

A Study on Food Loss in Agricultural Supply Chain and Measures to Mitigate with Special Reference to Indian Agricultural Sector

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Abstract

India is an agricultural country; its economy is mainly based on agriculture. Despite growing manufacturing as well as service sector, advances in agriculture continue to affect the economic growth of the country. Two-thirds of the population depends on agriculture for their livelihood.

India is the largest producer of milk, jute, tea, spices, pulses, and cashew. And India ranks second in the world in the production of agricultural commodities such as rice, wheat, cereals, peanuts, fruits, vegetables and sugar cane. But India faces many problems in agri-output marketing.

Lack of proper minimum support pricing mechanism for agri-output, food loss (failure in the handling and connecting of food produced to consumption points), rising prices of agri-inputs, rising wages of agricultural labor, lack of timely credit for the farmer, irregular rainfall, government negligence, etc., are the major causative factors for the decline of agricultural as source is livelihood, leading to loan defaults and suicides in large numbers. Millions of families in rural India are on the verge of collapse, and the rural system will eventually collapse.

The FAO of the UN, state that globally 1.3 billion tonnes of food incurs loss and waste, with the highest share in case of fruits, vegetables and tuber crops.

According to a FICCI study conducted on SLCM's systems and processes "AGRI REACH", using scientific processes for managing storage and agri-logistics in existing structures can reduce storage losses from 10 per cent to a mere 0.5 per cent, translating into a saving of \$13 billion every year in India alone.

Against this backdrop, the researchers are looking for alternatives to strengthen the agricultural sector and the focus of this study will be on mitigating the losses to farmers on account of food loss due to inefficiency in agricultural supply chain management.

Key Words: Agricultural products, Agri-Logistics, Food Loss, Supply Chain, Technology

Introduction to Indian Agriculture Sector:

India is an agricultural country; agricultural activities amount as the main source of sustenance for the Indian economy. Despite growing manufacturing as well as service sector, advances in agriculture continue to affect the economic growth of the country. Two-thirds of the population depends on agriculture for their livelihood.

India is the largest producer of milk, jute, tea, spices, pulses, and cashew. And India ranks second in the world in the production of agricultural commodities such as rice, wheat, cereals, peanuts, fruits, vegetables and sugar cane.

India's high proportion of arable land of 157 million hectares in 20 diverse agro-climatic regions and conditions encourage cultivation of different crops. Furthermore, India is home to 46 of the 60 soil types in the world. India's livestock population counts at around 512 million, which translates to around 1/3 of world livestock population.

At the time of Independence in 1947, India's population comprised of about 335 million and many doubts were raised pertaining to the country's self-sufficiency to feed its rapidly growing masses. The farmers responded robustly in the decades that followed by producing at a high rate and as a result, the population is four times in size since independence.

The production of food grains totalled 51 million tonnes between 1950-51 and 250 million tonnes between 2011-12. During 2018-19, the Government of India targeted food grain production of 283.37 million tonnes. This growth was a result of the Green Revolution which took place in the 1960s and 1970s in India. India's total agricultural exports grew at a compound annual growth rate of 16.45 per cent over the financial years 2010-18, reaching US\$ 38.21 billion in the year 2018. In 2019, income from exports of agricultural products amounted

to US\$ 38.54 billion. But this has not economically transformed or developed the farming or rural communities.

Lack of proper minimum support pricing mechanism for agri-outputs, food loss (failure in the handling and connecting of food produced to consumption points), rising prices of agri-inputs, rising wages of agricultural labour, lack of timely credit to the farmer, irregular rainfall, government negligence, etc., are some of the major causes for the decline of agriculture as a source of livelihood, leading to loan defaults and suicides in large numbers. Millions of families in rural India are on the verge of collapse, which eventually will result in the collapse of the entire rural system.

What is food loss and food waste? What are the concerns?

Food loss and waste refer to the reduction in the mass (quantitative) or nutritional value (qualitative) of food - edible parts - throughout the supply chain that was intended for human consumption. Food that was meant for human intake but for various reasons is removed from the human food chain is considered as food loss or waste, even if it is then directed to a non-food use (feed, bio-energy).

The United Nations Environment Programme, defines “Food Loss” as food that gets spilled, spoilt or otherwise lost, or incurs reduction of quality and value during its process in the food supply chain before it reaches its final product stage. Food loss typically takes place at production, post-harvest, processing and distribution stages in the food supply chain.

The United Nations Environment Programme, defines “Food Waste” as food that completes the food supply chain up to a final product, of good quality and fit for consumption, but still doesn't get consumed because it is discarded, whether or not after it is left to spoil or expire. Food waste typically (but not exclusively) takes place at retail and consumption stages in the food supply chain.

Boston Consulting Group (BCG) estimates that food loss & waste amounts to a sum of about 1.6 billion tonnes in quantity and worth about US\$ 1.2 trillion, which is one-third of the total amount of food produced worldwide. Another estimation by BCG that by 2030 annual food loss and waste will hit 2.1 billion tonnes, which is worth US\$ 1.5 trillion. The problem is spreading like fire.

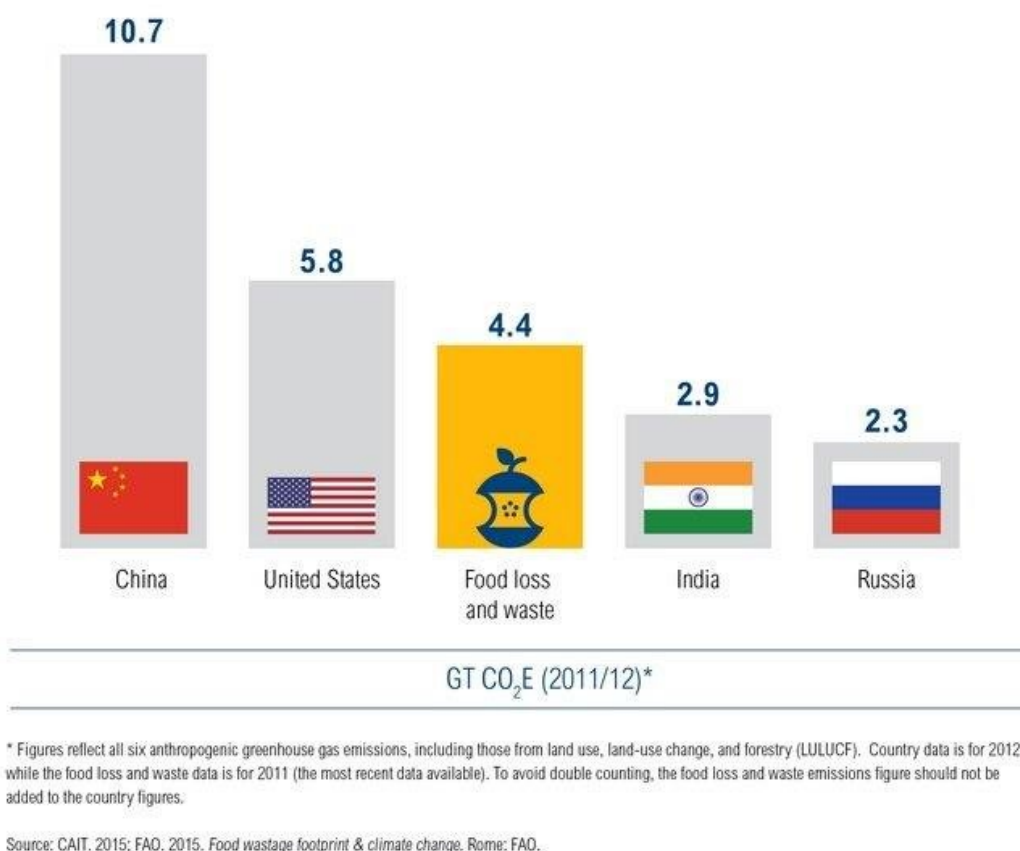
Food loss & waste and Sustainability:

Besides resulting in loss of water during cultivation, food loss & waste has a direct impact on global warming.

A report by FAO of the UN at 1.3 billion tons of physical loss, the equivalent in carbon dioxide (CO₂) emissions is assessed at 4.4 billion tonnes per annum. The FAO also emphasised that “If food loss and waste were a country it would be the 3rd highest emitter of GHG after China and the US”.

According to a 2018 report by CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), the carbon footprint of food loss and waste is estimated to be up to 3.49 giga tonnes of carbon dioxide equivalent, representing up to 6-10% of total anthropogenic greenhouse gas emissions.

Figure 1: Food Wastages Footprint



In context of environmental sustainability, it is worth working on reducing food loss and waste.

Food loss in India:

The losses in India, reported by CIPHET, are far lower than those reported globally by FAO. However, other estimates in documents of Indian Council of Agricultural Research (ICAR), state that the Indian agriculture sector incurs 18 to 25 per cent losses in the entire supply-chain.

The DFI Committee reviewed the unit level information from NSSO 70th round, to reveal that the losses in case of fruits and vegetables are 34 and 44.6 per cent, respectively. Grain inventory in central pool also incurs food loss when its usable life expires within warehouses due to an inadequate delivery and distribution mechanism.

The physical losses (weight loss and discards) of the selected produce are appraised at varied stages of movement to the market. At each stage of measure there occurs a change in custody, following which the produce enters the next level in its post-harvest journey to the market.

- At farm-gate (point of harvest);
- At collection point (aggregation);
- On loading onto transport;
- During transportation;
- On receiving at Wholesale point

Food loss in India – Causes:

The loss in the farm-to-market link segment, whether at 15 per cent or 40 per cent, is an unmistakeable opportunity to add to farmers' income. The physical loss of produce, denies revenue off the production and detracts any motivation to produce more. Such high loss can be averted with better physical connectivity, post-production. To ensure that the infrastructure development is market linked, the planners can benefit from adopting an inverse approach, working backwards from consumption to farms. Produce that reaches points of demand is less likely to result in food loss. Lack of a delivery system, is the leading cause for recurring losses.

Every year, farmers are dumping their produce on the roads. Such actions are being taken by farmers as crop yield does not help cover vehicle costs., such as tomatoes, Onions, etc.

Food loss is not necessarily due to lack of technology; a large quantum of food loss occurs from a lack of access to the national markets, resulting in localised surplus and discards in the hands of farmers. The answer to food loss, is a proper link to the market and effective logistics.

Especially in view of the fact, that many a times, the demand remains unfulfilled despite the surplus, which then has to be discarded due to the inability to connect to the demand.

Cultivation of a single crop by most of the farmers in the region is another reason for food loss. When a single crop comes into the market, the price of the crop tends to go down due to the increased competition among the producers of the same crop, who with their supplies try to meet the demand at the maximum price that they can get for their produce. The middle men cheat the farmers in such cases

In most cases the crops are not capable of being stored for a prolonged period of time and selling fresh produce becomes a hassle due to lack of variety. The Department of Agriculture should strive to ensure that all farmers cultivate different varieties, not just one crop.

Measure to mitigate Food loss in India:

Technology:

Technology can be a key enabler and game changer in establishing an efficient and transparent supply chain system and facilitate sharp reduction in the post-harvest losses. The efficient value chain will not only cut down wastage but also bring down the yawning gap between farm gates prices and retail prices. For example, introduction of GPS enabled handheld devices will ensure real time reporting on the status of the goods stored, enable digital signature, cut down turnaround time, and transmit data on key parameters to one central location while GPS tracking will ensure warehouse manager's availability. The real time data can also be shared with the clients so that they can immediately point out in case of any anomalies.

Infrastructure Development:

Infrastructure, such as irrigation, watershed development, rural electrification, roads, markets, in close coordination with institutional infrastructure, such as credit institutions, agricultural research and extension, rural literacy determines the nature and the magnitude of agricultural output in India. Adequate infrastructure raises farm productivity and lowers farming costs and its fast expansion accelerates agricultural as well as economic growth rate.

Agricultural infrastructure can be grouped under following broad based categories.

- Input based infrastructure: Seed, Fertilizer, Pesticides, Farm equipment and machinery etc.

- Resource based infrastructure: Water/irrigation, Farm power/energy
- Physical infrastructure: Road connectivity, Transport, storage, processing, preservation, etc
- Institutional infrastructure: Agricultural research, extension & education technology, information & communication services, financial services, marketing, etc.

The GoI and state governments need to ensure development of rural infrastructure. The GoI is expected to accelerate warehouse arrangements. Plans already set up for food-parks and processing units need to be implemented more quickly.

Strengthening of e-National Agriculture Market (eNAM):

National Agriculture Market (eNAM) is a Pan-India electronic trading portal which networks the existing APMC mandis to create a unified national market for agricultural commodities. eNAM seeks to leverage the physical infrastructure of the mandis through an online trading portal, enabling buyers situated even outside the Mandi/ State to participate in trading at the local level. Last year, the number of e-National Agriculture Market (eNAM) was increased to 585.

Export opportunities:

India's agricultural exports make up predominantly of raw food products. They are refined as they travel to other countries. Every state government in the country has its own food treatment systems. There are opportunities to further develop this sector. While India is the world's largest producer of food products, the share of agricultural exports in GDP is two per cent compared to other countries. In Brazil it is four, seven in Argentina and nine in Thailand.

Modern techniques in storage:

Agri-food storage systems should be set up in the private sector. It is beneficial to use advanced supply methods and technology to support the expanding retail and food processing sectors. Procedures for storing the product on the farm must come. This requires regular, cold warehouses. It's best to store in xylophones (bulk grain storage system). This greatly reduces the loss of agricultural products in storage. A loan facility can be arranged on a stored product.

Similarly, warehouses can be sealed with hybrid seals having unique numbers and the breaking and fixing of seals can be both monitored on daily basis. This also enables monitoring of timely

opening and closure of warehouse, facilities regulator monitoring of the stored commodity and allows immediate action in case of any fidelity or theft.

The Ministry of Food and Infrastructure is implementing a cold warehouse, transport system, value addition and care infrastructure. This includes supporting the creation of a comprehensive cold warehouse system. This can prevent harvest losses. This includes a maximum grant of Rs 10 crore for each project. The government has decided to set up 500 cold warehouses across the country with the aim of boosting food purification. Recently, the government had sanctioned a total of 299 integrated cooling and warehouse projects. Of these, 91 projects have been completed.

Food Processing Industry:

The role of food processing industry in the global economy is growing in importance. India has also started to grow in this sector since the past five years. The food processing industry will add additional value to the agricultural and manufacturing sectors. Despite being the largest producer of agri-products, India remains at the bottom when it comes to adding value from the food processing sector. This sector continues to be highly unorganized in India. The Indian government must also look into increasing the budget allocations for the processing industry.

Food processing can be divided into two categories: basic and latter. Processing of rice, sugar, cooking oil, and flour mills are examples of basic food processing. Fruits, vegetables, dairy, bakery, chocolates and other ingredients fall into the latter category. India has required infrastructure and facilities in basic category, but the additional value created to the farmers by this category is less. In the latter case the situation is much better.

There is a need to add value to food products in order to increase the income of the farmers. The process of food processing also provides an opportunity for efficient use of additional agri-output. It is beneficial not only in the growth aspects but also in terms of prevention of food waste.

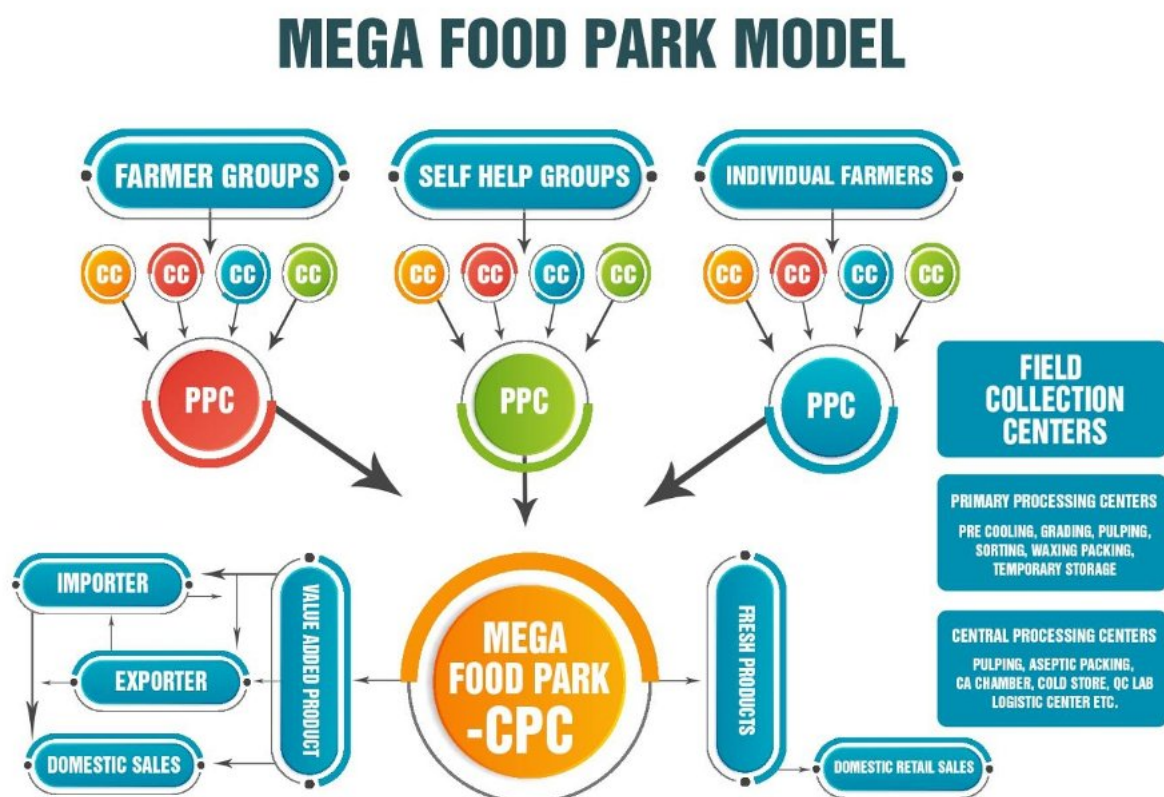
Success story of Mega Food Park Scheme:

The Mega Food Park Scheme has been introduced for the growth of the food processing industry. The scheme aims to provide employment opportunities in the rural sector, increase income of farmers, reduce waste, and provide a mechanism for linking agricultural products and markets to farmers, refineries and retailers in one go. It works like a cluster type. These

parks will facilitate the establishment of modern food treatment centers with sustainable supply chain for all amenities. Mega Food Park has all the basic amenities such as procurement centers, basic and mid-level refineries, cold warehouses and fully developed areas for entrepreneurs to set up food processing industries. The implementation of the Mega Food Park Scheme is facilitated by a separate organization. This includes the participation of government agencies, financial institutions, banks, organized retailers, food cleaners, service providers, producers and farmer organizations. The scheme will be implemented under the supervision of the Ministry of Food Processing Industries.

Each food park has 30 to 35 food processing industries. These require an investment of up to Rs 250 crore. With an annual turnover of Rs 450 to Rs 500 crore, it is likely to employ about 30000 people directly and indirectly. The project will be allocated 50% of the project cost excluding land expenditure as a lump sum capital.

Figure 2: Mega Food Park Model



Although the scheme was launched in 2008, until 2014 only two mega food parks were implemented. According to the government's latest figures, 42 mega-food parks have been funded and 17 have been implemented. They are:

- I. Cremica Mega Food Park, Una, Himachal Pradesh.
- II. Godavari Mega Aqua Park, West Godavari, Andhra Pradesh.
- III. Greentech Mega Food Park, Ajmer, rajasthan.
- IV. Gujarat Agro Mega Food Park, Surat, Gujarat.
- V. Himalayan Mega Food Park, Udham Singh Nagar, Uttarakhand.
- VI. Indus Mega Food Park, Khargaoan, Madhya Pradesh.
- VII. Integrated Mega Food Park, Tumkur, Karnataka.
- VIII. International Mega Food Park, Fazilka, Punjab.
- IX. Jangipur Bengal Mega Food Park, Murshidabad, West Bengal.
- X. MITS Mega Food Park, Rayagada, Odisha.
- XI. North East Mega Food Park, Nalbari, Assam.
- XII. Paithan Mega Food Park, Aurangabad, Maharashtra.
- XIII. Patanjali Food and Herbal Park, Haridwar, Uttarakhand.
- XIV. Satara Mega Food Park, Satara, Maharashtra.
- XV. Smart Agro Mega Food Park, Nizamabad, Telangana.
- XVI. Srini Mega Food Park, Chittoor, Andhra Pradesh.
- XVII. Tripura Mega Food Park, West Tripura, Tripura.

Conclusion:

India's farm output is precious and the efforts should be aimed at ensuring that not even a morsel is wasted. There is a need for sustained campaign to improve existing storage spaces and introduce technology to make the entire supply chain smooth, transparent and mobile to ensure quality, timely delivery, right process and minimal losses.

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