජධානිය

Circularity: A Silver Lining for the Prevailing Economic Crisis in Sri Lanka



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Sri Lanka is experiencing the worst economic crisis in history. The country announced defaulting on all its \$51 billion external debts. The Sri Lankan rupee depreciated against hard currencies, further escalating the issue. In addition, the import restriction policies adopted to discourage dollar outflows created shortages of goods, including essential items in the domestic market. The resulted shortage has led the domestic prices to increase. Hence, Sri Lanka's inflation has been recorded highest in Asia and ranked the 3rd highest globally as per Hanke's inflation dashboard. According to the National Consumer Price Index, the central bank declared a 21.5 per cent inflation rate (NCPI) for March 2022. As per analysts, ineffective monetary policies such as money printing resulted in an expanded money supply, which was the fundamental cause of the spiralling inflation. Numerous economic sectors, including tourism, which generated 3.61 billion USD in 2019, are also dramatically affected by the prevailing economic conditions.

Consequently, domestic consumers are worse off as the prices of imported and locally manufactured commodities continue to rise, and they find it more challenging to purchase essential and non-essential commodities. Thus, it is critical to seek whether adopting sustainable economic solutions to the nation's preexisting linear economic principles will benefit the public.

1.1 Linear economy vs circular economy

The linear and circular economic principles are two fundamentally different economic models explaining how the materials are being extracted, transformed into products, consumed, disposed of, and reused. In a unidirectional linear economy, the material is extracted, transformed into products, and then disposed of at the end of its lifecycle. Therefore, this conventional model follows the "take-make-dispose" stepwise approach. The model ultimately leads to mass consumerism, wherein firms produce and sell while consumers demand many products as possible. Hence, in the process, the linear economic model ignored a crucial aspect, resource constraints and led to the exploitation of natural resources. Mass consumerism and aggressive advertising campaigns of the linear model drove the economies toward extensive production, leading to unprecedented environmental impacts such as raising global GHG emissions while generating water, sound and land pollution. The disposal of materials at the end of their life cycle or due to their non-fit for use subjectively to consumers results in waste management challenges and underutilisation of materials.

Circular economy, on the other hand, is a way to achieve sustainable consumption and production that recognises the subjectivity of use-values of materials by promoting reuse, remanufacture, recycling or recovery principles for increased resource use

efficiencies. The principles gained widespread attention as a measure to mitigate global emissions to address climate change. The goal is to retain the value of the circulating resources, products, parts and materials by creating a system with innovative business models that allow for long life, optimal (re)use, renewability, refurbishment, remanufacturing and recycling. By applying these principles, organisations can collaborate to design waste, increase resource productivity and maintain resource use within planetary boundaries. However, these principles can be used to adapt to the prevailing economic crisis in Sri Lanka. Figure 1 illustrates the Butterfly diagram used to model the circular economy.

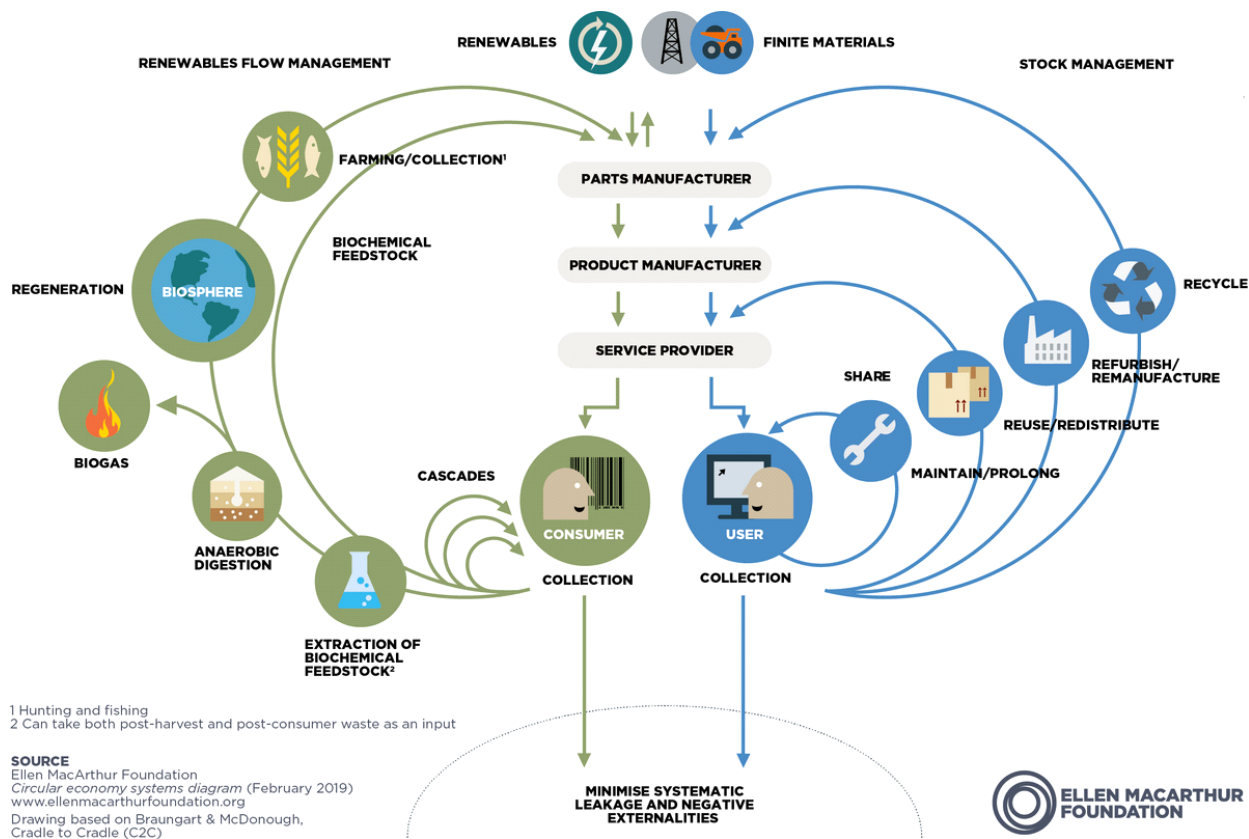


Figure 1: The Butterfly diagram

1.2 The Circular Economic Options

Adopting the circular economic principles extends the life of a product by simply using the product for a more extended period of time, extending its use through maintenance and upgrades, recovering broken products through repair, refurbishment or remanufacturing, accessible and efficient end-of-use product collection systems to support reverse logistics.

1.2.1 Reuse, remanufacture and refurbish

The model of mass consumerism and extensive advertising have planted a notion in consumers' minds that new products are a better way of owning rather than refurbished or used ones. However, as per their functionality, sometimes both products can serve the same necessity. Nevertheless, not all products are reusable, remanufactured or refurbished. Products like consumer electronics, computers, mobile phones, clothes and motor vehicles are some examples.

1.2.2 Recycle or material recovery

Recycling waste is a viable option for producers to harness any remaining use value at the end of a product's life cycle. It enables firms to sustainable sourcing and governments to minimise expenditures for waste management. Consumers can benefit directly through selling waste.

1.2.3 Social Entrepreneurship and sustainable businesses

Social entrepreneurs can initiate businesses with circular principles that circulate value throughout the value chain. New social enterprises focused on recycling, refurbishing and material recovery can deliver sustainable, affordable products to consumers. The producers would favour sustainable sourcing with the rising cost of material in the domestic market.

1.2.4 Transitioning into circularity

Though a circular economy is an economic model that generates opportunities for businesses across sectors, transitioning to one is not effortless. The existing businesses must modify their business models, tactics, and worker capabilities, while governments must amend their policies to support the circular economy.



1.3 The way forward

At the corporate level, present market signals continue to support a linear economy strategy. Nonetheless, specific estimations conducted by the Ellen MacArthur Foundation, Weetman (2020) and UNEP of the advantages of a more circular economy in the future setting of finite resources show that it might benefit the trade balance, employment, carbon emissions reductions, business and government resource efficiency, and resource conservation. Regarding employment, an economy that prioritises reusing and recycling materials and prolonging the life of items by repair, maintenance, upgrading, and refurbishment would need a larger workforce in the short term and therefore be able to absorb the persons who will become unemployed. Transitioning from the prevailing “take-make-dispose” behaviour into the circular ways of sustainable consumption and production would be pivotal for consumers to achieve resource use efficiencies. The resulted resource use efficiencies would deliver them the benefits of cost-effectiveness. Hence, the consumers would be left with additional disposable income for allocations towards more necessary expenditures such as healthcare and education. Therefore, the consumers should be more aware of the potential benefits.



How Present Economic Crisis Effects on Livestock Industry of Sri Lanka?

The Livestock industry is considered one of the most important well-established and fast-growing segments in the agriculture sector of Sri Lanka. According to Livestock Statistical Bulletin, 2020, the contribution of the agriculture, forestry, and fisheries sectors to the national Gross Domestic Production (GDP) is 8.4% in 2020. The contribution of the livestock sector in Sri Lanka to the GDP is around 1% which is responsible for ensuring the food security of humans, improving the nutritional status of consumers by providing value-added, animal origin products (animal protein) for healthy diets, creating employment or better livelihood status in order to eliminate poverty while improving the productivity of the agricultural economy in Sri Lanka.

Sri Lanka is currently experiencing its worst economic crisis in a period of more than 70 years with the highest inflation rate in Asia and Sri Lankan Rupee being considered as the worst-performing currency in the world. According to the government records, the price of diesel has nearly doubled within a month and the average price of goods increased by 25% in January due to the country's uncontrollable inflation. Sri Lanka's national inflation rate, as measured by the national Consumer Price Index (NCPI), had risen to 21.5% in March 2022, from 17.5% in February and food inflation has increased from 24.7% to 29.5% by March 2022. The lack of foreign currency is contributing to the current economic crisis, as the country is unable to pay for imports resulting in severe shortages and high costs for the goods. This has caused a short supply of basic goods including raw materials for livestock production. The frequent power outages hampered monitoring of environmental conditions; temperature, relative humidity, light, and



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aeration in hatcheries, brooders, closed house systems, ornamental fish farms, storage of the livestock products; fresh milk, meat, processed fish, milk-based and meat-based products and daily processing operations. The declining demand for high-priced products has resulted in lower profitability for the sector, as well as no recruitment and unemployment. The high cost of raw materials, feed, and the scarcity of fuel has a direct impact on animal production resulting in lowering production output and inefficiency.

The dairy sector, poultry sector (egg and poultry meat production), swine sector, fisheries, and animal feed processing industry are the major sub-sectors, classified under the livestock industry in Sri Lanka. Dairy farming is a predominant and developing sub-sector in the country which contributes to milk production and dairy-based products for household consumption. Dairy farming generates considerable income through value-added market commodities to the rural dairy cattle farmers and small-scale and large-

scale dairy farmers. At present, medium and large-scale dairy processors engage in dairy processing and manufacturing of dairy products; yogurt, cheese, butter, ice cream, sterilized milk, drinking yogurt, fresh milk, and milk powder in order to fulfill the dietary requirement of the consumers. Goat milk production is also popular in the country because of its valuable health benefits to the consumers as well as high profits generation for the goat farmers. Even though the dairy sector is developed in recent years, 64% of milk and dairy requirement still depends on the importation of milk powder and other dairy products. According to the Sri Lankan context, the poultry industry is considered a rapidly expanding industry including eggs, meat, and day-old chicks (DOC) production. Poultry meat includes meat from main species such as chicken, ducks, turkeys, and quails; chicken meat plays a major role in the meat industry with more than 80% of contribution including the fresh, frozen, and further processed value-added chicken products. Sri Lankan consumers purchase poultry products such as table eggs and meat because these products are considered essential food items and a good animal protein source that can be obtained at relatively cheap prices. At present, the domestic requirement of chicken meat and eggs of the country is fulfilled through local production while a small quantity of chicken meat is imported for special occasions. Currently, the animal feed manufacturing industry in Sri Lanka is developing to produce quality poultry feed, dairy feed, swine feed, and fish feed in order to improve the production and performance of the animals.

Aquatic animal production is a subsector of livestock production that significantly contributes to the economy of Sri Lanka. Fisheries and aquaculture, as a major component of agriculture, contribute to the food security, nutrition, and employment of the country, accounting for about 2.7% GDP of Sri Lanka. The fisheries sector contributes to the reduction of hunger and malnutrition since it provides between 50% - 60% of animal protein and a considerable proportion of Omega-3 fatty acids in human diets. Sri Lankan fishery sector has been divided into three major subsectors: marine fishery, coastal, offshore & deep sea, inland fishery, and aquaculture, providing employment opportunities. The Sri Lankan fish export industry consists of edible

fish products, ornamental fish, and live fish. There are a considerable amount of medium and large-scale export companies due to its exclusive seafood sourcing destination and significant harvest of inland fish and crustaceans. Sri Lanka ranked 50th in the world in terms of exports, with a total market share of 0.2%. The major exporting seafood products are fresh fish, frozen fish, fish fillets of Tuna, Swordfish, and Marlin due to the quality, taste, and texture of products. Ornamental fish farming has significant opportunities in both domestic and export markets as it has a strong demand for endemic and marine ornamental fish species. Sri Lanka currently exports only 3% of the overall demand and the ornamental fish industry in Sri Lanka has grown to be a significant foreign exchange earner in recent years.

The demand for the consumption of livestock products increased continuously in past decades due to many factors such as growth in population, increase per capita income, industrialization, novel technological innovations in the food industry, urbanization, socio-cultural differences, changes in consumer profile, and consumer behavior; changing taste and food habits. However, the present economic crisis of Sri Lanka has directly affected the production and marketing: price structure, distribution, demand, and selling of the products and the stakeholders; customers, manufacturers/ processors, and customers. The decline in the importation and the lack of feed ingredients (soya meal, maize, and fish meal) has negatively impacted growth, performance, production of the animals/fish, and quality of the animal products. As a result of the high price rates of the available manufactured feed, the average farm-gate price of the chicken meat, eggs, and milk can increase without control in price. In the fishery sector, less availability and higher price of fuel and gas have a direct effect on fishing activities as they disrupt fishing in international waters. The power failures caused the post-harvest losses of seafood due to improper storage conditions and it reduces the quality of products. The inability to continuously supply of seafood for the local market caused food scarcity and indirectly affected tourism, also. The ornamental fish farms are unable to provide the necessary conditions such as water, aeration, and light for the cultured fish species in farms as power shortages highly affect the ornamental industry resulting in the inability of providing market demand. Therefore, it definitely influenced purchasing power, market behavior, and demand of the consumers. It is important to maintain proper pricing strategies which benefit both the producer and consumer in order to ensure sustainability in the livestock sector.

In a livestock farm, feed cost is the major consisting of 80% of the total cost. In order to face the current crisis, the farmers can manufacture required animal feed and fish feed by utilization of locally available good quality and low-cost feed ingredients and agricultural by-products to minimize the cost of production. Due to the high prices of imported powdered milk, the consumers can move toward consuming fresh milk. For that, the responsible authorities can conduct awareness programs to persuade the consumers of the importance and advantages of consuming fresh milk over imported powdered milk. In addition, the authorities should encourage the local dairy farmers to produce sufficient dairy products that can be provided to local powdered milk producers. In the ornamental industry, alternative methods and technologies can be applied for maintenance, and transportation, as much as possible to overcome the issues. As a solution to the current economic crisis, the local livestock farms should take action on several management procedures; minimize the feed wastage, utilize manpower inefficiently and productively, use alternatives, save energy and recycle the materials. Excreta of livestock can be used to produce organic manure and utilized in energy production by domestic biogas units associated with cattle and pig farming, using it as an alternative energy source at the household level. Furthermore, the fish waste produced from seafood processing plants can be used to manufacture fish feed; also the involvement of the private sector; large joint venture companies, locally owned companies, and contract growing companies can collaborate to arrange facilities for production by technological advances, management of extension, research, and processing services for the sustainable development of the livestock industry. The responsible authorities should implement favorable long-run policies; give huge support to strengthen the local, rural farmers to ensure their employment and livelihood for a satisfactory level.

The stakeholders of the livestock industry should be responsible to avoid the collapse of the industry during the economic disaster of Sri Lanka.

Let's earn dollars to the country by the livestock industry!!!!



Fulfilling the Protein Requirement in the Economic Crisis



Food is essential for us to live. The food we eat gives energy and nutrition to our bodies. A nutritious diet must include carbohydrates, proteins, fat, vitamins, minerals, and water. The purchasing power of the consumer is declining with the current economic crisis in the country. Therefore, the percentage of consumer income spent on food is also reduced. The consumer may not be able to include some of the nutrients usually added to the diet. Due to this reason, health problems can arise with the economic crisis. There is malnutrition, vitamin deficiencies, immunodeficiency, increased stillbirth rates, etc.

Meat and processed meat provide the largest amount of protein; many types of meat such as red meat (beef, mutton), poultry, pork, etc. Meat is mostly the muscle of an animal. Most animal muscle is roughly 75% water, 20% protein, and 5% fat and assorted proteins. Meat is a complete, high-quality protein (actin & myosin) containing all the essential amino acids your body needs for optimal health. And meat is the natural source of vitamin B12. Therefore, it contributes to replacing red blood cells, building muscle tissues, and producing antibodies.

Unfortunately, prices of meat are also increasing frequently with the economic crisis in Sri

Lanka. For example, today the price of 1kg of chicken is Rs.1000/=, 1kg of mutton is Rs.3000/= and 1kg of pork is Rs.1700/=. These prices are unaffordable for the consumer. The consumer has to consume other alternative foods to fulfill their protein requirement due to this situation.



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This article gives a brief overview of meat substitutes that can be taken instead of meat and processed meat. It is envisaged that this article will be important to maintain nutritional requirements properly even in the economic crisis.

A meat substitute or a meat alternative is a food that may have taste, texture, and nutritional value similar to meat but does not contain meat.

Jackfruit

Jackfruit is an exotic fruit grown in tropical regions of the world. It has a subtle fruity flavor. Vegans often use jackfruit as a meat substitute due to its texture, which is comparable to shredded meat. Eating jackfruit is not only a fun and meatless way to add something new to your usual meals, it is also packed with nutrients, including fiber and antioxidants, one researcher even called it “miracle” food because it provides so many nutrients. One cup of jackfruit provides calories – 155, carbohydrates - 40g, protein – 3g and fiber – 3g. Furthermore, it contains almost every vitamin and mineral; especially, Sri Lankans add spices and seasonings to jackfruit to enhance its nutrition and taste.



TVP (Textured Vegetable Protein)

TVP is a by-product of soybean oil extraction. It is also called defatted soy flour. Manufacturers make TVP by separating soybean protein from fat using a high heating process. TVP is dehydrated, and thus, it needs to be soaked in hot water before cooking. One cup of dry TVP contains calories – 222, protein – 35g, fat – 0.83g, and calcium – 164mg. It is also a rich source of magnesium and some vitamin B.

Mushrooms

Mushrooms are edible fungi. It is rich in meat flavor. People taste mushrooms in different ways such as in curries, soups, and devils.

It produces antioxidants and is good medicine for cancer, and diabetes. One cup of pieces of mushroom contains calories – 16, carbohydrates – 2.3g, Protein – 2.2g, fat – 0.2g, and fiber – 0.7g. Also, it contains Vitamin D and minerals.

Lentils

Lentils are edible legumes. It can replace ground beef. It also adds much-needed texture to vegan meals, and thus, makes such a beef substitute. It comes in green, red, brown and black colors. One cup of cooked lentils provides calories – 230, carbohydrates – 40g, protein – 18g, and fiber – 15.6g. It has its unique composition of antioxidants and phytochemicals.

Nuts

The nut is a fruit composed of an edible hard shell. There are many types such as cashews, filberts and walnuts. It is used for making candy, butter and grain bread. One cup of nuts provides calories – 813, carbohydrates – 28g, protein – 27g, and fat – 72g. Further, it is rich in micro nutritious and omega 3 fatty acids.

Cauliflower

Cauliflower is a cruciferous vegetable. Tasty ways of eating it include crust pizza and cheese soup. It is similar to chicken and naturally high in fiber, vitamins and phytonutrients that can protect us against cancer. One cup of cauliflowers contains: calories – 27, carbohydrates – 5g, protein – 2g, fat – 0.3g.

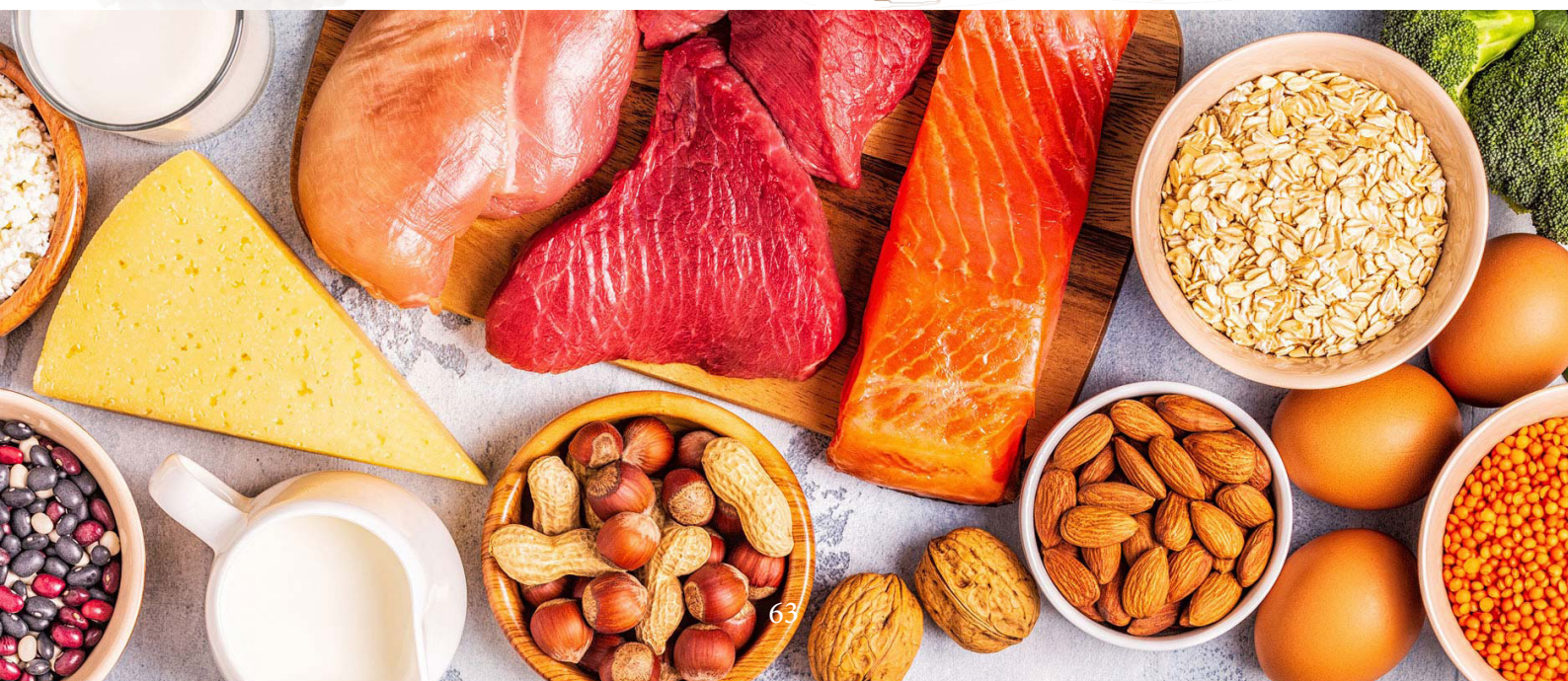


Brinjal (Eggplant/ Aubergine)

Brinjal is the most common vegetable in Sri Lanka. Eggplant is considered a meat substitute because of its texture and bulkiness. 100g of brinjal provides calories – 25, carbohydrates – 6g, protein – 1g, fat – 0.2g. In addition to that, it is rich in sodium, potassium and vitamins that can help prevent non-communicable diseases.

Potato

Potato is one of the main root vegetables. You can roast, boil, bake, fry potatoes and make delicious treats. 100g of boiled potatoes provide calories – 87, carbohydrates – 20g, protein – 2g, fat–0.1g. Furthermore, it has fiber, vitamins, minerals and phytochemicals that can help ward off diseases and benefit human health.



The Economic Crisis in Sri Lanka – Overview and Timeline of Recent Events

It is no secret that currently Sri Lanka is facing the worst economic crisis in 70 years. While the cost of basic goods and services is skyrocketing day by day, people are becoming more and more depressed. The economic crisis did not happen overnight. It has been years in the making, majorly affected by the government's economic mismanagement.



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Causes

The Sri Lankan government has borrowed large sums of money from foreign lenders to fund public services during the past few years. Along with this borrowing spree, there was the notorious government ban on chemical fertilizers that decimated farmers' harvest and threatened the food security in the country, with the breakout of the Covid-19 pandemic from 2020 onwards. Due to the massive deficit country had to face, the current President, Gotabaya Rajapaksha brought down the taxes to stimulate the economy. However, this idiotic move backfired instead of hitting the government revenue. It caused rating agencies to downgrade Sri Lanka to near default levels, meaning the country lost access to overseas markets. Then, the Sri Lankan government had to fall back on its foreign exchange reserves to pay off government debt. In 2018, there were \$6.9 billion in foreign reserves, and this year, it shrank down to \$2.2 billion. This heavily impacted the imports of fuel and other essentials and their prices escalated rapidly.

In addition, in March, the government floated the Sri Lankan rupee. This move made by the government to devalue the Sri Lankan rupee can be identified as an effort to qualify for a loan from the IMF and encourage remittances. However, for ordinary Sri Lankan citizens, the decision of plunging of the rupee against the US dollar only made things worse.

People on the ground

The daily lives of general Sri Lankan citizens have become a miserable endless cycle of waiting in lines for hours and hours to purchase basic goods. At the gas stations, there are soldiers stationed to maintain peace and calm the hot-tempered customers waiting in lines for hours under the scorching sunlight to fill their tanks. Some poor people are caught in the middle of impossible positions; they have to work hard throughout the day to feed their families but also wait in queues to get supplies. These conditions drain their life out of them making them physically, mentally, socially, and economically vulnerable. The most pathetic thing is some people have even died while waiting in these lines. Even the somewhat rich middle-class people are mentally depressed and frustrated that they could run out of essentials like medicine or gas in near future.

On top of all, the lives of people were made more difficult and depressed by regular and frequent power cuts, sometimes lasting for 8-10 hours. In recent weeks, most of the shops are being forced to close because they cannot run fridges, air conditioners or fans.

The people's frustration and anger towards the government have been depicted through the ongoing protests; though they remained largely peaceful, it climaxed when protestors threw bricks resulting in a firing outside the President's private residence.

Timeline of recent event

April 3

The government briefly blocks access to social media before the ban is lifted following a ruling by the country's Human Rights Council. Almost all of Sri Lanka's cabinet resigns leaving the President and the Prime Minister isolated.

April 4

The governor of the Central Bank, Ajith NiwaddKabral, who resisted calls to seek a bailout from the IMF, announces his resignation. The government offers to share power with the opposition under a unity administration but it is rejected.

April 5

Just a day after he was appointed, the Finance Minister, Ali Sabry resigns. The President loses his parliamentary majority. The government lifts the state of emergency.

April 7

President Gotabaya Rajapaksa appoints an expert panel to organize a debt restructure as rating agencies warn of a looming default.

April 8

The country's Central Bank hikes interest rates by a record 700 basis points in a bid to halt the free fall of the Sri Lankan rupee, which has plunged more than 35 percent in a month.

April 9

Tens of thousands march toward the President's office in the biggest protest to-date, demanding President Gotabaya Rajapaksa to resign.

April 10

Sri Lanka's doctors say they are nearly out of life-saving medicines, warning that the crisis could end up killing more than the coronavirus pandemic.

April 12

The country announces it is defaulting on its entire external debt of \$51bn as a "last resort" after running out of foreign exchange to import desperately needed goods.

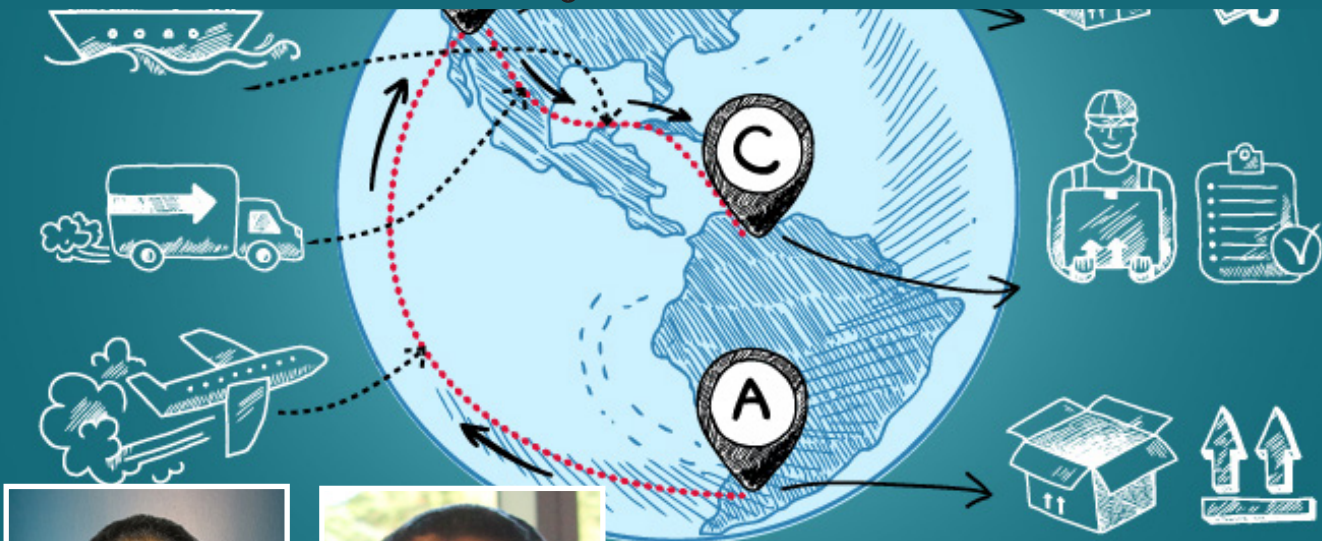
April 13

Prime Minister Mahinda Rajapaksa offers talks with protesters calling for the government to step down over its handling of an economic crisis, as the opposition threatens to bring a no-confidence motion against it in the Parliament.

April 14

Protestors share milk rice to celebrate their traditional new year opposite President Gotabaya Rajapaksa's office, where they have camped out for six days demanding his resignation.

Why Should Sri Lanka Adopt Block-Chain-Enabled Traceability for the Fisheries Sector?



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Sri Lanka, being an island, fresh fisheries harvest is consumed abundantly. A total of 228.02 USD million worth of fish and fisheries products were exported by the year 2021. The major market destination for edible fish products are France, Italy, USA, Germany, UK, Japan, Netherland, Hong Kong, China and Canada. The main fisheries products exported include tuna, prawns, crabs, mollusks, lobsters, and sea cucumber. Owing to the market requirements, fisheries product exporters have established a traceability system to track the origin of the produce. The existing traceability system is an exporter-dominated system where exporters feed all the data for the traceability system (Figure 01, and 02). Hence the value chain authenticity and the transparency of the majority of high-end fisheries (tuna, crabs, and lobsters) are a huge concern. The industry has its own concerns over illegal fishing, financial frauds, and counterfeits between suppliers and customers, mislabeling, increased food miles, poor worker/fishermen welfare, and quality and safety verification issues.

Due to the negative consequences of adulteration, losing the trust among the foreign buyers and completely banning from exporting to high-end markets can result. For example, European Union allows only entering ethically sourced fish and fisheries products. They issue a yellow card as a warning if the products appeared to be unethically sourced. At the most extreme, a red card will be issued completely banning the exports from the country. Contamination such as heavy metals (Hg), artificial colorings (histamine) etc. has a maximum threshold level. If these contaminants have exceeded the threshold level, the harvest will be rejected from entering European Union. This ripples the negative consequences while tarnishing the name of Ceylon fisheries products. Illegal fishing is also a major threat to Sri Lanka to enjoy its fisheries resources in the Indian Ocean. Illegal fishing vessels from India have been reported to exploit the fishery's harvest in the sea surrounding the island. At the same time, Sri-Lankan fishermen using prohibited fishing nets, vessels, and techniques (dynamite), fishing in prohibited seasons (i.e. during the lobster breeding season; September to February), and overexploitation of fisheries stocks have also limited the market access and the quality of the fisheries harvest. By enacting traceability, ethical and sustainable fisheries, harvest can be shaped.

Block chain technology can be successfully instrumented in eliminating these consequences. Block chain enabled traceable value chain can track the journey of fish from bait to plate leaving no space for frauds. **Open supply chain** is such an initiative that has established block chain technology for Australian fresh fish harvest. It stores data fed into the digital system at each value chain node (by the respective actor) and once data are stored, they become immutable. Thus, the risk of data being altered or deleted is eliminated. Block chains can thus reduce the food miles directing the nearby fresh fish harvest to the nearest customers/ collection point. This guarantees the fresh products' availability in the nearest market places with the minimum cost of production. Since every member in the block chain can view whether fish has been caught legally or illegally and the records are proved with the available evidences, this technology discourages illegal

fishing at any cost. Moreover, block chains can be designed to flag a marketplace once it is vacant with the harvest, thus, eliminating market surplus and deficit. Smart contract-enabled block chains in fisheries alleviate the need of intermediaries along the value chain.

Highly resilient fisheries value chain would be short, direct, simple and transparent. Counterfeits/ frauds between value chains actors are avoided through smart contract-enabled block chains. The technology will aid in disintermediation and re-intermediation of the value chains with automated cash transactions without financial institutions' involvement once the end customers verify their expectations are met with the supplied product. If the customers are unsatisfied and it has been verified with the available recorded evidences, the cash will

Level of traceability in some of the identified high-end fisheries species

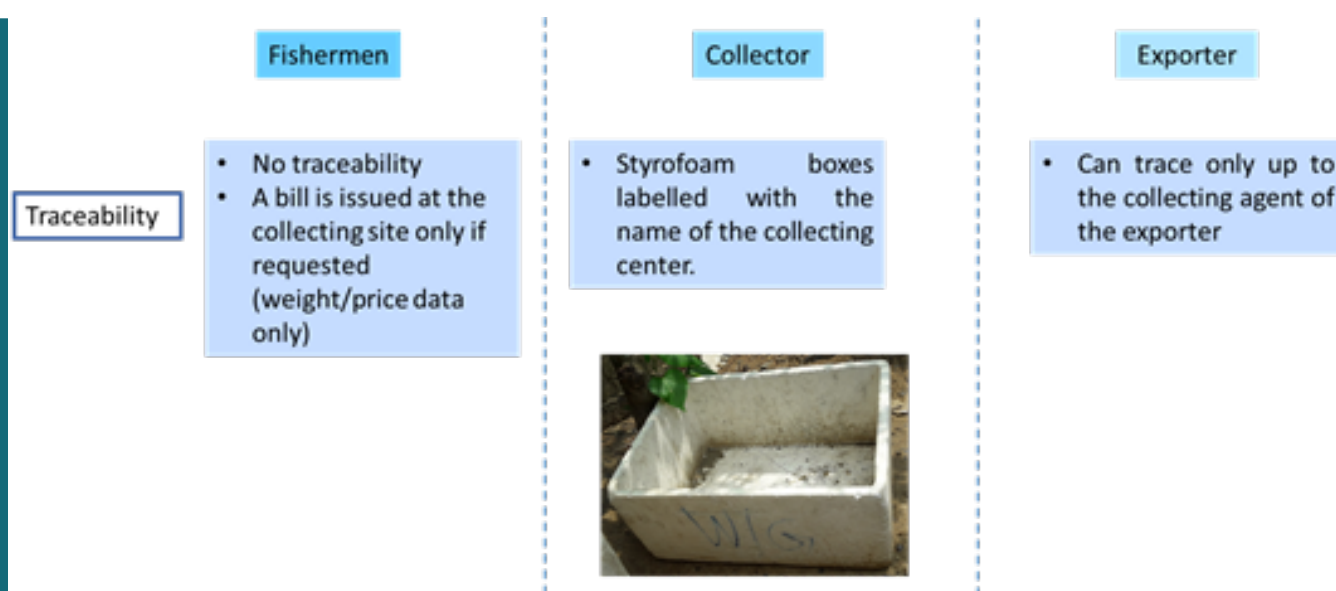


Figure 1 Existing traceability system in lobsters

not be transferred to the supplier. Hyper ledger fabric block chains will be used to reveal private data only to authorized partners. For example, if a Sri-Lankan exporter is providing fish products at a discounted price only to Chinese customer, he might not want to reveal it to his Canadian customer. Hyper ledger fabric becomes useful in such occasions.

Block chain-enabled traceability encompasses technologies to track product origin (including fishing vessel, captain, company, unique ID for the fish, catch date and time), entire journey of fish until consumers purchase (cleaning, grading, processing, storage conditions, packing and outbound logistics)

and the sustainability concerns of consumers. Sustainability concerns allow the availability of environmental (Carbon neutral, MSC, ASC, Friend of the Sea, organic), social (fair trade, cooperate social responsibility), and origin (Ceylon produce), quality and health (organic, GAP), and safety (Mealtime safe, GMP, HACCP, OSHAS 18001, BRC) certification evidences digitally. Moreover, data about the catch area of the fish will be automatically tracked. These data along with the illegal fishing zone maps, sea depth of the fishing zone, and the weather data will be combined by marine and data scientists to verify that it was possible to catch fish in legal fishing zones, within the recorded time.

Thus, block chains' primary role in fisheries industry revolve around data verification, tracing and sharing the recorded information. Internet of Things (IoT) and sensors, image capture, document evidences like bill of landing, quality certifications, and insurances are used in tracking purposes. Barcodes and RFID are utilized in sharing the stored data as per the demand.

Since there is a growing concern on ethical sourcing and sustainable fisheries, especially in European Union, Britain, USA, Australia and Canada, traceability with block chain technology will open new market opportunities for Sri-Lankan fisheries. Further, ethical sourcing will indirectly aid in conserving the available fish resources in the ocean surrounding the island.

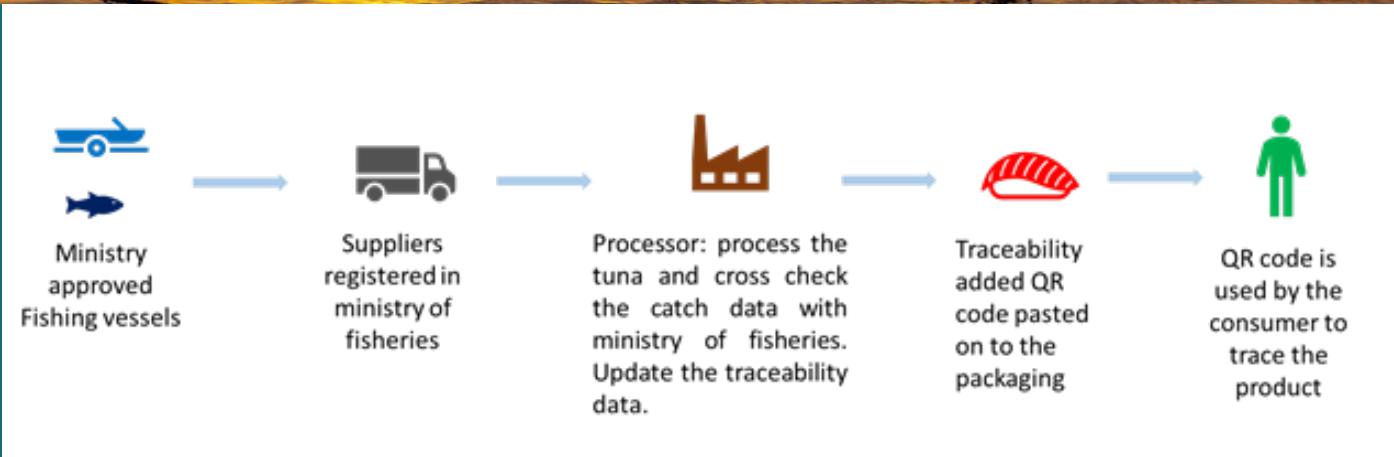
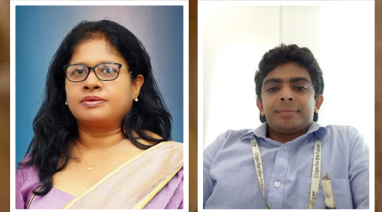


Figure 2 Existing traceability in Sri Lankan Tuna



ග්‍රීකමය අස්වැන්නක් මගින් දේශීය විපර්යාස යවනේ මෙහෙර් හොග්ගේ අස්වැන්න අනුමාන කිරීම



මහාචාර්ය ආශා කරණාරත්න සහ ආචාර්ය එරංග විමලසිරි කෘෂිවිද්‍යා පීඨය
ශ්‍රී ලංකා සබරගමුව විශ්වවිද්‍යාලය

මෙහෙර් යනු

උග්‍ර භාවිත ධාන්‍ය හෝගයක් වන මෙහෙර් දැනට ශ්‍රී ලංකාවේ පහතරට වියලි කලාපයේ හේන් ගොවිතැන් ආශ්‍රිත ව දැකිය හැකි ය. වර්ෂාපතනය සාපේක්ෂ ව අඩු යල කන්නයේ (මාර්තු - ජූනි අතර කාලයේ) දී මෙහෙර් වගාව සිදු කරනු ලබයි. වසර 10,000 ක් තරම් පැරණි මෙහෙර්, ධාන්‍ය කුලයේ වැඩිම ප්‍රෝටීන ප්‍රමාණයක් සහිත ශාකය (ප්‍රෝටීන 12% ක් පමණ) ලෙස හැඳින්වෙයි. ශ්‍රී ලංකාවට අමතර ව අප්‍රිකානු කලාපයේ රටවල්වල, ඉන්දියාව, ඇමරිකා එක්සත් ජනපදය ඇතුළු රටවල් විශාල ප්‍රමාණයක මෙහෙර් වගාව දැකිය හැකි ය. වි සඳහා ආදේශකයක් ලෙස භාවිත කරන මෙය කෙටිකාලීන හෝගයක් වන අතර දින 60 - 80 අතර කාලයකදී අස්වැන්න ලබා ගත හැකියි ශ්‍රී ලංකායේ දැනට විශේෂ ලක්ෂණ සහිත/ වැඩිදියුණු කළ මෙහෙර් වර්ග (varieties) හඳුන්වා දී නොමැති අතර ගොවිතැන් පෙර වසරේ අස්වැන්නෙන් ඉතුරු කර ගත් කොටසක් ඊළඟ කන්නයේ වගාව සඳහා යොදා ගනිති. මෙහෙර් වගාව පිළිබඳව පර්යේෂණ අවම වීම මෙය ප්‍රචලිත කිරීම සඳහා ඇති ප්‍රධානම බාධාව වෙයි.



මෙහේරි වගාවේ වැදගත්කම

- ජලය අවශ්‍යතාව අවම වීම - සහල් කිලෝ ග්‍රෑම් 1ක් නිෂ්පාදනයට ජලය ලීටර 4,000 පමණ අවශ්‍ය වන අතර මෙහේරි වගාවේදී අමතර ජලය සැපයීමක් (irrigation) සිදු නොකෙරෙයි.
- අධික පෝෂණ ගුණය - ධාන්‍ය කුලයේ වැඩිම ප්‍රෝටීන් ප්‍රමාණයක් සහිත බෝගය මෙහේරි වන අතර විටමින් සහ පෝෂණ ගුණය අතින් ඉහළ ය.

පෝෂණ ගුණය	ප්‍රමාණය
ප්‍රෝටීන්	12.00%
තන්තු	8.00%
දිරවිය හැකි ශක්තිය	1500 කිලෝ කැලරි/රාත්තලකට
කැල්සියම්	0.05%
පොස්පරස්	0.30%
ඊ විටමින් සමූහය	389.1 මිලිග්‍රෑම්/ රාත්තලකට
ඇමයිනෝ අම්ල	1.16%



- දියුණු පසක් අවශ්‍ය නොවීම/ නිසරු පස් වල පවා වගා කිරීමේ හැකියාව
- කෘත්‍රිම රසායනික පොහොර අවශ්‍ය නොවීම
- පලබෝධ නාශක, වල් නාශක අවශ්‍ය නොවීම
- අඩු කම්කරු ශ්‍රමය
- දේශගුණික විපර්යාසයට ඔරොත්තු දෙන ශාකයක් වීම

පර්යේෂණය සිදු කළ ආකාරය

- 1 මෙහේරි වගා කරන ප්‍රදේශ වල (මොනරාගල සහ හම්බන්තොට දිස්ත්‍රික්ක වල) ගොවිමහතන් සම්බන්ධ කරගෙන සමීක්ෂණයක් සිදු කරන ලදී. ඒ අනුව ඔවුන්ගේ වගා බිම්වල විස්තර, මෙහේරි වගාව සහ ඒ ආශ්‍රිත ගැටලු අධ්‍යයනය කරන ලදී.
- 2 මෙහේරි වගා කරන ප්‍රදේශ වල අතීත සහ වර්තමාන කාලගුණික තොරතුරු එකතු කර එම ප්‍රදේශවල වර්ෂාපතන රටා, විශලිත කාල (dry spell), වගා කන්නය ආරම්භය සහ අවසානය අධ්‍යයනය කිරීම.
- 3 මෙහේරි වගා කරන ගොවිමහතන්ගෙන් බීජ සාම්පල ලබා ගැනීම - මෙහේරි වගා කරන දිස්ත්‍රික්ක වල ගොවිමහතන්ගේ වගා බිම් වලින් 2015 යල කන්නයේදී බීජ ලබා ගන්නා ලදී. ඔවුන්ගේ වගා බිම්වලින් පස් සාම්පල එකතුකළ අතර මෙහේරි වගා කරන පස් පිලිබඳව එහිදී අධ්‍යයනය කරන ලදී.
- 4 එකතු කල සාම්පල වල බීජ ප්‍රමාණය වැඩි කිරීම සඳහා සහ පිරිසිදු ජාන ලබා ගැනීම සඳහා ඒවා නැවත වගා කිරීම සිදු කල අතර DNA වෙන් කිරීම සහ DArT Sequencing මගින්ව මෙහේරි වර්ග හඳුනා ගැනීම සිදු කරන ලදී.
- 5 මෙහේරි අස්වැන්න අනුමාන කිරීම සඳහා ගණිතමය ආකෘතියක් නිර්මාණය කිරීම, ක්‍රමාංකනය (model calibration) සහ නිර්මිත ආකෘතිය වලංගු කිරීම (model validation) තෝරාගත් මෙහේරි වර්ග 5 කට ගණිතමය

ආකෘතියක් නිර්මාණය කරන ලදී. මේ ආකෘතිය නිර්මාණය කරන ලද්දේ APSIM (Agricultural Production System Simulator) මෘදුකාංගය භාවිත කරමිනුයි. ආකෘතිය ක්‍රමාංකනය සඳහා ශ්‍රී ලංකා සබරගමුව විශ්වවිද්‍යාලයේ පර්යේෂණ ගොවිපල (2016 සහ 2017 වසර වල) දී පර්යේෂණ සිදු කර දත්ත ලබා ගන්නා ලදී. ආකෘතිය නිර්මාණය කිරීම සඳහා දෛනික කාලගුණික දත්ත, පාංශු දත්ත, හෝග දත්ත සහ වගාකටයුතු පිලිබඳ (crop management) දත්ත යොදා ගන්න ලදී. නිර්මිත ආකෘතිය වලංගු කිරීම මොනරාගල සහ හම්බන්තොට දිස්ත්‍රික්ක වල මෙහේරි ගොවියන්ගේ වගා බිම් වලදී ලබා ගත් දත්ත මගින් සිදු කරන ලදී. ඒ අනුව වගා බිම් වලින් ලබාගත් අස්වැන්න සහ නිර්මාණය කළ ආකෘතියෙන් ලබාගත් අනුමාන අස්වනු අගයන් විවිධ සංඛ්‍යාත ක්‍රම මගින්ව සංසන්දනය කරන ලදී.

6 මෙහේරි වගා කරන ප්‍රදේශවල අනාගත කාලගුණය (2040-2069) අධ්‍යයනය කිරීම - කාලගුණික ආකෘති 20 ක් (GCM) යොදාගෙන නිර්මාණය කරන ලදී.

7 අවසානයේදී නිර්මාණය කළ ගණිතමය ආකෘතිය යොදාගෙන අනාගතයේ (2040-2069) මෙහේරි අස්වැන්න අනුමාන කිරීම සිදු කරන ලදී.

පර්යේෂණය මගින් අත්වූ ප්‍රතිඵල

- ජාන සංරක්ෂණය - ගොවිමහතන්ගේ වගා බිම් වලින් එකතු කරන ලද බීජ සාම්පල අනාගත පර්යේෂණ සඳහා සංරක්ෂණය කිරීම
- ප්‍රථම වතාවට මෙහේරි වල අස්වැන්න අනුමාන

කිරීම සඳහා ගණිතමය ආකෘතියක් නිර්මාණය කිරීම. ඒ අනුව මෙතේර වර්ග 5 කට මෙම ආකෘතිය නිර්මාණය සහ ක්‍රමාංකනය කිරීම අනුමාන කරන ලද අස්වැන්නේ වලංගු භාවය ගොවිමහතුවන්ගේ වගා බිම් වලින් ලබා ගත් දත්ත මගින් සංඛ්‍යාත්මකව සිදු කරන ලද අතර එම අගයන්වලට අනුව නිර්මාණය කරන ලද ගණිතමය ආකෘතිය මගින් මෙතේර අස්වැන්න සාර්ථකව අනුමාන කිරීම සිදුකළ හැකි ය.

- වගා කන්නය ආරම්භ වීම පිලිබඳ සංඛ්‍යාත්මක තොරතුරු අල්ප වීම නිසා වගා කන්නයෙන් උපරිම ප්‍රයෝජන ලබාගත නොහැකියි දැනට ගොවිමහතුවන් වගා කන්නය ආරම්භය තම අත්දැකීම් අනුව සිදු කරත් වියලි කලාපයේ යල කන්නය විශාල වශයෙන් අසමත් වන බව දක්නට ලැබුණි. එම නිසා පහත රට වියලි කලාපයේ යල කන්නය ආරම්භ වීම සහ අවසන් වීම සොයාගැනීම සඳහා පැරණි කාලගුණික දත්ත පදනම් කරගෙන ගණිතමය ආකෘතියක් නිර්මාණය කරන ලදී. ඒ අනුව පහත රට වියලි කලාපයේ යල කන්නයේ ආරම්භයේ සහ අවසානයේ විචලනයක් අධ්‍යයනය කරන ලදී. ඒ අනුව මාර්තු 2 සිට මැයි 1 දක්වා යල කන්නය ඇරඹුණු අතර සමහර අවුරුදු වල යල කන්නය වාර්තා වී නොමැත (1989-2015 කාලයේදී තණමල්විල ප්‍රදේශයේ යල කන්නය සමස්තයක් ලෙස 21% ක් වගා කිරීමට නොහැකි තත්වයක් උදා වී ඇත. එමෙන්ම තණමල්විල ප්‍රදේශයේ යල කන්නය ආරම්භ වන දිනය සංඛ්‍යාත්මකව සැලකිය යුතු ලෙස ඉදිරියට පැමිණ ඇත. එහි යල කන්නය අවසන් වීම මැයි 1 සිට ජූලි 3 දක්වා සිදු වේ
- අතීත කාලයට සාපේක්ෂව (baseline 1980-2009) අනාගතයේදී (2040-2069) මෙතේර අස්වැන්න අස්වැන්න වැඩි වීමේ ප්‍රවණතාවක් සමහර දේශගුණික ආකෘති අනුව දැකගත හැකිය. APSIM මෘදුකාංගය භාවිතා කර කුරුණෑගල දිස්ත්‍රික්කයේ වී වගාවේ අනාගතයේ අස්වැන්න අනුමාන කර ඇති අතර වී වලට සාපේක්ෂ ව ඉහල අස්වැන්නක් දේශගුණික විපර්යාස යටතේ ලබා දීමට මෙතේර වලට හැකියාව පවතියි. දේශගුණික විපර්යාස යටතේ ඉහල අස්වැන්නක් ලබා දීම සහ වෙනත් බෝග වලට සාපේක්ෂව (වී) අස්වැන්න අඩු වන ප්‍රමාණය අඩු වීම අතීතකර දේශගුණික තත්ත්ව යටතේ මෙතේර වල භීතකර තත්ත්වය හොඳින් පැහැදිලි කරනු ලබයි.
- උෂ්ණත්වය සෙල්සියස් අංශක 1-1.5 දක්වා ඉහල යාමේදීත් මෙතේර අස්වැන්න සාමාන්‍ය උෂ්ණත්වයදීට වඩා 6% ක් පමණ ඉහළ අගයක් පෙන්නුම් කරයි. මෙතේර හෝගයට ඉහළ උෂ්ණත්ව වලදී අස්වැන්න ලබා දීමට හැකිවීම දේශගුණික විපර්යාස තත්ත්ව යටතේ හොඳ ලක්ෂණයකි.

නිගමනය

අනාගතයේ ඇතිවිය හැකි දේශගුණික විපර්යා වලට ඉතා හොඳින් ඔරොත්තු දිය හැකි ශාකයක් ලෙස හඳුනාගෙන ඇති මෙතේර පිලිබඳ ව පර්යේෂණ ඇත්තේ ඉතා අල්ප ප්‍රමාණයකි. ගණිතමය ආකෘතියක් යොදාගෙන අනාගත කාලයේ මෙතේර වල අස්වැන්න වෙනස් වීම මෙහිදී අධ්‍යයනය කල අතර ඒ අනුව දේශගුණික විපර්යාස යටතේ සැලකිය යුතු ඉහල අස්වැන්නක් ලබා දීමට මෙතේර වලට හැකි ය. මෙතේර ශ්‍රී ලංකාව තුල ප්‍රචලිත කිරීම සඳහා මූලික අඩිතාලමක් දැමීම මෙමගින් සිදු කරනු ලැබීය. එමෙන් ම අනාර සුරක්ෂිතතාව සඳහා මෙතේර වැනි උණු භාවිත හෝග යොදාගැනීම පිලිබඳ ව අදාළ බලධාරීන්ගේ අවධානය යොමු විය යුතු ය.

ව්‍යාපෘතියේ සංකල්පය, මූලිකත්වය සහ මගපෙන්වීම මහාචාර්ය ආශා කරුණාරත්න, කෘෂි විද්‍යා පීඨය, ශ්‍රී ලංකා සබරගමුව විශ්වවිද්‍යාලය

පර්යේෂණය සිදු කිරීම - ආචාර්ය එරංග විමලසිරි, කෘෂි විද්‍යා පීඨය, ශ්‍රී ලංකා සබරගමුව විශ්වවිද්‍යාලය

ව්‍යාපෘතියේ කාලය - අවුරුදු 3

ව්‍යාපෘතියේ දායකත්ව ආයතන
 ශ්‍රී ලංකා සබරගමුව විශ්වවිද්‍යාලය
 නොට්න්හැම් විශ්වවිද්‍යාලය - මැලේසියාව
 Crops for the future (CFF)- මැලේසියාව



AHEAD ව්‍යාපෘතිය මගින් ලබා දුන් පහසුකම් යොදා ගනිමින් සිදු කෙරෙන ජංගම සායන (MOBILE CLINIC) වැඩ සටහන



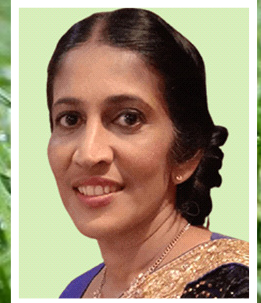
මහාචාර්ය වෛද්‍ය වී සංජීව ප්‍රසාද් ජයවීර
පශු සම්පත් නිෂ්පාදන අධ්‍යයනාංශය
කෘෂිවිද්‍යා පීඨය
ශ්‍රී ලංකා සබරගමුව විශ්වවිද්‍යාලය

ශ්‍රී ලංකාවේ විශ්වවිද්‍යාලයවලින් බිහිවන උපාධිඋරුන් තුළ සිය රටේ ආර්ථික සහ සමාජයීය දියුණුවට දායක වීම සඳහා දැඩි අභිලාශයක් විශ්වවිද්‍යාල කාලයේ දීම ඇති කිරීම අතිශය වැදගත් කාලීන අවශ්‍යතාවක් වී පවතී. එම කාර්යය ඉටු කිරීම සඳහා ශ්‍රී ලංකා සබරගමුව විශ්වවිද්‍යාලය හැකි සෑම අවස්ථාවකදී ම සිය උපාධි අපේක්ෂකයින් සමඟ ප්‍රදේශයේ සත්ත්ව පාලනයේ යෙදෙන ගොවි ජනතාව වෙත ගොස් ඔවුන්ට මුහුණ දීමට සිදු වී ඇති සත්ත්ව පාලනය හා සම්බන්ධ ගැටලුවලට විසඳුම් ලබා දීමට කටයුතු කිරීම සිදු කරන ලදී. මෙතෙක් යම් මට්ටමකින් ඉටු කළ එම මහඟු කාර්යයය වඩාත් සාර්ථක ලෙස කෘෂිවිද්‍යා උපාධිඋරුන්ට සහ ගොවි ජනතාවට වඩාත් ප්‍රයෝජනවත් වන ආකාරයට සිදු කිරීම සඳහා AHEAD ව්‍යාපෘතිය යටතේ ශ්‍රී ලංකා සබරගමුව විශ්වවිද්‍යාලයේ කෘෂිවිද්‍යා පීඨයට ලබා ගත හැකි වූ ජංගම විද්‍යාගාර බස් රථය (Mobile lab) මෙවර යොදා ගත හැකි විය. සත්ත්ව රෝග සඳහා ප්‍රතිකාර ලබා දීමේදී අවශ්‍ය වන එන්නත් සහ නිකේපණ ආරක්ෂිත ව රැගෙන යා හැකි පරිදි සියලු පහසුකම්වලින් සමන්විත මෙම බස් රථය යොදා ගනිමින් කෘෂිවිද්‍යා පීඨයේ පශු සම්පත් නිෂ්පාදන අධ්‍යයනාංශයේ අධ්‍යයන කාර්ය මණ්ඩලය තුන්වන වසර සිසුන්ගේ සහභාගීත්වයෙන් ප්‍රදේශයේ ගොවි ජනතාව වෙත ගොස් ඔවුන් මුහුණ පා ඇති සත්ව පාලනය හා සම්බන්ධ සෞඛ්‍ය ගැටලු වලට ප්‍රතිකාර ලබා දීම මාර්තු මස 25 වැනි දින දවස පුරා සාර්ථකව සිදු කරන ලදී. පුවක්ගහවෙල, මුත්තේට්ටුවේගම, පඹනින්න සහ සීලගම යන ග්‍රාම නිලධාරී වසම්වල සත්ත්ව පාලනයේ යෙදෙන ගොවි ජනතාව සඳහා සිදු කෙරෙන මෙම වැඩ සටහන සඳහා ඉහළ සහභාගීත්වයක් ගොවි ජනතාව වෙතින් ලැබුණි. ගව,



කුකුළු සහ එළු පාලනයේ යෙදෙන ගොවි මහතන්ට මෙම වැඩ සටහන මගින් ප්‍රයෝජනවත් ප්‍රතිඵල ලැබුණ අතර ඔවුහු මෙම වැඩ සටහන ඉතා ඉහළ අගයීම්කට ලක් කළහ. ගොවිපොල සතුන්ට අමතර ව ජලනීතිකා රෝගය පාලනය කිරීම සඳහා සුනඛයින්ට නොමිලයේ එන්නත් ලබා දීම ද මෙහිදී සිදු විය. ඉහත වසම්වල ග්‍රාම නිලධාරී මහතුන්, ප්‍රාදේශීය ලේකම්තුමිය සහ ප්‍රදේශයේ මහජන සෞඛ්‍ය පරීක්ෂක යන රජයේ නිලධාරීන්ගේ ද සහභාගීත්වයෙන් සිදු කෙරෙන මෙම වැඩ සටහන විශ්වවිද්‍යාලය සිසුන්ට සත්ත්ව පාලන ක්ෂේත්‍රයේ ඇති ප්‍රායෝගික ගැටලු පිළිබඳ මනා අවබෝධයක් ලබා දීමටත් විවිධ පාර්ශව සම්බන්ධ කරගෙන මෙවැනි වැඩ සටහන් සිදු කරන ආකාරය පිළිබඳව අත්දැකීම් ලබා දීමටත් ඉතා වැදගත් විය. AHEAD ව්‍යාපෘතිය යටතේ ලබා දුන් නව පහසුකම් වලින් සිසුන්ගේ අධ්‍යාපන කටයුතු වඩාත් ගුණාත්මකව සිදු කිරීමට පියවර ගන්නා අතර රටේ ජනතාවට විශ්වවිද්‍යාල හරහා සේවාවක් ලබා දීමට උපකාර වීමත් ඉතා හොඳින් සිදු කළ හැකි බව මෙම වැඩ සටහනින් මනාව පසක් කර දෙන ලදී.

ශ්‍රී ලංකාවේ වටු පාලනයේ වර්තමානය සහ එහි හොදු පැති කඩ



මහාචාර්ය රුවිනි මුතුකුමාරණ පඤ සම්පත් අධ්‍යයනාංශය කෘෂි විද්‍යා පීඨය ශ්‍රී ලංකා සබරගමුව විශ්වවිද්‍යාලය බෙලිනුල්ලිය

අනිතරයේ සිටම මිනිරි හාදු පතුරුවන පක්ෂීන් විශේෂයක් ලෙස ප්‍රචලිත වටුවන් කෙටි වූ පාද සහිත, භෞමිකව විසීමට ප්‍රියතාව යක් දක්වන පක්ෂීන් සමූහයකි විවිධ වූ වටු විශේෂ ලොව පුරා විසිරී ඇති අතර ඔවුන් අතුරින් ජපන් වටුවන්හට (*Coturnix japonica*) හිමි වනුයේ සුවිශේෂ ස්ථානයකි. ක්‍රි : පූ 2000 වන විට විසූ ආදි ඊජිප්තු වාසීන් වටුවන් ගැන දැන සිටි බව සඳහන් වුවද ගෞරවනීයකරණය කරන ලද වටුවන් පිළිබඳව පළමුවට සඳහන් වනුයේ 12 වන ශත වර්ෂයේදී ජපානයේ මෙම වටුවන් ගෞරවනීයකරණයට ලක් කිරීමෙන් අනතුරුව 11 වන ශත වර්ෂයේදී චීනයේ සිට ජපානයට රැගෙන එනු ලැබූ බවට විශ්වාසයක් පවතී.

වටු පාලනය ශ්‍රී ලංකාවට ආගන්තුක වූව ද, මස් පිණිස හෝ බිත්තර පිණිස වටුවන් ඇති කිරීම වර්තමානය වන විට ලොව පුරා සුලබ කර්මාන්තයක් බවට පත් වී තිබේ. යුරෝපීය සහ උතුරු ඇමරිකාව යන රටවල වටුවෝ බහුල ලෙස ජීව විද්‍යාත්මක පර්යේෂණ කටයුතු සඳහා යොදා ගැනෙති.

ලොව පුරා විසිරී ඇති රටවල් අතුරින් චීනය අද වන විට වටු මස් නිෂ්පාදනයේ ප්‍රමුඛයා ලෙස නමක් දිනා සිටී. ස්පාඤ්ඤය, ප්‍රංශය, ඇමරිකා එක්සත් ජනපදය වටු මස් කර්මාන්තයේ නියලෙන අනෙකුත් රටවල්වේ. චීනය, ජපානය සහ ඔසීලියා වටු බිත්තර නිෂ්පාදනය සඳහා ප්‍රසිද්ධියක් උසුලන රටවල්ය. ආසියාතික රටවල් අතුරින් නායිවානය, ඉන්දියාව, පිලිපීනය, ඉන්දුනීසියාව, මලයාසියාව යන රටවල වටු පාලනය ප්‍රචලිත කර්මාන්තයකි. ශ්‍රී ලංකාව කුකුළු පාලනය අතින් ඉදිරියෙන් ම සිටිය ද 2013/2014 වසර සඳහා සංගණන වාර්තා අනුව ශ්‍රී ලංකාවේ වටු ගහනය 15,447 ක් වන අතර වටු ගොවිපොළ සංඛ්‍යාව 369ක් පමණි. ශ්‍රී ලංකාවේ ගහස්ථ ආදායම් සහ වියදම්

සමීක්ෂණ වාර්තාවන්ට අනුව ශ්‍රී ලංකාවේ මාසික ගහස්ථ වටු බිත්තර පරිභෝජනය 0'02 ක් වැනිවූ ඉතා සුළු අගයක් ගනී. කිකිලි බිත්තර සඳහා මෙම අගය 11'83 ක් වැනි ඉහළ අගයක් ගනී.

ජපන් වටුවන් ලෙස හැඳින්වෙන වටු විශේෂය ශ්‍රී ලංකාවේ වානිජ්‍යමය ලෙස වඩාත් ප්‍රචලිත වටු විශේෂය යි. මීට අමතර ව කැලෑ පඳුරු වටුවන් (Jungle bush quail), වැනි වටුවන් (Rain quail) සහ ප්‍රසාදි වටුවන් (Blue breasted quail) වියළි කලාපය ආශ්‍රිත ව වෙල් ඉපහැලිවල හමුවේ. ජපන් වටුවන් නැගෙනහිර ආසියාතිකරයට ආවේණික වන අතර ඔවුන්ගේ ගහනය ඉන්දියාව, චීනය, ජපානය, කොරියාව සහ රුසියාව යන රටවල ව්‍යප්තව ඇත. සංචාරක පක්ෂී විශේෂයක් වන මොවුන් අප්‍රිකානු රටවල මෙන් ම යුරෝපයෙහිද බහුලව හමුවේ. වැඩුණු ගැහණු ජපන් වටුවෙකු ග්‍රෑම් 120-160 ත් අතර ජීව්‍ය බරකින් යුක්ත වන අතර වැඩුණු පිරිමි සතකු ග්‍රෑම් 100-140 ත් අතර බරකින් යුක්තවේ. ජපන් වටුවන්ගේ බිජෝෂණ කාලය දින 16 ත් 18 ත් අතර වේ. ගැහැණු සහ පිරිමි සතුන් උපතේදී වෙන්කොට හඳුනා ගැනීම අපහසුවන අතර ඒ සඳහා සති 3-4 ත් අතර කාලයක් බලා සිටීමට සිදුවේ. හොඳින් වැඩුණු ගැහැණු සතුන්ගේ පපු පෙදෙසෙහි කළු පැහැති කුඩා ලප දැකීමට පුළුවන. පිරිමි සතුන්ගේ පපු පෙදෙස ලප වලින් තොර වන අතර තනි ලා දුමුරු පැහැයක් ගනී. ලිංගික ව පරිනත වූ පිරිමි සතුන්ගේ පෙන ගුන්ටිය මගින් පෙන වැනි ස්‍රාවයක් නිපදවන අතර එමගින් ද පිරිමි සතුන් පහසුවෙන් වෙන් කර ගැනීමට පුළුවන.

පරිණත ගැහැණු වටුවකු සති 6 ක් හෝ 7 ක් වන විට බිත්තර දැමීම අරඹයි. රැක්ක වීම සඳහා බිත්තර එකතු කරන්නේ නම් ගැහැණු පිරිමි අනුපාතය 1:3 වන සේ මිශ්‍ර කිරීම සුදුසු ය. වටු බිත්තරයක සාමාන්‍ය බර ග්‍රෑම් 10-12 ක් පමණ වන අතර දුමුරු සුදු පැහැයකින් යුක්ත ය. වටු බිත්තර ඉතා ඉහළ

පෝෂණ ගුණයකින් යුක්ත ය. එහි ඇති ප්‍රෝටීන ප්‍රමාණය 13% කි. වටු බිත්තර වටමින් A අනුභ ආහාරයකි. එහි ඇති කැල්සියම් සහ යකඩ ප්‍රතිශතය කිකිලි බිත්තර වලට වඩා ඉහළය. වටු බිත්තර ආසාත්මිකතාවයන්ගෙන් තොර වන අතර ඇදුම, ආමාශගත වණ, දියවැඩියාව, රක්තහීනතාවය, වකුගඩු, අක්මා සහ පිත්තාශගත ගල් සඳහා ප්‍රත්‍යක්ෂ්‍ය ඔසුවක් ලෙස ද ප්‍රකට ය. අතීතයේදී වටු මස් අනුභව කිරීමෙන් එක්තරා ජපන් අධිරාජ්‍යයක ක්ෂය රෝගයෙන් සුවය ලැබූ බවට ද මතයක් පවතී.

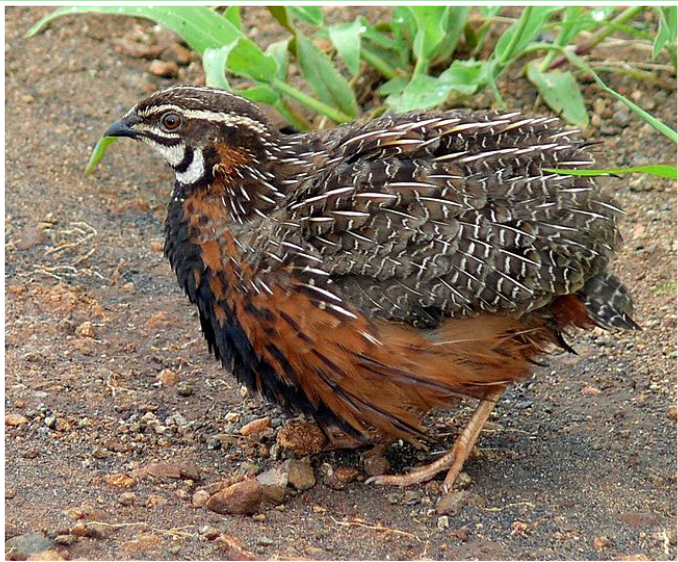
වටුවන්ගේ වසුරු පොහොරක් ලෙස යොදා ගන්නා අතර උග්‍රත් සඳහා ආහාරයක් ලෙසද යොදා ගැනේ. වටු පාලනය මගින් විවිධ රැකියා අවස්ථා උදාවන අතර ඉතා පහසු පාලනය ක්‍රමවේදයක් සහිත වීම නිසා අමතර රැකියාවක් ලෙස ද පවත්වා ගෙන යා හැකි ය.

ශ්‍රී ලාංකේය ජනතාව අතර සාම්ප්‍රදායික ආහාර සඳහා ඇති දැඩි හැඹුරුව, ආකල්පමය මත වාද, සුලභතාව අවම වීම, අධික මිළ, වටු මස් සහ බිත්තර පරිභෝජනය සඳහා සාමාන්‍යම ලෙස බලපා ඇති බව පෙනී යයි. කුකුළු පාලනය සඳහා ඇවැසි දැනුම ලබා ගත හැකි මාර්ග සහ ක්‍රමෝපායන් බොහෝ තිබුණ ද වටු පාලනය සඳහා ඇවැසි දැනුම ලබා ගත හැකි ක්‍රමවේදයන් අල්ප වීම ද වටු කර්මාන්තය අප රටෙහි ප්‍රචලිත නොවීමට බලපා ඇති බව පැහැදිලි ය. වටු පාලනය අලලා සිංහල මාධ්‍යයෙන් ලියැවුණු පොත පත අල්ප වීමද මෙයට තවත් හේතුවකි. විදේශීය රටවල වටුවන් ඇති කිරීමේදී ඔවුන්ගේ දෛනික පෝෂණ අවශ්‍යතා සපිරෙන පරිදි සැකසූ ආහාර වෙළඳ පොලෙහි ඇත. ශ්‍රී ලංකාවේ වටුවන් සඳහා විශේෂයෙන් සැකසූ ආහාර වෙළඳ පොලෙහි නොමැති බැවින් වටු පාලනයෙහි යෙදෙන්නන් මේ සඳහා ආදේශකයක් ලෙස යොදා ගනු ලබන්නේ මස් පිණිස ඇති කරනු ලබන බ්‍රායිලර් පැටවුන් සඳහා දෙනු ලබන සලාකයන්ය. මෙම බ්‍රායිලර් සලාක වටුවන්ගේ පෝෂණ අවශ්‍යතා නිසි ලෙස සැපිරීම සඳහා ප්‍රමාණවත් නොවන බැවින් අපේක්ෂිත නිෂ්පාදන ඉලක්ක කරා යාමට අපහසු වී ඇත. වටුවන් කුඩා පක්ෂීන් සමූහයක් වුව ද ඔවුන් පාලනයේදී පැන නගින ගැටලු රාශියකි. මෙම ගැටළු මනා කළමනාකාරිත්වය තුලින් ඉතා පහසුවෙන් මග හරවා ගත හැකි වුවද නිසි මග පෙන්වීමක් නොමැති කමින් ශ්‍රී ලාංකික ගොවි මහතන් අධෛර්යමත් වීම ගැටලු සහගත තත්වයකට මග පාදයි.

වටුවෝ අනෙකුත් ගොවිපොළ පක්ෂීන් මෙන් නොව කෂම ඉතිරිවා අපතේ දමති. කෂම බඳුන් අඩක් වනසේ පිරවීමෙන් හෝ කෂම බඳුන් කුඩුවට පිටතින් සවි කිරීම තුලින් මෙම ගැටලුව ඉතා පහසුවෙන් මග හරවා ගත හැකි ය. වටුවන්ගේ වසුරුවලින් හමන අධික ඇමෝනියා දුර්ගන්ධය තවත් ගැටලුවකි. වටුවන් කුඩුවෙහි ඇතිකරන්නේ නම් නිතරම මල දුව්‍ය ඉවත් කිරීම මගින් සහ නිවාස තුල මනා වාතාශ්‍රයක් පවත්වා ගැනීම තුලින් මෙම අපහසුතාවන් මගහරවා ගත හැකිවේ. වටුවන් ඉතා ඉක්මනින් වයස් ගත වන අතර ඒ සමගම ඔවුන්ගේ නිෂ්පාදන ධාරිතාව පහළ යාමක් සිදුවේ. මේ නිසා අඩු කාල පරාසවලින් නව සතුන් හඳුන්වා දීමට සිදු වීම ආර්ථිකමය අතින් අවාසිසහගත කරුණකි. වටුවන්හට පියාඹීමට ඇති හැකියාව නිසා ඔවුන් නිදැලි ක්‍රමයට ඇති කිරීම අපහසුය. මේ නිසා වටුවන් ඇති කිරීම සඳහා අතුරු ක්‍රමය යොදා ගැනේ. වටුවන්හට ප්‍රවේණික ව උරුමවූ ස්වභක්ෂකතාව ගොවි මහතන් මන්දගාමීත්වයට පත් කරන

තවත් කරුණකි. ස්වභක්ෂකතාව නිසා වටුවන් දුරුණු ලෙස තුවාලවලට සහ රුධිරය වහනයවීමවලට ලක් වන අතර තුවාල බක්ටීරියා ආසාදන වලට ලක් වීමෙන් වටුවන් මිය යාමට පවා පුළුවන. ස්වභක්ෂකතාවට හේතුවූ කරුණු කාරණා සොයා බලා නිසි පිලියම් යෙදීම මගින් එමගින් වන ආර්ථිකමය හානි අවම කර ගත හැකි ය. වටු බිත්තර කිකිලි බිත්තරවලට සාපේක්ෂ ව කුඩා වන අතර තුනී කටුවකින් යුක්ත වීම නිසා එම බිත්තර පහසුවෙන් බිඳී යාමට ලක් වීමට වැඩි ප්‍රවණතාවයක් පවතින අතර මෙය ආර්ථිකමය අතින් අවාසිදායක ය. වටු බිත්තරවල බාහිර පැහැය නිසා එම බිත්තර වල ජීව්‍යතාව පරීක්ෂා කිරීම අපහසු ය. කිකිලි බිත්තරවලට සාපේක්ෂව වටු බිත්තරවල සඵලතාව අඩු ය. අතුරුණු මත ඇති කිරීමේදී වටුවන් බිත්තර අතුරුණුවෙහි සැඟවීමට උත්සාහ කරන අතර එම නිසා බිත්තර බිඳීයාමට ලක්වීම සහ අපිරිසිදු වීම සිදු විය හැකි ය. වටුවන් පරිසරයේ ශබ්දවලට ඉතා සංවේදී වන අතර එමගින් කලබලයට පත් වීමෙන් බිත්තර නිෂ්පාදනය අනපේක්ෂිත ලෙස පහළ යාමට පුළුවන.

වර්තමානය වන විට මිනිස් ජනගහනය ඉතා සීඝ්‍රයෙන් ඉහළ යමින් පවතින අතර සාම්ප්‍රදායික සත්ත්ව පාලනය සඳහා වැඩි ඉඩ කඩ ප්‍රමාණයක් වෙන් කිරීම අපහසු කරුණක් වී ඇත. එබැවින් වටුවන් වැනි කුඩා පක්ෂීන් පාලනය කෙරෙහි වැඩි අවධානයක් යොමු කරලීම වැදගත් ය. ශ්‍රී ලංකාවේ ගොවි මහතන් වටු පාලනය සඳහා ආකර්ෂණය කර ගැනීමට නම් පුහුණු වැඩමුළු පැවැත්වීම මගින් ඔවුන් සඳහා අවශ්‍ය ප්‍රායෝගික සහ විෂයාණුකුල දැනුම ලබාදීම මෙන් ම ඔවුන්ට අවශ්‍ය යටිතල පහසුකම් සහ ණය පහසුකම් ලබා දීම කළ යුතුව ඇත. වටුවන් අභිජනන පර්යේෂණ ආයතන පිහිටුවීම, නවීන තාක්ෂණය හඳුන්වා දීම, වටුවන් සඳහා වූ ආහාර නිෂ්පාදනය දිරිමත් කිරීම, වටුවන් පාලනය කිරීම පිළිබඳ දැනුම පාසල් සහ විශ්වවිද්‍යාල විෂය නිර්දේශ වලට ඇතුළත් කිරීම ඉතා වැදගත් ය. වටු පාලනය සඳහා වූ ප්‍රවර්ධන කටයුතු වේගවත් කිරීමද වටු පාලනය රටෙහි ජනප්‍රිය කිරීමට රුකුලක් වනු ඇත. ශ්‍රී ලංකාව වැනි සංවර්ධනය වන රටකට ප්‍රෝටීන මන්දපෝෂණය පිටු දැකීමට සහ ආහාර සුරක්ෂිතභාවය සුරැකීමට අද අප ගන්නා පියවර අනාගතයේදී මහඟු ආයෝජනයක් වනු ඇත.



Enrich the Blue Economy through Commercial Seaweed Cultivation



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Introduction

Seaweed farming is a sustainable method for developing the blue economy and creating viable livelihoods development in 21st century. According to literature, seaweed mariculture is one of the fastest-growing arenas of global food production, with approximately 99% of production taking place in Asian countries such as China, Korea, Japan, Indonesia, Philippine, India etc. Moreover, North America has a very few seaweed aquaculture operations while Canada produces the red seaweed. Based on the existing statistics, it has been predicted that seaweed cultivation would generate 500 million metric tons (dry weight basis) by 2050. Moreover, the global seaweed cultivation market is estimated to USD 16.7 billion in 2020 and is projected to reach USD 30.2 billion by 2025. Seaweed is known as an excellent food source in human nutrition which is considered as the primary significance of seaweed. In addition to nutritional importance, seaweed is used in different industries such as cosmetic industry (as an ingredient in pharmaceuticals and neutraceuticals), agriculture industry (as a supplement in livestock feed and as a soil amendment), fuel industry (as a biofuel), food and processing industry (extraction of ingredients such as carrageenan) etc.

Requirements for seaweed farming

Similar to terrestrial plant, seaweed cultivation also needs some basic requirements to perform healthily and vigorously: clean sea water with essential mineral components without any organic or inorganic contaminants with salinity between 2834 ppt (parts per thousand) and shallow depth (approximately 10ft). Due to lesser depth, sunlight would easily penetrate to the bottom and reduce to tidal strength. Furthermore, it is important to avoid fresh water mixing in seaweed growing area because when salinity drops make a thread to cultivation. However, when seaweed cultivation is undertaken in artificially prepared tanks, we should consider providing these requirements thoroughly and allow proper sterilization procedures.

Commercial seaweed cultivars

Although there are numerous seaweeds available, a few selected cultivars are commercially grown worldwide. These species of algae generally fall into three groups: green algae (Chlorophyta spp.), red algae (Rhodophyta spp.), and brown algae (Phaeophyta spp.). Among them, *Ulva lactuca* [sea lettuce], *Caulerpa racemosa*, or *Caulerpa lentillifera*, *Kappaphycus alvarezii* (formerly known as *Eucheuma cottonii*) are popular cultivar among the farmers. However, in Sri Lanka, *K. alvarezii* was first introduced in 2014 and within a few years *K. alvarezii* cultivar has become as an ideal species, being commercially cultivated, especially in northern (Mannar) as well as southern (Dondra) coastal areas in small scales. According to recent studies, Mannar coastal side comprises ideal conditions to grow *K. alvarezii*.

Figure 1: Rafting method

Off-bottom monoline plots Monoline plot (30 m × 20 m) construct using casuarina and bamboo poles (1.5 m length with 25–8 cm diameter), and a polypropylene rope would be used for securely tying the raft to the stakes at a distance of 50cm from the bottom. Nearly 200 g of seed should be inserted into a loop with seed spacing of 20 cm in 30 m PP (3 mm) rope and line space of 1.0 m.



Figure 2: Monoline method

Cage culture is another seaweed growing system which is more suitable in coastal areas having strong tidal waves. According to figure 3, using galvanized iron rods to make a frame and plastic net can be effective to cover the frame. By using polypropylene rope, seeds should be attached similar to bamboo raft method.



Figure 3: Cage method

Harvesting and drying

The harvesting can be accomplished after 45 days of planting. Some portion of healthy well-branched seaweed cuttings should be kept remain as seed materials for the next cultivation. Then, the rest of the harvested biomass should be dried at least a few days under sunlight to reduce the moisture level up to a certain point. Then, the dried seaweeds should be packed properly before sold to the buyer.





Benefits from seaweed cultivation

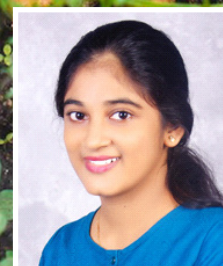
- Seaweed cultivation is a sustainable way to enhance the livelihood development of fishing community through effective enrollment of women. Through this, they could earn extra income and it would be a viable solution for unemployment
- Since Eastern and Southern provinces have good potential for seaweed cultivation, one can make optimum usage of natural resources to enrich blue economy without significantly alter the existing coastal environment
- Potential area to earn foreign exchange through strengthening the export market
- Can be used as an input for processing, pharmaceutical and agriculture industries.

Challenges in seaweed cultivation in Sri Lanka

- Though seaweed cultivation is a cheap with low-technology practice, it requires technical know-how and initial inputs. Thus, government support and aid from responsible authorities are essential.
- Introducing this type of aquatic cultivations would become difficult due to attitudes of fish community. Mainly, when we compared this cultivation with fishing industry, the profits or income generate after some time. It is totally different from fishing. Therefore, implementation of this type of novel occupations should be carefully examined.
- Seaweed cultivation might not be appropriate for every part of the coastal region of the country (especially, strong tide areas should be avoided). Therefore, pilot studies should be done before introducing seaweed cultivation to a particular area.
- Development of research side also is needed to develop low-cost methods for seaweed farming, and to identify areas with no or small puffer and rabbit fish populations, as these fish browse seaweed crops, reducing their yield.
- According to the current situation, seaweed is dried and exported without any value addition. Thus, we would get low foreign revenue. However, through an appropriate value addition process within Sri Lankan context, it would gain more results. Hence, processing industry should be developed.
- High quality seed availability has been identified as a critical factor for the expansion of culture. Thus, acknowledging growers to prepare seed materials themselves and providing necessary advices is important.
- At the moment, seaweed is not widely consumed locally. As such, it is necessary to target the export market, which means large-scale production. Furthermore, developing the public-private partnership with a successful marketing channel is needed and simultaneously we should create good relationship with global buyers.



Organic Agriculture: Sri Lanka Needs Strategic Policy Measures



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There have been widespread protests by Sri Lankan farmers over the past few months against the ban on the import of chemical fertilizers, arguing that the policy is detrimental to the industry as a whole and the country's food security. In taking this immediate decision, the government has sought to achieve a policy objective in their national policy framework, "Vistas of Prosperity and Splendor" which is to promote and popularize organic agriculture, organic fertilizers, organic food consumption, and exports of organic food and agricultural products to guarantee the people's right to safe food within ten years. However, by mid-November 2021, the government had to lift the ban imposed on chemical fertilizer imports aiming to address the immediate concerns within the agriculture sector.

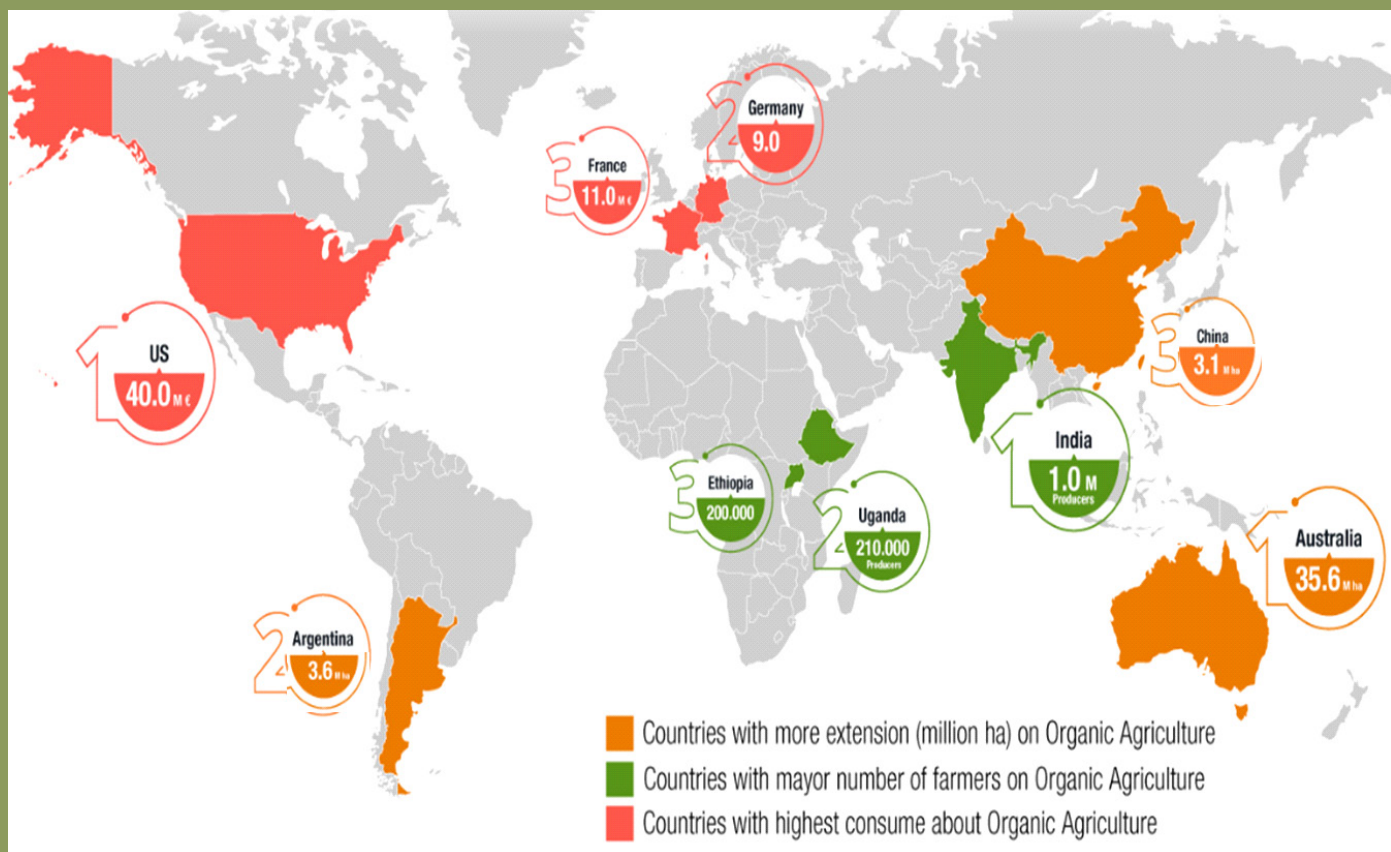
These immediate and tentative policy decisions underscore the importance of having a long-term strategic plan for this transition, demonstrating that this is not an overnight process. With this in mind, the purpose of this blog is to demonstrate the need for a roadmap and a well thought out transition plan for a smooth conversion from conventional

farming to organic farming or sustainable farming. This blog also provides examples of countries that have succeeded and failed in achieving organic farming status in the global context.

Global drive on organic agriculture

There is no doubt that organic agriculture can contribute to policy goals such as minimising negative environmental impacts of agriculture, providing safe and high-quality food, and reducing expenditures on agriculture in the long term. Thus, organic agriculture plays a strategic role in obtaining sustainable production and consumption.

In most countries, the gradually growing political interest in supporting organic agriculture is a noticeable trend, whether from a production or a consumption point of view. Research Institute of Organic Agriculture (FiBL) confirms that there are 72.3 million hectares of organic farmland worldwide and globally, 1.5% of farmland was under organic cultivation by 2019. In the same year, Australia was the country with largest organic agricultural area (35.6 million hectares), followed by Argentina (3.6 million hectares), and China (3.1 million hectares).



Source: Tradecorp and Down to earth

Figure: Countries involved in organic agriculture in the world

In the global context, governments in many countries have initiated national policies and programs to support the organic agriculture sector. These policies and programmes were initiated aiming the conversion of conventional farming into an organic farming to achieve objectives such as tapping into export potentials or addressing the issue of externalities in agriculture. However, some countries failed while some became successful in achieving organic agriculture goals.

The state of Sikkim in India is the first state globally that has achieved full organic status, following a decade of pro-active organic policy intervention. The political commitment towards organic agriculture in this state started in 2003. In 2014, the government adopted a State Policy on Organic Farming, accompanied by a five-year plan for 2013-2018, and could achieve the objective by 2015.

When it comes to Bhutan, in order to become 100% organic, it intended to phase out the use of chemical fertilizers and pesticides. However, in the pragmatic level, achieving the above target proved impractical, especially with the challenges involved, including the fact that the country is currently importing 45 to 50% of the domestic

rice requirement from India and other countries. The country now targets to achieve 100% organic by 2035. Cuba has gone through the largest farmland conversion methods that took place in history. This was from conventional agriculture, dependent on chemical inputs to a model based on organic products. In Cuba, this organic revolution was not only a change in terms of government policies but also a change of approach - from rural to urban.

In China, there has been an argument that further reforms in chemical fertilizer usage are needed in governmental policy. This would ultimately be leading to an integrated nutrient management policy based on three pillars; food security and farmers' income, resource use efficiency and environmental sustainability. Most importantly, China has identified that this requires a mix of policy instruments, including education, regulations, demonstration, and targeted economic incentives.

These provide great examples on how countries put long-term pro-active policy interventions on agriculture to convert the existing agriculture system either to an organic one or to an integrated one. Their aim is to systematically implement the necessary measures in the context of a country without reducing the current yield or the income of the farmers.

Is the conversion a matter of concern for Sri Lanka? As far as organic farming in Sri Lanka is concerned, the government focused on making it 100% organic in a shorter period of time since April 2021 and abruptly imposed a ban on chemical fertilizers and pesticides. This sudden policy decision was imposed on farmers with a lack of knowledge on the transition to organic agriculture.

In Sri Lanka, the agricultural lands have heavily relied on pesticides and inorganic fertilizers. Converting these types of lands into fully organic status is of great concern; hence it takes time to rebuild soil structure and soil health with compost, manure, and other organic fertilizers. Therefore, this conversion is a time of change for both the land and the farmer; hence, it needs a long-term well-structured conversion planning. According to the United States Department of Agriculture (USDA) standard, conventional farmers have to use organic methods for at least three years before calling it organic agriculture.

Most importantly, practicing organic agriculture is not a new thing to Sri Lanka. According to the FIBL-IFOAM survey, in 2019, Sri Lanka had 70,436 hectares of organic farmland while having a 2.5% contribution to the global organic land. Currently, Sri Lanka has boosted Ceylon organic tea production and is a pioneer in the Asian region for organic certified tea. Not only tea but also export organic products include coconut-based products, pepper, cinnamon, cardamom, cloves, nutmeg, fruits and vegetables, processed products, rice and bee products. Therefore, the future of organic farming is promising in Sri Lanka, primarily as an export or specific commodity enterprise rather than a general agricultural programme. In future, the agricultural exports essentially need to be organic as increasing global demand is observed for organic products. However, promoting and popularizing organic agriculture is important as it opens avenues for export potentials and as a solution for the issue of negative externalities on environment.



The way forward

Instead of rushing to become the world first country that converted into fully organic status in a shorter period, developing comprehensive well-structured national organic agriculture action plans is the requirement for Sri Lanka. Even though such a plan takes time and some resources, it encourages an analytical starting point, looking at the current situation of the domestic agriculture sector. Sri Lanka has already initiated few major steps to promote organic agriculture in the country such as establishing public-private partnership programs to commence 3,600 hectares of organic farmlands in Moragahakanda-Kaluganga area, providing training and export market facilities, setting up quality standards for organic products, fertilizers etc., and developing more technologies and high-quality organic fertilizers. Supporting the existing measures while addressing the issues of local situation by implementing supply side push measures and demand side pull measures, is more appropriate than implementing a policy statement without actions. Therefore, it is necessary to encourage policymakers and other actors of the sector to adopt a more comprehensive and strategic plan, and therefore more effective approach to organic support than leaving single policy measures to be adopted in isolation.





“Food” for thought Drivers of Changes in Asian Food Systems

According to the projections, the world population will hit the mark of 9 billion by the year 2050, and accordingly, the global food demand could double by 2050. The population explosion will mainly take place in the Asian and African regions; thus, these regions will be under heavy pressure of increasing their food production. It also assumes producing that much food could significantly increase levels of carbon dioxide and nitrogen in the environment, increased soil and water pollution, and cause detrimental consequences like the extinction of numerous species, climatic changes, and eventually the existence of human beings on the earth. Against this backdrop, managing the food systems to feed the growing number of mouths without compromising the social and environmental sustainability has become the gravest challenge of the 21st-century global agriculture and food sectors.

According to the FAO, food systems encompass the entire range of actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, consumption, and disposal of food products that originate from agriculture, forestry, fisheries, and food industries. In early comprehensions, food systems typically focussed on addressing the need to feed the growing populations by encountering production and distribution-related issues, and thereafter to more on consumption and



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consumer-oriented issues. However, the concept of food systems has been undergoing a rapid transition and transformation process. In recent years, a more holistic concept of food systems has gained attraction amongst scholars, policymakers, and producers. Hence, the sustainable food systems expect to produce four main outcomes namely, nutrition, food security, and health; environmental; social, and economic outcomes.

According to the World Economic Forum (WEF), in purchasing power parity (PPP) terms, Asian economies will become larger than the rest of the world combined for the first time since the 19th century. Consequently, Asia is shaping up to be the economic powerhouse of the world in the forthcoming centuries. With the socio-economic progression, the Asian food systems have been undergoing a remarkable transformation. This transformation is manifested at the industry level and the ground level or market level. The ten most important drivers of changes in Asian food systems are discussed below.



Globalization: This has immensely influenced market liberalization in Asia and consequently, marked growth in international trade has been reported. This growth and expansion of the food sector of Asia have succeeded to attract more and more capital inflows in the form of Foreign Direct Investments (FDIs). The Asian food sector is closely integrated into the global food sector in which the emergence of global supermarket chains, improved horticultural logistic operations, and global sourcing of inputs can be evident.

Rising Income: As Asia becomes rich, its' consumers become rich, and their disposable income has gone up significantly making them affluent consumers have the confidence of sustaining high income. Thus, their percentage expenditure on food has gone down allowing them to consume more food and more meat and dairy products. These trends have created numerous opportunities for the food industry and related industries.

Changes in Consumer Demands: Young urban consumers based has been developing in the region who are educated and informed consumers, can choose, most of the time dual income earners with busy lifestyles, have a small kitchen and have more selective food choices. These trends urge the industry to expand their knowledge base on consumer demands and go for differentiated products, convenient products (RTD- Ready to drink, RTS- Ready to Serve, RTC-Ready to cook, etc.), safe and healthy food (minimally processed, low sugar, low fat, high fibre, and low residues, etc) and environmentally friendly production processes.

Advancement of ICT: Availability of information, transparency of information, and easy access to information are the direct benefits of advanced ICT systems and tools. Consequently, producer farmers, processors, and other supply chain partners can access the market information, production and cost information, consumers and traders can access production information, traders can promote their products more efficiently and order placement and order processing can be done conveniently. This has influenced to change the entire landscape of the food systems.

Technology and Innovations: Technological advancement and innovations have contributed tremendously to enhancing the productivity of farms as well as the industry. Accordingly, quality seeds, efficient fertilizers, effective pest and disease control, advanced irrigation technologies, and effective postharvest technologies have been introduced to the farmers. Also, efficient processing technologies, advanced storage facilities, long distant transportation facilities, and novel modes of selling have been introduced to the industry. Consequently, producers have been able to reap quality products satisfying the consumers' demand at a lower price.

Urbanization: According to UN projections, 60 percent of the world population will live in urban areas and roughly 95 percent of this massive urban growth will occur in less developed countries. More than 60 percent of the increase in the world's



urban population over the next three decades will occur in Asia, particularly in China and India, but also in Pakistan, Bangladesh, the Philippines, and Vietnam. This population migration creates a tremendous impact on food systems. A modern home and work-lifestyle are forming in the region which is manifested through small family units, space and time deficit, small kitchen, use of more electric gadgetries, demand for easy prepare, ready use kind of foods and beverages, more dine outs, more social gathering and activities and so on. These demographic and lifestyle changes create a huge opportunity for the food and catering sectors who will be pressurized to come up with innovative solutions for the changing and growing consumer demands.

Population Profile: The population profile dynamics of the world show a gradual shrinking of the population in developed countries whereas a rapid expansion of population in developing countries. In the developing world, including Asia, the young population is expanding significantly. The nutritional requirement of the growing number of young people together with their diverse choices and taste would create pressure on the food systems in Asia. Convenient, fast, healthy, and environmentally friendly food products will be the demand in times to come and different niche markets will emerge.

Women in the Workplace: Changing the history of Asia, more and more women appear in the present workplace. These educated and empowered women play an active role in public. Thus, the Asian female counterpart is becoming more financially independent, capable of making purchasing decisions, and able to make independent choices. Consequently, healthy and nutritious food, less meat, less fat, less sugar, more veggies, and small serving are the trends in the food market.

Food Quality Standards: Expanding affluent consumer base with the increased level of education necessitates developing, implementing, and maintaining high food quality standards.

International food quality standards, national food quality standards, private third-party food quality standards, and supermarket standards have become essential and inevitable. This has created massive pressure on all stakeholders in the food system supply chain.

Rising Modern food retail outlets: The market share of the food retailing industry is being captured largely by a few very big corporations, categorically the supermarket chains. Supermarkets operate at low costs with improved warehousing & transportation system; hence, their power over stakeholders of the supply chain. They adopt a centrally controlled decision-making process and buy stuff directly from farmers and processors. With the increased spatial distribution of supermarket retailers out from city centers into the edges of towns and even into rural areas and the increased size of the retail centers, they are in a very competitive position to dictate the terms; for instance, grave promotion of their own brands (retailer brands), pressuring the producers to produce under their brand names, and taking the control of determining the credit cycle. On the flip side, all producers compel to produce quality products adhering to the agreed-upon standards continuously. From the consumer viewpoint, it offers quality products with substantial diversity at a competitive price together with a very attractive and convenient shopping experience both in-person and online.

Studying, analyzing, and comprehending the dynamics of food systems are very essential and beneficial for several stakeholders. Such comprehension will be useful for policymakers to do necessary policy interventions to facilitate the sector and remove hindrances while protecting the rights of all stakeholders. Further, the industry will benefit by identifying the marketing trends and priorities so as to enable their strategies accordingly to be more competitive and profitable in the sector. Also, this comprehension will be useful for researchers, practitioners, and academicians to identify and foresee emerging trends and forthcoming problems, and thereby innovate products and processes to resolve the problems.



Alternative Market for Giant Fresh Water Prawns?



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Giant freshwater prawn (*M. rosenbergii*) is one of the most economically important freshwater prawn species due to its taste and premium market value, which makes it one of the fittest species for extensive culture (New et.al.,2009; Rajeevan et.al.,2020). In addition, freshwater prawns are hardy and fast-growing, being able to grow in freshwater and low brackish water conditions. The species possesses many biological advantages for commercial culture including attaining maturation in captivity, a relatively large size, and a rapid growth rate (Rosario,2004). However, Over the past 10 years world, GFP production (primarily from aquaculture rather than Culture-Based Fisheries) has fallen, while the demand has increased.

Samanalawewa reservoir located in Belihuloya, is used by Sri Lanka primarily for irrigation, generation of hydroelectricity as well as for inland fisheries. There are more than 500 inland fishermen whose life depends on this reservoir. The fisheries activities of Samanalawewa reservoir is mainly governed by a village fisheries society, and fish the stocking is carried out with the support of the National Aquaculture Development Authority (NAQDA). In general, the daily catch was recorded as 20-25Kg, and in the windy season, it dropped to around 5-6 Kg. Common fish species are Catfish (*Siluriformes*), Rohu fish (*Labeo rohita*), Mariah fish (*Lota lota*), tilapia fish (*Oreochromis niloticus*), and giant freshwater prawns (*Macrobrachium rosenbergii*).

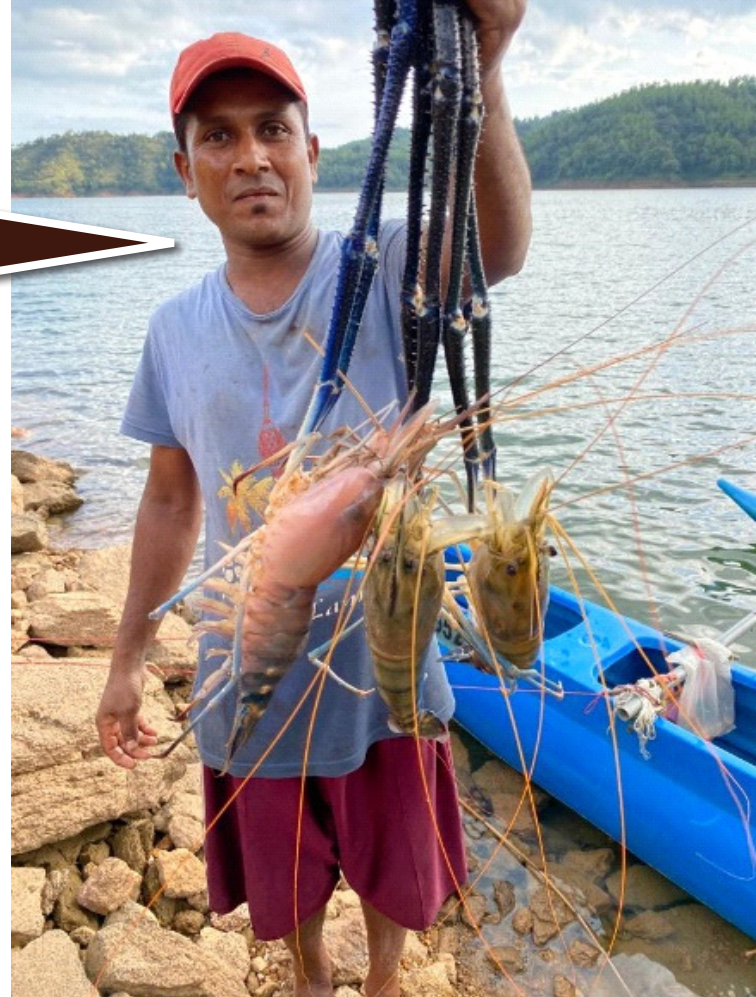
The *Macrobrachium rosenbergii* cultured by the NAQDA is released to the reservoir and about 100,000 of post-larvae annually. The supply chain of giant fresh prawns in Samanalawewa reservoir is mainly governed by the intermediaries such as the nearest hotel and restaurants. The price for restaurants is 1200-1500/-LKR per Kg, and for the village community, it is 600/- to 800/- LKR. Also, they catch only nearly 5-6Kg per day. The COVID-19 pandemic opened the opportunity for local consumers to taste the luxury food.

Hello! I'm Deleepa

I start my day at 5.00 a.m. early morning and till 9.00 a.m. I catch fish and prawns. Then, I sell my harvest in my own small outlet with the help of my wife. Then again at 2.00 p.m. I go to the reservoir to use the nets and finish the fishing activities around 4.00 p.m.

If I can catch 1kg of giant fresh prawns I can sell them for a better price than that of 1kg of fish. However, during the Covid-pandemic situation, we were unable to find good prices for prawns with the travel restrictions and unavailability of local and foreign tourists in the hotels, who pause to buy fresh water prawns from us; thus, we had to sell our fresh water prawns harvest to the village customers at lower rates (600-400/- LKR per 1Kg), and it was recorded as 40% of loss.

Sri Lanka's network of reservoirs are providing an ideal environment for the healthy growth of *Macrobrachium rosenbergii*; given the opportunity, the prawn can grow up to 500g and command a significantly higher price than that of fish. It is, therefore, a lucrative product for fishers as well as the business. If we could promote *Macrobrachium rosenbergii* farming among the local customer base with proper training as well as educate them on the demand and need of the export, improve postharvest management practices, minimize postharvest losses, promote small scale processing and value additions at household levels to empower the households with extra income, it can strengthen their supply chain and rural livelihood.





Excellence in the Use of E-Solutions to Transform Agriculture for the Betterment of the Country, E - Agriculture

Agriculture is the major sector in the enhancement of the economy of any country. Information has the potential to improve efficiency in all spheres of agriculture. Agricultural practices and advancements differ internationally since plants have their own differences, and the location plays a role on their progress as well. However, through the exchange of knowledge from different agriculturally-involved individuals from all over the world, improvement of techniques can be experienced as well. It has made an impact on how information is shared, and being able to use this information for the progression of the agricultural sector gives a great positive impact on everyone's life. Agriculture is the main livelihood of the people in many developing countries such as Sri Lanka. Intense competition in the modern world has also had an impact on agriculture. Farmers, doing traditional farming practices, face challenges in supplying quality harvests quickly enough to meet the demand due to competition. Adapting technology to agriculture is the solution.

E-agriculture is vital for supporting the promotion of agriculture products and to have an impact on the living standards of farmers. E-agriculture is evolving in scope as new Information and Communication Technologies (ICTs) applications continue to be harnessed in the agriculture sector. It is a field focusing on the enhancement of agriculture and rural development through improved information and communication processes.



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Digital technologies have been part of agriculture since well before the COVID-19 pandemic began. The rapid growth of mobile voice and internet globally provide new avenues to share and access information. In Sri Lanka, there were 30.41 million mobile connections in Sri Lanka in January 2021; there were 10.90 million internet users in Sri Lanka in January 2021 (Department of Census and Statistics). Smartphones are becoming more accessible and popular. Social media platforms are getting increasingly popular. The agriculture sector has a lot to gain from the rapid spread of broadband. Also, with directed guidance, access to the Internet can considerably enhance life and eliminate drudgery. The possibilities are endless with the addition of banking services.

ICTs' cross-sectorial nature pushes growth in other sectors, which the Agriculture sector can further utilize. The weather department, for example, can make micro insurance for the farm industry more efficient by collecting and analysing data. The Telecom and Banking sector's adoption of mobile banking and mobile money can considerably ease financial and transactional difficulties for rural people. When the two are combined, they can form a solid foundation for providing a social safety net for persons who work in the agricultural sector. E-government services can also provide a variety of services as well as recommendations, essential for the country's e-agriculture growth.

E-Agriculture has the potential to meet the agricultural goals of Sri Lanka by contributing in the following areas:

- Improving agricultural research and national agricultural information systems
- Facilitating International trade and domestic market access and trade
- Improving agricultural extension and advisory services
- Promoting sustainable farming practices
- Improving postharvest handling and logistics
- Enhancing disaster management and early warning systems
- Facilitating financial inclusion, credit, insurance and risk management schemes
- Advising policies and monitoring effective implementation
- Improving data availability and analytics for food safety and traceability
- Enhancing linkage between government, researchers and producers which in turn facilitates effective policies
- Improving farmers' incomes and productivity on a sustainable basis
- Enhancing knowledge management and access to information

The economic crisis will strongly impact Sri Lankan agriculture. The increase in world energy prices, in turn, increases prices of goods because of the biofuels relationship, Energy and fuel-related costs for all farmers will increase. As a consequence, applying ICT to agriculture in an efficient manner will be more beneficial in this sort of situation in order to effectively deal with the crisis.

Will Lab-grown Meat Overriding the Traditional Meat... ???



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Harvesting meat is causing significant damage to the planet. Every year, billions of terrestrial animals and marine animals are killed for human consumption. The mass of these animals is raised on factory farms, where they are subjected to cruel treatment and are kept in filthy circumstances for their entire lives. SuperMeat or lab-grown meat is an answer for protecting biodiversity. Most people are more prone to vegan to prevent slaughtering the animals. And now people can have an experience of eating real meat without having to worry about slaughtered animals.

Lab-grown meat is flesh, grown outside of an animal's body also known as clean meat, cultured meat, cellular agriculture, and in-vitro meat. Lab-grown meat begins as a tissue obtained from a living animal and is subsequently developed into masses of cells. Samples of cows, chickens, bunnies, ducks, prawns, and even tuna have been taken into labs in the hopes of recreating sections of their bodies without having to grow, imprison, or slaughter the animals themselves. Lab technicians add the sampled cell into bioreactors before adding them to the nourishing pool to grow and build edible "scaffoldings" out of the cells as they develop and multiply, forming genuine muscular tissue. They can use these scaffoldings to make steak, chicken nuggets, hamburger patties, and salmon sashimi from





lab-grown cells. The current challenge is producing the actual 3D structure meat from the scaffoldings. For that, hollowing out plant such as spinach, artichokes and printing long threads of starch onto LEGO pieces, gelatin, mushroom, and textured soy protein is used. In order to introduce the best structural scaffolding, culture media compositions are changing to trigger the differentiation of immature cells to skeletal muscles, fat and connective tissue that makes up the final meat product. The cells are differentiated into myotubes, adipocytes, or other mature cell types, just like natural meat cells.

Consuming meat may contribute to chronic disease due to its high cholesterol and saturated fat levels. Lab-grown meat has the potential to mitigate the harmful health effects of meat consumption. Food scientists can actually manage the amount of bad cholesterol and saturated fat in each cut while growing meat in a lab. Further, lab-grown meat will address the antibiotic resistance threat to human, cause of the overusing of antibiotics to the living animals in order to keep them alive. For farm animals, they may give several growth hormones to boost their growth. Researchers were commissioned by the European Union to investigate six growth hormones used in cattle production, and they found that the hormones had “developmental, neurological, genotoxic, and carcinogenic impacts. But lab-grown meat does not lead to such kinds of struggles.

Lab-grown meat has the potential to meet consumer demand for meat products while avoiding the environmental costs of industrial animal husbandry. According to studies, lab-grown meat produced with renewable energy has a lower carbon footprint than even the most “sustainably-raised” traditional meats

Lab-grown meat is designed to appeal to Omnivorous consumers other than the vegetarians and it will facilitate Omnivores not to worry about the ethical and environmental factors of slaughtering the animals.

The legal aspect of it is that conventional meat producers argue that lab-grown meat is not meet the definition of “meat”. Therefore, restricting the labeling in this way could lead to consumer possible misunderstandings and even health issues since people with meat allergies may not be able to properly distinguish between meat and non-meat products.

The major challenge of the lab-grown meat industry is a growth medium. Commonly used growth medium serum is a bovine fetal serum taken from the blood of fetal calves. Currently, growth media has been made by biotechnological companies; however, clean meat company scientists have paid their attention to produce the growth medium hormone by using algae and fungal extracts.



Trade Openness and Agricultural Development; Gain or Loss

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Sri Lanka is a country which embraced the economic liberalization policies, even before all other SAARC countries thought of it, assuming that it would gain much from trade by increasing its exports. Moreover, literature evidence suggests that agricultural productivity can also be improved through trade openness along with liberalized trade policies. However, agricultural trade liberalization in particular tends to adversely affect small farmers in countries like Sri Lanka while large scale farmers gain. This may have resulted from the fact that we have not fundamentally reshaped agricultural sector from the production of undifferentiated bulk commodities sold in anonymous spot-markets to a production system of segmented and specialized markets, identity-preserved (IP) commodities, value-added food products, and a focus on the end-user to the extent that everybody anticipated.

Sri Lanka's policy framework has been conducive for exporting although exports remain limited and the competitiveness of agricultural products in the world market is not in satisfactory state. Export products and markets have not diversified and penetration to world markets by Sri Lankan trade names, trade promotion, and certification measures has been very slow i.e. export composition is stagnant and dependent on a few low complexity products. One of the major reasons for low export performance is heavy dependence on a few export markets and high dependence on imports to meet the domestic food requirement. This may be due to the poor knowledge of exporters of niche markets. Also, Sri Lanka has not been able to adjust to the world market requirements of agricultural products to cater to the changing demand. The value added in the value chain is very low, and produce deteriorates as it changes many hands from farmer to consumer. Currently more

than 70% of our exports are sent to developing countries with relatively low profits due to low quality, no market mechanism for pay for high quality products, lack of traceability, sending largely raw materials for other countries and low value addition.

Performance of Export Agricultural Sector was not satisfactory due to various reasons among which changing agricultural and other related policies due to change in governments and ministers and less interconnectedness and coordination among the related ministries could be highlighted. Silo based environment also played a major role in hindering the development of those sectors. Research and Development (R & D) activities, have mostly been carried out without having a clear understanding of market demands and customer requirements. Therefore, we have failed to diversify our export products as we expected. Further, development of new products is seen to be very low. According to Kelegama (2013), close 99% of Sri Lanka export products are simple and easily copied by our competitors.

Although Sri Lanka started implementing liberalized policies, the agricultural sector has always been protected and farmers have been provided with many subsidies. From time to time, policies related to protectionism was changed depending on the elected governments without having stiff policies ultimately creating much more market distortions losing the welfare of the country. The protectionist policies have led markets to become less competitive. In addition, each government provided price subsidies further distorting the free market mechanism. Therefore,

the farmers have been dependents on the government and this process has led to create less innovative, less entrepreneurial, less competitive, and less productive farmer base in Sri Lanka. The engagement of farmers directly in international trade is very limited and they are not in a better position with respect to bargaining power. As noted, protectionism is particularly worrying for the agricultural sector, where high protection of import-competing crops along with fertilizer subsidies have created strong disincentives for crop and export diversification. Sri Lanka has the most complicated tariff system and traders complain that they have to face many Non-Tariff barriers, Para-Tariffs, Procedural Obstacles (POs) and Trade Related Business Environments (TBEs). Para-tariffs' dispersion leads to prices that distort production and consumption patterns, created a major anti export bias by significantly increasing nominal protection and prices of import while adding to trade policy complexity, the addition of para-tariffs, including import surcharges, the policy framework became even more distorted and ad hoc. High levels of protection divert factors of production from more efficient sectors discouraging the development of new products and export diversification. Trade barriers also make it difficult to access world class inputs at competitive prices thus reducing the ability of firms to compete and integrate into global value chains and regional value chains. Non-tariff barriers resulted in poor performance in FTAs. Positive results of CESSes have not been identified. The poor performance in trade logistics has led to weak integration into global production networks. Many government related parties to trade create an incentive to produce and sell in the domestic market instead of exporting so that domestic producers are under less pressure to match international quality standards. One of the major issues related to investment in trade and related activities is the poor performance on trade logistics and FDI. Also, Sri Lanka has less demand driven technology development to cater to transformed markets and niche markets.

Continuation of protectionist policies is neither necessary nor efficient in the present era though they had been very successful in expanding paddy and rice sector during post independent era. Removal of tariff without liberalizing agricultural markets is welfare reducing both at national and provincial levels due to indirect impacts on expanding agriculture. Therefore, removal tariff together with tariff on fertilizer is welfare gaining.

In the case of Sri Lankan agricultural exports such as coconut, cinnamon, cloves and nutmeg, the traders have to comply with strict technical regulations applied by various countries to import from Sri Lanka. When organic products from Sri Lanka to EU is concerned, EU buyers need to obtain a special import authorization for organic products which is costly and time consuming for EU buyers. As Sri Lanka has not been classified by EU as an equivalent country in terms of organic regime, EU buyers are motivated to buy from EU or EU equivalent countries. Therefore, Sri Lankan exporters of organic foods depend on a very few authorized buyers and therefore traders can't diversify across them. The solution is to get certification from an authorized body recognized by European Commission.

We have poor market intelligence for new market links, niche markets, prices, technology, potential markets, SPS testing requirements, export procedures, logistics, and raw material supplies. Most importantly public private partnership is highly inadequate.

According to the economic theory, it has been shown that any interference with the market mechanism by imposing tax would lead to welfare losses to the society. On the other hand, complex structure of tax system would hinder the trade. Sri Lanka is a country which has a complex tariff structure. inculcating entrepreneurial mindset among us, developing real time business models to cater to the demand of agricultural commodities, making the general public think economically and business-oriented and creating innovative marketing strategies would be essential in developing the nation. Efforts to develop and expand new types of and uses for bulk agricultural commodities (e.g., alternative fuels, bioplastics), alternative agricultural production systems (e.g., organic, intensive and precision agriculture), finding niche markets, and growing specialty crops are regarded as creating new opportunities for improving the economic viability of agriculture and rural communities and increasing the foreign exchange earnings of export agricultural products through new technological innovations, research and learning must be excelled with a strong emphasis on value addition to local agricultural resources through modern scientific and technological approach.



කෘෂිකාර්මික සංචාරක ව්‍යාපාරයේ පවතින අභියෝග සහ ගැටලු

ශ්‍රී ලංකාවේ කෘෂිකාර්මික සංචාරක ව්‍යාපාරය

කෘෂිකාර්මික සංචාරක ව්‍යාපාරය යනු සංචාරකයින් කෘෂිකාර්මික පහසුකම් සහ භූ දර්ශන හැරුණිම මෙන්ම විනෝදාස්වාදය හෝ විවේකය සඳහා කෘෂිකාර්මික ක්‍රියාවලීන්ට ක්‍රියාකාරීව සහභාගී වන ග්‍රාමීය සංචාරක ව්‍යාපාරයකි. කෘෂිකාර්මික සංචාරක ව්‍යාපාරය ගොවීන් තම නිෂ්පාදන සෘජුවම සංචාරකයින්ට අලෙවි කිරීම ලෙසද සැලකිය හැකිය.

ශ්‍රී ලංකාව තුළ කෘෂි සංචාරක ව්‍යාපාරය සඳහා අවස්ථා විශාල ප්‍රමාණයක් ඇති දැපන් රාජ්‍යයක් වන ශ්‍රී ලංකාවේ ආර්ථිකය සාම්ප්‍රදායිකව පදනම් වී ඇත්තේ කෘෂිකාර්මික නිෂ්පාදන නිෂ්පාදනය සහ අපනයනය මත වන අතර රටේ ජනගහනයෙන් 25% කට වඩා වැඩි පිරිසක් කෘෂිකර්මාන්තයේ කටයුතු කරති. කෘෂිකර්මාන්තය රටේ වැදගත්ම කර්මාන්තයක් වන අතර රටේ ජනතාවගෙන් වැඩි පිරිසක් ග්‍රාමීය ප්‍රදේශවල ජීවත් වෙයි.

සංචාරකයින් ආකර්ෂණය කර ගැනීමට සහ සංචාරක ව්‍යාපාරයෙන් අමතර මුදල් උපයා ගැනීමට ශ්‍රී ලංකාවේ හේ අංශය විශේෂයෙන් විශාල දායකත්වයක් ලබා දෙයි. කෘෂිකාර්මික ක්‍රියාකාරකම් රාශියකින් සහ පොල්, රබර්, කුළුබඩු පිළිබඳ දීර්ඝ වෙළෙඳ ඉතිහාසයක් සහිත ශ්‍රී ලංකාවට අතිමහත් ආකර්ෂණයක් ඇත.

මෙම ලිපියෙන් අපි ශ්‍රී ලංකාවේ කෘෂිකාර්මික සංචාරක කර්මාන්තයේ ගැටලු සහ අභියෝග සාකච්ඡා කිරීමට බලාපොරොත්තු වෙමු.



අභියෝග සහ ගැටලු

දුර්වල යටිතල පහසුකම් සහ මාර්ග පහසුකම්

සංචාරකයින් සඳහා යටිතල පහසුකම් ඉතා වැදගත් වේ. සංචාරකයන්ගේ බොහෝ කෘෂිකාර්මික ගමනාන්තයන් රටේ ග්‍රාමීය ප්‍රදේශවල විය. ප්‍රවාහනය ඇතුළු යටිතල පහසුකම් ග්‍රාමීය ප්‍රදේශවල දුර්වල තත්ත්වයක් පවතී. කෘෂිකාර්මික ගමනාන්ත, බොහෝ මාර්ග දුර්වල තත්ත්වයේ පවතින අතර පුද්ගලික ප්‍රවාහනයකින් තොරව ප්‍රදේශයට ළඟා විය නොහැක. පොදු බස් රථය නගර මධ්‍යයේ පමණක් නවත්වන බැවින් පොදු ප්‍රවාහන ප්‍රවේශය තවමත් සීමිතය.

ග්‍රාමීය භෞතික යටිතල පහසුකම් වැඩිදියුණු වී ඇතත්, අන්තර්ජාල සම්බන්ධතාව, අමුත්තන්ගේ මධ්‍යස්ථානයක් සහ සායන වැනි වෙනත් ආධාරක සේවා වර්ධනය වී නොමැත.

සංචාරක මාර්ගෝපදේශය සහ සංචාරක ක්‍රියාකාරකම් ඒකාධිකාරයක් පැවතීම

කොමිස් මුදල් උපයා ගැනීම සඳහා, ඇතැම් සංචාරක ක්‍රියාකරුවන් සහ සංචාරක මාර්ගෝපදේශකයින් විසින් විශේෂිත කෘෂි සංචාරක ගමනාන්ත වෙත අමුත්තන් යවයි. මෙය අසරණව සිටින කුඩා ව්‍යාපාර හිමියන්ට ඇති ප්‍රධාන ප්‍රශ්නයකි. එහි ප්‍රතිඵලයක් වශයෙන්, සංචාරක ක්‍රියාකරුවන්, මාර්ගෝපදේශකයින්, සහ ධනවත් සහ බලගතු හිමිකරුවන් කාර්මාන්තය පාලනය කරයි. අවශ්‍ය නොවන ප්‍රදේශවලට පැමිණෙන අයට ගැටලු ඇති කරන අතරම ඔවුන්ගේ ස්ථානවලට අමුත්තන් පොළඹවා ගැනීම මගින් සංචාරකයන් අපහසුතාවට පත්වෙයි.

මෙය ශ්‍රී ලංකාවේ කෘෂි සංචාරක ව්‍යාපාරයේ ප්‍රධාන ගැටලුවක් වන අතර එහි ප්‍රතිඵලයක් ලෙස බොහෝ සුන්දර කෘෂි සංචාරක ගමනාන්ත වසා දමා ඇත.

මෙහෙයුම්කරුවන්ට දේශපාලන බලපෑම්

විශේෂයෙන්ම පළාත් පාලන ආයතනවල දේශපාලකයන්ට සමහර ක්‍රියාකරුවන් කෙරෙහි බලතල ගණනාවක් තිබේ. මෙය ක්ෂේත්‍රය තුළ පැන නැඟුණු අත්තනා වශයෙන්ම බරපතල ප්‍රශ්නයක් වූ අතර එය ක්‍රම කිහිපයකින් සිදුවෙයි. සෑම වසරකම, බලපත්‍ර ලබා ගැනීම සඳහා ක්‍රියාකරුවන් විසින් ප්‍රාදේශීය නිලධාරීන්ට විශාල මුදලක් ගෙවිය යුතුය. සමහර අවස්ථාවල මැතිවරණ ව්‍යාපාර, උත්සව, වැනි දේශපාලන කටයුතු සඳහා ද මුදල් වියදම් කළ යුතුය.

විශේෂයෙන්ම කුඩා පරිමාණ ව්‍යාපාර සඳහා මෙය දරාගත නොහැකි බරකි. ඇතැම් අවස්ථාවල දේශපාලකයන්ට මුදල් ගෙවීමට නොහැකිවීම නිසා ව්‍යාපාරවලට තම ව්‍යාපාර වසා දැමීමට සිදුවී ඇත.

ආර්ථික අර්බුදය

ශ්‍රී ලංකාව පෙර නොවූ විරූ ආර්ථික අර්බුදයකට ලක්ව ඇත. මෙම අර්බුදයේ ප්‍රතිඵලයක් ලෙස විදේශීය රජයන් කිහිපයක් සංචාරක උපදේශන නිකුත් කර ඇති අතර ශ්‍රී ලංකාවට සංචාරක පැමිණීම් විශාල ලෙස පහත වැටී ඇත. මෙය කණගාටුවට කරුණක් වන්නේ සංචාරක ව්‍යාපාරය ශ්‍රී ලංකාවට ජාත්‍යන්තර ආයෝජන ආකර්ශනය කර ගැනීමට ඉතිරිව ඇති මාර්ග කිහිපයන් එකකි. ඉන්ධන, ගෘහ ආදී අත්‍යවශ්‍ය ද්‍රව්‍ය ඇතුළු සියලුම නිෂ්පාදනවල මිල ඉහළ යාම හේතුවෙන් කෘෂි සංචාරක කාර්මාන්තය ද විශාල දුෂ්කරතාවන්ට මුහුණ දී ඇත. ඒ පමණක් නොව ශ්‍රී ලංකාවේ දෛනික විදුලිය ඇනහිටීම් සංචාරක ව්‍යාපාරයට ද විශාල බලපෑමක් ඇති කර ඇත්තේ එය ක්‍රියාකාරීත්වයට බලපාන බැවිනි. පසුගිය වසරේ ශ්‍රී ලංකාවේ රසායනික පොහොර තහනම කෘෂිකර්ම ක්ෂේත්‍රයට විශාල බලපෑමක් එල්ල කළේය. මේ නිසා කෘෂි සංචාරක කාර්මාන්තයට ද අභියෝග රැසකට මුහුණ දීමට සිදු විය.

සංචාරක ස්ථාන ප්‍රචාරණයේ අඩු මට්ටම සහ ප්‍රවර්ධනය අවම වීම

කෘෂිකාර්මික ස්ථාන වෙත සංචාරකයින් ආකර්ෂණය කර ගැනීම සඳහා ප්‍රචාරණය ඉතා වැදගත් වේ. බොහෝ කෘෂිකාර්මික ස්ථාන ග්‍රාමීය ප්‍රදේශවල පිහිටා ඇතත් එම ස්ථාන ප්‍රසිද්ධියට පත් නොවන්නේ අඩු ප්‍රචාරණ මට්ටමක් නිසාය. ඒ වගේම ප්‍රචාරණය වියදම් අධික නිසා ජනතාව ඒ ගැන දැනීමක් නොමැත. නමුත් හොඳ ප්‍රචාරණය ඔවුන්ගේ ලාභය වැඩි කර ගැනීමට උපකාරී වේ.

කෘෂිකර්මාන්තය පදනම් කරගත් අධ්‍යාපනයේ දුර්වල මට්ටම

කෘෂි සංචාරක ව්‍යාපාරය විසින් ලබා දිය හැකි අගය එකතු කළ හැකි අවස්ථා තිබියදීත්, ශ්‍රී ලංකාවේ බොහෝ ක්‍රියාකරුවන් කෘෂිකාර්මික පාදක අධ්‍යාපන අවස්ථා පිළිබඳව නොදැන සිටිති. ක්‍රියාකරුවන්ට ඔවුන්ගේ ගොවිතැන් කටයුතු විවිධාංගීකරණය කිරීමට අවශ්‍ය නිවැරදි තොරතුරු සහ කුසලතා අධ්‍යයනය කිරීමට කාලය හෝ පෙළඹවීමක් නොමැති බව පෙනේ, ඔවුන් හැකියාවන් පිළිබඳව දැනුවත් වුවද කෘෂි සංචාරක ව්‍යාපාරයන් නිසි ලෙස ආරම්භ කිරීම, කළමනාකරණය, සංවර්ධනය, අලෙවිකරණය සහ ප්‍රවර්ධනය සඳහා සංකල්පය පිළිබඳ ගැඹුරු අවබෝධයක් අවශ්‍ය වේ.

එසේම, ක්‍රියාකරුවන්ට කෘෂි සංචාරක ව්‍යාපාරයේ වැදගත් කොටස් පිළිබඳව අඩු අවබෝධයක් ඇත. රටේ පුරවැසියන්ගේ සාමාන්‍ය අධ්‍යාපන මට්ටම වැඩි වුවත්, ග්‍රාමීය ගොවීන්ගේ ඉංග්‍රීසි දැනුම, භූ දර්ශන කුසලතා, කළමනාකරණ කුසලතා, සන්නිවේදන සහ අන්තර් පුද්ගල කුසලතා පිළිබඳව ගැටළු තිබේ. සෘජු විකුණුම් සඳහා සීමිත පහසුකම්

අවශ්‍ය මූල්‍ය, දැනුම, තාක්ෂණය සහ ගබඩා පහසුකම් නොමැතිකම හේතුවෙන් ග්‍රාමීය කෘෂිකාර්මික ක්‍රියාකරුවන්ට තම නිෂ්පාදන සෘජුවම විකිණීම පිළිබඳව නොදැන සිටින නමුත් සෘජු විකුණුම් ඉහළ ලාභයක් ලබා ගැනීම සඳහා හොඳම ක්‍රමයය

සංචාරකයින් උසස් තත්වයේ නිෂ්පාදන මිලදී ගැනීමට කැමැත්තක් දක්වයි. එබැවින් ගොවිපල නිෂ්පාදන සැකසීම හෝ අගය එකතු කිරීම කෘෂි සංචාරක ව්‍යාපාර සඳහා ආකර්ෂණය වැඩි කරයි. නිෂ්පාදන ගුණාත්මක භාවයෙන් අඩු නම් එය ව්‍යාපාරයට අහිතකර ලෙස බලපානුයේ මෙම නිෂ්පාදන සඳහා ඇති ඉල්ලුම අඩු වන බැවිනි.

ප්‍රමාණවත් නොවන රජයේ සහයෝගය

රජයේ සහාය නොමැතිව සංචාරක ව්‍යාපාර වලට සාර්ථක විය නොහැක. මධ්‍යම සහ පළාත් පාලන ආයතනවල යම් සහයෝගයක් තිබුණද, නිසි ප්‍රතිපත්ති මාලාවක් නොමැති වීම ගැටලුවකි. කෘෂිකාර්මික සංචාරක ව්‍යාපාරයේ නියැලී සිටින පුද්ගලයින්ට සැපයුම් ආධාර හැර රජය මූල්‍ය ආධාර ලබා දිය යුතුය. රජය හැර අනෙකුත් පුද්ගලික ආයතනවල ක්‍රියාකරුවන්ට ලැබෙන සහයෝගය ද අවමය. කෘෂිකාර්මික අවස්ථා පිළිබඳ ක්‍රියාකරුවන් දැනුවත් කිරීමේ දුර්වල මට්ටම

සාර්ථක කෘෂිකාර්මික ව්‍යාපාරයක් පවත්වාගෙන යාමට නම්, ඔබ කර්මාන්තයේ ප්‍රධාන පැතිකඩ පිළිබඳව දැනුවත් විය යුතුය. කෘෂිකර්මාන්තය පිළිබඳ මූලික අවබෝධයක් තිබියදීත්, ශ්‍රී ලාංකික ක්‍රියාකරුවන්ට කෘෂි සංචාරක ව්‍යාපාරයේ විවිධ පැතිකඩ පිළිබඳ සීමිත අවබෝධයක් පැවතීම ගැටලුවකි.

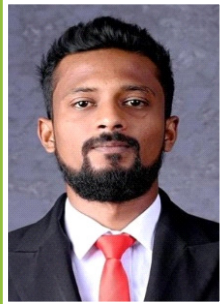
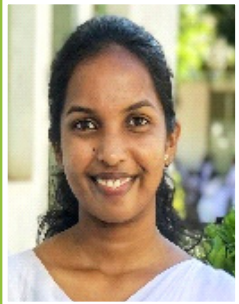
කෘෂිකාර්මික ස්ථානයක් නිසි ලෙස ආරම්භ කිරීම, කළමනාකරණය කිරීම, සංවර්ධනය කිරීම, අලෙවි කිරීම සහ ප්‍රවර්ධනය කිරීම සඳහා සංකල්පය පිළිබඳ වැඩි



අවබෝධයක් අවශ්‍ය වේ. අනෙක් අතට, ක්‍රියාකරුවන්ට කෘෂි සංචාරක ව්‍යාපාරයේ වැදගත් කරුණු පිළිබඳ අඩු අවබෝධයක් ඇත.

පරිසර දූෂණය සහ දුර්වල අපද්‍රව්‍ය කළමනාකරණය ප්‍රසන්න පරිසරයක් කෘෂි සංචාරක කර්මාන්තයේ අත්‍යවශ්‍ය අංගයකි. නමුත් රට පුරා විවිධ සංචාරක ස්ථානවල යම් පරිසර දූෂණයක් අපට නිරීක්ෂණය කළ හැකිය.

සැලසුම් රහිත සහ පාලනයකින් තොරව සංචාරක ක්‍රියාකාරකම්, අධික ජනකාය, මාර්ග තදබදය, කසල ගොඩගැසීම ආදිය මෙම පරිසර දූෂණයට ප්‍රධාන හේතු විය. එමෙන්ම බොහෝ කෘෂි සංචාරක ස්ථානවල නිසි අපද්‍රව්‍ය කළමනාකරණ වැඩසටහන් නොමැත.



යූ.පී.එන්.යූ. විමලසිරි, ඩබ්.වී.එන්. පෙරේරා, එන්.ඩබ්.ආර්.එම්. විතානගේ අපනයන කෘෂිකර්ම දෙපාර්තමේන්තුව කෘෂි විද්‍යා පීඨය
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මහාචාර්ය එස්.එච්.පී. මල්කාන්ති, කේ.කේ.ඒ. කිරිවැල්ලෙනිය කෘෂිව්‍යාපාර කළමනාකරණ අධ්‍යයන අංශය කෘෂි විද්‍යා පීඨය
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Let's Make Chocolates



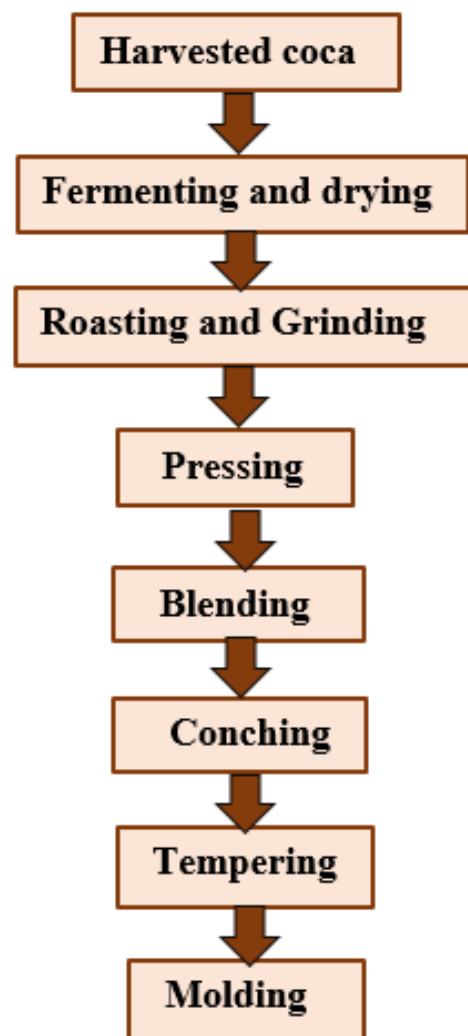
S.T. Hansika and Prof. D.A.M. De Silva
Department of Agribusiness Management
Faculty of Agricultural Sciences
Sabaragamuwa University of Sri Lanka

“Let's make chocolate” is a workshop undertaken by the AHEAD ELTA ELSE Faculty DP funded by the world bank with the resource contribution of Mr. M. L. A. Leelarathna, Mr. Samantha Mirandu, and Prof. P. L. N. Lakshman by targeting the third year and fourth-year students who specialized in the Department of Agribusiness management. The main objective of the workshop is to motivate students to involve in the agri-food sector and open up new Agri-venture pathways and opportunities which are not explored in the Sri Lankan chocolate industry.

Chocolates???

Chocolate is a delicious food and flavoring ingredient that is popular among all the generations in the world. Mainly chocolate is made out of roasted and ground coco pods and is available in solid and liquid forms.

Chocolate preparation process





Chocolate tempering

Tempering is the process that ensures chocolate is smooth and shiny, and not dull and greasy-looking. During the tempering process heat chocolates and cool them to particular temperatures to control the crystal structure to stabilize. Tempering makes chocolates smooth and glossy and once chocolates melt they set up smoothly and glossy.

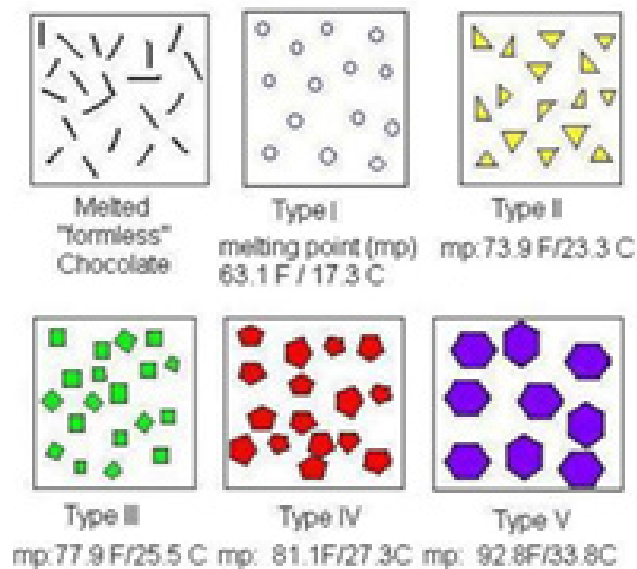
If chocolates allow cooling on their own, the crystal structure can be loosed which is made out of different types of crystals. This resulted dull, matt texture of chocolate with a low melting point. Through tempering, ensure that chocolate has a dense structure of beta crystals and a glossy, shiny finish that does not melt when you touch it.



Tempering process

- Heat chocolates to the melting point of all crystal types
- Cool to the point where type IV and type V crystals form
- Heat again to melt the type IV crystals, leaving only the Type V behind
- Type VI does not form during the tempering Process

Chocolate tempering needs more skills and hand-on practice to handle since the temperatures of tempering are highly specific to the particular product.





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Marketing in Tea Tourism

Tourism – which is motivated by an interest in the history, culture, and traditions related to the consumption of tea, consists of tea gardens where tea is planted, tea factories where it is produced, tea shops where it is for sale or served, and institutions that preserve and interpret the tea culture – can be defined as tea tourism. Tea tourism is becoming a widespread topic due to the extensive and forever growing number of tea lovers all around the world. This whole religion of tea comes from almost all of the main tea-producing countries of the world; among them, Japan, China, Sri Lanka, and Scotland play a principal role in tea tourism. Sri Lanka has been holding a very rich heritage the tea production for decades. Ceylon tea estates are breathtakingly favorite destinations; especially, among the tourists who are interested in Ceylon tea. Central Highlands of the country which can be called the golden valley of the hill country, especially situated in and around Nuwara Eliya, really catch the attraction of local and foreign tourists. In Sri Lanka, there are a number of tea cultivations that go with this tea tourism concept. “Damro Tea” and “Amba Tea” are very good examples of tea tourism here.



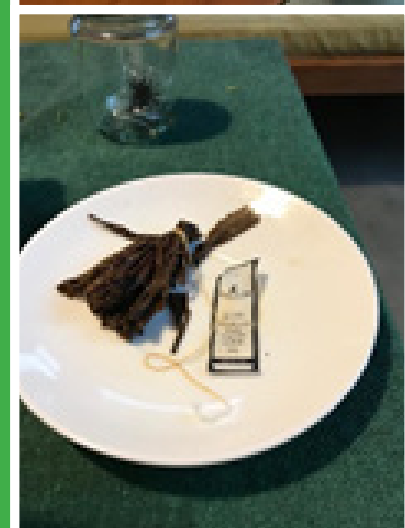
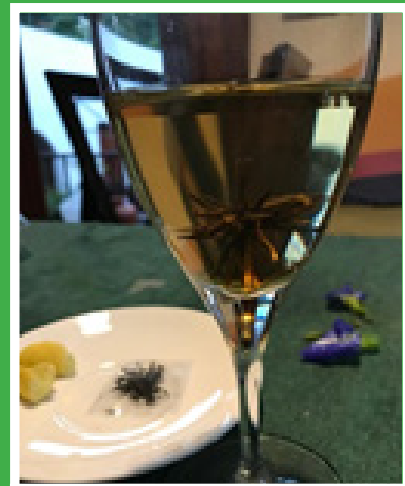
-Tea restaurant in “Damro” tea plantation-

“Damro Tea” has a well-trained staff in the tea restaurant to serve tourists in a decent and well-organized manner. Every visitor to the tea factory tastes their tea to be refreshed. In “Amba tea” mostly deal with innovative tea products and have a vast range of tea-related beverages. Tourists have the opportunity of feeling nature while tasting the best tea in the world. They have arranged interesting viewpoints of tea cultivations as another strategy. The lectures and awareness sessions they provide for their visitors make it more effective. Tourists are able to know the tea history in Sri Lanka, the available tea range in the restaurant, and many interesting stories and achievements obtained by the institution.

Tea tourism can be identified as a niche tourism segment that emerged with a novel concept of responsible tourism, and sustainable and nature-based eco-friendly tourism. The tea estates, open for tourists, are cleverly maintaining their natural environment as visitors can freely enjoy nature. Tea combination has developed as an art in some societies, such as Japan. Various tea tourism-based products attract tourists to tea destinations such as China, Japan, and England that promote tea-related products to their visitors who take a nice memory of their favorite beverage from the destination where it originated. In Amba tea estate, several tastes of tea are offered to their visitors: white tea, black tea, green tea, “Pittu Bambu” tea, “Katarolu” tea, etc. It is a good strategy for winning tourist attractions to the places.

Sri Lankan stakeholders and service providers have the capacity to target this category and create unique new trends to cater to guests in different segments. Global trends in tea tourism such as tea-based cuisine, healthcare products and services, and cosmetrical or spa treatments would definitely attract luxury tourists. The famous Virgin White Tea grown in Sri Lanka is rich in antioxidants and is said to be the healthiest and most expensive tea in the world with a price tag of over USD 1,500 per kilogram. According to the latest testing, Virgin White Tea has an antioxidant content of 10.11 percent, which is said to be the highest naturally occurring content of antioxidants in any beverage. For instance, Handungoda’s Virgin White Tea exported from Sri Lanka is the main ingredient at the only Tea Salon considered the world’s most exclusive boutiques situated in Central Paris. Such products can add similar value to the tea experience in Sri Lanka.

In order to obtain the best benefit and to ensure sustainability reaches the grass-root levels, scientific approaches and strategic planning will need to be in place. Local communities may essentially need to gain awareness and periodical assessments after implementation to ensure the quality of the product is maintained. It will be a challenge to make developments without providing the necessary awareness and education to the local community.



-Tea range in “Amba”-



Participatory Approach on

Hybrid Maize Seed Production

World's population will increase by one third, with most of the additional 2 billion people living in developing countries. The United Nations Food and Agriculture Organization (FAO) estimates that agricultural production will have to increase by 60 per cent before 2050 to satisfy the increased demand for food, feed and fibre. Agriculture faces the daunting task of boosting productivity in the face of an increasing scarcity of arable land and water, and while coping with the challenges of climate change. This task has recently been summarized and prioritized in the United Nations Sustainable Development Goal 2 (SDG2) – “End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.

“Agriculture begins with seeds and planting materials. Without seed and planting materials, there can be no crops and no food production. When harvests fail or seed stocks are lost, seed insecurity ensues, which can reduce food security and livelihoods. In most smallholder farming systems farmers save seed from the previous harvest to plant in the next season. They select seed from the best plants and then dry, clean and store the seed in a safe place. These traditional seed-saving practices and farmers’ sharing of seed are called the informal seed system, or the farmer/community-based seed system. They also add to their crop diversity with seed they obtain from social networks or purchase in local markets, from agro-dealers or seed companies. Maize or corn is a global commodity which feed the people across the continents as well as key ingredient of the many livestock feeds. Maize in Sri Lankan context is mainly a feed ingredient for livestock feeds. Maize cultivation mainly based on hybrid seeds and most of the popular varieties; JET 99, SA 336, HP 4311, TF 222, SA 501, etc. are imported hybrid maize seeds. Moreover, locally developed hybrids; Ruwan, Badhra, Waruna, Muthu, etc holding comparably low market share with limited cultivation extent.

Complementing this informal seed system is the formal seed system, which is made up of public and private seed companies that develop high-quality seed of new crop varieties. The challenge for seed sector development, is how to address both the informal and formal seed systems so that farmers have access to a sustainable supply of quality seed of improved crop varieties which is affordable, meets their needs (for food, feed and markets), is well adapted to the local agro-ecologies and adapted to climate change. A key issue is for farming households to have timely and affordable access to high-quality seed of adapted varieties to grow food for their families and fodder for their livestock, or to pursue other income-generating opportunities. Farming households need seeds for a range of crop varieties that meet their local needs and tastes and are adapted to local agro-ecological and climatic conditions. Quality seed is a necessary but not sufficient condition for sustainable production. Seed is more than just an agricultural input and economic agent of household economy. Therefore, access, availability and affordability to seeds decide performance of individuals, households, communities and country as whole. The aim of developing seed producing clusters following participatory approach aimed to bridge the existing gaps in local seed industry.



Figure 1: Cobs of traditional maize landraces hang for drying

The main gaps in local seed production is higher production cost (farmer affordability) and the yield loss origins from poor postharvest chain management. It has been reported that about 20% of maize yield loss is experienced by 64% farmers mainly due to poor pest management (Fall Army worm), water availability (droughts, and limited water access), fertilizer application (poor plant nutrient supply, especially the micro nutrients, Lack of scientific approach, i.e. soil testing and recommend the fertilizers, mitigation controls over wild animals or macro pest control and using inferior quality or unsuitable machinery (poor mechanization). The absence of said good agricultural practices is due to higher cost involvement in seeds, fertilizer, labor, fuel and machinery usage and lack of farmer interest, poor attitudes and knowledge on certified seed production. Moreover, key concerns on developing local seed production is providing facilities for seed processing, grading and sorting, seed treatments, packaging and storage.



Figure 2: Hybrid maize cultivation

In general, the proposed Maize Seed Production will have a significant positive impact on rural agriculture communities by enhancing their economic conditions and prosperity while it has an influence on the national economy at the national level which outweighs the potential negative impacts. Environmental and social feasibility of establishing a maize seed production should consider factors such as proximity to Wildlife Conserve areas and Forest Reserves, Land use, Soil Type, Agro-ecological zones, Topography and terrain, availability of water, willingness of farmers, availability of lands, social capital, etc. However, in general, maize cultivation may lead to soil erosion due to agricultural practices, soil types, and terrain. Therefore, implementing proper erosion control measures from commencement will reduce the erosive forces and impact due to soil erosion can be reduced up to greater extent. Selection of lands and farmers should avoid selecting farmers in the border areas of Wildlife and Forest areas to reduce the edge effects due to Cultivation. In addition, human-elephant conflict and damages to cultivations are higher. Hence, precautionary measures should be made in advance. Furthermore, selection of farmers should be carefully and transparently carried out to reduce the biases which will lead to issues in social cohesiveness. Integrated Pest Management Practices should be implemented from the land preparation up to marketing stage. Accordingly, use of chemicals can be reduced.

Lessons learned from previous approaches on hybrid maize seed production and overcome their shortcomings, it is fundamental to understand national seed as a system. Country's seed system comprised of 3 key pillars, Research arm of the Dept. of Agriculture (DoA) and seed certification division, the formal seed system and the informal seed system. At the intersection of all three circles sits plant genetic resources for food and agriculture, which is important for all three areas and includes genetic material conserved in gene banks, such as landraces and improved varieties and wild relatives of crops that are used in plant breeding. The informal seed system represents farming households and communities producing, saving, selling or exchanging uncertified seed of improved varieties and local landraces. Farming households normally save seed from the previous harvest to plant the following season. If necessary, they source or exchange seed through their social networks or buy it on the local market. The formal seed system represents certified/commercial seed production and marketing, usually by seed companies, and includes the importation of parental lines under the supervision of DoA. This seed is sold to farming households through, for example, agro-dealers, seed companies, government agencies and non-



Figure 3: Traditional knowhow on postharvest management of seeds
Source: Dilmah conservation

governmental organizations (NGOs). Production of hybrids, maintain parental lines, by agricultural research institutes and the private sector to develop new, improved varieties. This process can take 5-15 years, depending on the 5 crop. These new varieties bred from germplasm brought in from outside a country or from local landraces of crop varieties preferred by farmers.

Our approach is to design certified seed production clusters based on primary production, enabling environment, market, and stakeholder and structure feasibility.

Maize seeds production for Maha season.

1. Introduction:

The purpose of this project is to grow maize in Kandaketiya in Badulla District under Agriculture Sector Modernization Project (ASMP) to fulfil the pure line seed requirement of the Department of Agriculture (DOA). The selection of maize as a suitable crop for the above districts is based on several agronomic factors including drought tolerance, low requirement of water, optimum climatic conditions for post-harvesting operations, and low incidence of pests and diseases. The most important factor, however, is farmers' willingness to grow maize in their homesteads and the experience gained over several generations. The area under this sub-project is 125 acres scattered in Karachi, Vavuniya North, and Kandaketiya. The number of farmers is also 125 who are willing to participate in this project. Though the requirement of water for Maize is very limited, the area under Mahaweli (e.g., Kandaketiya) could provide supplementary irrigation under extreme drought conditions.

1. a. Maize Cultivation Dry Zone

Maize it is mainly cultivated for animal feed. However, young cobs also have a good market in many parts of the Island. Maize is a four-month crop which requires about 0.3 Acre-feet water and survives on very low levels of supplementary fertilizer dosage. Maize grows in wide variety of soil types but the predominant soil type is well-drained RBC. DOA has recommended maize cultivation in LHG, grumusol, reddish yellow latosols, and regosols, RB latasolic, Immature brown soils. Army Worm had been a threat for the crop in other parts of Sri Lanka but the selected areas had never been threatened by armyworm.

1. b. Pure-line seed production

This project is about the production of pure-line maize seeds to fulfil the DOA annual requirement. It is anticipated to produce 229,375Kg of maize seeds from these 125 acres which may fulfil the part of DOA requirement.

The process of making the first pure line crop

- I. Infuse enthusiasm of the farmers by making them understand the responsibility entrusted with pure line seed production does not confine only to agronomic practices. The key in this process is the farmer with devotion and commitment. To make the farmer committed needs to infuse enthusiasm about his selection to be a pure seed producer. This needs some psychological counselling to promote him as an elated one among the community.
- II. Feed him with new information and technology on pure line seed producing.

Next, the farmer must be provided with new technology and the pollination process of maize. The pollens get matured after three weeks of flowering and the stigma is susceptible for mature pollens from the same flower. This period is critical to get pure seeds. Therefore, all measures have to be taken to avoid cross-pollinations with other types of Maize plants (outside pure line plants).

Among these measures:

- a. Planting other types of maize three weeks after the planting of pure line seeds
- b. Allowing cross-pollination between male and female flowers of pure line
- c. Emasculate the male portions of female flowers of pure line maize three weeks before the fertilization and do artificial pollination.
- iii. Setting up natural or artificial barriers to prevent cross-pollination between non-pure-lines

How do we select suitable areas and farmers?

Here we have to follow the published data by DOA and collect the data as follows.

Area selection:

- a. Agro ecological data.
- b. Rain fall pattern.
- c. Soil types of the area.
- d. Relative Humidity.

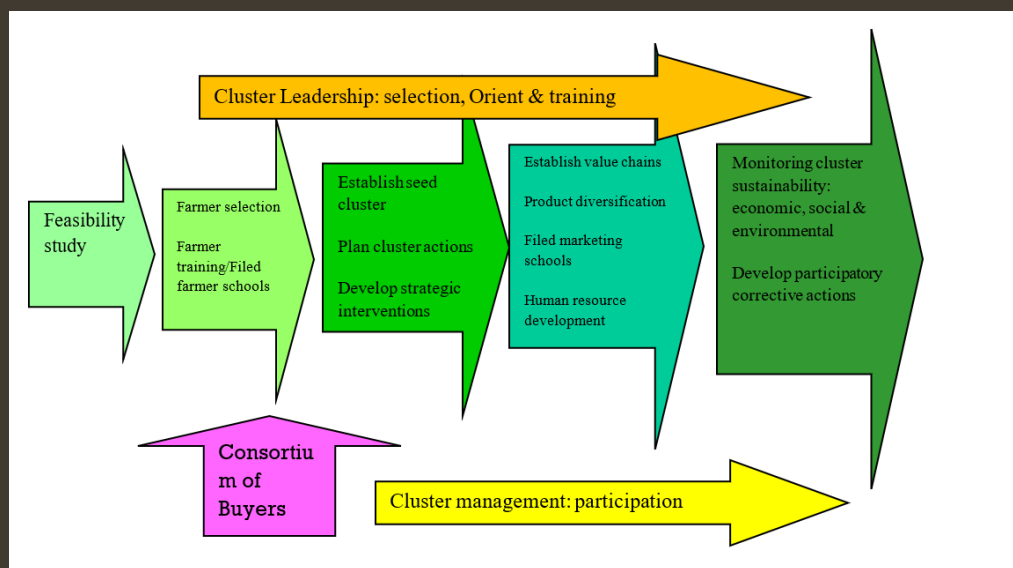


Figure 4: Participatory seed cluster development program for smallholder farmers

- e. Water availability.
- f. Land availability.

Farmer selection:

Here we have to have formal and informal discussions with relevant officers (ADAs, AOs, Dos, AIs, Krupanisas) and farmers.

- a. Willingness of farmers.
- b. Capability of farmers.
- c. Education level of farmers.
- d. Financial and labour capacity of farmers.

After completing the selection Farmer Companies will be established and implementation will be started as follows.

- a. Analysing soil samples.
- b. Prepare fertilizer recommendations.
- c. Trainings and exposure visits.
- d. Methodically monitor the whole process until finish the crop as well as the season.

Maize is a very important cereal crop cultivated in many districts in Sri Lanka. Due to its high yield potential and variety of uses, it has become popular among farmers. It has further gained its popularity due to availability of hybrid seeds which produce higher yield than other cereals. Maize occupy around 6% of cereal cropped area in Sri Lanka. As a result of hybrid maize varieties, the total area under maize has increased by 73% while its production has increased by 258%. Maize is considered to be one of the most important inputs in poultry industry in Sri Lanka while it is used

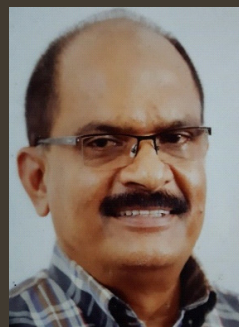
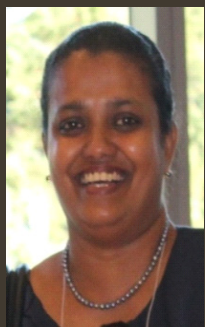
for producing food items such as Samaphosha and Thriposha. Boiled popcorn and fried popcorn also have been popular among Sri Lankans. Sri Lanka requires about 500000 - 600000 Metric Tons (MT) of maize per year.

Maize seed requirement of Sri Lanka is largely fulfilled by the imports. Apart from seed imports, maize and related products are also imported to Sri Lanka. Approximately, 98 to 99 percent of the hybrid maize seeds widely used by farmers for cultivation are imported. Although the Department of Agriculture (DoA) has already developed four local hybrids of which characters and yield parameters are comparable with imported hybrids, the use of local hybrid seeds among farmers are low as a result of the non-availability of local hybrid seed materials in required quantities in the local markets. The yield of local hybrid varieties is in par with those of imported varieties and average yield is around 5.5-6.5 metric tons per hectare. And the potential yield has been estimated to be 7.5-8.5 metric tons per hectare. Those hybrid varieties have been named as MI (III), MI (IV) and MI (V). In 2020, Sri Lanka has imported more than 1600 metric tons of maize seeds. Therefore, country like Sri Lanka should now turn to import substitution and save the foreign exchange. In this process, local hybrid seed production has important implications towards Sri Lankan economy.

If hybrid maize seed production is to be implemented in districts such as Badulla, Vavuniya and Ampara, the implementation must be financially feasible and economically viable. As it has created to a high

demand for local hybrid seed especially as a result of the price escalations due to exchange fluctuations, the production of hybrid seed must generate economic profits to the farmer and continuous supply of seed should be assured. Otherwise, the whole effort of hybrid seed production will be to no purpose. Therefore, assessing the financial feasibility is crucial as the ASMP intends to invest on the seed production by providing capital requirements. Hence a financial analysis was done to check the feasibility of hybrid maize seeds production and results show that maize hybrid seed production is financially feasible in farmers' perspective and market perspective. As the economic returns are higher and the future maintenance of the seed production is planned to be conducted through the Public Unlisted Farmer Company, their ability for direct marketing of the seeds should be strengthened as the gains from direct marketing is higher. Farmers' perception on local quality hybrid seeds should be improved.

Assuring a seed market will cater to the long term sustainability of the Public Unlisted Company. Training on how to market their product through Urban Marketing Centers should be given to the farmers. Having a fixed buyer will not always serve the purpose as they again will depend on the middlemen whereby they reduce their share in total benefits. The farmers may have to be trained on costing, innovative marketing, financial management, use of IT and online platform. They should also be trained to manage their own data as those data will assist them in future planning and identifying their failures and successes. Providing subsidies and other machineries will initially assist them in establishing their business. However, proper monitoring is essential once they start to produce and market their product.



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The Hidden Meaning of Fruit and Vegetable Sticker

For the watchful consumer, reading food labels is simply a matter of habit. Consumers can select the best products from the market by checking the labels on certain products. However, when it comes to purchasing fruits and vegetables, we may face some difficulty in order to find the best ones. We have noticed a small sticker with numbers on the skin of fruits including oranges, bananas, and apples. Most Sri Lankans believe that the sticker is applied to close the mark on the fruit, resulting from the injection an artificial preservative inside the fruit. You may be surprised by what that produce sticker reveals.

These stickers provide useful information to consumers and can tell them if the fruit has been genetically modified. The sticker informs whether the fruit was cultivated organically or conventionally. The numbers on the sticker are called a PLU code.

What is a PLU (Price Look - Up) code?

PLU codes are 4- or 5-digit numbers and appear on a small sticker applied to the individual piece of fresh produce. The codes are assigned by the International Federation for Produce Standards (IFPS), which comprises produce associations across the world. However, this coding system is voluntary and has not been made mandatory by any governing body.





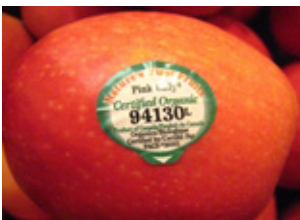
The logic of four-digit code

- ★ If there are only four numbers in the PLU, starting with '3' and '4', it means that the produce was grown conventionally or 'traditionally' with the use of pesticides. i.e. 3000-4999. Conventionally grown is an agriculture term referring to farming systems that include the use of synthetic chemical fertilizers, pesticides, herbicides, and other continual inputs and even genetically modified organisms (GMOs). Although the method sounds reassuring, it does not mean the food is free of chemicals or GMOs.
- ★ If there are five numbers in the PLU code, and the number starts with '8', it tells us that the item is a genetically modified fruit or vegetable.
- ★ If there are five numbers in the PLU code, and the number starts with '9', it means the produce was grown organically and is not genetically modified.

Organic



**Five Digit code
Starting with '9'**



Genetically Modified



**Five Digit code
Starting with '8'**



Conventionally Grown



**Four Digit code,
Starting with '3' and '4'**





Agrovoltatics, an Emerging Agro-Technology Which Can Save Sri Lanka from this Electricity Shortage

The world population is expected to grow by 1.2 billion people within 15 years, coupled with a growing demand for meat, eggs, and dairy, which soak up over 70% of freshwater for crops, plus electricity demand that's growing even faster than the population growth. We all are facing power outages these days.

What are we supposed to do about all that? Well, we combine two of my favorite things, technology, and food, both of which I have been accused of having too much of. However, could combining solar panels and farming be a viable solution to all of those problems?

This paper takes a closer look at (a) electrifying our crops, not literally electrifying our crops; (b) adding solar to our farmland, as well as some of the side benefits and challenges that it creates.

The problem with solar panels is that they need a lot of space to generate a significant amount of electricity. Agrovoltatics, or APV for short, combines agriculture with electricity generation by farming under a canopy of solar panels, and there are some really interesting recent examples that make a compelling case for it. However, first understanding the challenges around solar farms in general and some of the solutions that have been developed will throw light upon matters.



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The major problem with this type of solar installation is that the ground beneath the panels cannot be used mainly due to the small amount of space between the rows of panels, too small for modern farming equipment to pass through.

Now, it is possible to convert a typical solar park into a dual land use when it is designated as a living area for grazing by small livestock like chickens, miscellaneous birds, and goats, as well as for beekeeping. These animals are beneficial to solar farms because they reduce the cost of maintaining vegetation growth, without any harm to the panels. The same cannot be said of something a bit larger, like pigs, goats, horses or cattle. Cattle hate solar panels, and when more space is allowed between the solar panel rows, crops can be grown there. However, the space beneath the panels still is unusable and needs to be maintained.

This is considered alternating land use instead of dual land use because there are areas of the land that are one or the other, not both solar and crops at the same time. The land between the rows will be shaded during some hours of the day, meaning you are altering the characteristics of the land and the types of crops that can be grown there. Thus, what if we started to go vertical with our solar panels? That is where we start to get some interesting alternatives to standard ground-mounted solar park-style installations. Using vertically mounted bifacial modules allows for more irritable land.

There are bifacial solar panels that can collect solar energy from both sides of the panel. This type of installation would work well, particularly in areas suffering from wind erosion, since structures reduce the wind speeds, which can help protect the land and the crops are grown there. The bifacial panels can also generate more power per square meter than traditional single-faced panels and do not require any moving parts. Then, there is also the option of mounting panels on stilts, which allows farming machinery to pass underneath. In this design, a certain clearance has to be maintained between the rows to protect the stilts from the machinery, so there is still a modest arable land surface loss, which is usually about 3% to 10%.

Many variations on this theme are currently under active research, and instead of fixed panel mounting, panels can be mounted with movable sections. It allows the panels to tilt in one or two directions, which allows for both solar energy and plant growth optimization. This can be very important for some crops during the initial stages of growth. Although some may think that growing crops under the elevated panels solar panels would cast shade on plants harming them, the way photosynthesis works make things rather interesting. Plants grow their mass out of CO_2 with the help of sunlight.

They literally grow from the air, but not all available sunlight can be converted into biomass. After a certain threshold, which is called 'the light saturation point,' plants can't absorb any more energy, so they need to get rid of that excess energy by evaporating water.

According to a report from the German Fraunhofer Institute for Solar Energy, nearly all crops can be cultivated under solar panels, but there may be



some yield loss during the less sunny seasons for some hungry plants. The big successes have been mainly done with shade-tolerant crops like lettuce, spinach, potatoes, and tomatoes which lead us to some of the super promising examples that make a compelling case for agrovoltaics.

A major difference between the Agrovoltaic fields and the other fields is the temperature was several degrees cooler under the solar panels. Not only is it more pleasant for the farmworkers, but it also reduces the amount of irrigation water by 50% compared to other fields. Even cooler is how the crops affect the solar panels. The crops and their limited water evaporation actually keep the panels cool. Solar panels actually do not like the heat since it reduces their energy efficiency. The cooler a panel, the more energy it will provide.

If we were to convert even a fraction of our current agricultural land into a solar field, a large portion of our energy needs could be met pretty easily. Also, with these added benefits and reduced water consumption, agrivoltaics could be a game-changer in hot and narrowed regions of the world. Thus, what is keeping us from rolling out this dual-purpose game-changing system at a massive scale? What's the catch? There's always a catch.

Energy production is a different game from agriculture, which can slow down farmers from embracing the technology

Not all renewable energy solutions are receiving a warm reception. The best example is obviously the sight and sounds of giant wind turbines. We have seen them all around our country. Also in agriculture, there are examples where current laws enabled the building giant biogas plants that were not always welcome by the local community. No matter what the reason behind the community is, the government is shy about pushing them forward.

Therefore, in order to prevent communities from turning against agrovoltaics, it is important to educate them about this. The researchers recommend that agrovoltaics should be deployed mainly where synergistic effects can be achieved, for instance by reducing the water demand for crop production. Also, it can be helpful to maintain proper local support. Agrovoltaic systems should be preferably operated by local farms, energy cooperatives or regional investors. With these guidelines in mind, community resistance

against agrovoltaics can be kept to a minimum.

For our country, this is the most crucial time to introduce this kind of innovative technology.

The scarcity of fossil fuels and low water retention in our reservoirs affected badly for electricity consumption of our country. We are facing very long power cuts and the whole country put on a halt for the development. I think this is the best time to start and get benefit from agrovoltaics as a forwarding country.





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Experience the Beauty of the Desert in Your Home Garden

WHAT ARE SUCCULENT AND CACTUS?

Succulents are plants that have thickened, fleshy and engorged plant parts that can retain water in arid climates. The term, “Succulent” is derived from a Latin word meaning “juice” or “sap”. Succulents store water in their plant parts such as leaves, stems, and roots. These plants are hardy plants adapted to survive under dry climate conditions. Therefore, these types of plants are known as “xerophytes”.

Cactus (plural-cacti) is a member of the plant family, Cactaceae. These cacti are of a wide range of shapes and sizes. Cacti also have several adaptations for conserving water. Cacti and succulents are from different plant families. However, in-home gardening, these plants are generally termed together as a Cactus and Succulents.

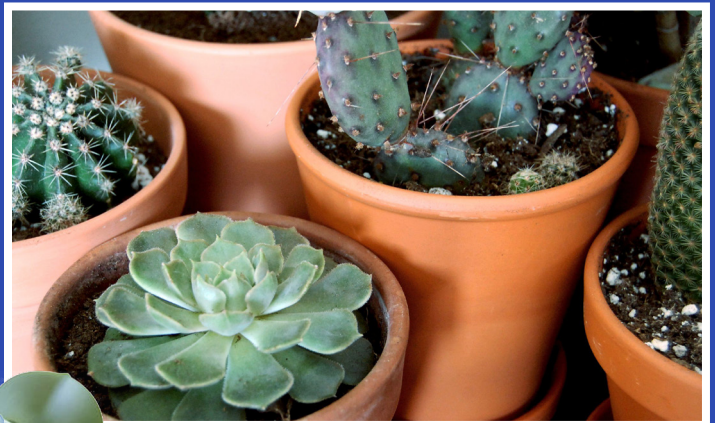
Succulent and cactus farming are great for bringing the beauty of the desert to home as a new art of indoor cultivation, a modern style of home and institution decoration, a new trend of gift-giving, and a hobby that brings mental satisfaction.



All Cacti are Succulents. But not all Succulents are Cacti.

When considering the differences between the physical features of these plants, cacti are identified from their needle-like spines. They have fleshy stems which can store water and perform photosynthesis, but succulents majorly store water in their leaves; one other major difference is cactus have small white bumps on their surface called “areoles” whereas succulents do not have areoles.

Flowers of cacti are brighter, larger in size, and have complex structures as compared with flowers of succulents. But succulent flowers are simple and small in size. Another different characteristic is both cactus and succulents have flowers, but only cacti bear fruits. Also, cacti can propagate by seeds and offsets, but succulents most often propagate from stem or leaf cuttings



HOW TO CARE FOR CACTI AND SUCCULENTS

The native habitat for most succulent and cacti is the desert. Therefore, optimum growth can be expected in bright light, good drainage, high temperature, and low moisture conditions.



Light

Keep in a bright place but not in direct sunlight



Compost-

Use a well-draining potting mixture; for Cactus and Succulent potting mixture can be used



Watering-

they do not need much water, but depend on the variety

In the growing season, plants should be watered at least once a week



Fertilizer-

10:10:10 N.P.K fertilizer mixture can be used for manuring the plants once a year; it is done just before the growing season or at the very beginning.



BENEFITS OF GROWING SUCCULENT AND CACTUS

- These plants can purify the air. They can have the ability to produce O₂ even at night and also remove toxins like Formaldehyde, Xylene, and Toluene away from the air.
- Not only that a number of studies have proved that these plants improve concentration, attentiveness, and brain capabilities when studying or working with plants.
- Furthermore, having a cactus at home and caring for it can be therapeutic for those who have endured some type of trauma.
- These plants can help reduce blood pressure and recover stress.
- According to some evidences, these plants placed in hospital rooms have been shown to help patients heal faster due to their soothing effects and stress-reducing properties.
- In this hyperactive generation, succulents have proven to be a cool gift. They have benefits which other plants don't. Apart from having numerous benefits gifting a succulent will add a personal touch to the gift. It will show that you care for the person. Also, gifting a succulent will ensure that your gift is not lost or exchanged or left unattended.

CACTUS AND SUCCULENT FARMING AS A PROFITABLE BUSINESS

Nowadays, cactus farming is becoming a profitable agricultural enterprises in the field of agricultural sector. Compared to other farming systems, caring requirements for these plants and production cost are very low. However, output is very profitable, and nowadays, there is a high demand for cacti and succulents in both local and foreign markets.

Also these plants are xerophytes and can tolerate hard environmental conditions; they have the ability to grow under water deficit conditions. Land requirement and fertilizer requirement are low and most plants are disease and pest free. By using propagation methods, one single plant has the ability to produce many plants and there is great diversity among the plants. Therefore, there is a high potential to start a successful business through cactus and succulent farming.

Further, maintenance is very easy and commercial cactus farming can be a good business idea and good employment source for unemployed educated youths. Even at a time of economic crises, cactus and succulent farming is important since it is a low cost, high income enterprise targeting the local and foreign market.

Role of Underutilised Crops in the Climate Change Era



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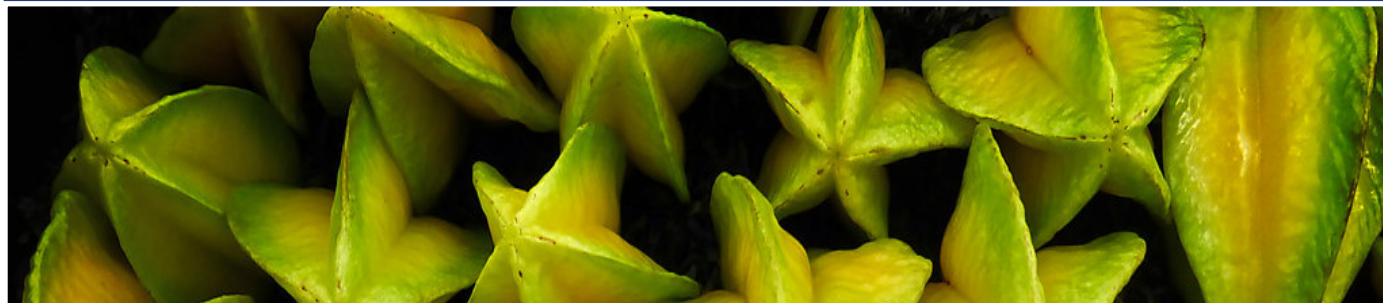
Due to the changes in climate and associated issues after the last ice age (around 10,000 years ago), our forefathers started growing food instead of hunting and collecting them. Since then, different crops and cropping systems shaped human civilisations and fulfilled the nutrient requirement of people. It has been estimated that approximately 250,000 plant species have been identified and around 30,000 of them are edible. Approximately 7,000 species have been used as food crops. However, around 120 are considered as important crops at national levels while 30 crops fulfil 90% of the global calorie intake (FAO, 1997). Out of them, three major crops (wheat, maize and paddy) provide more than 2/3 of the calorie supply. Several thousand plant species that can contribute to food and nutrition security remain underutilised.

By the year 2037, the world population will be 9 billion. Due to the rapid population growth rate along with climate change and loss of arable lands, the food and nutritional security will be a challenge to most of the countries. Therefore, the use of alternative crop species and cultivars is essential to avoid the over-dependency on three key crops.

Underutilised crops cover a broad range of plant species where their potential was not fully utilised. They also received a lesser research attention compared to other crops (Mohd Nizar et al., 2021). Most of the underutilised crops require low water amount which makes them useful in arid and semi-arid environments. They also utilise moisture more efficiently compared to other crops. They are resilient to adverse climate (high temperature/ low rainfall/ extreme events) and soil conditions. Most of these underutilised crops do not demand fertile soil and can yield even in degraded soils (Mabhaudhi et al., 2019). They are rich in antioxidants, anti-cancer agents, vitamins and nutrient content and contain medicinal properties. These underutilised crops exhibit favourable characteristics which make them future crops. Other than the food source, several underutilised crops showed potential to be used as an energy source, biofuel production, construction material and pharmaceutical production.

It was reported that the yields of key crops such as paddy, maize and wheat declined with the increment of the temperature and rainfall reduction. This yield reduction of the key crops under climate change will create a severe food shortage in the future. It was proven that underutilised crops are the best alternative for food and nutritional security and sustainability under climate change.

Out of the 17 Sustainable Development Goals (SDGs) of the United Nations, the underutilised crops show the potential to contribute to SDG 1 (no poverty), 2 (zero hunger) and 13 (climate action). With the availability of data (crop, climate, soil), in the recent past, there is a growing demand for underutilised crop research (Mohd Nizar et al., 2021). In order to popularise these neglected and underutilised crops, detailed studies on agronomy, product development, marketing and breeding are essential.



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Speed breeding – A Novel Breeding Technique for Smart Agriculture

Plant breeding started 10 000 years back, with the beginning of the agriculture. Firstly, it started with plant domestication, where the early ancestors selected wild plants with desirable characteristics and utilized them over generations by multiplying as a seed source for their food production. Over the generations, the favourable traits were accumulated; hence, crop improvement took place unintentionally. Over the years, plant breeding has passed several milestones such as the discovery of Mendel's laws of inheritance, hybridization, the green revolution, genetic engineering, genetically modified crop production, genome editing, shuttle breeding, speed breeding etc. are some of them. Utilizing these different techniques, plant breeders worldwide trying to achieve several objectives such as, increasing the potential crop yield, enhancing the nutritional value, extending the shelf life, producing plants to tolerate biotic and abiotic stresses, bio-fortification and many more. In a new cultivar production process, plant breeders first identify potential parental lines and cross them. The offspring selection would be carried out for at least 6-7 generations to select an elite cultivar which has the higher genetic gain of the favorable trait. Therefore, a conventional breeding program may take longer generation time, minimum of 8-10 years to develop an elite cultivar, which is a significant bottleneck in the breeding process.



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It has been estimated that world population will be over 9 billion by 2050; hence, the food demand will increase accordingly. Climate change and global warming may also affect continuous crop production. Therefore, plant breeders put effort into expediting the breeding process to address these challenges. The speed breeding concept was such an innovative method that has been introduced to the world by the scientists from the University of Queensland of Australia, a team led by Dr. Lee Hickey, that was inspired by the extra-terrestrial experiments done by NASA, USA to cultivate wheat in space.



Speed breeding process accelerates plant growth rate, giving rise to more generations per year. It is a novel plant breeding approach that expedites the plant breeding process. The technology was earlier utilized for the research projects extensively. However, now it has been adopted by the industries as well. Speed breeding could be incorporated as a platform for all crop breeding activities such as marker-assisted selection, gene editing, wide genome selection and gene expression studies, hence researchers would be able to improve new cultivars in no time.

Requirements for Speed Breeding

The major principle behind speed breeding is to provide extended light durations (long daylight) under controlled environmental conditions to accelerate the breeding cycle of the targeted crop. The photo-insensitive crops are ideal for improving with speed breeding techniques. This induces early reproduction, shortening the plant's life cycle. The researchers have proven that a fully matured wheat plant population could be obtained within 8 weeks of time by providing an extended photoperiod of 22 hours followed by 2 hours of dark period under controlled environmental conditions. With this technique, six wheat generations per year can be obtained. In addition to that, recent research reports suggested that bread wheat, durum wheat, barley, pea and

chickpea would give rise to six generations per year and four generations per year for canola.

Different plant breeders use different structures to provide extended light regimes; for instance, they use either light-emitting diode (LED), metal halide lighting or both of them. Listed below are the preliminary requirements to establish a speed breeding setup.

- Light - light source which produces Photosynthetic Active (PAR) region (400-700 nm), that extends up to 22 hours duration and 2 hours of dark period
- Temperature: 22 degree Celsius of day temperature with 17 degree Celsius of night temperature
- Humidity: 60-70% humidity
- There are three different method of speed breeding
- Speed Breeding I – controlled environment chamber conditions
- Speed Breeding II – glasshouse conditions
- Speed Breeding III- low-cost homemade growth room design

Generally, different crop responds to different growing environments; hence it is necessary to design and develop crop-specific standard speed breeding protocol for each.

Applications in Plant Breeding

Integrating speed breeding in different breeding approaches will accelerate the generation time. It can be integrated to techniques such as single seed



descent method, embryo rescue, genome editing, marker-assisted selection and processes such as checking the cultivar purity, checking the heterosis and checking the induced mutations. Speed breeding has been integrated throughout these years along with the other modern breeding techniques, for the crop improvement programs. Listed below are some of those achievements

- To accelerate crop bio-fortification , increasing the level of Vitamin B9 in rice
- To remove saponin from quinoa (*Chenopodium quinoa*), remove glucosinolate from Brassica spp. and neutralize toxin from *Lathyrus sativus* for safe consumption
- Development of disease resistance and scoring of wheat leaf rust
- Development of new wheat variety named DS Faraday to tolerate pre-harvest sprouting with higher protein content.
- Development of disease resistant scarlet barley cultivar incorporating modified back crossing.
- Development of a salt resistant rice variety , YNU31-2-4

This technology has dramatically shortened the generation time facilitating plant breeders and researches to conduct extensive studies on plant-pathogen interactions, plant anatomy and flowering time etc., repeatedly.

Every coin has two sides, so speed breeding comes

with its drawbacks. It cannot be applied to the photosensitive crops like soybean, to speed up the breeding cycles. Other than that it requires higher initial investments to establish and maintain special environmental conditions.

So far speed breeding has been a success for most of the cereal crops. Continuous researches must be conducted to develop speed breeding protocols for horticultural and fruit crops. As it reduces the generation time, evaluation and selection of hybrids can expedite, allowing rapid production of new cultivars. Further studies on speed breeding, protocol development may facilitate plant scientists to study the physiology of plants as well as to increase the future crop production.

Climate Change and Occurrence of Extreme Climate Events



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Climate is the average weather in a given area over a longer period of time. A description of a climate includes information on the average temperature in different seasons, rainfall, sunshine, relative humidity, and wind. Climate change refers to any systematic change in the long-term statistics of climate variables such as temperature, precipitation, pressure, or wind sustained over several decades or longer. It can be due to natural external forces (changes in solar emission or changes in the earth's orbit, natural internal processes of the climate system) or it can be human-induced.

Climate change has become the global issue with long term inevitable changes for at least a period of 30 years and it has become the most discussed topic nowadays.

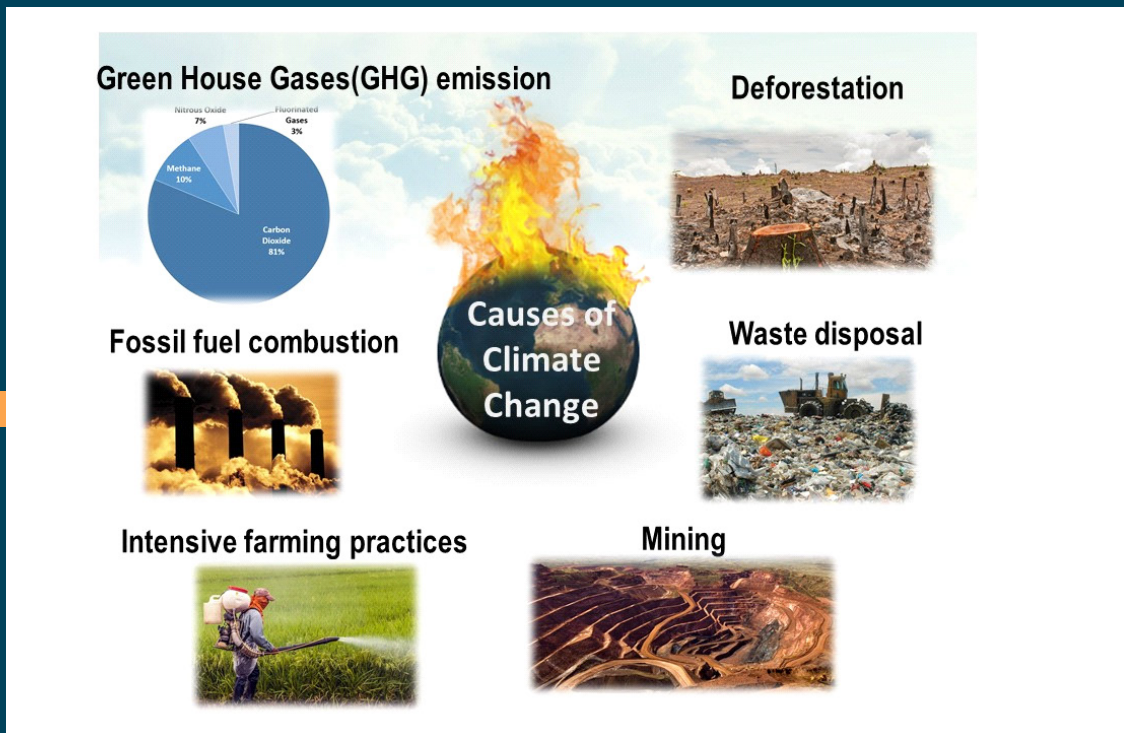
The most eminent threat posed to mankind due to the man-made causes of the natural ecosystems and in turn to human civilization can also be identified as climate change. The world is paying more and increasing attention, especially to the current trend

of the relatively higher warm condition during the days and nights of the 21st century and the change of the regular rain cycles and change of seasons throughout the year.

Causes of the climate change

There are different causes which drive climate to change and those can be categorized as natural causes and man-made ones. However, there is less than 5% probability that the observed climate changes are due to natural climatic variation.

Global warming is featured mostly due to anthropogenic activities which emit greenhouse gases into the atmosphere. Carbon dioxide (CO₂), Methane (CH₄), Nitrous oxide (N₂O), and several halocarbons are the major GHGs that cause global warming by retaining part of outgoing thermal radiation from the earth's surface. Atmospheric concentrations of all these GHGs have increased significantly since the beginning of the industrial revolution around 1750.



Fossil fuel burning also causes to emit gases such as CO₂, CH₄ and some other gases. Most of the world's energy consumption depends on fossil fuels such as oil, coal, and natural gas for 80% of its energy needs. Deforestation has become one of the major sources which increase the CO₂ concentration in the atmosphere. At present, intensive farming is also a major source of climate change. Modernized fertilizers, equipment, and industrial processes have become a necessary evil with the expansion of the human population causing undeniable destruction to the environment because it is another means of greenhouse-gas emission.

Impact of climate change

Climate change can have both beneficial and adverse impacts on human and natural systems; especially, for livelihoods, health and well-being, ecosystems and species, services, infrastructure, agriculture, economic, social, and cultural assets which are interrelated. Climate change impacts are seen in every aspect of the world we live in. However, climate change impacts are uneven across the country and the world; even within a single community, climate change impacts can differ between neighbourhoods or individuals.

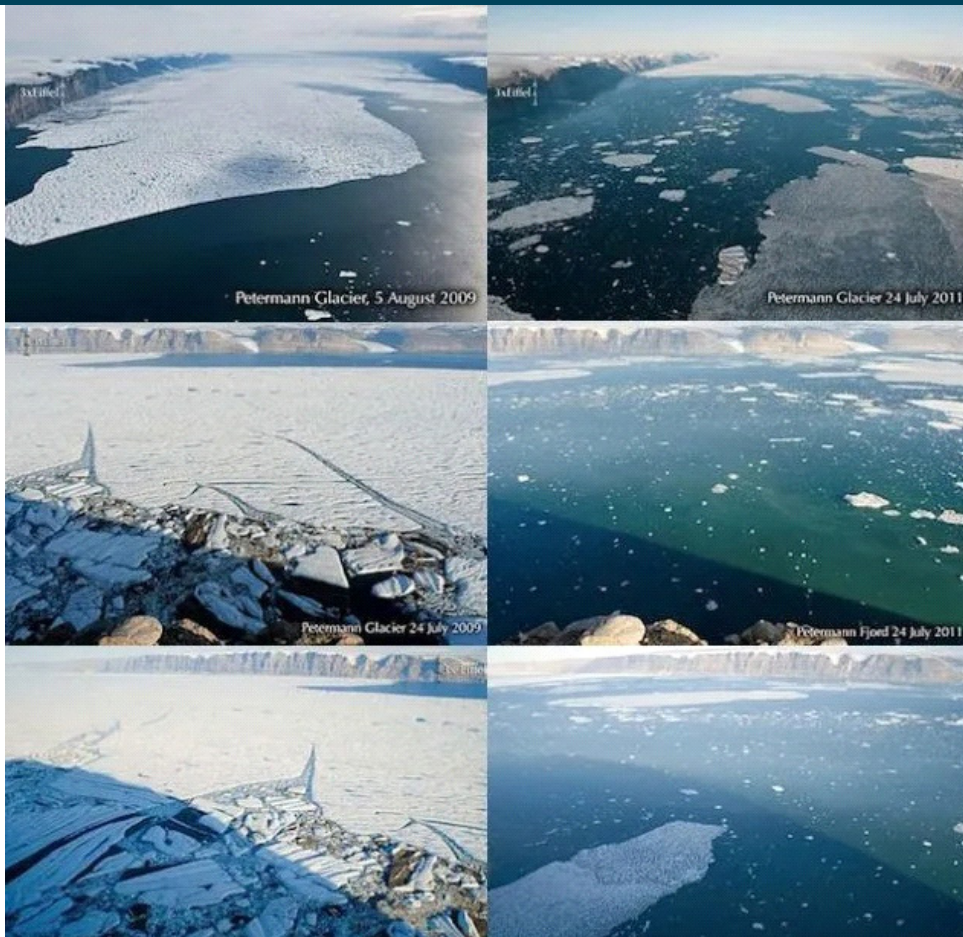
Rising the atmospheric temperature has been identified as a major impact of climate change. Most of the studies done globally have proven it. Changes in temperature may induce the changes in precipitation patterns throughout the world. As temperatures rise and the air becomes warmer, more moisture evaporates from land and water, which in turn, increases the near-surface air temperature and sea surface temperature, through which it alters the precipitation patterns.

Melting glaciers has become the worst impact of the climate change. Glaciers melt because of the changes in temperature, precipitation, and incoming solar radiation. As a result of the melting of the glaciers and changes in temperature patterns, the sea level may rise. It may cause on shrinking of the lands reducing the availability of the lands.

Snow melts, ice jams along the rivers and the most common phenomenon heavy rains are the causes of flooding. Some regions of the world are experiencing frequent and prolonged droughts as a result of changes in the climate. Droughts, which are events of the prolonged shortage of water above ground or underground, may be for a shorter period or as long as 3-4 years with dryness. Drought is largely the result of precipitation deficits, often exacerbated by high temperatures and low humidity that favours enhanced evapotranspiration.

A period of excessively hot weather accompanied by humidity mostly in oceanic climate countries is known as heatwaves. Extreme heat and heatwaves were recorded in many parts of the world during the period 2015–2019. Heatwaves have a particularly high impact on human health and are challenging with the rising of humidity in the atmospheric conditions as the days are getting hotter with fewer cold nights.

A tropical cyclone is also a result of climate change which occurs as a rapidly rotating system of the storm because of low-level pressure conditions in the atmosphere.



Ocean acidification is an ongoing process of decrease in the pH of oceans due to increasing atmospheric CO₂ concentrations. As CO₂ reacts with seawater it decreases its pH increasing the acidity of the ocean. The combined changes affect marine life, lessening the potential for growth and reproduction.

Wildfire is also a scenario that occurs as a result of a typical reaction to warmer/hotter conditions on the earth's surface. Excessive dryness helps as a catalyst for mass widespread destruction.

Anthropogenic climate change impacts almost all the species in the current world threatening their survival, posing a great threat to global biodiversity. Over the next 100 years, it may be inevitable to prevent the extinction of certain species and block the consequences. Furthermore, climate change may have significant interactions with other anthropogenic impacts such as the loss of habitats.

The entity of all the above-mentioned factors is a threat to human life in numerous ways – just as in illnesses, deaths pandemics and stress and mental trauma from displacement as well as the loss of livelihoods and property. As an example, drought can harm food production and human health. Flooding can lead to disease spread and damage to

ecosystems and infrastructure. Human health issues can increase mortality, impact food availability, and limit worker productivity. Long-standing socioeconomic inequities can make the underserved groups, who often have the highest exposure to hazards and the fewest resources to respond, more vulnerable

Extreme climate events

The occurrence of weather variables beyond the thresholds is known as climate extremes. Such as Tornados, Hurricanes, Cyclones, Blizzard, Dust storms, Flood, Hailstorm, Ice storms, Landslides, Sever droughts etc. To date, climate research has yet to show that any given event was caused solely by global warming. However, over the past decade, research has demonstrated that climate change due to global warming has made many extreme events more likely, more intense, longer-lasting, or larger in scale than they would have been without it. For many of the events that have been studied, global warming has been identified as the primary driver of the event, not just a supporting player. Also, a number of recent studies provide evidence for the occurrence of climate change throughout the globe.

Widespread changes in extreme temperatures have been observed over the last 50 years. Cold days, cold nights,

and frost days have become less frequent, while hot days, hot nights, and heat waves have become more frequent, more challenging both physically as well as scientifically. The amount, intensity, and frequency of heavy precipitation events also exhibited positive trends in most areas around the world.

Climate change and Extreme climate events in Sri Lanka

The Fifth Assessment Report of the Intergovernmental Panel of Climate Change stated that increasing trends in annual mean temperature in East and South Asia have been observed during the 20th century. Also, precipitation trends, including extremes, are characterized by strong variability, with both increasing and decreasing trends observed in different parts and seasons of Asia. As a result of changing climate, Asian countries are highly vulnerable to extreme climate events. A recent study demonstrated a declining trend in annual counts of days with heavy rainfall in Southern India and Sri Lanka based on different definitions of extreme events. Over the past few years, Sri Lanka has witnessed numerous extreme weather events, causing catastrophic floods, and droughts and some studies have revealed that the unbearable temperature rises are so noticeable in Sri Lanka. The rate of increasing temperature was more than conclusive evidence of the rate of global warming. Despite the temperature rising, the Sri Lanka National Report on Disaster Risk, Poverty and human development relationship reveals that drought and floods affect up to 4 million people a year in 2009.

By considering all the above findings, it is clear that the climate of Sri Lanka has changed significantly. Therefore, more attention should be paid to the climate extremes as climate changes can increase

the rate of occurrence of extreme climatic events. Identification of those changes is very important for policymakers to decide and adapt to climate change. There are different ways in which we can face climate change. Among them, adapting and minimizing the impacts of climate change is very important.

Adapting and minimizing the impacts of climate change

Since the projections of a climate change impacting the future are not inevitable, paying attention to adaptive measures is very important. Climate change adaptation refers to actions that reduce the negative impact of climate change while taking advantage of potential new opportunities. It involves adjusting policies and actions because of the observed or expected changes in climate. Adaptation can be reactive (occurring in response to climate impacts) or anticipatory (occurring before impacts of climate change). In most circumstances, anticipatory adaptations will result in lower long-term costs and be more effective than reactive adaptations. When defeating climate change, neither adaptation nor mitigation actions alone can prevent significant climate change impacts; taken together, they can significantly reduce risks mitigation is necessary to reduce the rate and magnitude of climate change, while adaptation is essential to reduce the damages from climate change that cannot be avoided.

Many of the problems and solutions are known to us now, and the ongoing research continues to provide new ones. Experts believe there is still time to avoid the most negative outcomes by limiting warming and reducing emissions to zero as quickly as possible. Additionally, lowering emissions will lessen harmful impacts on human health, saving countless lives and billions of dollars in health-related expenses.



Possessing nature gifted resources around us as food ingredients, why don't we use them?



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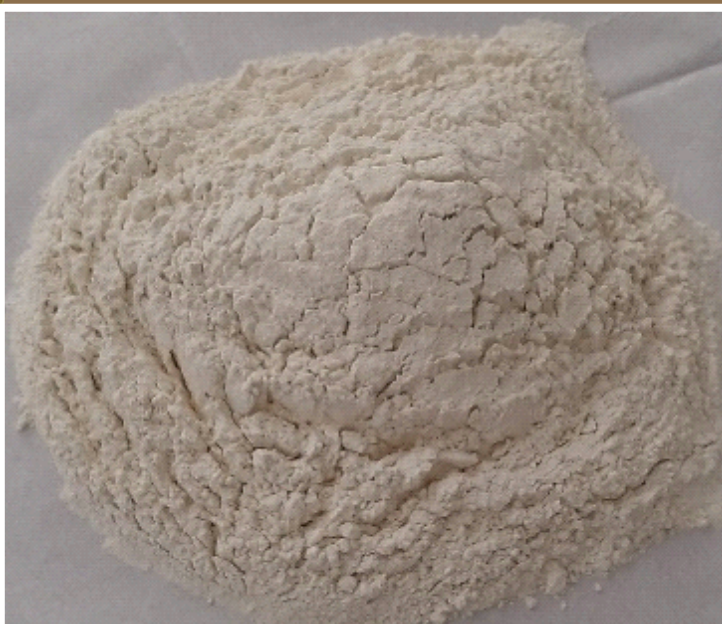
Jackfruit (*Artocarpus heterophyllus L.*), locally known as 'Kos,' is a tropical fruit plant abundantly found in South-East Asia including Sri Lanka. It is considered the largest tree-borne fruit. It is a multiple fruit having edible bulbs and seeds surrounded by the rind. It is composed of hundreds of berries and rich in carbohydrates, complex B vitamins, minerals and phytonutrients. It is used as a human food in different stages of its maturity. Jackfruit cultivars are of two types as 'Wela' and 'Waraka' depending on the soft and firm texture of the ripen fruit respectively.

Jackfruit seeds represent about 10 – 15% of the whole fruit. The seeds are rich sources of starch and proteins. During the jackfruit seasons, a colossal number of seeds are produced. Though, Jackfruit seeds are readily available potential local food source, pounded into flour; mostly the seeds are discarded, except sometimes they are boiled or roasted for consumption. Spotting this situation, this article reveals the potential use of jackfruit seed flour in formulating flour confectionery products with reference to biscuits.

Biscuits are one of the most popularly consumed flour confectionery items in the world due to their appealing properties such as ready-to-eat nature, affordable cost, good nutritional quality, availability in different flavors and textures and the comparatively longer shelf-life. Thereupon an initiative was taken to consider the potential of using jackfruit seed flour as a raw material in the preparation of biscuits. Though the customary ingredient of biscuits is wheat flour, jackfruit seed flour is successfully used as a substitute for wheat flour in order to formulate a gluten-free (GF) biscuit.

Various GF products have been introduced to the market to aid the celiac disease community. GF goods are growing and the range of products offered to consumers is wider and wider. Although global demand for GF bakery products including biscuits is witnessing a rise day by day, GF biscuits are not exploited at all in Sri Lankan market yet. Hence, jackfruit seed flour biscuits can be introduced as a successful, competitive, GF product that can triumph the market with its great organoleptic properties. Furthermore, with this successful findings, it is worthy to further exploit the potential use of jackfruit seed flour in flour confectionery and bakery industries.

As mentioned, wheat flour is the customary ingredient of biscuits and cookies. Since wheat is not grown in Sri Lanka, we have been importing wheat for flour milling for decades due to the lack of native output. According to Foreign Agricultural Service (FAS) Colombo forecast, Sri Lanka's total wheat consumption within 2021/2022 marketing years starting from July 2021 is 960,000 MT. As of FAS, Sri Lanka is expected to import 1.2 MMT of wheat in the marketing years 2021-2022 from Canada, Russia, the United States, Australia, Pakistan, India and Romania. According to BACI: International trade database at product level 1.85% of 2020-year imports are wheat and 0.038% of imports are wheat flour, and Sri Lanka has spent about 300M US dollars and 6.23M US dollars on importation respectively. Due to a dollar shortage, Sri Lanka is now experiencing inflation and an economic disaster. Reduction of imports and increase of exports are key solutions to thrive in this crisis. The use of jackfruit seed flour as a substitute for wheat flour in biscuit production can succor to reduce wheat imports. Further, this jackfruit seed flour biscuit can be exported as a novel GF product. This aids to generate foreign income out of wasting, readily available jackfruit seeds. Thus, having been surrounded by nature-gifted resources as food ingredients, why don't we use them?



Lead by:

Sri Lanka

United Kingdom

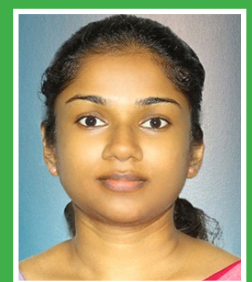
Estonia

Lithuania



Building Resilience in Tropical Agroecosystems (BRITAE), is funded by the European Union and is led by the University of Ruhuna, Sri Lanka with four partner universities in Sri Lanka such as University of Colombo, University of Moratuwa, University of Sri Jayawardhanapura and Sabaragamuwa University of Sri Lanka and four universities in Estonia, Lithuania and the United Kingdom. The aim of the BRITAE project is the development of a joint MSc Degree Program on Building Resilience in Tropical Agro-ecosystems in Sri Lankan universities in order to increase their capacity to continually modernize, enhance the quality and relevance of education of students to global market needs, and to ensure international cooperation in line with the above needs.

The project is engaged in a detailed needs assessment exercise to identify examples of good practices across the research institutes/companies and to specify areas of the capacity building needed at distinct institutions. Further, this project provides a platform for the latest teaching and learning opportunities along with high impact research experiences from EU and UK partner universities. The students will get the opportunity to be part of a field and practical based international master program taught by local, EU and UK teaching staff with exposure to an international and multicultural educational environment. They will get exposure to the European and UK good practices (learning and teaching tools, methodologies and didactic approaches including learning outcomes and ICT-based practices) in Agro-eco system education. It is also expected that activities of the project will support to strengthen the collaboration of local and international partners in terms of capacity building, research and knowledge sharing on agroecosystem education, which will invariably benefit the prospective students. Moreover, the local students, while staying in Sri Lanka, will be able earn a qualification offered by an international consortium of partner universities.



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Artificial Intelligence is Hying Up Aquaculture!

Artificial Intelligence and machine learning are fast becoming essential for everyday activities in an expansive range of industries, one of which is Aquaculture. Aquaculture or aquafarming dates back almost 4000 years, yet is still considered to be a relatively new industry, however, aquaculture has secured its place as the fastest growing food industry in the world. Apart from fish, aquaculture is also the production of shellfish, crustaceans, and seaweeds (which are used in pharmaceuticals as well as food). Consumption of Fish has been part of many cultural traditions across the world due to its taste and high abundance of nutrients.

As common with most industries, aquaculture began with conventional practices and on a much smaller scale than what is found in the present. Worldwide, aquafarmers are now gradually shifting from labor-intensive methods, to mechanised, and then onto Automated farming procedures. This shift in the industry is preparing to adopt smart technology which uses artificial intelligence and advanced data analytics in order to predict and to provide understanding and precision on a considerable amount, if not all, of farm operations. With the always increasing population, and in turn, the rise in demand for protein, the aquaculture industry is growing fast. The industry is led by China, which is the world's top seafood producer, responsible for roughly 15% of the world's wild catch, as well as 60% of the global aquaculture production out of the world's total aquatic product of 66.63 million tonnes (Figure 1). China, US, Russia, Europe, Japan are considered to be the main markets in the industry. The market for aquaculture is forecasted to hit approximately \$87.6 billion by the end of 2025.



Rushmi Rosairo
Uva Wellassa University of Sri Lanka



Figure 1: Breeding Tilapia in artificial ponds. Tilapia lives in fresh and brackish waters; it is one of the most widely grown fish in aquafarms around the world. (Picture Credit: U.S. Soybean Export Council website)

When using conventional practices, feeding, disease control and harvesting all depend mostly on educated guesswork, this often would lead to over/underfeeding and on most occasions, suboptimal harvest and the decline of product quality. This is one of the main reasons why modern technology has become a godsend in aquaculture. From minimising of risks in output to building efficiency to even reducing seafood fraud, artificial intelligence is proving to be rather useful.

Aquaculture has experienced a remarkable hitch in terms of innovation throughout the last five years, with half of the existing software apps, machinery, and other technology used in the industry being launched within said time. These emerging technologies are being researched, developed and validated by many large tech companies, hopefully to become part of daily use in standard operating processes among many commercial aquafarms.

Innovations in the industry has led for new concepts to come into play, concepts which aquaculture has adopted from agriculture, such as; Smart Farming, Precision Farming, and Digital Farming, to name a few.

The employment of technologies such as IoT and AI (artificial intelligence) ensures efficiency, cuts costs and maintains the health of the livestock as well as the quality of water. It tackles issues that intuition and guesswork cannot properly deal with, using artificial intelligence (AI) for decision making helps in predictive analysis and the AI offers improved, data-based decisions and observations. AI is improving aquaculture as you read, by helping farmers to understand the reasoning of how their inputs effect the growth and other aspects of the fish/other aquatic livestock under various conditions.



Figure 2: Advanced sensor technology used in this aquafarm helps reduction of feeding cost by preventing over-feeding. (Picture Credit: Alltech website)

“Across the board, AI ticks all the boxes for a high-growth area for investors right now,” states Nathan Pyne Carter, CEO of Ace Aquatec an award-winning aquaculture technology company. “The reason aquaculture is such a hot space for investors is because they’re seeing how much potential AI has in the field. To ensure aquaculture is growing in an ethically, responsible way, you need intelligent systems to deliver transparency in the supply chain, to monitor water conditions and to ensure you’re not wasting feed or causing stress to your fish. Monitoring all this in a way that’s not labor-intensive on the people side makes sense, and that’s where AI comes in.”

When operating an aquafarm there are some main aspects that come into mind; feeding, quality of water, health of the livestock, and harvesting. Artificial intelligence has proven to be quite valuable when handling said aspects.

Feeding represents the single highest cost to fish farmers, so even minute improvements in daily efficiency in this area means better profitability. AIs consider all variables, not only when, but how much and at what rate to feed. Some decision-making tools claim to save up to 20% of feeding costs by reducing over-feeding.

Feeding regimes are important to the harvest; if fed too little, the livestock loses valuable weight, whereas if they are overfed, resources go to waste, and the chemicals in the pellets tend to pollute the water. Using artificial intelligence, the technology identifies feeding patterns, behavioral changes in the fish during feeding time. By observing the movements of the fish, the AI measures speed, dispersion in the tank/pond using special cameras and sensors, analysing a few hundred fish in a span of a few hours in order to provide highly accurate biomass estimates. It decides when to stop feeding, or to change feeding rates, guaranteeing optimal growth and feeding utilization.

Diseases are the next main cost drivers for aquafarmers. It is also something that AIs can easily tackle, programs can predict disease outbreaks by collecting data and observing the behavioral patterns, early symptoms and changes in the water. The system can then use preventive measures, leading to dramatic reductions in mortality and antibiotic use, and overall improvement in farm management.

Ensuring the health and living environment of the livestock is essential, a drop in the water quality can be catastrophic, luckily, drones with sensors and robots are capable of collecting data such as salinity, pH value of water, oxygen levels, turbidity, pollutants, even the heart rates of the livestock in order to prevent any disruptions due to quality of water. One of the most innovative and user-friendly technologies is SHOAL, a robotic fish which uses AI or Swarm Intelligence (SI) in order to detect underwater pollution by making autonomous decisions. Said robots are capable of navigating the tank/pond while avoiding obstacles, and can also recharge themselves at charging stations.

Even harvesting can be aided with the use of AI. Using conventional practices, the farmers would usually rely mostly on educated guesswork and experience, but with the use of AI, the growth rate of the livestock can be calculated by pinpointing the livestock's historical growth cycle and nutritional regime, this helps farmers



Figure 3: SHOAL robotic fish detects underwater pollution. (Picture Credit: InfoNIAC website)

predict the most profitable harvesting periods. Harvesting is with a minimal risk.

So, you can see how aquaculture has benefited from the shift from conventional methods into using Artificial Intelligence. AI can help reduce the overexploitation of fish and other species, increasing sustainability which is important in this new day and age. Although, the current technology still needs slight human intervention in order to function, it is clear that fully automated aquafarms are still not a reality. However, the possibility of fully automated aquafarms is not out of reach, with the ever-growing technology and fast pace of the industry, automated fish farms are likely to be seen in the near future.



திரு எம். நவீன்
விரிவுரையாளர்
கால்நடை உற்பத்தித்துறை
விவசாய விஞ்ஞான பீடம்

இலங்கை சபரகமுவ பல்கலைக்கழகம்

அந்நியச் செலாவணியை ஈட்டித்தரக்கூடிய அலங்கார மீன்வளர்ப்பு

இலங்கையின் வரலாற்றில் இதுவரையில் நடந்திராத பாரதாரமானதொரு பொருளாதார நெருக்கடிநிலை தற்போது ஏற்பட்டிருக்கிறது. சுதந்திரத்தின் பின்னரான காலப்பகுதியில் பல்வேறு பிரச்சினைகளையும் சவால்களையும் இந்த நாடு எதிர்கொண்டிருந்தாலும் தற்போதைய காலகட்டத்தில் ஏற்பட்டுள்ள பொருளாதார நெருக்கடியானது நாட்டின் பல்வேறு துறைகளையும் பாதித்ததோடு மட்டுமல்லாமல் மக்களின் அன்றாட வாழ்க்கையையும் சவால்மிகுந்ததாக மாற்றிவிட்டது. நாட்டின் ஒட்டுமொத்த பொருளாதாரமும் முன்னெப்போதும் இல்லாதளவிற்கு அதள பாதாளத்திற்குச் சென்றுவிட்டது.

பொருளாதார நெருக்கடிக்கான சுருக்கமான பின்புலம்

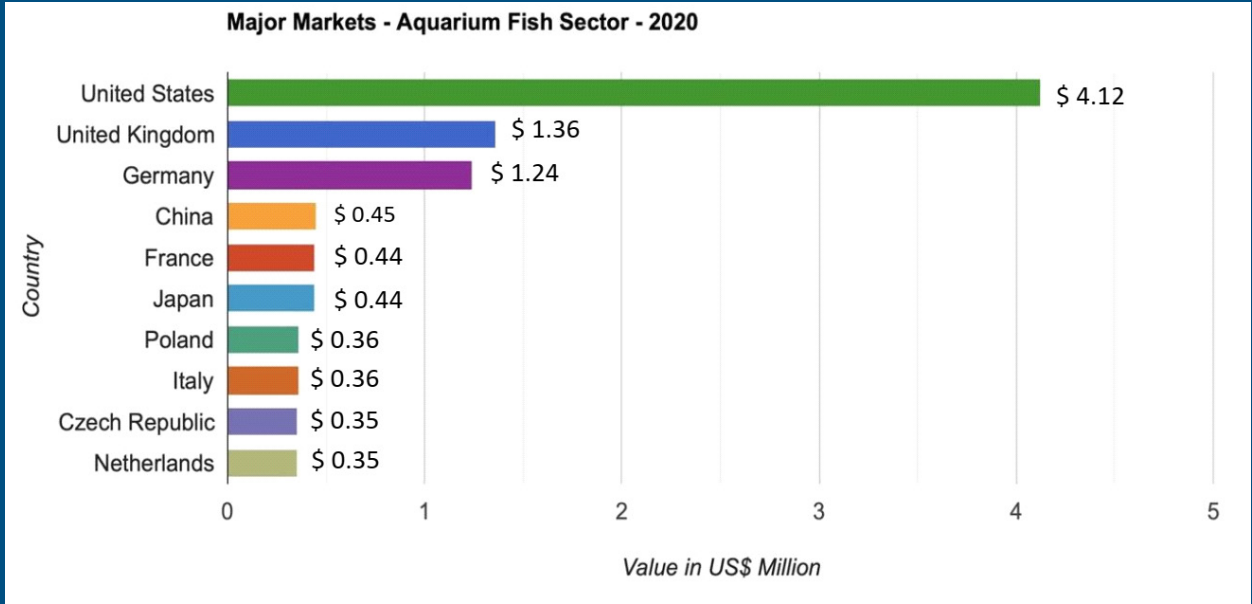
இலங்கையின் பொருளாதாரம் ஒரு மோசமான நிலையினை 2022 ஆம் ஆண்டின் ஆரம்பகாலப்பகுதியில் அடைந்திருந்தாலும், இதற்கான பின்புலம் திடீரென ஏற்படவில்லை என்பதே உண்மை. 2019 ஆம் ஆண்டின் இறுதியில் உலகளவில் பரவத்தொடங்கிய கொவிட்-19 தொற்று நோயின் தாக்கமானது பல நாடுகளின் பொருளாதாரத்தை ஆட்டம் காணச் செய்தது என்றாலும், 2021 ஆம் ஆண்டின் பிற்பகுதியில் பல நாடுகளும் தங்களின் பொருளாதாரத்தினை ஓரளவுக்கேனும் சரிசெய்வதில் வெற்றியடைந்தன என்பதே உண்மை. இதன் பின்னர் ஏற்பட்ட உக்ரைன்-ரீய போரின் தாக்கம் (2022 ஆம் ஆண்டின் முற்பகுதியில்) உலகப் பொருளாதாரத்தின் மீது தாக்கத்தினை ஏற்படுத்தியது. இவ்விரண்டு சம்பவங்களும் சிறிய பொருளாதாரத்தைக் கொண்டிருக்கும் இலங்கையை ஆட்டம் காணச் செய்தது. ஆனாலும், இலங்கையின் பொருளாதார நெருக்கடி மேலே குறிப்பிட்ட சம்பவங்களால் வேகம் பெற்றதே தவிர, வெறுமனே அவற்றால்தான் ஏற்பட்டது என்று கூறமுடியாது. நீண்டகாலம் தொட்டே இலங்கையின் பொருளாதாரம் பலவீனமாகத்தான் இருந்தது. இதற்குப் பல காரணங்கள் உள்ளன.

இலங்கையின் வெளிநாட்டுக் கையிருப்பு (கழசநஓ சநளநசநள) மிக ஆபத்தான அளவிற்குக் குறைந்தமைக்கான காரணங்களில் ஒன்றுதான் ஏற்றுமதித் துறைகளின் மந்தமான வளர்ச்சி. இலங்கையானது நீண்டகாலம் தொட்டே தேயிலை, இறப்பர், தைத்த ஆடை உற்பத்தி மற்றும் உல்லாசப்பயணத்துறை போன்ற துறைகளை நம்பியிருந்தது. இவற்றுக்கு மேலதிகமாக அந்நியச் செலாவணியை ஈட்டித்தரக்கூடிய பல துறைகள் குறிப்பிடத்தக்க வளர்ச்சியை அடையவில்லை என்பதே உண்மை.

அலங்கார மீன்வளர்ப்பிற்குச் சாதகமான நிலை

இலங்கையின் அந்நியச் செலாவணியை ஈட்டித்தரக்கூடிய ஒரு துறையாக அலங்கார மீன்வளர்ப்பைக் கூறலாம். இதற்குப் பல்வேறு காரணங்கள் உள்ளன. அவற்றுள் முக்கியமான காரணிகளாகப் பின்வருவனவற்றைக் கூறலாம்:

- இலங்கை வெப்பவலயத்தில் நிலைகொண்டிருப்பதால் நீர்வாழ் உயிரின வளர்ப்பிற்குத் தேவையான காலநிலை வருடம் முழுவதும் காணப்படுகிறது
- நாலாபுறமும் கடலால் சூழப்பட்ட தீவு என்பதால் கடல்வளம் நிறைந்த நாடு. இதனைப் பயன்படுத்தி உவர்நீர் அலங்கார மீன் வளர்ப்பினை அபிவிருத்தி செய்யலாம்.
- சுமார் 2,905 கி.மீ² பரப்பளவிலான நீர்நிலைகளைக் கொண்டது
- சுமார் 103 ஆற்றுப்பெருநிலங்களைக் கொண்டுள்ளது
- பண்டையகாலம் தொட்டு மனிதனால் உருவாக்கப்பட்ட நீர்த்தேக்கங்கள், குளங்கள் மற்றும் தொட்டிகளைக் கொண்டது
- இலங்கையின் புவியியல்சார் அமைவிடமானது சர்வதேச வர்த்தகத்தில் முக்கியத்துவம் வாய்ந்தது
- இலங்கையில் உற்பத்தி செய்யப்படும் மீனினங்களுக்குச் சர்வதேச சந்தையில் காணப்படும் அதிகரித்த கேள்வி



இலங்கையின் ஏற்றுமதித் துறையில் அலங்கார மீன்வளர்ப்பு கணிசமான பங்களிப்பைச் செலுத்துகிறது. குறிப்பாக மேற்குலக நாடுகளில் அதிக சந்தைவாய்ப்பு இருப்பதைக் காணலாம் (Source: 3rd International Ornamental Fish Trade and Technical Virtual Conference> 2021)

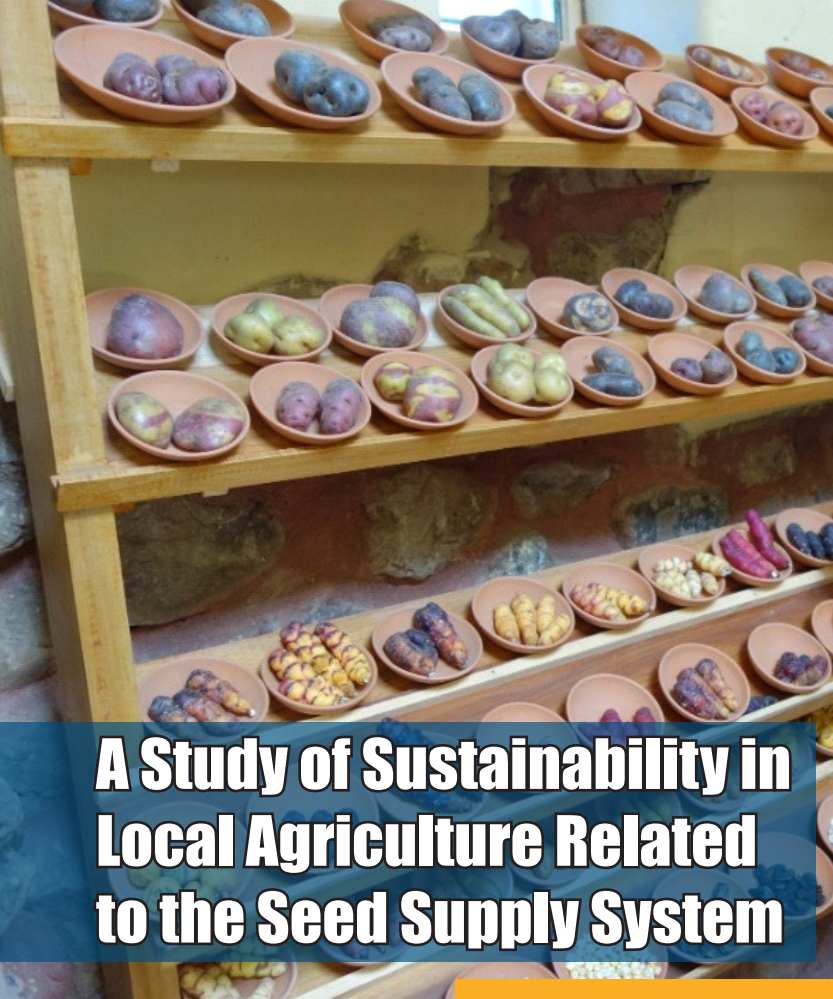
சர்வதேச சந்தைவாய்ப்பினை விஸ்தரிப்பதற்கு மேற்கொள்ளக்கூடிய சில அணுகுமுறைகள் இலங்கையின் அலங்கார மீன்வளர்ப்புத் துறையினை மேலும் விஸ்தரிப்பதற்குப் பல்வேறு வேலைத்திட்டங்களை செயற்படுத்துவது காலத்தின் தேவையாக உள்ளது. அவற்றில் சில பின்வருமாறு:

- ஏற்றுமதி செய்யப்படும் மீனின் வகைகளை அதிகரித்தல்
- புதிய சந்தைக்கேள்வியைக் கொண்டிருக்கக்கூடிய மீனினங்களைக் கண்டறிந்து அவற்றை உற்பத்தி செய்தல்
- புதிய தொழில்நுட்பங்களை அறிமுகம் செய்வதன் மூலம் உற்பத்தியைப் பெருக்குதல்
- சர்வதேச சந்தையில் ஏற்படக்கூடிய புதிய விதிமுறைகளை அறிந்து அவற்றுக்கு ஏற்ற முறையில் உள்நாட்டில் அலங்கார மீன் உற்பத்தியை நடைமுறைப்படுத்தல் (உதாரணமாக மீன் வளர்ப்பில் இரசாயனப் பொருட்களின் பயன்பாட்டினைக் குறைத்தல்)
- கிராமிய மட்டத்தில் அலங்கார மீன்வளர்ப்பை ஊக்குவித்தல்
- அலங்கார மீன்வளர்ப்பு தொடர்பான பயிற்சிகளை மக்களுக்கு வழங்குதல்
- மீன்வளர்ப்புத் துறையை அபிவிருத்தி செய்வதற்குத் தேவையான வெளிநாட்டு முதலீடுகளை ஊக்குவித்தல்
- பல்கலைக்கழகங்களுடன் தனியார்துறையும் இணைந்து நீர்வாழ் உயிரின வளர்ப்பை அபிவிருத்தி செய்வதற்கான வேலைத்திட்டங்களை முன்னெடுத்தல்

இலங்கை எதிர்கொண்டிருக்கும் இந்த பொருளாதார நெருக்கடியிலிருந்து முழுமையாக மீள்வதற்கு ஒருசில வருடங்கள் ஆகலாம். ஆனால் அவ்வாறு மீள்வதற்கு நீண்டகால அடிப்படையிலான செயற்றிட்டங்கள் அவசியம். நீர்வாழ் உயிரின வளர்ப்பு இலங்கையின் பொருளாதாரத்தை வலுவடையச் செய்யக்கூடியது என்பதில் ஐயமில்லை. முறையான திட்டங்கள் மூலமாக இத்துறையினை அபிவிருத்தி செய்தால் குறுகிய காலத்திலேயே இத்துறையினூடாக அந்நியச் செலாவணியை நாட்டிற்குள் கொண்டுவரமுடியும் என்பது திண்ணம்.



பல்வேறு வகையான அலங்கார மீனினங்களை உற்பத்தி செய்வதற்குரிய இயற்கைச் சூழல் இலங்கையில் காணப்படுகிறது (Photo credit: M.S. Artharpaul)



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A Study of Sustainability in Local Agriculture Related to the Seed Supply System

Synopsis

How important are local/informal seed-saving systems in conserving agrobiodiversity? This study investigates the current state of various organizations engaged in seed conservation activities in Sri Lanka. By conducting interview surveys with farmers, Agricultural cooperatives, government agency, research institutes and NGOs, this study examines the functions related to these organizations' activities. Then, the characteristics of conservation systems of local seeds will be compared with those in other Asian countries and regions (e.g. Nepal, Laos, China, South Korea, Taiwan and Japan).

Keywords

indigenous varieties, traditional varieties, local varieties of crops and vegetables, Heirloom, market, self-consumption, seed governance, plant genetic resources, farmers' right

Purpose of this study:

- to verify the impact of formal and local seed supply on the sustainability of farmers' seed preparation.
- examine the role of stakeholders in conserving agro-biodiversity at local and national levels.
- investigate the role of women in growing local varieties at kitchen gardens and in inheriting property seeds.

Targeting Areas and Research Methods

Areas: Sabaragamuwa Province, eastern or south area (a fishing village), western area (around the big metropolitan city), mountainous areas

Methods

- (1) Collecting relevant literature,
- (2) Collecting rural statistics and
- (3) Interview survey: local farmers, Agricultural cooperatives / Community seed banks (CSB) / Seed companies, private organizations/international NGOs, research institutes (Governmental / University), Ministry of Agriculture, Plant Genetic Resources Centre (Gannoruwa, Peradeniya)

Table. A comparison of genetic resource/heirloom seed conservation efforts in Japan, Taiwan and South Korea

Type of organization	Japan	Taiwan	South Korea
Government institution	Plant genetic resources in gene banks: approximately 220,000 items • Government/local government support the conservation of traditional vegetables	Plant genetic resources in gene banks: approximately 80,000 items • Government has a passive attitude regarding participatory plant breeding	Plant genetic resources in gene banks: approximately 200,000 items
Seed/seedling company	A diminishing number of small- to medium-sized seed companies Seed companies specialising in heirloom seeds exist	Links with Japanese seed companies due to the territory's suitability as a place for growing seeds Small and medium-sized seed companies aiming at popularising open pollinated varieties and home-seed production	Many large-scale seed companies bought out by multinational corporations State of small to medium-sized seed companies is unclear
NPOs	National, prefectural and local organizations – active throughout the country Many organizations of different sizes	Conservation activities commenced on the basis of advice from university researchers. Collection and conservation programmes for local heirloom cultivars introduced Nationwide network launched	Surveys and collaboration on a national level by farmers' organizations Conservation and dissemination by public interest incorporated foundations in collaboration with companies Small number of large-scale organizations

Source: Tomiyoshi (2022)





Figure 1. Local potato seed bank in Peru.
 Photo by the author (2nd July, 2019)



Figure 2. Original birth place of Potato in Andes (central: the author)
 Photo by the author (2nd July, 2019)

Other Research Topics of interest

- Characteristics in the distribution of Heirloom rice varieties and promotion for cultivating those varieties
- Mechanism of choosing rice varieties by farmers and its historical transition
- Changes in the market system for agricultural product distribution
- Changes in dietary habits due to the impact of globalization
- Characteristics of Farmers selecting Organic agriculture (LISA: Low Input Sustainable Agriculture) or sustainable farming systems
- The actual situation of development and export of fair trade products (Items, Producing Areas, Export destination countries, Companies involved)
- Ground water management related to agricultural production

Other Research Keywords

NPOs, agriculture & agricultural communities, regional planning & innovation, germplasm, buckwheat, agricultural biodiversity, Satoyama conservation, traditional knowledge

Biographical Note

During my Master's degree in the Graduate School of Agriculture in Kyoto University in Japan, I conducted surveys on the distribution of cultivated and wild varieties of buckwheat, and examined the phylogenetic relationships through DNA sequence comparison. Subsequently, for my doctoral degree in the Graduate School of Global Environmental Studies, Kyoto University, I examined the role of Non-Profit Organizations (NPOs) networks and their activities on agriculture and agricultural communities. Now, I am researching on the seed conservation systems of traditional varieties of crops and vegetables in Japan and East Asian countries.

Related research achievements (peer reviewed articles)

Tomiyoshi, M. (2022). Organizations and Functions for Seed Management in East Asia: Korea, Japan and Taiwan. In: Nishikawa, Y., Pimbert, M. (eds) *Seeds for Diversity and Inclusion: Agroecology and Endogenous Development* (pp. 107-119). Palgrave Macmillan, Cham. DOI: https://doi.org/10.1007/978-3-030-89405-4_7

Tomiyoshi, M., Y. Uchiyama and R. Kohsaka (2021). Evaluating plant genetic diversity maintained by local farmers and residents: A comprehensive assessment of continuous vegetable cultivation and seed-saving activities on a regional scale in Japan. *The International Journal of Sociology of Agriculture and Food*. 26, 2: pp. 111-142 (Feb. 2021). DOI: <https://doi.org/10.48416/ij saf.v26i2.433>.

Tomiyoshi, M. and Y. Nishikawa, A Study of Sustainability in Local Agriculture and the Seed Supply System: A Case Study of the Indigenous Crop Tef in Ethiopia, *Journal of Rural Problems* Vol. 54, No. 2, pp. 36-43, DOI: <https://doi.org/10.7310/arfe.54.36>



INTERNATIONAL CONFERENCE ON BUILDING RESILIENCE IN TROPICAL AGRO-ECOSYSTEMS - 2023 (HYBRID)

15-16 MARCH 2023
GALLE FACE HOTEL, COLOMBO, SRI LANKA.

WELCOME TO BRITAE 2023

The BRITAE project helps to share knowledge and develop new strategies for resilience building, which is the need of the hour. BRITAE claims that the knowledge gap is significant and skewed in favor of developed countries as developing countries struggle from a lack of both financial and human resources in research and innovation. They need to advance their capability to produce knowledge domestically and absorb the knowledge for capacity building in the field of higher education. This can happen when human resources are trained in adequate numbers and an institutional framework to carry out research and innovation activities is created. Hence, 'BRITAE' addresses some of the most pressing issues for researchers and universities, in the context of developing and sustaining research capacity of graduates into a professional career in the field of ecological resilience building.

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The partners of the BRITAE project proudly invite you to the International Conference on Building Resilience in Tropical Agro-ecosystems-2023 (BRITAE 2023), an event that has attracted both local and international scholars. BRITAE 2023 aims to provide a platform for renowned intellectuals and emerging scholars to exchange and share their experience and research on all aspects of resilience in tropical agro-ecosystems.

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Abstracts for oral and poster presentation at the symposium will be entertained from case reports, concept notes, innovations and original research, based on the following sub-themes:

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- Green Infrastructure and Urban Resilience
- Indigenous Knowledge, Precision Agriculture and Agricultural Productivity
- Global Food Safety and Security
- Disasters and Agricultural Vulnerability
- Life Cycle Assessment and Circular Economy
- Agricultural Policies, Concepts and Strategies

ABSTRACT SUBMISSION TIMELINE (IMPORTANT DATES)

- Abstract submission opens: 17th Jun 2022
- Abstract submission deadline: 17th Aug 2022 (12 noon)
- Author notification of acceptance: 1st Nov 2022
- Submission of Revised Abstract: 30th of Nov 2022
- Conference Dates: 15th & 16th March 2023

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Survey on Consumers' Determinants of Selection of Fruits and Vegetables with Minimum Postharvest Losses in Matara Area.

Present study was undertaken to identify the Consumers' determinants of selection of fruits and vegetables with minimum postharvest losses in Matara area. The purpose of this study is to identify the determinants of selection of fruits and vegetables with minimum postharvest losses and determine the consumers' problems associated with fruits and vegetables with postharvest losses in Matara area. The data were collected by using questionnaire and publications related to postharvest losses at consumers and retailer level, and analyzed by using SPSS statistical software, multiple regression model. The findings of the result show that most of consumers (98.1%) are aware of postharvest losses, but they do not have sufficient awareness (69.2%) about causes of postharvest losses. Another finding is 23.1 percent of the consumers prefer to buy low quality fruits and vegetables, if they can buy them at lower prices than the general market price. According to consumers' perception, high waste and bad health effects are their major problems with low quality fruits and vegetables. According to findings, maturity stage of the commodity and minimum microbial activities and pest attacks are significant with consumer satisfaction. Also, the variable of physiological deteriorations is not significant with consumers' satisfaction. According to external determinants of selection fruits and vegetables, variables of market premises sanitation and storage condition in the market are significant with consumers' satisfaction level. However, appropriate packaging and washing and grading level are not significant with consumer satisfaction.



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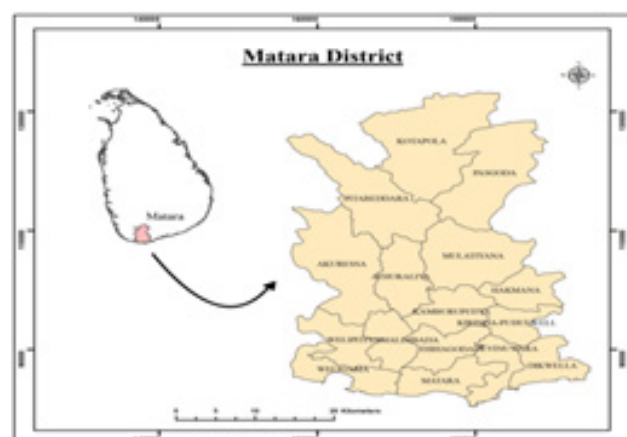
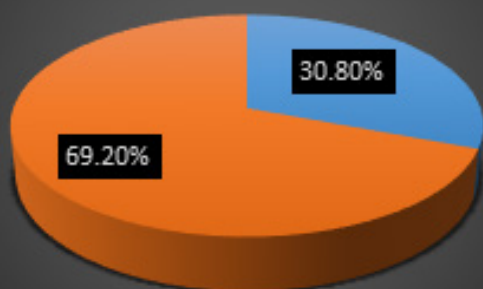
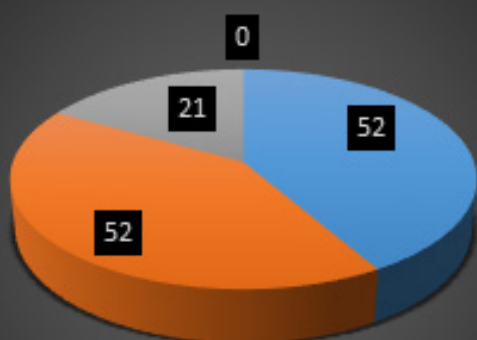


Figure 1 - Survey Area(Matara DS Division)

Awareness about causes for postharvest losses of fruits and vegetables

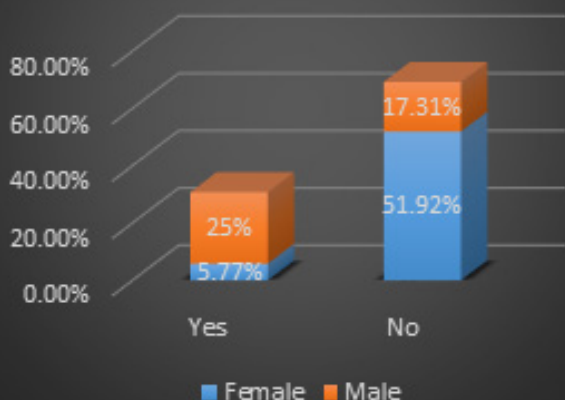


Problems with low quality fruits and vegetables



- High waste
- Bad health effects
- Lack of taste
- Other

Awareness of causes for postharvest losses Vs Gender



Conclusion

When we consider the internal determinants of the selection of fruits and vegetable, variables of maturity stage of the commodity and minimum microbial activities and pest attacks are significant with consumer satisfaction. Also variable of physiological deteriorations is not significant with consumers' satisfaction.

According to this survey results, I also identified that a lot of consumers do not have sufficient knowledge about methods of postharvest losses. Most of time, they consider maturity stage of commodities, microbial damages and pest attacks as determinants of their selections. Because a lot of horticultural commodities usually show physiological deteriorations in the market. Thus, according to consumers' perception this pest attacks, microbial activities and maturity stage of the commodity are serious problems with fruits and vegetables.

However, appropriate packaging and washing and grading level are not significant with consumer satisfaction. Nevertheless, these results may be vary in the supermarket situations because at the supermarkets, already have field sanitation and good storage conditions. Thus, consumers consider appropriate packaging, washing and grading level at this places.



නාගරික වැසියන් උදෙසා ජලරෝපිත වගාව



සිනෙර රිඳුමික
කෘෂි විද්‍යා පීඨය
ශ්‍රී ලංකා සබරගමුව විශ්ව විද්‍යාලය

ගතවෙමින් පවතින කාල පරිච්ඡේදය ශ්‍රී ලාංකිකයන් වශයෙන් තරමක් අර්බුදකාරී කාලයක් වන අතර මෙම අර්බුදකාරී වාතාවරණය ඉදිරියේදී තව තවත් දරුණු අතර හැරෙනු ඇති බවට විෂයානුබද්ධ විද්වත්තු මත පළ කරති. මැයි මස අග භාගයේදී කළ ගණනය කිරීම් වලට අනුව උද්ධමන වේගය 28.4% ක් විය. ඒ අනුව සියලු ආකාරයේ බෝග ආශ්‍රිත ආහාරපානවල මිල ඉහළ යන අතර මෙය වැඩි වශයෙන් බලපාන්නේ නාගරික ජනයා කෙරෙහි ය.

ශ්‍රී ලංකාවේ සමස්ත ජනගහනයෙන් 19% කට ආසන්න ප්‍රමාණයක් නාගරික වාසීන් වන අතර ඔවුන්ට දෛනික ආහාර අවශ්‍යතාව තමන් විසින් ම සපුරා ගැනීමේ ගැටලුකාරී තත්ත්ව පවතී. උදාහරණයක් ලෙස ඔවුන් වාසය කරන සීමිත ඉඩ ප්‍රමාණය සැලකීමේදී ඔවුන්ට සාර්ථක වගාවකින් තම ආහාර අවශ්‍යතාව සපුරා ගත නොහැකි වේ. නමුත් පවතින උද්ධමන තත්ත්වය හේතුවෙන් ඇතැම් ආහාර වර්ග ඉතා මිල අධික වන අතර මේ හේතුවෙන් නගරබද වැසියන්ට විකල්ප වගාවන් වෙත යොමුවීමට සිදුවේ. මෙකී විකල්ප වගාවන් ලෙස නාගරික වාසීන්ට වඩාත් උචිත වන්නේ ජල රෝපිත වගාව (Hydroponic Cultivation) යි.

ජල රෝපිත වගාවේදී පාංශුමය මාධ්‍යක් රහිත ව සම්පූර්ණයෙන් ම බණිජලවණ වලින් පොහොසත් ද්‍රවමය මාධ්‍යක් යොදාගැනේ. මෙහිදී මූලකේශවලට පාංශු ද්‍රාවණය තුළට වඩා පහසුවෙන් පෝෂක ද්‍රව්‍ය අවශෝෂණය කළ හැකි වේ. මෙහිදී භාවිත කරන පෝෂ්‍ය ද්‍රාවණය පිළිබඳ වඩා සැලකිලිමත් විය යුතු වෙයි. මෙම පෝෂ්‍ය ද්‍රාවණයේදී සාමන්‍යයෙන් N-P-K හෙවත් නයිට්‍රජන් - පොස්පරස් - පොටෑසියම් අනුපාතය 6 : 5 : 5 යන අනුපාතයට යොදාගනී. නමුත් තරමක් ඉහළ ප්‍රෝටීන අවශ්‍යතාවක් පවතින විශාල දඬු හෝ පත්‍ර දරණ වගාවන් සඳහා ඉහළ නයිට්‍රජන් ප්‍රතිශතයක්;

එනම් 20 : 5 : 5 වැනි හ-ප්-ණ අනුපාතයක් යොදාගැනේ. මීට අමතරව බෝරෝන් (B) කැල්සියම් (Ca), ක්ලෝරීන් (Cl), කොපර් (Cu), යකඩ (Fe), මැග්නීසියම් (Mg), මැන්ගනීස් (Mn), මොලිබ්ඩිනම් (Mo), සල්ෆර්(Sa) සහ සින්ක් (Zn) යන මූලද්‍රව්‍ය පෝෂක ද අවශ්‍ය වෙයි. නමුත් මෙහිදී අවධානය වැඩියෙන් ම, යොමු කළ යුතු කාරණය වන්නේ අවශ්‍ය මූලද්‍රව්‍ය සංයුතීන් නිවැරදි ව අඩංගු කර නිෂ්පාදනය කළ පිළිගත් පෝෂ්‍ය ද්‍රාවණයක් භාවිත කිරීමයි. මේ සඳහා ශ්‍රී ලංකාවේ බොහෝ පිරිස් භාවිත කරනු ලබන්නේ ඇල්බර්ට් ද්‍රාවණය (Albert's Solution) යි. සාමාන්‍යයෙන් ජල රෝපිත වගාව යම් බෝග වර්ග කිහිපයකට සීමා වී ඇති පවතී. ඒවා ගෝවා, සලාද, කංකුං, ස්ට්‍රෝබරි වැනි වගා සඳහා කොටුවී පවතී. නමුත් මෙම ක්‍රමය නාගරික ජනතාවට අවශ්‍ය පළා වර්ග වැනි ශාකමය ආහාර බොහෝමයක් සඳහා යෝග්‍ය වෙයි. ජල රෝපිත වගාවේ ඇති විශේෂත්වය වන්නේ මෙම වගා ක්‍රමය තිරස් ආනතියට මෙන්ම සිරස් වගාවක් ලෙසද භාවිතා කළ හැකි වීමයි. මේ හරහා භූමියේ ඒකක වර්ගඵලයකින් වැඩි වගා වර්ඵලයක් නිර්මාණය කළ හැකි අතර තට්ටු නිවාසවල වාසය කරන ජනයාට පවා තමා සතු සීමිත ඉඩ ප්‍රමාණයේ වුවද වගා කළ හැකි වේ. අවශ්‍ය නම් අර්ධ ජල රෝපිත වගා ක්‍රම (Semi-hydroponic Cultivation method) වුවද භාවිත කළ හැකි ය. මෙහිදී කොහුබත් වැනි මෘදු මාධ්‍යක් යොදාගත හැකි අතර එම මාධ්‍ය සඳහා පෝෂ්‍ය ද්‍රාවණයක් භාවිත කළ යුතු වෙයි.

කෙසේ වුවත් ශ්‍රී ලංකාවෙහි තවමත් ජල රෝපිත වගාව වැනි භූමිය ප්‍රශස්ත ලෙස පරිහරණය කළ හැකි වගා භාවිතය සුලභ නොවේ. ඊට හේතුව බොහෝ පිරිස් ජල රෝපිත වගාව සඳහා ඉහළ යාන්ත්‍රික දැනුමක් අවශ්‍ය බවට වරදවා තක්සේරු කිරීමයි. නමුත් නුදුරු අනාගතයේ ශ්‍රී ලංකාවෙහි නිර්මාණය වීමට නියමිත අර්බුදය නමුවේ මෙවැනි වගාවන් ප්‍රචලිත කිරීම වඩා යෝග්‍ය වනු ඇත.



Marketing Day 2022

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Marketing day is one of the main practical components undergone by the third-year students who specialized in the Department of Agribusiness Management, Faculty of Agricultural Sciences under the subject of Marketing Management (AB 31053) under the supervision of course coordinator Prof. D. A. M. De Silva. All the batches who specialized in Agribusiness Management were involved in this marketing day which was organized by the Department of Agribusiness Management.

Objectives

- Enhance students theoretical and practical knowledge of marketing mix variables
- Research, innovation, and commercialization of products
- Introduce students to farm families of the area, use their raw materials and develop products, and open market avenues to smallholders

Mainly each student has to select one crop or crop product that specific to each student. By building continuous communication with the farmer, the student should be able to identify the opportunities in the agriculture value chain that are not addressed by the particular farmer yet. Through this practical, students innovate novel innovations to increase the value of the product produced by the farmers and open new marketing pathways to the farmers who are still not practicing. Recently students have selected eight farmers who mainly cultivate pepper, cinnamon, banana, tomato, chili and cardamom. eight novel products are introduced based on the selected crops. They are,





- Lime black pepper
- Sun dried cured chili
- Pepero dewilla
- Tomantino
- Cardamom shape-up tea
- Black pepper bread spread
- Bananza
- Cinnamon spring air freshener

Lime black pepper

Lime black pepper is a seasoning powder enriched with lime and salt to tantalize your taste buds.

Sun-dried cured chili

Value addition to the traditional Moru Miris dish with salt favor and turmeric color to gain hot experience to feel different in your cuisine.

Pepero dewilla

A non-alcoholic beer resulted from perfect combination of pepper, ginger and lime for the consumers who love the aroma and taste of pepper.

Tomantino

Tomantino is a tomato chutney of value addition of fresh tomatoes as mitigation strategy of post-harvest losses. Two different recipes are introduced as classical tomato chutney and spicy tomato chutney induced with green chili and pepper.

Cardamom shape-up tea

For healthy body and shape figure the Cardamom shape-up tea has launched enriching with cardamom.

Black pepper bread spread

A spicy bread pepper blended with garlic, ginger and coconut butter resulting a great cuisine to boost body immune system.

Bananza

An energy bar made out of banana and chocolate as a mini meal or snack.

Cinnamon spring air freshener

Cinnamon spring air freshener is best quality air freshener using premium quality Ceylon cinnamon to make fresh your surrounding with natural fragrances.



නිදහස් පාරාදීසයක අන්දැකීමක්

SUSL - Agri-fac farm-Stay ගොවිපළ නවාතැන පිලිබද හැදින්වීමක්

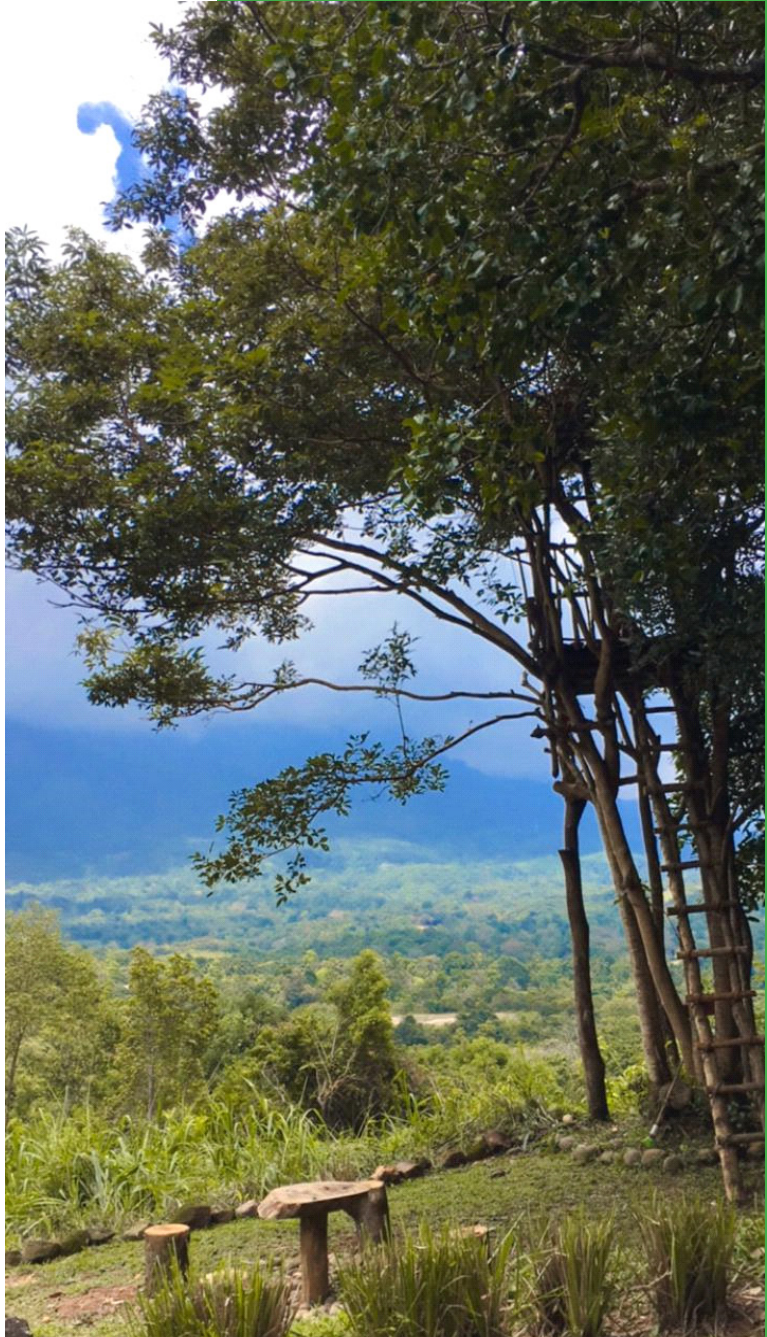
කෘෂිකර්මාන්තයේ දී කෘෂිකාර්මික ගොවිපළ මූලික නිෂ්පාදන ඒකකය වේ. ගොඩනැගිලි, යන්ත්‍රෝපකරණ, මෙවලම්, ජලය, අන්‍යන්තර මාර්ග, ඇළ මාර්ග සහ බලශක්ති ප්‍රභවයන් වැනි කෘෂිකාර්මික නිෂ්පාදන සඳහා අවශ්‍ය ඉඩම් මෙන්ම අනෙකුත් අවශ්‍යතා ද එය සමන්විත වේ. එයට තමන්ගේම ශ්‍රම බලකායක් ඇත. ගොවියා සියළුම ක්‍රියාකාරකම් සහ නිෂ්පාදන අධීක්ෂණය කරයි. ගොවිපළ අනෙකුත් නිෂ්පාදන ඒකකවලට වඩා වෙනස් වන්නේ භූමිය වඩාත් වැදගත් සාධකය වන අතර එය මූලික වශයෙන් මිනිසුන්ට සහ සතුන්ට ආහාර නිෂ්පාදනය කරයි. කෘෂි සංචාරක ව්‍යාපාරය යනු කෘෂිකර්මාන්තය සහ සංචාරක ව්‍යාපාරය මුණාගැසෙන වාණිජ ව්‍යවසායකි. කෘෂිකාර්මික ගොවිපළක් යනු එහි රාමුව තුළ කෘෂි සංචාරක අංශයක් ඇතුළත් කර ඇති එකකි. කෘෂි සංචාරක ගොවිපළ ශාක හා සත්ව නිෂ්පාදන නිෂ්පාදනය කරන අතර කෘෂි සංචාරක ව්‍යාපාරයේ සේවාවන් සපයයි.

සබරගමුවේ කෘෂි විද්‍යා පීඨය පිහිටා ඇත්තේ මධ්‍යම කඳුවැටියේ දකුණු කඳු පාමුල දිවයිනේ ඉතාමත් මනරම් ප්‍රදේශයකය. මෙහි ගොවිපළ නවාතැනක් සහිත පීඨ ගොවිපළක් ඇත. එය ලංකාවේ කෘෂි සංචාරක ව්‍යාපාරය පෙන්වීමට ඉතා හොඳ ආදර්ශයකි. මෙම ස්ථානය නැරඹීමෙන් සෑම කෙනෙකුටම ජීවිත කාලය පුරාවටම අපූරු අන්දැකීමක් ලබා ගත හැක.

කෘෂිකර්ම පීඨ ගොවිපළ

එය 2003 වසරේ මුංගස්තැන්න ප්‍රදේශයේ ආරම්භ කරන ලද අතර, පීඨය සඳහා ඉගැන්වීම් ගොවිපළක් ලෙස අක්කර 38 ක පමණ භූමි ප්‍රමාණයක් සංවර්ධනය වෙමින් පවතී. පීඨ ගොවිපලෙහි ප්‍රධාන වශයෙන් ඒකක හතරක් ඇත.

- පශු සම්පත් නිෂ්පාදන ඒකකය
- ජලජීවී වගා ඒකකය
- බෝග ඒකකය
- ගොවිපළ රැඳී සිටීමේ ඒකකය



සත්ව පාලන ඒකකය මගින් පශු සම්පත් නිෂ්පාදන විශාල ප්‍රමාණයක් බිහි කරමින් විවිධ පර්යේෂණ වලට අවශ්‍ය සම්පත් ලබා දෙමින් ඉතා අනගි අධ්‍යයන හා පර්යේෂණ කාර්යභාරයක් ඉටුකරයි. මෙහි ඵලකිරි නිෂ්පාදනය, ඵළ කිරි නිෂ්පාදනය, යෝගට් නිෂ්පාදනය, බ්‍රෙයිලර් කුකුළු මස් නිෂ්පාදනය හා බිත්තර නිෂ්පාදනය සිදු කරයි.

ජලජීවී වගා ඒකකය මුංගස්තැන්න ප්‍රදේශයට ආසන්නව පිහිටා ඇත. එය පශු සම්පත් නිෂ්පාදන අධ්‍යයනාංශය විසින් නඩත්තු කරනු ලැබේ. එහි විකිණීමට සහ අධ්‍යයන කටයුතු සඳහා මාළු වර්ග බොහොමයක් තිබේ. ප්‍රධාන වශයෙන් ඒකක හතරක් ඇත. බිත්තර දැමීමෙන් අනිපනය වන මසුන්ගේ ඒකකය පැටවුන් දැමීමෙන් අනිපනය වන මසුන්ගේ ඒකකය විකුණුම් ඒකකය සහ නිරෝධායන ඒකකය යනු එම ඒකක හතර වේ. මෙම ඒකකය විසිතුරු මත්ස්‍ය කර්මාන්තය සහ ගොවීන්ගේ අවබෝධය වැඩිදියුණු කිරීම සඳහා විසිතුරු මත්ස්‍ය වගාව පිළිබඳ පුහුණු වැඩසටහන් ද පවත්වයි.

හෝග නිෂ්පාදන ඒකකය ක්ෂේත්‍ර බෝග සහ බහු වාර්ෂික හෝග වලින් සමන්විත වේ. තේ, රබර්, පොල් සහ පළතුරු බෝග කුඹුරු බෝග ඵළවළු වගා සමය අනුව පුළුල් පරාසයක ඵළවළු හෝග වසර පුරා වගා කෙරේ.

ගොවිපළ නවාතැන

ගොවිපළ නවාතැන්, ගොවිපළ නිකේතන ලෙසද හැඳින්වේ. මේවා සංචාරකයින් සඳහා නවාතැන් සහ ආහාර සපයන ගොවිපළවල් වේ. සංචාරකයින් ගොවිපළ ජීවිතයේ අත්දැකීම් ලබා ගැනීම සඳහා සපයනු ලබන ගොවිපළ ක්‍රියාකාරකම් සහ අනෙකුත් සේවාවන් සඳහා සහභාගී වීමට හෝ භුක්ති විඳීමේ අරමුණින් ගොවිපලෙහි රැඳී සිටියි.

Agri-fac farm-Stay යනු කොළඹ-බදුල්ල අධිවේගී මාර්ගයේ පිහිටා ඇති පරිපූර්ණ නැවතුම්පොළක් වන අතර විවේකී විවේකයක් සඳහා ආකර්ශනීය සහ සාමකාමී නිවාඩු ගමනාන්තයකි. මෙම ප්‍රසන්න වාතාවරණය තුළ අපට අමතක නොවන, උණුසුම් සහ ගොවිපළ සහ අත්දැකීමක් ලබා ගත හැකිය.

කෘෂි සංචාරක ව්‍යාපාරය සඳහා ගොවිපලේ පිහිටුවන ලද කඩානා 2010 පෙබරවාරි 02 සිට සංචාරකයින් සඳහා විවෘත කරන ලදී.

ඇග්‍රිෆැක් ගොවිපොළේ කඩානා වර්ගයේ ගෘහ තුනක් ඇත. සෑම ගෘහයකම නිදන කාමරයක් සමග නාන කාමරයක් සහ පුද්ගලයන් දෙදෙනෙකුට සහ අවුරුදු 10ට අඩු ළමුන් දෙදෙනෙකුට නවාතැන් ගත හැකි මහරම් ඉඩකඩක් ඇත. කඳුකර පරිසරය නැරඹීමට “ගොවිපොළ නැරඹීමට” සමනළ වැව නැරඹීමට ඇති කඩානා තුන නම් කර ඇත්තේ ගිරිවාස, කෙත්වාස සහ විල්වාස ලෙසිනි. ගිරිවාසයට කඳුකර දසුන මහරම්ව පෙනෙන අතර ඉදිරියෙන් ලෝකාන්ත කඳුකර ප්‍රදේශයට මුහුණලා ඇත. විල්වාසානි දී සමනල වැවේ වමන්කාරජනක දසුනක් දැකගත හැකියි. එසේම එය නිවර්තන වනාන්තරවල මායිම් වේ. ගොවිපළ දර්ශනය ඔබට වැව, කැලය සහ ගොවිපළ පිළිබඳ පරිදර්ශක දසුනක් ලබා දෙයි. සෑම ගෘහයකම තේ සහ කෝපි සෑදීමේ පහසුකම්, නැවුම් පලතුරු කුඩයක්, රෙදි මැදීමේ පහසුකම් සහ උණු වතුර පහසුකම් ඇත.





ආහාර

ප්‍රීතිමත් උදෑසන ආහාරය සඳහා කොළ කැඳ (මාෂධ පැළෑටි අඩංගු), තේ හෝ කෝපි, කිරිබත් “ ඉඳිආප්ප, පිට්ටු “ නැවුම් පළතුරු, යෝගට්, නැවුම් පළතුරු යුෂ, ගොවිපළ බිත්තර සහ තවත් බොහෝ දේ ලැබෙනු ඇත.

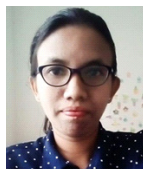
දිවා ආහාරය සහ රාත්‍රී ආහාරය පාරිභෝගිකයාගේ ඉල්ලීම මත ලබා ගත හැකිය.

දිවා ආහාරය බත් සහ ව්‍යංජන, එළවළු, මස් සහ බිත්තර ඇතුළත් ගොවිපලෙන්ම සපයාගත් දෑ සමග රසවිඳිය හැක. රාත්‍රී ආහාරය සාම්ප්‍රදායික ශ්‍රී ලාංකේය ආහාර වර්ග වලින් සමන්විත වේ.

ගොවිපළ ක්‍රියාකාරකම්

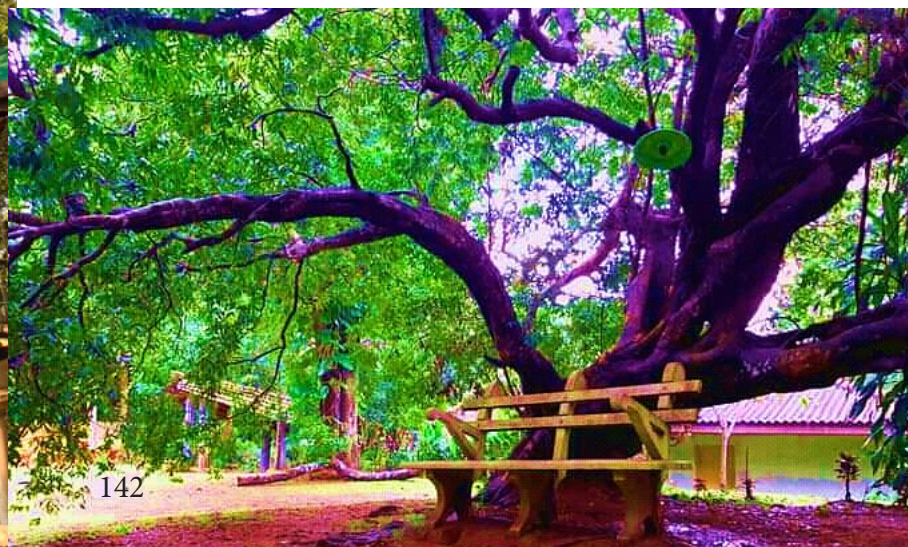
- ඔසු උයන
- ගොවිපළ සතුන් පෝෂණය කිරීම
- කිරි දෙවීම
- සත්ව පාලනය
- මාර්ගෝපදේශක ගොවිපළ වාර්තාව
- පලතුරු, එළවළු හෝ මල් තමා විසින්ම නෙලා ගැනීම
- කුරුල්ලන් නැරඹීම
- කැලේ සංචාරය කිරීම
- සමනළ වැව රක්ෂිත නිරීක්ෂණය
- කඳු නැගීම

මෙම ස්ථානයට පැමිණෙන පුද්ගලයින්ට ගොවිපළ ක්‍රියාකාරකම් දැකීමෙන් හා ඒවායේ නිරත වීමෙන් අපූරු අත්දැකීමක් ලබා ගත හැකිය.



එරංදි ජයසිංහ මහාචාර්ය එස්.එච්.පී මල්කාන්ති
 කෘෂි විකාශන කළමනාකරණ අධ්‍යයනාංශය
 කෘෂි විද්‍යා පීඨය
 ශ්‍රී ලංකා සබරගමුව විශ්ව විද්‍යාලය

කෞමදී ජිනදාස හා හාග්‍යා විමලසිරි
 පශු සම්පත් නිෂ්පාදන අධ්‍යයනාංශය
 කෘෂි විද්‍යා පීඨය
 ශ්‍රී ලංකා සබරගමුව විශ්ව විද්‍යාලය



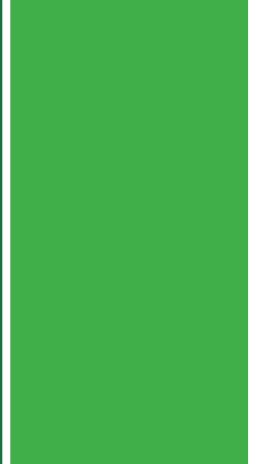
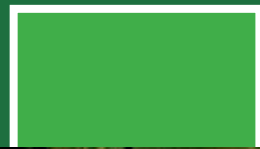


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Final year students and third-year students, who are specialized in Agribusiness Management, organized an event to launch their products. This is in line with the continuous evaluation of the Agribusiness Venture Creation-III (AB 41032) course. The event was held on 15th March 2022 at the University main entrance premises with the participation of Prof. R.M.U.S.K. Rathnayake, Vice-chancellor, Sabaragamuwa University of Sri Lanka, Prof. Asha Karunaratne, Dean, Faculty of Agricultural Sciences, Dr. Rasangi Sabaragamuwa, Dean, Faculty of Applied Sciences, Mr. Vipula Abeyrathne, Dean, Faculty of Geomatics, Prof. Achini De Silva, Head, Department of Agribusiness Management, Senior Academic staff of the Faculty of Agricultural Sciences, and Mr. S. Uyangoda, Registrar, Sabaragamuwa University of Sri Lanka.

Agribusiness Venture Creation: Product Launch

After two years of a break due to the pandemic situation in the country, the Department was able to organize and conduct this event physically as a practical, and it supported students to create profits in their startups, get comments from the customers to improve their business, work collectively, enable and foster interpersonal relationships; and moreover, it was a good opportunity to improve motivation and working mood of the students.





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