

AGRICULTURE WORLD

the pulse of global agriculture

ISSN 2455-8184

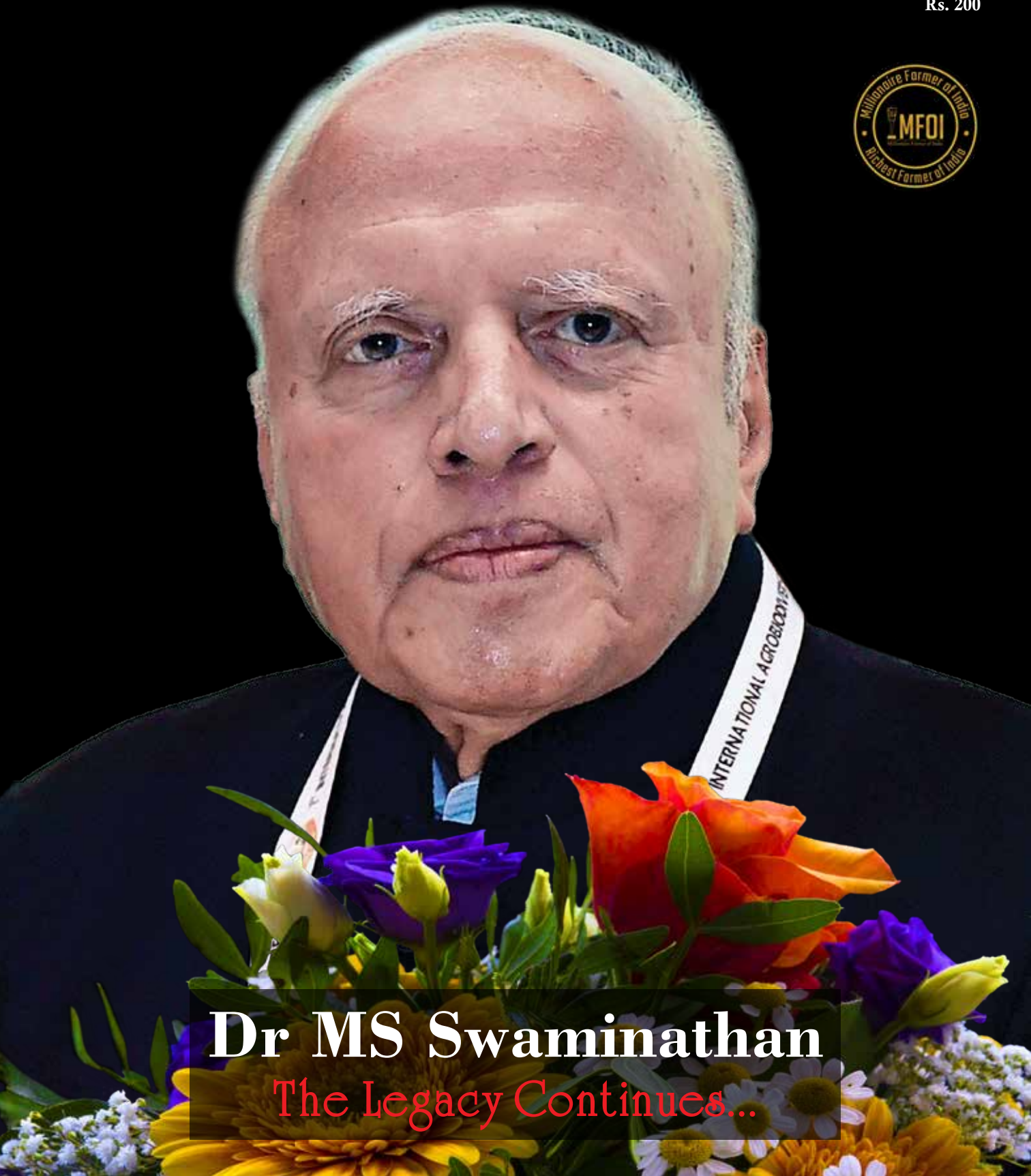


VOLUME 9

ISSUE 10

OCTOBER 2023

Rs. 200



Dr MS Swaminathan
The Legacy Continues...

apollo
TYRES

DOUBLE GRIP OFFER

DISCOUNT ON EXCHANGE. DOUBLE GRIP ON FIELD

Now get a discount of upto ₹ 1500* on exchanging old tyres with Apollo Virat

15% OFF

Segment	VIRAT/VIRAT CR	VIRAT 4R/VIRAT Plus	Faktor - F
Tr. Front	250	300	400

Segment	Pattern Rim	FX	KG	VIRAT/ Farm King
Tractor Rear	Up to 24"	200	300	1000
	26"-28"	1200	400	1200
	30"-36"	800		1500

Offer valid from 3rd Oct till stock lasts

TOLL FREE 1800 212 7070
*T&C apply.

*T&C apply. Limited period offer. Valid till stocks last. Up to ₹1500/- off on the best buy of 2 Tractor tyres and the exchange discount value will become half on the purchase of 2 Tractor tyres. No two different offers can be clubbed. Old Tractor front/rear tyres of any type and size can be exchanged. Disclaimer: Apollo is the proprietor of the trademarks Virat, Virat Plus, Virat 4R, Virat CR, Krishak Gold, Farm King, FX, and all associated Apollo trademarks, trade names, service marks, logo, tyre tread designs. Copyright © 2018 APOLLO TYRES LTD.

W AGRICULTURE
WORLD
the pulse of global agriculture

ISSN 2455-8184



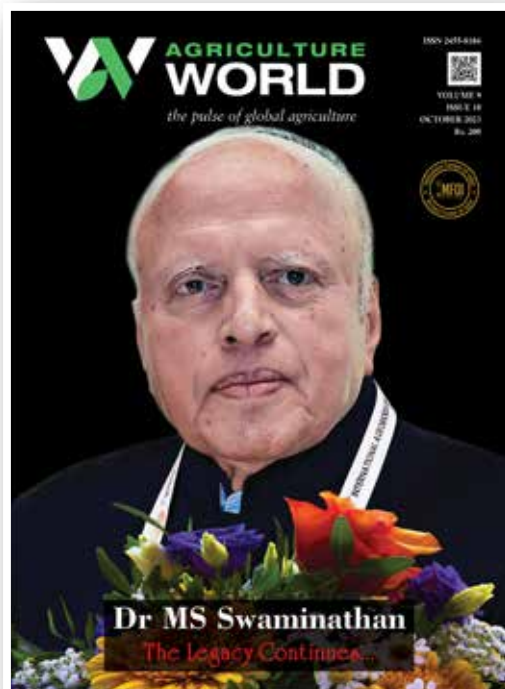
VOLUME 9
ISSUE 10
OCTOBER 2023
Rs. 200



FOOD PROCESSING

To Escalate Farm Revenue





Founder & Editor-in-Chief	MC Dominic
Managing Director	Shiny Dominic
Group Editor & CEO	Mamta Jain
Executive Editor	Rajni Shaleen Chopra
Sr. Vice President Corporate Comm. & PR	P.S. Saini
Sr. GM - Special Initiatives	Mridul Upreti
GM - Business Development	Megha Sharma
GM - Events	Harsh Kapoor
Special Initiatives	Anika Bassi
	Parikshit Tyagi
Circulation	Abdus Samad
	Vaishali Das
Sr. Graphic Designer	Md. Nasim Ansari

Printed and Published by :
MC Dominic
60/9, 3rd Floor, Yusuf Sarai Market, Near Green Park Metro Station, New Delhi-110016

Printed at :
Pushpak Press Pvt. Ltd.
Shed No. 203, 204, DSIDC Complex Indl. Area, Okhla Phase-I, New Delhi-110020

All rights reserved.
Copyright @ Krishi Jagran Media Group. Agriculture World is published by Krishi Jagran Media Group.
Editor in Chief: MC Dominic

Content Disclaimer
Please note that the information in this magazine, does not make any claims. Agriculture World has made a constant care to make sure that the content is accurate, and the views expressed in the articles reflect the author(s) opinions.

CONTENT

- 08. The Doyen of Agriculture Legendary Dr MS Swaminathan
- 12. Shri Pashupati Kumar Paras, Hon'ble Minister, MOFPI
- 14. Shri Prahlad Singh Patel, Hon'ble Minister of State, MOFPI
- 16. World Food Day 2023
- 20. World Food India 2023 and Beyond
- 22. Vision and Support
- 24. Food Processing, The India Story
- 28. From The Executive Editor's Desk
- 32. Food Processing Industry
- 34. Hon'ble LG of Ladakh UT inaugurates Ladakh Dairy Federation's dairy plant refurbished by NDDB
- 36. Food Processing
- 40. Fueling Prosperity
- 42. The Road To Growth
- 50. Revolutionising, Indian Agriculture
- 52. IPL Biologicals
- 56. Post-Harvest Mechanization Vital For Farmer Prosperity
- 58. Sustainable Food Processing
- 62. Championing Innovation and Supporting Local Fruit Farmers
- 64. Dynamic Sector, Innovative Technologies
- 66. Cultivating Prosperity and Increasing Farmers' Income through Plant Protein Processing
- 68. Contribution of Food Processing to Indian Agriculture
- 70. High-Quality Agri Inputs for Sustained Growth
- 74. Food Technology
- 76. High Potential High Growth
- 80. Game-Changer for Indian Agriculture
- 82. Food Processing for Escalating Farm Revenue
- 84. Critical Driver Of India's Economic Growth
- 86. The Chemical-Biological Matrix
- 90. Tomato Round The Year

TRIBUTE



Mankombu Sambasivan Swaminathan

Woven in fabric which legends are made of...

Dr MS Swaminathan's life was a testament to unwavering dedication, brilliance, and a profound commitment to improving the lives of countless individuals across the world. His remarkable contributions to the field of agriculture and food security have left an indelible mark on our global community.

Dr. Swaminathan's journey began in the hallowed halls of science, where he pioneered groundbreaking research in agricultural genetics. He played a pivotal role in India's Green Revolution, a transformational movement that catapulted the nation from the brink of food scarcity to self-sufficiency. His tireless efforts in developing high-yielding crop varieties, particularly in rice and wheat, not only revolutionized agriculture but also helped alleviate hunger and poverty for millions.

Beyond his scientific achievements, Dr. Swaminathan's vision encompassed sustainable agriculture and the welfare of small-scale farmers. He championed the idea that science should serve humanity, advocating for equitable access to technology, knowledge, and resources for all farmers, regardless of their means.

Throughout his illustrious career, Dr. M.S. Swaminathan garnered numerous awards and accolades, including the World Food Prize, the Tyler Prize for Environmental Achievement, and the Padma Vibhushan, India's second-highest civilian award. However, his humility and dedication to his work always remained at the forefront.

Dr. Swaminathan's legacy will endure through the generations of scientists, policymakers, and individuals inspired by his work. His profound impact on agriculture, food security, and sustainable development will continue to shape our world for years to come.

In his memory, let us rededicate ourselves to the principles he held dear...A commitment to science, a passion for feeding the hungry, and a tireless pursuit of a more equitable and sustainable future for all. Dr. M.S. Swaminathan's life was not just an era; it was a legacy of hope, compassion, and progress that will forever inspire us all. May his soul rest in peace

MC Dominic
Founder & Editor-in-Chief



MFOI 2023 - The Game Changer



It is said that celebrations infuse life with passion and purpose. Celebrations summon the human spirit and drive us to be the best of what we can be. This is the ethos that defines Millionaire Farmers of India (MFOI) Awards, the globally unique initiative of the Krishi Jagran Group.

As we embark on this proud initiative, we are beholden to **Dr MS Swaminathan**, the legend who gave Indian agriculture its rightful place on the global high table. We pay our tributes to the visionary who found India in 'ship to mouth' distress, and led India to the glory of 'farm to ship'. We salute the man who enabled our farmers to be millionaires and led our nation to prosperity and abundance.

The prosperity of Indian agriculture is a matter of national pride and celebration. It is a testament to the hard work and dedication of millions of farmers who have been working tirelessly to feed the nation and contribute to its economic growth. The agricultural sector has been instrumental in ensuring food security for the country's population, which has grown significantly over the years.

The purpose of celebration is to glorify and honour all that we want to see more of. Our Millionaire Farmers in every sector are those success stories that need to be replicated. Our Millionaire Farmers provide the template for triumph over the diverse challenges.

The agriculture sector has been undergoing significant changes in recent years. The government has introduced several reforms aimed at improving farmers' livelihoods and increasing their income. These reforms have included measures such as increasing minimum support prices for crops, investing in agricultural infrastructure, and promoting FPOs.

Celebrating the prosperity of Indian agriculture is essential because it recognizes the contributions made by millions of farmers to the country's economy and food security. It also highlights the potential for growth and development in the sector while raising awareness about the challenges faced by farmers.

The MFOI Awards initiative has been welcomed and hailed by all stakeholders of the agricultural sector. The titans of the agriculture sector and those in pivotal positions have acknowledged the significance of this initiative and have joined us in this exhilarating journey for the awards event to be held in December.

Shiny Dominic
Managing Director

www.krishijagran.com

EDITOR'S DESK



Food Processing: For Farmer Prosperity



India's food processing sector has been growing at a rapid pace in recent years. According to the Ministry of Food Processing Industries, the sector grew at a CAGR of 8.4% between 2014-15 and 2019-20. The sector is expected to grow at a CAGR of 11% between 2020 and 2025.

India is the world's second-largest producer of food, and the food processing sector has the potential to add significant value to the country's agricultural output. The increasing demand for packaged and processed food products due to changing lifestyles and increasing urbanization is expected to drive growth in the sector. Additionally, the sector has a large untapped potential for exports. Currently, only a small percentage of processed food products are being exported.

The government's focus on creating modern infrastructure for food processing is expected to attract more investment into the sector. The sector has significant potential for employment generation, particularly in rural areas, where most of the raw materials are produced.

GOI has taken several initiatives to promote the food processing sector. The Pradhan Mantri Kisan Sampada Yojana (PMKSY) is one such initiative that aims to create modern infrastructure for food processing in the country. The scheme provides financial assistance for setting up new food processing units, modernizing existing units, and creating cold chain infrastructure.

India's food processing sector has immense potential for growth. The government's initiatives and the increasing consolidation in the sector are positive signs. Overall, the outlook for the sector is positive, and it is poised to gain strength in the coming years. The government's initiatives and focus on exports and infrastructure development are positive signs for the sector's future. They are expected to drive growth and enable the food processing sector to play an important role in the country's economic development.

Mamta Jain
Group Editor & CEO

To a Legend From a Legend

Dr RS Paroda Fondly Remembers The Contribution
Of **Dr Monkombu Sambasivan Swaminathan** To
Indian And Global Agriculture



The void created by him will be very difficult to fill as he had been a visionary, a good planner, great human being and above all most respected by the country for his recommendation as Chairman Farmers Commission to give farmers MSP 50% higher than cost of cultivation + C2. The entire farming community is grateful for his love for the peasants and the Indian agriculture

ABOUT THE AUTHOR

Dr R.S. Paroda

Padma Bhushan Awardee

Former DG, ICAR, and Secretary, DARE, Govt of India

Chairman, TAAS, New Delhi



Obituary

The Doyen of Agriculture Legendary Dr MS Swaminathan

With passing away of Dr Monkombu Sambasivan Swaminathan, India has lost a great son who led green revolution in late 60s to let country achieve food self-sufficiency. He is popularly known as father of the Green Revolution in India. Today, thanks to his dynamic leadership and invaluable contributions, India has her head high, meeting the domestic food demand despite being the most populous country in the world.

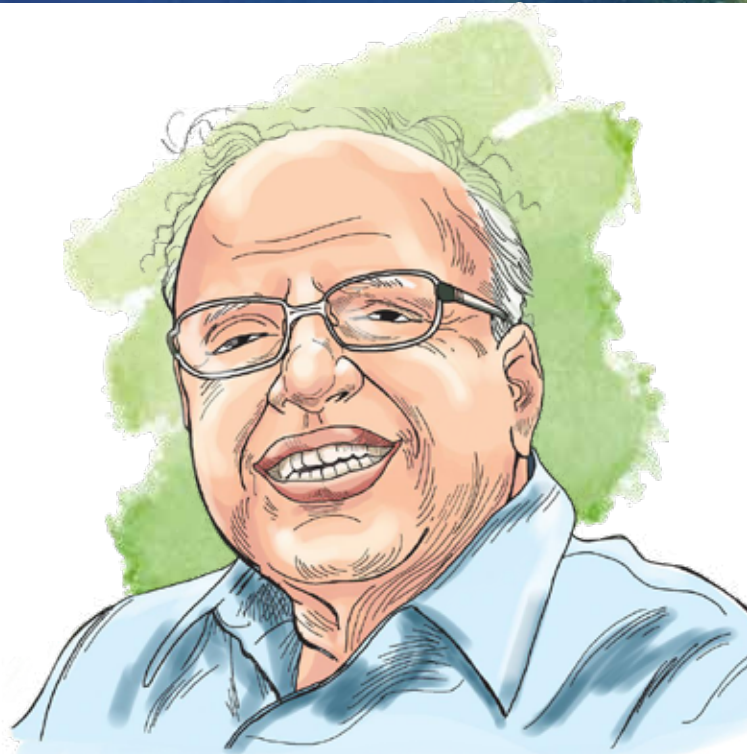
Far from being a importing country, we have become a major exporting nation in the world. Dr Swaminathan's contributions to strengthen National Agricultural Research System, first Director General of reorganized Indian Council of Agriculture Research, having gained the status of Secretary, Department of Agriculture Research and Education, creation of agriculture research service and many reforms would all be remembered with great admiration. He has been the most decorated globally as an agricultural scientist from India.

Dr Swaminathan was the first World Food Prize winner (1987). He was also recipient of Magsaysay award for community leadership in 1971; recipient of Elbert Einstein World Science Award in 1987; the Indira Gandhi prize for peace in 1994; UNEP Sasakawa Environment prize in 1994; The UNESCO Gandhi Gold Medal in 1999 and many more.

He also was decorated with Padma Bhushan and Padma Vibhushan by the Hon'ble President of India for his immense contribution to agriculture. He was also the President of Indian Science Congress and Chairman, FAO Council. He also served as Director General of International Rice Research Institute (IRRI) and was the Founder Chairman of M S Swaminathan Research Foundation, Chennai.

The void created by him will be very difficult to fill as he had been a visionary, a good planner, great human being and above all most respected by the country for his recommendation as Chairman Farmers Commission to give farmers MSP 50% higher than cost of cultivation + C2. The entire farming community is grateful for his love for the peasants and the Indian agriculture.

The entire agricultural scientific community is saddened by his demise, and we pray to the Almighty to give peace to his noble soul.



His commitment to bridge the gap between scientific discoveries and practical implementation led to the inception of the Lab-to-Land Program. This visionary initiative sought to transfer agricultural technologies directly to farmers, ensuring that the benefits of research reached those toiling in our fields. It was a testament to his dedication to the welfare of India's farming community

The entire nation is mourning the passing away of our most beloved Prof MS Swaminathan on 28 September 2023 at Chennai. He was a Mahanayak, a legend, great visionary, eminent scientist, mentor, guide, philosopher, reformer, thinker, policy maker, global trend setter, science administrator and a human being par excellence. With his demise, India has indeed lost a great son of the soil which is a big loss for Indian agricultural fraternity and the huge void left by this great visionary is immeasurable.

Prof Swaminathan played a pivotal role in shaping the future of agricultural research and development in India. He was instrumental in the creation of the All India Agricultural Research Service (ARS), which facilitated collaborative research efforts among scientists from all corners of the nation. This networking of scientific minds laid the foundation for innovative solutions in agriculture, fostering a sense of unity among researchers dedicated to improving our agricultural landscape.

Pioneering Work

His pioneering work in wheat breeding and genetics laid the foundation of India's Green Revolution. The high yielding wheat varieties developed by him transformed the country's agricultural landscape. His contributions to make country self-sufficient in foodgrains, by introducing and breeding dwarf wheat varieties, had led to enhanced production from 50 million tons in 1950 to now 330 million tons. Hence, from an importing country India became a net exporting nation in the world. His scientific innovations thus brought about a paradigm shift offering lifeline to millions facing food insecurity and created a profound impact

His commitment to bridge the gap between scientific discoveries and practical implementation led to the inception of the Lab-to-Land Program. This visionary initiative sought to transfer agricultural technologies directly to farmers, ensuring that the benefits of research reached those toiling in our fields. It was a testament to his dedication to the welfare of India's farming community. Throughout his distinguished career, he made outstanding contributions in agriculture nationally and internally.

Influence And Leadership

Prof Swaminathan's influence and leadership extended beyond

India's borders. As Director General, International Rice Research Institute (IRRI) in the Philippines from 1982 to 1988, he guided the institute to significant strides in rice research, benefiting the rice-growing regions worldwide. He was the President of the [Pugwash Conferences](#) and the [International Union for Conservation of Nature](#). In 1999, he was one of three Indians, along with Mahatma Gandhi and Ravindra Nath Tagore, on [Time Magazine's](#) list of the 20 most influential Asians of the 20th century.

The awards and accolades he received during his lifetime bear witness to his exceptional contributions. From being the first World Food Prize laureate in 1987 to the [Shanti Swarup Bhatnagar Award](#), the [Ramon Magsaysay Award](#) (1971), and the [Albert Einstein World Science Award](#), Indira Gandhi Prize for Peace, UNEP Sasakawa Environment Prize, and UNESCO Gandhi Gold Medal, among others, further highlighted his exceptional dedication to agriculture and rural development. The nation honoured him with the Padma Shri, Padma Bhushan and Padma Vibhushan for his immense contributions. Adjudging his pioneer contributions, the Government of India must consider honouring him with 'Bharat Ratna' posthumously.

Prof Swaminathan was a great statesman who tirelessly advocated for the welfare of our farming community. As Chairman of the Farmers Commission, he convinced the Government to come up with the National Farmers Welfare Policy and recommended paying farmers MSP +50% of cultivation cost +C2. This earned him high respect and gratitude of the entire farming community. He was a deeply respected figure whose love for the peasants and Indian agriculture was unwavering.

Excellence with relevance, vigour with rigour, science for society, quality with humility, are among the invaluable lessons he taught all of us throughout his life. His achievements will continue inspiring the young generations to strive for yet better future for Indian culture.

On behalf of entire scientific community and on my own behalf, I pray the Almighty to rest the departed noble soul in eternal peace and give enough strength and courage to the bereaved family members, relatives and friends to bear such a tragic and irreparable loss with fortitude.

2nd Edition
World Food India
Nov 3-5, 2023

Immense Possibilities Of India's Food Processing Sector On World Stage

Shri Pashupati Kumar Paras, Hon'ble Minister, MOFPI

Sir, in March 2021, Prime Minister Shri Narendra Modi had highlighted that there is a need to bring a food processing revolution in the country through public-private partnership. Two and a half years later, do you feel that the private sector has come forth to participate in the food processing revolution in the country?

Public Private Partnership is important for any sector of the economy and the food processing sector is no different. The private sector has made consistent efforts to revolutionize food processing by infusing innovation and technology to transform the sector. From large corporations to SMEs, the private sector has shown resilience and endeavour to adopt sustainable practices across the value chain.

There has been a significant increase in investment in terms of technology adoption, sustainable packaging solutions, integrating the logistics infrastructure, contract farming, etc. The Ministry of Food Processing Industries is supporting the private sector through schemes such as PMKSY, PMFME, and PLI for food processing in a holistic manner. At World Food India 2023, we are actively promoting the Indian food processing industry to showcase

collaborative initiatives and provide a platform for various stakeholders to network, work, and grow together.

Sir, the Prime Minister has spoken about the need for the participation of farmers in the food processing revolution that is needed in the country. Please tell us about the progress made in this regard.

The government has undertaken several initiatives to encourage the participation of farmers in the food processing revolution. Initiatives such as Pradhan Mantri Kisan Sampada Yojana (PMKSY) and various state-level schemes are promoting food processing and providing incentives and subsidies to encourage farmer participation.

These schemes are aimed at improving agricultural infrastructure, build cold storage facilities, and provide training to farmers. Pradhan Mantri Formalization of Micro Food Processing Enterprises Scheme (PMFME) provides support to Farmer Producer Organisations (FPOs)/Self Help Groups (SHGs)/ producer cooperatives along their entire value chain by facilitating grants with credit linkages, training support, seed capital support, capital investment, etc.

Sir, with the country's foodgrains production increasing, there is a need for a post-harvest revolution or food processing revolution, and value additions. Please throw light on the efforts made by the Centre to achieve this objective.

Pradhan Mantri Kisan Sampada Yojana (PMKSY), the flagship scheme of the Ministry of Food Processing was launched with the objective of modernizing and reducing post-harvest losses in the food processing sector. Integrated Cold Chain and Value Addition Infrastructure, a sub-scheme under PMKSY, aims to reduce post-harvest losses by promoting the development of integrated cold chain and value addition infrastructure.

Another such sub-scheme, Agro-Processing Cluster Scheme encourages the formation of agro-processing clusters to enhance infrastructure, create common facilities, and reduce post-harvest losses. It supports activities like sorting, grading, processing, and packaging.

The Creation of Backward and Forward Linkages focuses on creating linkages between farmers and food processing units. It facilitates the supply of raw materials from farmers to processing units, reducing wastage, and ensuring better income for farmers. The Ministry of Food Processing Industries has supported the establishment of several Food Testing Laboratories crucial role in reducing food wastage by identifying and addressing quality issues early in the supply chain.

Sir, the Prime Minister had announced that loans to food and agro-based processing units and cold chains had been classified under priority sector lending, making them easier and cheaper to obtain. What are the gains made in this sector?

The Reserve Bank of India (RBI) made a landmark decision in 2020 by classifying loans for food and agro-processing under Priority Sector Lending (PSL) for borrowers with an aggregate sanction limit of up to 100 Cr. This pivotal guideline has emboldened lenders to extend financial support to the sector, even acknowledging its seasonal operational nature and inherent viability challenges. Consequently, the paradigmatic shift towards recognizing the sector's importance has not only enhanced its access to credit but also solidified its status within the broader economic landscape. This has facilitated the creation of several food testing laboratories, food processing units, agro-processing units, cold chain units, etc.

Sir, food processing starts with raw materials, and India is one of the largest producers of agro-based raw materials in the world. Please tell us of the policy initiatives of the Centre to expand to global processed food market, and the successes that have been achieved.

The central sector scheme - "Production Linked Incentive Scheme for Food Processing Industry (PLISFPI)" was launched to support creation of global food manufacturing champions commensurate with India's natural resource endowment and support Indian brands of food products in the international markets with an outlay of Rs.10900 crore.

Additionally, to unlock the potential of our natural resource endowment, MoFPI is organizing the second edition of World Food India from November 03-05, 2023 at Pragati Maidan. This program is aimed to present the immense possibilities of the food processing sector in India on the world stage and to finalize the strategy ahead by having direct talks with the world's leading countries and companies to promote investment in India.

Through this program, the Ministry wants to showcase how India is optimizing its natural resources, adopting modern technologies, and identifying investment opportunities in strategic segments like marine products, fruits and vegetables, meat and poultry, packaged foods, and dairy products. These steps aim to enhance production, consumption, exports, and value addition in these sub-sectors.

Sir, agri-production centres are far from urban centres. We need extremely strong infrastructure to connect farm and fork. Please elucidate the policy initiatives of the government to cover this gap.

To connect farm to fork, the government has launched initiatives such as Pradhan Mantri Kisan Sampada Yojana (PMKSY) which includes sub-schemes such as Integrated Cold Chain and Value Addition Infrastructure, Agro-Processing Cluster Scheme, and Creation of Backward and Forward Linkages, aimed at creating a holistic infrastructure for the food processing industry, reducing post-harvest losses, and promoting value addition.

The eNAM initiative aims to create a unified national electronic trading platform for agricultural commodities. It connects agricultural produce markets (mandis) across the country, enabling farmers to access a wider market and get better prices for their produce. Other allied ministry schemes such as Pradhan Mantri Gram Sadak Yojana (PMGSY), Rashtriya Krishi Vikas Yojana (RKVY), etc. have been launched to bridge gaps in the supply chain.

Sir, the government has set up mega food parks, integrated cold chains and various schemes and subsidies to boost the food processing sector. Please illuminate the growth of Bharat's food processing industry following these diverse measures.

The Indian food processing sector has experienced rapid growth, exhibiting an impressive average annual growth rate of over 9 percent since the fiscal year 2014-15.

The Indian food processing sector extends its support to a wide array of products, encompassing traditional food items such as food grains, spices, fruits, and vegetables, as well as modern processed foods like baked goods, dairy products, superfoods, infused products, nutraceuticals, and convenience foods. Its contributions to the economy are substantial as it employs 12.2% of the total workforce in the Indian registered manufacturing sector.

In the fiscal year 2020-21, the remarkable contribution of processed foods to India's total Agri-Food Exports reached an astonishing 22.2%. The percentage share of food processing industries in the overall Indian manufacturing GVA was 10.54% at 2.37 lakh crores (US \$31.9 Bn) in 2020-21.

'Agro-Processing Clusters Shall Significantly Boost Rural Growth'

Shri Prahlad Singh Patel, Hon'ble Minister of State, MOFPI

Sir, in order to give the required impetus to the food processing sector, the nation needs a strong and vibrant network of micro, small and medium enterprises (MSMEs) along with traditional businesses, which are equipped with the latest technology. Please highlight the measures taken by the government to achieve this objective.

The Ministry of Food Processing Industries (MoFPI) has instituted three noteworthy national schemes to support food processing units across the entire value chain equipped with latest technology. These schemes include Pradhan Mantri Kisan Sampada Yojna (PMKSY), Pradhan Mantri Formalisation of Micro Food Processing Enterprise (PMFME), and Production Linked Incentive Scheme for Food Processing Industries (PLISFPI).

PMKSY aims to create modern infrastructure with efficient supply chain management from farm gate to retail outlet. PMKSY provides a huge impetus to employment generation especially in rural areas, reducing wastage of agricultural produce, increasing the processing level, and enhancing the export of processed foods.

PLISFPI envisions creation of global food manufacturing champions commensurate with India's natural resource endowment and support Indian brands of food products in the international markets with an outlay of Rs.10900 crore. PMFME provides support to Farmer Producer Organizations (FPOs)/Self Help Groups (SHGs)/ producer cooperatives along their entire value chain by facilitating grants with credit linkages, training support, seed capital support, capital investment, etc.

Sir, in the last few years, the Centre has been keen on increasing the number of agro- industries cluster along the villages so that the rural population can get employment related to farming. Please shed light on the gains made on this front.

Agro-processing clusters enable the conversion of raw agricultural produce into value-added products. This value addition enhances the income of farmers, employment generation, and benefits other stakeholders in the value chain, as processed products often command higher prices than raw commodities.

Under Pradhan Mantri Kisan Sampada Yojna (PMKSY), the Agro-Processing Cluster Scheme was launched which aims at the development of modern infrastructure and common facilities

to encourage group of entrepreneurs to set up food processing units based on a cluster approach by linking groups of producers/ farmers to the processors and markets through well-equipped supply chain with modern infrastructure. The clusters enhance infrastructure, create common facilities, reduce post-harvest losses, and are eligible for financial assistance. So far, we have 16 agro-processing clusters in India.

Sir, in March 2021, Prime Minister Shri Narendra Modi had stated that the public sector has mainly contributed towards R&D in the agriculture sector, and now the time has come to increase the private sector's participation in it. Please elucidate the progress made in this regard.

In the past few years, the private sector has made consistent efforts to revolutionize food processing by infusing innovation and technology to transform the sector. Product innovation has been at the heart of R&D initiatives which include the creation of healthier, convenience-oriented, and value-added products.

The private sector which includes large corporations and MSME, has significantly increased investment in terms of technology adoption, sustainable packaging solutions, integrating the logistics infrastructure, contract farming, etc. These initiatives have also complimented the adoption of advanced processing technologies and equipment to improve production efficiency, reduce waste, and maintain product quality.

Sir, the stalwarts of the food processing industry state that there are challenges, but the potential for the food processing industry far outweighs the challenges. Please shed light on the challenges faced by the food processing sector.

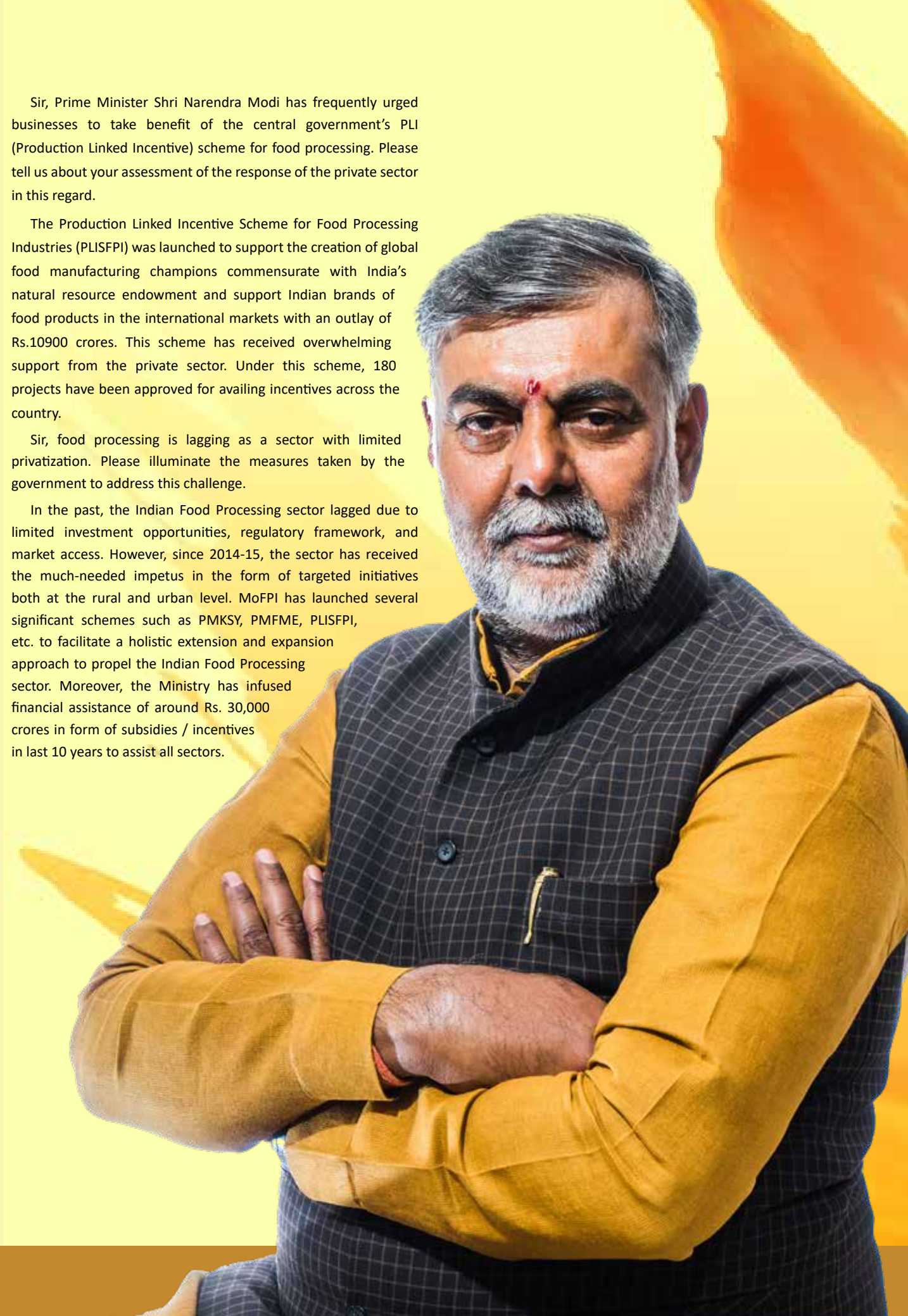
The growth of the food processing sector is crucial for the greater social and economic development of the country. The Ministry of Food Processing Industries (MoFPI) has launched several initiatives, primarily, Pradhan Mantri Kisan Sampada Yojna (PMKSY), Pradhan Mantri Formalization of Micro Food Processing Enterprise (PMFME), and Production Linked Incentive Scheme for Food Processing Industries (PLISFPI) to address challenges faced by the sector. However, MoFPI is working closely with the industry and allied stakeholders to address the challenges while formulating solutions for the same.

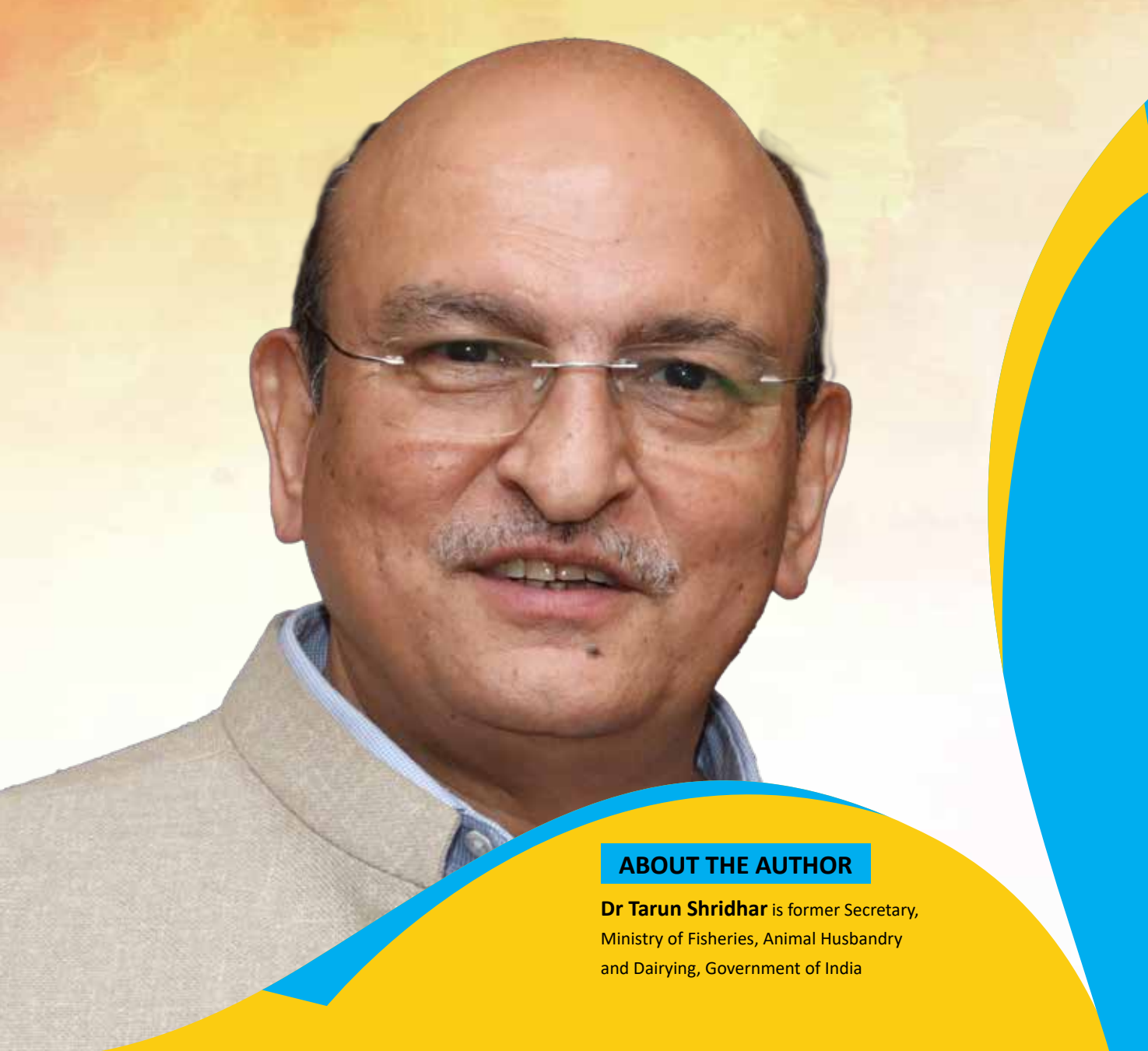
Sir, Prime Minister Shri Narendra Modi has frequently urged businesses to take benefit of the central government's PLI (Production Linked Incentive) scheme for food processing. Please tell us about your assessment of the response of the private sector in this regard.

The Production Linked Incentive Scheme for Food Processing Industries (PLISFPI) was launched to support the creation of global food manufacturing champions commensurate with India's natural resource endowment and support Indian brands of food products in the international markets with an outlay of Rs.10900 crores. This scheme has received overwhelming support from the private sector. Under this scheme, 180 projects have been approved for availing incentives across the country.

Sir, food processing is lagging as a sector with limited privatization. Please illuminate the measures taken by the government to address this challenge.

In the past, the Indian Food Processing sector lagged due to limited investment opportunities, regulatory framework, and market access. However, since 2014-15, the sector has received the much-needed impetus in the form of targeted initiatives both at the rural and urban level. MoFPI has launched several significant schemes such as PMKSY, PMFME, PLISFPI, etc. to facilitate a holistic extension and expansion approach to propel the Indian Food Processing sector. Moreover, the Ministry has infused financial assistance of around Rs. 30,000 crores in form of subsidies / incentives in last 10 years to assist all sectors.





ABOUT THE AUTHOR

Dr Tarun Shridhar is former Secretary, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India

World Food Day 2023

Celebrate Water

Nourishment of Humanity

“

The theme of the World Food Day and the objectives of our own PMKSY call for commitment and concerted efforts by one and all. Managing water would mean managing food for now and for the future

“Nothing is softer or more flexible than water, yet nothing can resist it. If there is magic on this planet, it is contained in water”, so said the ancient Chinese philosopher Lao Tzu, circa 500 BCE. The English poet WH Auden makes a lyrical statement, “Thousands have lived without love, not one without water.”

Yet today, despite the poetic association of Lao Tzu and Auden, water has emerged as one of the biggest challenges facing mankind. Rapid population growth, urbanisation, economic development, and climate change are putting the planet’s water resources under increasing stress. At the same time, freshwater resources per person have declined 20% in recent times. Water availability and quality are deteriorating fast due to decades of poor use and management, over extraction of groundwater, pollution and climate change. We risk stretching this precious resource to a point of no return.

More Crop, Per Drop

“More crop, per drop” is a catchy slogan of the flagship irrigation programme of the government of India, the Pradhan Mantri Krishi Sinchaayi Yojna (PMKSY) aiming to improve the efficiency of water use; the goal, as the slogan conveys, is to maximise crop yields with minimal water use. It lays the foundation to manage the emerging water crisis by systematically increasing water productivity and conservation, especially in the agricultural sector, to free it up for other essential and productive uses.

It is a remarkable coincidence that water, quite aptly, takes the centre stage as the theme of World Food Day 2023: “Water is Life, Water is Food. Leave No One Behind.” This thematic statement emphatically establishes the common ownership of this most precious of natural resources and exhorts for its equitable access to all.

World Food Day is an international day celebrated every year worldwide on October 16 to commemorate the birth of the United Nations Food and Agriculture Organization (FAO). On this day, in the year 1945, 42 countries met in Quebec, Canada, to create FAO; India was one of the founding members, however recognised at the time as a low-income food deficient country. Haven’t we come a long way since then? Not only are we self-sufficient but are a net exporter of a range of food products; we also maintain a comfortable and healthy buffer stock of food grains.

Creation of the FAO marked an important step forward in the global community’s cooperation in its perpetual struggle against hunger and malnutrition. FAO provided a mechanism for its member countries to deal with these formidable problems and issues which were, and continue to be, of major concern.

Our ancestor was a hunter, continuously engaged in the struggle to feed himself, even when he had emerged as a being that could walk upright and had a level of intelligence a notch above that of his ancestors. A few million years later he took his first giant step forward when he learned to cultivate plants and began to develop the art of farming. Another two to five thousand years later, he took a second giant step forward when he learned to domesticate animals.

With cultivated plants and domesticated animals at his command, man was much better able to ensure a steady food supply for himself. But these developments brought with them an extension of the problem, for they opened the way for a vast increase in the number of people the earth could support, and eventually that increase erupted into the population explosion the world has witnessed during the last century.

The Beginning Of Farm Machinery

Man has made many further steps forward in his efforts to ensure an adequate food supply. Improved varieties of plants

and more productive animals were developed. Farm machinery was created as were fertilisers and pesticides which soon got into widespread use. Improved methods of processing, storage and distribution were the resultant evolution. Inequities arose alongside; in some countries, most people were well fed, even resulting in food surpluses.

But in many parts of the world the population increase outpaced increases in production, and many were under-nourished, or malnourished, or both. The problem was brought into sharp focus by World War II when agricultural production was disrupted in vast areas, and one of the post-war reconstruction outcomes was the establishment of the FAO.

Ensure sustainable consumption and production patterns, says the Sustainable Development Goal (SDG) 12 and goes on to elaborate in 12.3, “By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses.”

More than 30% food produced gets lost or wasted, and an equal percentage of the human population suffers from moderate to severe food insecurity, including the 800 million close to starvation. This is an admission by the FAO, whose raison d'être is, ironically, enshrined as a “specialised agency of the United Nations that leads international efforts to defeat hunger. Our goal is to achieve food security for all and make sure that people have regular access to enough high-quality food to lead active, healthy lives.” We do not lack sufficient calories on a global scale to feed the world's growing population, but rather that the calories produced are not equitably distributed and not readily accessible to all, as evidenced by overconsumption on the part of 2 billion people, while 800 million remain undernourished.

Impact Of Food Losses And Waste

It is indeed a mockery that the food lost and wasted is precisely what the vulnerable population is struggling to get, and if salvaged, would end hunger and malnutrition in the world? The equation, however, is not as simple and linear as it would appear; though it does point towards a collective failure of the international community in general, and the FAO in particular, that after more than seven decades of its existence all it must showcase is increased hunger and nutritional insecurity.

In a world where hundreds of millions of people go hungry, that is a stark reflection upon the inefficiency of current food systems. Food losses and waste often translate into economic losses for farmers and other stakeholders within the food value chain, and higher prices for consumers, both of which affect food insecurity by making food less accessible for vulnerable groups.

It is against this background and context that the significance of October 16, the World Food Day, deserves to be appreciated, a day

celebrated widely by the nations of the world as well as many other organisations concerned with hunger and food security, including the World Food Programme, the World Health Organization and the International Fund for Agricultural Development.

Food: A Global Issue Calling For Collaborative Efforts

Food, as a global issue calling for collaborative efforts, may have caught attention in the year 1945, however, declaration and its resultant commemoration as a World Food Day commenced in the year 1981. Since 1981, World Food Day has adopted a different theme each year to highlight areas for collective action and a common focus. The themes have been varied, as also carrying a common thread of food security, livelihoods, smallholder producers, environmental concerns etc.

To mention a few as an illustration: the theme in the inaugural and the following year was Food Comes First; later years had themes such as Women in Agriculture; Rural Poverty; Fishermen and Fishing Communities; Fighting Hunger and Nutrition; Harvesting Nature's Diversity.

Most of the themes revolve around agriculture because it is only an investment in agriculture, together with support for education and health, that could lead societies to sustainable growth. The bulk of that investment will have to come from the private sector, with public investment playing a crucial role, especially in view of its facilitating and stimulating effect on private investment. Despite the importance of agriculture as the driving force in the economies of many developing countries, this vital sector is frequently starved of investment.

Water Stress

That water is essential to life on Earth is stating the obvious. It makes up over 50% of our bodies and covers about 71% of the Earth's surface. Even though only 2.5% of water is suitable for drinking, agriculture and most industrial uses, it is the foundation of our food. Agriculture accounts for 72% of global freshwater withdrawals, and like all other natural resources, fresh water is not infinite.

An estimated 2.4 billion people live in areas under severe water-stress, and most of these are smallholder farmers who are under the drudgery and struggle to meet their daily needs. Particularly vulnerable are the women, indigenous communities and the displaced, whose numbers do not show any signs of receding.

On the other hand, competition for this priceless resource is increasing by the day and water scarcity has become an ever-increasing cause of conflict. Another about 600 million people who depend, at least partially, on aquatic food systems for a living are suffering the effects of pollution, ecosystem degradation, unsustainable practices and climate change. High levels of land and water use are stretching the productive capacity of land and water



High levels of land and water use are stretching the productive capacity of land and water systems to the limit, and severely degrading land and environment in the process

systems to the limit, and severely degrading land and environment in the process.

Important To Use Water Wisely

It is high time that we start managing water wisely. How? Produce more food, as also other essential agricultural commodities, with less water. Simultaneously, it is imperative that while ensuring water is distributed equally, our aquatic food systems are preserved, thus securing livelihoods too. Let us not take water for granted and improve the way we use and manage it in our daily lives. What we eat, and how it is produced affect water. A difference can be made simply by choosing local, seasonal, and fresh foods; importantly wasting less of it - reduction of food waste would obviously translate into reduction of water use.

Since times immemorial, communities have been directly influenced by the quality and quantity of water. In fact, to ensure an assured and adequate supply of drinking water, we developed innovative ways of treating and managing it. Today, irrigation may not seem exciting, but centuries ago, it was one of the major inventions that transformed agriculture, especially in areas where climatic conditions were harsh, and rainfall was rare.

The theme of the World Food Day and the objectives of our own PMKSY call for commitment and concerted efforts by one and all. Managing water would mean managing food for now and for the future.

Remember the words of the celebrated Bohemian author Franz Kafka, “So long as you have food in your mouth, you have solved all questions for the time being.”



Dr Anita Praveen
Secretary, Ministry of Food Processing Industries

Unleashing India's Food Processing Potential

World Food India 2023 and Beyond

“The Ministry of Food Processing Industries (MoFPI) is set to organize the second edition of World Food India (WFI) in 2023 as a truly global event enabling convergence of Indian and global food processing industries. India's food processing industry has significant export potential. Connecting with global industry players, Indian business can tap into these lucrative export markets for processed foods

India's journey in the 21st century has been one worth celebrating. Our growth story as a nation, is adorned with sustained progression, technology, commitment to sustainability, resilient enterprises, and our global outlook. This exemplary growth has been importantly fuelled by our industries and its many constituent sectors, that transform India every day. One of the most promising, dynamic and under highlighted of these is the Indian food processing sector.

Food processing industry in India has had a remarkable growth trajectory in recent years and has the enormous potential for consistent growth ahead. The value addition through processing makes food processing sector one of the key sectors that can transform India's agricultural landscape and contribute to the push for doubling farmers' income. In the light of United Nations' Sustainable Development Goal (SDGs) of ensuring sustainable consumption and production patterns, food waste reduction has been given emphasis. Through innovation in processing techniques, sustainable sourcing, reprocessing and efficient utilisation of agricultural produce, the food processing industry can be the catalyst in food waste reduction, contributing to realisation of multiple SDGs.

Critical Driver Of India's Economic Growth

Given its consistent high growth rate in recent years and impressive future projections, food processing industry will be one of the critical drivers of India's economic growth. Government of India has undertaken numerous policy initiatives to augment this sector's growth.

The Pradhan Mantri Kisan Sampada Yojana (PMKSY) is a scheme launched by the union government with the objective of creation of modern infrastructure in the food processing sector. The scheme is expected to leverage substantial investment of around ₹11,000 crores, creating 5.44 lakh jobs and providing a strong impetus for the food processing industry. The PM Formalisation of Micro Food Processing Enterprises (PMFME) is another centrally sponsored scheme with the objective of helping micro food processing enterprises' inclusion in the formal sector.

With an outlay of ₹10,000 crores, it undertakes to provide capital linked subsidy to 2,00,000 micro units. Under PMFME, MoUs have been signed with 15 lending banks and project implementation plans for 25 states have been approved. The Union Government also aims to provide financial support to rising Indian food brands through the Production Linked Incentive Scheme for Food Processing Industry (PLISFPI), a ₹10,900 crores scheme. The scheme is expected to help expand output in food processing sector by ₹33,000 crores and create 2.5 lakh jobs.

World Food India – A Major GOI Initiative

An important initiative highlighting the vision of the Government of India has been 'World Food India', a global event with domestic and international participation. The mega event is focused on showcasing India's potential in the food processing domain to investors, leaders and partners across the globe. The first edition of World Food India (WFI) in 2017 was a remarkable success and welcomed leaders, delegates, and participants from 61 countries and 27 states. World Food India, 2017 also turned out to be an unprecedented success in facilitating investments which will induce transformative growth in this industry.

The Ministry of Food Processing Industries (MoFPI) is set to organize the second edition of World Food India (WFI) in 2023 as a truly global event enabling convergence of Indian and global food processing industries. India's food processing industry has significant export potential. Connecting with global industry players, Indian business can tap into these lucrative export markets for processed foods.

The food processing industry is built upon the primary sector as processing starts with agricultural inputs. With the second largest agricultural output in the world, India is in the most comfortable position to sustain very high growth in the food processing sector for years. Also, food processing levels in India hover around 10% which represents massive untapped potential.

Increased urbanization, higher disposable incomes and preference for convenience food products are pushing up the global demand for processed foods, growing steadily at 4%. India has the largest population in the world and with increasing income levels, growth in consumer spending is likely to be a continuous trend. Additionally, India is the fastest growing major economy today and is set to have robust growth through this decade. A genuine consideration of these enabling factors substantiates India's position as one of the most reliable investment destinations with food processing industry being one of its brightest sectors.

As India marches towards becoming a \$5 trillion economy, the food processing industry is poised to play a pivotal role. With the right mix of innovation, investment, and policy support, it can significantly contribute to this ambitious goal. With World Food India 2023, India's potential is going to attract unmatched global attention. It is just the right time for domestic and foreign investors and the global food processing industry to tap into Indian food processing potential, forging ahead a better global future with India's growth story. World Food India 2023 is set to be a landmark event and as the gateway to the Indian food processing industry, addressing global challenges with India's potential.



APEDA forecasts that sector will grow at 3% CAGR between 2022 and 2030. Poor quality and the high cost of marketing channels are major impediments to the industry's growth



ABOUT THE AUTHOR

Dr Minhaj Alam is Additional Secretary & CVO, Ministry of Food Processing Industries, GOI

Vision and Support

PM Formalisation of Micro Food Processing Enterprises (PMFME) Scheme

The Indian food processing industry is among the largest in the nation in terms of growth, production, consumption, and exports. The industry produces several food products such as meat, poultry, fisheries, fruits, vegetables, spices, milk and milk products, alcoholic beverages, and grains.

India is a major producer of food in the world, with a large and growing market. The food and grocery retail market, valued at US\$ 11.3 trillion in 2021, is also among the largest in the global economy.

The Indian food processing industry accounts for 32% of the country's total food market, one of the largest industries in India. In 2017-18, the food processing industry accounted for 7.9 per cent of manufacturing GVA and 9.5 percent in agricultural value added. (Source: RBI Bulletin - Food Processing Industry in India: Challenges and Potential, Mar 11, 2020).

CAGR of 3% Between 2022 and 2030

The Agricultural and Processed Food Products Export Development Authority (APEDA) forecasts that sector will grow at the compounded annual growth rate (CAGR) of 3% between 2022 and 2030. Poor quality and the high cost of marketing channels are

major impediments to the industry's growth. Meanwhile, over 72% of food sales occur through superstores and major retailers.

Processing level in India is very low at 2.2 per cent for fruits and vegetables, 35.0 per cent for milk, 21.0 per cent for meat and 6.0 per cent percent poultry products. In 2010-11, share of raw food entering the processing channel has been estimated at 6.8 per cent in 2010-11. (Source: RBI Bulletin - Food Processing Industry in India: Challenges and Potential, Mar 11, 2020). Major processed food products exported from India include processed fruits and juices, pulses, guar gum, groundnuts, milled products, cereals preparations, oil meals and alcoholic beverages.

Dominance Of Micro And Small Enterprises

As per the latest Annual Survey of Industries (ASI) 2018-19, total number of food processing units were 40,579 in the registered sector. In this industry on an average the fixed capital per registered factory is 4.27 Cr indicating that most of the factories in this sector are micro and small enterprises. Micro sector contributes around 75% of food processing sector. Based on the NSSO 73rd round report there are estimated 25 lakhs unregistered food processing enterprises in the country which constitute 98% of the food processing sector and are unorganized and informal.

The unorganized food processing sector in the country comprises nearly 25 lakh food processing enterprises which are unregistered and informal. With only 7% of investment in plant & machinery and 3% of outstanding credit, the unorganized enterprises contribute to 74% of employment (a third of which are women), 12% of output and 27% of the value addition in the food processing sector. Nearly 66% of these units are in rural areas and about 80% of them are family-based enterprises. Most of these units fall under category of micro manufacturing units in terms of their investment in plant & machinery and turnover.

Unorganized micro food processing units need intensive hand holding support for skill training, entrepreneurship, technology, credit, and marketing, across the value chain, necessitating active participation of the state government for better outreach.

One District One Product

The States have identified the food product for a district, keeping in perspective the focus of the scheme on perishables. ODOP has been finalized based on agriculture production, presence of micro-food processing enterprises/SHGs/FPO/Cooperatives engaged in processing of the ODOP etc.

PMFME Scheme Brief

MoFPI is implementing a centrally sponsored "PM Formalisation of Micro Food Processing Enterprises (PMFME) Scheme" for providing financial, technical, and business support for upgradation of micro food processing enterprises in the country. The scheme is operational for a period of five years from 2020-21 to 2024-25 with an outlay of Rs 10,000 Crore.

The scheme aims to enhance the competitiveness of new / existing individual micro-enterprises in the unorganized segment of the food processing industry and promote formalization of the sector by addressing the challenges faced by the micro enterprises.

Support to upgrade existing units or setting up of new micro units for individuals is provided through a credit linked grant @ 35% with maximum grant of Rs.10 lakh. The Scheme also provides support to food processing units of SHGs/ FPOs/ Cooperatives for setting up of Common Infrastructure facilities with credit linked subsidy@35%, Seed Capital to SHGs, Incubation Centre, Common Infrastructure, Marketing & Branding and Capacity Building.

Scheme Outcome

Two lakh micro food processing units will be directly assisted with credit linked subsidy. Support for capacity building and marketing and branding would also be provided.

The Scheme adopts One District One Product (ODOP) approach to reap the benefit of scale in terms of procurement of inputs, availing common services and marketing of products. The States have identified the food product for a district, keeping in perspective the focus of the scheme on perishables. ODOP were finalized on the basis of agriculture production, presence of micro-food processing enterprises, SHGs/FPO/Cooperatives/micro-enterprises engaged in processing of the ODOP etc.

Achievements

One District One Products (ODOPs) for 713 districts from 35 States/UTs have been approved.

Credit Linked Subsidy for Micro Food Processing Units - Loans for 53,565 micro food processing enterprises have been sanctioned for Credit Linked Subsidy out of which 37,559 loans have been disbursed.

Seed capital amount of Rs. 390.96 crores released for 1,25,737 Self Help Group (SHG) members

76 Incubation Centres have been approved with an outlay of Rs. 205.95 crores for the establishment of Incubation Centre which are established in ODOP processing lines and allied product lines.

Overall, 13 brands have been launched under the scheme. 11 State proposals for marketing & branding have been approved which include Aasna (Punjab), Bhimthadi (Maharashtra), Semi (Karnataka), Bhima Pulses (Karnataka), Madugula Halwa (Andhra Pradesh), Aamodam (Andhra Pradesh), Jeevika (Bihar), Umed (Maharashtra), Temi Tea (Sikkim), Pudhugai (Tamil Nadu) and Neithal (Puducherry). National tie-up with NAFED has been done.

Training and Capacity Building – 41,008 beneficiaries trained in 29 States/UTs. 486 Master Trainers of 35 States/UTs trained; 1013 District Level Trainers of 26 States/UTs trained on ODOP and Entrepreneurship Development Programme (EDP).

760 training modules on ODOP by NIFTEMs which include 190 Presentations, 190 Videos, 190 DPRs and 190 Course Content/ Handbooks. All the modules are available in the PMFME website for public view.

42 State Level Technical Institutions (SLTI) nominated in 35 States/UTs approved.

MoFPI has signed Memorandum of Understanding (MoU) / Joint Letters with Indian Council for Agriculture Research (ICAR), Department of Animal Husbandry and Dairying (DAHD), Food Safety and Standards Authority of India (FSSAI), Ministry of Rural Development (MoRD), Ministry of Housing and Urban Affairs (MoHUA), Ministry of Tribal Affairs, National Cooperative Development Corporation (NCDC), National Scheduled Tribes Finance and Development Corporation (NSTFDC) and National Schedule Castes Finance Development Corporation (NSFDC), Standard Operating Procedure signed with Ministry of Agriculture & Farmers Welfare for convergence of Agriculture Infrastructure Fund (AIF) Scheme with PMFME.

Coordinated efforts are being taken with converging partners to maximize the benefit to the targeted beneficiaries and bringing in sustainable development in the product value chain by various interventions in backward and forward linkages.



ABOUT THE AUTHOR

Mr S Sivakumar is the Group Head of Agri and IT Businesses of multi-business conglomerate ITC Limited. He also holds responsibility for ITC's large-scale Sustainability and Social Investments Programme.

India stands at a transformative moment in its history. With a rapidly growing economy, burgeoning youth population, and renewed focus on development and progress, the nation is firmly on the path towards achieving its vision of Vikshit Bharat (Developed India). The Prime Minister's clarion call for Atmanirbhar Bharat, pathbreaking policy reforms for infrastructure, agriculture etc, and initiatives like "Make in India" and "Digital India" are propelling the country into the next orbit of growth. Such efforts reflect India's determination to realize its vast potential and emerge as a shining example of a modern and developed nation.

Challenges of the Agri-Food Sector

The Agriculture and Food Processing sectors are important pillars for achieving the PM's vision of building an Atmanirbhar Bharat. While India is the world's second-largest contributor to food production, accounting for nearly 10% of the total output, the agri sector is plagued by myriad challenges. Climate change is a severe threat which aggravates water scarcity that affects 54% of the country. As per estimates, significant water stress will impact around 74% of India's wheat cultivation area and 65% of its rice cultivation area by 2030. The inevitability of temperature rise, and the consequent extreme weather events highlight the need to build resilience of the sector and find solutions for adaptation.

The sector, which supports nearly half of India's workforce, also faces the traditional challenges of low productivity, poor farming knowledge and know-how, small land holdings, creating a vicious cycle of low incomes and low investments, accentuating rural poverty. Agri wastage is rampant - as per a 2022 study, between harvesting and consumption, India lost 5-15% of its fruits and vegetables and around 3-7% of crops that included pulses and oil seeds. The issue is further aggravated by household food wastage with an estimated

50 kg per person annually, implying that a staggering 68.76 million tonnes of food is lost every year.

The agri sector has the herculean task of providing food, bio-energy and livelihood security to the nearly 10 billion people who will inhabit the planet by 2050. It is estimated that world-wide food production will need a massive 70% increase to feed this population. India, with its burgeoning population moving to 1.7 billion, will experience a 60% growth in food demand, putting immense pressure on limited agricultural land.

To address challenges of such scale and complexity, there is urgent need for a new developmental paradigm for this sector. The food processing sector can address some of issues facing Indian agriculture today by driving a transformational shift of the agri ecosystem from traditional production-centric to demand-responsive value chains.

Role of Food Processing – Far Reaching Benefits

India's strong endowments in agriculture offer significant opportunities for the food processing industry, given that less than 10% of the country's agricultural produce is processed currently. Food processing has tremendous benefits for the economy. It drives competitive agri value chains by enabling better transmission of market signals, linking farmers to value-added markets, promoting sustainable agriculture, enhancing rural incomes, managing food inflation and generating sustainable livelihoods.

Value addition through processing also minimises food waste and maximises economic benefits. By processing surplus or perishable crops into value-added goods such as packaged foods, juices, frozen fruits and canned vegetables, the shelf life of the produce is extended, reducing spoilage. This enhances food security by ensuring a more stable supply

Food Processing The India Story



The potential of India's agri-food sector positions it as a powerful catalyst for economic growth and prosperity. Fifth-largest industry in terms of production, consumption, exports and potential growth, Food Processing aims to double its GDP contribution from 8% to 20% by 2030



By addressing challenges, leveraging opportunities and fostering collaboration among government, private sector and farmers, India can transform its agri-food landscape, boost exports, and enhance food security while contributing to economic growth and prosperity



While the benefits of food processing are many, it must be recognised that its true potential can only be fully realized when the entire agri value chain is made competitive, sustainable, and agile. Although this will require concerted and coordinated action on several fronts, there are 3 critical levers to pivot transformation of this sector and usher in NextGen agriculture.

Combating Climate Change

First is the need to strengthen climate resilience and adaptability of the agri sector given the increasing vulnerabilities to the impact of climate change. Climate-smart agriculture can significantly reduce greenhouse gas (GHG) emissions and increase farmer incomes.

The benefits of pursuing this were recently demonstrated by ITC Limited, one of India’s foremost private sector conglomerates and a leading Agri Business player, through its future-ready Climate-Smart Agriculture programme that aims to de-risk farmers from extreme weather events. ITC implemented multiple initiatives to promote regenerative agriculture with a package of agronomy practices, high-yielding and climate-resilient varieties as well as appropriate mechanisation. The initiative has already covered over 2.3 million acres, benefiting more than 7,40,000 farmers.

Leveraging The Power Of Digital

Second, it is critical to harness the power of new-age digital technologies and adopt modern farming techniques and technologies to give new impetus to the sector. Training and support must be provided to farmers supplying to the food processing units to ensure higher crop yields and better-quality produce.

The Government of India’s thrust to accelerate digital adoption in the farm sector and promote Farmer Producer Organisations (FPOs) are laudable steps in this direction. FPOs can serve as aggregators and act as the crucial link with individual farmers, especially the small and marginal, whilst raising their incomes.

This will provide significant competitive advantage to the Food Processing sector.

To enhance the competitiveness of domestic agri-value chains, strengthen market linkages and augment value creation opportunities, ITC has recently launched ITCMAARS, a phygital ecosystem that enables larger efficiencies in sourcing, higher value addition and better traceability of attribute-specific products, besides promoting sustainable agriculture. ITCMAARS has been rapidly expanded to 9 states, supporting more than 6,00,000 farmers through 1,150 FPOs.

Value Addition and Exports

Third, increase in incomes, urbanization and globalisation as well as shifting geopolitical dynamics have led to a perceptible shift in food consumption patterns globally. Today’s consumers seek greater safety and nutrition, superior taste, better quality and value-added food products. Increasing awareness of health and wellness has also spurred demand for different types and qualities of grains, including traditional and forgotten grains, apart from fortified and super foods.

With the world’s population projected to reach an additional 2 billion people by 2050, India can seize the opportunity to expand both agri commodity and value-added food exports. Today, despite India’s inherent strengths in agriculture, the nation accounts for a mere 3% of global trade. To meet this demand, transforming the agricultural value chains to be demand-responsive is essential. Focusing on agri-transformation can make India a source of agri-food exports while addressing domestic consumer needs.

A report by the HLEG set up by India’s 15th Finance Commission has highlighted that the country’s agri-food exports can double over the medium term, given that the country possesses the largest tracts of arable land in the world as well as diverse agro-climatic zones. India excels in the production of various commodities,

including shrimps, spices, fruits like mango, papaya, and bananas, rice, and buffalo population. Concentrating on crops where India has a natural advantage and strengthening the entire value chain can increase agri exports from \$40 billion to \$70 billion.

Mission Millets

ITC’s world-class Food brands anchor several agri value chains contributing to rural transformation. ITC’s Agri Business has also been building on its portfolio of Value-Added Products across multiple value chains including spices, coffee, frozen marine products, processed fruits and organic produce. The Company has also set up a state-of-the-art export-oriented spices facility in Guntur, Andhra Pradesh.

In line with the Government of India’s focus on promoting millets as a supergrain globally, the Company has recently launched ‘ITC Mission Millets’ which is founded on a 3-pillar model that encompasses development of a ‘good-for-you’ foods portfolio, implementation of sustainable farming and enhancing consumer awareness. The initiative also supports FPOs in the millet value chain. Recognising the export potential of Medicinal Aromatic Plant Extracts (MAPE) and organics crops, triggered by consumer affinity towards health and wellness products globally, ITC is also gearing up for a full play in this area with a plant in Sehore, Madhya Pradesh.

The Next Horizon

The Government of India’s reinvigorated focus on agriculture and food processing will go a long way in fostering inclusive growth and strengthening the competitiveness of the Indian economy. Measures including PLI Scheme for Food Processing, Financial Support to FPOs, the Agriculture Infrastructure Fund, Direct Benefit Transfer to farmers under PM-KISAN, More Crop per Drop, Make in India, Export Clusters, will help in catalysing growth in the agri and food processing sectors.

Navigating the Path to a Thriving Food Processing Sector

The potential of India’s agri-food sector positions it as a powerful catalyst for economic growth and prosperity. Fifth-largest industry in terms of production, consumption, exports and potential growth, Food Processing aims to double its GDP contribution from 8% to 20% by 2030. The sector is expected to generate 9 million jobs by 2024 and by 2030, India’s household consumption would quadruple, making it the world’s fifth-largest consumer of food and food technology.

By addressing challenges, leveraging opportunities and fostering collaboration among government, private sector and farmers, India can transform its agri-food landscape, boost exports, and enhance food security while contributing to economic growth and prosperity. The time is ripe for India to embark on a journey towards a sustainable and thriving food processing sector.

FROM THE EXECUTIVE EDITOR'S DESK

"Kisan Vaigyanik"

The Farmers' Scientist



On September 28, India paused to lovingly pay homage to Dr M.S. Swaminathan, the man who ensured that there was food on our plate, and who restored our pride when the world was mocking us.

Globally, accolades poured in for the visionary agricultural scientist who revolutionized agricultural science.

PM Shri Narendra Modi On Dr Swaminathan

Prime Minister Shri Narendra Modi wrote for Dr Swaminathan, "Farmers are described as the pin that holds the world together because it is the farmers who sustain everyone. Swaminathan understood this principle very well. A lot of people call him a "Krishi Vaigyanik" – an agricultural scientist. But, I have always believed that he was even more. He was a true "Kisan Vaigyanik" – a farmers' scientist.

In his heart there was a farmer."

Pivotal Role In Salvaging The Indian Masses From Severe Food Shortage

Dr Swaminathan played a pivotal role in salvaging the Indian masses from the most difficult times of food shortage prior to the green revolution and transforming India's agricultural landscape. His unwavering dedication and pioneering work have left an indelible mark on India's food security and self-sufficiency. It is said that the future belongs to those who believe in the beauty of their dreams. In writing this letter to you, we pay our respects to Dr Swaminathan, the legend who believed in the beauty of his dreams and believed in the glory of India. He led his nation to achieve the collective dream of the people. He led the green revolution that saw India swiftly transform and move from shortages to surpluses.

Dr Swaminathan had watched India being scorned with the headline, 'Ship to Mouth'. Decades before he departed for his heavenly abode, global headlines for Indian agriculture had changed. We became a nation of 'farm to ship'. Now such is the power of Indian agriculture that if India decides to restrict the export of a few key products, there is panic and furore in international markets, and stress at the global high table.

He Walked and The Earth Turned Green

The contribution of Dr Swaminathan was acknowledged by the national and international media. The headline in The Times of India, the nation's leading newspaper, read: 'He Walked and The Earth Turned Green'.

On September 29, among the best tributes to Dr Swaminathan appeared on the front page of Malayala Manorama, the leading newspaper of Kerala. The banner headline read: 'Undachorinu nanni'. 'Gratitude towards the hand that feeds'.

Dr Swaminathan proved to his fellow Indians and to the world that there is always a way through the tough times if one works

hard enough and looks close. It all depends on one's level of determination.

Groundbreaking Research, Innovative Farming Techniques

Dr Swaminathan's groundbreaking research and innovative farming techniques revolutionized agricultural practices in India. By introducing modern farming methods, improved seeds, and advanced irrigation techniques, he played a crucial role in boosting crop yields and ensuring food security for millions of people. One of Dr Swaminathan's most significant contributions was his emphasis on sustainable agriculture and conservation of natural resources. He recognized the importance of preserving biodiversity and promoting eco-friendly farming practices to ensure long-term food security. His efforts to promote organic farming, conserve water resources, and protect fragile ecosystems have had a lasting impact on sustainable agriculture in India.

National And Global Accolades

Dr Swaminathan's work extended beyond the boundaries of India. He was actively involved in international organizations such as the Food and Agriculture Organization (FAO) and the International Rice Research Institute (IRRI). His expertise and guidance were sought after by governments and organizations worldwide, making him a global authority on agricultural development.

Throughout his illustrious career, Dr Swaminathan received numerous accolades and recognition for his contributions to agriculture. He was awarded the prestigious World Food Prize in 1987 for his exceptional achievements in increasing agricultural productivity and alleviating hunger. In addition, he received several honorary degrees from universities around the world, further testament to his remarkable achievements.

The M S Swaminathan Research Foundation (MSSRF), a not-for-profit research institution established in 1988, maximizes the use of science and technology for equitable and sustainable social development and environmental stability. Dr Swaminathan's legacy will continue to inspire future generations of scientists, researchers, and policymakers. His vision for sustainable agriculture, commitment to social justice, and tireless efforts to eradicate hunger have left an indelible impact on India's agricultural landscape.

As we bid farewell to this extraordinary visionary, we remember Dr M.S. Swaminathan for his immense contributions to Indian agriculture and his unwavering dedication to improving the lives of farmers across the nation. His pioneering work will continue to guide us as we strive for a more sustainable and food-secure future.



India and the World Pay Homage to Dr M.S. Swaminathan

Global Agricultural Testing Market Set to Expand to \$7.5 Billion by 2028, Fueled by Rising Food Safety Concerns

The global agricultural testing market has shown significant growth, reaching a size of US\$ 5.6 billion in 2022. Projections indicate further expansion, with the market expected to reach US\$ 7.5 billion by 2028, exhibiting a compound annual growth rate (CAGR) of 4.6% during 2023-2028.

Agricultural testing plays a pivotal role in evaluating the quality and contaminant content of water, seeds, and soil. This technique is vital for analyzing essential resources and inputs, such as moisture levels, soil fertility, acidity, and pH, necessary for achieving optimal crop yields.



menafn.com

Climate intervention technologies may create winners and losers in world food supply

Analysis by scientists shows future techniques limiting global climate change may create uneven benefits, forcing difficult decisions worldwide

Source: Rutgers University

Summary: A technology being studied to curb climate change – one that could be put in place in one or two decades if work on the technology began now – would affect food productivity in parts of planet Earth in dramatically different ways, benefiting some areas, and adversely affecting others, according to new projections.

A technology being studied to curb climate change -- one that could be put in place in one or two decades if work on the technology began now -- would affect food productivity in parts of planet Earth in dramatically different ways, benefiting some areas, and adversely affecting others, according to projections prepared by a Rutgers-led team of scientists.

Writing in the journal, Nature Food, the scientists described the results of computer models simulating varying climate scenarios and their impacts over time on the production of the world's four major food crops: corn, rice, soybeans and wheat in all locations where they are grown.

Some scenarios were produced by simulated stratospheric aerosol intervention (SAI), also known as geoengineering, to halt or reverse climate change, while others, for comparison purposes, weren't. The SAI scenario, inspired by volcanic eruptions, would involve spraying sulfur dioxide gas into the stratosphere. By placing a cloud of what becomes sulfuric acid in the upper atmosphere continuously, the process would shield the Earth from the Sun, cooling it.



Moderate amounts of atmospheric sulfur spraying, which may either halt or slightly lower global average temperatures, favors food production in the temperate regions known as the mid-latitudes, where most of the large land masses of North America and Eurasia are located, according to the analysis.

Large amounts of climate intervention to significantly reverse warming and lower the global average temperature would favor agricultural production in the tropics, the region of Earth around the equator. In the Western Hemisphere, the region includes Mexico, all of Central America, the Caribbean and the top half of South America. In the Eastern Hemisphere, the tropics include most of Africa, parts of the Middle East, most of India, all of Southeast Asia, most of Australia and most of the island nations of Oceania.

sciencedaily.com

Global Sugar Prices Surged By Nearly 10% in September 2023

Global sugar prices surged by nearly 10 per cent in September to their highest level since 2010, pushed by decreased production from major suppliers and concerns about energy prices and the impacts of the El Nino weather phenomenon, the United Nations Food and Agriculture Organisation (FAO) said Friday.

FAO said sugar prices in September were on average 9.8 per cent higher than in August due to lower sugar production. An increase in transport costs due to rising energy prices and dry weather caused by El Nino, a warm weather event in the Pacific Ocean, were also contributing factors, reported Xinhua.

With the increase in September, the FAO sub-index for sugar reached its highest level since November 2010, while other parts of the overall FAO Food Price Index saw less dramatic moves.

themalaysianreserve.com



Cheap Nepal Tea Hits India's Darjeeling Tea Sales

Cheaper Alternatives From Nepal, As Well As Rising Costs Of Domestic Production, Have Slashed Demand For The 'Champagne Of Teas'

World-famous Darjeeling tea gardens in India's West Bengal state immediately whip up picturesque visuals of clouds floating over rolling hills covered in tea bushes where women, draped in colourful sarongs, pick tea leaves that they collect in woven baskets tied to their backs.

But there is another reality behind those postcard visuals: a drop in production and demand as buyers turn to cheaper alternatives from neighbouring Nepal, endangering the future of an area, and its workers, once known for producing the "champagne of teas".

Today, the hills have 87 tea gardens spread across 17,800 hectares (44,000 acres) with a total production of about 6,640 tonnes (6.64 million kg or mkg) of organic tea in 2022, lower than the 7.69mkg produced in 2019, according to the Tea Board of India, the apex body of the tea industry.

Tea experts attribute several reasons for the falling production,



including a nearly 40 percent decline since the gardens were converted to fully organic to meet buyer demand, said Sanjay Choudhry, the owner of Ringtong tea estate.

"We are also facing a severe labour shortage as the young generation is not ready to enter the industry and migration is rampant. Climate change is another reason for the decline in production," he added.

aljazeera.com

Food Processing Industry

One Of India's Economic Pillars

The country has come a long way, from a food scarce country during the pre-independence era to presently being one of the major food exporters in the world. Attaining food security was the most significant milestone in the journey of Indian Agriculture and raised the country's stature globally. The Food Processing sector has also been playing an instrumental role in linking Indian farmers to consumers in the domestic as well as across the international markets. In fact, Food Processing industry has emerged as one of the significant economic pillars of the country contributing remarkably to India's GDP, providing income generating support to the farmers, creating investment opportunities across the value chain and is one of the largest employment generating industries in India.

In recent years, the country has become one of the largest producers and exporters of food products like Milk, Meat, Rice, Cereals, Sugar, Fish, Seafood, Egg, etc., which is testimonial of immense contribution of Food Processing industry towards country's agricultural growth. Today, India's food processing sector is one of the largest in the world whose output is expected to touch \$535 Bn by 2025-26.

Massive Transformations

The journey of food from farm to fork has undergone massive transformations over a period. Today, before turning into a consumable product, the raw materials undergo several processes, such as harvesting, cleaning, packaging, grading, preserving and transportation. The Food Processing journey is dependent on various techniques like Preservation, Preparation, Packaging, Enrichment, Fortification, Extraction, Concentration, etc. Now there are unique and innovative methods under adoption viz., packaged food, tetra packaging, artificial sweeteners, preservatives, vegan food, plant-based meat, ready-to-eat food, bakery ingredients, sugar free food, organic and health food which are re-inventing and re-shaping the food processing industry in the country.

Diverse Sub-Sectors

Today, the Indian Agriculture scenario has changed completely. Food Processing industry is one of the mainstays behind this growth story. It comprises of segments which are major end products from Agriculture and allied sectors like food grains, cereals, pulses, fruits, vegetables, meat, poultry, dairy products and processed foods. India is one of the largest producers of food grains in the world like rice, wheat, corn, and millets.

One of the major components of food processing industry is grain processing i.e., processing of cereals and pulses into flakes, puffed cereals, and ready-to-eat snacks, as well as the milling of



ABOUT THE AUTHOR

Mr. Shantanu Pendsey is the head of Agri Business Unit and Govt. Sponsored Schemes (ABU & GSS) in State Bank of India. In a career spanning more than three decades, Mr. Pendsey has rich experience in Retail Credit, Retail Operations, SME Credit and Agricultural Credit

grains to generate flour, granules, and other products. Govt. of India has also aimed to make India a global hub for Shree Anna (Millets).

The country is also one of the significant producers of a variety of fruits and vegetables. The fruits and vegetables have limited shelf life and are highly perishable. Thus, the food processing industry is engaged in various activities of processing and preserving these perishable items through preparation of fruit and vegetable juices, jams, and pickles, as well as the processing of fresh and frozen fruits and vegetables. India has vast resources of livestock and poultry.

The country is one of the major producers and consumers of meat and poultry products. Manufacturing of frozen meat, meat products, and poultry products, are processed and preserved with the help of the food processing sector. India is the world's largest producer of milk, and the dairy sector is a significant part of the nation's food processing business. The industry involves churning of milk into a variety of dairy products, including butter, cheese, yoghurt, and others. The processed food sector is an instrumental segment which produces a wide variety of food items which includes, packaged foods, ready-to-eat meals, and snacks. The industry is ably supported by food processing companies and retail groceries. Thus, food processing helps in value addition to raw agricultural produce by transforming it into various processed and packaged products, thereby, enhancing the income of farmers and creating more profitable opportunities for them.



SBI has recently launched a curated product "Agri Enterprise Loan (AEL)" for the stakeholders of this sector. This tailor-made product offers credit at attractive rates to meet all types of funding requirements for the processing units across Agri/Food/Fruits/Fish/Dairy/Allied Agri.

Synergy For Growth

The food processing industry has generated new avenues of growth & income for farming community through collaboration with food-hubs, food parks, start-ups, e-commerce platforms and corporates involved in food processing and retail. Farmers can earn higher profits by selling their produce to food processing units instead of traditional markets. Contract farming agreements with food processors also provide stable income opportunities. With this kind of forward linkages, the farmers can reduce the wastage and enhance their income by selling the produce at the optimum time with best price.

Food processing, hence, extends the shelf life of agricultural products, reducing wastage due to spoilage. This helps farmers access larger markets and reduces post-harvest losses, which have been a significant issue in India. This also encourages the farming community to invest in modern farming practices to improve the quality of produce. The growth of the food processing industry necessitates the development of infrastructure such as cold storage facilities, warehouses, and transportation networks, benefiting the entire agricultural supply chain.

By creating income and investment generating opportunities across the Agri Value Chain, food processing sector has helped the farmers to diversify and view Agriculture as a source of income and business. The sector is a major source of employment in rural and urban areas. It provides jobs in food manufacturing, packaging, transportation, and retail, thereby reducing unemployment and underemployment in the agricultural sector. Processed food products have export potential, contributing to India's foreign exchange earnings. Items like spices, rice, tea, and processed fruits and vegetables are in demand globally. The food processing sector encourages diversification of crops and products, reducing the dependence on a few staple crops and promoting crop diversification. Farmers have now started growing new varieties of exotic crops, fruits and vegetables such as kiwi, dragon fruit, avocado, etc. and learnt to grow seasonal vegetables in off-seasons and off-locations.

GOI Initiatives

The Ministry of Food Processing Industries (MoFPI), Government of India has also taken various initiatives for the development of the food processing industry to boost investments, employment generation and income support across the value chain. Pradhan Mantri Kisan Sampada Yojana (PMKSY) aims at developing modern food processing infrastructure with efficient supply chain management from farm gate to retail outlet. Under PMKSY, initiatives like Mega Food Parks, Cold Chain projects, Agro-Processing Clusters, proposals under Creation/Expansion of Food Processing & Preservation Capacities (CEFPCC), Creation of Backward and Forward Linkages Projects, Operation Green projects, Food Testing Laboratories projects have been undertaken across the country. Pradhan Mantri Formalisation of Micro Food Processing Enterprises Scheme (PMFME) has been launched to enhance existing individual micro-enterprises in the unorganized segment of the food processing industry. Production Linked Incentive Scheme for Food Processing Industry (PLISFPI) is another scheme to boost domestic manufacturing and increase exports across the food processing sector. Further, Ministry of Agriculture and Farmers Welfare has also launched a host of initiatives in the form of Agri Infrastructure Fund (AIF) and Animal Husbandry Infrastructure Development Fund (AHIDF) for strengthening the food processing infra across the country.

Recognising the potential of food processing sector in transforming India as the food basket of the world, the Ministry of Food Processing Industries, Government of India has taken this path breaking initiative of World Food India Event. The World Food India Event of 2023 will bring all the stakeholders of India's as well as global food processing industry together, thus will facilitate investments across the domestic food processing industry, boost exports and promote rich Indian food culture.

SBI's Agri Enterprise Loan (AEL)

State Bank of India, the largest lender in the country is aligned with the growth objectives of the food processing sector. Understanding the importance of this sector towards the Indian economy particularly Agri economy, Bank has recently launched a curated product "Agri Enterprise Loan (AEL)" for the stakeholders of this sector. This tailor-made product offers credit at attractive rates to meet all types of funding requirements for the processing units across Agri/Food/Fruits/Fish/Dairy/Allied Agri.

Post-independence, over these decades, India has showcased an impressive growth trajectory from a food-scarce country to food sufficient and a food surplus one now. However, compared to the developed countries, the food processing industry in our country is still in nascent stage. India is uniquely positioned in terms of vast supply of raw materials, which can be utilized for food processing. Additionally, India's vast population and increasing disposable income present a significant opportunity for the growth of this sector. We are sanguine with the policy level support and enablers from the Government, the food processing sector will tap its unrealized potential, scale newer heights and immensely contribute towards the growth of the agriculture sector.

Hon'ble LG of Ladakh UT inaugurates Ladakh Dairy Federation's dairy plant refurbished by NDDB

“ An integrated approach involving the creation of an organised milk procurement, processing and marketing system will strengthen dairying and augment rural income in Ladakh

Brig (Retd) Dr B D Mishra, Hon'ble Lieutenant Governor, Union Territory of Ladakh, inaugurated the newly refurbished dairy plant of Ladakh Dairy Cooperative Federation on 4th October 2023 in the gracious presence of Dr Meenesh Shah, Chairman, NDDB, Dr Pawan Kotwal, Advisor to Hon'ble Lt Governor and other dignitaries. IDMC Ltd, a wholly owned subsidiary of National Dairy Development Board (NDDB) has refurbished the dairy plant.

The Hon'ble Lieutenant Governor praised NDDB for steering dairy development activities in Ladakh, where these activities have hitherto been low. He said that an integrated approach involving the creation of an organised milk procurement, processing and marketing system will strengthen dairying and augment rural income.

Managerial And Technical Support For Five Years

Chairman NDDB said that NDDB had entered into a tripartite MoU with the Union Territory of Ladakh and the Ladakh Autonomous Hill Development Council (LAHDC) for providing managerial and technical support to Ladakh Dairy Cooperative Federation for a period of five years.

The MoU focused on increasing market access, ensuring sustainability and economic viability of the Federation's overall

operations. NDDB administered Ladakh Dairy Federation will work towards establishing a transparent and remunerative milk procurement system for the dairy farmers.

Chairman, NDDB further said that a grant of Rs 40 lakh has been sanctioned to Ladakh Dairy Federation to start and smoothly run the operations. NDDB intends to develop a dairy value chain in Ladakh, which will provide profitable returns to the producers from the milk business. Consumers will also get quality milk & milk products at affordable prices. The milk procured will be processed and sold under Oma brand. Ladakh Federation will also supply fresh pasteurised milk to Indian Army base in Ladakh.

NDDB's Pivotal Role

NDDB aims to promote, finance, and support dairy development across the country. NDDB has been instrumental in transforming India's rural economy by making dairying a viable and profitable economic activity for millions of milk producers while addressing the country's need for self-sufficiency in milk production.

NDDB has also been offering other income-generating innovative activities to dairy farmers and providing them with sustainable livelihoods. NDDB has been adding value to Indian agriculture through food processing by promoting dairy farming as

a viable economic activity, strengthening dairy infrastructure, and providing sustainable livelihoods to dairy farmers.

Technology Bringing Prosperity to Small Dairy Holders

Technology is playing a significant role in transforming the lives and livelihoods of small dairy holders.

NDDB has been working on several initiatives to improve the dairy sector's efficiency and productivity. The National Dairy Support Project (NDSP) has helped dairy farmers to increase milk production by improving animal productivity and strengthening milk procurement systems. The NDSP has been successful in increasing milk production and improving the livelihoods of small dairy holders.

Another initiative is the Dairy Knowledge Portal, which provides information on various aspects of dairy farming, including animal health, breeding, feeding, and management practices. The portal also offers online training programs for dairy farmers to improve their knowledge and skills.

Overall, technology has played a crucial role in improving the lives and livelihoods of small dairy holders in India. The NDDB's

initiatives have been successful in increasing milk production, improving animal productivity, and providing training and support to dairy farmers.

The Board is focused on making the livestock sector more sustainable and moving towards a more efficient, inclusive, resilient, and sustainable livestock sector, in order to achieve the objective of 'Better Production, Better Nutrition, Better Environment and Better Life.'

NDDB has consistently helped farmers with the twin objectives of increasing milk production by increasing productivity, and providing market access to milk producers is addressing many of these challenges.

NDDB has also enabled the farmers for indigenous breed development programmes. Selected indigenous dairy breeds are being implemented in the respective native tracts of dairy farmers through scientific selection programmes.

Considering that energy use is the biggest source of emissions, NDDB has also been encouraging dairies in the dairy cooperative network to adopt renewable energy. These initiatives include use of concentrated solar thermal for preheating of water and solar powered milk collection systems.





ABOUT THE AUTHOR

Mr Pradipta Kumar Sahoo is Chief Strategy Officer and Head, International Business, Mother Dairy

Food Processing

Key Driver for Farmer Prosperity

Agriculture production is the base for food security and food processing is a path towards growth in agriculture in an economically and socially sustainable manner. Food Processing Industry (FPI) acts as a gateway to bridge the gap between the two main pillars of Indian Economy; Agriculture and Industry.

By 2030, India’s annual household consumption is believed to quadruple, making it the fifth-largest consumer in the world. India’s food processing sector is one of the largest in the world and its output is expected to reach \$535 Bn by 2025-26.

The changing need for healthy and nutritious food post pandemic will drive the Food processing sector to develop and will bring in structural changes in the agriculture sector.

The Three As Of Food

The three A’s of food are Availability, Access, and Absorption in the country. “Availability” of food is reasonable enough in a context of domestic production while “Access” relates to physical and economic aspects of food available for consumption. “Absorption” here referred as the ability to utilize the food produced for human consumption. This is in turn related to growth and competitiveness of food processing as well. Though public policy support is crucial for enabling this, there is a need for both vision and appropriate action, particularly with reference to food processing to take this to next level.

Globally, there is a competition searching for various methods to modify the availability, safety, and value proposition of food. The search starts and culminates to processing to conduct our daily lives for food requirements. Beside this, food processing is a significant economic pillar to the country’s economy. The gross value added in the food processing sector reached investments up to Rs.2.24 lakh crore in 2019-20 contributing 1.69% of the total GVA in the country (Ministry of Food Processing 2021). The government of India has set a vision for the sector to achieve a target of doubling its contribution to the GDP by 2030. Invest India initiative drawn FDI equity inflow to the tune of USD 709.72 for the period of April 2021-March 2022 in the food processing sector.

The route our food takes from the farm to the plate is changing steadfast. Food processing refers to the conversion of raw agricultural products into value-added products for human consumption. The conversion processes such as harvesting, cleaning, packaging, grading, preserving, and transportation are the prerequisites.

The raw products from agriculture undergo processing involving cutting-edge technology. The sector continues to innovate on adopted methods and addition of newer trends like plant-based meat, ready-to-eat food, or nutraceuticals. The key sub-segments of the Food Processing industry in India related to agriculture are food grains, fruits & vegetables, poultry & meat processing, fisheries, dairy, etc.

Although at present, the sector in India is at a nascent stage, it has shown promising growth in recent years. India is working towards defending the gains, extending the gains, and making new gains both in agriculture and food processing sector.



The Union Cabinet chaired by the Prime Minister has introduced the Production-Linked Incentive (PLI) Scheme in Food Products for Enhancing India’s Manufacturing Capabilities and Enhancing Exports – Atmanirbhar Bharat

Defending The Gains

Food grain production of the country is estimated to reach 330.5 MMT (Ministry of Agriculture, 2022-23) while Milk production reached at 221.1 MMT (NDDB, 2021-22). The per capita availability of milk reported at 444 grams per day (NDDB) already exceeds the world average of 305 grams per day (GAIN, USDA Report 2022).

Further, India is the second largest producer of fish in the world (Ministry of Fisheries expecting 174 lakh tonnes in 2022-23), fourth largest sea food exporter (exports value close to 63,969 crores in 2022-23), and largest producer, consumer and exporter of spices and spice products (Spice Board notified production is 15.31 lakh tonnes in 2021-22 and exports of Rs 31761 crore in 2022-23) and second largest producer of fruits and vegetables (Ministry of Agriculture likely to record 351 MMT production in 2021-22) with a share close to 12% in world fruits and vegetables production.

Extending The Gains

National Action Plan for Dairy Development is targeted to increase organised milk handling from 20% to 41% wherein the milk handling by cooperatives dairies is targeted to increase from 10% to 20% and private sector from 10% to 30% (NDDB).

To support Food and Grains sector, there exists an investment opportunity for processing of cereals and millets to high value products like snacks, ready to cook or ready to eat products, bakery, etc. Indicative opportunity in fisheries and marine sector includes upgradation and capacity expansion for cold chain, innovations in packaging for increased shelf life and product differentiation, and Infrastructure development for fishing harbours, landing centres, wholesale markets to international standards.

There exists a potential to process value added products with Indian taste like fish/shrimp pickle, fish/shrimp curry, marinated fish with Indian spices etc. Currently processing levels for fruits and vegetables in India are at 3.3% (Ministry of Food Processing). India witnesses 4.58% - 15.88% wastage in fruits and vegetables, thus, opportunity lies in processing to reduce wastage and maximize utilization in the market.

The Annual Survey of Industries (ASI) 2019-20 stated that 41481 food processing units existed in the country and food processing sector contributed 12.22% of total persons engaged in the registered manufacturing sector. The food processing industry in India is primarily concentrated in the northern and western regions of the country. The states of Maharashtra, Uttar Pradesh, Andhra Pradesh, Tamil Nadu, and Gujarat are the leading contributors and gainers in the sector. The sector is now being extended to eastern and north-eastern regions of the country.

Further, the Annual Survey of Industries (ASI) 2018-19 pegged the total output in food processing sector increased from Rs. 9.3 lakh crore in 2014-15 to Rs.12.7 lakh crore in 2018-19 at a CAGR

of 8.13%. The number of persons engaged in the registered food processing sector increases from 17.73 to 20.05 lakh during this period.

Making New Gains

The food processing sector in India faces various challenges related to infrastructure, storage and cold chain facilities, and a fragmented supply chain. However, the government has taken various initiatives to promote the growth of the food processing sector.

Government is working towards setting up / upgradation of two lakh micro food processing enterprises in the country through credit linked subsidy during five years (2020-25) with an investment outlay of Rs. 10,000 cr. Further, One District One Product (ODOP) approach implemented across the country to reach out to maximum beneficiaries of agriculture and allied sectors. ODOP selected based on raw material production, presence of micro-food processing enterprises, SHGs/FPOs/Cooperative/micro-enterprises engaged in food processing considering the market and socio-economic needs. In total, 137 unique products of 713 districts across 35 States and UT notified so far under ODOP scheme.

Additionally, a total of 272 R&D projects assisted, 72 R&D projects approved since 2017-18 on preservation of food products under the scheme of Research and Development in Processed Food Sector. For larger benefits, Government has approved 41 Mega food Parks, 382 Cold Chain projects, 72 Agro Processing Clusters, 469 Food Processing Units, 61 Creation of Backward & Forward Linkages Projects & 46 Operation Green projects across the country to develop agriculture and allied sectors. These initiatives estimated to benefit more than thirty-two lakh farmers across the country.

In Year 2020, M/s NABARD Consultancy Limited (NABCONS) estimated an increase in the farm-gate prices by 12.38 % under Integrated Cold Chain and Value Addition Infrastructure projects. Beside this, 100% FDI in food processing sector allowed to support Indian agriculture as per Ministry of Food Processing.

The Union Cabinet chaired by the Prime Minister has introduced the Production-Linked Incentive (PLI) Scheme in Food Products for Enhancing India's Manufacturing Capabilities and Enhancing Exports – Atmanirbhar Bharat.

The food processing industry in India has tremendous potential for achieving growth in agriculture and allied sectors, and the sector's vision for the next decade should be to increase its capacity and reduce food wastage. The industry, farm sector, premier technical institutions, and the government should work together to achieve this vision by adopting modern technologies, developing new products, and improving infrastructure and supply chain efficiency.

PREMIUM QUALITY FEEDS

OPTIMAL NUTRITION

ENHANCED IMMUNITY

SUPERIOR GROWTH



There is a need to create a world where people pay more attention to the food they consume. We believe that the quality of food (animal protein) begins with the quality of feed.

"NUTRITION FOR EVERYONE, EVERYDAY, EVERYWHERE"



Food Processing Industry

Fueling Prosperity



The food processing industry is not just a part of Indian agriculture; it is a catalyst that empowers its multifaceted contributions, ranging from reducing wastage and generating employment to expanding markets and fostering technological innovation, make it an integral cornerstone of India's agricultural ecosystem

ABOUT THE AUTHOR

Mr Roshan Lal Tamak is Executive Director & CEO of DCM Shriram Ltd. He has over three decades of experience in the sugar sector

India, often referred to as the "Land of Agriculture," is experiencing a transformational journey led by the food processing industry. The food processing industry plays a crucial role in the nation's economy, rural development, food security, and sustainable growth. Its value addition concept involves transforming agricultural products into processed goods, increasing farmers' income and reducing post-harvest losses.

The industry also expands markets for agricultural products, catering to diverse tastes and preferences, and creating jobs in both urban and rural areas. This job creation bolsters both rural and urban economies, curbs urban migration, and contributes to the holistic development of the nation.

As the food processing industry grows, it creates a sustained demand for various agricultural commodities, encouraging farmers to diversify their crops and livestock, enhancing agricultural sustainability and reducing vulnerability to price fluctuations.

Technological advancements in agriculture are encouraged by the food processing industry, leading to the development of sophisticated cold chain logistics and innovations like fortified foods.

The food processing industry is subject to rigorous quality and safety standards, both domestically and for exports, which encourages better farming practices, proper hygiene, and adherence to safety regulations.

Size of Food Processing Industry in India

The industry is primarily concentrated in the northern and western regions of India. However, there is a huge untapped potential in the eastern and north-eastern regions of the country. Foreign direct investment in food sector is US\$4.18 billion between April, 2014, and March, 2020. The sector's contribution to the GDP is currently 8% which has huge potential to increase.

Challenges

India's processed food exports are gaining global recognition, contributing to the country's foreign exchange earnings and enhancing its reputation as a supplier of quality food products. However, the industry faces several challenges that need to be addressed to unlock its full potential. These include infrastructure gaps, lack of modernization, quality and safety standards, access to finance, fragmented supply chains, skilled labor shortage, seasonal nature, regulatory challenges, waste management, research and development, and high energy costs. To address these challenges, coordinated efforts from the government, industry players, and support organizations are needed to foster growth, improve food security, and contribute to India's economic development.

Actions Taken By Government

The government has taken various initiatives, such as the Pradhan Mantri Kisan Sampada Yojana to promote the growth of the food processing industry.

Way Forward

The government has set a vision for the sector to achieve a target of doubling its contribution to the GDP by 2030. This can be achieved by focusing on the development of backward and forward linkages, increasing the share of processed foods in total food consumption.

To reduce food wastage and increase the utilization of by-products and waste generated during food processing the industry should adopt modern technologies such as AI, IoT, and blockchain to improve the supply chain's efficiency and reduce wastage. The government can provide support in the form of incentives and subsidies to promote the adoption of these technologies.

Also, the farm sector needs to focus on increasing the production of raw materials suitable for food processing and adopt modern farming practices to improve the quality of the produce. Also here the role of researchers is very important. Their focus should be on developing processing efficient varieties which gives better industrial yield and other parameters as per customer requirements.

The sugar sector is the second largest agro-industry and second largest employer in the country providing direct and indirect employment to over 5 million sugarcane farmers and around 0.5 million workers. This sector contributes around 2% to India's GDP. Today Indian sugar industry's annual output is worth more than US\$12 billion and contributes around 8% to the total agricultural output. The sugar sector is uniquely placed and can play a pivotal role in providing impetus to India's economy by developing as food processing hubs as sugar industry is in the rural heartland of India. It has the following inherent advantages:

Sugar complexes are located exactly at the origin of agri-produce. All sugar factories have a well-oiled extension network that can be used for educating growers to produce other crops as well and the supply chain linkage is well established.

Sugar factories have the basic infrastructure readily available for food processing, such as power, manpower, machinery and production capabilities.

The industry produces excess green power that can be used for setting up cold chain infrastructure and warehousing facilities adjacent to the existing mills.

On the market side, the fundamental market linkages for selling processed food are available, and selling other products will be an adjacency only.

The food processing industry is not just a part of Indian agriculture; it is a catalyst that empowers its multifaceted contributions, ranging from reducing wastage and generating employment to expanding markets and fostering technological innovation, make it an integral cornerstone of India's agricultural ecosystem. As India advances towards a more prosperous and sustainable agricultural future, the food processing industry will continue to be a driving force, fueling the nation's progress and prosperity.

Food Processing

The Road To Growth



Dr. Nutan Kaushik is
 Director General, Amity Food
 and Agriculture Foundation,
 Amity University, Noida, Uttar
 Pradesh
 With Ayushi Sharma



India's food processing industry accounts for approximately 8.80 and 8.39% of the Gross Value Added (GVA) in manufacturing and agriculture, 13% of exports from India, and 6% of all industrial investment. This change is not only noteworthy in terms of its broad implications, but also in terms of its outstanding scale

Millions of people in India depend on the agricultural industry for their living, and it has long been the nation's economic and cultural identity. A nation of more than a billion people has been nourished by the vast fields, thriving markets, and the labour of numerous farmers. However, this essential sector of the economy has not been without its share of challenges.

Agriculture has provided sustenance, but it has also had to deal with integrated limitations. Farmers' low income is a major threat that keeps them in a cycle of financial obligations. Large post-harvest losses have lowered the sector's efficiency because of insufficient infrastructure, which often creates obstacles on the route from farm to market.

Safety Net For Farmers

Fruits spoil before they are consumed, vegetables wither, and grains become dust. The entire ecosystem is affected by these inefficiencies, which result in massive food loss. Despite these obstacles, there is cause for optimism because the food processing industry is transforming India's agricultural landscape. This industry, which was once in its early stages, has developed into a powerful and dynamic force that provides Indian agriculture a boost. The food processing sector is more than simply a commercial endeavour; it also serves as a change, a link between farms and factories, and a safety net for the millions of hopeful farmers who till the land every day. It has brought growth, decreased waste, produced jobs, and opened the door for more new possibilities for Indian agriculture.

Indian Agriculture: An Overview

Agriculture in India is a tapestry of history, diversity, and resiliency. It includes a huge area of land, from the rich landscapes of Kerala to the arid deserts of Rajasthan, from the fertile plains of Punjab to the terraced farms of the Northeast. Indian agriculture has a long history that is rooted in both history and culture. Central to Indian agriculture's uniqueness is its remarkable diversity of crops.

Across the nation's geography, you'll find a kaleidoscope of plant life, with staple grains like rice and wheat forming the bedrock of sustenance. These crops sustain millions, providing the daily bread that fuels the nation's populace. Apart from the fundamentals, India's agricultural landscape is ornamented with a diverse range of crops. The bright fields of Punjab sway to the rhythm of wheat in the north, while the aromatic fields of Haryana produce delicious basmati rice. The Gangetic plains are fertile land for rice and sugarcane due to their good soil and plentiful water supply.

As you travel towards the south, the topography changes, giving rise to spices like black pepper and cardamom in Kerala and abundant paddy in Tamil Nadu's fields. Hardy plants like millets and



Food processing plants in rural areas create jobs, boosting local people and limiting migration to cities in pursuit of work. This decentralization of economic activity demonstrates the industry's ability to serve as a promoter of inclusive growth

pulses find a place to grow in the desert regions of the west and grow without difficulty. The gentle undulations of tea plantations, orange orchards, and bamboo groves distinguish the topography of the northeastern states. As a result of climate, soil, and cultural practices, each region has developed its own agricultural character.

Challenges and Vulnerabilities

Indian agriculture faces a variety of difficulties regardless of its diversity and rich history. Small and dispersed landholdings, which are frequently insufficient to generate significant profits for farmers, characterize the sector. Many are forced to practice subsistence farming while they struggle to escape the vicious cycle of debt and poor output.

Another obstacle is inadequate infrastructure. With unpredictable weather patterns and a rise in extreme events like floods and droughts that damage crop production, climate change offers an increasing threat. Additionally, the lack of comprehensive crop insurance subject farmers to a great deal of financial risk. A crucial concern in agriculture is income inequality. Although the sector may help ensure food security for the country, the income gap between farmers continues to be evident. Large

landowners frequently reap greater benefits from government programs and subsidies, leaving smallholders without access to necessary tools and resources.

Post-Harvest Losses

Post-harvest losses have a big impact on the economy, society, and environment in India and throughout the world. These losses take place between the time that crops are harvested and the time when they are ultimately consumed or processed. Numerous things, including poor storage facilities, transportation problems, pest problems, and weather circumstances, might be blamed for them. Post-harvest losses have always been an issue in India. According to estimates, post-harvest losses cost India between 30-40% of its complete food production.

In severe cases, these losses can be up to 80% of the total production. These losses are particularly noticeable in perishable foods like fruits and vegetables. According to the studies, among various agricultural commodities, fruit and vegetable losses account for around 19%, 20%, and 44% of the weighed losses, respectively. These losses are a result of poor cold chains, inadequate cold storage, and ineffective transportation networks. Globally, the picture is similar.

According to the Food and Agriculture Organization (FAO), around one-third of all food produced for human consumption is lost or wasted worldwide. This translates to approximately 1.3 billion metric tons of food annually. These losses have severe economic consequences, valued at hundreds of billions of dollars, while also exacerbating food insecurity and hunger.

Growth of Food Processing Industry in India and its Economic Impact

In recent years, India's food processing industry has seen a tremendous shift. It represents 32% of the nation's overall food market, is one of India's largest industries, and is rated fifth in terms of production, consumption, export, and anticipated growth. It accounts for approximately 8.80 and 8.39% of the Gross Value Added (GVA) in manufacturing and agriculture, 13% of exports from India, and 6% of all industrial investment. This change is not only noteworthy in terms of its broad implications, but also in terms of its outstanding scale.

The Evolution

The post-independence era, when the primary objective was to minimize post-harvest losses, was when India's food processing business first emerged. Primitive attempts were made at the time to develop a few food processing facilities, mainly for the dairy and meat industries. These were predominantly government-led programs intended to reduce the substantial quantity of agricultural produce wasted after harvest. However, the industry didn't start to experience significant expansion until the 1990s. New



opportunities for investment and innovation were made possible by a number of economic reforms and liberalization measures. The tremendous agricultural potential and large consumer base of India were recognized by entrepreneurs and global organizations. As a result, the investments in the food processing industry in the private sector increased.

With more businesses entering the market, the processing of fruits and vegetables has been gaining momentum. The variety of processed agricultural goods is wide, ranging from frozen peas to dried fruits. Since Indian spices are still in high demand both domestically and internationally, the spice industry has also experienced impressive growth. This economic impact spreads widely into rural India, where there are numerous food processing facilities, and is not limited to urban areas.

One of the most notable elements of this growth is its ability to bridge the rural-urban gap. Food processing plants in rural areas create jobs, boosting local people and limiting migration to cities in pursuit of work. This decentralization of economic activity demonstrates the industry's ability to serve as a promoter of inclusive growth.

FDI and Government Initiatives

Foreign Direct Investment (FDI) has proven fundamental in moving the food processing industry ahead. Several multinational

food firms have established operations in India because of the government's efforts to liberalize FDI regulations and encourage investment. This not only generates capital but also promotes cutting-edge technologies and best practices while raising industry standards. The Indian government has also launched many efforts to aid the growth of industries.

Major Government Initiatives

The Indian government has been taking various initiatives to promote Farmer Producer Organizations (FPOs) in the food processing sector to overcome various challenges. These programmes are intended to increase farmers' income, enhance the supply chain, and advance the food processing sector. Here are some important government programmes and initiatives in this area.

Formation and Promotion of FPOs: The government has been actively encouraging the development and registration of FPOs by offering farmers financial aid and technical support. This project encourages FPOs to collaborate for improved access to resources, technology, and markets.

Scheme for Agro-Marine Processing and Development of Agro-Processing Clusters (SAMPADA): This scheme focuses on developing advanced facilities in the food processing industry, which is beneficial to FPOs. It comprises the construction of food

processing plants and cold chain facilities, which can help FPOs decrease post-harvest losses and improve their processing capabilities.

Pradhan Mantri Kisan SAMPADA Yojana (PMKSY): This umbrella scheme includes various components to promote food processing, including the development of backward and forward linkages, supporting FPOs in value addition, and facilitating infrastructure development.

National Agriculture Market (eNAM): The eNAM platform aims to establish a unified national market for agricultural products. It can benefit FPOs by providing them with a larger market to sell their produce.

Mega Food Parks: The government has been setting up Mega Food Parks across the country. These parks provide state-of-the-art infrastructure for food processing units, including FPOs, and help in reducing wastage and improving value addition.

Interest Subvention Scheme: FPOs can avail interest subvention on loans under this scheme, making credit more affordable for them.

Technology and Skill Development: The government also provides training and capacity-building programs to FPOs, in order to enhance the skills and knowledge of farmers in modern agricultural practices and food processing techniques.

Positive Impacts on Indian Agriculture

India's expanding food processing industry has multiple positive effects on the country's agriculture sector. These changes have been critical in addressing long-standing issues and improving the livelihoods of millions.

Increased Income for Farmers

The potential of the food processing sector to improve farm income has been one of its most significant contributions. Farmers can command higher prices if they provide a steady and profitable market for their produce, particularly for the perishable items such as fruits and vegetables. For farming communities, this translates into better livelihoods and financial security.

Reduction of Post-Harvest Losses

Reducing post-harvest losses, a persistent problem in Indian agriculture has been made possible in large part by the food processing industry. Crops are more effectively maintained and get to consumers in excellent condition because of the advancements in storage, packaging, and transportation.

This decrease in waste not only makes the food supply chain more efficient but also saves vital resources like water and land that would otherwise be utilized to produce food that would go to waste. Additionally, by lowering the carbon footprint associated with food waste, it supports sustainability goals.



The industry's spread into rural areas is one of the most amazing aspects of its influence. Farmers who previously only practiced basic agriculture now have access to a second market for their goods. Through diversification, crop failure risks are reduced, and rural incomes are stabilized

Employment Generation

In India, the food processing sector has grown to be a significant source of new employment opportunities, providing possibilities in both urban and rural areas. In addition to producing millions of jobs, this dynamic sector has made a substantial contribution to the socioeconomic advancement of the country.

Rural Empowerment

The industry's spread into rural areas is one of the most amazing aspects of its influence. Villages and small towns are frequently chosen for food processing facilities, where local farmers provide the raw materials. Farmers who previously only practiced basic agriculture now have access to a second market for their goods. Through diversification, crop failure risks are reduced, and rural incomes are stabilized.

Urban Opportunities

Despite having substantial rural footprints, the food processing industries also create employment opportunities in urban areas. A network of manufacturing facilities, distribution centres, and retail stores has been established because of the expansion of this

sector. These facilities demand both expert and unskilled labour, from engineers and food technologists to production line workers and sales staff. As a result, job openings across the entire industry value chain are increasingly being created in urban areas.

Export Opportunities, benefits and challenges

In addition to transforming domestic agriculture, India's food processing industry has also carved out a significant position for itself in the world market. Spices, dairy products, and other processed food items from India are in high demand overseas and have greatly increased the country's export earnings. In addition to earning significant foreign currency, exporting processed agricultural goods can help balance trade deficits. It creates opportunities for economic expansion, makes technology exchange easier, and improves relations with countries that import.

Technological Advancements

India's food processing industry has seen a significant transition as a result of technical improvements. Innovations have completely changed how agricultural product is produced, processed, packed, and transferred from farm to fork. These technological advancements have improved productivity while also improving the sustainability, quality, and safety of food.

Cold Chain and Storage Solutions

The establishment of a strong cold chain infrastructure is one of the most important technological developments in the food processing sector. Post-harvest losses have been reduced because of cold storage facilities, temperature-controlled warehousing, and refrigerated transportation. Since fruits, vegetables, dairy products, and even meat now have longer shelf life, less food is wasted, and consumers can still buy fresh produce even in distant marketplaces.

Some Major Food Processing Industries in India

The food processing industry in India is vast and comprises a wide range of companies producing various food products. While it's not possible to list all of them and their products comprehensively, some prominent companies and the types of products they typically offer are listed below:

Nestlé India: Known for products like Maggi instant noodles, Kit Kat chocolates, Nescafé coffee, and various dairy products.

Britannia Industries: Well-known brand for biscuits and cookies, including Good Day, Tiger, and Marie Gold biscuits.

Amul: Famous for dairy products such as milk, butter, ghee, and a wide range of cheeses.

ITC Limited: ITC offers a diverse range of food products, including Aashirvaad atta, Sunfeast biscuits, and Bingo! snacks.

Parle Products: Known for popular biscuit brands like Parle-G, Monaco, and KrackJack.



Marico Limited: Marico produces cooking oils like Saffola and Parachute coconut oil.

Dabur India: Dabur is known for products like Real fruit juices, honey, and Chyawanprash.

Godrej Consumer Products Limited: This company produces a variety of food products under brands like Godrej Nature's Basket and Jumpin.

MTR Foods: MTR offers a range of packaged ready-to-eat Indian dishes like masala dosa and paneer tikka.

Mother Dairy: Known for dairy products, ice creams, and Safal branded frozen vegetables.

Patanjali Ayurved: Patanjali produces a wide range of Ayurvedic and food products, including Patanjali Atta and ghee.

Case Studies

To illustrate the real-world impact of the food processing industry on Indian agriculture, we turn our attention to two notable case studies that exemplify its transformative potential: Amul and Parle Agro.

Amul: Empowering Dairy Farmers

Amul started as a Milk Producers' Union and became an iconic brand in the Indian dairy sector. It was established in 1946. It developed as a reaction to middlemen and privately owned dairy firms taking advantage of milk producers. The greatest producer of

milk and milk products in the world today, Amul is a cooperative federation of 3.6 million dairy farmers spread across 18,600 communities.

The cooperative business model of Amul has been essential in revolutionizing the dairy industry. It has significantly enhanced the income of dairy farmers by offering a steady market for milk and milk products. Rural women are also included in this empowerment because they are frequently the decision-makers in dairy cooperatives and play a key role in milk collection and processing.

Numerous rural households have benefited socially and economically because of Amul, which has led to a chain reaction of prosperity. It also has great global presence. Butter, cheese, and powdered milk are just a few of the dairy products made by Amul that have a worldwide market. Due to its dedication to quality, the brand has established a name for itself in the global dairy market.

Parle Agro: Adding Value to Agricultural Produce

Leading Indian beverage manufacturer Parle Agro was established in 1984 and is renowned for its innovative fruit-based products. It has been crucial in increasing the value of agricultural products and developing markets for crops like apples and mangoes. Popular brands including Frooti, Appy, and Appy Fizz, which all use fruit pulp as a primary ingredient, are among the products in Parle Agro's portfolio. Farmers have been encouraged to grow more



Complex Regulatory Framework

It can be challenging for Indian food processing industries to navigate the regulatory system. At times, delays and higher operational costs result from a complicated web of rules, licenses, and compliance requirements. To encourage industrial expansion, these laws must be made simpler and more efficient while still maintaining high standards for food safety.

Supply Chain Inefficiencies

India's food supply chain exhibits inefficiencies at many points. Higher prices, a decline in quality, and delays can be brought on by fragmented supply chains, a lack of integration, and a reliance on intermediaries. Efficiency must be increased through the modernization and optimization of supply chains using technology and logistics management.

Access to Finance

In the food processing industry, many small and medium-sized businesses (SMEs) struggle to find affordable financing options. Their inability to invest in technology, grow their business, and compete in the market is hampered by their limited access to funding. Increasing financial inclusion and making loans more accessible will help SMEs flourish and propel economic growth.

Technological Adoption

Although there have been technological advances, there is still a space for wider use of conventional food processing technologies, particularly among smaller firms. This gap can be closed by funding R&D, encouraging innovation, and offering financial incentives for adopting new technologies.

Sustainability Concerns

The worldwide food processing sector is placing more and more emphasis on sustainability and environmental concerns. By addressing these issues, such as limiting water usage, reducing energy consumption, and implementing eco-friendly packaging, the industry may become more competitive and attract customers who are concerned about the environment.

Future Prospects

In India, the food processing sector is expected to keep expanding over the next few years. The demand for processed and value-added food items is being driven by a growing middle class, shifting consumer preferences, and rising health consciousness. This change offers opportunity for the sector to become even more innovative and diverse.

Another interesting prospect is the potential for exports. There is space for growth in the markets for processed foods, spices, and dairy goods from India. The sector may seize global markets by utilizing its expertise in traditional Indian food, which is famous for its wide range of flavours and recipes.

fruit-bearing trees, especially mango and apple trees, because of their dependence on fruit supplies. As a result, it has boosted fruit growers' income in addition to increasing fruit yield.

These case studies demonstrate the Indian food processing sector's potential for transformation. Dairy farmers now have more leverage because of Amul's cooperative model, while Parle Agro has increased the value of agricultural products for both farmers and customers. These success stories offer an approach forward for sustainable growth by serving as motivating examples of how the sector may influence positive developments in the agricultural landscape.

International Comparisons

It is crucial to place the food processing sector within the larger global framework to comprehend the full extent of its impact on Indian agriculture. India's food processing industry may learn a lot about other nations' sectors by comparing their strengths, weaknesses, and growth potential. India stands out in the global market due to its abundant agricultural resources, wide variety of crop farming, and rich culinary tradition. A major player in both the production of raw agricultural products and the processing of food, the country's agro-climatic zones enable the growing of a wide variety of crops.

Challenges and Bottlenecks

While the Indian food processing industry has shown tremendous growth and assurance, there are several ongoing problems and obstacles that must be resolved for long-term success. To develop successful plans for the expansion of the industry, it is essential to comprehend these challenges.

Inadequate Infrastructure

The lack of adequate infrastructure, especially in rural areas where the majority of India's agricultural production is based, is one of the most serious issues. Significant post-harvest losses are a result of a lack of modern warehouses, cold storage facilities, and transportation networks. These losses not only reduce farmers' profits but also result in food waste, which is a problem from both an ethical and financial standpoint.

SOMANI SEEDZ™

HYB CAULIFLOWER KHUSHI

HYB RADISH CROSS X 35

HYB CABBAGE TEJ (IMP)

HYB RADISH WHITE SNOW

SOMANI KANAK SEEDZ PVT LTD
 C-91/7, 2nd Floor, Wazirpur Industrial Area, New Delhi - 110052.
 Phone: 011-47503925, 011-47505228. Customer Care No. : 91 - 70273 75220
 e-mail : contact@somaniseedz.com
 website - www.somaniseedz.com

Revolutionising Indian Agriculture

Enhancing Sustainability,
Economic Growth and Food
Safety through Food Processing



ABOUT THE AUTHOR

Shri G. Kamala Vardhana Rao, IAS, is Chief Executive Officer (CEO), Food Safety and Standards Authority of India (FSSAI), a statutory body established under Ministry of Health and Family Welfare.

Shri Rao has also served as the Director General in Ministry of Tourism and Chairman and Managing Director of India Tourism Development Corporation (ITDC). He served as Secretary, Revenue and Principal Secretary, Tourism and Public Work Department, Government of Kerala. Mr. Rao has also served as Chairman, Indian Tobacco Board, Ministry of Commerce, GOI



Food processing contributes significantly to the promotion of agriculture by providing market access to farmers, amplifying the success and viability of the agriculture sector

India's strategic geographical location and its diverse climatic conditions enable it to emerge as a prominent global producer of a wide array of crops, ranging from millets to staples like wheat and rice alongside sugarcane, varieties of fruits and vegetables etc.

With 1,80,888 thousand hectares of total arable land, India has naturally emerged as the largest producer as well as the largest exporter of cereal products in the world. Out of the nation's total arable land, 1,53,882 thousand hectares is cultivated land, and the gross irrigated area is of 1,02,667 thousand hectares.

India produces 130.29 million tonnes of rice annually, apart from 106.84 million tonnes of wheat, 431.81 million tonnes sugarcane, 50.90 million tonnes of Nutri-Cereals, Millets etc., apart from other food crops. During 2021-22, India produced 107.24 million tonnes of fruits and 204.84 million tonnes of vegetables.

India's export of cereals stood at Rs. 111,062.37 Crore / 13,857.95 USD Millions during the year 2022-23. With its abundant agricultural resources, India sustains a thriving agrarian sector that employs over half of its population. The surplus of agricultural raw materials has laid the foundation for a robust food processing industry.

FSSAI's Pivotal Role In Safeguarding Public Health

In this dynamic agricultural ecosystem, the Food Safety and Standards Authority of India (FSSAI) plays a pivotal role in safeguarding public health. Established in 2006, Established under the Food Safety and Standards Act (FSS), 2006, the FSSAI is the apex food regulatory body in the country

with the mandate to ensure safe and wholesome food for all citizens. As a part of its core regulatory functions, FSSAI sets science-based, globally benchmarked standards for food safety. FSSAI has constituted Scientific Panels under Section 13 of the Food Safety and Standards Act (FSS Act), 2006 for the purpose of developing standards and also to provide scientific opinion/inputs to the Food Authority, as and when sought.

With stringent standards, FSSAI ensures that processed foods meet the highest safety and quality benchmarks

by following good manufacturing practices. This encompasses guidelines for processing, packaging, labelling and storage, establishing a robust framework for safe food production and distribution. To ensure, that the material used for food packaging is of high quality in order to ensure the safety and quality of food, FSSAI has come up with the Food Safety and Standards (Packaging) Regulations, 2018.

The food processing industry stands as a cornerstone in seamlessly converting raw agricultural produce into processed foods, enhancing shelf life of the food products and also facilitating their distribution on a wider scale. There has been a significant contribution of food processing sector in the Indian economy.

Robust Increase In GVA

The Gross Value Addition (GVA) in this sector has grown from Rs. 1.79 lakh crore in 2016-17 to Rs. 2.37 lakh crore in 2020-21, showing an annual growth rate of 7.27%. With agriculture being the backbone of the Indian economy, all allied sectors, including food processing, play a pivotal role in creating employment opportunities. According to the Ministry of Food Processing Industries, this sector contributes to 12.2% of employment within the registered manufacturing sector, showcasing its significant impact on job creation.

In addition to economic benefits, food processing is the next step in sustainable development. Processed foods have a longer shelf life, reducing the likelihood of spoilage and subsequent food wastage. This not only conserves resources but also addresses the critical issue of food security. Furthermore, due to their extended shelf life, processed foods can be smoothly exported to different parts of the world, strengthening India's position in the global market.

Moreover, food processing contributes significantly to the promotion of agriculture by providing market access to farmers, amplifying the success and viability of the agriculture sector. With the advancement and development of cold storage facilities, it has become possible to reduce the post-harvest losses of perishable food products, which otherwise have a limited shelf life. Availability of adequate storage and transportation facilities helps to increase the market reach of food products. Today, villages are well connected to cities which enable the farmers to transport their agricultural produce in a swift manner, saving transit time to a large extent.

One of the primary motivations for food processing is to eliminate harmful microorganisms that could lead to foodborne illnesses and simultaneously extend the shelf life of products, ensuring food safety and reducing health risks associated with consumption of spoiled goods. Processing also helps to maintain the quality and stability of food products, meeting consumer expectations for consistent and safe food products. Food manufacturing industries can make use of six sigma methodology

by identifying and removing the causes of defects in the food production processes. This quality improvement strategy helps in improving the profitability of the manufacturing industries as well.

Nation's Food Testing Ecosystem

The processed food is tested in laboratories as per the safety (microbiological, contaminants, toxins, insecticides and antibiotic residues etc.) and quality parameters specified under the FSS Act 2006. With four well established state-of-the-art National Food Laboratories in Ghaziabad, Kolkata, Mumbai and Chennai and a network 246 notified food testing laboratories across the country, FSSAI is constantly strengthening country's food testing ecosystem to ensure safety and quality of food.

Food processing also enhances the variety of food products available to consumers, catering to the demands of a fast-paced lifestyle. However, there is a critical need to establish and enforce standards for food products to ensure compliance with safety regulations after processing. This is where the Food Safety and Standards Authority of India steps in. FSSAI ensures that processing does not obscure any potential issues with the raw food material. In fact, processing food without ensuring food safety is not considered acceptable.

Besides setting standards, FSSAI actively monitors and inspects food processing units to verify compliance with food safety regulations. At the state-level, food regulation is administered by Commissioners of Food Safety appointed by state governments. Designated officers and food safety officers function at district and local level in coordination with state and local authorities. They have a frontline role in surveillance, monitoring, inspection and ensuring compliance with regulations at the local level. For instance, FSSAI has conducted five surveillances on milk & milk products since 2011 and continue to monitor the safety and quality of the food products to avoid any food related issues and emerging risks.

This proactive approach enables the identification and rectification of potential issues before they can pose a risk to public health. In cases of non-compliance, FSSAI has the authority to enforce legal action against entities found in violation of food safety regulations. This ensures that accountability is maintained throughout the food processing and distribution chain. By upholding these and taking swift action when necessary, FSSAI stands as a guardian of food safety, instilling confidence in consumers and strengthening the integrity of processed foods.

The food processing industry is an essential pillar in Indian agriculture, adding immense value to raw materials and driving economic growth. Through the vigilant oversight of FSSAI, the safety and quality of processed foods are diligently monitored and maintained. With their standards, regular inspections and awareness activities, FSSAI continues to be a beacon of food safety, ensuring that processed foods remain a trusted and essential component of India's agricultural landscape.

IPL Biologicals

The Glorious Journey



ABOUT THE AUTHOR

Mr. Harshvardhan Bhagchandka is the President of IPL Biologicals, India's largest microbial solutions company. Backed by extensive global experience in the USA, UK & India, Harsh has been at the helm of IPL Biologicals since 2011 and is now steering the company on its rapid global expansion



IPL has the largest product portfolio of agri-biological (microbial) products in the world, which provide solutions for all problems of pest control, disease control and nutrition management for all crops. This provides farmers the opportunity to not only avoid poisonous chemicals but also increase crop yield and quality. These products have been successfully field tested in nearly 25 countries with very successful results.

IPL Biological has collaborated with the Uzkimyosanoat joint stock company in Uzbekistan. What's the objective behind this partnership?

Uzkimyosanoat is Uzbeki govt body to promote modern products and technology in agriculture in Uzbekistan. The President of Uzbekistan has declared a policy to reduce chemicals in agriculture by 30% in the next 5 years.

After an intensive global search for a suitable partner, they found that the only company which had products providing non-chemical biological solutions for all problems of pest control, disease control and nutrition management for all crops was India's IPL Biologicals Ltd. IPL had a state-of-the-art R&D lab which had a pipeline of latest futuristic biological products and formulations for the future. IPL had a modern manufacturing factory in Hardwar and was setting up a new most modern factory in Baroda with huge capacity. IPL also had extensive experience in training and development in new territories.

It is for this reason that Uzkimyosanoat decided to tie-up with IPL for a JV to market its biological products in Uzbekistan, train the farmers in the use of biologicals, and to set up a plant in Uzbekistan to manufacture the products locally. This will help to reduce the use of poisonous chemical pesticides and other agri inputs in Uzbekistan and also increase the yield and quality of produce for Uzbeki farmers.

How is this collaboration going to help IPL and India at large?

IPL has the largest product portfolio of agri-biological (microbial) products in the world, which provide solutions for all problems of pest control, disease control and nutrition management for all crops. This provides farmers the opportunity to not only avoid poisonous chemicals but also increase crop yield and quality. These products have been successfully field tested in nearly 25 countries with very successful results. IPL has a business plan to expand globally. This Uzbekistan JV will increase IPL business, and

also open up the entire CIS market to IPL.

It will also be another step in the vision of the Chairman of IPL to provide safe chemical-free crops to consumers across the world, and to enhance India's image globally.

IPL has recently joined hands with the agriculture supply chain and financial services startup, Unnati Agri. How will this association aid Indian farmers?

Unnati has done exceptional work since its inception for the whole agriculture value chain specially on the farmers, and channel partners. Their software is easy to use and will give the all the stakeholders critical and timely information which will help reduce losses and increase revenue. IPL is working with Unnati to leverage their tech platform for our farmers and offer financial services to our supply chain partners.

What are the company's plans for expansion in the global market?

IPL has embarked in its journey and quest into the international markets. The plan is to create a global footprint, the first of its kind, amongst the Indian owned Bio companies.

The steps involved in this process prior to creating a global entry roadmap was:

- Established a business model and have made new organisational structure (Sales lead, Business development & International Regulatory team has been formed under IBD)
- Market research to understand the challenges and opportunities in the specific geographies.
- Understanding the business landscape and regulatory environment
- Decided on the short term and long-term strategies and have set measurable goals against them.
- Create high visibility by participating in all major global

events of relevance. The Sales team is also aggressively reaching out to potential partners in addressable markets by direct visits and introducing them about IPL Biologicals.

- IPL is also open to forge collaboration with partners in specific markets by way of Joint venture partnerships, co-manufacturing/ Licensing, etc.

We have planned a Hybrid model for entry into the markets of current high potential and future attractiveness:

- IPL's own registration/JV registrations. Where ever JV registrations are planned, we will work with the national distributor in that country. In case of own registrations, IPL will appoint distributor/s upon securing the regn. Product will be marketed under IPL trade names.
- Source registrations (wherein IPL will be the source and registration owner will be the local company)

How is IPL Biological addressing the issues of the farmers in relation to the microbes in agriculture?

Farmers in India face several key issues that can limit their adoption of biological products in agriculture. These issues often revolve around awareness, affordability, and efficacy. Here are some of the key challenges:

- **Lack of Awareness and Education:** Many farmers in India may not be aware of the benefits and proper use of biological products. There is a need for education and training programs to inform farmers about the advantages of these products and how to integrate them into their farming practices.
- **Perceived Effectiveness:** Farmers may have doubts about the effectiveness of biological products compared to traditional chemical inputs. Ensuring that biological products are as effective in pest and disease control as chemical alternatives is crucial for adoption.
- **Affordability:** The cost of biological products can sometimes be higher than chemical alternatives, which can deter small and marginal farmers from adopting them. Ensuring affordability through subsidies or innovative pricing strategies is essential.
- **Availability and Access:** Accessibility to biological products, especially in remote and rural areas, can be a challenge. Expanding distribution networks and ensuring availability in local markets is important.
- **Storage and Shelf Life:** Some biological products require specific storage conditions and have shorter shelf lives compared to chemical inputs. Farmers may face challenges in storing and managing these products.
- **Risk and Uncertainty:** Farmers may perceive higher risks and uncertainties when using biological products, such as concerns about product efficacy under varying weather conditions or the presence of natural predators.

- **Compatibility with Existing Practices:** Biological products may require adjustments to traditional farming practices. Farmers may resist change if they perceive it as disruptive or if they lack guidance on how to integrate these products into their existing systems.

To address these issues, IPL Biologicals can implement several strategies:

- **Education and Training:** Conduct farmer education and training programs to raise awareness about the benefits and proper use of biological products. Provide technical guidance on application methods and dosage.
- **Demonstration Farms:** Set up demonstration farms where farmers can see firsthand the results of using biological products. This can build trust and confidence in these solutions.
- **Affordability:** Explore pricing strategies that make biological products more affordable to small and marginal farmers. Collaborate with government agencies to offer subsidies or incentives.
- **Distribution Network Expansion:** Expand the company's distribution network to reach remote and rural areas, ensuring that farmers have easy access to biological products.
- **Technical Support:** Offer technical support through helplines, field visits, or digital platforms where farmers can seek advice and troubleshooting assistance.
- **Product Development:** Continuously invest in R&D to improve the efficacy and shelf life of biological products, addressing concerns about their effectiveness and storage requirements.
- **Partnerships and Collaboration:** Collaborate with government agricultural extension services, research institutions, and NGOs to jointly promote the adoption of biological products and provide comprehensive support to farmers.

IPL Biologicals can play a pivotal role in addressing these issues by combining product innovation with educational initiatives and outreach programs. By actively engaging with farmers and providing solutions to their challenges, the company can contribute to the broader adoption of biological products in Indian agriculture.

How is IPL Biological disrupting the Bio agriculture industry?

IPL Biologicals is making waves in the agriculture industry through several disruptive strategies and initiatives:

- **Next-Generation Microbial Products:** IPL Biologicals leverages extensive research and development efforts to introduce cutting-edge microbial products. These innovations enhance soil fertility, increase crop yields, and reduce the environmental footprint of farming. By staying ahead in technological advancements, the company sets

new standards for sustainable agriculture.

- **Farmer Training Programs:** IPL Biologicals places a strong emphasis on farmer education and training. By conducting workshops, seminars, and on-field demonstrations, the company ensures that farmers have the knowledge and skills to maximize the benefits of microbial products. This empowerment is pivotal in driving widespread adoption.
- **Carbon Credits and Sustainable Farming:** IPL Biologicals actively promotes the concept of carbon credits in agriculture. By helping farmers adopt sustainable practices, reduce greenhouse gas emissions, and sequester carbon in their soils, the company not only enhances farm productivity but also opens new revenue streams for farmers through carbon credit monetization.
- **Social Media Marketing:** The company utilizes social media platforms to connect directly with farmers. Through informative content, success stories, and interactive discussions, IPL Biologicals creates awareness about the benefits of microbial products and sustainable farming practices. This digital outreach facilitates a direct line of communication with farmers across India.
- **Strategic Partnerships:** IPL Biologicals collaborates with agricultural research institutions, government agencies, and international organizations to drive research and development initiatives. These partnerships help leverage expertise, share knowledge, and bring about innovative solutions to address agricultural challenges.
- **Customized Solutions:** IPL Biologicals understands the diversity of India's agricultural landscape. The company tailors its microbial products to suit specific regional and crop requirements. This customization ensures that farmers receive solutions optimized for their unique conditions.
- **Inclusivity:** The company's commitment to inclusivity means it focuses on empowering small-scale and marginalized farmers who often face resource constraints. By making microbial solutions accessible and affordable, IPL Biologicals plays a crucial role in supporting these farmers.
- **Environmental Sustainability:** IPL Biologicals' products promote environmentally sustainable farming practices by reducing chemical inputs, minimizing soil degradation, and contributing to cleaner water sources. This aligns with global efforts to address climate change and protect ecosystems.
- **Market Expansion:** The company's expansion into new markets and regions ensures that more farmers can benefit from microbial solutions. This market diversification broadens the reach and impact of IPL Biologicals.

IPL Biologicals is disrupting the agriculture industry by combining innovative microbial products, education, carbon credit initiatives, and digital marketing to foster sustainable farming practices, empower farmers, and drive positive change across India's agricultural landscape.

How is IPL Biological transforming agriculture through the World-Class Technology & Innovation Centre in microbial solutions?

Technology and Innovation Centre of IPL Biologicals Limited works on the principle of aiming at sustainable solutions by using the concept of nature to nature. Novel innovative approaches are used to bring about the transformation in agriculture by leveraging the legacy of 30 years of intensive research in biological product development processes.

Some Novel Approaches

1. Bio-mapping of potent and novel strains from various niche areas, identifying and cataloguing them through molecular techniques and using novel approaches for IPR protection.
2. Selected most potent strains are screened using stringent screening protocols for various abiotic stress tolerance. This approach makes our strain superior in-terms of efficacy, and they can perform under diverse climatic conditions.
4. Robust product development processes with expertise in submerged fermentation to achieve optimised production parameters, high density CFU, highest quality and enhanced shelf life.
5. IPL emphasis on application technology. Unlike chemical technology, proper application protocols with respect to stage of growth, dosage, nutrition and biocontrol product combination is required to harness the best potential of biologicals.
6. Working on next generation formulations of biologicals to meet the growing demand of user-friendly formulations, lesser dosage and prolonged shelf life.
7. Stringent product validation through laboratory validations, pot trials, field trials and various multi-location trials prior to commercialisation.
8. Exploring innovative approaches of enhancing secondary metabolites to achieve targeted pest and disease control solutions, endophytic approach to enhance plant immunity, novel nutriocoat technology for enhanced seed germination and plant growth.
9. All the above are cost intensive which involves having a team of experts in different specialised area along with huge investment on modern infrastructure. IPL has put many years of hard work to create a world class product portfolio of more than 50 plus products.

Post-Harvest Mechanization Vital For Farmer Prosperity

Green Revolution has helped India in attaining self-sufficiency (surplus in some commodities) in the food sector. This green revolution was also possible due to mechanisation of agricultural operations as well as due to an infrastructure that was developed for storage of different commodities.

Although the pace of adding storage space was a bit slow initially and supported by government agencies only, but now it has increased, and a substantial quantity of food material is stored by the private sector. The growth of agricultural production warrants that the produce is handled within a reasonable time and delivered to the consumer with minimal loss of quality. Although, quality and food safety were not important criterion a few decades ago; but now since the focus is shifting from 'Food Security' to 'Nutritional Security'. They are requirement of the market and the need of the hour.

Advanced Mechanization

The usage of machines and tools for processing of food materials is also almost as old as agriculture; but the form and material for making these equipment and tools has changed considerably over the years. Fabrication materials such as wood, bamboo, natural fibres, stone, etc. have been replaced by metals, alloys, glasses, polymers, composites, etc., if not completely then still to a very large extent.

These new materials have provided durability, better consistency, more reliability, higher efficiency, economic advantage, and more safety to the machines as well as the product being handled/ processed. Another major change, especially in the post-independence era has been use of mechanical power, generated by electricity or fossil fuel, that has resulted in higher capacities of machines, more uniformity in the processed product and reduced drudgery in the operations.

Huge Agro-Based Subsidiary Industry

The mechanization of secondary and tertiary processing led to formation of a huge agro-based subsidiary industry (both in organized and unorganized sector) which not only helps providing food to the consumer but also a huge employment generator. An Agro Processing Center, a multi-machinery – multi-commodity processing facility in or near the production catchment, is known to provide full-time employment to around four persons.

The processing at production catchment using appropriate machines ensure reduction in post-harvest losses, reduction in transport and storage quantum, better retention of product quality and additional income to the farmer-turned-entrepreneurs. Improved on-farm storage facilities also help in stabilization of commodity prices in market and help farmers realized better returns. A very good example of advantage of post-harvest technology intervention is the milk sector, in which the post-harvest losses are 0.87% (MoFPI, 2022).

Durability And Quality Are Important Parameters

Management of moisture in food products is one of most important aspect in the durability and quality of the product. Moisture removal or drying is an age-old practice for preventing post-harvest losses and open sun drying is the most prevalent practice. Mechanized drying has helped in quicker operation, quality retention, ensuring product safety and made available variety of traditional as well as innovative products at affordable prices. Advanced drying machines using radiations, vacuum, sublimation and other chemical engineering operations have become imperative in processing of some high-value commodities.

Mechanization of the post-harvest sector has also helped development of machine manufacturing sector. For example, the rubber roll sheller-based rice milling industry replaced the hullers which were the main equipment used for milling of paddy; use of rubber rolls required cleaning, grading of raw materials besides free from impurities like stones or metal scrap and, therefore, equipment like air screen cleaners, de-stoners, specific gravity separators and other pneumatic devices were introduced in primary processing of durable commodities especially food grains.

Since the scales at which the food processing industries operate vary a lot, and there is scope for operators of all sizes, there is a very large sector of food processing machinery manufacturers. The post-harvest sector has not only supported the machine manufacturing industry, but also helped the instrument manufacturing industry.

Need For Trained Human Resource

With the introduction of Agricultural Produce Marketing Centres, weight and moisture of the product became an important factor in the trade of many commodities; similarly fat content, soluble solid content, and some other nutritional parameters have significance in the food commerce. These measurements required reliable instruments, which were initially imported and then the local manufacturers emerged in case of some major instruments.

The food sector will always be in demand, but the changes in market influence this sector drastically. There is a huge consumer base that is very much aware of quality of the produce and demand safe food; the rural workforce is also moving to more lucrative sectors, cost of conventional energy is increasing and norms for environmental protection are becoming stringent, hence there will be a huge demand for automated, intelligent, robust and reliable machines, instruments and systems in the entire gamut of post-harvest management operations.

To fulfil the demand of this huge sector the country needs a well planned physical, financial and intellectual infrastructure. A sizable pool of trained human resource is necessary for production, operation, repair and maintenance of these food processing machines. All these developments are expected to support the primary food producer – the farmer, the backbone of the agriculture sector.



Mechanized drying has helped in quicker operation, quality retention, ensuring product safety and made available variety of traditional as well as innovative products at affordable prices



ABOUT THE AUTHOR

Dr Nachiket Kotwaliwale is Director, ICAR-Central Institute of Post-Harvest Engineering and Technology, Ludhiana

Sustainable Food Processing

Towards a Greener Future



We are witnessing greater consumer preference for processed food in the post COVID-19 world. The sector is expected to see enhanced private sector investment creating opportunities for integrating farmers into the value chain of large producers

ABOUT THE AUTHOR

Mr Saikat Sarkar is Head – Premium Grocery, Reliance Retail Ltd. He is a Food and Beverage specialist having 25 years of functional experience as a Retailer, Hotelier, and an Entrepreneur

Food processing is India's way of dealing in doubling farmers' income. This critical sector links agriculture, manufacturing sector and final consumers; reduces post-harvest wastage through infrastructure creation and adds significant value to agriculture produce through modern processing technologies. The added value, if flown back to farmers via the value chain through wastage prevention and complete utilization can add significantly to farmers' income.

Food Processing sector in India has also grown at a faster CAGR of 9.5% as compared to agriculture's five-year CAGR of 3.4%. KPMG in India in one of its reports – "[Indian Food Processing Industry- Growth opportunities post the COVID-19 pandemic](#)" estimates that, going forward, this sector will reach US\$ 535 billion by 2025 at a CAGR of 15 per cent, which indicates significant potential for increasing farmers' income through processing. The sector also aims to add 9 million jobs by 2024. Thus, the sector can potentially be the solution India needs to double farmer's income.

Advanced Global Food Processing Ecosystems

Globally all major economies have advanced food processing ecosystems with high levels of processing (70-80% against 10% in India) and correspondingly higher value added per worker in agriculture. India, despite being the leader in production of several agricultural commodities, lags several countries in terms of value added per worker in agriculture. India is the world's second-largest producer of food after China. Yet, it has one of the lowest levels of [food processing](#) in the world. However, our, still developing food processing industry holds tremendous potential and impact on its economy.

The Indian food and grocery market is the world's sixth largest, with retail contributing 70% of the sales.

The Indian food processing industry accounts for 32% of the country's total food market, one of the largest industries in India and is ranked fifth in terms of production, consumption, export and expected growth.

It contributes around 8.80 and 8.39% of Gross Value Added (GVA) in Manufacturing and Agriculture respectively, 13% of India's exports and 6% of total industrial investment.

The Indian gourmet food market is also currently valued at US\$ 1.3 billion and is growing at a Compound Annual Growth Rate (CAGR) of 20%. There's a huge opportunity to capture this space with a newfound attention, from not only the food connoisseurs, but also from a growing population of urban youth.

As on today, even sustainable agriculture can bring huge value to the farm produce. By using such ingredients one can bring enormous benefits in terms of value addition and value creation for the packaged food. This is very much in line with the govt's sustainable development goals.

By catering to different segments of processed food, our agricultural production can have a game changing effect on the way we do our farming activities.

Agri Products can feed the Processed Food Industry in India in four different ways.

Unprocessed Or Minimally Processed Food

This includes natural edible part of plants and animals. Minimally processed food may be slightly altered so this can be easily stored, prepared, and eaten; this processing level does not substantially change the nutritional content of the food. Examples include cleaning and removing inedible or unwanted parts, grinding, refrigeration, pasteurization, fermentation, freezing, and vacuum packaging. Many fresh fruits, vegetables,



whole grains, nuts, meals, plain yoghurt with no added sugar or artificial sweeteners, fresh and dried pasta, tea, coffee and milk, fall into this category.

Processed Culinary Ingredients

This category includes food ingredients used in kitchens to prepare and season foods that are derived from minimally processed foods by pressing, refining, grinding or milling. They are not typically eaten on their own but are used to prepare other foods. Examples include oils from plants. Seeds and nuts; vinegar made from acetic fermentation of wine; honey extracted from combs; and syrups from date without added flavours or stabilizers.

Processed Foods

In this category, the processing increase the durability of foods or modifies or enhances their flavour and texture. Processed foods derive from either of the two previous groups but have added salt, sugar or fat. Some canned fruits and vegetables, cheese, freshly made bread and canned fish are examples. These foods are usually made from two-three ingredients and can be eaten without further preparation.

Highly Processed Foods

These are the foods from the prior group that go beyond the incorporation of salt, sugar and fat to include artificial colours and flavours, preservatives, thickeners, emulsifiers and artificial sweeteners that promote shelf stability, preserve and enhance textures and increase palatability. Several processing and steps using multiple ingredients are involved in Highly processed foods. Examples are sugary drinks, cookies, crackers, chips, breakfast cereals, frozen foods etc. The consumption of this category is still on the rise, even if, not everyone recommends the same for regular consumption.

All the above categories have a huge value addition, while having the Agri product input with enough value additions, for charging premium.

SAMPADA Yojana

The Government of India has approved more than 63 near farm Agri-processing clusters under its Scheme for Agro-Marine Processing and

Development of Agro-Processing Clusters (SAMPADA Yojana - Scheme for Agro-Marine Processing and Development of Agro-Processing Clusters). Now Government of India has also approved the continuation of the SAMPADA Yojana with an allocation of Rs. 4600 Cr. till 31.03.2026 coterminous with the 15th Finance Commission cycle.

In terms of processes, there must be a continued effort on bringing sustainable solutions to the age-old issues, as well.

Reduction Of Post-Harvest Losses Through Efficient Storage And Transportation

The post-harvest/in transit wastage account for approximately 40% of the total food wastage in India compared to 28% globally and result in significant erosion of farmer income. The impact is more so in high-value crops, such as fruits and vegetables, keeping farmers away from reaping benefits.

Well-developed storage (e.g., cold storage) and transportation facilities help farmers reduce these losses by preserving food for extended periods of time. This also allows monetisation of the crop when the prices are higher. For achieving the desired results, the storage and transportation facilities need to be accessible and affordable. A cluster approach with shared infrastructure is one such model with demonstrated success, as now happening with SAMPADA yojana.

Near Farm Processing

Farmers engaged in the production of low-value crops can add value and increase household income through primary and secondary processing creating higher value products. This is a proven method globally. In many African countries, farmers process sorghum into beer or cassava into garri or snack foods and have formed very successful small-scale businesses. In India, demonstrated examples include papad, pickle and chutney-making, which have become a major source of income for many farmers, including women in rural areas.

By including more farmers and expanding the product range, near farm processing activities are already successful and can be very fruitful for a large number of farmers.

Value Chain Linkages

Farmers can be directly connected to food manufacturers (secondary/ tertiary processors) and sell their produce (fresh/ primary production) to large food manufacturers. A recent study involving farmers of Krishnagiri cluster in Tamil Nadu, showed that farmers who are linked with the processing industry were able to gain on an average additional income of about 49% in comparison to the farmers who operate in the non-processing industry region.

The future market potential of food processing (US\$ 535 billion) is likely to generate greater demand for crop produce, creating a new market for processable varieties for farmers. Food processing companies can enter end-to-end arrangements for direct engagement with farmers, including their education leading to the enhancement of farmers' knowledge of advancing technologies, cultivation of processable crops and manufacturing of higher value-added product lines.

Food processing has the potential to enhance farmer's income in India by adding significant value to the agricultural produce. By engaging farmers in processing activities, providing better storage and transportation, and creating market linkages, it is possible to generated avenues for enhancing income for the farmers.

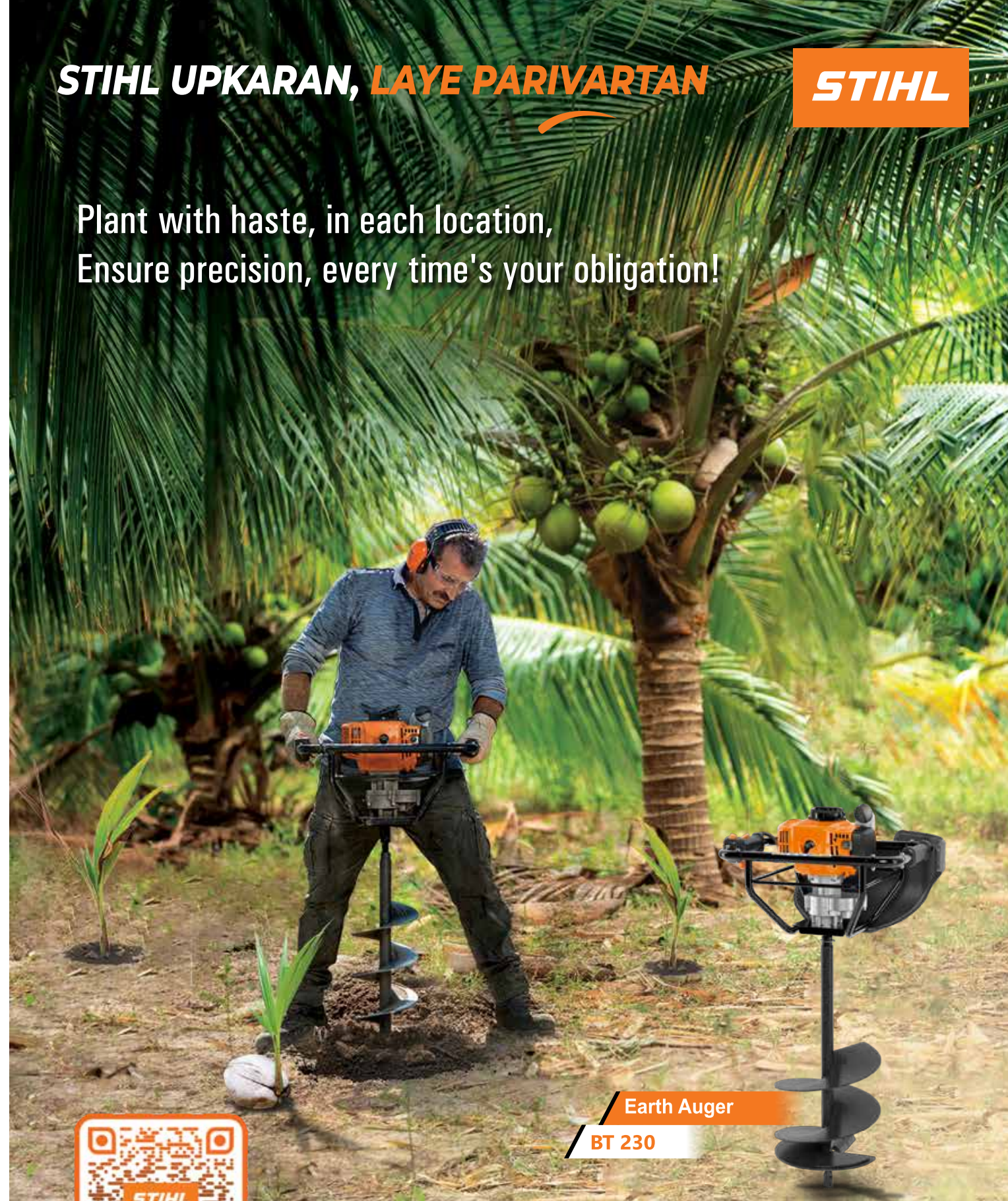
We are also witnessing greater consumer preference for processed food in the post COVID-19 world. The sector is expected to see enhanced private sector investment creating opportunities for integrating farmers into the value chain of large producers.

An effort needs to be made to ensure that the benefits reach the intended beneficiaries - small and marginal farmers. All policy interventions and Implementations at the ground level will do a world of good, for both the agricultural sector and the most promising food processing industry in India.

STIHL UPKARAN, LAYE PARIVARTAN



Plant with haste, in each location, Ensure precision, every time's your obligation!



Earth Auger

BT 230



Call or Whatsapp
90284 11222

info@stihl.in
www.stihl.in

German Quality and Innovation

Parle Agro

Championing Innovation and Supporting Local Fruit Farmers



For nearly four decades, Parle Agro has formed enduring partnerships with fruit farmers and processors in India. The vision behind this is two-fold: firstly, to spur the development of these key stakeholders, and secondly, to provide them with opportunities to improve their earnings significantly

ABOUT THE AUTHOR

Ms Schauna Chauhan is Chief Executive Officer, handling operations of Parle Agro Pvt. Ltd

Founded in 1985, Parle Agro has become synonymous with the creation and marketing of iconic fruit-based beverages that have deeply resonated with the Indian populace. Products like Frooti and Appy are more than just beverages; they have become an integral part of the nation's palate. The journey of Parle Agro has always been about innovating and staying ahead of the curve, and a significant part of that journey involves updating and expanding their infrastructure.

As the demand for their products has soared both nationally and internationally, Parle Agro realized the importance of ensuring their production capabilities meet this ever-increasing demand. A vital component of their strategy lies in empowering their fruit processing partners across India. The goal is to ensure these partners have both the capacity and the capabilities to contribute effectively to the supply chain.

Enduring Partnerships With Fruit Farmers And Processors

For nearly four decades, Parle Agro has formed enduring partnerships with fruit farmers and processors in India. The vision behind this is two-fold: firstly, to spur the development of these key stakeholders, and secondly, to provide them with opportunities to improve their earnings significantly. The company's commitment is evident in their substantial investment in these processing partners, assisting them in optimizing their infrastructure development and revenue.

Totapuri Mango

One of the ground breaking initiatives by Parle Agro (PAPL) was the introduction of the Totapuri mango variety, a type that previously didn't find favour among farmers due to its low commercial value. However, with PAPL's intervention, not only did the Totapuri mango see heightened cultivation, but the farmers and processors associated with it also gained prominence in the industry.

PAPL's endeavor provided an assurance of business to the processors, paving the way for a sustainable and long-term relationship between the processors and farmers. This move indirectly bolstered the farmers' confidence in Totapuri cultivation and ensured a steady fruit supply for the industry.

Peek into Parle Agro's sourcing strategy, and you'll notice a commendable shift. Historically, they sourced fruits from India.

The company fulfill 100% of their fruit needs from within India. This decision not only fortifies the local fruit industry but also guarantees unparalleled product freshness and quality.

Revisiting the initial days of Parle Agro in 1985, their foray into the fruit beverage market began with procuring 1,000 MT of mangoes to produce the beloved Frooti. Today, the company sources 2,12,000 TONS of mangoes, underscoring their exponential growth. Across their product range, they consume approximately 2,72,000 MT of fruit, which equates to one-third of India's fruit pulp production.

Rejuvenating Local Economies, Offering Growth Opportunities For Regional Processors

Building on the mango success, Parle Agro set its sights on apples, driven by the surging demand for apple-based beverages like Appy and Appy Fizz. From a humble 5,000 MT, their apple procurement has surged to 60,000 MT, rejuvenating local economies and offering growth opportunities for regional processors.

However, the road wasn't devoid of challenges. Apple processors, especially from regions like Jammu and Kashmir, Himachal Pradesh, and Uttarakhand, face issues ranging from poor infrastructure, inconsistent fruit quality, and political unrest to erratic weather patterns. These challenges previously mandated imports to match the soaring demands.

In their unwavering commitment to quality and efficiency, Parle Agro has supported processors in adopting advanced machinery. This includes equipment such as Fruit Washers, Pulpers, Evaporators, Pasteurizers. By replacing manual operations with these machines, there's been a noticeable spike in productivity, fruit juice yield, and a significant reduction in costs.

Massive Network Of 25,000 Farmers

Today, the magnitude of Parle Agro's influence can be gauged by the fact that they work directly or indirectly with 20 processors and a massive network of 25,000 farmers in India's southern mango belt.

In conclusion, Parle Agro's journey serves as a beacon of inspiration, reflecting the transformative power of innovation, dedication, and fostering local collaborations. Their commitment to local farmers, processors, and delivering top-notch beverages remains unshaken as they continue their pioneering journey.

Food Processing

Dynamic Sector, Innovative Technologies

India is blessed with diverse agro-climatic conditions and crops can be cultivated year around. Importantly, the Indian economy is largely agrarian-driven and heavily depends on monsoons. In the mid-20th century, India was grappling with food scarcity, largely due to increasing population, lack of awareness about new crop varieties and farming techniques. Green revolution pioneered by Padma Vibhushan Prof. M.S. Swaminathan has transformed India into a self-sufficient nation in the agriculture sector, especially the production of staples such as wheat and rice.

There have also been major contributions in the field of food and agri-processing. Notable ones are the milling and parboiling technologies developed by CSIR-Central Food Technological Research Institute (CSIR-CFTRI) located in Mysore and National Institute for Food technology, entrepreneurship and management, Thanjavur (erstwhile "Paddy Processing Research Centre"). During the same period, operation flood (white revolution) initiated by Padma Vibhushan Dr. Verghese Kurien had drastically increased milk production in the country. Further, indigenous technology to produce nutritious infant formulation (Amul Baby Food) developed by CSIR-CFTRI are examples of the landmark achievements made in the country, contributing to food and nutritional security.

Over the past few decades, the significance of food processing is increasing being realised and Governmental initiatives have supported the tremendous growth we witnessed today. Given the importance of the sector, Government of India set up Ministry of Food Processing Industries (MoFPI) to provide the necessary support system to create a dynamic and robust food processing ecosystem in the country.

In a century where many in the agriculture field have moved towards other industrial jobs and relocated to urbanized zones, the focus of our country is commendable – 'doubling farmers' income'. This calls for a realisation of greater contributors; that is, an increasingly focus towards food processing and value addition.

In this conjuncture, MoFPI, has launched the ambitious Pradhan Mantri Formalisation Of Micro Food Processing Enterprises (PMFME) scheme. It includes the One District One Product (ODOP) concept, providing a framework and supports infrastructure for the creation of value chain for agro-food produce



There is a need for strong interdisciplinary research and development to better support the rising needs and cater to the Indian agro-food processing sector

in every district across the country. Further, it also provides seed grants, supports the upgradation of food processing units, creating common infrastructure, branding, and marketing. Overall, the food processing sector in India is getting transformed and marching towards the golden period (Amrit kaal), backed by some of the best annual growth rates in the manufacturing sector.

Initiatives To Support Farmers

Initiatives to support farmers are many and two novel interventions are presented here, both for crops that are prone to price fluctuations, causing heavy losses. Firstly, shallots (small onions, *Allium ascalonicum* L.), which are relished for their sweet and pungent sensory attributes, are predominantly used in south Indian cuisines.

On average, a farmer earns a profit of ₹10,000 per hectare of the crop. However, the income is not constant, prices fluctuated from ₹ 1/kg (April 2022) to above ₹300/kg (April 2023). To alleviate this precarious situation, two options are present in front of the

farmers, one is to extend the shelf-life of the harvested crop and the second is to process them into value-added products. The above options can be fulfilled through the diffusion of low-cost and appropriate technology at the farmer level.

In 2018, NIFTEM-T developed shallot processing techniques to address the issues and established an incubation centre for small onion processing in Permbalur (TN), one of the largest shallot producing districts in The country. Adopting these interventions, a farmer can convert his fresh produce into value-added products such as dehydrated onion flakes, onion rings, onion oil, puree, onion salt, and pickled onions. This can fetch an income of ₹32000 – 40000 per hectare to the farmer which is around 220-300% increase in farmer's income. It is a classical example highlighting the role of processing in reducing losses and boosting farmer's income.

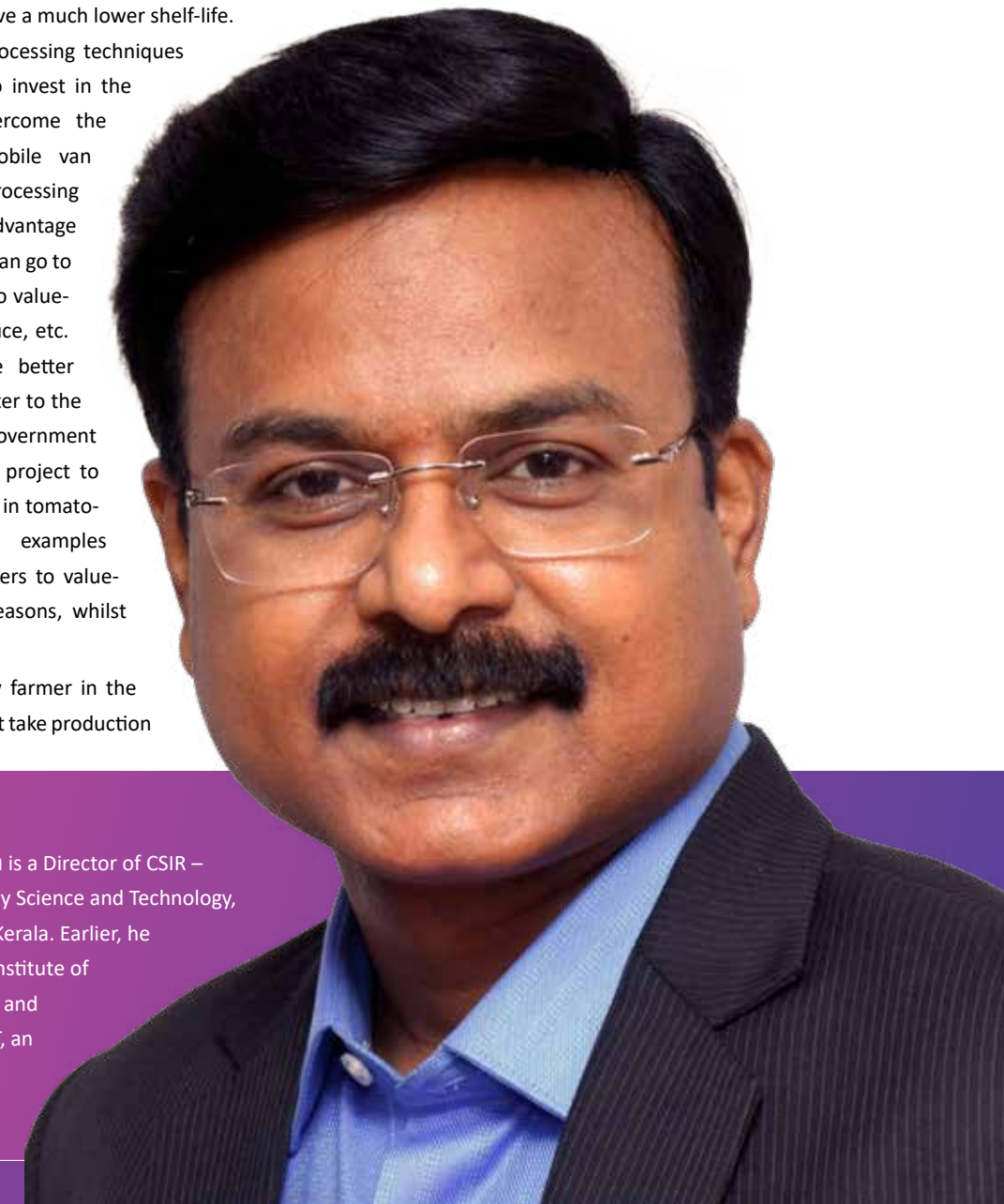
Second, is the case of tomatoes (*Solanum lycopersicum*), which sell in significantly varying prices during different seasons. Compared to shallots, tomatoes have a much lower shelf-life. Often, tomato farmers lack the processing techniques and are not financially prudent to invest in the processing infrastructure. To overcome the issue, NIFTEM-T designed a mobile van equipped with all the necessary processing equipment housed in it. The main advantage of the unit is its mobility. That is, it can go to the farm and process tomatoes into value-added products such as puree, sauce, etc. Processed tomato products have better shelf life and can be supplied to cater to the local market requirements. The government of Tamil Nadu has sponsored the project to build more units and operate them in tomato-producing areas. Overall, such examples highlight the opportunity for farmers to value-add fresh produce during peak seasons, whilst reducing losses.

This is an open call now! Every farmer in the country who has the capability, must take production

to the next level; that is, following it with processing and value addition. These will certainly increase farmer's income and create more employment opportunities.

Rapidly Growing Sector

Food processing is one of the fastest-growing sectors. Hence, farmers should take an early leap into the sector to value their crops at a small scale or in the form of cooperatives to have better reach in the market. This also explains the need for joint interventions between the Government, technologists, policy makers, safety and regulatory bodies, product handlers and exports, industries, and the farming community. From the technical point, there is a need for strong interdisciplinary research and development to better support the rising needs and cater to the Indian agro-food processing sector.



ABOUT THE AUTHOR

Dr. C. Anandharamakrishnan is a Director of CSIR – National Institute of Interdisciplinary Science and Technology, (CSIR-NIIST) Thiruvananthapuram, Kerala. Earlier, he served as Director of the National Institute of Food Technology, Entrepreneurship and Management, Thanjavur (NIFTEM-T, an INI under MoFPI, GoI)

Cultivating Prosperity and Increasing Farmers' Income through Plant Protein Processing



The rising global demand for plant-based foods and plant proteins brings a potential goldmine for Indian farmers, leading to increased production with diversification from crops, a greater demand for raw materials for processed products, and the production of valuable varieties—all contributing to farmers' income

The world's appetite for protein is growing at an unprecedented rate. As this demand soars, traditional sources of protein, such as animal-based products, face challenges due to environmental concerns and limited resources. This scenario presents a unique opportunity for farmers to embrace plant-protein processing as a gateway to not only meet global protein needs but also enhance their income and help achieve sustainable development goals.

India's economic scene has transformed significantly since its independence. We have shifted from scarcity to surplus in terms of food production. However, despite the growth in our economy and allied sectors, farmers are increasingly relying on the government support system. Although initiatives like the Green and White Revolutions have improved land productivity, they have also come with consequences like harming the environment, affecting small-scale farmers, causing fiscal deficits, and leading to nutritional insecurity (as there is a rising prevalence of obesity and anemia). Indian farmers are renowned for their tireless dedication and deep understanding of agriculture, which has contributed to India's rich agricultural diversity. To improve our farming practices and gain an international competitive edge, it is crucial to develop a comprehensive action plan.

Plant-Protein Processing - A Game-Changer for Farmers

We urgently need a food system that improves farmers' income, builds their market accessibility, and brings nutritional security. Imagine an ecosystem where farmers can sell their produce to be processed and transformed into high-quality protein sources, which would attract international companies to procure these products by paying premium prices.

The rising global demand for plant-based foods and plant proteins brings a potential goldmine for Indian farmers, leading to increased production with diversification from crops, a greater demand for raw materials for processed products, and the production of valuable varieties—all contributing to farmers' income.

Increasing Gross Income with Value Addition

Plant-protein processing utilizes crops like soybeans, pulses, millets, and cereals and turns them into valuable products such as protein powders, meat alternatives, and dairy substitutes. This

adds value to what farmers produce, enabling them to command higher prices in the market. By venturing into plant-protein clusters, farmers can expand their income sources and reduce their vulnerability to market changes.

Soybean protein is in high demand with the global market for soy protein isolate is likely to reach around US\$ 3 Billion by 2030 and US\$ 5 Billion for soy protein concentrates. The USA has excelled in producing the highest quality soybeans required by the industry, presenting an opportunity for India to draw valuable lessons from their success. Institutions like the US Soybean Export Council are helping make US soybeans accessible for human utilization. By working with them and promoting trade, Indian farmers can grow these varieties of soybeans and improve their income through diversification.

Expanding Market Opportunities

The global market for plant-based products is expanding rapidly due to health-conscious consumers, ethical considerations, and environmental awareness. This opens doors for farmers to expand their operations. Processed plant-protein products often bring in higher profits compared to raw produce. By focusing on producing high-quality goods with minimal use of fertilizers and other sustainable practices, farmers can capture the attention of global buyers.

Meeting Sustainable Development Goals

Increasing agricultural productivity in a sustainable manner is a priority in the race to fix food systems so that farmers can produce higher quality food, feed growing populations, and improve their livelihoods while reducing the impact of agriculture on climate and natural resources. Plant-based focused farming is generally more environmentally friendly compared to traditional animal farming. Crops like pulses have a natural ability to enrich the soil with nitrogen and trap carbon. Shifting to plant-protein processing helps farmers align their practices with sustainable development goals and supports India in reaching net-zero emissions by 2070.

Need for Infrastructure Development as Plant Protein Clusters

Even though the benefits of plant-protein processing are clear, there are hurdles to overcome, including the need for better infrastructure, improved processing technologies, and enhanced access to markets.

The Plant Protein Clusters an initiative by the Plant-Based Foods Industry Association (PBFIA), aims to bridge the gap between supply and demand. It plans to achieve this by sourcing high-quality raw materials from farmers and providing protein ingredients with state-of-the-art functionalities. These clusters will primarily focus on obtaining soybeans, rice protein, wheat, sorghum, lentils, chickpeas, and guar. This diversification of ingredient sources is aimed at connecting with the rapidly growing market for plant-based foods. The initiative aims to establish 12 strategically positioned Plant Protein Clusters in India (as outlined in the table below). This strategy leverages India's excellent logistical infrastructure and agricultural prowess. The initiative requires a collaborative effort involving farmers, agribusinesses, and processors to develop solutions that make plant-protein processing both financially viable and technically feasible.

In conclusion, plant-protein processing emerges as a source of hope for farmers looking to boost their income and contribute to sustainable agriculture. By capitalizing on the growing demand for plant-based protein products, farmers can not only secure their financial future but also play a significant role in shaping a more environmentally conscious and ethically aligned food system. We can take inspiration from countries like the USA, European countries, Canada, New Zealand where agriculture is highly efficient and always improving to enhance our agricultural heritage. They use advanced technology, invest in farming, and have strong partnerships between the government, universities, businesses, and farmers. As farmers become active participants in the plant-protein revolution, they hold the key to cultivating not just suitable crops but a new era of agricultural prosperity.

ABOUT THE AUTHOR

Mr Sanjay Sethi is Executive Director, Plant Based Foods Industry Association



Contribution *of* **Food Processing** *to* Indian Agriculture



ABOUT THE AUTHOR

Mr Pankaj Agarwal is Co-Founder & MD at Treta Agro (P) Ltd., Engineer and Management graduate. He is a mobile tech leader turned agripreneur, empowering 5000+ farmers and promoting organic and sustainable agriculture. Mr Agarwal is active in industry committees and startup mentoring

“

Advancements in food processing technology have revolutionized the way we produce, package, and distribute food. Moreover, innovations in food additives and preservatives have not only enhanced food safety but have also expanded our culinary options

Who makes agriculture output palatable? Food Processing Industry makes the food!

Imagine the International year of millets being successful without active participation of Food Processing Industry. From processing of raw millets to making the cookies and pasta of these millets, IYM2023 wouldn't have been possible. Such is the importance of a strong and focused Food Processing industry.

The Crucial Link

The output of agriculture is insufficient to meet the diverse and growing dietary needs of humanity. This is where food processing steps in as a crucial link in the chain that transforms agricultural output into the food we consume daily. Food processing industry can be visualised as a large factory, where agriculture, horticulture and floriculture etc are the raw material and various food products and brands etc are the output.

Agriculture is deeply intertwined with culture and tradition, shaping dietary habits and local cuisines. Processing to make them palatable, safe, and suitable for extended storage and reducing post-harvest losses.

Over the past few decades, we have accumulated a wealth of knowledge regarding agriculture and its outcomes. This knowledge encompasses a wide spectrum, ranging from understanding the environmental and economic implications of every grain and

leaf produced to appreciating its profound effects on our health and overall well-being as a source of sustenance. However, with these valuable insights comes a pressing challenge: how can we effectively translate this knowledge into tangible outputs or products that benefit society?

Pivotal Bridge

One of the pivotal bridges between our understanding of agriculture and its practical application lies within the food processing industry and the technological advancements that have fuelled its growth. The food processing industry has been a critical conduit for transforming raw agricultural products into a vast array of consumable goods, thereby making our knowledge about agriculture's intricacies more accessible and impactful.

Advancements in food processing technology have revolutionized the way we produce, package, and distribute food. Moreover, innovations in food additives and preservatives have not only enhanced food safety but have also expanded our culinary options.

The advent of automation and robotics in food processing has further increased efficiency and precision. These technologies enable us to standardize the quality of food products and streamline manufacturing processes, ensuring that consumers receive consistent, safe, and high-quality food items. Integration of

data analytics and quality control systems has allowed the industry to monitor and optimize production at every stage.

Vital Collaborations

Collaboration between the agricultural and food processing sectors has become increasingly vital. Farmers and processors now work together to develop crops that are better suited for processing into a wide range of food products.

In the fast-changing instant communication era, when everything is transparent and independent of borders and treaties, consumers get influenced easily with the food consumption of more developed geographies. Hence consumer awareness of the interplay between agriculture, food processing, and health has driven demand for more nutritious and sustainable food options. The food processing industry has responded by developing healthier and more environmentally friendly products, aligning with our evolving understanding of the link between diet and well-being.

Another significant dimension is the intersection of smart nutrition and the evolving dietary preferences of various consumer groups. For instance, in the realm of sports nutrition, cutting-edge technologies and scientific insights have allowed for personalized dietary plans that cater to the unique needs of athletes. Precision nutrition is possible now.

Just imagine plant-based foods without the active involvement of Food Processing industry. It's impossible. The food processing industry has enabled diverse dietary trends, including vegan, gluten-free, and plant-based diets. Technological innovations have enabled the creation of vegan and plant-based alternatives. This not only caters to the preferences of individuals with dietary restrictions but also aligns with the growing global movement towards sustainable and ethical food choices.

Modern, Sustainable, Resilient Sector

Food processing is a catalyst for transforming Indian agriculture into a modern, sustainable, and resilient sector. It is an enabler of ever evolving dietary and nutritional trends and demands of the end consumer. The close connection between agriculture, the food processing industry, technological advancements, and evolving dietary trends has led to a multifaceted transformation of our food landscape. By continuing to foster collaboration and innovation within this nexus, we can look forward to a future where agriculture, food processing, smart nutrition, and diverse dietary preferences work harmoniously to benefit society and the planet.

GOI initiatives such as 'Make in India' and 'Production Linked Incentive Scheme' have aimed to promote food processing in the country. India must invest in infrastructure, technology, and skill development, positioning itself as a global leader in the food processing industry and become the food bowl of the world that caters to every ethnicity taste and choices. In doing so, India can secure the future of its agriculture while meeting the nutritional needs of its growing population and contributing to economic growth.

High-Quality Agri Inputs *for* Sustained Growth



GOI has introduced multiple regulations such as the implementation of QR codes on insecticide labels, the launch of the SATHI portal to automate the supply chain of seeds, and mandating the use of labels on urea bags with proper barcodes to prevent counterfeits from circulating in the market



ABOUT THE AUTHOR

Mr S Swaminathan is CEO, GS1 India



The Indian agricultural sector harbors immense potential for economic growth and the country's food security. The Ministry of Statistics & Programme Implementation estimated the GVA of agriculture and allied sectors in 2021-22 stood at 19%, which dropped to 18.3% in 2022-23.

However, the sector faces several roadblocks in this rapidly evolving landscape. For instance, increasing demand for food, resource scarcity, climate change, and the need for sustainability continue to arise as challenges that must be addressed to help the agricultural sector reach its potential and contribute to growth.

Additionally, outdated machinery and lack of access to modern and quality agri-inputs often prompt farmers to resort to polluting or substandard agricultural practices. These practices often lead to low-quality produce. On top of these, the rampant inefficiencies of the supply chain and poor risk resilience add more dampeners.

Urgent Need To Adopt Sustenance Practices On Large Scale

To overcome these challenges it is crucial to acknowledge the urgent need for adopting sustenance practices on a large scale, and the first step is to provide farmers easy access to quality

agri inputs. A study by the Indian Council of Agricultural Research showed that using high-quality seeds can enhance crop yields. On average, premium seeds alone can boost yields by up to 20% under optimum conditions.

High-quality agri-inputs, such as potent seeds, organic fertilizers and pesticides, and advanced machinery, can help farmers improve their crop yield, reduce losses due to pests, and boost the output and efficiency of farming. Needless to say the adoption of quality inputs will help achieve sustained growth, and promote economic development and food security.

Let's discuss how superior quality agri-inputs can play a crucial role in the sustained growth of the country and add to the country's development.

Types Of Agri Inputs And How They Affect Output

The agro-inputs used by our Indian farmers are biological, chemical, or inorganic compounds in their farming practices and harvest. Typically, these can be grouped as consumable inputs, capital inputs, and eco-friendly inputs.

Consumable inputs can be consumed by the crops naturally. Some of the most common consumable inputs used by Indian farmers include high-quality seeds, soil fertilizers, pesticides, straws, and water. While these inputs are regarded as most basic they are essential to aid the harvest. For instance, insecticides and pesticides deter pest and weed activities, while high-quality seeds ensure healthy crop produce and minimal wastage.

Capital inputs are more mechanical and technologically advanced. Essentially these farming tools cannot be consumed by the crops. Some of the most common capital inputs are tractors, plows, stakes, irrigation systems, and nylon netting, and could save farmer's time and labor.

Using capital inputs increases mechanization, enhances farm management, and boosts crop yield.

Eco-friendly agri inputs are the need of the hours, especially when global warming is advancing at an alarming rate. By using

eco-friendly inputs, farmers can make their farming practice as eco-friendly as possible. They can incorporate practices such as Integrated Pest Management, where they use both organic and non-organic means to curb pest activities and use cover crops and organic fertilizers. These practices will protect crops and increase yield without adding to global warming concerns.

Balanced utilization of superior quality consumables, capital, and eco-friendly inputs will help farmers improve crop production and increase yield. This will directly help boost the agricultural sectors' output, facilitate exports, and contribute significantly to the country's growth prospects. However, continuous efforts are required to ensure that farmers have access to quality inputs at competitive rates so that they can implement proficient and eco-friendly farming techniques and become efficient in tackling issues related to food security and climate change.

Challenges and Reforms in the Agri-Input Sector

Despite the growth potential of the agri-input sector and several efforts on the part of the government, the industry players and stakeholders face burgeoning challenges. Notably, most of these challenges are associated with the prevalence of non-approved and misbranded products in the market, disorganized supply chains, and lack of traceability in the agri-input sector. These hurdles impact the agricultural productivity of the nation significantly and affect farmers' livelihoods as well. A report by the Indian Council of Food and Agriculture stated that using counterfeit pesticides can lead to 30% crop loss.

However, the country can overcome these obstacles by having strict quality control measures in place and developing proper mechanisms for traceability and supply chain management. To tap into the agri-input sector's potential for economic growth the Indian government has already introduced several initiatives to double farmer's income and implemented reforms to improve the quality and transparency of the agr-input at each level of the supply chain.

Crucial Role Of Technology

However, to sustain the growth and more importantly to support the agricultural transformation there is an urgent need to reduce the cost of crop production. Moreover, the government should promote the use of technology to extend the crops' shelf life and establish advanced infrastructure to ensure access to better markets. More efforts to digitize seed production and the overall distribution process can help farmers lower the cost and make more profits.

Notably, the government has introduced multiple regulations such as the implementation of QR codes on insecticide labels, the launch of the SATHI portal to automate the supply chain of seeds, and mandating the use of labels on urea bags with proper barcodes to prevent counterfeits from circulating in the market.

How QR code implementation can benefit agri-input industry

The Ministry of Agriculture and Farmers Welfare has mandated the implementation of QR codes on retail packaging. The regulatory body stated that the QR code must feature the unique identifier, batch number, date of manufacturing and expiration, and manufacturer's website link. So that when an individual scans the code, they will access the product information and the details of manufacturers.

To help the agri-input sector comply with the mandate and help implement the QR codes, GS1 India collaborated with decision-makers and industry leaders to build a solution by using the global supply chain standards. This proposed solution helps fulfill compliance requirements and paves the way for businesses to extend the technology in their supply chain levels to optimize their overall operations and end results.

At a glance this can help address problems such as selling non-approved or misbranded pesticides and other agri-input products. Additionally, it is expected to foster end-to-end traceability and promote a more harmonized identification system at all levels of the supply chain. The immediate effects of the implementation could manifest by facilitating real-time product validation, ensuring single-platform management of product labels, and easing access to farming product information. This move is expected to help farmers weed out spurious and inferior-quality agri-input products and ensure that they use high-quality crop protection products for their produce.

Addressing The Challenges

The government has already taken multiple initiatives to foster an environment that's conducive to sustainable growth in India's agricultural sector. For instance, the government has launched the Digital India Mission, which aims to bring the internet to the rural and remote areas. This initiative could help agri-tech startups and agri-input companies to connect with farmers and promote their offerings. On the other hand, the move aims to help farmers access premium inputs, better markets, and a more streamlined supply chain.

However, the prerequisite to promoting the rural supply side and paving the way to achieve sustained agricultural growth in India is to ensure a stable supply of first-rate input factors for agricultural progress.

Above all, as the rate of technological advancement increases it makes more room for improvement. By leveraging the continuous advancement to improve the supply chain, India can address the challenges that plague the agri-input industry. Additionally, through widescale adoption of sustainable farming practices, the agriculture sector can overcome hurdles and add to economic development and food security.



VAIKUNTH MEHTA NATIONAL INSTITUTE OF CO-OPERATIVE MANAGEMENT (VAMNICOM)

(A National Institute under the aegis of National Council for Cooperative Training (NCCT), Promoted by Ministry of Cooperation, Government of India)

Savitribai Phule Pune University Road, Pune – 411 007

ADMISSION OPEN FOR 2 YEAR FULL TIME RESIDENTIAL PROGRAMME

POST GRADUATE DIPLOMA IN MANAGEMENT-AGRI BUSINESS MANAGEMENT PGDM- ABM (2024-26)- 32nd BATCH

(Approved by AICTE & Recognized as equivalent to MBA degree by AIU & accredited by National Board of Accreditation, New Delhi*)

ADMISSION PROCEDURE : The selection to PGDM-ABM programme is based on Entrance Examination comprising of (1) Latest valid test score of CAT / XAT / GMAT / CMAT (NTA) at the time of application (GMAT / GRE for foreign national candidates) (2) Group Discussion (GD) & (3) Personal Interview (PI)

ELIGIBILITY FOR ADMISSION : Any Graduate from a recognized University, with minimum education of 15 years full time education (10+2+3) with at least 50% marks for General/OBC (non-creamy)/EWS candidates and 45% for SC/ST candidates and having valid test scores of one of the National Level Common Entrance Tests - CAT/XAT/GMAT/CMAT (NTA). These guidelines may get modified / subject to be modification by AICTE or Government guidelines from time to time. Candidates appearing in forthcoming degree examinations can also apply subject to fulfillment of conditions by 14.08.2024. Reservation of seats for OBC (Non Creamy)/SC/ST/Differently Abled persons and wards of Kashmiri Migrants and Kashmiri Pandit/Kashmiri Hindu families (non-migrants) living in Kashmir Valley as per Govt. of India rules. Few seats are available for wards of NCCT / NCUI /VAMNICOM employees, co-operative sponsored candidates and foreign nationals. The Group Discussion and Personal Interviews will be conducted at selected centres during April/May 2024, subject to sufficient number of candidates opting for it.

HOW TO APPLY : Candidates can apply online on VAMNICOM website and pay fees online. The prescribed application form may be downloaded from the VAMNICOM website and apply with valid score of CAT/XAT/GMAT/CMAT (NTA) from 11th January 2024 to 31st March 2024. Pay Rs. 500/- through online in favour of "The Director, VAMNICOM, Pune". For details on the admission criteria, programme structure, application form, please visit www.vamnicom.gov.in

WHO CAN APPLY : Students willing to make career in Agri Business Sector.

PGDM AT URICM, GANDHINAGAR

The application form and merit list is valid for taking admission in 17th batch of PGDM Programme offered by URICM, Gandhinagar.

*applied for extension

DIRECTOR, VAMNICOM

Food Technology

New Markets, Happy Farmers



It is true that India has come a long way in deriving the benefits of application of food technology, but in comparison with our competing countries, like China, US and some countries in Europe, there is a tremendous untapped potential



It is hard to imagine now that barely six decades back, India faced severe food security issues. One of our most respected Prime Ministers, Shri Lal Bahadur Shastri, had to appeal to masses to go without food for one meal to leave some to go around and reach the hungry.

There was massive rationing for food grains, sugar, milk etc and one had to queue up to get these commodities. India has been one of the most populous countries of the world. This situation had to change forever in a few decades due primarily improvement in agri-technology, spearheaded by the likes of Mr. M.S. Swaminathan, the father of green revolution in the country, by developing high yielding varieties of seeds. A more significant contribution was exploitation of food technology to safeguard the produce already harvested on the farms.

It takes a significant amount of time, effort and investment to create agricultural produce. The idea of this invaluable fruit of labour going waste is a dreadful one. But despite the strides we have made in agricultural management, 30% of all our agricultural produce still goes to waste as per the latest data available for the year 2021. One could imagine what the percentage would have been half a century ago. There was lack of roads, transportation, cold chain hardly existed, and lack of investment made the task of preserving food wastage un-daunting.

Value Addition Transformed Indian Agriculture

There are a few pioneering examples in our country that have been at the forefront of transforming the adverse situation and bringing it to the present day, when we are spoilt for choices of food we consume. Credit for pioneering white revolution in the country goes to Mr. Varghese Kurian of Amul fame, who learning from scratch about pasteurization technology of milk, s game changer and made Amul one of the most reliable brands in the country and beyond. Value addition by up scaling the milk into flavoured milk, yoghurt, butter milk, cheese, and ice cream only made the sector more attractive to the farmers. Milk processing technology and the management thereof has made milk and milk products like ice creams, cheese etc affordable and abundantly available in the country, but has made dairy farming one of the most lucrative

forms of agriculture and farmers cooperatives to be the way to go in the business. This is one form of agriculture where the business cycle from input in investment and output in the payment for the milk is greatly compressed to a day or two only.

Fruit and vegetables are the produce which is required on the table on daily basis, but the production is seasonal making it unmanageable at the harvest time and scarce at others. Food technology in the form of juice, jam and jelly making in the fruit and canning, freezing, dehydrating and freeze drying of the vegetables has greatly addressing this problem. Further value addition is happening in the food processing by making it ready to use in the kitchens. Two income nuclear families have little time to cook at home especially procuring and processing the ingredients.

Food technology companies have come to rescue by providing various levels of value-added ingredients to such households right from fresh cut vegetables to ready to consume home style meals. India being only second to China in vegetable and fruit production holds a tremendous potential to export this value added produce to the world.

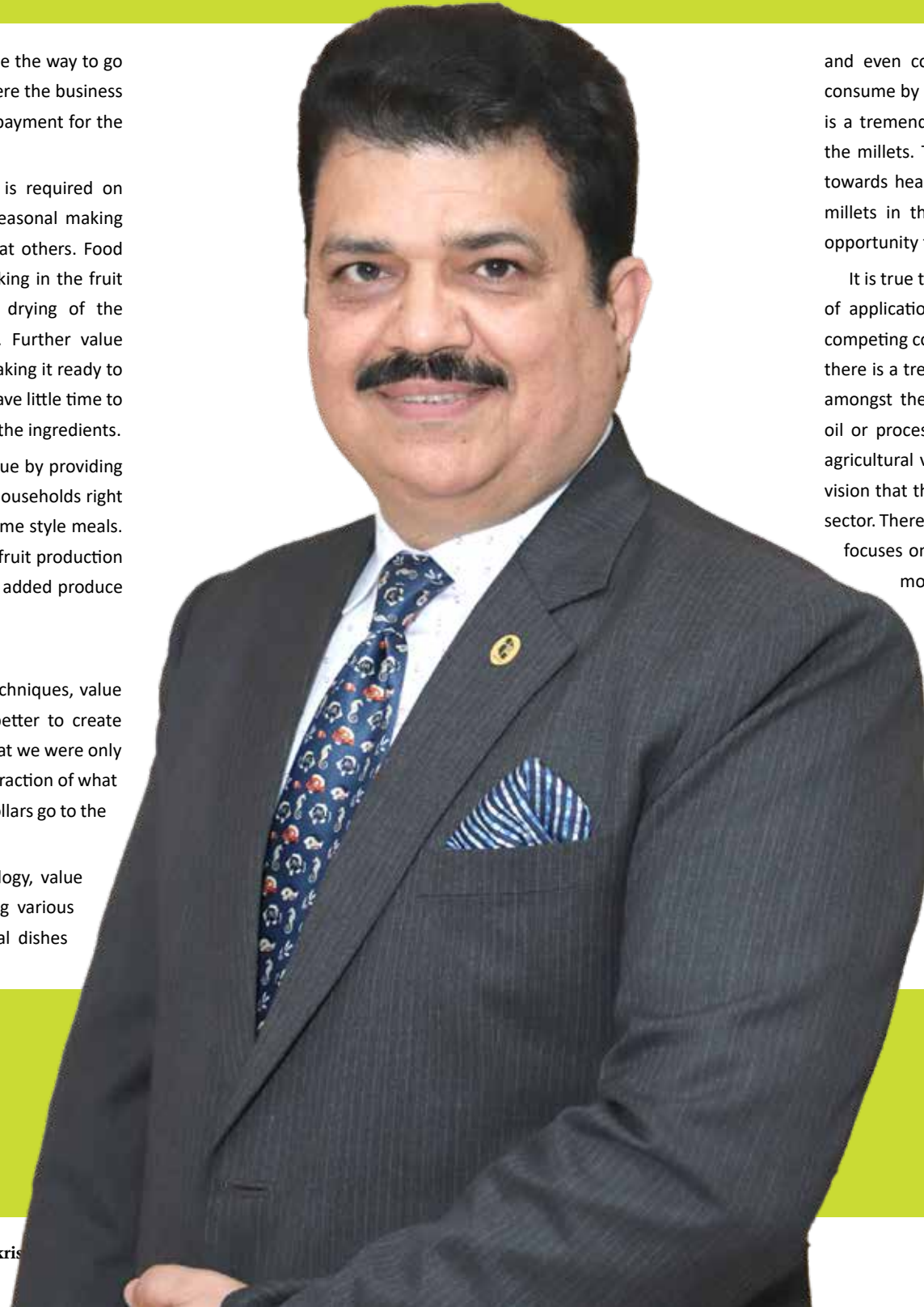
The Power Of Technology

In terms of storage of grains, better storage techniques, value addition along the way has made us so much better to create value addition in our produce. There was a time that we were only exporting the raw grains which use to fetch only a fraction of what the true potential was, letting the value addition dollars go to the respective importers.

But now, with the application of food technology, value addition is being done in the produce by making various ready to consume products like snacks, individual dishes

ABOUT THE AUTHOR

Dr Kamal Kant Pant is the Principal at Institute of Hotel Management - Catering and Nutrition, Pusa, New Delhi



and even complete meals, which are shelf safe and ready to consume by popping in a microwave oven or a steam bath. There is a tremendous potential knocking on our doors in the year of the millets. The shifting preference of the first world consumers towards healthier alternatives in the staples is bringing different millets in the focus. India being the largest producer has the opportunity to capitalize on it.

It is true that India has come a long way in deriving the benefits of application of food technology, but in comparison with our competing countries, like China, US and some countries in Europe, there is a tremendous untapped potential. There is a competition amongst the European players as to who makes the best olive oil or processed meats or cheese. China is a giant in exporting agricultural value added produce across the world. It is with this vision that the government of India wishes to give a boost to this sector. There is a draft National Food Processing Policy '2017, which focuses on the issue of affordability, nutrition, deployment of modern processing technology, traceability and the like.

The state of UP has this policy already in place which assures 35 percent subsidy in plant and machinery and technical civil work. Such plants when they come up close to the farms, will bring employment opportunities there and avoid unnecessary transportation of raw material into town and cities. With such interventions, day is not far when the size of the food processing industry in the country will double in the size offering tremendous employment opportunities while making affordable value added safe food available to the citizens.

Food Processing

High Potential High Growth



ABOUT THE AUTHORS

Dr Pradyumna Agrahari is MD AND CEO, NextOn Foods Pvt Ltd, Pune

Mr Mahabir Singh is Chief Technical Officer, Scoville Tech WorX, Pune

India is the second-largest food producer in the world, with an annual output of 270 million tonnes. Food processing is a critical component of the agricultural sector in India, a country with a rich and diverse agricultural heritage. The food processing industry in India is estimated to be worth \$380 billion and is projected to grow at a CAGR of 11% to reach \$540 billion by 2025. The agro-food processing industry is a vital cog in the Indian economy, contributing to 8% of the GDP of the nation. In FY 22 alone India exported Agriculture and processed food worth US\$ 25.6 billion. (Source: www.thetimesofindia.com)

Over the years, food processing has played a significant role as a spoke in the wheel of Indian growth. The multifaceted contribution of food processing to Indian agriculture can be explained as follows.

Reduction in Post-Harvest Losses

India has long grappled with high levels of food wastage due to inadequate infrastructure and storage facilities. Food processing, through canning, freezing, and drying techniques, has helped preserve perishable agricultural products, extending their shelf life and reducing losses. This reduction in post-harvest losses has had a direct positive impact on the income of farmers, as more of their produce reaches the market intact. In 2022 India lost about 5–13% of its fruits and vegetables and 3–7% of other crops including oil seeds and spices between harvesting and consumption. If we were to give it a number, it's a problem worth over ₹1,52,000 crores!



Food processing has emerged as a crucial link in the agricultural value chain in India. It contributes significantly to reducing post-harvest losses, adding value to agricultural produce, generating employment, and promoting rural development



And it hasn't witnessed any significant drop over the years. To put things into perspective, India grew 23% more grains and crops in FY22 than it did in FY15. But the post-harvest losses have only reduced by less than 1% during the same period. (Source: finshots.in)

Value Addition to Agriculture produce

A substantial value to raw agricultural produce is added by converting perishable crops like fruits and vegetables into products like juices, canned vegetables, and frozen fruits. As a result, the value of the produce increases significantly and allows farmers to fetch better prices for their crops, thus improving their overall income. Moreover, processed food products also have a longer shelf life, allowing them to be produced in bulk in season at affordable cost.

India's food processing sector generated a much higher gross value added (GVA) (USD 5,367 at current prices) per employee per worker than that generated in agriculture (USD 1,981) in 2019.

Country	Value added per worker in Agriculture (USD)
Canada	1,12,867
United States	93,728
United Kingdom	51,960
Germany	42,622
United Arab Emirates	30,180
Brazil	13,750
China	4,191
India	1,998

(Source: kpmg.com)

Diversification of Agricultural products

Enabled by food processing, the diversification of agricultural products in India has started. Instead of selling raw crops, farmers can now produce a wide range of processed goods such as pickles, jams, sauces, and snacks. This diversification opens new markets and reduces the dependency on a single crop, making the agricultural sector more resilient to market fluctuations.

Employment Generation

The food processing industry provides jobs not only in processing plants but also in packaging, distribution, marketing, and research and development. This sector has created employment opportunities for both skilled and unskilled labour, benefiting rural and urban populations alike. Indian food processing sector has potential to attract US\$ 33 billion of investment and generate employment of 9 million persons days by FY 2024 (Source: ASSOCHAM-Grant Thornton Research paper). The growth



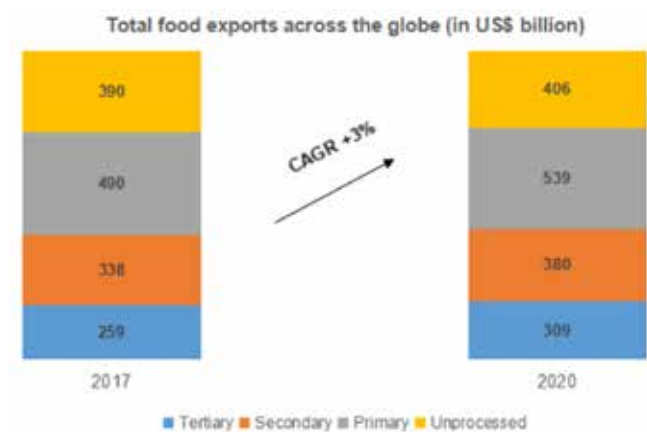
of food processing units in various parts of the country has helped mitigate rural-urban migration by providing local employment opportunities.

Rural Development

Setting up processing units in rural areas can create a robust supply chain, from farmers to processing plants and distribution centres. This integrated approach not only boosts agricultural production but also improves infrastructure in rural areas. Additionally, it encourages the development of ancillary industries such as transportation, packaging, and machinery manufacturing.

Export Potential

The processed foods have opened up new avenues for Indian agricultural products in the international market. By processing and packaging products according to global standards, Indian farmers and manufacturers can access a wider customer base. In terms of worldwide exports, the processed food category is increasing far faster than the unprocessed food category - secondary and higher processed foods are growing at 5-6% CAGR, while unprocessed and primary foods are growing at 1-3% CAGR.



(Source:ibef.org)

Looking at years from 2016 to 2022 alone, India's food stuff exports reached US\$ 10.5 billion in 2022, growing at a CAGR of 22.4% over a period of 5 years. The food sector was valued at US\$ 263 billion in 2019, and a report by has projected the industry to reach a size of US\$ 535 billion by 2025 with CAGR of 15% (Source: KPMG Report, 2023).

Reduction in Food Insecurity

India has been battling issues of food security for decades. Food processing can contribute to reducing food insecurity by creating a stable supply of processed foods. Processed products are less susceptible to spoilage and can be stored for longer periods, making them accessible during times of scarcity. The development of fortified foods through food processing has also helped address nutritional deficiencies in vulnerable populations. National Food Security can be ensured by strengthening the agricultural sector with improved farm practices, increased production yields, and better access to market opportunities.

Technological Advancements

The food processing industry has witnessed significant technological advancements over the years. Modern equipment and techniques have improved efficiency, reduced wastage, and enhanced the quality of processed products. This technological progress has also resulted in cost savings for both producers and consumers. Additionally, it has opened up opportunities for research and development in food science and technology.

Challenges and Future Prospects

To fully realize the potential of food processing to Indian agriculture, certain challenges need to be addressed. These challenges include:

Infrastructure - India still lacks adequate infrastructure for cold storage, transportation, and processing facilities, particularly in rural areas. Investment in infrastructure development is crucial for reducing post-harvest losses.

“ Food processing has the potential to enhance food security, improve food safety, and boost exports. The challenges can be addressed through targeted policies and investments to transform Indian agriculture into a vibrant and sustainable sector

Quality Control - Ensuring consistent quality and safety standards across the food processing industry is a constant challenge. Strengthening regulatory frameworks and promoting good manufacturing practices are essential steps in addressing this issue.

Skill Development - The industry requires a skilled workforce to operate modern processing equipment and maintain quality standards. Investments in skill development and training are necessary to meet this demand.

Market Access - Expanding the reach of processed agricultural products to both domestic and international markets requires strategic marketing and distribution networks.

Research and Innovation - Continuous research and innovation in food processing are essential to keep up with changing consumer preferences, market trends, and technological advancements.

Crucial Link

Food processing has emerged as a crucial link in the agricultural value chain in India. It contributes significantly to reducing post-harvest losses, adding value to agricultural produce, generating employment, and promoting rural development. It has the potential to enhance food security, improve food safety, and boost exports. While challenges exist, addressing them through targeted policies and investments can further harness the potential of food processing to transform Indian agriculture into a vibrant and sustainable sector.



ABOUT THE AUTHOR

Mr Rakesh Matai is General Manager Plant Operations, Havmor Ice Cream

Food Processing Game-Changer for Indian Agriculture



The food processing sector is significant economic pillar and immense potential to grow and contribute significantly to the country's economy. The industry is expected to add 9 million jobs by 2024

Indian food industry is going at fast rate and the contribution of the food processing sector has increased continuously with Gross Value Added (GVA) in food processing sector from Rs.1.34 lakh crore in 2014-15 to Rs. 2.37 lakh crore in 2020-21 at a Compound Annual Growth Rate (CAGR) of 9.97%. It has 12.32% total share in employment and 10.4% share in Indian export. India is no.1 in milk production, third in egg production, second largest fruits and vegetable producers, second in marine production.

Despite a large production base, the level of processing is low (less than 10%). Approximately 2% of fruits and vegetables, 8% of marine products, 35% of milk, and 6% of poultry are processed. The lack of adequate processable varieties remains a significant challenge for this sector.

India has the world's largest livestock population, with 50% of the world's buffaloes and 20% of the world's cattle, but only about 1% of total meat production is converted to value added products. More than 75% of the industry is unorganised. Most of the processing in India is classified as primary processing, which has lower value addition than secondary processing. To increase farmer incomes, processed food products must be moved up the value chain. India's agricultural exports primarily consist of raw materials, which are then processed in other countries, indicating yet another opportunity to move up the value chain.

Vital For Farmer Prosperity

Food processing can be India's answer to the current PM's call for doubling farmers' income. This critical sector links agriculture, manufacturing sector and final consumers; reduces post-harvest wastage through infrastructure creation and adds significant value to agriculture produce through processing technologies. The added value, when it flows back to farmers via the value chain along with the value realised through wastage prevention, can add significantly to farmers' income. The sector has also grown at a faster CAGR of 9.5 per cent as compared to agriculture's five-year CAGR of 3.4 per cent.

KPMG in India in its recent report – "[Indian Food Processing Industry- Growth opportunities post the COVID-19 pandemic](#)" estimates that, going forward, this sector will reach USD535 billion by 2025 at a CAGR of 15 per cent, which indicates significant potential for increasing farmers' income through processing. The sector also aims to add 9 million jobs by 2024. Thus, the sector can potentially be the solution India needs to double farmer's income.

In the past, efforts have been made to increase farmers' income by increasing food production and introducing new ways to increase productivity, providing incentives through better crop prices and subsidies, and via public investment in agriculture and facilitating agricultural institutions. While these efforts have increased our agriculture produce by 3.7 times since independence, it has not translated into a corresponding increase in farmers' income.

Majority of the farmers small and marginal - accounting for 82 per cent of all farmers still have not seen any significant rise in their

income. Being at the lowest end of the value chain without any bargaining power, these farmers continue to bear losses arising due to several reasons, including lack of post-harvest storage and transportation and processing facilities.

Globally all major economies have advanced food processing ecosystems with high levels of processing that is 70-80 per cent against 10 per cent in India and correspondingly higher value added per worker in agriculture. India, despite being the leader in production of several agricultural commodities, lags in terms of value added per worker in agriculture. Farmers will have to be integrated into the food processing value chain, not as producers but as entrepreneurs engaged in primary and secondary processing activities that are profit generating.

Ways To Strengthen Food Processing Sector

Reduction of post-harvest losses through efficient storage and transportation

If farm product processing facilities can be created near production of farm products will help quick processing and involve farmers to be part of value creation. Reduce cost of processing so that returns to farmers can be increased. The Government of India has approved more than 63 near farm Agri-processing clusters under its Scheme for Agro-Marine Processing and Development of Agro-Processing Clusters (SAMPADA Yojana).

By linking farmers to food manufacturers (secondary/ tertiary processors) and sell their produce (fresh/ primary production) to large food manufacturers. Food processing companies can enter into end-to-end arrangements for direct engagement with farmers, including their education leading to the enhancement of farmers' knowledge of advancing technologies, cultivation of processable crops and manufacturing of higher value-added product lines.

To develop food processing industry and generate sustainable livelihoods for people associated with agriculture sector government support is must and already taken a steps like 100% foreign direct investment, allocation of funds to develop dairy infrastructure, to improve quality allocation of funds for FSSAI (The food safety standards authority of India), extensive research on fertilizers, skill development initiatives, infrastructure creation, schemes like PM Kisan Sampada Yojna and creation of Mega food parks.

The food processing sector is significant economic pillar and immense potential to grow and contribute significantly to the country's economy. The government of India has set a vision for the sector to achieve a target of doubling its contribution to the GDP by 2030 and increase. This industry is expected to add 9 million jobs by 2024. By 2030, India's annual household consumption is believed to quadruple, making it the fifth-largest consumer in the world. The sector's size is estimated to be around US\$322 billion, and it is expected to reach US\$543 billion by 2025, growing at a CAGR of 14.6% which certainly help agriculture sector to be innovative and grow.



With rising consumer demands, export potential, technological advancements, supportive government policies, and a focus on rural empowerment, the sector is poised for significant growth. By leveraging these opportunities, India can not only escalate farm revenues but also contribute to economic growth, job creation, and food security

ABOUT THE AUTHORS

Mr Pradeep Dwivedi is CEO, Nutrelis Agro Foods.
Mr P S Ojha is FPO Division Head, Uttar Pradesh Govt

India, with its diverse agricultural landscape and rich heritage, has always been an agricultural powerhouse. The sector not only plays a crucial role in feeding the nation but also serves as the backbone of its economy. However, despite its significant contribution, the Indian agriculture sector remains untapped in terms of its true potential. The gateway to unlocking this potential lies in the strategic development of the food processing industry – a transformation that could lead to the exponential growth of revenue in both sectors.

The Confluence of Agriculture and Food Processing

Agriculture forms the foundation of India's economy, employing a substantial portion of its workforce and contributing to a considerable share of the GDP. Yet, the sector faces numerous challenges, including fluctuating crop prices, post-harvest losses, and inadequate infrastructure. This is where the food processing industry steps in as a game-changer.

Food processing involves transforming raw agricultural produce into a variety of consumable products, ranging from packaged foods to beverages, spices, and more. It not only reduces post-harvest losses but also adds value to the produce, opening new avenues for farmers to increase their revenue. The synergy between agriculture and food processing creates a cycle of growth, where enhanced agricultural production fuels the food processing industry, which, in turn, supports and strengthens the agricultural sector.

Opportunities Galore: The Indian Context

India possesses all the necessary ingredients for a flourishing food processing industry. Its abundant agricultural resources, diverse climate, and rich biodiversity lay a strong foundation for producing an array of raw materials. However, the current level of processing remains significantly low, offering immense untapped potential for growth.

Factors That Contribute To Burgeoning Opportunities In Indian Food Processing Landscape

Rising Consumer Demand

As India's economy grows and lifestyles change, the demand for processed and convenience foods is on the rise. Urbanization and busier schedules have led to a shift in dietary preferences. Consumers are seeking packaged foods that offer both convenience

Food Processing for Escalating Farm Revenue

Seizing Opportunities in the Indian Context

and nutrition. This shift in demand opens up opportunities for the food processing industry to create a wide range of products that cater to these evolving consumer needs. From ready-to-eat meals to packaged snacks and beverages, there is a growing market waiting to be tapped.

Export Potential

India's agricultural diversity provides it with a unique advantage in global markets. The country is known for its diverse range of spices, fruits, and other agricultural products. When these products are processed and packaged, they become more suitable for export, as they meet international quality standards and have longer shelf lives. The global demand for ethnic and traditional Indian foods, spices, and ingredients creates a substantial export potential. By focusing on value addition through processing, India can tap into international markets, boosting its export revenues.

Technological Advancements

Advancements in food processing technology have significantly improved the shelf life and quality of processed products. Techniques such as cold storage, dehydration, canning, and vacuum packing have revolutionized the preservation of perishable goods. These technologies not only reduce wastage but also allow for the distribution of products over longer distances without compromising quality. Additionally, innovations in packaging, such as eco-friendly and tamper-proof materials, further enhance the attractiveness of processed foods to consumers.

Government Initiatives

The Indian government's initiatives are aimed at providing a supportive ecosystem for the growth of the food processing industry. Programs like 'Make in India' encourage domestic production and manufacturing, while the 'Pradhan Mantri Kisan Sampada Yojana' focuses specifically on modernizing and strengthening food processing infrastructure. Financial incentives,

subsidies, and grants are provided to promote investment in food processing units. These initiatives not only create a conducive environment for entrepreneurs but also contribute to job creation and skill development.

Rural Empowerment

Establishing food processing units in rural areas has a significant impact on local economies. By processing agricultural products closer to their source, farmers gain access to new markets and better prices for their produce. This directly translates to increased farm income and improved livelihoods for rural communities. As food processing units expand, they also generate employment opportunities, further boosting economic growth in rural regions. This synergy between agricultural production and processing fosters a self-reliant ecosystem that empowers rural India.

In conclusion, the convergence of these factors paints a promising picture for the food processing industry in India. With rising consumer demands, export potential, technological advancements, supportive government policies, and a focus on rural empowerment, the sector is poised for significant growth. By leveraging these opportunities, India can not only escalate farm revenues but also contribute to economic growth, job creation, and food security. The journey ahead requires collaboration, innovation, and a shared commitment to unlocking the full potential of the agriculture and food processing sectors. In the Indian context, the symbiotic relationship between agriculture and food processing presents a golden opportunity for escalating farm revenue. By harnessing this potential, the nation can address multiple challenges simultaneously – from reducing post-harvest losses and creating employment opportunities to contributing to the overall economic growth. The journey towards a thriving food processing industry demands collaboration between farmers, entrepreneurs, policymakers, and technology innovators. Together, they can create a landscape where India's bountiful agricultural resources are transformed into value-added products that enrich both the economy and the lives of its people.

As the food processing sector continues to expand, it serves as a beacon of hope for a prosperous and sustainable agricultural future in India.

Food Processing

Critical Driver Of India's Economic Growth



The food processing sector's contributions to Indian agriculture are immense. It mitigates post-harvest losses, adds value to agricultural produce, generates employment, and fosters diversification



The Indian subcontinent, with its bountiful fertility and abundant waterways, has always been a land of plenty. From the ancient times, it has been a granary of cereal grains, millets, pulses, fruits, and vegetables. Many have been drawn to its richness, but few have managed to leave a lasting mark.

The 21st century India is transforming, from the remotest parts of India is pouring innovation & tranquil flow of ideas. The economy is booming & all the sectors are witnessing growth with tremendous inflow of FDIs. Out of all the sectors of growth, one such is the sector of food processing, an area residing on the backbone of Indian economy, i.e., the Indian Agriculture. This industry, deeply rooted in Indian agriculture, is shaping the future of the nation's economy.

The food processing sector in India has undergone a remarkable transformation, with its contribution continuously increasing at a Compound Annual Growth Rate (CAGR) of 9.97%. This growth has been pivotal in aiding agricultural produce in India and has brought about a multitude of benefits for the nation's economy and the livelihoods of its people.

Reduction In Post-Harvest Losses

One of the primary contributions of the food processing sector is the substantial reduction in post-harvest losses. As per the MOA&FW, around 1% of the GDP is depleted in the form of food wastage, which equals nearly Rs.50,000 Cr of food produced get wasted every year. By converting perishable agricultural produce like fruits, vegetables, and milk into processed food products with extended shelf life, this industry has the potential to curtail the wastage of valuable resources. This reduction in post-harvest losses not only ensures a consistent supply of food throughout the year but also stabilizes the prices of these commodities, benefiting both consumers and farmers.

Value addition is another significant aspect of the food processing sector's contribution. By processing raw agricultural materials into various value-added products, such as snacks, cereals, ready-to-eat and ready-to-cook meals, this sector enhances the income of farmers and stakeholders along the agricultural value chain. This added value not only boosts the financial well-being of those involved but also bolsters the nation's economy.

Generation Of Employment Opportunities

Furthermore, the food processing industry plays a vital role in generating employment opportunities. It employs millions of people directly and indirectly, particularly in rural areas. This serves as a powerful tool for poverty reduction and elevates the standard of living in these communities. With a share of 12.38% in the employment generated in all registered factory sectors, the food processing industry significantly contributes to job creation, benefiting approximately 1.93 million people. Additionally, the unregistered food processing sector supports employment for around 5.1 million workers, as reported by the National Sample Survey Office (NSSO).

The Indian government has also initiated various programs and projects to create a robust ecosystem for the food processing sector. These include Mega Food Parks, Cold Chain projects, Agro-Processing Clusters, and many others under various schemes and initiatives. These initiatives have further accelerated the growth of the sector, creating an environment conducive to innovation and development.

Diversification of agricultural production is another key benefit of the food processing industry. It encourages farmers to cultivate high-value crops suitable for processing, thereby

improving overall productivity and profitability in the agricultural sector. This diversification not only provides farmers with new income streams but also reduces the risks associated with relying on a single crop.

Resurgence Of Millet Processing

A noteworthy example of the positive impact of the food processing industry is the resurgence of millet processing in India. Millets have long been regarded as the common man's food, providing nutrition to rural populations. However, recent efforts, such as the International Year of Millets (IYM) 2023 initiative by United Nations, aim to popularize millets among urban consumers as well. This shift promotes the cultivation of crops that are more water-efficient, addressing future water scarcity concerns.

Multiple Benefits

Millet processing and its value addition offers various benefits to the agricultural production:

- 1. Value Addition:** Processing millets into products like flours, flakes, snacks, ready-to-cook and ready-to-eat meals increases their appeal to consumers and boosts demand.
- 2. Marketability:** Value-added millet products are more marketable, convenient, and customizable, offering consumers a wider variety of choices.
- 3. Income Generation:** Farmers can sell their millet produce to processing companies, securing better prices and improving their livelihoods.
- 4. Rural Employment:** Millet processing companies create jobs in rural areas, reducing unemployment and enhancing socio-economic well-being.
- 5. Nutritional Improvement:** Processing makes millets more digestible and palatable, promoting better nutrition and reducing malnutrition.

With the inclusion of natural and nutritious foods like millets, the food processing sector aims to improve the health of masses by making people fall less sick, become more productive, thus reducing burden on the healthcare budgets which was 2.2% of GDP in FY 21-22

Moreover, millet cultivation conserves water resources, making it a sustainable choice for the future. While rice and wheat demand substantial water for growth, millets thrive with less water, making them a critical component of India's water management strategy.

Immense Benefits

In conclusion, the food processing sector's contributions to Indian agriculture are immense. It mitigates post-harvest losses, adds value to agricultural produce, generates employment, and fosters diversification. Millet processing stands out as a sustainable solution to water scarcity while improving nutrition and livelihoods. India's embrace of millets exemplifies its commitment to a healthier, more sustainable, and future-proof agricultural landscape.

ABOUT THE AUTHOR

Passionate about nutrition, **Palak Arora** is amongst the youngest entrepreneurs in the millet industry, Founder of SatGuru Superfoods, All India Safe Food Cadre Professional, FSSC 22000 Lead Auditor and a food technologist from NIFTEM (K)



ABOUT THE AUTHOR

Dr Renuka Diwan is Co-Founder & CEO, BioPrime Agrisolutions, an ag-biological focused startup that is harnessing the power of microbes and their relationship within the microbiome to build climate resistance within crops. Her work at Bioprime has been instrumental in developing the patented “SNIPER platform” (Small nano-molecule induced physiological response), on which the Prime Organics is based

The Chemical-Biological Matrix

Where Boundaries Merge and Solutions Converge

“

The debate between chemicals and biologicals in agriculture should be reframed as an exploration of their complementary potential. The integration of these approaches, supported by robust scientific research, holds the key to unlocking novel solutions that address critical challenges

At least 40% of the population today is alive and has access to food only due to use of chemicals in agriculture. The green revolution was possible due to synthetic fertilisers.

Despite the significant role played by chemical inputs in modern agriculture, it is crucial to confront their limitations and acknowledge the emerging areas of concern. Excessive use of chemicals in agriculture has indeed come at a significant cost, impacting various aspects of our environment, biodiversity, and human health.

It's difficult to overlook the impact fertilisers alone have on economies. Globally, governments provide substantial subsidies for chemical fertilisers to support agricultural production. For instance, in 2019, the total fertiliser subsidies across 89 countries amounted to approximately \$75 billion (FAO, 2021). Examples of countries heavily subsidising fertilisers include China, India, and the United States, where billions of dollars are allocated annually to support their agricultural sectors (FAO, 2021).

Ecological Consequences Of Harmful Pesticides

The use of harmful insecticides, pesticides and herbicides has resulted in severe ecological consequences, including the loss of species and threats to biodiversity. In the United States, the cost of managing herbicide-resistant weeds was estimated to be over \$1 billion annually (Heap, 2020). This cost includes expenses related



to additional herbicide applications, manual labour, and reduced crop yields. The intensive use of chemicals in agriculture has raised concerns about the declining nutritional content of food crops. Several studies have indicated a decrease in essential nutrients, such as minerals and vitamins, in fruits, vegetables, and grains over the past few decades. This “silent hunger” remains one of the most overlooked aspects of modern agriculture.

The Big Divide

The development of agricultural solutions, whether in the realm of chemicals or biologicals, has traditionally occurred in separate silos. Research and development efforts have largely remained compartmentalised, with chemical-focused corporations often overlooking the potential of biologicals. This divide was partly due to the complexity of biological sciences and the challenges in distilling their mode of action into clear and concise terms.

Fortunately, the landscape is changing, and chemical companies are now beginning to integrate biologicals into their dedicated research and development programs. However, the predominant focus remains on finding replacements or alternatives to chemicals, without fully exploring the potential synergies between the two approaches.

Breaking Down The Silos

To truly unlock the power of agricultural innovation, these silos of operation need to be broken down. Instead of adopting an either/or approach, it is essential to recognize the value of combining chemicals and biologicals in a harmonious manner. By embracing synergy, we can leverage the strengths of both approaches to develop novel and more sustainable solutions for agriculture. This paradigm shift requires a focus on the holistic understanding of the complexities of plant biology and ecosystem dynamics that has hereto largely been ignored. It necessitates breaking free from the traditional confines of isolated research and embracing a unified approach that transcends the boundaries of chemical and biological sciences. Some avenues for this are as follows.

Nutrient Use Efficiency

One area where the integration of chemicals and biologicals has shown remarkable potential is in improving nutrient use efficiency. Scientific studies have consistently shown that molecules targeting nitrogen uptake and utilisation can significantly reduce synthetic fertiliser requirements while maintaining or even enhancing crop yields. For instance, a study conducted by Smith et al. (2018) found that the application of specific microbial inoculants improved nitrogen utilisation efficiency in soybean crops, resulting in a 40% reduction in nitrogen fertiliser usage without compromising yield. Bioprime has discovered a molecule that can activate nutrient uptake and use pathways to cut synthetic fertiliser needs by 50%.

These findings provide evidence that the combination of biologicals and targeted chemical inputs can revolutionise crop production by reducing environmental impacts, minimising input costs, and ensuring sustainable agricultural practices.

Resistance Management

Effective management of insecticide and pesticide residues is another critical area where the integration of chemicals and biologicals can bring about significant benefits. Traditional approaches focused solely on eradicating pests have led to the development of resistance, rendering these chemicals less effective over time. However, by adopting a combined approach, we can tackle resistance development and extend the lifespan of these chemicals in the market. Research by Davis et al. (2019) demonstrated that targeting xenobiotic pathways in insects can overcome resistance and improve the efficacy of insecticides. By identifying and disrupting key metabolic pathways involved in resistance mechanisms, scientists can develop innovative solutions to combat pest populations effectively.

Additionally, the manipulation of microbial communities within insects has shown promising results in pest management. Chen et al. (2021) conducted groundbreaking research revealing that altering the microbiota of certain insect species can reduce their tolerance to pesticides. By understanding the intricate relationship between insects and their associated microbes, we can design novel approaches that enhance the effectiveness of chemical control methods while minimising adverse environmental impacts.

Unlocking Novel Solutions

The integration of chemicals and biologicals offers a multitude of opportunities for developing novel solutions in agriculture. By combining the precise targeting capabilities of chemicals with the sustainable and eco-friendly aspects of biologicals, we can address various challenges faced by farmers and the environment. For instance, the use of smart delivery systems, such as nanoencapsulation, enables the controlled release of chemical compounds, enhancing their efficacy and reducing environmental impact (Li et al., 2020). This technology ensures that chemicals are delivered precisely to the intended target, minimising off-target effects and optimising their performance.

Paradigm Shift of Chem-Bio Integration

The debate between chemicals and biologicals in agriculture should be reframed as an exploration of their complementary potential. The integration of these approaches, supported by robust scientific research, holds the key to unlocking novel solutions that address critical challenges such as nutrient use efficiency, insecticide resistance, and environmental sustainability. By embracing this synergy, we can foster a more resilient and productive agricultural system that benefits both farmers and the planet.



8th INTERNATIONAL EXHIBITION & CONFERENCE ON AGRI-MACHINERY & EQUIPMENT

aima agrimach INDIA 2023

30 November - 3 December 2023
University of Agricultural Science, GKVK, Bengaluru, Karnataka

Bookings Open!

MAJOR HIGHLIGHTS

- Participation of leading companies of farm machinery & technologies at the exhibition
- Progressive farmers delegation from southern states of India
- Product Launch & Live Demonstration of latest machineries & equipments in the event
- International Buyers Program attracting the largest & most active buyers of agricultural machinery and equipments from all across the globe

EXHIBITOR PROFILE

AGRI-MACHINERY & FARM TECHNOLOGIES	AGRI-SERVICES	AGRO PROCESSING INDUSTRY	AGRI COMPONENTS & TOOLS	DAIRY EQUIPMENTS
------------------------------------	---------------	--------------------------	-------------------------	------------------

MSME Approved

For further information, please contact:

FICCI, Federation House, Tansen Marg, New Delhi - 110 001
Vinay Kumar Gupta • M: +91 9910103354
E: vinay.gupta@ficci.com • T: 011-23487299

Overseas Associate: FEDERUNACOMA Surl
Via Venafro, 5, 00159 Rome, Italy
T: +39 06 432981, Fax: +39 06 4076370
E: marco.acerbi@federunacoma.it, davide.gallarate@federunacoma.it

Diamond Partner
SILVER PUMPS & MOTORS

Bundelkhand

Tomato Round The Year



The duration of the greenhouse tomato is about 8-9 months. For round year tomato production, nursery sown in July-August and transplanting done in August-September (hybrid variety NS-4266) it will be harvested up to March-April



In India, growing horticultural crops in protected cultivation and the area under high-tech horticulture goes larger day by day and the productivity and exports both tremendously improve. Vegetables can be cultivated in off-season, with the induction of an artificial technique like greenhouse technology, in which temperature and moisture is controlled for specific growth of vegetables.

Tomato is one of the most important vegetable crops of the solanaceous family group grown on a large scale in polyhouse across different parts of India such as Karnataka, Madhya Pradesh and Andhra Pradesh. It is grown easier than the other vegetable crops and it can be grown successfully round the year in polyhouses in different parts of the country. Indeterminate types of tomatoes preferred for round the year production in greenhouse cultivation. It has very important pigment lycopene associated with a good number of vitamins.

Protected Cultivation

Protected cultivation is least popular and sounds uncomfortable because it comes across with harsh and challenging climatic conditions.

But protected cultivation technology has great potential if implemented in a planned manner. It is a well-established fact that the harsh and challenging climatic conditions (extreme heat and cold waves) ultimately reduce the potential production and productivity of crops.

During summer and winter season in north India in general and Bundelkhand in particular, it is extremely difficult to grow vegetables in open field conditions; however, with creation of a false microclimate through modified protected structures, some high-value crops and vegetables could easily be growing continuously.

ABOUT THE AUTHOR

Dr R.K. Singh is Professor and Head, Department of Vegetable Science, College of Horticulture, Banda University of Agriculture and Technology, Uttar Pradesh



Due to poor resourced farmers' level, the popularity of protected cultivation has not been encouraging. This could be due to unawareness about its significance, unavailability of working capital for developing infrastructure, illiteracy of farmers', deprived communication channels & tormented glitches in transportation and lack of sound resources. Bundelkhand with its wide variability of climate and soil type is favourable for growing many vegetables crops.

Ensuring Round The Year Production

Selection of varieties made very carefully, considering the yield as well as growth behaviour. Hybrid varieties with indeterminate growth habits are suitable for greenhouse cultivation. The maximum yield with vertical growth of the plant increases the yield, quality and colour. Tomato hybrids grow up to a height of 5-6 meter, utilizing the vertical space in the greenhouse and having a yield potential of more than 200-250 t/ha.

The duration of the greenhouse tomato is about 8-9 months. For round year tomato production, nursery sown in July-August and transplanting done in August-September (hybrid variety NS-4266) it will be harvested up to March-April. To get the fruit from May, June, July and August the nursery sown in the month of December-January (hybrid varieties-Saho and Arya) transplanted in January-February and harvested up to August.

Growing Technique

Growing media includes vermicompost + sand + sterilized cocopeat (1:1:1). 3000-3200 seedlings are required for a 1000-meter square polyhouse. Seed treated with Captan @ 0.2g /100 seed) are sown one per cell. The emerging seedlings are drenched with copper-oxchloride solution @ 3 g/ lit, covered with a plastic sheet immediately after germination. The seedlings are provided nutrition by drenching them with 0.2 per cent, 19:19:19 (N: P: K) plus trace elements at 15 days after germination. Drenching the seedlings with Carbendazim (0.1%) solution on the day of planting is required for avoiding damping off and better establishment. To plant tomatoes in a 1000-meter square of greenhouse area, 20 g seed is required.

Fertilizer, Drip, Mulching And Spacing

Well decomposed organic manure at the rate of 10-15 kg per square meter of the bed is added and mixed thoroughly before

fumigation. Two inline drip lateral 16 mm at 50 cm dipper distance laid on each bed at 50 cm of spacing having a discharge of 2 LPH is placed at each planting row on the bed prior to planting.

Plastic mulching may be done on transplanting beds; it provides several advantages such as 20-30 % yield increase, fruit earliness, weed controls and soil moisture retention. Black/silver polyethylene mulch film 100-micron (400 gauges) thickness having 1.2 m width is used to cover the planting beds and securing the edges of the sheet by burying in the soil.

The tall growing tomato seedlings are planted in two rows per bed with spacing of 50 cm x 50 cm i. e 4 plants per square meter in a triangular fashion.

Transplanting, irrigation and fertigation

Seedlings are removed from the trays by applying slight pressure on the bottom of the individual cells. The beds are drenched with copper oxchloride (@ 3 g/lit) if seedling mortality due to damping off is observed. Most of the nutrients are given to plants through the drip irrigation system. Drip irrigation is started 8-10 days after transplanting. Drip irrigation is provided daily to supply 2 to 3 litres of water/m²/day depending on crop requirement and weather conditions.

The fertigation of nutrients and fertilizers started after transplanting to first flowering through N: P: K: (19:19:19) 250g/500 square meter, flowering to fruit set N: P: K: (19:19:19) (100g), 46: 0: 0 (175 g) and 0: 0: 50 (275 g) should apply. The water-soluble fertilizers such as N: P: K: (19:19:19) (100g), 46: 0: 0 (250 g) and 0: 0: 50 (275 g) should be given at fruit set up to peak harvesting. The dose of N: P: K: (19:19:19) (50g), 46: 0: 0 (125 g) and 0: 0: 50 (150 g) should be given at the crop end. The plants are fertigated twice a week, starting from 25 days after transplanting.

Pruning and Training

In polyhouse indeterminate tomatoes transplanted, so it attains good height and weight it required trellising of the plant. Initially tomato plants are pruned to retain single stem and sides' shoots or suckers that develop between leaf petiole and the side branches must be pruned. Pruning operation starts 20 to 30 days after transplanting at weekly intervals.

The main stem of tomato plants branches into two after the first flower cluster. Only two branches are retained & all other branches and buds/suckers developing at the base of the stem are also removed. For pruning the entire sucker is removed at the base or the tip of the sucker is pinched out. Plants are supported by separate plastic twine hanging from an overhead GI wire trellis support system 3 m above the ground level.

Harvesting and Yield

Harvesting starts at 75 to 80 days after transplanting and continues up to 210-240 days. Yield may reach 200 to 250 t/ ha (20 to 25 kg/ square meter).

**A TRIBUTE TO THE GRIT
AND DEDICATION OF
INDIAN FARMERS**



Millionaire Farmer of India

The Mahakumbh of Indian Agriculture

06th to 08th December 2023

NOMINATION GET STARTED

CONTACT US

P. S. Saini : 98916 55340

Megha Sharma : 98916 68292

Anika Bassi : 93542 19435

Harsh Kapoor : 98917 24466

Nishant Kr. Taak : 9953756433

Parikshit Tyagi : 98913 34425

Millionaire Farmer Categories





WAA MOTORS AND PUMPS
A WAAREE group company

INSTALLED 10000+ SOLAR WATER PUMPS ACROSS INDIA

SOLAR WATER PUMPS (0.5HP to 50HP)



Energy Efficient Design



Works on Lower Voltage



Excellent Hydraulic Design

ELECTRIC WATER PUMPS (0.5HP to 15HP)



Higher Operating Efficiency



Low Maintenance Long Life



Silent Operation

Application : Farms, Garden, Residential Building, Drinking Water Supply, Water Storage Tanks



Saving Money



More Productivity



Trusted Brand



Long Life



www.waamotors.com

1800-2121-321

मेरा
SWARAJ

Powerful Tractor Strong Oil



Available in
1L, 8.5 L & 10L

Savsol Tractor Special Engine Oil



from



Savita Oil Technologies Limited

66/67, Nariman Bhavan, Nariman Point, Mumbai 400 021, Maharashtra, India

T: +91 22 2281 8042 F: +91 22 2202 9364

E: customersupport@savita.com

www.savita.com www.savsol.com

[/SAVSOLLUBRICANTS](#) [/SAVSOLLUBRICANTS](#)

[/SAVSOLLUBRICANTS](#) [SAVSOL_OFFICIAL](#)

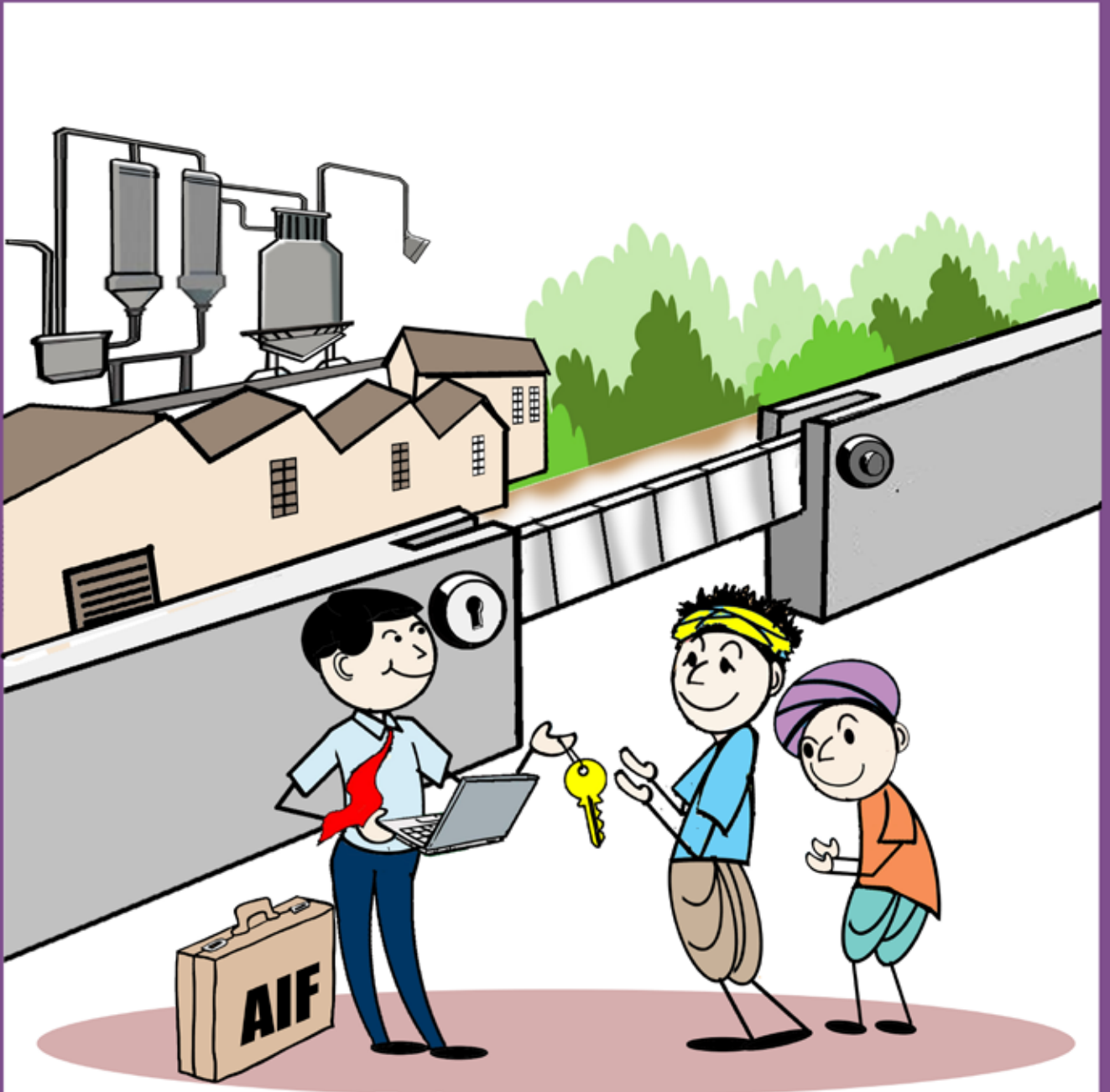


www.savsol.com



AGRI INFRA FUND

Empowering Farmers, Enhancing Income
by opening Door to Primary Processing Prosperity



Click an AIF Loan Today

Bimbadhar

www.agriinfra.dac.gov.in