INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH & DEVELOPMENT

ISSN 2278 – 0211 (Online)

Analysis of Indian Food Industry- a Global Perspective

Rachit Kuchhal
Student, Textile Technology, IIT Delhi, Haus Khaz, New Delhi, India
Akanshu Verma
Student, Production & Industrial, IIT Delhi, Haus Khaz, New Delhi, India

Abstract:
Food industry consists of multiple businesses that provides all of the food for the entire population on the earth. The sector plays a tremendous role in the overall development of a country by providing large employment opportunities. To make a comparative study of Indian food industry as compared to other countries, a study has been made on BRICS and the neighboring countries of India, using a powerful model DEA which evaluates the technical efficiencies of all the countries relative to the most efficient frontier.

Keywords: *Indian Food industry, DEA model, World Bank*

1. Introduction

Food industry consists of multiple businesses that provides all of the food for the entire population on the earth. The sector plays a tremendous role in the overall development of a country by providing large employment opportunities. It is one of the major industry of India having a huge impact on its economy. According to Ministry of Food processing industry, India, the industry has been valued at USD 39.71 billion with a Compounded Annual Growth Rate of 11%. The Indian food and grocery market is the sixth largest in the entire world, with retail contributing to 70% of the sales.According to United States Department of Agriculture, global food retail sales has been estimated at USD 4 trillion annually with India retail food sales valued at USD 490 billion in 2013. According to World Bank Enterprise Surveys, food industry in India has a capacity utilization of 81.8% with an annual sales growth of -4.5%and annual employment growth rate of 5.1%. Thus adequate focus on this sector is essential for food security and controlling food inflation.

2. Literature Review

Barbara and Fransesco (2014) has emphasized in their research paper that food industry since time immemorial has been one of the most important branches of the national economy for nearly all the countries across the globe. They are instrumental in the processing of agricultural raw materials and food supply.

Mohammad, Shatroopa and Neeraj (2013) have concluded in their research that rapid changes in market, consumer segments and various regulations has led to significant growth of the Indian food industry. However the Government of India need to treat the food industry particularly Indian food processing industry as a priority sector and shall ensure effective policies and regulations in order to support investments and attract more Foreign Direct Investment (FDI) into the country.

John Wilkinson (2004) has concluded that FDI in the food industry of developing nations like India has transformed the competitive environment in the country which has thus led to the promotion of exports and a rapid increase in productivity.

It has also become a key source of employment in countries like India, Japan etc.

Jabir, Surendra and Enefiok used DEA to estimate and analyze efficiency and productivity changes in 12 broad segments the food industry in India for a period of two decades from 1980-2002. The authors concluded that food industry particularly food processing in India has immense potential in terms of employment growth and income generation. This has been due to wide availability of resources, labor, technology and a favorable business market due to the recent regulations introduced by the Indian government especially FDI. The paper estimates the growth rate for the Indian industry to be at 10 percent per annum. The need of the hour for the government is to introduce reforms in domestic food and agricultural market so as to establish a direct link between the farmers and the food processors.

Willian, Lawrence and Joe have expressed in their research paper that DEA is a powerful quantitative analytical tool for efficiently evaluating the performance of several Decision making Units converting multiple inputs into outputs.

Yong and Choonjoo is a linear programming based model which computes the relative efficiencies and productivity of decision making units

3. Food industry in India

Food Industry is one of the major industry of India having a huge impact on its economy. According to Ministry of Food processing industry, India, the industry has been valued at USD 39.71 billion with a Compounded Annual Growth Rate of 11%. The Indian food and grocery market is the sixth largest in the entire world, with retail contributing to 70% of the sales. According to United States Department of Agriculture, global food retail sales has been estimated at USD 4 trillion annually with India retail food sales valued at USD 490 billion in 2013. According to World Bank Enterprise Surveys, food industry in India has a capacity utilization of 81.8% with an annual sales growth of -4.5% and annual employment growth rate of 5.1%. Thus adequate focus on this sector is essential for food security and controlling food inflation.

India post-independence witnessed heavy growth in food processing sector especially during the 1980's period. Agricultural production had increased many fold following the Green revolution and also increased need for post-harvest management. Business community realized the industries true potential, resulted in diversification from grain trading to processing [7]. India's food value chain is very different from the established markets because of organized as well as unorganized players present in the industry and the different consumption patter present in India. Indian consumers prefer to procure and consume unprocessed fruits and vegetables by converting them via homemade preparations techniques. This is quite different from other countries where people prefer to consume ready-to-eat foods. Wide availability and limited evolution of food processing industries have also contributed to the same [8]. However consumption behaviors are shifting towards processed in urban areas because of lack of time.

India's food processing industry is still underdeveloped even after having such strong agricultural production and technological base as compared to other countries. Dairy products has the highest share of the processed food industry, where 35% of the total produce is processed out of which 15% is processed from organized sector. Processing level of meat and poultry is around 21%, 2.2% of fruits & vegetables.48% of the processed fruits and vegetable i.e. 2.2% is from organized sector rest is from unorganized [9]. In sectors like fruit & vegetable processing, the growth has been poor due low demand for processed goods by consumers. In cases like these, the industry hasn't been able to develop demand to appropriate levels due to low level of processing which are drive by consumer habits. Hence fresh fruits and vegetables are more preferred than processed.

Food and its products accounts for nearly 21% of India's GDP & a market size of Rs 9,050 billion, India's biggest consumption category. The share of food processing industry in GDP has gone up to Rs.44,93,743 crore in 2009-10 from Rs 32,54,216 crore in 2005-06, with Compound Annual Growth Rate (CAGR) of 8.40%. CAGR for total manufacturing sector during the same period has been 9.35 % (Table 1).

Contribution to GDP (Rs. in Crores) at 2004-2005 prices							CAGR
	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2005-06 To 2009-2010
Manufacturing	453225	499011	570436	629052	655775	713428	9.35
Food processing industry	44355	47690	52164	57320	67122	66078	8.49
Registered food processing industry	22148	26780	30710	34752	43893	43910	13.16
Non-registered food processing industry	22207	20910	21454	22568	23229	22168	1.47
Total GDP	2971464	3254216	3566011	3898958	4162509	4493473	8.40

Table 1: Contribution in GDP from 2004-2010 [17].

Table 1: Contribution of different sectors to GDP

A study by McKinsey reiterates the importance of the food sector in India. It indicates that food in India has an economic multiplier of 2-2.5. That is to say that for every rupee of revenue from food, the economy at large gets Rs. 2-2.50. [10]

The Indian food and grocery market is the world's sixth largest, with retail contributing 70 per cent of the sales. Food has also been one of the largest segments in India's retail sector, which was valued at USD 490 billion in 2013@. The Indian food retail market is expected to reach Rs 61 lakh crore (US$ 894.98 billion) by 2020(IBEF Report). India is the largest producer of milk, pulses, cashew nuts, milk etc. accounting for about 10% of world's fruit production. Confederation of Indian Industry has estimated that the food processing sector has potential of attracting US$ 33 billion (Rs. 1,50,000 Crores) of investment in next ten years. The Indian domestic food market is expected to grow by nearly 40% of the current market size to Rs. 12,900 billion by 2015 and Rs. 17,200 billion by 2025 [9,11].

Targets such as increase in the level of processing of perishables from 6% to 20%, increase in share of global food trade from 1.5% to 3% etc. could be achieved hence leading to higher avenues if the policies of the govt are implemented properly.

Significant constraints are present in the industry which if not addressed properly can lead to slow down growth prospects of the industry. In 2013, our share in exports of processed food in world trade had remained at about 1.5% or Rs. 16 billion [12]. Competitiveness of Indian export items are lowering. According to Annual Report of MOFPI, 2008-09, India produces 105 million tons of milk, 150 million tons of fruits and vegetables, 485 million Livestock, 230 million tons of food grain, 7 million tons of fish, 489 million poultry and 45, 200 million eggs, and still our presence at world stage is even less than 1.5% (Figure 1)

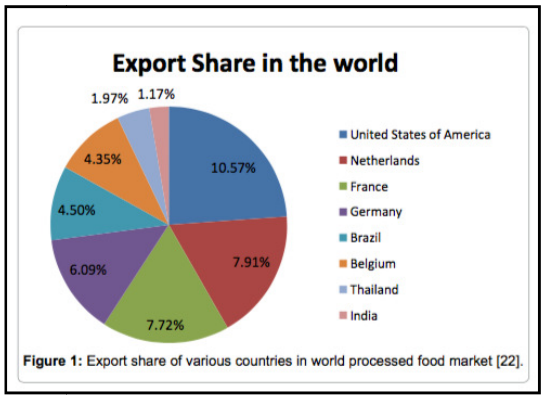

Figure 1: Export share of various countries in world processed food market [10]

Until now, in this paper we have analyzed the general scenario pf food processing industry, contribution to national income & its contribution to the international trade. The major segments of the food processing industry are, dairy, oils, meats and poultry etc. Out of these segments, dairy (16%), bakery-based products (20%), grain based Products (34%) & fish and meat products (14%) contribute to a dominant portion of industry revenues, apart from the manufacturing of beverages.

Fruits and vegetable: Processing in Fruits and vegetables is dominated by unorganized players, who have about 70% of the total market. Over the past few years, the industry has seen fast growth of ready-to-eat foods, frozen vegetables etc. Unavailability of infrastructure facility to store produce is the major challenge with this sector. Also consumers prefer fresh fruits and vegetables over processed items [10].

Dairy: According to Dairy India estimates of 2007, the current market size of the Indian industry's dairy sector is about Rs. 3133.50 billion & has a steady growth rate of 5% a year.Unorganized player dominate the dairy sector due to which the products do not match international standards. In 2011, the value of milk output from livestock is around Rs. 240000 crore and the value of dairy products market is around Rs. 400000 crores [13].

Meat and Poultry: Growth of this sector has been accelerated due to Entry of Godrej, Venkateshwara Hatcheries, Suguna poultry etc. i.e. organized players, meat processing and packaging has accelerated growth of this industry segment. Meat production is estimated at 6.5 MT during 2007-2008, which is about 2% of world meat production. The contribution is 43%, 12%, 8% and 37% by bovine, ovine, pig and poultry respectively [14].

Fish and marine products: The consumption habits of the people all across the world have been changing fast and India is gearing up to produce-supply value added products by adopting the latest technologies and by tapping the unexploited and under exploited fishery resources. Main focus is purely on Value addition which has been acknowledged as the thrust area. Value addition and export are being encouraged for Indian seafood processing units through setting up new units, expanding their capacity and diversifying their current activities. Marine products account for approximately 1.1% of the total exports from India [14] & has steadily grown over the years-from a mere Rs. 3.92 core in 1961-62 to Rs. 8607.94 crore in 2008-09.

(in US $ billion)

Year	Total FDI inflows in India (US $ billions)	% Growth over previous year (US $ billions)
2000-01	2.31	--
2001-02	3.4	47.19
2002-03	3.45	1.47
2003-04	4.27	23.77
2004-05	5.5	28.81
2005-06	7.6	38.18
2006-07	20.3	167.11
2007-08	25.5	25.62
2008-09	43.4	70.20
2009-10	35.6	-17.97
2010-11	24.2	-32.02
2011-12	36.5	30.17
2012-13	46.3	62.6

Source: Annual Report 2013-14, Ministry of Food Processing

Table 2

Snacks: The snack market in Indian is estimated to have a total cap of Rs.150 billion with the organized segment accounting for 50 % of the market share and is growing at a rate of around 15-20%. The unorganized player's share sums up to about Rs. 75 billion and is currently increasing at a rate of 7-8%. 85% share of the Indian snack market [14] is Potato chips and potato based products.

Beverages: The market for beverages in India is worth around INR 10,000 crores while the juice and juice-based drinks market accounts for INR1697.2 crores. Growing at a rate of 25%, the fruit-drinks category is one of the fastest growing segments in the beverages market [14].

Major food processing states in India are Gujarat (12.7%, and a center for edible oils and Dairy), Andhra Pradesh (13.4% of India's food processing industry, and a center for fruits, vegetables, grains and livestock products viz. Poultry, dairy, fisheries, meat, etc.), Uttar Pradesh (12%, across almost all product categories), and Maharashtra (14%, and a center for fruit, vegetables, grains, and beverages) [10].

The Government of India has permitted 100 % Foreign Direct Investment (FDI) in the food processing industry. Many American companies are showing interest in the food industry as the Indian government has made it a priority sector. From 1999 to 2008, exports and imports in the food processing sector increased at an average annual rate of 19.25 % and 17.4 % respectively. Similarly, there has also been a steady growth in Indian food processing industry's FDI inflow. [15]

Table 1: Sector specific limits of Foreign Investment in India

Sector	FDI/Cap/Equity	Entry Route
1. Agriculture Floriculture, Horticulture, Development of seeds, Animal Husbandry, Aquaculture, cultivation of Vegetables & mushrooms and services related to agro and allied sectors.	**100 %**	**Automatic**

Source: RBI report on FDI 2011-12

Table 3: Sector specific limits of foreign investment in India

The food processing industry in India has become an attractive FDI destination; it attracted around INR 45.2 billion FDI during 1991-2005, which was 3.3 % of the total FDI into India for the same period. Table 2 shows the FDI inflow in the food processing sector from 2000-09. Liberalization of inflow of foreign capital was one of the major changes in the external sector of the Indian economy following the reforms process of 1991, in general and that of Foreign Direct Investment (FDI) in particular. The country has received substantial inflows of FDI following the aftermath of these reforms, the especially in the food processing sector.

India have seen significant capital inflows in the country on the account of its economic policies & to encourage technology sharing between foreign and Indian firms. The food processing sector in India considered to be one of the fastest growing areas which steady increase in the share of FDI over the year. [15]
(Table 3) FDI inflow in India from 2000-13

4. Data and Methodology

We have used the data envelopment analysis (DEA) technique to measure the technical efficiency for a particular country. DEA is primarily used for benchmarking in management for instance in our case we have benchmarked the performance of the Indian food industry with respect to its neighboring countries.
The present study is based on the data taken from the World Enterprise Surveys for the food industry of following countries:

- India
- Brazil
- Russia
- China
- South Africa
- Israel
- Bangladesh
- Cambodia
- Nepal
- Sri Lanka
- Pakistan
- Myanmar

These countries were chosen because India has close geographical or strategic relations with all of these countries. India, Brazil, Russia, China and South Africa all are five major emerging economies of the world, they all are developing or newly industrialized countries with very fast growing economies and rapidly increasing global presence. All five of these countries are G-20 members. Out of these it has been well known that India and China are world's fastest growing economies with each of them competing against one another. According to The Telegraph, India has now become the world's fastest growing major economy overtaking china. GDP growth in India was 7.3 percent in 2015 overtaking China's growth rate of 6.9 percent. [16] However contribution of food industry to this growth has not been high. Despite 47 percent of population which amounts to a billion people, being employed in agriculture, India has not realized its full potential in the food industry [17].

Bangladesh, Nepal, Pakistan and Sri Lanka are chosen because they form a geopolitical and intergovernmental union known as South Asian Association for Regional Cooperation (SAARC). All of these countries share close borders with India. At some point of time, all the four countries were a part of India, later separated after colonization by British. The SAARC countries accounts for 23% of Global population according to the World Bank. Also in all of these countries, agriculture and food industry is a major source of employment. Roughly half of the population is employed in agriculture, where a major chunk of the rural population is engaged in agriculture practices including farming, poultry, fishing etc. [18]

Country	Permanent Employees	Temporary Employees	Total Employees	Real Annual sales growth	Capacity utilization	Technical Efficiency
Brazil	34.9	1	35.9	23.9	83	0.58747
India	52.3	7.5	59.8	-4.5	81.8	0.3478
Russia	112.2	0.8	113	0.5	75.1	0.1689
China	89.1	8.6	97.7	10.9	83.9	0.2739
South Africa	61.2	7	68.2	8.4	79.6	0.3518
Israel	34.6	2.3	36.9	1.5	79.7	0.5491
Bangladesh	77.6	3.5	81.1	3.3	76.2	0.2412
Cambodia	31.3	2.4	33.7	20.9	76.2	0.9557
Myanmar	68.6	1.3	69.9	23.1	80.4	0.4969
Nepal	14.6	3.3	17.9	2.8	70.4	1
Pakistan	106.5	11	117.5	10.9	77.3	0.2151
Sri Lanka	89.2	6.4	95.6	13.5	71.5	0.27
					Average	0.4548

Table 4: Technical Efficiency calculated with Input: Total no. of employees, Output: Real Annual Sales Growth & Capacity Utilization

Israel was chosen because India have several strategic and bilateral ties with the country. They have an extensive economic, military and strategic relationship.[19] Also in 2008 both the countries finalized and signed an agricultural plan which aimed at bringing in crops of the middle east to India, especially Olives so as to provide the much needed boost to the agricultural and food industry of the country.[20] As a result of this, areas suitable for olives plantations were identified and consequently roughly 1 lakh olive trees were planted in Rajasthan.[21] The implementation of the project led to agricultural centres being established in various parts of India. These excellence centers focuses on growing horticulture crops, production of seeds and cut flowers. Several new technological advancements were also introduced in the area of bee keeping and dairy farming. [22] Thereby through our study we thus established to compare the food industry of the two countries which can give us insights on how the 2 economies compare.
In order to use DEA, input as well as output parameters are established which will then determine the final technical efficiency. The input and output parameters for our study are as follows:

- → Input: Total workforce in the food industry of a country

This is equal to the sum of permanent and temporary employees

- → Output: capacity utilization and real annual sales growth
- → Capacity utilization: Capacity utilization is the metric which ascertain the rate of potential output levels being achieved. [23]
- → Real annual sales growth: Real annual sales growth is the rate of increase of sales or the annual growth rate accounted for the price changes as well.

Data envelopment analysis is the tool that has been used by us in order to compute the technical efficiency for different countries after fixing the data for inputs and outputs (Table 4). It is an increasingly popular management tool particularly for operations research. It evaluated a country relative to an average country. One should avoid taking in a large number of variables in the DEA model as the model has a tendency to fail to distinguish between the different countries as most of them would be rated efficient. For evaluating the technical efficiencies, several input output variables were identified based on the previous studies. DEA establishes the efficiency by computing the ratio of weighted sum of outputs to weighted sum of inputs. Using a linear programming algorithm the degree of the inefficiencies of the other countries relative to the efficient frontier are then determined.

5. Conclusion

As evident from the above table, the technical efficiency of Nepal and Cambodia is found to be the highest followed by Brazil and Israel. Countries with high population such as China & Russia with a very large workforce are found to have the lowest technical efficiency among the countries selected. It is noted that countries like India, China & Russia even though being much more technically advanced as compared to others have very low technical efficiency as compared to countries such as Nepal and Cambodia. The "Global Competitiveness Index" (GCI) is a measure which evaluates the productivity and efficiency of countries. According to World

Economic Forum "The Global Competitiveness Report 2015-2016" India (GCI- 4.3), China(GCI-4.8), Russia(GCI-4.4) have much higher GCI as compared to Nepal(GCI-3.9) and Cambodia(GCI- 3.9) thus further verifying our claims of technological advancement of India over Cambodia & Nepal. We observe that major developing countries perform poorly as compared to the underdeveloped countries like Nepal, Cambodia & Israel. Another interesting observation we noted while running the DEA model is that the countries with large number of employees working in this sector have low technical efficiency. Also Countries with low capacity utilization have high technical efficiencies with Russia, Bangladesh & Sri Lanka being the exceptions. It can be noted from the dataset that countries with high annual sales growth have technical efficiency higher than the threshold value i.e. 0.4548 with Nepal & Israel being the only exceptions. India despite being the third largest producer of food in the world has not realized its full potential due to low rate of technological progress and increasing inefficiencies of the firms. Faster technological progress can be ensured by heavy investments in R&D. Government should manage the resources being put in the food processing industry appropriately to reduce inefficiency. Moreover countries with high technical efficiency should strive to improve/maintain their efficiency in order to keep the annual employment growth rate steady. Hence it is important for India and its Government to make adequate reforms to tackle the problems faced by the Indian food industry.

6. References

i. Barbara, Fransesco "Innovation trends in the food industry: The case of functional foods", Trends in Food Science & Technology 31(2):118–129 • June 2013
ii. Jabir Ali, Surendra P. Sing and Enefiok Ekanem "Efficiency and Productivity Changes in the Indian Food Processing Industry: Determinants and Policy Implications"
iii. John Wilkinson, "The Food Processing Industry, Globalization and Developing Countries", electronic Journal of Agricultural and Development Economics, Vol. 1, No. 2, 2004, pp. 184-201,International Food and Agribusiness Management Review Volume 12, Issue 1, 2009
iv. John Wilkinson, "The Food Processing Industry, Globalization and Developing Countries", electronic Journal of Agricultural and Development Economics, Vol. 1, No. 2, 2004, pp. 184-201,International Food and Agribusiness Management Review Volume 12, Issue 1, 2009
v. William W. Cooper, Lawrence M. Seiford and Joe Zhu "Data envelopment Analysis", Handbook on Data Envelopment Analysis Volume 71 of the series International Series in Operations Research & Management Science pp 1-39
vi. Yong-bae Ji, Choonjoo Lee "Data envelopment Analysis", The Stata Journal (2010) 10, Number 2, pp. 267–280
vii. Kachru RP, Agro-Processing Industries in India-Growth, Status and Prospects. Indian Council of Agricultural Research. New Delhi, India, 2006
viii. A T Kerney, "Feeding a Billion People: The Role of the Food Processing Industry ", 2014
ix. Merchant A, India-Food Processing Industry OSEC Business Network, New Delhi, India, 2008
x. Mohammad Rais, Shatroopa Acharya & Neeraj Sharma, "Food Processing Industry in India: S&T Capability, Skills and Employment Opportunities", 2013
xi. Government of India, Ministry of Earth Sciences, Executive Summary of the report of the Working Group on S & T for Vulnerable Sections of Society. New Delhi, India, 2011
xii. Bhuyan A, "India's Food Industry on the path of high growth". Indo-Asian News Service, Zurich, 2010.
xiii. Government of India, National Dairy Research Institute, International Animal Industry Vision 2020, Future of Indian Dairy Industry, 1-2 December, 2011, Karnal, Haryana, India.
xiv. Government of India, National Productivity Council, Productivity & Competitiveness of Indian Manufacturing: Food Processing Sector. New Delhi, India 2009
xv. G. Suresh Babu & Prof. M. Raja Sekhar, 'Impact of Foreign Direct Investment (FDI) In Indian Food Processing Sector', 2015
xvi. Mehreen Khan, "Growth star India overtakes China as world's fastest growing major economy", Feb 2016
xvii. Census of India
xviii. SAARC website (http://www.saarc.net/)
xix. Amos Harel, "Israel-India Strategic Ties Are No Longer a Secret", Feb 2015
xx. Blakely, Rhys "A million olive trees to make Indian desert bloom for farmers", May 2008.
xxi. Daily News and Analysis, "Rajasthan produces 100 Tonnes of olives, production expected to grow many fold", September 2014
xxii. The Times of India, "3 Israel centres of excellence coming up", September2012.
xxiii. Investopedia