

The Indian Mega Food Park Scheme: Objectives, Recent trends and Prospects

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Abstract- The demand for food and value-added healthy products in the world grows at a vast rate every year. However, the post-harvest loss (PHL) in the Indian agricultural sector is a great dip to the value addition and the country's economy. The Government of India (GOI) thus proposed a vision known as Mega Food Park Scheme (MFPS) to couple farmers to the food processors. This assists in reducing the PHL, thereby improving the manufacturing infrastructure, direct and indirect employment, export rate, etc. The main purpose of this review is to illustrate the scheme of the MoFPI and disclose the working milieu of the mega food parks based on the primary objectives set by the Mega Food Park Scheme, their growth to the agricultural sector and the generation of value addition to the consumers.

Keywords: Mega Food Park, Post-harvest loss, Farmer's income, Cold storage, Employment generation, Value addition.

HIGHLIGHTS

- A cluster based approach to link farmers and processors
- Public – private partnership to cater high end infrastructural and other needs of the government
- Eliminates the system of middle-men, thereby increasing safe procurement of raw materials without post harvest losses
- Emerging technologies for value addition and waste reduction
- Micro, small and medium enterprises (MSMEs) was structured by the Mega Food Parks for direct and indirect employment generation

GRAPHICAL ABSTRACT



I. INTRODUCTION

Agriculture is the backbone of livelihood in India, making it a bright spot in the country's GDP reaching 20 percent in the year 2021 [1, 2]. Food processing is a way to convert agricultural produce into easily consumable foods. For this manner, the harvested crops undergo a series of activities such as sorting, grading, washing, processing, packaging, storage and distribution. Despite high food production levels, the processable quality of harvested crops is challenged as the country processes only 2.2 percent, in contrast to the USA (65%) and China (23%) owing to the post-harvest loss (PHL) of agricultural produce due to lack of proper handling, storage conditions, transportation, etc. [3].

This loss accounts to about INR 926.51 billion (0.6 percent of the country's GDP) in the fiscal year 2014 [4]. This has turned to be a significant concern in increasing the food availability to consumers and also affecting the environment by greenhouse gas emissions, increase in cost of waste management, diseases spread loss of resources to value added products, decreased income to farmers, etc. Elsewhere, there are copious literatures that suggest and harness various methods to combat post-harvest losses.

In pointing this out, the Ministry of Food Processing Industries (MoFPI) came up with vision 2015, the Mega Food Park Scheme (MFPS) that works on Cluster based approach that is, bridging the gap between the farmers and the manufacturers. This aids in reducing the post-harvest losses, increasing the value addition and boosting farmer's income. There are at present 41 Mega Food Parks (MFPs) sanctioned by the government of India to make available high quality modern infrastructure with efficient logistics from farm to market. These mega food parks are said to increase the supply chain management (SCM) and export rate of perishable food and agricultural products.

The present review thus brings together a broad outline of the PMKSY scheme and the demand and performance of Mega Food Parks in India.

II. ABOUT MOFPI AND PMKSY SCHEME

The Ministry of Food Processing Industries (MoFPI) is a ministry of Government of India responsible for formulating and implementing rules, laws and regulations related to food and food industries. In India, though the farmlands are decreasing, the dependence of rural workforce is still in demand in the same proportion for daily living. This has led the government to initiate a scheme known as Vision 2015 [5]. The vision 2015 is organized under Pradhan Mantri Kisan SAMPADA Yojana Scheme (PMKSY) of MoFPI which operates on a "hub and spoke" model with a cluster based approach and doubling farmer's income. This central sector scheme (PMKSY) has been allocated with Rs. 6000 crores for the period 2016-20 coterminous with the 14th Finance Commission cycle. The SAMPADA scheme is being publicized as it leverages an investment of Rs. 31,400 crores for handling of 334 lakh MT agro-produce priced at Rs.1,04,125 crores, thereby, benefiting 20 lakh farmers and rewarding 5,30,500 direct/indirect employments in the country by the year 2019-20.

The eight schemes that has been implemented under PM Kisan SAMPADA Yojana are:

1. Mega Food Parks
2. Integrated Cold Chain and Value Addition Infrastructure
3. Creation/ Expansion of Food Processing / Preservation Capacities (Unit Scheme)
4. Infrastructure for Agro-processing Clusters
5. Creation of Backward and Forward Linkages
6. Food Safety and Quality Assurance Infrastructure
7. Human Resources and Institutions
8. Operation Greens

The following are the objectives of the PMKSY scheme to benefit farmers and consumers: [5, 6]

- Doubling of farmers income
- Availability of safe and convenient processed food at affordable prices to consumers
- Facilitate modern infrastructure
- Enhance employment opportunities
- post-harvest losses and increase the availability of value added products

- Improve in supply chain management (SCM) and export rate
- Contribution to the country's GDP and investment
- Stabilizing the prices of agro commodities

The Mega Food Park Scheme

The food park scheme was evolved in the year 1992-1993 in view of benefiting small and medium entrepreneurs and introducing common infrastructure facilities to all the food industries. The common facilities under the scheme were funded by the central government subject to the utmost Rs.13.58 crores. In the year 2002-2003, the quantum of grant was increased to 25 percent of project cost in general areas and 33 percent in difficult areas. Until March 2007, the scheme sanctioned 56 food parks with no forward and backward linkages. In view of providing public-private partnership and state of art infrastructure to the food industries, the food park scheme was replaced by Mega Food Park Scheme (MFPS) in 2007-2008 with government stake of less than 26 percent [7].

The Mega Food Park project is implemented by a Special Purpose Vehicle (SPV), which is an entity formed for a specific business or purpose, registered under the Companies Act. The scheme is carefully planned, driven by a 50-50-50 scheme such that it gives a grant up to Rs.50 crores for the buildup of the mega food park, with a minimum of 50 acre of land, with at least Rs.50 crore investments from the Mega Food Park developer. The state government or state government entities and cooperatives are not required to form a SPV for the enforcement of Mega Food Parks [8]. The MFPS is backed by a "hub and spoke" model, wherein the Central Processing Centers (CPCs) function as a hub, while Primary Processing Centers (PPCs), Collection Centers (CCs) and Supply Chain Management (SCM) act as spokes. Collection Centre (CC) is a point where the individual farmers, self-help groups and farmer's groups put together the produce and deliver it to PPCs within the range of 10 km radius, spurring the economic activities in the area. PPCs perform the basic processing activities such as cold storage, pre-cooling, grading, pulping, refrigerated vans, etc. to deliver the goods to CPCs. The CPCs covers a land

area of about 50-100 acres with a collective investment of Rs.250 crore that would eventually lead to about Rs.450-500 crore of annual turnover benefiting 25000 farmers. The MFPs are said to uplift farmer's income and provide direct or indirect employment to at least 5000 individuals [9].

The scheme would provide a capital grant of 50 percent of project cost to the general areas, 75 percent to difficult or hilly regions and subject to a maximum of Rs. 50 crore per project for Integrated Tribal Development (ITDP) notified areas of the state. Further, the scheme releases grant-in-aid in four installments of 30, 30, 20 and 20 percentages [10]. As per the project status of MoFPI (dated 24.11.2021), of the 41 mega food parks that have been implemented by the government, 22 MFPs are operational, 17 are under-implementation and 2 are under in-principal approval [11].

III. VALUE ADDITION AND WASTAGE REDUCTION

India has always been pinned as one of the greatest production base of agricultural produce in the world. However, the availability and processable quality of the produce is paltry owing to different post-harvest losses and nutritional depletion. Value addition is a concept that focuses on production, maintenance, supply of goods and consumer satisfaction by enriching the manufacturing processes and the product quality with higher returns or profit [12]. For instance, processing of milk into ghee, milk powders, and whey protein concentrates, etc. and wheat into wheat flour, etc. is considered as the value added products. The MoFPI thus launched the Mega Food Park Scheme that connects farmers directly to retailers thereby increasing the value addition to wake up the process of utilizing the harvested produce.

In view of this, many MFPs such as Srini MFP, Paithan Mega Food Park and Godavari Mega Aqua Food Parks process the raw materials into fruit pulps, ready to serve beverages along with sauces, condiments, pickles and confectioneries and ready to eat fish products respectively as their value addition. The Patanjali Food and Herbal Park on the

other hand expanded the exports with setting up thousands of retail outlets thereby increasing the export demands in the country.

In addition, shelf-life of the food products can also be enhanced to sustain the long transportation process and increase their availability to the markets. Fortification and production of functional food products might also be an eye opener for the nutrition deficient people leading to increase in crop production. Case in point, India mega food park manufactures fortified food products such as toor dhal alternate, protein fortified rice, diabetic rice and soy meal to deliver functional food products.

The tremendous boom in food production in the developing countries led to stocking up of food products for a longer time thus reducing their eating properties and making it unavailable for billions of people and children. A study revealed that, owing to sole rejection at the farm gate and delays in the distribution process, crops worth around US\$ 19.4 million are wasted in India on a daily basis [13]. Further, food grain wastage records to nearly 150

percent of India's budget allocation on agriculture. It is said that "A grain saved is a grain produced" [14]. Therefore, abating the agricultural loss is inevitable in the developing nations to feed the malnutrition and the poor. As per the reports of MOFPI, the reasons for poor utilization of food produce include:

- Poor connecting facility
- Outside zone infrastructure
- Inter-state border issues
- Regulatory barriers
- Reduction of wastage in agricultural produce can be employed by the following practices:
- Cold storage
- Improve packaging
- Process improvements eg. automation
- Consumer education
- Accuracy of forecasting
- Resource planning software

Considering the importance of the scheme, all the operational mega food parks indulged in wastage reduction by employing various strategies. Some of which are listed below in the table 3.1.

S.No.	MFP	Wastage Reduction	Reference
1	Srini food park	• Reduced wastage from 40 percent to 10 percent for mango, guava and papaya • Central Effluent Treatment Plant	[31]
2	Patanjali Food & Herbal Park Pvt. Ltd.	• New product developed from Amla solid waste. And, more than 10,000 exclusive Patanjali Stores were established to grow the exports • Effluent treatment plant – capacity 1,550 MT per day • Bio-gas power plant	[32]
3	Integrated food park	• Common Effluent Treatment Plant • Rain water harvesting for recycling water	[33]
4	Indus Mega Food Park Pvt. Ltd.	• Water treatment plant • Storm water drainage system • Treated water for use in boilers, utilities and processing	[34]
5	North East Mega Food Park	Solid waste and effluent treatment plants for clean and pollution free environment	[35]
6	Paithan Mega Food Park Pvt. Ltd.	• Equalization cum neutralization and primary treatment of flash mixer and clariflocculator • Two stage biological treatment system • Tertiary treatment of pressure sand filter & activated carbon filter • Final Treated effluent store in storage tank • Hazardous like used spent oil which will be sent to Authorized Recycler for Disposal	[36]

7	Jangipur Mega Aqua Food Park	• Effluent Treatment Plant for Industrial effluent: 560 KLD • Sewerage Treatment Plant of 35 KLD • ETP of Rice Mill Effluent: 150 KLD • Bio conversion of organic wastes	[37]
8	Godavari Mega Aqua Food Park	• Water Reservoir: with Over Head Tank of 300,000 Liters • Intake Water Treatment System (WTP) • Central Effluent Treatment System (ETP) • Aquaponics System	[38]
9	Gujarat Agro Infrastructure Mega Food Park Pvt. Ltd.	Optimal Solar Power Utilization	[39]
10	Cremica Food Park Pvt. Ltd.	• Waste water, effluent & solid waste treatment services • Storm Water Drain	[40]
11	Avantee Mega Food Park Pvt. Ltd.	Common Effluent Treatment Plant for state-of-the-art treatment of industrial and human waste	[41]
12	Satara Mega Food Park Pvt. Ltd.	• ETP : 0.9MLD • STP : 150 m3/Day • WTP : 1.2 MLD • Biodegradable waste - As manure • Non-biodegradable waste - For recycling • STP Sludge - As manure • Used / spent oil - Sale to authorized vendor	[42], [43]
14	Greentech Mega Food Park Pvt. Ltd.	STP/CETP plant connection at every plot	[44]
15	Smart Agro Food Park Pvt. Ltd.	Effluent and Sewage treatment plant	[45]
16	Sikaria Mega Food Park Pvt. Ltd.	Effluent discharge system	[46]
18	International Mega Food Park Ltd.	Biomass Power Plant	[47]
20	Zoram Mega Food Park Pvt. Ltd.	Effluent Treatment Plant at 0.75 MLD	[48]
21	Sukhjit Mega Food Park & Infra Ltd	• Captive power generating plant • Water treatment plant	[49]
22	Indus Best Mega Food Park Pvt. Ltd.	• Covered storm water drainage system. The treated water from the water treatment plant is exploited for use in boilers, utilities and processing • Rain water harvesting	[50]

On the other hand, the utmost reasons for no innovation in new product development in food parks might be due to;

- Less market availability
- Lack of technical man power
- Conventional product
- No need felt

- Risky investment

Thus, improvisation by the researchers and scientists in these aspects would increase the identification and production of value-added products and utmost utilization of harvested produce.

IV. CAPACITY UTILIZATION OF MEGA FOOD PARK

Cold Storage Facilities

The perishable products such as fruits, vegetables, milk, meat, fish etc. are prone to biological deterioration like ethylene production and physiological damage viz. limited nutritive value after harvest due to adverse climatic conditions. The storage conditions of these might vary between -20°C to 16°C depending on the products. Hence, packing and storage of food products under controlled humidity and optimum temperatures is necessary to augment their potential shelf life for further utilization [15, 16].

Cold storage is the core processing feature of the MoFPI assisted mega food park scheme. The MFPs engage in utilizing different cold storage facilities such as freezer rooms, individual quick freezing (IQF) freezers, spiral freezers, deep freezers, etc. for the storage of harvested crops. The number and processing capacity of these cold storage facilities vary depending on the land area and proposed investment of each and every MFPs. The Integrated food park situated at Tumkur has 3 cold rooms with 150 million tons (MT) capacity along with IQF freezer, spiral freezer and freezer room each of 1 Kg/ hr, 300 Kgs/hr and 3x300 MT capacities respectively. Further, Jangipur Mega Food Park utilizes potato cold storage at 10,000 MT, vegetable cold storage at 5000 MT, deep freezer (-18°C) at 3000 MT and IQF at 1.5 tons per hour (TPH) capacities. Paithan Mega Food Park also contains a cold storage unit of 1000 MT with 4 cold storage chambers of 250 MT capacities each for the storage of fruits, vegetables and field crops. This performs as the sound basis for the production of value-added products with extended shelf life.

Packaging Technologies

Packaging is the backbone for the storage of processed or unprocessed food articles. They aid not only in sustainability and product safety but also have a chance of succor in branding and marketing the products efficiently. According to FSSAI, "a package or container means a pre-packaged barrel, box, bottle, casket, tin, pouch, receptacle, sack, case,

bag, wrapper or such other things in which an article of food is packed" [17]. Thus, the products packed adapts to the customer's lifestyle thereby ensuring increased product shelf life and significantly reducing the product loss. Intelligent packaging is a type of packaging which indicates the product quality without actually exposing the product. It employs spoilage detectors with colour coding, RFID tags and bar coding for better traceability of the product [18].

Packaging is also one of the basic needs of a CPC in mega food parks. As per the scheme, the MFPs run the central hub with pack houses and packaging units with varying capacities depending on the mega food parks. Integrated food park (at Tumkur) and Cremica food park (at Himachal Pradesh) utilize a pack house of 100 MT/day and multi-crop pulping line with bulk aseptic packaging of 24 MT/ hour respectively for safe delivery of processed products. Similarly, MITS mega food park operates a multi fruit processing complex with 3 MT Pulping, 3 MT Canning & 1000 LPH Bottling units for preserving the products. Himalayan Food Park brings into play the use of tetra packs (200ml-Tba-19) for a sustainable packaging solution, capable of stuffing juice, flavoured milk and ORS at 7500 packs/minute.

In addition, the potential risks associated with the packaging material (using toluene and mineral oil-based inks) might pose chemical contamination of processed food through the process of migration. Mineral oils are obtained by distillation of petroleum with a complex group of hydrocarbons, which migrate through the packaging material and enter the food surface posing a health hazard. As per FSSAI, printed surfaces should not make direct contact with the food surface. As a value addition, materials used for packaging could be in coherence with the processed food product without having any adverse effect on the quality. The use of safe food packaging materials can be listed as [19, 20]:

- Vegetable oils (plant oils), vegetable oil ester-based inks
- Synthetic reactive diluents and resins - ultraviolet curable sheet fed inks
- Low migration inks

- Formulated flexographic inks - water based or UV curable

Further, subjecting to packaging safety compliances, employing biodegradable polymers such as starch, cellulose, polyhydroxyalkanoates (PHA), polylactic acid (PLA), polyhydroxybutyrate acid (PHB), etc. for wrapping up of processed food articles might combat against environmental hazard by reducing harmful emission of gases.

Land area and processing facilities

In par with the MoFPI scheme guidelines, 50 to 100 acres of land is required to establish a central processing centre, with each of the mega food parks possessing high quality processing infrastructure along the value chain from farm to retail. It is expected that based on the business plan, the projects might maintain 30-35 processing units in the CPCs. The major requirements for the CPC to work are cleaning, grading, sorting and packing facilities, dry warehouses, specialized storage facilities, cold storages, pre-cooling and ripening chambers, reefer vans, testing laboratories, etc.

The processing facility of a mega food park determines the extent of technology adoption, efficiency of utilization of land area, harvested crop and manufacturing equipment established in the specific CPC.

The table 4.1 enlists below are the land area and processing facilities of 22 operational mega food parks.

As illustrated in the above table, Srinivasa Food Park being the first implemented one, adopts the highest land area of 147 acres in comparison to other mega food parks. It has a total leasable area of 35 acres, of which 4.8 acres are available till date.

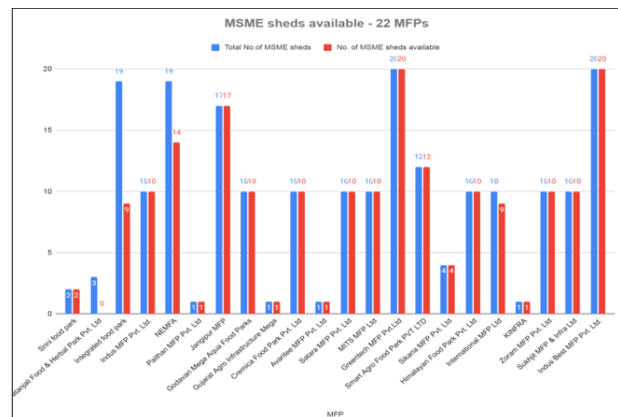
Factory Buildings / Industrial Plots

In accordance with the revised guidelines of MoFPI, a maximum of 10 percent of the area of CPC are

secured for the standard design factories (SDFs) for Medium, Small, and Micro Enterprises (MSMEs) as part of plug and play facilities. The factory sheds are leased out to entrepreneurs to set up small processing units with related plant and machinery facilities, thereby generating an income source to the mega food park. Since, the Ministry (MoFPI) has no role in deciding the lease rental rate; they rely on the information provided by the respective Special Purpose Vehicle (SPV) or Implementing Agency (IA) depending on the availability of plots and market value. For instance, MITS Mega Food Park which owns 10 MSME Sheds with a total of 2200 sq ft., leases the plots at Rs 8 per sq ft.

In a similar way, North East Mega Food Park possesses a total of 19 sheds with a total area of 3574 sq. meter, of which 14 plots are leased out already for MSMEs leaving 2614 sq. meter of area for further renting. The Zoram mega food park has opined that the lease period for plots would be for 25 years, payable in flexible installments. In case of early application for the industrial plots and the MSME SDF sheds, the MFP has proposed to offer payment relief for the first five years of the lease period [21].

An illustration on total number of factory sheds built and number of sheds available without leasing out in all the operational mega food parks (22 MFPs) as on date is depicted below in the figure 5.1.



Mega Food Parks	Land Area (In Acre)	Processing Facilities
Srini food park	147	100,000 tons
Patanjali Food & Herbal Park Pvt. Ltd	71.63	Cold Storage: 3000 MT, RM Warehouse: 10000 MT
Integrated food park	110	70,000 MT storage capacities
Indus Mega Food Park Pvt. Ltd.	73.03	Combined capacity of up to 5,000 MT
North East Mega Food Park	Total Land: 50.023 Acres CPC alone: 41.5	1. Cold storage facility - about 3000 tons 2. Four modular warehouses - 2500 tons each
Paithan Mega Food Park Pvt. Ltd	102	1. Freezer room for frozen vegetables 1000 MT 2. IQF Facility 1 MT per hour 3. Cold storage 1000 MT with 4 cold storage chambers of 250 MT each 4. Sorting & Grading line 3 MT per hour 5. Pre-Cooling facility 10 MT 6. Banana Ripening chambers 100 MT 7. Aseptic Pulping Line for Mango and other fruits with aseptic filling 5 MTPH 8. Mango Ripening Chambers 300 MT 9. Dry Warehouse for raw materials and Finished Goods 70000 Sq.ft. 10. Grain silos 10000 MT 11. Steam Generation Unit 4 Ton per Hour 12. Freezer capacity of 1000 MT with 4 freezer chambers of 250 MT each 13. Reefer vans 5 nos.
Jangipur Mega Aqua Food Park	90 Acres - phase 1, expandable up to 250 Acres in phases 2 and 3	1. Potato cold storage - 10,000 MT 2. Vegetable cold storage - 5000 MT 3. Deep freezer (-18 deg C) - 3000 MT 4. IQF - 1.5 TPH capacity
Godavari Mega Aqua Food Park	57.81	16,000 tons capacity
Gujarat Agro Infrastructure Mega Food Park Pvt. Ltd	70.15	1. Central Processing Centre: Warehousing capacity of 5000 MT will be available 2. Primary Processing Centre: Warehousing capacity of 5000 MT will be available
Cremica Food Park Pvt. Ltd	52.4	Multi-crop pulping line with bulk aseptic packaging (24 MT/ hour), Frozen storage (1000 MT)
Avantee Mega Food Park Pvt. Ltd	51.2	1. Cold Storage - 2000 MT 2. Silos – 16000 MT 3. Irradiation Plant – 5 MTPH 4. Raw Material Warehouse -2500 MT 5. Capacity of Finished Goods Warehouse -5000 MT 6. Capacity of Grain Processing Plant – 18 MTPH

Satara Mega Food Park Pvt. Ltd	64	Godown - 5000 MT; Warehouse with racking system - 2000 MT; Cold storage - 3000 MT
MIT'S Mega Food Park Ltd	65.71	1. Rice Processing Complex - 12 TPH 2. Multi fruit Processing Complex: 3 MT Pulping, 3 MT Canning & 1000 LPH Bottling 3. Cold Store - 2500 MT and Pack house - 10 MT 4. Dry Warehouse - 10,000 MT 5. Pack house - 10 MT
Greentech Mega Food Park Pvt.Ltd	90	7500 MT (warehouse), 5000 MT (cold storage), 2MT/hrs (Individual Quick freezing Facilities), Deep freezer(2550 MT)
Smart Agro Food Park Pvt. Ltd	78	1. Warehouse (10,000 MT) 2. Multipurpose cold storage (5,000 MT) 3. Deep freeze (600 MT)
Sikaria Mega Food Park Pvt. Ltd	50	1. Operational dry warehouse and material handling - 5,000 ton 2. Pineapple canning and pulping line - 2TPH each 3. Packing unit and ripening chambers - 40 tpd 4. Cold storage - 5,000 ton with frozen storage of 1,000 ton 5. Quality control 6. Research and development centre
Himalayan Food Park Pvt. Ltd	50	1. Aseptic line of all paste, puree & concentrates of fruits and vegetables at 10 MT/hr 2. Tetra pack (200ml-Tba-19) Capable Of Packing Juice, Flavoured Milk & Ors At 7500 Packs/Minute
International Mega Food Park Ltd	54.8	High pressure Boiler -25 TPH; Milk Processing Plant- 4 L per day; IQF-2.5 MT, Silos-40,000 MT, Deep Freezer-2000 MT; Cold Storage-4000 MT
Kerala Industrial Infra. Development Corp. (KINFRA)	79.42	1. Ripening Chamber Capacity: 30 Tons/day (120 Tons per batch) 2. Spice Processing Centre Capacity – 15 MT per day 3. Chill Storage Total Storage Capacity – 3456 pallets (6 separate chambers) 4. Frozen Storage Total Storage Capacity – 960 pallets (2 separate chambers) 5. Pack House Capacity: 10 MT per hour
Zoram Mega Food Park Pvt. Ltd	55	1. Fruit Processing Line - 2 Tons/ Hour 2. Spice Drying Line - 2 Tons/ Hour 3. Ripening Chamber - 40 Tons/ Day 4. Warehouse - 3000 Tons 5. Cold Storage - 1000 Tons 6. Quality Control Labs
Sukhjiti Mega Food Park & Infra Ltd	55	Cold Store - 3000 MT, Dry Warehouse - 3500 Sqm, Silos - 20000 MT
Indus Best Mega Food Park Pvt. Ltd.	63.8	1. IQF Line with packaging hall - 2MT/H 2. Cold storage: - 20 deg C and 0-10 deg C, 5 chambers each

V. MODERN INFRASTRUCTURE IN MEGA FOOD PARKS

One of the major requirements for establishing the mega food parks is to envisage the modern infrastructure and equipment for creating state of art food processing units and increasing the value

addition of harvested produce. This includes machines employed in storing, processing, lab testing and supply chain, external infrastructure and safety machines.

In accordance with this, Avantee Food Park implanted an irradiation plant consisting of gamma

irradiation (cobalt 60) in its primary processing center. Further, Patanjali Food Park is anticipated to produce around 150 tons of products through 500 tons of raw materials by utilizing the installed facilities such as steam sterilization unit, crate washing, an integrated cold chain facility, packaging units, boilers, compressors and an automated washing and grading unit [22]. Besides, the Godavari mega aqua food parks had built an efficient and modern palletized and racking system bearing a capacity of 3000 MT, enabling farmers to store the caught fish and shrimps safely without losing their freshness [23].

Efficient logistics

The logistic efficiency is determined by the streamlined connectivity of collection centers and primary processing centers to the central processing hub. Technologies such as geo tagging and bar-coding, RFID tags, farm traceability and spoilage detectors, etc. can be adopted for elevating the logistic infrastructure. The effective logistic planning in a food park paves way to link agricultural produce to market, efficient raw material purchase, product to reach customers safely, timely delivery and storage of products and most importantly to maximize value addition and minimize wastage. In addition, vehicular transportation of raw materials such as in reefer vans might render a chance to increase road connectivity, but also conversely increase emissions.

VI. RAW MATERIAL AVAILABILITY

The scheme of the mega food park brings together the local farmers and processors by implementing PPCs for efficient procurement and processability of all the raw materials without any delay to reduce the middlemen and the post-harvest losses. This in turn facilitates convenient production of a variety of value added food products. Further, the presence of retail giants nearer to the local farms gives expanded opportunity for global marketing of goods, thereby reducing the burden on farmers and aiding in expanding their cultivation. Noting this, Srikaria Food Park established food processing units for processing the raw material available in the catchment area of Tripura and adjoining states [24].

Similarly, Srini mega food park has envisaged comprehensive backward linkage by tying up with farmers and traders such as Federation of Farmers Association (FFA), Sowbhagya Krishi Vikas Pvt. Ltd. (a contract producer) and Farmers' Mutually Aided cooperative Societies to procure quality raw material [25]. Telangana state also has a rich agro-food raw material base, where the Smart Agro Mega Food Park has around 5000 MT of raw material and finished raw material base [26]. Satara Mega Food Park also has a bio-diversity of raw materials for processing of fruits, vegetables, grains, spices, milk and sugar [27]. In addition, the Godavari Mega Aqua Food Park has a raw material base with fish and shrimp cultures of 6000 acres in the MFP to produce value added products such as cutlets, burgers, pickles, skewers, samosa, etc.

VII. EMPLOYMENT GENERATION

The cluster based approach assists in increasing farmer's income and providing direct or indirect employment opportunities particularly in rural areas. The scheme guidelines projected that the fully operational mega food park might generate employment to around 5000 people including farmers since the scheme is not area or state specific. Even so, this is based on the business plan of the respective mega food park. As of 2021, over 6 lakh direct and indirect jobs were generated by the 22 operational mega food parks [28]. However, Patanjali mega food park has reported that it generated jobs to around 0.6 million people directly and indirectly through the creation of a value chain. Additionally, Paithan mega food park reported that it generated a total of 5800 to 23000 direct and indirect employment respectively [29].

VIII. PUBLIC - PRIVATE PARTNERSHIPS

Public-private partnerships impose a possible relationship between the public and the private entities in terms of infrastructure and other industrial duties. To cater to the infrastructural and other needs of the government, it is not possible to address the manpower and financial needs of the government entities alone. Consequently, to obtain high end infrastructure, to leverage large capital

investment and to increase value addition, public-private partnerships are indispensable. They acknowledge the role of the government on whether the sector formed is successful, the obligations are met and the proposed investments are achieved. The public partners referred here are government entities including ministries, departments, municipalities and state-owned sectors. The private partners are the local or international businesses or investors and promoters of the specific mega food park. The partnership also includes non-governmental organizations (NGOs) or community-based organizations (CBOs) who might represent the stakeholders [30].

IX. CONCLUSION

The current system of food processing gives ample value-added products required for day-to-day consumption. However, considering the facts about the post-harvest losses and wastage reduction, India leads its way when compared to the other countries. In attention to this, the Indian government's initiative on Mega Food Park Scheme (MFPS) provides efficient use of raw materials by procuring it directly from farmers (linking farmers and manufacturers directly) thereby increasing the value addition and improving the country's economy. These operational MFPS could be assessed from time to time to authenticate whether the objectives set by the ministry are met. This would also aid in scraping out the needs and modifications to improvise the MFP scheme. Thus, the mega food park scheme is a novel vision by the Government of India to expand the cultivable land and link the industries to the global chains, being a vital growth for the Indian agriculture sector.

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ETHICS STATEMENT

This study was conducted in accordance with the ethical standards of the institution and with accepted scientific research practices. The authors confirm that the work is original, has not been published previously, and is not under consideration for publication elsewhere.

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