



GOLDEN JUBILEE YEAR
Agricultural Engineering College and Research Institute



International Workshop
Sustainable Growth of Food Processing Sector For
Food and Nutritional Security

FoodXplore'22
Leave NO ONE Behind

SOUVENIR

TAMIL NADU AGRICULTURAL UNIVERSITY
AGRICULTURAL ENGINEERING COLLEGE AND RESEARCH INSTITUTE
COIMBATORE - 641 003

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AEC & RI Publication No. : 41/2022

Published by

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Agricultural Engineering College and Research Institute,
Tamil Nadu Agricultural University,
Coimbatore - 641003.

Fax: 0422 - 6611455

Mail: processing@tnau.ac.in

Phone No: 0422 - 6611272/82

Printed at

Sree Kumaran Computers TNAU,
Coimbatore - 641003.

Ph. No. - 9894149413

Email : registrar@tnau.ac.in
Website : www.tnau.ac.in
www.agritech.tnau.ac.in



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FOREWORD

Agricultural Engineering College and Research Institute, Coimbatore is celebrating its marvellous Golden Jubilee Year and it has been a legendary icon in teaching, research and extension activities by way of its innovative thoughts and techniques. Development of farm implements, renewable energy gadgets, soil and water conservation through augmentation of surface and ground water resources and innovative post-harvest processing technologies are the main research areas of the institute. The initiatives and endeavours taken by the faculty, research scholars and students in these areas are highly appreciable.

2022 finds us with a climate that won't stop warming, rising prices, an ongoing pandemic, conflicts and international tensions. This is affecting global food security. With a motto of building a sustainable world where everyone, everywhere has regular access to enough nutritious food, Food and Agricultural Organization observed **World Food Day 2022** with the theme:

“Leave NO ONE Behind”

I am happy that 24th batch of B.Tech. (Food Technology) students are organizing **FOODXPLORE '22 - International Workshop on Sustainable Growth of Food Processing Sector for Food and Nutritional Security** in commemoration of Golden Jubilee celebration of AEC&RI, Coimbatore and World Food Day 2022. This platform will encourage the interaction of students with the more established industrial experts to discuss new and current work undertaken in food processing sector. Also the lead paper presentations by eminent scientists and experts will be a thought provoking session for students in learning the recent advances in the various areas of food and nutritional security.

I congratulate all the lead speakers and industrial experts for their enthusiasm and participating in Industry-Institution Interaction Workshop and making the event a grand success. I convey my regards to all the sponsors and express my best wishes for all the participants of this grand event.

I convey my best wishes for the entire Organizing Committee and students who are actively involved in hosting this remarkable event **FOODXPLORE '22**.

Best Wishes


(R. THAMIZH VENDAN)

Date : 19.10.2022
Place : Coimbatore

சுழன்றும் ஏர்ப் பின்னது உலகம் அதனால்
உழந்தும் உழவே தலை - திருவள்ளூர்



FROM THE DEAN'S DESK

Dr. A. Raviraj
Dean (Agrl. Engg.)



I am glad that Agricultural Engineering College and Research Institute, Coimbatore hosts **FOODXPLORE '22** - International Workshop on **Sustainable Growth of Food Processing Sector for Food and Nutritional Security** in commemoration of Golden Jubilee celebration of AEC&RI, Coimbatore and World Food Day 2022.

Maintaining the food security in all the corners of the country is an important step towards the sustainable development of the nation. It is time to work together and generate a better production, better nutrition, better environment, and a sustainable future for all.

I am extremely delighted that this workshop is organized at right time and brings passionate food technologists on a single platform to exchange their knowledge, which would be very beneficial for the students' community. I hope this workshop will be helpful in making remarkable establishment in the minds of budding entrepreneurs and bring out their innovative ideas in the field of food processing and technology.

I convey my best wishes for the entire Organizing Committee members and 24th batch of B.Tech. (Food Technology) students who are actively involved in hosting this event. Also my best regards for all the sponsors, lead speakers and industrial experts for sharing their valuable resources and knowledge for the benefit of our students.

Best Wishes!

(A. Raviraj)

19.10.2022
Coimbatore



LEAD PAPERS

SUSTAINABLE GROWTH OF FOOD PROCESSING SECTOR FOR FOOD AND NUTRITIONAL SECURITY

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Food processing sector is an important Economic center of India contributing 12.8 per cent to the Indian GDP and provides, huge employment, directly or Indirectly. India's food processing sector is one of the largest in the world and its output is expected to reach USD 535 billion by 2025-26. Annual Growth Rate (AAGR) of this sector has increased to 11% and around 9.87% of GVA (Gross Added Value) was constituted by the Food Processing sector in Manufacturing. This positive shift in the sector is due to increased food demand, high supply of raw material and policies initiated by Indian government. They also Contribute in global food trade in both imports and exports. Food processing sector shares about 13.2% of India's total exports value. The list of India's exported food commodities value (2017 - 2022) taken from MOFPI annual report 2021 - 2022 indicates its growth with 2.31 percent of its share in Global export and 1.31 percent share in global Import. (Table 1.1)

Table 1.1: India's share in Global Food Trade

	Value in US\$ million				
	2016	2017	2018	2019	2020
World food export	1324404.3	1432272.3	1493758.6	1488060.0	1525621.1
World food import	1342585.9	1449095.6	1524012.3	1521161.4	1553119.4
India's food export to world	29196.3	34418.9	34070.2	33617.8	35200.7
India's food import from world	21938.0	25090.3	19603.5	19183.7	20365.6
% Share of India's food export in world	2.20%	2.40%	2.28%	2.26%	2.31%
% Share of India's food import in world	1.63%	1.73%	1.29%	1.26%	1.31%

Source MOFPI Annual report 2021-2022

SCENARIO IN INDIA:

a) India's Agriculture and raw material Supply

The growth in food processing sector is in proportional to the production growth in agro and food industry as witnessed by the Ministry of Agriculture and Farmers Welfare with a statistical data of Rice both Kharif and Rabi with 91.97 million tonnes in the year 2005-06 which has now increased to 118.23 million tonnes in 2019-20. The report of wheat states the increase from 69.35 million tonnes in 2005-2006 to 107.59 million tonnes in the year 2019-2020. In recent years, India has made rapid progress in the food production sector. India is the world's largest producer of milk and also ranks second largest producer of rice, wheat, sugarcane, groundnut, vegetables, fruit and cotton. India's food exports in cereals, milling products oilseeds, vegetable oils, sugar, coffee, vegetable and fruits have increased showing good signs in the economical perspective. (Table 1.2)

b) Elevating Food Demand

India is the second most populated country in the world with 1.3 billion population. The population has also subsequently increased with a statistical data of 114.76 crores to 138 crores from the year 2005 to 2020. Increase in Indian economy, population and rise in urbanization have created high demand of food. In addition to increased food consumption, the diversified diet and incidence of non-communicable disease have contributed to this high food demand. All people especially the poor and the most vulnerable should have access to safe affordable and nutritious food which is the fundamental to life. The preamble of the Food Safety and Standards act (FSS ACT, 2006) ensures safe and wholesome food for every citizen of India. Working towards the goal and the mandate are the foremost actions to be taken by FSSAI. The world food day 2022 has also the theme of

"Leave No one behind". "In the face of a looming global food crisis, we need to harness the power of solidarity and collective momentum to build a better future where everyone has regular access to enough nutritious food,"

- FAO Director-General QU Dongyu

said in his speech. The growth of Food Processing and Agriculture sectors are promising with its sustainable growth to meet the Mandate of FSSAI.

Blooming Issues of India's Food and Nutrition security:

India is also witnessing the increase of the food processing sector and the agricultural sector is promising but at the same time the issues of Food and Nutrition faced by such a hugely populated Country is not less. India ranks 107th out of 121 countries in the 2022 Global Hunger Index (GHI) with a global hunger index score of

29.1 which indicates serious level of hunger (2022 Global Hunger Index Report, concern worldwide and Welt Hunger Hilfe).(Graph1)

Table.2: Commodity wise Export data-India

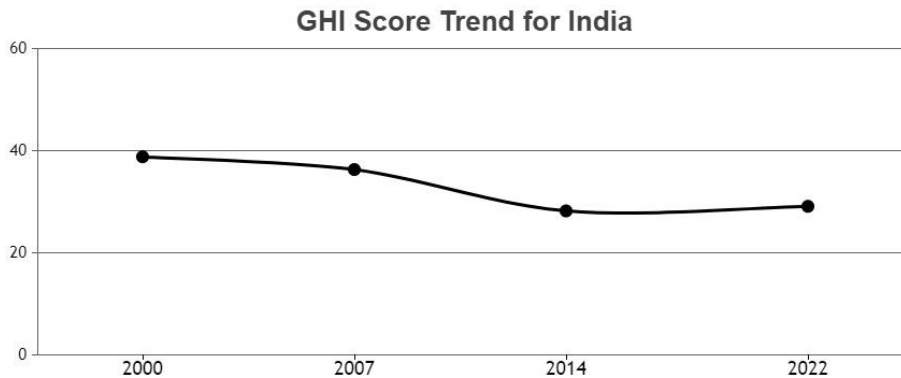
India's Food Exports (in US\$ million)							
S. No.	HS Code	Commodity Description	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022 (Apr-Oct)
1	2	MEAT AND EDIBLE MEAT OFFAL.	4,174.6	3,722.5	3,300.7	3,223.3	1,947.4
2	3	FISH AND CRUSTACEANS, MOLLUSCS AND OTHER AQUATIC INVERTABRATES.	6,850.9	6,256.9	6,159.2	5,235.4	4,218.3
3	4	DAIRY PRODUCE; BIRDS' EGGS; NATURAL HONEY; EDIBLE PROD. OF ANIMAL ORIGIN, NOT ELSEWHERE SPEC. OR INCLUDED.	366.6	538.7	353.6	77.8	265.8
4	7	EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS.	1,305.6	1,301.7	1,095.6	1,302.6	859.9
5	8	EDIBLE FRUIT AND NUTS; PEEL OR CITRUS FRUIT OR MELONS.	1,857.1	1,617.4	1,490.8	1,350.5	740.6
6	9	COFFEE, TEA, MATE AND SPICES.	3,310.3	3,199.6	3,299.3	3,901.6	2,337.8
7	10	CEREALS.	8,151.6	8,160.2	6,672.4	10,064.0	6,699.3
8	11	PRODUCTS OF THE MILLING INDUSTRY; MALT; STARCHES; INULIN; WHEAT GLUTEN.	247.4	321.3	334.7	434.4	343.5
9	12	OIL SEEDS AND OLEA. FRUITS; MISC. GRAINS, SEEDS AND FRUIT; INDUSTRIAL OR MEDICINAL PLANTS; STRAW AND FODDER.	1,647.1	1,640.5	1,773.1	1,822.6	901.6
10	13	LAC; GUMS, RESINS AND OTHER VEGETABLE SAPS AND EXTRACTS.	1,019.0	1,056.9	822.9	727.3	493.7
11	15	ANIMAL OR VEGETABLE FATS AND OILS AND THEIR CLEAVAGE PRODUCTS; PRE. EDIBLE FATS; ANIMAL OR VEGETABLE WAXEX.	1,263.9	1,097.6	1,165.7	1,631.8	910.5
12	16	PREPARATIONS OF MEAT, OF FISH OR OF CRUSTACEANS, MOLLUSCS OR OTHER AQUATIC INVERTEBRATES	422.3	432.6	480.1	637.9	409.9
13	17	SUGARS AND SUGAR CONFECTIONERY.	1,018.7	1,629.2	2,192.1	3,142.3	2,291.8
14	18	COCOA AND COCOA PREPARATIONS.	177.5	192.7	180.1	149.8	89.9
15	19	PREPARATIONS OF CEREALS, FLOUR, STARCH OR MILK; PASTRYCOOKS PRODUCTS.	538.4	535.0	531.2	615.9	359.3
16	20	PREPARATIONS OF VEGETABLES, FRUIT, NUTS OR OTHER PARTS OF PLANTS.	584.9	588.5	623.6	702.6	425.2
17	21	MISCELLANEOUS EDIBLE PREPARATIONS.	725.9	770.2	834.5	931.2	615.8
18	22	BEVERAGES, SPIRITS AND VINEGAR.	346.6	325.8	254.8	354.6	198.9

19	23	RESIDUES AND WASTE FROM THE FOOD INDUSTRIES; PREPARED ANIMAL FODER.	1,459.7	1,915.2	1,167.5	2,008.8	792.8
		Food Exports	35,467.9	35,302.5	32,732.0	38,314.3	24,901.7
		Processed Food Exports	5,273.9	6,389.2	6,264.0	8,543.1	5,183.4
		%share of Processed Food in Food Exports	14.9%	18.1%	19.1%	22.3%	20.8%
		India's Total Export	303,526.2	330,078.1	313,361.0	291,163.5	233,912.6
		%share of Food Exports in Overall Exports	11.7%	10.7%	10.4%	13.2%	10.6%

Source MOFPI Annual report 2021-2022

According to the report of Food and Agriculture Organization of United Nation (FAO) 2021, Asia constitutes 8.2% of world's total percentage of undernourishment of which India constitutes 15.3% of Asia's total percentage of undernourishment.

Graph1: Global Hunger Index Score Trend for India



Source: Global Hunger Index Report, concern worldwide and Welt Hunger Hilfe

There are multiple forms of malnutrition and Undernourishment, a measure of inability to access minimum nutrition requirement expressed in terms of daily calories intake, is one of the most serious health problems affecting the Indian population as per the report of NFHS [Achieving Nutritional Security in India: Vision 2030] The above said health problem have now become a social problem questioning India's Production capacity and Export as a leading pioneer in agricultural and cultivable products due to its rich diversity, Climate and geographical strata.

An increasing number of people across all population groups including children below 5 years of age, adolescent girls and boys, pregnant women are being affected by Malnutrition (Anaemia) as per the findings of the fifth round of National Family Health Survey (NFHS-5, 2019-21) According to the survey report, at least 67 per cent children (6-59 months) have anaemia as compared to 58.6 per cent in the last

survey conducted in 2015-16. Among adults, 57 per cent of women and 25 percent of men (in the 15-49 group) have anaemia, in India which reflects the Nutritional imbalance in the country. The intensification of the major drivers behind recent food insecurity and malnutrition trends (i.e., conflict, climate extremes and economic shocks) combined with the high cost of nutritious foods and growing inequalities will continue to challenge food security and nutrition.(Table 3)

Table 3: Anaemia Prevalence in India

S.No	Category	Percentage of Anemia prevalence (%)	
		2019 - 2021	2015 - 2016
1.	Children 6 - 59 months	67	58.6
2.	Adolescent girls 15 - 19 years	59	54.1
3.	Adolescent boys 15 - 19 years	31	29
4.	Women of reproductive age 15 - 49 years	57	53
5.	Pregnant women	52	50
6.	Lactating women	57	53
7.	Men 15 - 49 years	25	22

Source: National Family Health Survey (NFHS - 5) 2019 - 2021 and National Family Health Survey (NFHS - 4) 2015 - 2016.

FSSAI (Food safety and Standards Authority of India) the food Regulator addresses these issues by Science based standard and its applicability by increasing the role of Food Scientist and the role of Engineers and Technologists. On the other side the level of awareness and education that need to be compensated with competency and capacity building to combat this is to gear up production by Sustainable growth and addressing the Nutritional security by various initiatives . FSSAI brings newer initiatives that works in the level of citizens gearing up awareness and knowledge of food safety, food hygiene, eating healthy and eating sustainable. The awareness drives are not only to the citizens but also equally to every Food processing industry at various levels of the business

Acknowledging the current recessionary context, of food security and nutrition situation of our country, which makes it even more challenging for many governments to increase their budgets to invest in the Agri food systems transformation. Hence, lets takes a deep dive into how governments are supporting the food and agriculture sector through policies and strategies, based on evidence and recommendations to increase the food security of the country

STRATEGIES AND INITIATIVES IMPLEMENTED BY GOVERNMENT:

Pradhan Mantri Kisan SAMPADA Yojana (PMKSY). The yojana was launched on 3rd May, 2017 under the Ministry of Food Processing Industries (MoFPI) to promote the growth of food processing sector. Schemes under PMKSY are launch of Mega Food Parks, Integrated Cold Chain and Value Addition Infrastructures, Creation/Expansion of Food Processing & Preservation Capacities (Unit Scheme), Creation of Infrastructure for Agro-Processing Clusters, Creation of Backward and Forward Linkages, Food Safety and Quality Assurance Infrastructure, Human Resources and Institutions, Operation Greens

The second scheme is *PM Formalisation of Micro food processing Enterprises (PMFME)* Scheme. The scheme was Approved on 20 May 2020 under the Ministry of Food Processing Industries (MoFPI). It Provides financial and technical support for improvisation of existing micro food processing enterprises.

Production Linked Incentive Scheme for Food Processing Industry (PLISFPI). Incentives and supports offered by the government to support and enhance Indian food products in the international markets. And to encourage and increase Exports of food products.

Government is also rethinking better solutions and ways to reallocate their existing public budgets to increase food security and nutritional security to the country by reducing the cost of nutritious food and increasing the availability and affordability of healthy diets sustainably and leaving no one behind.

Moreover by promoting safe and healthy habits throughout the creation of community awareness at the gross root level and reenergising the food safety ecosystem across the country through initiatives of FSSAI is the next important strategy to promote sustainable growth. Along with its regulatory outlook, FSSAI also trusts on self compliance of the regulation which makes everyone responsible for the growth of India.

In convergence with governments ongoing effort to improve public health and nutritional security schemes promotive health care and flagship programmes such as Poshan Abhiyan, Anemia Mukta Bharat, Ayushman Bharat yojana, Swachh Bharat Abhiyan have played the Food Processing sector in high growth trajectory. FSSAI also has started the Eat Right India Movement taking its pace and emergence to spread the message of safe, healthy, and sustainable food in India. Eat Right India adopts an integrative or 'whole of the government' approach since the movement brings together food-related mandates of the agriculture, health, environment and other ministries and all stakeholders to a common platform aligned to the national health policy 2017.

FSSAI has signed an MoU with food processing ministry to support micro-level food entrepreneurs and Farmer Producer Organizations (FPOs). The MoU, signed on October 2022, also aims to support Self Help Groups (SHGs) and producer's cooperatives to improve the standard of their food businesses.

To address the anaemic condition in the country FSSAI has adopted *Fortification of Rice, atta, milk, oil, and salt* by notifying Food Safety and Standards (Fortification of Foods) Regulations, 2018. This is implemented in large scale pan India by creating awareness to the processing sectors as well to the consumers giving a great solution for the nutritional insecurity.

GOVERNMENT INITIATIVES



Further Eat Right initiatives are designed to build capacities of food sectors on food safety, Hygiene and sustainability by training and certifying employees as Food Safety Supervisors by FoSTaC certification initiative. Food handlers of food processing units will be provided training on understanding of good hygiene, food testing process and other regulatory requirements. On successful completion of training, the food handlers will be provided 'Food Safety Supervisor' certificate by FSSAI.

Several benchmarking and certification schemes of FSSAI are also implemented to improve food safety and hygiene standards at various places giving a consumer level approach. Clean Street Food Hub, Clean and Fresh Fruit and Vegetable Markets, Eat Right Station and BHOG (Blissful Hygienic Offering to God)

improves the standards quality and availability of food in food hubs, market places, railway stations and Temples in a structural designed manner complying the Regulations.

The growth of Food processing sector in terms of production, consumption, export and Growth prospects are remarkable with the government accordance prioritising with a number of reliefs schemes incentives and initiatives to encourage commercialisation and value addition to the agricultural products. Food processing sector has ample opportunities to prosper in future years ahead.

The imperative need today is to unleash the power of food processing industry in more sustainable way and reap fruits by bringing about the much-needed food and nutritional security in India to witness the bloom of the era.

SUSTAINABLE GROWTH OF FOOD PROCESSING SECTOR FOR FOOD AND NUTRITIONAL SECURITY

Mrs. Preetha Palanisamy,
Regulatory Affairs Manager,
Symrise Pvt. Ltd., Chennai.

Food security exists when “all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life”.

Nutrition security “exists when secure access to an appropriately nutritious diet is coupled with a sanitary environment, adequate health services and care, in order to ensure a healthy and active life”

[\(FAO, IFAD, & WFP, 2015\)](#)

Introduction

Food and nutrition security, a major global challenge, relies on the adequate supply of safe, affordable, and nutritious fresh and processed foods to all people. The challenge of supplying healthy diets to 9 billion people in 2050 will in part be met through increase in food production. Food processing has a crucial role in achieving food and nutrition security wherein reducing the food losses is an important strategy to maximize efficiency in using the resource. A balanced approach to both energy and nutrient content of foods is required.

However, reducing food losses throughout the supply chain from production to consumption and sustainable enhancements in preservation, nutrient content, safety, and shelf life of foods, enabled by food processing will also be essential. Healthy diets which meet consumer expectations produced from resilient and sustainable agrifood systems need to be delivered in a changing world with diminishing natural resources. An integrated multi-sectoral approach across the whole food supply chain is required to address global food and nutrition insecurity.

- About 795 million people in the world were undernourished in 2014–16 (FAO et al., 2015) while more than 2 billion people were overweight or obese in 2013 (Ng et al., 2014).
- To be able to feed the world population that is expected to increase from 7.3 billion today to 9 billion in 2050, an increase in agricultural productivity by 30–40% is required by 2050 just to meet the dietary energy needs.
- The energy gap can be addressed by reducing demand, lessening the current level of food waste, or increasing food production (Keating, Herrero, Carberry, Gardner, & Cole, 2014).

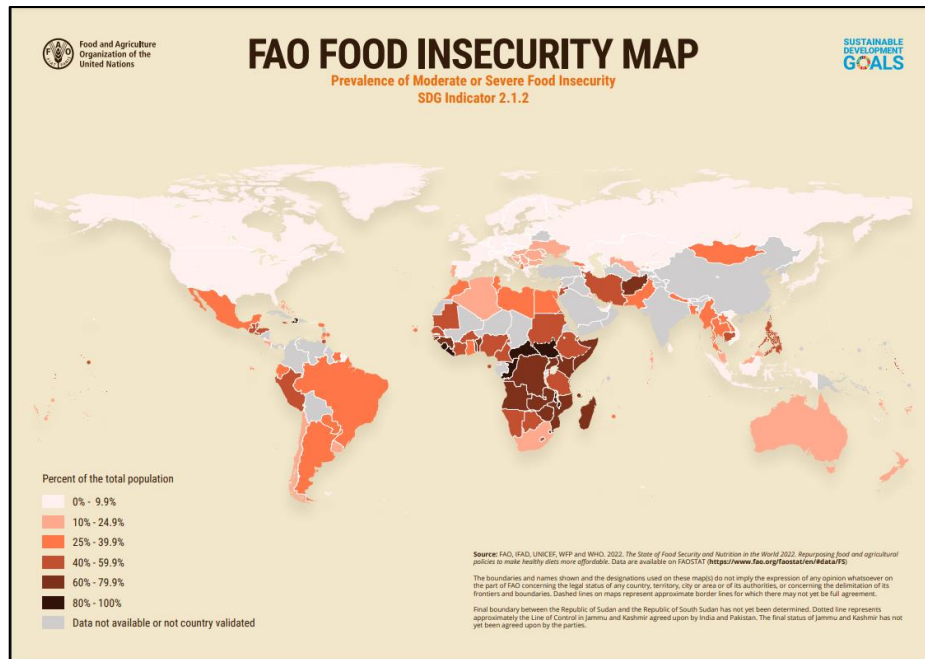


Figure 1: Source- FAO: Latest issue: *The State of Food Security and Nutrition in the World 2022*

Reducing the prevalence of food insecurity today and in future will require technological solutions through collaborative efforts across agriculture, food, nutrition, and health that are acceptable to society. Many considerations need to be factored into a discussion of food and nutrition security, which include effective distribution channels between where food is produced and required, the differing food regulations in various regions, the role of indigenous foods, religion and culture, urbanisation, biodiversity, and climate change (Burlingame and Dernini, 2012, Muchenje and Mukumbo, 2015, Rolle, 2011).

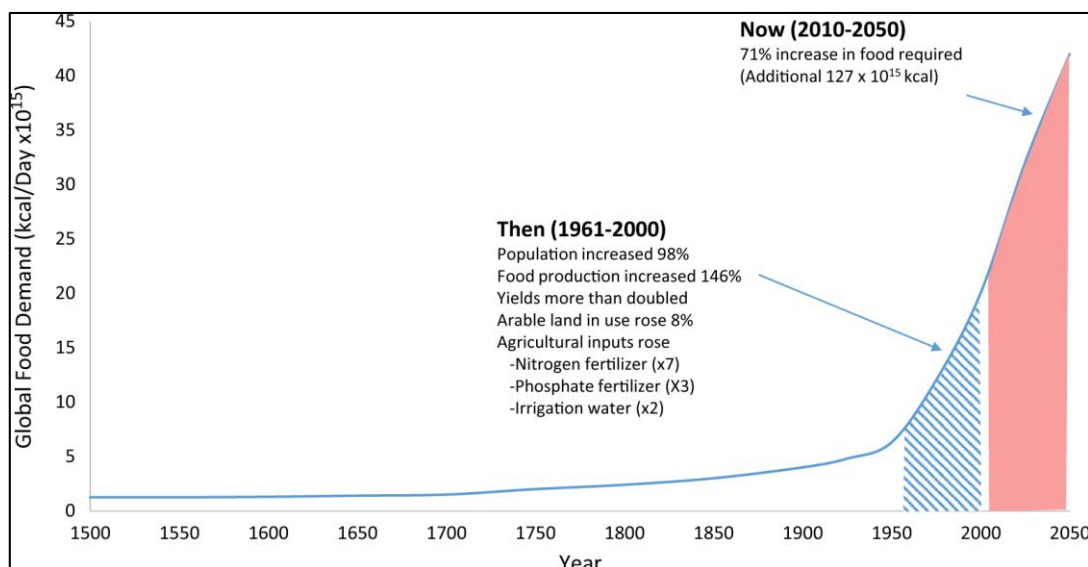


Figure 2: Framing the food security challenge (adapted from Keating et al. 2014; Keating and Carberry, 2010)

Sustainable Food Processing

Sustainable food production is “a method of production using processes and systems that are non-polluting, conserve non-renewable energy and natural resources, are economically efficient, are safe for workers, communities and consumers, and do not compromise the needs of future generations”

The goal of sustainable food production is to meet society's food needs in the present without compromising the ability of future generations to meet their own needs. Sustainable foods satisfy human nutritional needs while limiting impacts on the environment.

Generally, this means favouring vegetables over meat, locally produced options over those that are transported from far away and selecting foods that help enhance the environment during their production.

Different aspects on how we have evolved from traditional to emerging techniques in food processing sector.

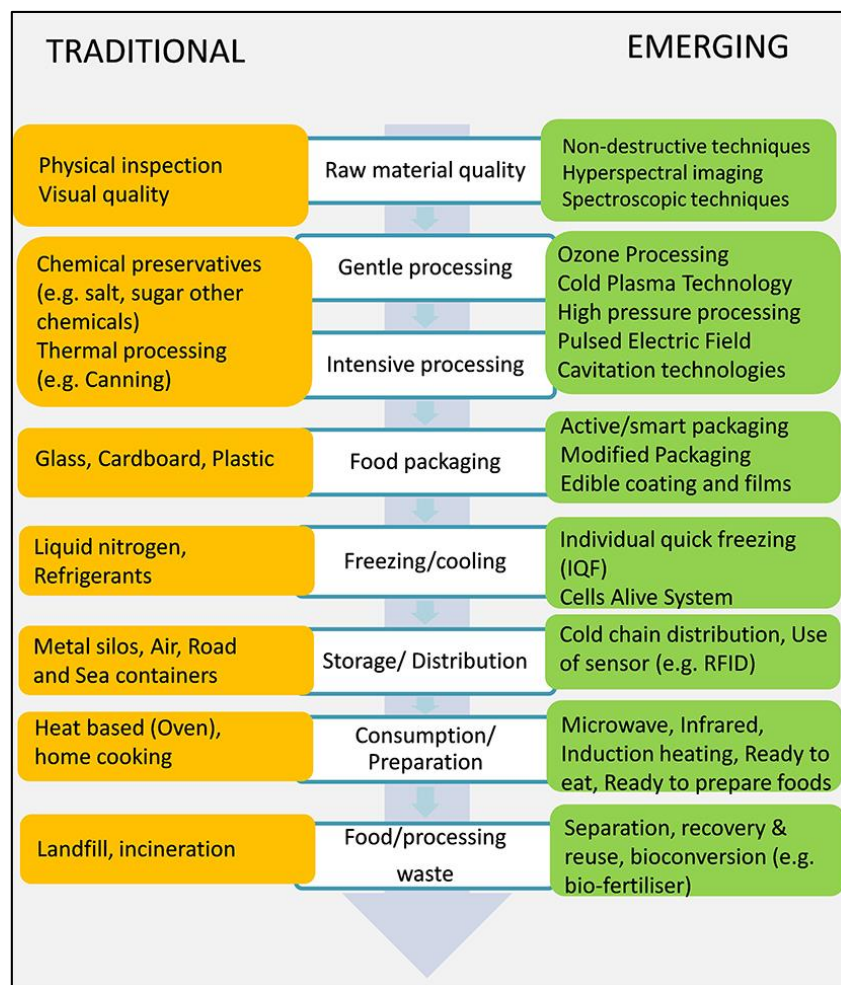


Figure 3: Traditional and emerging technologies and approaches used along the food chain

Sustainable food production also necessitates the development of sustainable food value chains in order to offer innovative pathways out of poverty, e.g., by local value addition through local processing, and by linking farmers directly to higher-value export markets.

Food waste reduction represents an important but often overlooked component of sustainable food systems. Globally, up to 33% of all food harvested is wasted. Addressing food waste offers a major opportunity to improve food security and minimize the environmental footprint of agricultural systems throughout the supply chain.

Food & Nutritional Security

The four pillars of food security are: food availability, access to food, utilization, and stability. The nutritional dimension is integral to the concept of food security.



Figure 4: Dimensions/Pillars of Food Security

Threats to Global Food Security

1. Climate Change and Environmental Shocks

The climate crisis is changing weather patterns and increasing the chances of extreme events such as hurricanes, floods, and droughts. It is also responsible for changing and polluting entire ecosystems, compromising biodiversity, and destroying harvests. All these events have a huge impact on food production, as they significantly limit the quality, availability, and accessibility of resources, and compromise the stability of food systems around the world.

According to a new NASA study, maize (corn) crops are among the most threatened under a high greenhouse gas emissions scenario. If countries do not manage to drastically reduce their carbon footprint, maize crop yields are projected to decline by about 24% by 2030, with severe implications worldwide. Global warming is also responsible for droughts and catastrophic wildfires, both of which represent a risk to global food security as they destroy agricultural land and reduce the availability of water, a crucial resource to keep extensive irrigated agriculture going.

2. Population Increase and the Modern Food System

By 2050, estimates predict that the total number of people living on Earth will reach nearly 10 billion. More people on the planet means more mouths to feed and this can put a strain on its resources as the modern agricultural system is already struggling to meet global needs. According to the 2020 IPCC Special Report on climate change, since 1961, food supply per capita has grown more than 30%. As a consequence of this, the use of nitrogen fertilisers and water needed to boost agricultural production have increased by a staggering 800% and 100% respectively.

The rise in demand has turned the global food chain into a machine designed first and foremost to generate capital. Looking into the modern food system, it becomes clear that food insecurity is in part a by-product of it rather than an inevitable consequence of population growth. The biggest and most worrisome problem is related to food waste. Roughly one-third of the total food produced for human consumption every year – around 1.3 billion tons valued at nearly USD\$1 trillion – is wasted or lost. This quantity would be enough to feed 3 billion people or nearly 40% of the global population.

At the same time, producing all this food that remains uneaten represents a waste of one-quarter of our water supply, enough to be used by 9 billion people at around 200 litres per person every day. This data goes to show that rather than a problem of supply and demand, the world is currently facing an issue with the unequal production and distribution of food, the victims of which are, for the largest part, those living in developing countries. These losses in precious resources, therefore, exacerbate climate change without improving food security or nutrition.

3. Disruptions in the Food Chain

Two recent catastrophic events have heavily compromised the global food chain, sparking changes in consumers' demand, leading to the sudden closure of food production facilities, restricting food trade policies, and adding financial

pressure on the food system. Combined, these factors have led to shortages of food supplies and an increase in the number of people facing hunger and malnutrition.

The first was the coronavirus pandemic. When COVID-19 unexpectedly hit the world in 2019, our current production and distribution systems were not prepared for what was about to happen. The pandemic has sparked not only a health crisis but also an economic crisis. Together, they pose a serious threat to global food security.

Another more recent event that has raised questions over global food security is the war in Ukraine. Armed conflicts are one of the leading causes of hunger globally. At first, they lead to immediate food shortages in the countries directly involved in the conflict. However, the effects of wars on the food chain are eventually felt on a larger scale.

Ways to integrate Food Security and Nutrition

I. To reduce the food production demand

a. Reducing food waste from farm to consumer

Reducing food waste from farm to consumer. Reducing food wastage, which comprises food loss and food waste, and capturing more of the food that is produced for human consumption is an obvious opportunity to increase food security without increasing the environmental burden of production. Food loss is the decrease in edible food mass, which occurs at production, postharvest and processing stages in the food supply chain, while food waste refers to what is lost at retail and by consumers.

Recovering food loss and waste is a huge opportunity to reduce production demand, given that about 1.6 billion tonnes of food is wasted along the chain and of this 1.3 billion is edible. The relative amounts of food loss and food waste in various regions vary. Food loss is the major contributor to food wastage in developing countries. This contrasts with developed countries where waste primarily occurs at the retail and consumer end of the food supply chain.

Tools to achieve this goal:

- Food science and technology- Food preservation and stabilisation technologies to extend shelf life of products
- Good post-harvest handling practices from farm to retail, including supporting logistics and infrastructure, can mitigate against the loss of fresh produce
- In terms of processing, new extraction technologies such as ultrasound can improve the recovery of oil from biomass. Natural preservation through

fermentation and separation technologies, such as forward osmosis, offer the potential to create new value-added food ingredients and bio actives from food loss and food waste.

- Food banks have been set up in various countries to rescue and redistribute nutritious foods to vulnerable groups. These initiatives reduce food waste, whilst alleviating food insecurity.
- However, there may be competing interests with various players along the chain who wish to address economic, environmental, and social impacts of food wastage.
- A holistic approach taking into consideration multi-stakeholder perspectives is required to ensure sustainable production and consumption and a win-win solution for all.

b. Reducing over consumption in human diets

The food wedge framework considered the future food demand in terms of calories to simplify and communicate the likely stabilisations that would be required. New metrics based on 'nutritional yield' have been proposed to replace 'tonne/ hectare yield' to consider the importance of demand for nutritious food for sustainable agricultural intensification. Ironically, small farms that offer more nutritional diversity may not be in position to afford the new technologies, such as hybrid seeds and genetically modified organisms (GMOs), needed to support intensification.

Nutritional food security is complicated by the fact that we need to increase the amount of available food; but at the same time there are over 2 billion people who are obese or overweight. Reducing over consumption in this population represents a significant opportunity to increase food security without having a negative impact on the environment, and at the same time reducing the impacts of the global health burden due to poor diets.

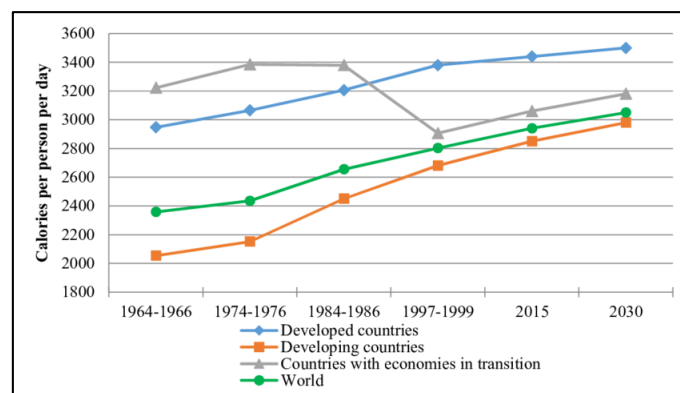


Figure 5: The depth of the food shortage in the world (Compiled by the authors based on (Kopteva, Smolnitskaya, 2019

However, whilst healthy foods and information may be made available to consumers to make informed choices about food, they may not always make healthy food choices. What consumers eat is governed by a complex interplay of other factors including appetitive behaviors controlled by neural circuits and hormones, cognitive factors, sensory properties and the feelings of satiety and satiation that the food offers. An integrated transdisciplinary approach is required to design culturally acceptable foods and optimize healthy food choices for various ethnic populations and religious groups (e.g., Halal and Kosher foods).

c. Rebalancing the livestock component of future diet

The changing dietary patterns and the rise of the middle class have increased the demand for animal products. However, the carrying capacity of land for different diets varies, with it being generally higher for diets with less meat. The shifting consumption patterns towards lower meat consumption, observed in some developed countries, is a strategy to reduce loss of biodiversity and to offset the effects of climate change.

However, In-vitro cultured meat may be technically feasible to produce but production is currently cost prohibitive. In addition, the technology faces challenges in overcoming consumers' willingness to try.

d. Developing 'smart' biofuel policies and/or technologies

Moving away from first generation biofuels that use highly arable land (i.e., feedstocks such as corn, sugarcane) to second generation biofuels from marginal land or waste (i.e., cellulosic material) may alleviate some of the tension between food or fuel use. The issues between land, food, and energy and the multiple end-use of crops make it greater than just the food versus fuel debate, as their interdependencies should be considered when framing land use change policies. New technologies may offer the potential to produce biofuels from the non-edible parts of plants. Plants do not usually produce oils to any significant levels in their leaf tissues. New technology allows plants to produce significant levels of oil in their leaves, which may offer a new high yielding.

II. To increase food production

a. Expanding the land resources used for agricultural production

Given that options for unlocking new arable land are limited it is critical that when opening new land there must be the accompanying infrastructure (e.g., for capturing and storing the rainfall) to avoid its loss through transpiration from the soil. It is also necessary to consider the significant drop in the water table over the

years which results in degradation of the productive environment. Both the removal of forest due to urbanisation and climate change affect land surface evapotranspiration, with climate change having the greater effect than change in land cover usage.

b. Expanding the water resources used for agricultural irrigation

Water security is becoming a global issue. Better forecasting of soil moisture and requirement of crops for water and efficient use of irrigation water may be achieved by combining weather predictions and hydrological modelling, supported by data using new technologies for environmental monitoring and Earth observations from space. Real-time irrigation smartphone apps and soil water sensors are also becoming more available to provide advice for optimal irrigation scheduling. These developments are a step towards precision irrigation to conserve water and maximise water use efficiency.

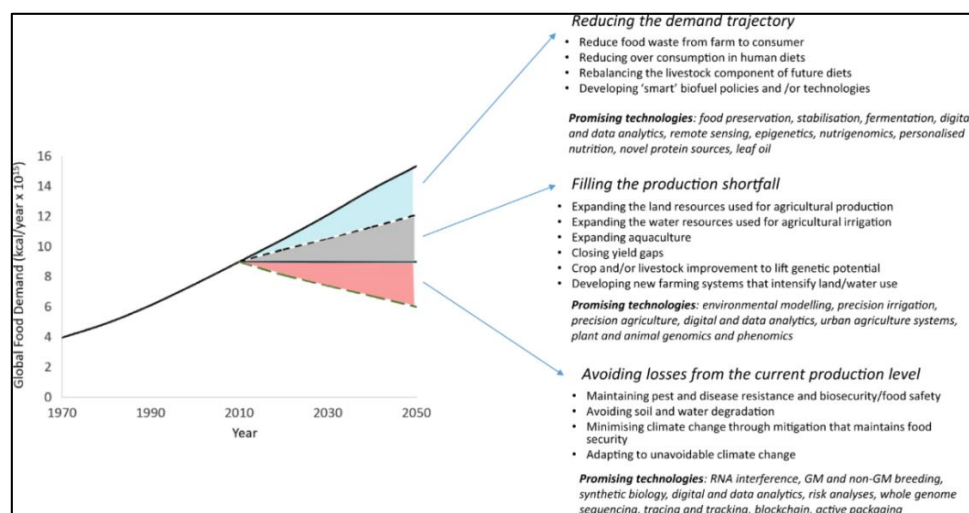


Figure 6: Food wedges framework linking food demand to likely stabilization and promising technologies (Adapted from Keating et al. 2014)

Other major ways to increase food production

1. Expanding aquaculture
2. Closing yield gaps in existing crop and livestock production systems - Advances in digital technologies are enabling precision agriculture that will integrate controlled release fertilisers, pest and weed management, new crop and animal genotypes, soil amelioration techniques and weather and climate forecasting.
3. Crop and/or livestock improvement to lift genetic potential.

III. To avoid losses of future production potential

a. Maintaining pest and disease resistance and biosecurity/food safety

Weeds, pests, and diseases cause major losses to current agricultural production systems. Pests and pathogens of crops and livestock are continually evolving, and ongoing protection programs are necessary to both maintain current productivity as well as securing further gains. There is pressure to reduce the use of chemical herbicides, pesticides and antimicrobials in agriculture and alternative technologies are needed. The use of genetic approaches such as selective breeding, hybrid seeds and the addition of exogenous genes via genetic modification has been extremely important in increasing yields and reducing chemical inputs in several farming systems (e.g., Bt cotton and maize crops). Similarly, novel disease resistance strategies include the cloning and introduction of durable genes and their transfer into other crops to obtain broad resistance, and gene editing to alter susceptibility genes.

The global food supply chain is extremely complex, and many biosecurity issues are also food safety issues. With a large proportion of emerging human infectious diseases originating from animal sources there is an increasing need to consider both animal and human health as a 'one health' issue. Biosecurity and food safety issues may cause a disruption to the food supply chain through direct public health impacts, through recalls or even market 'avoidance' of particular trading areas due to real or perceived public health concerns.

In an environment of global interdependence in food safety, countries cannot solely rely upon their own food safety managements systems, and it is therefore essential that food safety standards are universally based on sound scientific principles and focus regulatory efforts on genuine public health risks.

Regulatory efforts have become focused on the use of risk assessment tools to drive food safety policy and standards away from prescriptive to outcome-based control measures. New risk management approaches have been developed that are based on concepts such as of Food Safety Objectives and Performance Objectives.

These approaches enable the food industry to meet specific objectives through the application of the principles of Good Hygienic Practice (GHP) and Hazard Analysis Critical Control Point (HACCP). This modern approach to assuring the safety of the food supply provides a scientific basis that allows industry to select and implement control measures specific to its operations, and also leads to a better understanding of the role of microbiological criteria in testing. Despite the availability of food safety protocols and the stated intent of companies to implement food safety measures, there are incidences of food recalls and foodborne outbreaks.

Hence, improving food safety culture requires a high level of senior management commitment to food safety and a shared purpose in maintaining food safety standards amongst employees. The role of government and food safety audits for compliance are ingredients for reducing risks for foodborne illness.⁵⁹ Promoting good food safety culture through the supply chain should also be supported by Government initiatives at national and international levels.

b. Minimising climate change through mitigation that maintains food Security

There is currently no global target for greenhouse gas emission mitigation from agriculture. A recent analysis, for the first time, calculated that in order to limit global warming in 2100 to 2 °C above pre-industrial levels, annual emissions from the agricultural sector must be reduced by 1 gigatonne of carbon dioxide equivalents per year by 2030.

Currently available interventions, such as sustainable intensification of dairy production and alternate wetting and drying in irrigated rice, to achieve emission efficiencies will be necessary. Yet these are insufficient, to achieve these targets. There is a need to develop and implement transformative technical options, such as methane inhibitors in the livestock sector, nitrogen inhibitors in annual crops, and innovative policies to promote sequestering soil carbon.

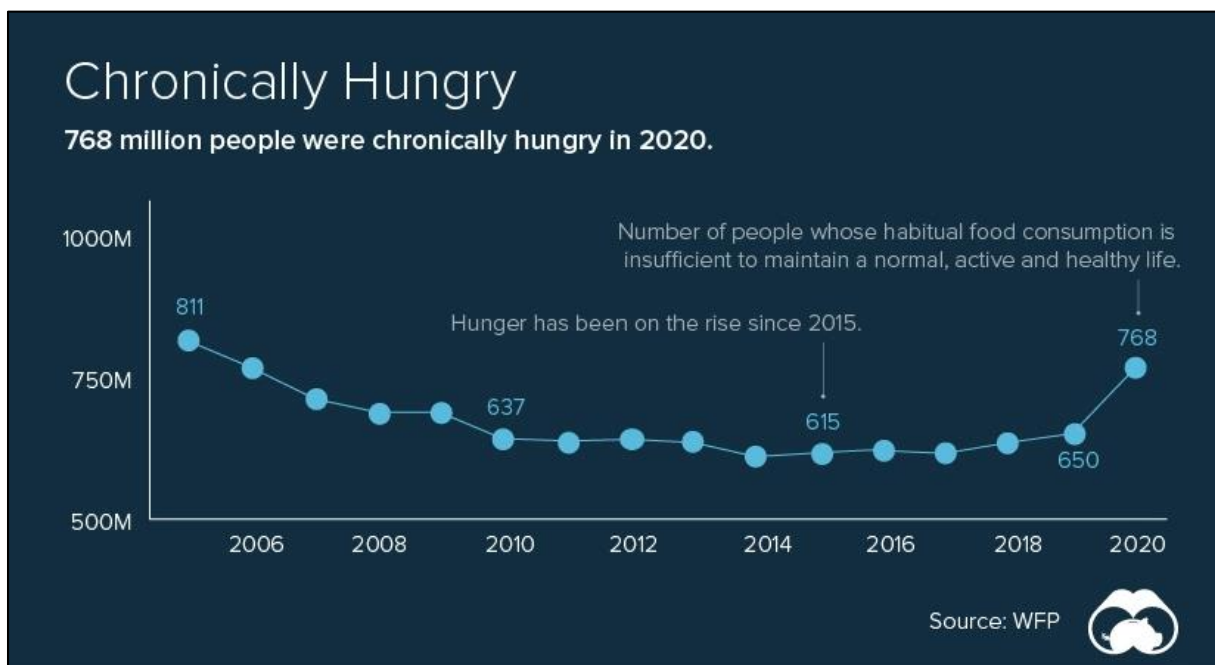


Figure 7: World Food Programme- Hunger Map

Conclusion

For a resource constrained world, it is essential to have a balanced approach to both energy and nutrient content of foods. Environmental sustainability is critical and both the agrifood production and the food processing sectors will be challenged to use less resources to produce greater quantities of existing foods and develop innovative new foods that are nutritionally appropriate for the promotion of health and well-being, have long shelf lives and are conveniently transportable. Healthy diets which meet consumer expectations produced from resilient and sustainable agrifood systems need to be delivered in a changing world with diminishing natural resources. An integrated multi-sectoral approach across the whole food supply chain is required to address global food and nutrition insecurity.

Nutrition security exists when secure access to an appropriately nutritious diet is coupled with a sanitary environment, adequate health services and care, in order to ensure a healthy and active life” ([FAO, IFAD, & WFP, 2015](#)).

The H₂O Footprint in Agricultural Crop Production – Eating Water Up

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“When the well is dry, we learn the value of water”

-Benjamin Franklin

Introduction

Global food security is a prerequisite for sustainable development. The Food and Agricultural Organization has projected an annual growth of agricultural demand by 1.1% for the period 2005–2050. Population growth, rising per capita consumption, and changing diets have led to a larger demand for agricultural products and rising crop production. This can be achieved by expanding croplands, improving crop yields, and double cropping. Freshwater is essential for agriculture. Expanding crop production implies the increase in the use of water, land, fertilizers, pesticides, energy, human labor, and financial investments. Often, water is a limiting factor for crop growth as is demonstrated by the dominant position of agriculture in global freshwater use. Water productivity and consequent water scarcity are key factors that may threaten sustainable social and environmental development, and, ultimately food security in arid areas.

The Concept of Water Footprint

The concept of a water-footprint was first introduced in 2002 as an analogue to the ecological and carbon footprint of an individual or a commodity. The concept of the water footprint has been developed to create an indicator of water use in relation to the consumption by people. The water footprint of a country is defined as the volume of water needed for the production of the goods and services consumed by the inhabitants of the country. The water footprint is an indicator of freshwater use that looks not only at the direct water use of a consumer or producer, but also at the indirect water use. The water footprint of a product comprises three color-coded components, which are green water (water evaporated from soil moisture supplemented by rainfall), blue water (water withdrawn from ground or surface water sources), and grey water (the polluted volume of blue water returned after production).

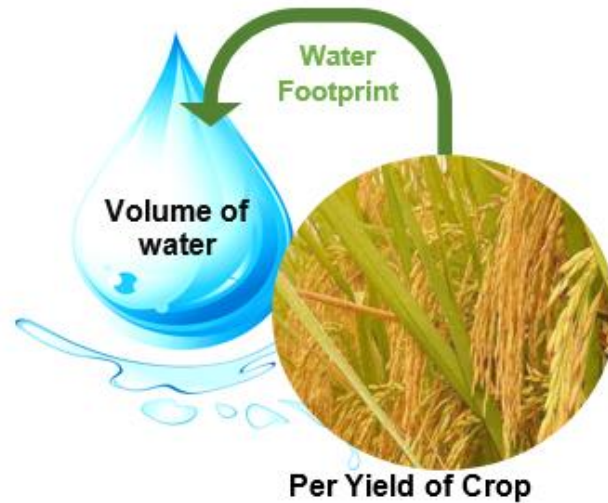


Fig. Water Footprint

Green water is the rainfall directly utilized by food crops or the plants and grasses that feed grazing animals. The more familiar blue water includes lakes, rivers, and aquifers that serve as sources for domestic, industrial, and irrigated agriculture use. The utilization of blue water for agriculture generally results in greater environmental impacts than does green water and the former is often a limited resource. Finally, grey water represents the volume required to dilute contaminants produced primarily by agriculture and industry to concentrations that meet water quality standards for human health or the environment.




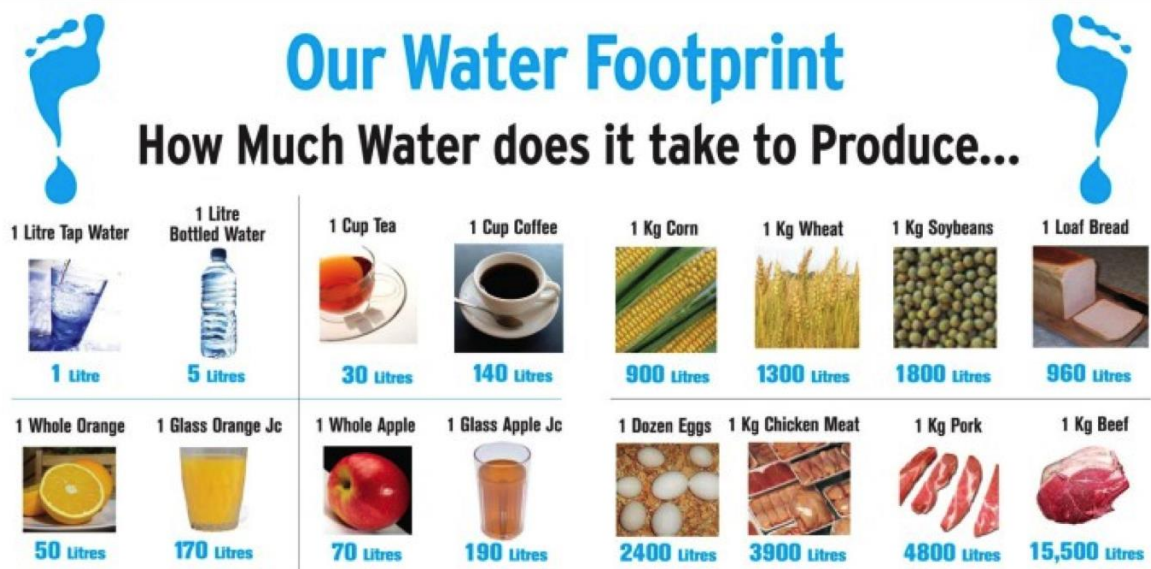
		
<i>Blue water footprint</i>	<i>Green water footprint</i>	<i>Gray water footprint</i>
<p>Water consumed from surface water (lakes and streams) and groundwater</p>	<p>Water consumed from rainwater insofar it doesn't become runoff</p>	<p>Water needed to dilute pollutants down to safe concentrations</p>
		

Fig. Blue, Green and Grey Water Footprint

The Relationship between Food and Water Footprint

All foods have a water footprint. How big this footprint is, however, differs drastically depending on the number and variety of processes involved in getting that food from farm to plate. Crops, for example, like all living things, require water to survive. Whilst rainfall provides a large proportion of this, rainwater alone is typically insufficient. Farmers therefore rely on other means such as irrigation or abstraction, where water is removed from rivers, lakes or groundwaters to supplement natural water supplies.

When it comes to animal products, however, there are a whole host of additional water-heavy processes to take into consideration. Just like plants, animals need to drink water to live and grow, but on top of that they require feeding, cooling and washing, as well as the maintenance of yards, parlours and abattoirs, all of which adds to the final footprint. As a result, almost all animal-based products have a higher water footprint than their plant-based counterparts.



Methods to Reduce Water Footprint of Agricultural Crops

1. Drip Irrigation:

These irrigation systems deliver water directly to the roots of plants. This reduces water evaporation that happens due to Spray Watering Systems. They also carry fertilizers directly to the roots of plants resulting in better absorption. You can even schedule watering timings using timers. This will further reduce water loss. Drip irrigation systems are so effective that they can save around 80% of water while also increasing crop yields.



2. Rainwater Harvesting:

The importance of rainwater is critical for global agricultural practices. In times of drought and low rainfall, conserved rainwater can be used for increasing yields. By planting pits or building your own ponds and then adding organic materials into them, you can hold the captured rainwater for much longer. Properly managed pits and ponds can help in storing and using the rainwater throughout the year.



3. Use Cover Crops:

These types of crops are planted to protect the soil as soil health is critical for water conservation. Cover crops help in increasing soil fertility and prevent soil erosion. These practices help in keeping water and nutrients in the soil. This allows much easier water penetration into the soil and also improves its water holding capacity. In addition to this, you can plant trees and do inter-cropping on your farm for its diversification and maximum yields.



4. Schedule Irrigation:

It is essential to know about your crops and when and how much should be used for them. For avoiding the problem of over and under watering the crops, you can monitor plant and soil moisture. Then you can adapt your irrigation scheduling according to current conditions. There are various sensors in the market that are low in cost and have really long battery lives, they will make the process much easier by telling you about soil moisture and its temperature. You can then plan on how, when, and if to water.

5. Choose Drought Tolerant Crops:

All the crops you choose to grow should be ideal for your local climate. These crops have a better chance to survive in natural weather conditions in your region easily. Various crop varieties have been shortlisted over time for their low water tolerance. They can help cut down on watering. This is another way you can get more yields in drought or low rainfall times.

6. Crops Rotation:

This is a common but effective practice. Many farmers do crop rotation around the year. This increases soil fertility and increases soil water absorption. This helps in maintaining soil moisture and makes it more drought resistant.

7. Maintain Soil Quality:

Higher quality of soil ensures a better ability to hold moisture and oxygen for crops, thus reducing the amount of water needed on regular basis. For fertilizing compost or decomposed organic matter can be used. Mulch can also be used to spread on top of the soil to conserve moisture.

8. Going Organ :

Organic methods help in retaining soil moisture, and save water streams and water bodies from pesticides. Furthermore, organically grown crops produce better yields than non-organic in drought conditions.

9. Sustainable Farming

Given all the water requirements of agriculture, there are more sustainable farming methods that strive to take water conservation into account, which can make farms more resilient to water issues like drought and competition for water resources. Regenerative agriculture, permaculture and organic farming aim to use resources wisely to improve the quality and productivity of soil so that it retains moisture, minimizing the need for excessive irrigation. Recent technological advances in hydroponic, aquaponic, aeroponic and vertical farming make it possible to grow produce very efficiently, minimizing water use in a variety of locations. While no one farming method is perfect, they all can work together to create local and regional food systems that build agricultural resilience.



Conclusion Remarks

With the current water productivity in India and the food demand scenario for the year 2050, it seems inevitable for India to become an importer of virtual water. This is because the average (utilizable) water availability per capita in India will drop below the minimum amount of water needed to feed a person in the near future. This means that water scarcity is not only a local problem in India but also a national problem. The concept of the water footprint may also help policy makers make rational policies for water-resources management.

PROSPECTS OF FOOD PROCESSING INDUSTRIES IN INDIA

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Food processing sector has essential role in linking Indian farmers to consumers in the both domestic and international markets. The Ministry of Food Processing Industries (MoFPI) is making all efforts to encourage investments across the value chain. The food processing industry has a share of 12.38% (at 3-digit of NIC classification) in the employment generated in all Registered Factory sector engaging approximately 1.93 Mn people. Unregistered food processing sector supports employment to 5.1 Mn workers as per the NSSO 73rd Round report. Major sectors constituting the food processing industry in India are grains, sugar, edible oils, beverages, and dairy products.

India has totally 40,581 registered food processing industry (2018-2019) as per the Annual Survey of Industries. As per Annual Survey of Industries (2018-19) among the industry, highest numbers of registered factories are located in Andhra Pradesh (13.93% of the total registered factories in FPI sector industries) followed by Tamil Nadu (12.28%) 'Telangana (9.61%), Punjab (7.67%) and Maharashtra (6.88%). India exports about US \$ 38.32 Billion accounting for about 13.2 per cent of India's total exports (total exports US \$ 291.17 Billion) and imports about US \$ 20.99 Billion which was 5.3 per cent of India's total imports (total imports US \$ 393.61 Billion) of food product during 2020- 21. Under PMKSY, 41 Mega Food Parks, 348 Cold Chain projects, 68 Agro-Processing Clusters, 281 proposals under Creation/Expansion of Food Processing & Preservation Capacities (CEFPPC), 61 Creation of Backward and Forward Linkages Projects & 06 Operation Green projects across the country have been approved. The key sub-segments of the Food Processing industry in India are Fruits & Vegetables, Poultry & Meat processing, Fisheries, Food retail, dairy industry, etc.

Need for Food Processing

In the recent past, there is an upward trend for more fresh and processed foods in urban India. Food habits among consumers particularly in metros and cities are also changing phenomenally and there has been a greater consumer demand for convenience foods that are appealingly packaged. Rising incomes, more women in the work place and changes in lifestyles have also brought about momentous shifts in the dietary patterns and life styles of the people. Consumption of non-traditional fast foods and street foods are increasingly growing even among non-urban consumers. The institutional (hotels, airlines, hospitals and defence services) and

tourism sectors are also rapidly growing, with marked increases in international, domestic, business and leisure travel. India has the capacity to produce a varied set of agricultural and horticultural commodities due to diversified agro-ecological situations. It is expected that the food production will also get doubled in the next decade due to innovative farm technologies, input management practices etc. and the consumption of value added food products is also projected to grow at a faster rate. Hence it is obvious that the growth of the food processing industry will also bring immense benefits to the economy in terms of generating employment, income, food security and raising standards of living of a very large number of people throughout the country, especially in the rural areas. Trade liberalization and enhanced consumer prosperity have already created new opportunities for diversification in food processing sector.

Stages of Food Processing

Food processing includes (i) **Manufactured Processes:** If any raw product of agriculture, animal husbandry or fishing is transformed through a process (involving employees, power, machines or money) in such a way that its original physical properties undergo a change and if the transformed product is edible and has commercial value, then it comes within the domain of Food Processing Industries. (ii) **Other Value-Added Processes:** If there is significant value addition (increased shelf life, shelled and ready for consumption etc.) such produce also comes under food processing, even if it does not undergo manufacturing processes.

From an analytical perspective, food processing can be viewed as different levels of processing –primary, secondary and tertiary. Primary Processing relates to conversion of raw agricultural produce, milk, meat and fish into a commodity that is fit for human consumption. It involves steps such as cleaning, grading, sorting, packing etc. Food Processing Industries usually deal with higher levels of processing where new or higher value food products are manufactured. Food processing could strengthen the link between agriculture and industry and help in generating farm income and employment as also in reducing wastage of agricultural products. A strong database is required for pursuing a policy towards this end.

Status of Food Processing Industry in India

Fruits and vegetable processing: India is the world's second largest producer of fruits and vegetables. It has potential to grow all types of temperate, sub - tropical and tropical fruits and vegetables because of varied agro - climatic diversity. The total production of fruits and vegetable is over 45 million tonnes and 85 million tonnes respectively. The losses are estimated to the extent of 20 -30 per cent due to lack of proper harvesting, processing and storage facilities, which is valued at Rs. 230 billion. Products that have growing demand, especially in the Middle East

countries include pickles, chutneys, fruit pulps, canned fruits and vegetables, concentrated pulps and juices, dehydrated vegetables and frozen fruits and vegetables. The percentage production of processed fruits and vegetables are fruit juice and fruit pulp - 27, jams and jellies - 10, pickles -12, ready to serve beverages - 13, synthetic syrups - 8, squashes - 4, tomato products - 4, canned vegetables- 4 and others -18. The number of license issued under Fruit Product Order (FPO), 1955 has increased to 5198 till 2004. But the production of processed product increased from 0.24 million tones to 1.03 million tones only, recording a growth rate of 14 per cent per annum. At rural level solar assisted dehydrators could be promoted for preparation of ethnic food products like resins, mango papad, onion flakes and powder, chips, vegetables etc.

Food grain sector: Grains could emerge as a major export earner for India in coming years. India's food grains production is now at around 225 - 230 million tones. These include rice, jowar, bajra, maize, wheat, gram and pulses. Increased export of Basmati rice has increased the foreign investment in installation of modern rice mills with hydraulic jet polishing and colour sorters that provide better quality grains. Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Bihar, West Bengal, Punjab, Haryana, Madhya Pradesh, Assam, Gujarat, Kerala have the largest number of roller flour mills. At present wheat flours made by the roller mills are sold to institutional buyers like defence, hotels etc., and the household purchase is limited to only 1.0 per cent due to absence of open policy for sale of wheat flour through public distribution system. The production of pulses in India is about 14 million tonnes. Traditional designs of dhal mills require immediate modernization as they pollute the environment with fine particles and dust besides, have low recovery Technology Mission on oilseeds has helped in increasing the oilseeds production to 24.5 million tonnes. Small capacity oil expellers have been developed which could be installed in rural areas for promoting agri - business and that might provide more employment. Soybean is not only a good source of oil but also rich in protein. India is now the fifth largest producer of soybean at a global level with production of more than 5.2 million tones: there are more than 155 solvent extraction plants for soy and 64 soy food manufacturing units. Soymilk analogues, nuggets and soy - blends are being marketed.

Processing of commercial crops: Sugarcanes, tea and coffee are major commercial crops grown in India. India exports between 150 -170 million kilograms of tea per annum. Of course, the scope of foreign investment in this sector is good and the multinational tea companies would either be trying for marketing joint ventures with the Indian producers or acquire stakes in Indian tea companies. The production of sugarcane has increased to more than 299 million tones.

Packed and convenience food: Modern packed and convenience foods such as bread, biscuit, confectionery, chocolates, ready to eat foods like noodles, cereal flakes, etc. have become popular in recent years especially in urban areas although traditional foods have been used in the country in the form of roasted, puffed, sweet meat and baked products. There are more than lakh bakeries and 20,000 traditional food units. The production of bread and biscuits has increased to 3.70 million tons / year of which about 40 per cent is produced through the organized large - scale sector and the remaining 60 per cent in the small scale and unorganized sector. About 1.15 million tonnes of biscuits are manufactured in the organized and about 0.38 million tonnes in the unorganized sector. The output of flakes has increased to 14,000 tons / year. The extruded foods are largely produced in the unorganized sector. The traditional ethnic ready to eat foods prepared in hygienic conditions and marketed with better packaging has plenty of domestic and exports market.

Fishing and Fish Processing: With its long coast line of over 8000 km, 50600 sq. km of continental shelf area and 2.2 million sq. km. of exclusive economic zones, India is endowed with rich fishery resources. It is the largest producer of fish and the second largest producer of inland fish. It contributes around US \$ 4.4 billion to the national income, which is about 1.4 percent of the total GDP. Processing of fish into canned and frozen forms is carried out mainly for the export purpose. It is widely felt that the substantial fishery resources are under-utilized and there is a tremendous potential for the increase of output from this sector. There is growing demand for canned and processed fishes from India. The marine fish include prawns, shrimps, tuna, cuttlefish, squids, octopus, red snappers, ribbon fish, mackerel, lobsters, cat fish etc. In this concern, Government of India has taken few initiatives to increase the utilization of marine products and their processing.

As per the Ministry, the following would be concentrated upon for reaching the target:

- ✓ Product diversification.
- ✓ Focus on potential brackish water aquaculture in Maharashtra, Gujarat and Orissa.
- ✓ Substantial increase in value addition of exports from 15 to 75 percent.
- ✓ Developing India as a major hub for outsourcing and reprocessing of marine products.
- ✓ Creating a Bio-security zone.

Meat and Poultry Processing: India ranks first in world cattle population, 50 per cent of buffalo population and one - sixth of total goat population of the world. India's current level of meat and meat - based exports is around Rs. 8,000 million. Compared with meat, poultry industry has registered significant growth. India ranks fifth in the world with annual egg production of 1.61 million tones. Both poultry and

egg processing units have come in a very big way in the country. India is exporting egg powder, frozen egg yolk and albumin powder to Europe, Japan and other countries. Poultry exports are mostly to Maldives and Oman. Indian poultry meat products have good markets in Japan, Malaysia, Indonesia and Singapore. While meat products registered a growth of 10 per cent, eggs and broilers registered 16 -20 per cent growth. Presently there are only five egg powder plants in India which is considered insufficient in view of growing export demand for different kind of powder - whole egg, yolk and albumin.

Dairy: India ranks first in the world in terms of milk production. In dairy sector most of the processing is done in an unorganized sector. Though the share of organized sector is less than 15% and is expected to grow very rapidly especially in the urban regions. The organized sector (large scale dairy plants) processes about 13 million tons annually, while the unorganized sector processes about 22 million tons per annum. About 35 percent of milk produced in India is processed. Among the milk products processed in the Dairy industry, the most predominant ones are ghee, butter, liquid milk, ice cream, cheese, milk powders, malted milk foods, condensed milk and infant foods. The southern and western regions collectively contribute for 80 percent of the milk produced in India. At present, the dairy sector has an estimated consumer demand for milk and milk products, growing at about 8 percent per annum. Ultra High Treated milk is becoming more popular and the market is estimated to be about Rupees 1.5 billion (US \$ 33.4 million). A higher demand for branded and probiotic milk, yoghurt has also led to a rise in investment for milk processing. Industry profitability has been good and there is good potential for introduction of new value added products and their exports. Market for yoghurt in India is growing at 18 percent and that for sour milk at 33 percent. The manufacture of casein and lactose has good scope in the country; at present these are generally imported.

Fruit Juices (Non-carbonated)

Convenience and natural taste together with health-consciousness has played an important role in the growth of packaged fruit juices. The fruit drink market has grown at 20 - 25 percent, of this, the exotic fruit juices segment has grown at 40 percent this year. Fruit based milk drinks and fruit-based soya milk is another emerging segment and expected to grow rapidly.

Cola sales have fallen dramatically after health concerns and this seems to have benefitted the fruit beverage industry. Tetra Packs have offered a solution to provide fruit juice practically fresh and preservative free. These factors have resulted in an increased consumption of juices.

Tea

Tea is indigenous to India and is an area where the country can take a lot of pride being the largest producer in the world. In all aspects of tea production, consumption and export, India has emerged to be among the world leaders, mainly because it accounts for 31 percent of global production. Indian tea production has grown at 1.2 percent CAGR over the last ten years. Tea is an essential item of domestic consumption and is a major beverage in India.

Domestic demand for tea has grown at over 4 percent in the last three decades. The tea Industry provides gainful direct employment to more than a million workers mainly drawn from the backward and socially weaker section of the 20 society. It is also a substantial foreign exchange earner Due to the highly competitive nature of the market, brand differentiation emerges as the most important factor. Value addition strategies include: introduction of new variants in the form of special blends (ice tea, flavored tea, diet tea, herbal tea, organic tea, ready-to-drink tea in liquid and granulated form) and new packaging techniques that help preserve freshness, aroma and increase convenience. Tea is primarily produced in four states in India Assam, West Bengal, Tamil Nadu and Kerala. Tea is either sold in loose or packaged form in the domestic and export markets. India is the fourth largest tea exporter in the world.

The packaged tea segment processes the tea in three divisions packed, loose and tea bags which contribute to the overall tea production at 55, 2 and 42 percent respectively.

Coffee

India is the sixth largest producer and exporter of coffee in the world. About 72 percent of coffee production is exported. (4 percent of total global coffee exports), leaving the balance for domestic consumption. Italy is the largest export destination for Indian coffee, accounting for 25 percent of total exports. India is one of the few countries that produce both the Arabica and 21 Robusta varieties of coffee. The industry can be segmented into filter coffee and instant coffee. Among all the beverages consumed in India, coffee ranks third, after tea and plain milk.

Ready-to-eat Foods

Ready-to-eat industry is estimated to be grow at 30 percent. This can be attributed largely to the demand from global Indians, Non Resident Indians (NRIs) and others looking for convenient food, (almost) authentic dishes and entrée on the go. This demand for ready-to-eat meals has captured a large amount of the food retail market in India and around the world. Another reason for this boom is the use

of new technology and ensured sterilization which has helped reduce prices and increase shelf life without the need for refrigeration.

Organic Food

In large parts of the world today, consumers are averse to Genetically Modified (GM) foods and chemical additives, and are gravitating towards organic/bio-foods. Organic foods has market growing at 8-10 percent annually, this is an exciting opportunity for India across key segments. Organic Foods include almost everything that is used in the kitchen from fruits, vegetables, pulses, cereals, bread, and sweeteners such as honey, brown sugar and raw sugar to all cereals, pulses, flours and spices, bakery and dairy products, typically sourced from farmers practicing organic farming, free from conventional chemical systems of farming using artificial fertilizers and pesticides.

By default, a majority of the farming in India is organic with minimal use of agri-chemicals and GM seeds. India's export of organic produce is quite low, however, the entry of larger and more organized companies is likely to give a boost to the industry.

Role of Government in Food Processing Opportunities

- The government has formulated and implemented several plans and schemes to provide financial assistance for setting up and modernizing of food processing units, creation of infrastructure, support for research and development and human resource development in addition to other promotional measures to encourage the growth of the processed food sector.
- Separate commodity boards of tea, coffee, cashew etc. besides APEDA, MPEDA, EIC, NHB, CFTRI, DFRL, IIP, D.M.I, Ministry of Agriculture and Ministry of Food Processing Industries was established to help entrepreneurs to start processing industries.
- Multiple laws / regulations prescribe varied standards regarding food additives, contaminants, food colour and preservatives and labelling. In order to rationalize the multiplicity of food laws, a Group of Ministers (GOM) was recently set up to suggest legislative and other changes to formulate a modern, integrated food law, which will be a single reference point in relation to the regulation of food products. The food laws in India are enforced by the Director General of Health Services, Ministry of Health and Family Welfare, Government of India.
- Food processing and agro industries have been accorded high priority with a number of important relief's and incentives. At present, no industrial license is required for almost all of the food and agro processing industries except for

some items like: beer, potable alcohol and wines, cane sugar, hydrogenated animal fats and oils, etc. and items reserved for exclusive manufacture in the small scale sector. Items reserved for Small Scale Industry include pickles and chutneys, bread, confectionery, rapeseed, mustard, sesame and groundnut oils, ground and processed spices other than spice oil and oleoresins, sweetened cashew nut products, tapioca sago and tapioca flour.

- In order to boost the food processing sector, the centre has permitted under the Income Tax Act a deduction of 100 per cent of profit in the next five years in case of new agro processing industries set up to package and preserve fruits and vegetables. Excise duty of 16 per cent on dairy machinery has been fully waived off and excise duty on meat, poultry and fish products has been reduced from 16 per cent to 8.0 per cent.
- The Government has recently established Special Economic Zones with the purpose of promoting exports. These Zones do not impose duty on imports of inputs and they enjoy simplified fiscal and foreign exchange procedures and allow 100 % FDI.
- Setting up of food technology parks boost the food processing sector through establishment of proper manufacturing and processing units, integrated supply chain management and to reduce wastage of agricultural produce.
- The multinationals now entering the food industry have an international marketing network and have their brand loyalties all over the world. This will enable the Indian products reaching all over the world in the form and packing required.

Food Processing Sector- Major Challenges

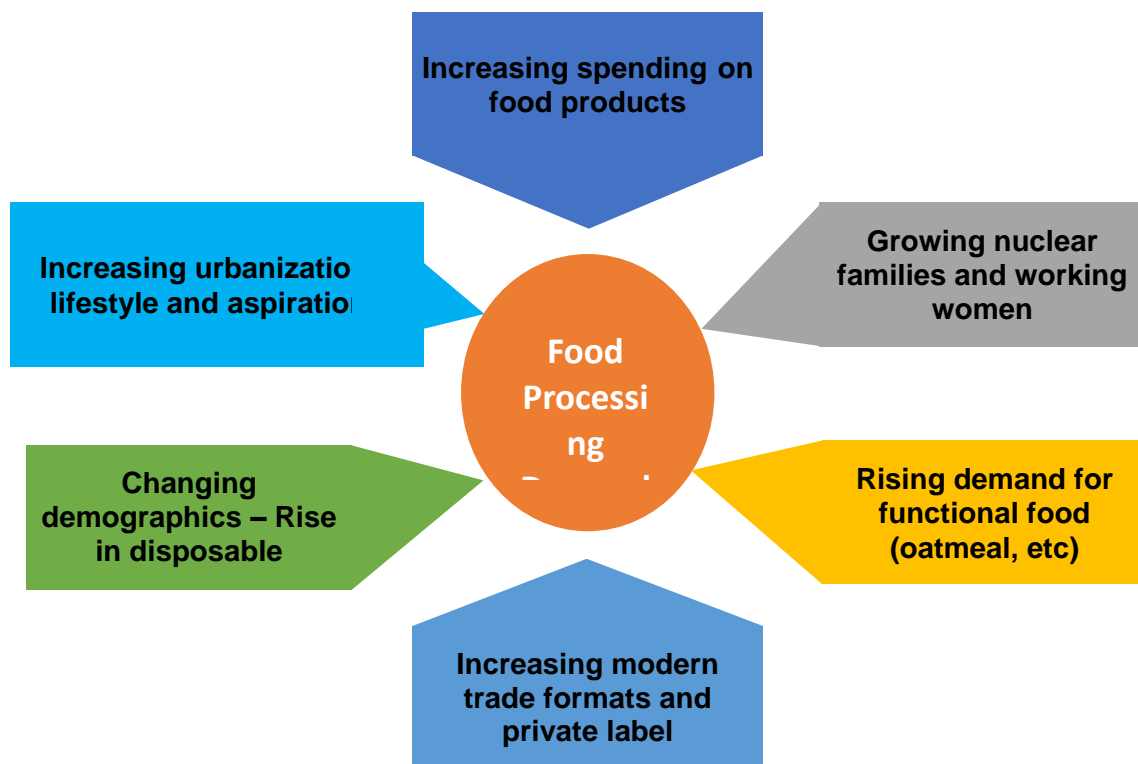
- Supply chain Infra gaps (Lack of primary processing, storage and distribution facilities)
- Supply chain institutional gaps (procurement dependence on APMC markets)
- Lack of product development and Innovation
- Inadequate focus on Quality and Safety Standards
- Seasonability of operations and Low capacity Utilization
- Inadequate link between Production and Processing (lack of processable varieties)

Food Processing Sector Growth Potential

The various factors such as demand for functional food/ nutraceuticals food, growth of organised retail and private label penetrations, changing demographics, Increasing urbanization- life style and aspirations, Increasing spending on food

products, Increasing nuclear families and working women which are likely to increase the demand for processed food in coming years. Programmes to increase the output of Indian agriculture without corresponding investments in processing facilities are likely to lead to a mismatch resulting in rural distress and decline in farmers' income.

The most important step for improving the bargaining capacity of the farmer is to add value to his produce. This will come about if farmers are able to produce according to the requirements and standards demanded by the market. Food processors and retailers can provide the necessary demand for the agricultural produce and facilitate the flow of market information, technology and inputs to the farmer so that they can tailor their output to the needs of the market. In the process the farmers will be able to raise their own level of income and employment. The consumer is also likely to benefit as there will be an increase in the supply of food products with a longer shelf life.



It is essential to build sustainable supply chains, which will link the farmer to the processing and marketing enters seamlessly. In the absence of on-farm cooling and grading arrangements and slow development of cold chain infrastructure, the farmer is compelled to sell his produce to the 'Adathiya (Broker)' without waiting for a better price. If the farmer is enabled to grade and store his produce closet of farm,

the farmer will be empowered to demand and obtain a better price from the processors and also add value to his produce.

Considerable investments are required in rural infrastructure and components of the supply chain by way of grading and packing centers, controlled atmosphere storage facilities, reefer vans, testing laboratories, etc., which may not come from private sources at this stage of the development of the food processing industry. It is therefore essential that public investment is significantly increased to fund these components of rural infrastructure to enable private enterprise to take up the remaining, commercially viable components of the supply chain. This is borne out by the experience of developed countries where the state has stepped into to build rural infrastructure in a big way. Carefully calibrated subsidies, innovative strategies, empowering rural producers & consumers through better awareness and support to entrepreneurs in terms of technology and training are some of the ways in which this Ministry has catalyzed growth in this sector.

“MAKE IN INDIA” Programme

- (i) Food processing sector has been identified as one of the priority sectors under “MAKE IN INDIA”, an initiative of Hon’ble Prime Minister of India. With a view to attract investment to this sector, Ministry of Food Processing Industry has been implementing schemes for development of infrastructure for promoting food processing industries. Mega Food Parks with common utility/ facility like roads, electricity, water supply, sewage facility and common processing facility like pulping, packaging, cold storage, dry storage and logistics are being promoted in areas with strong agricultural resource base. These parks provide fully developed plots and factory sheds to entrepreneurs on long term lease basis where they can set up food processing units in “plug and play model”.
- (ii) Government has also declared investment in Food Parks covered under the Harmonized List of Infrastructure Sub-sectors (HLIS) vide Government of India Notification dated 13th October 2014. Following this notification, it is expected that Mega Food Parks assisted by the Ministry will be able to access to infrastructure lending on easier terms.
- (iii) In the context of “MAKE IN INDIA” campaign, the Ministry has been disseminating information to potential investors to attract investment to the sector through a dedicated “Investors Portal” in which a range of information like resource base, availability of land, state specific policies, fiscal incentives are shared with the potential investors. The Ministry is also collaborating with Invest India to help the investors in terms of

locating joint venture partners, extending hand holding services, expediting regulatory approvals and providing investors after care services. The investor can also put their query in the Investors portal which is promptly attended to by the Ministry for guiding the investors.

Ease of Doing Business

- (i) As a measure towards improving Ease of Doing Business, the Food Safety and Standards Authority of India (FSSAI) issued notification in January 2016 and October 2016 shifting product by-product approval to ingredient and additive based approvals.
- (ii) (ii) The Ministry of Food Processing Industries is following a transparent selection process and working completely on an online scheme management system "SAMPADA Portal" from receiving of proposals to release of grant in aid under the various component schemes of Pradhan Mantri Kisan SAMPADA Yojana (PMKSY). A dashboard has been put in place for MIS purpose and to facilitate real time monitoring of progress and key performance indicators. (iii) Separate online portals have been developed to cater to new schemes like Prime Minister-Formalisation of Micro Food Processing Enterprises (PMFME) and Production Linked Incentive (PLI).

Promoting Investment in Food Processing Sector

Food processing sector faces a set of unique problems which have a direct bearing on the strategy and required intervention for the development of the sector. The processors in this sector deal with seasonal, perishable materials which need to be processed in a short period. As the sector mainly consist of tiny, micro & small units, neither they are able to generate adequate surplus for their expansion nor invest in supporting infrastructure. Therefore, the sector needs support for creation of infrastructure and targeted incentives to attract investment for creation of processing capacity. To address these issues, considerable investment is required in different components of the supply chain by way of grading and packing centers, controlled atmosphere facilities, reefer vans, cold storage for perishable cargo at port/airport/railway stations, testing laboratories and other supporting infrastructure and services such as setting up of testing laboratories, research & development, imparting skill training, marketing support etc.

Long Term Strategies:

- Promoting cluster approach for intervention in the sector in view of the progressive reduction of farm size and preponderance of tiny processing units

as well as the inability of individual entrepreneurs to sustain viable infrastructure facility at different stages in value chain.

- Financial support and fiscal incentives for creation of common supply chain infrastructure viz. cold chain, dry storage, packaging, logistics, back and front-end infrastructure, expansion of processing capacities etc. to reduce cost of investment, enhance viability and ensure higher conformity to regulatory standards;
- Introduction of measures to lower cost of capital for the projects and reduce cost of formal credit to make it affordable to both organized and unorganized sector;
- Promoting processing clusters and creating strong backward and forward linkages from farm gate to retails outlet through various measures including setting up of Mega Food Parks /Processing Clusters with appropriate fiscal and financial incentives;
- Promoting institutes of national importance to create pool of technical manpower and skilled workforce to meet the growing need of the sector; (vi) Support creation and provision of services like R&D, testing, quality improvement, marketing and enhancing competitiveness of the sector through promotion of innovations in products and processes, environment friendly packaging etc.;
- Creating adequate infrastructure for food testing and training manpower for food safety, and promoting adoption of best practices in the industry in food production, processing, packaging, storage and transportation
- Support for market development, brand building and export promotion of food products;
- Advocacy for promoting farmers Industry connect, removal of impediments in commodity movement, storage, retail policy, land policy, labor laws and smoothening access to formal credit etc.

India's food ecosystem offers huge opportunities for investments with stimulating growth in the food retail sector, favorable economic policies, and attractive fiscal incentives.

Through the Ministry of Food Processing Industries (MoFPI), GOI is taking all necessary steps to boost investments in the food processing industry in India. GOI has continued the umbrella PMKSY scheme with an allocation of INR 4600 crores till March 2026. The Ministry has also been implementing two more flagship schemes:

- I. **The Production Linked Incentive(PLI) Scheme-** to modernize and enhance the competitiveness of the food processing industry by manufacturing specific categories of food products having a high potential for growth in output and value addition for a period of six years till 2026-27.

- II. **PM Formalization of Micro Food Processing Enterprises Scheme (PMFME)** for providing financial, technical, and business support for the up-gradation of existing micro food processing enterprises.

Conclusion

India ranks 5th in the world in terms of the value of food processing. The industry is expected to grow to Rs. 126,840 crore , growing at 13% each year since 2012. The FPI is estimated to grow at 9-12 percent in the near future.

F&V processing, which is currently around 2 percent of total production and further to 25 percent by 2025. Value-addition in food products is expected to increase from the current 8 percent to 35 percent by the end of 2025.

Higher sales growth, increased earnings of the companies, rising exports of agri-processed foods and government policy initiatives have set the stage for a buoyant performance by the FPI. The expected growth rate is higher than the expected growth rate of the economy. The industry has really taken off in India and abroad as convenience is the most important factor for the consumers. Consumers are willing to pay more as their work habits and lifestyle changes. Moreover, increasing media penetration and awareness levels have increased the demand for 'quality food', 'nutritional food' and 'healthy eating habits'.

Many companies are investing in the product innovation and trying for newer technologies that can make the units more cost competitive, while offering a better product.

The industry provides a win-win situation to all the people involved – consumers (in terms of better quality of food), producers (in terms of profit generation) and society (in terms of generating employment and providing adequate and nutritional food).

The industry is critical from the economic point of view and hence the government has its focus on the development of this industry. Moreover, it is supported by various climatic and geographic advantages that India enjoys. Under the right guidance, the industry can take India to the leadership position in the export of processed food products.

Status of Food Processing Sector in Tamil Nadu

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Tamil Nadu with numerous agro-geo climatic zones, has a competitive advantage of abundant agro resources, growing demand potential and excellent access to national and export markets, hence food processing is considered as a promising sector in Tamil Nadu. The CAGR of the food processing industry is around 11.2%.

Tamil Nadu stands second in the country in registered food processing output in India and stands fifth in the country with Rs 85,686 crore. It is assumed that food processing output value of Rs one lakh crore can be achieved in a couple of years.

The agricultural sector of Tamil Nadu contributes 12% to the economy and provides livelihoods to around 40% of its population. Tamil Nadu is India's leading producer of mangoes, bananas, turmeric, papayas, rice, maize, sugarcane, coconuts, groundnuts, cashews, beans, and grapes. It is the largest producer of tapioca and tamarind, second largest producer of poultry and eggs, third largest producer of tea and coffee, and fourth largest in marine fish production.

Tamil Nadu is home to over 24,000 food processing firms classified as MSMEs as well as 1,100 medium and large units. It is ranked 2nd in terms of food processing units & contributes around 8% to India's national food processing output.

Tamil Nadu is also among the leading exporters of marine products, rice, cereal products, dairy products, etc. The sector provides exciting business opportunities for developing infrastructure pertaining to agro-processing clusters, food parks, coastal aquaculture parks/cluster, Food Testing & Quality Control Labs and capital goods manufacturing. Tata Coffee, Britannia, Nestle, Pepsico, Lotte, Suguna foods, HUL and ITC are among the leading MNCs present in Tamil Nadu.

The state offers a favourable business habitat for Integrated Storage and Warehouses, Cold Storage Infrastructure, and packaging & barcoding of food products. Tamil Nadu has built a huge talent pool through a network of agricultural colleges and research centres. Companies can explore avenues for technology infusion in fruits, vegetables & marine products, milk products, ready-to-eat products, medicinal herbs & aromatic extraction, edible oil extrusion plants and cashew nut processing.

Currently, the level of processing of food commodities is less than 2%, and the government is working to raise it to 10%. It is setting up 6 mega food parks and 15 small food parks/agro processing clusters where units will be eligible for capital investment subsidy and other incentives as per the new Industrial Policy 2021 for large investors and MSME Policy 2021 for MSMEs.

The policy is focused on promoting innovative measures for group cooperation in adoption of pre- and post-harvest technologies, change in cropping patterns, upgrading processing standards, providing financial assistance to entrepreneurs, speedy infrastructure development and removal of legal/ statutory hurdles to growth.

State infrastructure development agencies SIPCOT and SIDCO offer developed lands and ready to occupy plug-and play facilities along with infrastructural facilities like dedicated power, water, drainage, STP/ETP, telecom, banking etc. on long-term lease (*99 years*) to large industries and on outright sale and short-term lease (*30 years*) to MSMEs.

In addition to various taxation/ stamp duty/interest payment/market fee exemptions/marketing promotion incentives, necessary technical assistance is provided to food processing industries in branding, exports, packaging, and training. All statutory clearances can be applied and received online through the single window portal. M-TIPB will function as facilitating agency for single window clearance system for new investments for speedy and timely clearances.

Work on seven agro-processing clusters in Theni, Dindigul, Krishnagiri, Tiruvannamalai, Madurai, Salem and Cuddalore and one mega food park in Gangaikondan is under way. Mega food parks are coming up in Theni, Manapparai and Tindivanam at a cost of Rs 381 crore.

Coastal aquaculture parks are being created. Cold storages are coming up in Ambattur, Red Hills, Sular, Dharmapuri, Thoothukudi, Madurai, Oddanchatram and Panruti. An agro export facilitation centre has been created at Guindy and the Tamil Nadu Food Processing and Agri Export Promotion Corporation has been registered under the Companies Act to steer the food processing and agri export sector.

Infrastructure for processing and export of moringa at Madurai. Processing and post-harvest infrastructure for millets in two zones. One zone comprises Tiruvannamalai, Salem, Kallakurichi, Villupuram, Cuddalore, Dharmapuri, Krishnagiri and Vellore districts. The other zone comprises Thoothukudi, Virudhunagar, Madurai, Tenkasi, Ramanathapuram, Sivagangai, Theni, Trichy, Karur, Dindigul, Ariyalur and Perambalur districts. A draft project report is being prepared for the agro-industrial corridor between Trichy and Nagapattinam. Dry ports and cold

ports in seaports and airports for maintaining the quality of processed food products would be established.

It will be amended in line with the Tamil Nadu Industrial Policy 2021 and schemes for MSMEs in food processing are under discussion. Currently, the level of processing of food commodities is less than 2% and the government is working to raise it to 10%. It is setting up six mega food parks and 15 small food parks/agro processing clusters, where units will be eligible for capital investment subsidy and other incentives.

In Tamil Nadu, food processing is considered a sunrise sector with several factors such as varied agro climatic zones, multiple commodities and sufficient infrastructure favouring its growth. The CAGR of the food processing industry is around 11.2%. Tamil Nadu stands second in the country in registered food processing units with 5,161 factories out of 37,175 units in India.

The state contributes to 7.2% of food processing output in India and stands fifth in the country with Rs 85,686 crore. We will achieve a food processing output value of Rs one lakh crore in a couple of years.

The Tamil diaspora is spread across the globe and they want our native foods such as drumsticks, curry leaves and coconuts. We are focusing on them. The Tamil diaspora is ready to invest more than \$300 million in food exports. Moringa is one of the superfoods is demand globally. We are also focusing on export of spices such as coriander, cumin, cloves and pepper.

The farmer producer organizations are being promoted as the go-between for farmers and food processing industries. The state has 903 FPOs so far. FPOs are encouraged to aggregate products from their own farmer-members and trade them with processing industries directly. The primary processing centres provide the scope for this. E-trading under e-NAM is being promoted in the state with 63 regulated markets already on-board and 64 in the pipeline. This will enable farmers directly trade their produce to food processing industries using the platform.

No industrial license is required for almost all food processing industries with the exception of some items. Automatic investment approval up to 51% foreign equity is allowed for most of food processing sector, except few items. Up to a maximum of 24% foreign equity is allowed in SSI sector. MRTP (Monopolies & Restrictive Trade Practices Act) rules and FERA (Foreign Exchange Regulation Act) regulations have been relaxed to encourage investment and expansion by large corporates. Most of the items can be freely imported and exported.

Capital goods are also freely importable, including second hand ones in the food processing sector. Free trade zones (FTZ) and export processing zones (EPZ)

have been set up with all infrastructure. Also, setting up of 100% Export oriented units (EOU) is encouraged in other areas. Capital goods, including spares up to 20% of the Cost Insurance and Freight (CIF) value of the Capital goods may be imported at a concessional rate of Customs duty.

Export linked duty free imports are also allowed. Units in EPZ/FTZ and 100% Export oriented units can retain 50% of foreign exchange receipts in foreign currency accounts. All profits from export sales are completely free from corporate taxes. Profits from such exports are also exempt from Minimum Alternate Tax (MAT).

Bestowed with numerous agro-geo climatic zones, Tamil Nadu has a strong presence in most of the agro and food processing sector. It has about 24,000 SMEs and 1100 medium and large units involved in this sector. The state has a competitive advantage of abundant agro resources, growing demand potential and excellent access to national and export markets.

The Government of Tamil Nadu is establishing 8 Agro processing clusters and 6 mega Food Park. Tamil Nadu has a strong network of Agricultural Colleges, research centers under TNAU - a globally renowned Agricultural University which provides talented Human Resources. Leading producers of Rice, Maize, Sugarcane, Mango, Banana, Turmeric, Coconut, Groundnut, Cashew, Tea, Coffee, Dairy, Egg, and Poultry.

The most critical challenges that we face in positioning government as a value-added service provider is improving the quality, impact, and efficiency of public services. In the days of yore, traditional file systems were used to maintain the details of the business and the issues they registered. These legacy systems require personal visits to the offices and registration on paper, which is a time-consuming and man-power intensive process. The future is digital. The widespread use of digital technologies, including the rapid evolution of mobile connectivity and internet, offer digital feedback mechanisms that are faster, cost-effective, and scalable as compared to traditional approaches. By digitalizing the feedback loop alone, we are able to circumvent challenges posed by departments that are not yet fully digital internally and which may take a long period of time. Governance also becomes digital and real-time.

Taking a leaf out of one of the largest companies in the world to be the Earth's most customer-centric company, there is a need to put citizens at the center of governance and service delivery, and in the case of G2B services, there is a need to be business-centric.

Biz Buddy is such an initiative of the Government of Tamil Nadu. It is an industry help desk portal with three primary objectives:

- Streamlined redressal mechanism for resolution of industrial investor's unsolved issues.
- Tracking & monitoring investor issues in a real-time manner.
- Improving Tamil Nadu's investment climate by enhancing the aftercare services provided to industrial investors.

Investors can submit Help Calls on Biz Buddy on items pertaining to approvals, clearances, operational issues, subsidy disbursal, and other issues. Once the investor submits a Help Call, it is reviewed by Guidance officials monitoring the portal and assigned to the concerned department for resolution. Each stage has a defined resolution period. If a Help Call is not solved within the defined period, it gets escalated and brought to the next stage of the escalation matrix. The resolution period for the stages is designed in a manner to ensure that Help Calls are resolved within a period of 30 working days on a best effort basis. Upon resolution of the issue, the investor gets an instant alert on the progress.

Customer centricity lies at the heart of Biz Buddy and is designed with a digital feedback loop – a mechanism that generates information on the quality of service and can be used to improve performance. This includes an administrative data loop that collects information on individual service transactions (the number of days between request for service and resolution of the help call), and a choice and voice loop that collects data on the service experience of the business (satisfaction with the experience).

MSMEs form an important and growing segment of Tamil Nadu's industrial sector and occupy a place of prominence in the economy of state. Assessing the greater potential of MSMEs, we have made sure that it is easier to initiate and access the required resources and most importantly, achieve what your MSME aims to do.

As per the latest notification issued in accordance with Micro, Small and Medium Enterprises Development Act, 2006 (27 of 2006) vide S.O. 1702(E) of the Ministry of MSME, Government of India, Dt.: 1.6.2020, the Central Government, notified that the enterprises engaged in the manufacturing of products or engaged in the rendering of services shall be classified based on the composite criteria as follows:

Type of Enterprise	Investment in Plant & Machinery not Exceeding	Turnover not Exceeding (excludes Export)
Micro	Rs.1.00	Rs.5.00
Small	Rs.10.00	Rs.50.00
Medium	Rs.50.00	Rs.250.00

Department of MSME

The MSME Department deals with policy matters relating to the MSME sector and formulates schemes for the development of the sector.

Major institutions under the department are:

- The Commissionerate of Industries & Commerce
- The Entrepreneur Development and Innovation Institute (EDII)
- Tamil Nadu Small Industries Corporation Limited (TANSI)
- Tamil Nadu Small Industries Development Corporation (TANSIDCO)

Through the District Industries Centres, it provides a variety of services to the entrepreneurs and MSMEs, some to mention are as follows:

- Providing Escort Services to the Entrepreneurs towards identification of viable activities and preparation of Project Profiles for assistance from financial Institutions/Banks.
- Organising Entrepreneurship and skilled Development Training Programmes.
- Facilitating MSMEs in getting various Statutory Approvals, Clearances, Licenses and their renewals through Single Window Clearance Mechanism.
- Facilitating Entrepreneur in filling UAM (Udyog Aadhaar Memorandum).
- Sanction and Disbursement of Incentives and Subsidies to MSMEs, as per MSME Policy of GoTN.
- Export Promotion through the Export Promotion Cell in the District Industries Centres.
- Facilitating MSMEs in getting payment of dues from the large Industries through the Micro and Small Enterprises Facilitation Councils.

- Implementing Credit Linked Subsidy Schemes, Rehabilitation Assistance Schemes and various other Schemes of Government of India in the State.

Tamil Nadu is emerging as a hub for industrial R&D. Upgradation, advancement, and innovation in technology for industrial use is a key focus area for the State. This provides a pathway to leapfrog industrial development and to accelerate Tamil Nadu's integration into the global value chains. The transformative potential of technology in improving productivity and capacity utilization has shifted the paradigm of viewing R&D expenditure as an investment.

As one of the pioneering States in R&D, this Policy includes R&D as part of Eligible Fixed Assets. The Government of Tamil Nadu shall provide incentives to R&D Projects in the State to further the development of intellectual property and adoption of technology in industries. Stand-alone R&D projects shall be eligible for the following Incentives, in addition to the Standard Incentives, subject to the following conditions: - Must have a Minimum Investment of Rs. 50 cr. in Eligible Fixed Assets and creation of

Employment for 50 persons - Clearly demarcated facilities inside or outside the industrial unit. - Must be located in Tamil Nadu - Must be Registered with the Department of Scientific and Industrial Research, Government of India (DSIR) 16.1 Land Cost Incentive for Standalone R&D Projects R&D projects shall be given an incentive of 50% of the cost of purchase or lease of land for up to 20 acre, subject to a ceiling of Rs. 50 lakh/acre. This shall be provided as a reimbursement upon commencement of the R&D Centre. R&D projects shall also be given priority in land allotment in SIPCOT Industrial Parks.

R&D Training Incentive of Rs. 10,000 per person per month can be availed for 12 months. This incentive is intended for employees engaged in core R&D who have:

- Undergraduate degree in technology/sciences and work experience of 7 years, or
- Post-graduate degree in technology/sciences and work experience of 5 years, or
- Doctorate in sciences/technology

It excludes employees in administration or in support services deployed in R&D projects. Projects availing the R&D Training Incentive shall not be eligible for Training Subsidy under the Structured Package.

Projects obtaining certifications like ISO, ISI, BIS, FPO, BEE, AGMARK, and ECOMARK or any other national or international certification shall be given a

subsidy of 50% of the total cost incurred for obtaining the certification, as certified by the Chartered Accountant, limited to Rs. 1 cr. for the period of investment.

The Government will reimburse 50% of the expenditure incurred by the Project subject to a maximum of Rs. 1 cr. for the period of investment for in-house R&D for a patent, copyright, trademarks, and Geographical Indicators registration and up to Rs 5 cr. for standalone R&D assets.

The Project shall also be eligible for standard incentives, namely, electricity tax exemption for 5 years (Para 13.5.1), stamp duty exemption (Para 13.5.2 and Para 14.3), and green industry incentives of up to Rs. 1 cr. (Para 13.5.3), as specified in Para 13.5. In-house R&D units shall not be eligible for standard incentives if the Industrial Unit has also availed the incentives. Projects availing the Enhanced Quality Certification/Incentive/Enhanced IP Incentive shall not be eligible for Quality Certification/IP Incentive under Standard Incentives, respectively.

GOVERNMENT POLICY

Infrastructure

- Setting up of Agro processing clusters and food parks
- Development of coastal aquaculture parks/cluster
- Food Testing & Quality Control Labs
- Capital Goods Manufacturing for Food Processing Industry

Innovative Technologies

- Food Processing units focused on fruits, vegetables, and marine products
- Manufacture of value-added milk products such as yogurts, ice-creams, flavoured milk
- Manufacture of Ready to eat products
- Medicinal herbs and aromatic extraction
- Edible oil Extrusion Plants
- Cashew nut Processing Plants

Logistics & Supply Chain

- Establishing Integrated Storage and Warehouses
- Development of Cold Storage Infrastructure
- Packaging & Barcoding for food products

Other Key Enablers

- Setting up of Joint Research Institutes
- Establishment of training and skill development centres

The policy is focused on promoting innovative measures for group cooperation in adoption of pre- and post-harvest technologies, change in cropping patterns, upgrading processing standards, providing financial assistance to entrepreneurs, speedy infrastructure development and removal of legal/ statutory hurdles to growth.

State infrastructure development agencies SIPCOT and SIDCO offer developed lands and ready to occupy plug-and play facilities along with infrastructural facilities like dedicated power, water, drainage, STP/ETP, telecom, banking etc on long-term lease (*99 years*) to large industries and on outright sale and short-term lease (*30 years*) to MSMEs.

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MARINE FISHERIES DEVELOPMENT

Tamil Nadu has a coastal length of 1076 km (13% of the country's coast line) 1.9 lakh sq.km of EEZ (9.4% of the India's EEZ) and a continental shelf of about 41,412 sq.km and is one of the leading state in marine fish production. The marine fisheries production of the state is 4.97 lakh tons.

The State has marine fishermen population of 10.07 lakh from 608 marine fishing villages scattered along the 13 coastal district. In the inshore waters the fishery potential is exploited by 38,779 traditional crafts and 5893 mechanized boats. The infrastructure facilities include 6 major fishing harbours, 3 medium fishing harbours, 36 fish landing centres and 254 fish landing points.

A report on the achievements of the Department of Food Process Engineering, AEC&RI, TNAU, Coimbatore

The Department of Food and Agricultural Process Engineering was founded in the year 1974 (in the name of Department of Agricultural Processing) as one of arms of the then College of Agricultural Engineering. The inception of the department was on the back of the merger of the then Crop Dryer Scheme operated by the Department of Agriculture, Government of Tamil Nadu with the Tamil Nadu Agricultural University. Thereafter, this department has been actively involved in promoting the mandate of the Agricultural Engineering College and Research Institute through teaching, research and extension in the discipline of Food and Agricultural Process Engineering.

This Department offers courses on Agricultural and Food Process and Engineering to the undergraduate programmes of Food Technology, Agriculture, Horticulture and Agricultural Biotechnology and post graduate and research programmes in Processing and Food Engineering.

In response to the growing demands of man power from the Research and Development institutions of the Indian food processing sector as well as higher education sector and Government research institutes a post graduate degree programme, M.Tech. (Agricultural Process Engineering) of two years duration was started in the Tamil Nadu Agricultural University (TNAU) in Coimbatore during the year of 1984. It was later renamed as M.Tech. (Processing and Food Engineering) in 2017 to comply with the 5th Deans committee recommendations.

The course was designed and structured mainly to produce highly competent professionals in food engineering. The graduates are trained in all the latest food processing technologies such as preservation and handling of food, value-addition of agricultural and horticultural commodities, design of food processing equipment, packaging technology, dairy, meat, poultry and fish processing technologies, etc.,

They are also equipped in all the latest instrumentation and mathematical skills so that they can plan and conduct independent research in the field of food process engineering. So far 180 M. Tech. Graduates have completed the programme. The thesis research carried out by the scholars is in line with the recent and emerging fields and application oriented with the cliental group.

This department has received financial supports from various national and international agencies *viz.* ICAR, MOFPI, DST and UGC for development of infrastructure facilities to conduct research in processing and food engineering. The center is identified by ICAR as one of the lead centers under AICRP on post harvest engineering technology. The following 41 agricultural processing gadgets/

technologies have been developed by this department. These gadgets and technologies are popular among the farmers and entrepreneurs.

1. Double walled bamboo bin
2. Husker Sheller for maize
3. Groundnut decorticator (power operated)
4. Arecanut Dehusker
5. Poultry/fish feed pelletizer
6. Dhal mill
7. House hold paddy parboiling tank
8. Turmeric boiler
9. Chilly seed extractor
10. Improved four roller sugarcane crusher
11. Vegetable seed dryer
12. Bottling of Sugarcane Juice
13. Sorghum peeler
14. Insect trap
15. Agricultural Waste Fired Mechanical Dryer
16. Puffing- cum-roasting machine
17. Tapioca chipper(power operated)
18. Seed-cum-urea coating equipment
19. Adhesive from tamarind kernel powder
20. Stored grain insect trap
21. Cleaner-cum-grader for pulses and ragi
22. Compost pelletizer
23. Process for particle board using coir pith
24. Stirrer mechanism for settling of Tapioca Starch
25. Tomato seed extractor
26. Pulper-cum-washer for coffee
27. Vacuum packaging of banana
28. Brinjal seed extractor
29. Technology of production of tomato paste

30. Extrusion cooking for finger millets
31. Fluidized bed dryer for mushroom
32. Mechanical thresher for pepper
33. Improved farm level turmeric boiler
34. Hand operated pepper thresher
35. Peeler cum washer for production of white pepper
36. Cardamom garbling unit
37. Cleaner cum grader for cardamom and pepper
38. Value added product from cabbage
39. Improved farm level Dhal Mill
40. Centrifugal dehuller for millets
41. Post harvest machinery for turmeric

The popularization of the gadgets and technologies developed are carried out through demonstration and training. These activities are executed in collaboration with the Krishi Vigyan Kendra (KVK), developmental departments and non-government voluntary organization (NGOs and SHGs). Through the exhibitions arranged during farmer's day, trade fairs and other occasions the gadgets and

Research findings which helped in development of techniques / varieties / proof of concept etc in the last five years:

- Parboiling of millets
- Ohmic heating of eggs
- Diffusion channel technique
- Green house drying
- Foam mat drying
- Centrifugal dehuller for millets
- Storage structure for millets
- Turmeric processing machineries
- Grading of fruits and vegetables

The degree programme is well supported by ample number of technical people, supporting staff (including the technical support from inter disciplines) for

the efficient conduct of practical classes and research. Periodically the students are exposed with Scientists/ Experts/Industrialists to know the latest developments in their subject.

Class rooms for UG teaching are equipped with Computer Based Teaching Aids such as Desktop Computer, LCD Projector Audio Visual gadgets for interactive learning of concepts through presentation of slides, lecture videos, online assignments and quizzes. Further, students are also provided with e-books and list of e-resources for the courses they undertake.

The interaction between the students and faculties are mobilized through What's app groups and research discussions between the labs are facilitated through skype. And also the students are instructed to access the webinars to download the seminars. Laboratory sessions on the tedious experiments like demonstration of hi-tech equipment's are explained through you tubes. Faculties are frequently showing animations related to their subject during the theory sessions.

The above facilities are introduced to the students and faculties to enhance their learning resources including writing of text books and preparation of quality instructional material, e-learning tools, modules and networking and overall library strengthening along with promotion of ICT connectivity, video conferencing and Technology Enhanced learning (TEL). TNAU strongly encourages the use of Information Communication Technology (ICT) based education and is being followed in the undergraduate and post graduate teaching programmes.

PMFME scheme

Tamil Nadu Agricultural University, Coimbatore, has been identified for the successful implementation of all India Centrally Sponsored Pradhan Mantri Formalization of Micro food processing Enterprises Scheme (PM FME Scheme) in Tamil Nadu for providing financial, technical and business support for up gradation of existing micro food processing enterprises by Ministry of Food Processing Industries (MoFPI), in partnership with the Department of Agricultural Marketing and Agri Business, Government of Tamil Nadu.

Dr. A. Raviraj, Dean (Agrl. Engg.) guides the scheme as Nodal officer, State Level Technical Institute and **Dr. M. Balakrishnan**, Professor & Head (Food Process Engineering) coordinates the establishment of Common Incubation Centres in Tamil Nadu based on the approved One District One Products (ODOP's) and for the conduct of trainings at state level through Capacity Building Programme.

Under this scheme two Common Incubation Centres (CIC) were approved for the year 2020 - 21, one for the establishment of Incubation Centre for Coconut Processing at the Department of Food Process Engineering, AEC&RI, TNAU, Coimbatore with the project outlay of Rs. 2.56 Crores and another for the establishment of Incubation Centre for Dhal Processing at CSC& RI, Madurai with the project outlay of Rs. 2.54 Crores.

FOODXPLORE'22 REPORT ON SCHOOL EVENTS

World Food Day is celebrated annually on 16 October to **promote global awareness and action for those who suffer from hunger, and to highlight the need to ensure healthy diets for all**. The Food and Agriculture Organization of the UN (FAO) designated 16 October as World Food Day in 1979.

On the account of world food day 2022 with the theme of **“Leave NO ONE behind”** we've conducted several events for school students on 17/09/22. Around 168 students from more than 20 schools participated in the events conducted in Agricultural Engineering College and Research Institute, Tamil Nadu Agricultural University. Totally 4 events have been conducted (Quiz, pencil sketching, collage and toss without pass). Quiz and toss without pause were conducted under two categories for 8 to 10th standard and 11 to 12th standard, rest of the events were conducted under one category from 8 to 12th standard. The main motive for conducting these events is to give awareness to students regarding food processing.

Inauguration was started with the prosperous guidance of Dr. A. Raviraj, Dean, AEC&RI and Dr. M. Balakrishnan at 9.45 AM. Welcome address was given by students organizing secretary Ms. A. Amirthavalli and invited Dr. T. Pandiarajan, Professor, FPE, Dr. R. Thiyagarajan, Assistant Professor, FM&PE, and Dr. S. Parveen, Assistant Professor. Then Dr. R. Thiyagarajan addressed “In India food production is more and almost self-sustained, but storage structure for raw materials and produces are less so wastage is more almost 40%. Awareness should be created among people regarding this.

Dr. T. Pandiarajan enlightened the crowd by outlining the courses offered by the institute such as three undergraduate engineering degree programmes - B. Tech Food Technology, B. Tech Energy and Environmental Engineering and B. Tech Agricultural Engineering under AEC&RI in a self-supporting manner he also added that apart from this we're offering B. Sc (Hons.) Agriculture, Horticulture, forestry, sericulture, B. Sc Agri business management and B. Tech Biotechnology. Adding on, he also quoted about the problems associated with excessive and deficiency of food across the globe. Then it was followed by Dr. S. Parveen, who addressed on importance of food day and quoted “World food day is our day, without food no can survive”. The event finally ended on vote of thanks delivered by students organizing secretary Mr. Surya Prakash.

Events:

1. Quiz

Totally 25 teams participated in the category of 8 to 10th is 25 teams and 10 teams in 11 to 12th category in prelims, time given for every team was 1 hour for 40 questions, 5 teams with top scores in both category was selected for mains. Quiz mains were also conducted separately for both category as three rounds (current affairs, who am I, connections). Top scored 3 teams were awarded for 1st, 2nd, and 3rd prize.

PRIZE	8 to 10 th winners	11 to 12 th winners
1 ST	Dileep. P.K, Dharan. S.- Sri Ramakrishna Mission Vidhyalaya Swami Shivanananda HSS	Joshna. M., Menaka. A- Government HSS, Sundapalayam
2 ND	Kamalesh Ramu. S. V., Nirmalraj. S.- Kikani HSS	Kalpana Salva. M., Muthu Ashwitha. R- Sri Avinashilingam HSS (Girls,) SRP Ammaniammal Girls HSS
3 RD	Akarshana. S., Rakshan Fardheen. S.- SBOA Matric HSS	Prithviraj. R. Narayanan. S.- Corporation HSS, Government HSS



2. Collage

The theme given for collage was "fast food". Totally 17 teams have been participated and duration given was 1 hour. The best three collage had been selected and awarded with 1st, 2nd and 3rd prize to the respective teams.

PRIZE	NAME OF THE WINNER AND SCHOOL NAME
1 st	Thasleema. P., Rismal Mina.M.A.(IX)- Manbaul Uloom HSS
2 ND	Nitya.R.N., Janavi.V.K.(IX)- Elgi Matric HSS
3 RD	Roshini.N., Shahana(VIII)- N.S. HSS



3. Pencil sketching

The theme was “world food day”, 41 students participated in this event and duration given was 1 hour. The best three sketches had been selected and awarded with 1st, 2nd and 3rd prize to the respective students.

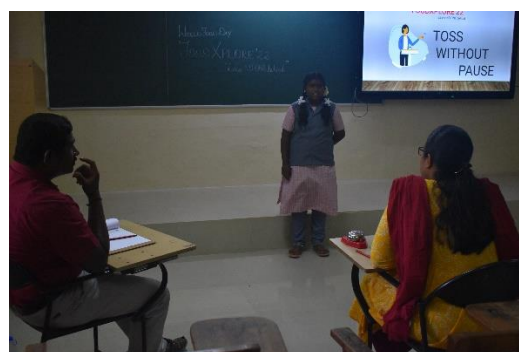
PRIZE	NAME OF THE WINNER AND SCHOOL NAME
1 st	Shivaram.G. (IX)- Government HSS, Sundapalayam
2 ND	Kaliraj.G.(IX)- SBOA Matriculation HSS
3 RD	Mirthiyujayan(X)- Government HSS, Sundapalayam



4. Toss without pause

It was conducted under two categories, total students in 8 to 10th category was 15 and they were given with topics **milk, millets, fast food** and in 11 to 12th category 5 participants were given with topics **processed foods, plant-based foods and soft drinks**. Topic was selected by participants by lot system. Evaluation is done by the judges Dr. J. Deepa, TA, FPE and Dr. P. Preetha, TA, FPE.

PRIZE	8 to 10 th winners	11 to 12 th winners
1 ST	Nasheeha Shreen.F.(X)- Manbaul Uloom HSS	Sudha.G.(XI)- Marudhamalai School
2 ND	Sri Dharshini.E.(VIII)- SNMV School	Vel Mrugan(XII)- Government HSS, Telungupalayam
3 RD	Nivetha.D.(IX)- Elgi Matric HSS	Zubair Ahamed(XI)- N.S. Matriculation HSS



The prizes for winners will be given on 20.10.2022 "Foodxplore'22"

A Trip down Memory lane

FOODXPLORE'15



FOODXPLORE'10





**TAMIL NADU AGRICULTURAL UNIVERSITY
COIMBATORE – 641 003**

O/o the Dean,
Agrl. Engg. College & Res. Instt.,
TNAU, Coimbatore – 641 003

No.Dn/AEC&RI/ FoodXplore'22/International Workshop/Organizing Committee/2022 dated 07.09.2022

Sub. : AEC&RI, TNAU, Coimbatore - International Workshop on “Sustainable Growth of Food Processing Sector for Food and Nutritional Security”– FoodXplore'22 on 14.10.2022 – Organizing Committee – Intimation – reg.

I wish to inform that the following organizing committee has been constituted for the conduct of International workshop on “Sustainable Growth of Food Processing Sector for Food and Nutritional Security”– FoodXplore'22 on 14.10.2022 at AEC&RI, TNAU, Coimbatore.

CHAIRMAN: Dr. A. Raviraj

Dean (Engg.), AEC&RI, TNAU, Coimbatore

Organizing Secretary

Dr.M.Balakrishnan

Professor and Head, Dept. of FPE

Joint Organizing Secretary(s)

Dr.S.Parveen, Assistant Professor (FPE)

Dr.R.Thiyagarajan, Assistant Professor (FM&PE)

Convenors

Dr.S.Ganapathy, Deputy Registrar (Education)

Dr.S.S.Sivakumar, Deputy Registrar (Administration)

Dr. A. Surendrakumar, Professor and Head (FM&PE)

Dr. P. Subramanian, Professor and Head (REE)

Dr. K. Nagarajan, Professor and Head (SWCE)

Dr. S. Karthikeyan, Professor and Head (CPHT)

Dr. Dr. Balaji Kannan, Professor and Head (PS&IT) & Staff Advisor

Organizing committee

Technical Committee (Industry – Institution Interaction Workshop)

Dr.V.Thirupathi, Professor (CPHT)

Dr.R.Mahendran, Assoc. Professor (REE)

Dr.C.S. Sumathi, Assoc. Professor (PS&IT)

Dr. J. Deepa, TA (FPE)

Dr.P.Preetha, TA (FPE)

Dr.R.Divya Bharathi, TA (REE)

Finance & Purchase Committee

Dr.M.Balakrishnan, Professor & Head, Dept. of FPE

Dr.S.Sriramajayam, Assoc. Professor (REE)

Dr.M.Anand, Asst.Professor (Horti.)

Dr.A.P.Mohan Kumar, Asst.Professor (FM&PE)

Dr.J.Gitanjali, TA (FM&PE)

Dr.T.Arthi, TA (SWCE)

Food Committee

Dr.T.Pandiarajan, Professor (FPE)

Dr.M.Anand, Asst.Professor (Horti.)

Dr.B.Suthakar, Asst.Professor (FM&PE)

Dr.R.Gangaiselvi, Assoc. Professor (Statistics)

Dr.G.Vasuki, TA (FM&PE)

Dr.A.Selvaperumal, TA (SWCE)

Transport and Accommodation Committee

Dr.A.Surendrakumar, Professor & Head, Dept. of FM&PE

Dr.P.Dhananchezhian, Asst.Professor (FM&PE)

Dr.P.Vijayakumary, Asst.Professor (REE)

Dr.K.Gurusamy, Asst.Professor (Biochem.)

Dr.P.Vivek, TA (FM&PE)

Dr.J.Ramachandran, TA (SWCE)

Hall & Session arrangements committee

Dr.K. Nagarajan, Professor and Head, Dept. of SWCE

Dr.S.Sridevy, Assoc. Professor (Computer Science)

Dr.G.Amuthaselvi, Asst.Professor (FPE)

Dr.M.Angaleeswari, TA (SWCE)

Dr.R.Kiruthika, TA (REE)

Er.G.Vasanthi, TA (CPHT)

Design Committee

Dr.D.Ramesh, Professor (REE)

Dr.M.R. Duraisamy, Professor (PS&IT)

Dr.R.Vasanthi, Assoc. Professor (Mathematics)

Dr.R.Ravikumar, Asst. Professor (Mathematics)
Dr.Patil Santhosh Ganapathi, Asst.Professor (Agrl. Statistics)

Sponsorship Committee

Dr.S.Karthikeyan, Professor and Head, CPHT
Dr.P.Geetha, Assoc. Professor (FSN), CPHT
Dr.R.Thiyagarajan, Asst.Professor (FM&PE)
Dr.P.Sudha, Asst.Professor (FPE)
Dr.S.Parveen, Asst.Professor (FPE)

Registration & Reception Committee

Dr.G.Gurumeenakshi, Professor (FSN), CPHT
Dr.K.Chandrakumar, Asst.Professor (Biochem.)
Dr.R.Parimaladevi, Asst.Professor (Microbiology)
Dr.A.Eswari, Asst. Professor (Mathematics)
Dr.J.Deepa, TA (FPE)

Outreach committee

Dr.Balaji Kannan, Professor and Head, Dept. of PS&IT
Dr.V.Ravikumar, Professor (SWCE), WTC
Dr.A.Valliammai, Assoc. Professor (SWCE), WTC
Dr.R.Pangayarselvi, Assoc. Professor (Mathematics)
Dr.P.Preethi, TA (FPE)
Dr.N.Nisha, TA (FM&PE)
Dr.M.Ramanan, TA (PS&IT)
Er.A.Yasodha, TA (SWCE)

Press and Write-Up Committee

Dr.P.Subramanian, Professor and Head, Dept. of REE
Dr.P.Sudha, Asst.Professor (FPE)
Dr.P.G.Saravanan, Asst. Professor (Agrl. Statistics)
Th.R.Chellamuthu, Asst. Professor (Computer Science)
Dr.J.Gitanjali, TA (FM&PE)

Invitation & Certificate Committee

Dr.R.Kavitha, Professor (FM&PE)
Dr.G.Thangamani, Assistant Professor (Microbiology)
Dr.S.Selvakumar, Assistant Professor (SWCE)
Dr.C.S. Sumathi, Assoc. Professor (Computer Science)
Dr.A.Selvaperumal, TA (SWCE)

To

All the individual staff members through the concerned Head of the Departments, AEC&RI, TNAU, Coimbatore.

All the Head of the Departments, AEC&RI, TNAU, Coimbatore.


Dean (Engg.)