Food security in India: Milestones achieved so far

ABSTRACT

World hunger is one of the major challenges, across globe; up to 828 million people do not have enough food and 49 million people facing emergency level of hunger. Being the most populous country of the world, India has achieved steady economic growth and the production of the foodgrains has increased however 21.25 per cent of the population lives on less than US$1.90 a day. Over the past seven decades the growth in the area and production of the foodgrains was 0.19 % and 2.37 % per annum respectively. The per capita availability of the foodgrains has increased to 185.4 Kg per annum with growth rate of 0.15 per cent from 1951 to 2021. The availability of the foodgrains has increased due to the improvement in the various government schemes like Targeted Pubic Distribution System (TDPS) with the joint efforts of World food programs. Further the country has achieved a lot in terms of the foodgrains export as it increased to Rs. 3759.09 billion during 2021-22 from Rs. 60.13 billion during 1990-91. The country still suffers from hunger and malnutrition. The reason being the poor people still have limited access to these commodities in the country. Increasing the rural and urban employment along with the self employment can increase the access to the food. Thus government needs to focus more on the food accessibility and make available the nutrition rich food to the population.

Keywords: Economic growth, Food accessibility, Food security, Hunger, Malnutrition, TDPS.

1. INTRODUCTION

Food security has always been a matter of prime importance for India. The Green Revolution during 1966 played major role as it was the crucial time for the country asduring these years the scientist of the country knew that the biological basis for an immense increase in grains outputs was at hand. Although so many causalities happened during this period like the war with the neighboring country and failed monsoon in the previous Kharif season but the focus of the scientist was on the future of the nation (Hopper, 1976).Dr. M.S. Swaminathan the father of Indian Green Revolution along with other scientists put all their efforts to bring the country from the food scarce to food sufficient nation. However, the green revolution during the 1960s had increased the food production of the staple foods – rice and wheat in the economies and crowded out the traditional micronutrient-rich food crops such as coarse grains, millets and pulses which were essential from nutrition point of view (Pingali, 2012).

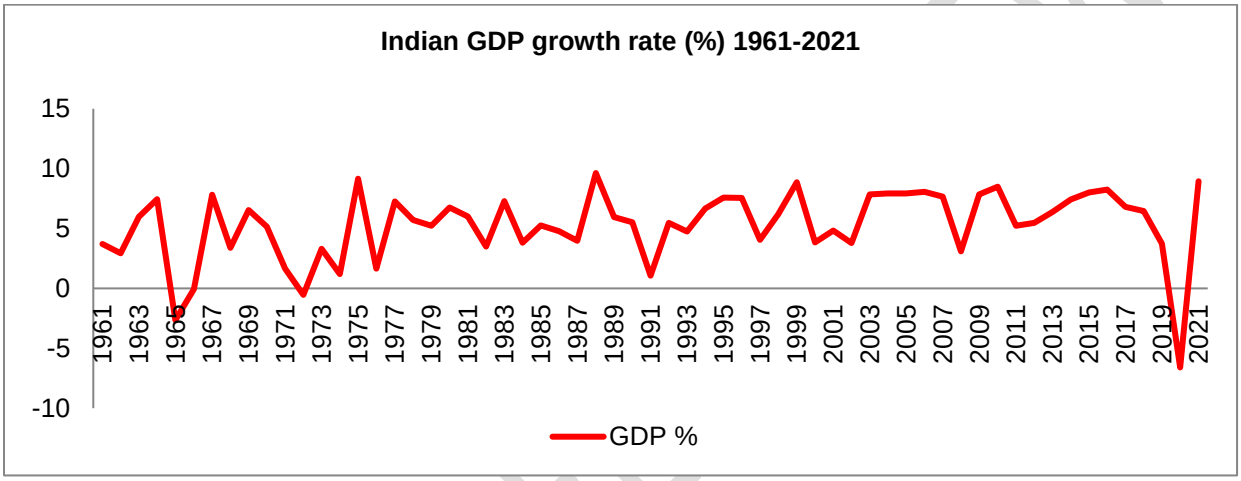
Achieving food security and improvement of nutrition - the second Sustainable Development Goal by 2030 of the United Nations is the most pressing development challenge in the world(FAO). The Food and Agricultural Organization (FAO) states that food security emerges when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet the dietary needs and food preferences for a healthy life. The three important components of food security are availability of food, access to food and absorption of food.It includes the household food availability, household food consumption and nutritional status as Food security has number of dimensions.

The government of India has adopted a range of policies over the past 70 years in an attempt to improve the food security. One of the major food security improvement measures is the government controlled Public distribution system in India (Joshi, 2016).The amendments made in PDS in June 1992 sought to improve coverage (living in remote and difficult areas). It then improved again in 1997 and further to

Targeted Public Distribution System in to provide over seven million tonnes of foods to 60 million households below poverty line(DFPD).

Looking into the development of India the nation has achieved the economic growth of around 8.95 % during 2021 which was 15.54 % more than previous 2020. The economy of the nation has grown from 3.72 % during 1961 to 8.95 during 2021. The most populous country of the world around 21.25 % of population lives on less than US$ 1.90 a day(WFP).However looking at the statistical data India is a nation where more than –one third of the population is estimated to be absolutely poor, and more than the half of the children suffer from the malnutrition. Further, the demand for food is projected to expand by 60 % as the global population increases to almost 9.7 Billion by 2050 (FAO).

Graph 1: Indian GDP growth rate (%) 1961-2021



The reasons for the food insecurity in India are many some of these are; migration from rural to urban areas (Upadhyay et al. 2011), adverse climatic conditions and occurrence of droughts (Joshi, 2016). The Global Hunger Index, 2023 ranks India at 111th place out of the 125 countries with the score of 28.7 which is serious level of hunger.India ranks 68 out of 113 major countries in terms of food security index 2022 with the score of 58.9. India fared worst that the other South Asian countries such as Pakistan, Nepal and Sri Lanka. The GHI ranking of India fell for the third straight year which was 101 in 2021 and 94 in 2020(Staff, 2022) Many in India suffer hidden hunger, evident from both national and small surveys which occurs when the quality of the food people take does not meet the nutrient requirements as the food is deficient in vitamins and the minerals. The National Family Health Survey in 2019-21 revealed that around 18.7 % of women has body mass index below normal, with 16.2 % of men fall in the same category. The percent of the obese women and men in the nation is 24.0 % and 22.9 % respectively. The percentage of the anemic children aged 6-59 months is 67.1 which was around 58.6 % during 2015-16. Children under 5 years of age who are stunted and wasted are 35.5 % and 19.3 %, respectively.The core of India's food problem today prevails not so much on increasing food production or availability but with the food distribution. There are numerous reasons for the food insecurity in the nation but few of these are the rising food prices, proper implementation of the National Food Security Mission in the country and leakages in programs implemented to overcome this issue of the food insecurity in the country.

The under-nutrition is a consequence of the number of factors but the food security lies at the heart of it.The current study focused on the rise in the areas and production of foodgrains in the country over the years, and the key challenges country faces in ensuring the food and nutritional security in the

country.The paper further examined the performance and policies in the food security in India in terms of availability and access over the years.

2. MATERIAL AND METHODS

The study is based on the secondary data collected from various sources published data. The data on foodgrains area and production is collected from Ministry of Agriculture and farmers' Welfare, data on food subsidies, procurement and buffer stock is collected from Ministry of Consumer Affairs, Food & Public Distribution and Data on export and import of food commodities is collected from Ministry of Commerce and Industry. Food and nutritional intake data is collected from the various NSSO rounds on Consumer Expenditure Survey. The various tabular and graphical representations are used to display the results. The data has been presented by using mathematical calculations like averages and percentages.

Compound annual growth rates (CAGR)

The Compound annual growth rate of area and production of crops were estimated as:

$$Y_t = AB^t$$

Where, Y_t = area/ production/ yield of major crops in t^{th} period
t = time variable (1,2,3….,n)
A = constant
B = (1+r)
r = compound growth rate
After log transformation and estimation of the above function as:

$$\ln Y_t = \ln A + t \ln B$$

Compound growth rate was estimated as:
r = (Antilog B – 1)×100

Coefficient of variation

Coefficient of variation (CV) was calculated using the formula,

$$CV = \frac{\sigma x}{\bar{X}} \times 100$$

Where, σ_x= standard deviation of X
$\bar{X}$ = mean of X
X = area/ production

3. RESULTS AND DISCUSSION

Performance of Agricultural Sector in India

Growth in Agricultural GDP in India

Fig 1 clarifies that the share of the agricultural sector in total Gross Value Added (GVA) of the economy is 18.8 per cent. It has although improved to 20.2 per cent during 2020-21 and declined to 18.8 per cent during 2021-22 which was more than that of the previous years. From 2012-13 the share of GVA of agriculture & allied sectors has increased by 3.3 % over the past one decade. This increase in GVA attributed to good monsoon, increased credit and market facilities, improved infrastructure development, etc. in the country.

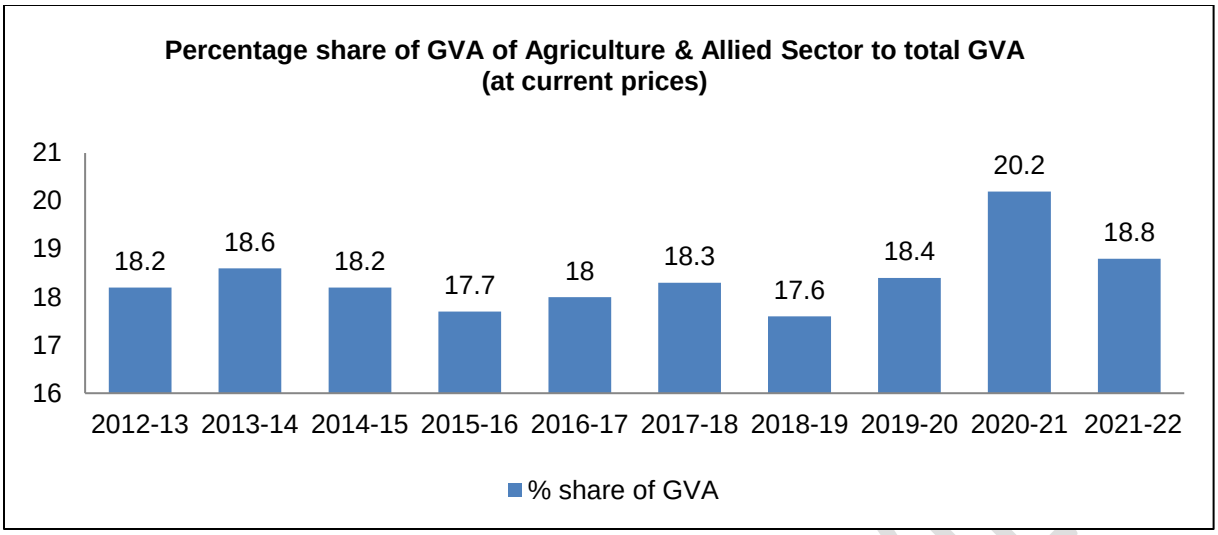


Fig 1: Percentage share of GVA of agriculture & Allied sector to total GVA (at current prices)

Fig 2 shows that the share of GVA of crops has declined over the years from 12.1 % in 2011-12 to 10.7 % during 2019-20 (Economic survey, 2021-22). This further depicts that share of the allied sectors in the total agricultural sector has increased. The share of the livestock has increased from 4 % to 5.2 % from 2011-12 to 2019-20. Likewise the share of the fishing and aquaculture has increased from 0.8 % to 1.2 % during the same period. The allied sectors plays significant role in the overall development of the agricultural sector in India.

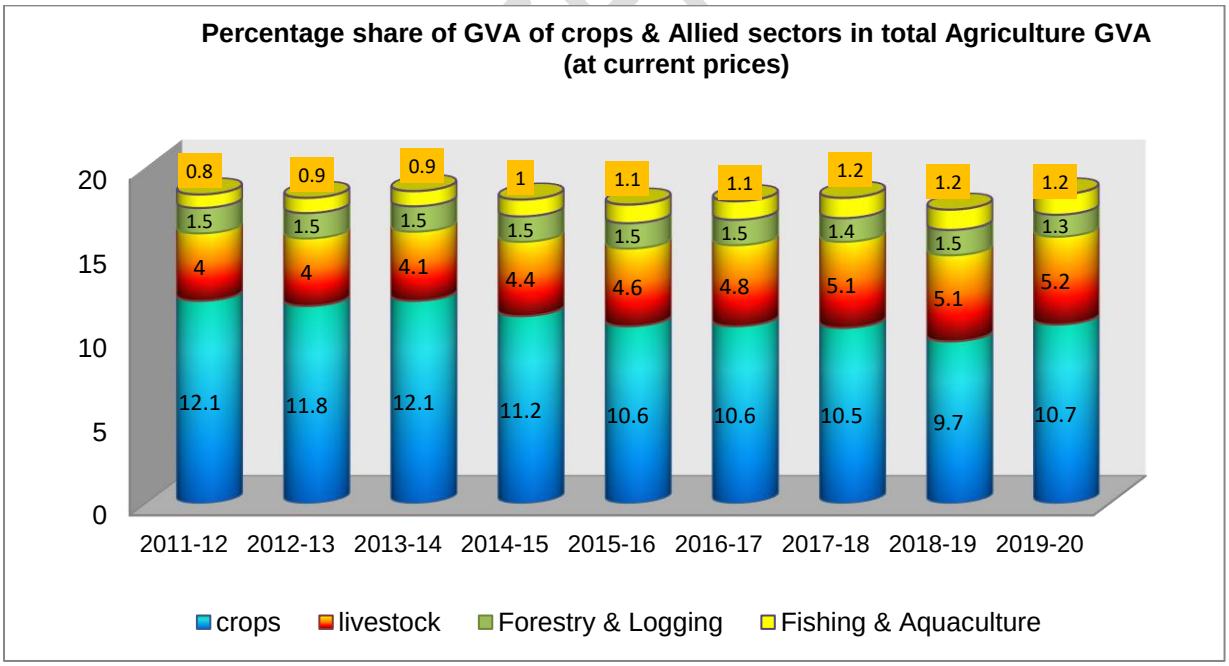


Fig 2: Percentage share of GVA of Crops & Allied Sector in Total Agricultural GVA (at current prices).

Availability of food in India

Attaining self-sufficiency in foodgrains was among prime goals in the country after post independence. The country was food deficit for almost two decades after attaining independence. It was post green revolution when the production of the foodgrains has increased in the country. Before the mid- sixties increase in the foodgrains output in the country was mostly due to the growth of cultivated area and improved irrigation facilities. Since the mid sixties with the introduction of the HYV, Chemical fertilizers and other improved technologies had led to the increase in the production of the food grains. During mid 1970s there was hardly any import of foodgrains in the country(Dev and Sharma, 2010). The growth rate of the area was comparatively more during 1950 to 1960 which was 1.80 % as during this period there was extension of the area under the cultivation (Table 1). Thereafter, there was a decline in the compound annual growth rates of the area. Since during the late sixties with the onset of green revolution, the increase in the production was due to the introduction of the High Yielding varieties and the chemical fertilizers hence there was no much increase in the area. This is reflected from the compound annual growth rate of 1.80 % during 1950-60. However the growth rate of area declined thereafter as the increase in the production of the food grains was due to the implementation of the green revolution and not due to the extension of the cultivable area.

Table 1: Trend Growth Rates in area of foodgrains in India (1950-2022)

Year	Average Area (mha)	C.V. (%)	CAGR (%)
1950-60	1082.55	5.95	1.80
1961-70	1190.60	2.57	0.65
1971-80	1250.50	2.42	0.52
1981-90	1269.30	2.25	-0.19
1991-2000	1229.50	1.01	0.03
2001-10	1220.50	0.23	0.49
2011-22	1259.55	0.25	0.56

The compound annual growth rate of the production of foodgrains was around 2.37 per cent over the last seven decades. The compound annual growth rate of production of foodgrains was around 4.27 per cent during 1950-60 (Table 2). The foodgrainsproduction increased in the first plan period in the country (Hopper, 1976). By the end of the second plan food output had grown by around 3 per cent per annum.The growth in foodgrains output declined from three per cent between 1955-60 to two per cent between 1960-65. Withdrawal of economic aid by the United States during this period following the war served worsened the situation. The production of the foodgrains fallen to 72.3 million tones which was around 20 % lower than previous year production. The production was rose by only 1.9 million tonnes during 1966-67. The growth rate of the foodgrains in the last two decades was 2.31 % and 2.26 %, respectively. There are the short run and long run problems in agriculture.

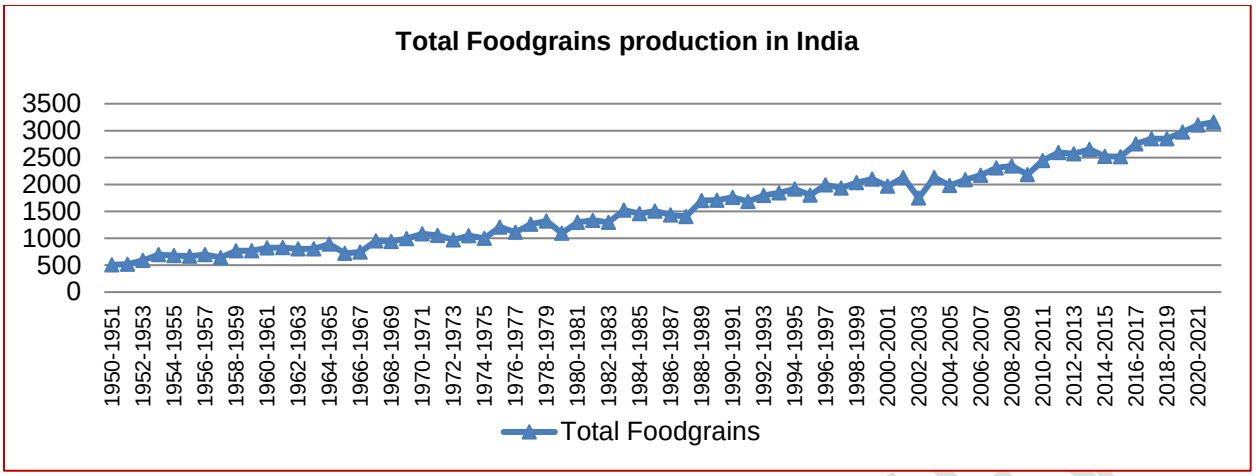


Fig 3: Food grains production in India (1950-51 to 2021-22)

Table 2: Trend growth rates in production of foodgrains in India (1950-2022)

Year	Average Production (m tonnes)	CV (%)	CAGR (%)
1950-60	669.75	14.19	4.27
1961-70	876.42	12.57	3.03
1971-80	1136.5	10.58	2.78
1981-90	1512.29	10.20	2.99
1991-2000	1906.81	6.25	1.91
2001-2010	2152.91	8.63	2.31
2011-2022	2776.67	7.91	2.26
1950-2022	1579.99	45.86	2.37

Major food grain producing states in India

Around 39 % of the total food grains production in India comes from three states namely Uttar Pradesh, Madhya Pradesh and Punjab (Fig 4). Uttar Pradesh contributes around 18.70 % of the food grains to the country's total production followed by Madhya Pradesh (10.57 %) and Punjab (9.79 %). Uttar Pradesh is an agrarian economy where 47 % of the population directly depends on the agriculture for their livelihood. Being blesses with Indo-Gangetic plains and given size of geographical area state contribution is more in the country's food grain production. Around 28 % of country's wheat and 12 % of country's rice are produced from the state (Gulati et al. 2021). Cereals andmillets accounted for around 69 % and pulses around 9 % of the gross cropped area in Uttar Pradesh. Likewise, Madhya Pradesh accounts for the 10.6 % of the total foodgrains production in the country and it is thesecond largest producer of pulses. Gram, Tur andUradare the highly cultivated and grown in Madhya Pradesh. Punjab, Rajasthan, West Bengal and Haryana accounts for around 9.8 %, 7.8 %, 6.4 % and 5.9 % of total food grains production in India. Rajasthan is the largest pulse producing state in the country.

Per capita availability of foodgrains

Looking at the past trends of the per capita availability of the foodgrains in the country we can say that the availability of the food grains has increased from 144.1 Kg per year during 1951 to 185.4 Kg in 2021 with a compound annual growth rate of 0.15 per cent per annum (Fig 5 and Fig 6). The decadal growth in the

per capita availability of food grains revealed that the per capita availability of food grains during 1951-60 was 1.47 per cent per annum and it declined by 0.51 per cent per annum during 1961-70 and by 0.37 per cent per annum during 1971-80. This clarified that in the initial few years the growth in the per capita availability of foodgrains increased slowly (Gavhale, 2017). The growth in the per capita availability was around 0.63 per cent per annum during 1981-90 and it was around 0.88 per cent per annum during the period 2011-21. Out of the total Food grains the per capita availability of rice has increased from 58 Kg to 71.9 kg per annum during this period and the per capita availability of wheat has increased from 24 Kg per annum to 66.9 kg per annum. The per capita availability of pulses has decreased from 22.1 Kg to 16.4 Kg per annum.

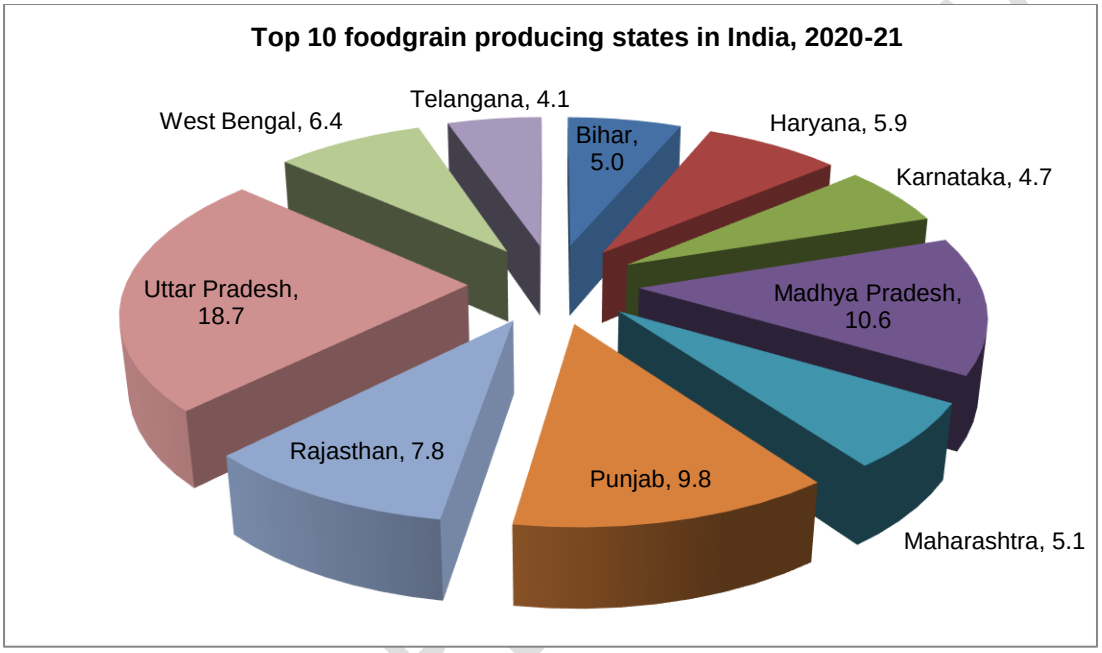


Fig 4: Contribution of each state in food grain production in India

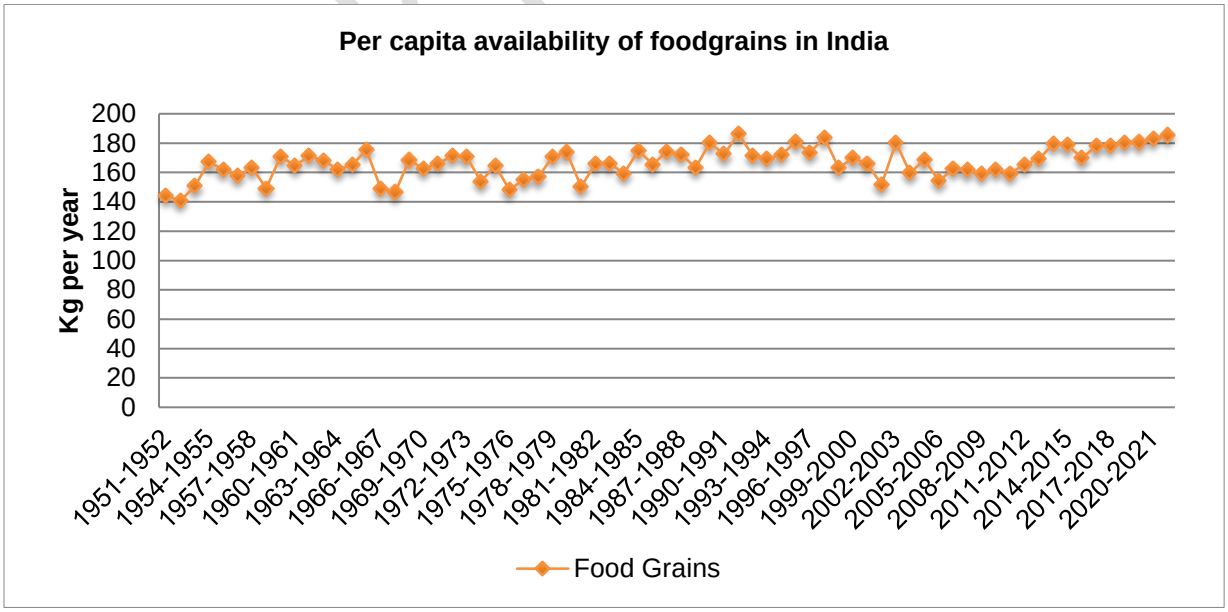


Fig 5: Per capita availability of foodgrains in India during 1951 to 2021

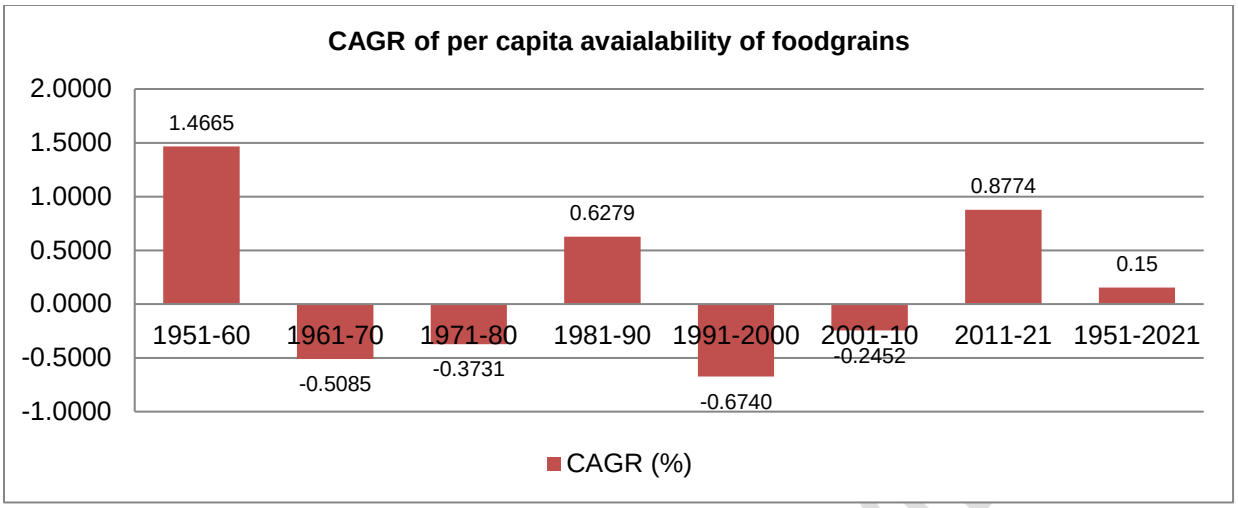


Fig 6: Compound annual growth rate of per capita availability of foodgrains in India (1951-2021)

Foodgrains management

Public Distribution System

Evolved as a system of management of scarcity, PDS helped in distribution of the foodgrains at affordable prices during the time of food shortages of 1960s. Initially started in the urban areas due the rise of food prices but with the increase in the foodgrains production in the nation it extended to tribal blocks and areas of high incidence of poverty in the 1970s and 1980s. Further, in 1992 the revamped public distribution system was started to reach the far hilly, remote and poor people of the country. During 1997 the targeted Public Distribution System was launched to reach out the around 6 Crore poor families and for that the about 72 Lakh tonnes of foodgrains were earmarked annually (NFSA).

Minimum Support Price and Procurement

Minimum support price an integral component of Agriculture Price Policy ensures support price to farmers and affordable prices to the consumers through public distribution system (Parikh and Singh, 2007). The minimum support prices (MSP) for 24 important crops announced every year on the recommendation of Commission on Agricultural Cost and Prices (CACP). The annual growth rate of MSP is around 5.88 % during 2010-11 to 2022-23 for the common variety of paddy and 5.68 % and 9.95 % for the Grade A and Hybrid varieties during the same period. The MSP plays vital role in achieving the broad objective of building buffer stock of foodgrains to meet scarcity situation during crop failure and to encourage farmers to grow crop for food security concerns as depicted from the annual increase in the MSP over the years (Dev and Sharma, 2010). The overall procurement of the rice and wheat has increased significantly over the years. During 2021-22, 49.20 lakh wheat growing farmers and 128.14 lakh rice growing farmers were benefitted with the procurement. Around 140.35% and 72.60% of farmers benefitted from the procurement of the wheat and rice from 2016-17 to 2021-22.

Procurement of food grains in India

In 2013, the PDS was replaced with a blanket scheme under the National Food Security Act, 2013 (NFSA 2013), which, inter alia, expanded the coverage under PDS, increased the extent of grain subsidization, legalized the right to food and opened up scope for the substitution of grain entitlement with cash. For running the system smoothly, the Food Corporation of India, which is the nodal agency for implementing the NFSA the foodgrains are procured at the Minimum Support Price fixed by the government. The

Procurement is done for the Kharif Marketing season (01st Oct to next 30th Sep) and Rabi Marketing Season (01st April to next 30th March). The procurement of the rice has increased from 9.86 million tonnes during 1984-85 to 58.60 million tonnes during 2021-22 (Fig 7).

Likewise, the procurement of wheat increased from 9.30 million tonnes to 43.34 million tonnes during same period. The procurement of the total foodgrains (rice and wheat has increased with the growth rate of 5.02 % per annum. With the view to effecting savings in food subsidy and enhancing efficiency of procurement and public distribution and encouraging local procurement to the maximum extent the Decentralized Procurement (DCP) of foodgrains was introduced in various states and Union Territories. The states like Jharkhand, Karnataka, Kerala, Odisha, Tamil Nadu, Tripura, Andhra Pradesh, Telangana and Union Territory Andaman and Nicobar Islands procure rice under DCP. Wheat and rice is procured under DCP in states of Bihar, Chhattisgarh, Gujarat, Madhya Pradesh, Uttarakhand, West Bengal and Maharashtra.

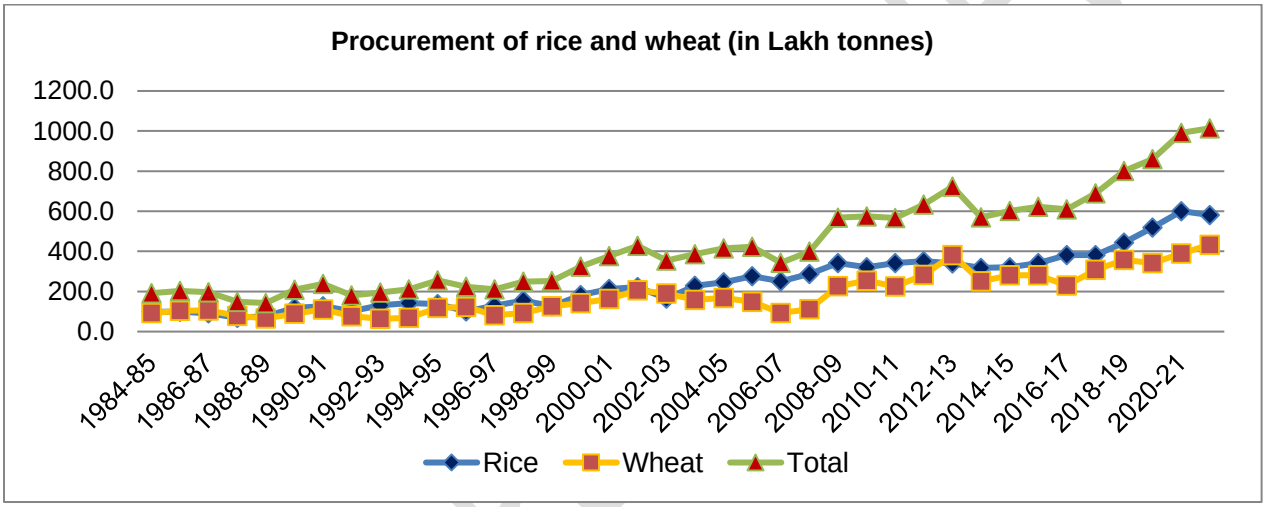


Fig 7: Procurement of rice and wheat in India from 1984-85 to 2020-21
Source: Ministry of Food, Consumer Affairs and Public Distribution, Government of India.

Fig 8 represents the food subsidy release under the Decentralised Procurement scheme in India. In country as whole the total of around Rs. 79790 Crore of subsidy has been released under DCP during 2021-22. Madhya Pradesh has released the total subsidy of around Rs 14421 Crore followed by Andhra Pradesh (Rs. 9323 Crore), Odisha (Rs. 7893 Crore) and Bihar (Rs. 7672 Crore). The subsidy has increased by around 460 % from Rs. 14240 Crore in 2013-14 to Rs. 79790 during 2021-22.

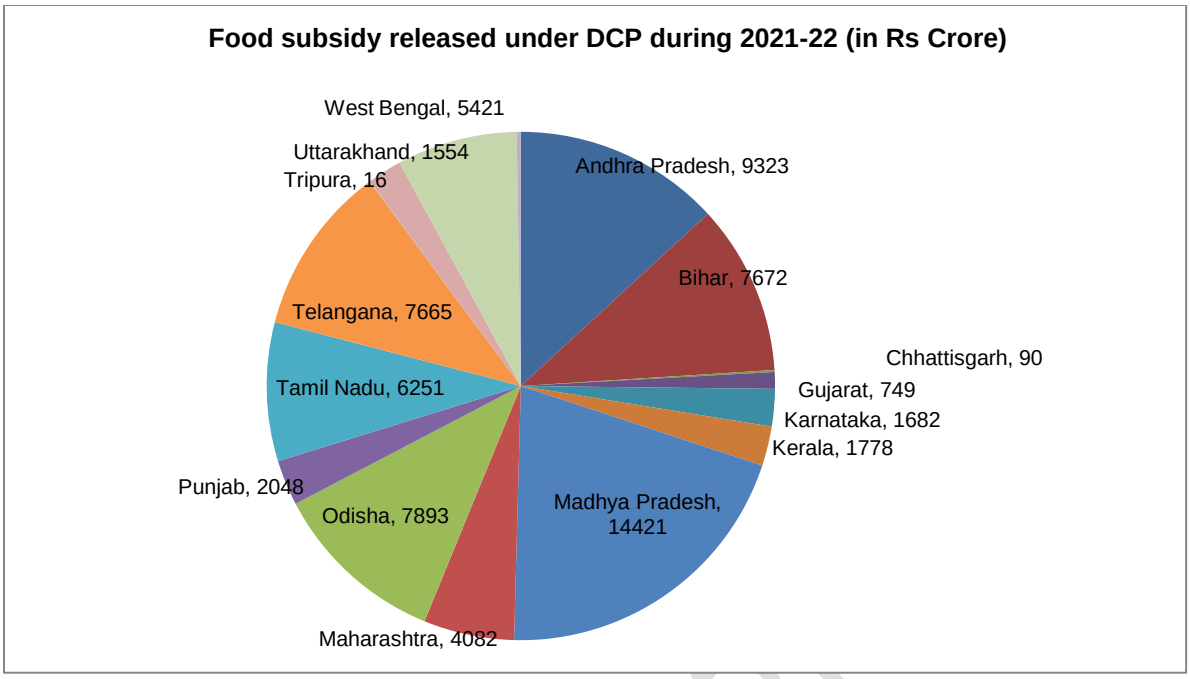


Fig 8: State-wise Food Subsidy Released under Decentralised Procurement (DCP) Scheme in India
Source: Ministry of Consumer Affairs, Food & Public Distribution, GOI

Allocation and off take under TPDS

The allocation of rice and wheatunder Targeted Public Distribution System has increased by 141.95 % during 1998-99 to 2021-22 and the off take has increased by 163.29 % during the same period.The National Food Security Mission has initiated in2013 till 2021-22 the allocation of rice and wheat increased by 83.56 %.

Buffer stock

Over the years the buffer stock for rice increased from 8.58 million tonnes to 54.92 million tonnes and for wheat from 12.47 million tonnes to 18.99 million tonnes from 1984-85 to 2021-22 (Fig 9). The stock of the total foodgrains including coarse cereals increased from 21.20 million tonnes to 74.40 million tonnes with compound annual growth rate of 4.68 % from 1984-85 to 2021-22. The foodgrains stocks were higher than the norms for buffer stock during 2000 to 2003 as the there was continuous rise in the procurement price than the market prices. The drought during 2003 led to the reduction in the stocks. Further during 2004-2007 the foodgrains stocks fell below the norms of stocks (Dev and Sharma, 2010).

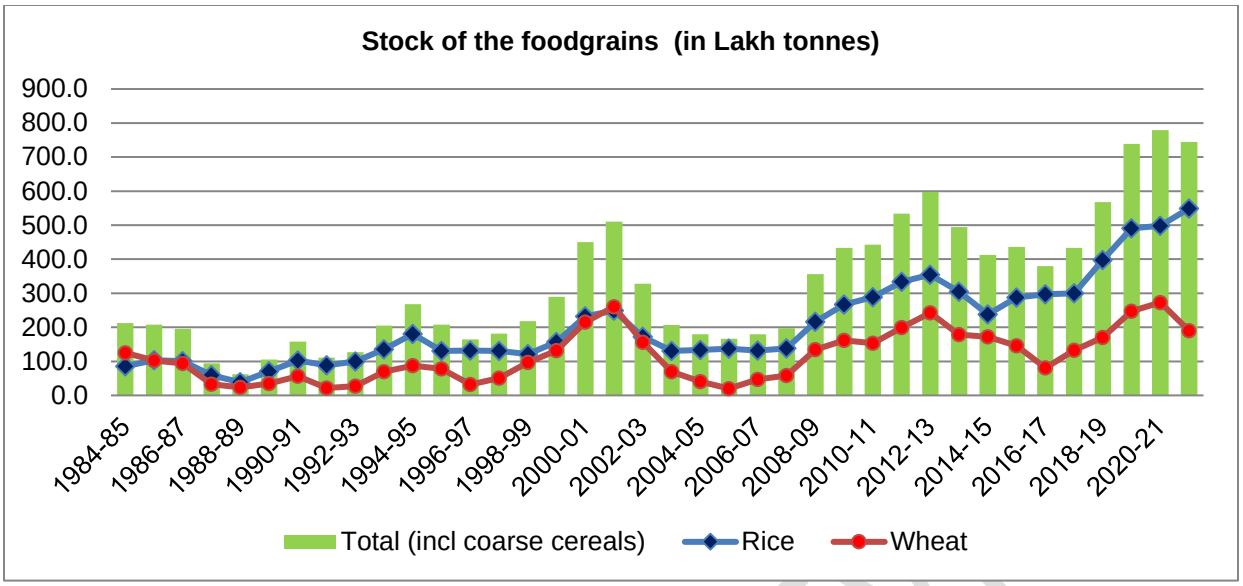


Fig 9: Foodgrains stock in India for the period of 1984-85 to 2020-21
Source: Ministry of Food, Consumer Affairs and Public Distribution, Government of India.

Table 3: Food grains Stock in Central Pool for the years 2016-2023(Opening Balance)

Year	Rice	Wheat	Total	Unmilled Paddy	Coarse grain
2016	2046.29	2782.9	4829.19	1443.96	22.47
2017	2214.63	2673.99	4889.22	1522.89	17.7
2018	2131.35	3280.39	5411.42	953.43	14.49
2019	3049.08	4106.5	7155.55	1895.81	21.32
2020	2956.27	4818.5	7775.9	2636.84	33.06
2021	3150.76	5311.31	8462.07	3446.15	53.46
2022	3095.03	3079.59	6174.62	3600.68	38.38

Malnutrition in India

Nutritional intake Assessment

The intake of calories has declined over years in India and the real consumption expenditures have increased (Chandrasekhar & Ghosh, 2003). Many scholars have studies about the diversified food baskets and the changing dietary pattern in the country (Paroda and Kumar, 2000; Dastagiri, 2004; Mittal, 2006). The per capita intake of the calorie intake declined over the years, indeed fats are the only major nutrient whose consumption has increase ambiguously over the years.From 1983 to 2011-12, the average dietary energy intake per person per day has decreased from 2240to 2233 Kcal, intake of proteins declined from 63.5 gms to 60.7 gmsin rural India.In case of urban India the average intake of the energy declined from 2070 Kcal to 2021 Kcal from 1983 to 2004-05 however it increased to 2206 Kcal in 2011-12. The intake of the fats has increase over the years from 27.1 gms to 46.1 gms in rural India and 37.1 gms to 58.0 gms in the urban India. The increase in the intake of the fats revealed that the households haveshifted more towards more unhealthy food.

Table 4: Change in Intake of Calories, Proteins and fats by households from 1983 to 2011-12

Year	Calories (Kcal)		Protein (gms)		Fats (gms)	
	Rural	Urban	Rural	Urban	Rural	Urban
1983	2240	2070	63.5	58.1	27.1	37.1
1987-88	2233	2095	63.2	58.6	28.3	39.3
1993-94	2153	2073	60.3	57.7	31.1	41.9
1999-00	2148	2155	59.1	58.4	36.0	49.6
2000-01	2083	2027	56.8	55.3	34.6	46.1
2001-02	2018	1982	54.8	54.2	33.6	46.1
2002	2025	2014	55.4	54.9	34.7	47.0
2003	2106	2020	58.0	55.5	36.4	46.7
2004	2087	2036	56.9	55.9	35.5	46.8
2004-05	2047	2021	55.8	55.4	35.4	47.4
2011-12	2233	2206	60.7	60.3	46.1	58.0

Source: Various NSSO rounds on Consumer expenditure survey.

Export of major agricultural commodities

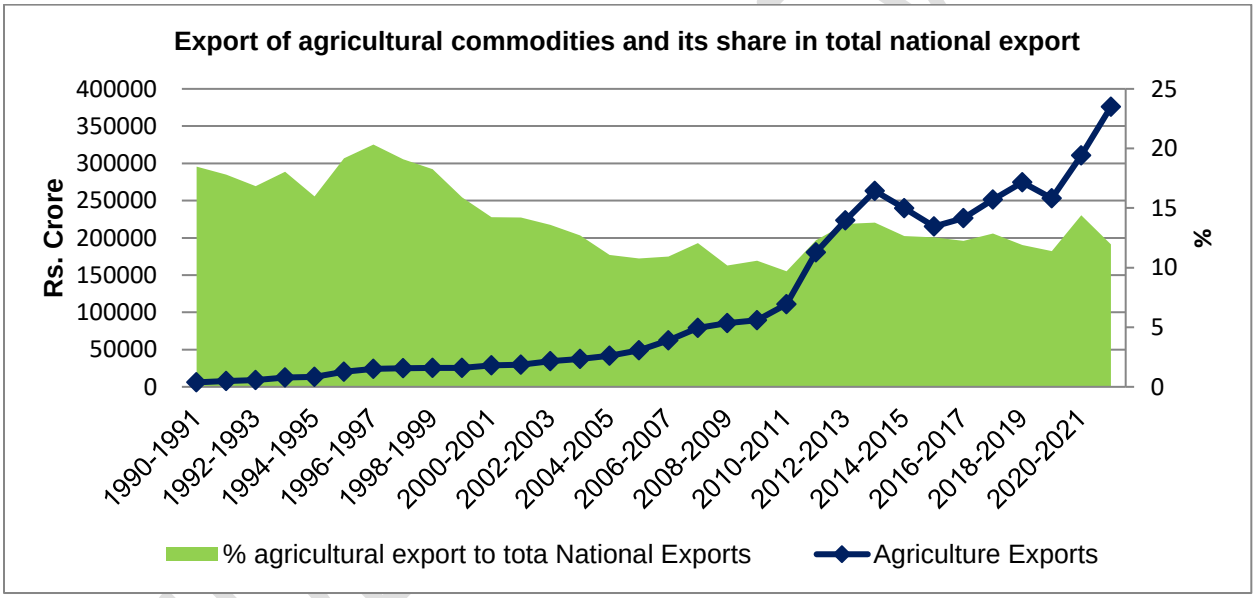


Fig 10: Export of agricultural commodities and its share in total national export

Within rice, exports of non-Basmati varieties have seen a remarkable rise drawing strength from rising price competitiveness, especially in markets such as Bangladesh, China and Vietnam. Fig 10 and Fig 1 shows the export and import values of agricultural commodities in India. The export of the agricultural commodities from India increased from Rs. 6013 Crore to Rs. 375910 Crore during 1990-91 to 2021-22. The value of agricultural export has increased with the growth rate of 13.87 % per annum during the same period. The share of the agricultural export in total national exports has shown a varying trend as it decreased from 18.49 % in 1990-91 to 11.95 in 2021-22. The share of agricultural export was 14.4 % during 2020-21 which was more compared to previous year and next year. On the other hand the value of agricultural imports increased with the growth rate of 16.75 % per annum during 1990-91 to 2021-22. The share of the agricultural imports in total national imports increased from 2.79 % to 5.07 % during the same period.

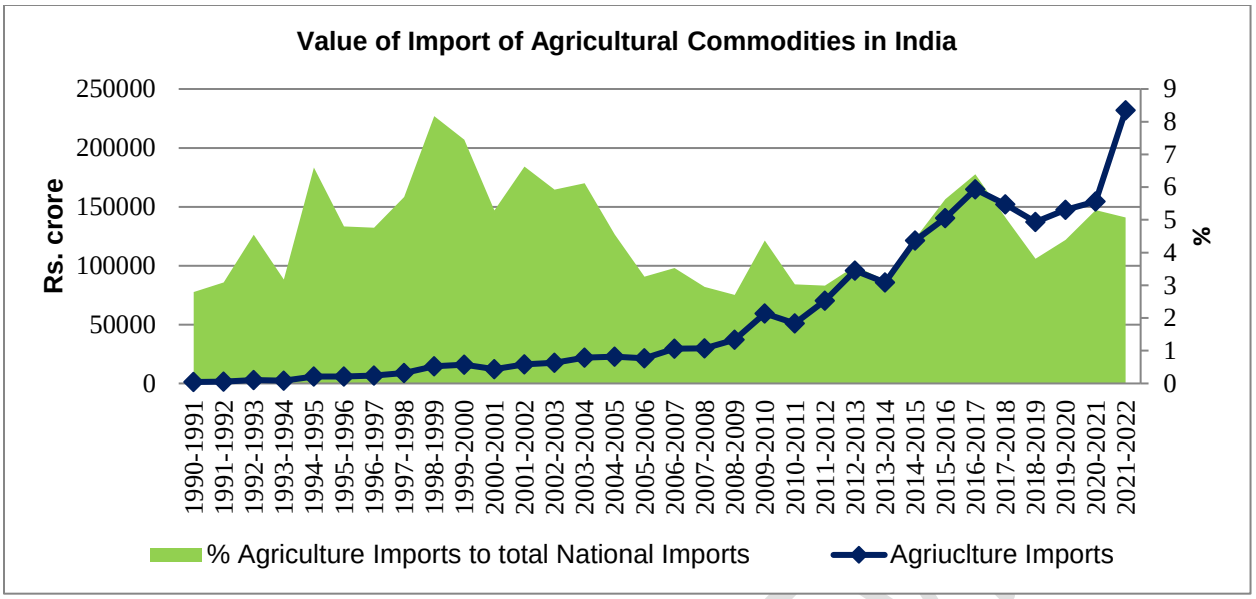


Fig 11: Import of Agricultural commodities and its share in total national imports in India.

Demand and Supply projections of foodgrains

Several studies have been conducted to project the demand and supply of the foodgrains in India.Kumar et. al. 2016 projected the demand for foodgrains at 236.2 million tonnes for 2010 and 274.4 million tonnes and 310.8 million tonnes for 2020 and 2030, respectively. The supplyprojection for the same was234, 281.2 and338.8 million tonnes with the demand and supply gap of around -2.2, 6.8 and 28 million tonnes respectively. The demand for the cereals and pulses will be increasing due to the increasing population in the country, changing tastes and the consumption pattern (Mittal, 2006).

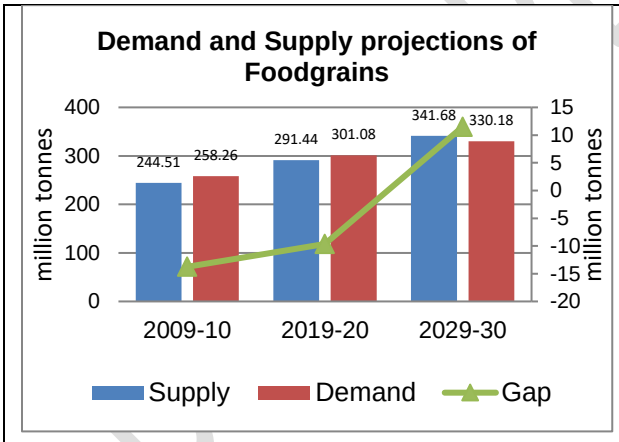


Fig: 12 Demand and Supply projections of Foodgrains
Source: Goyal and Singh, 2002

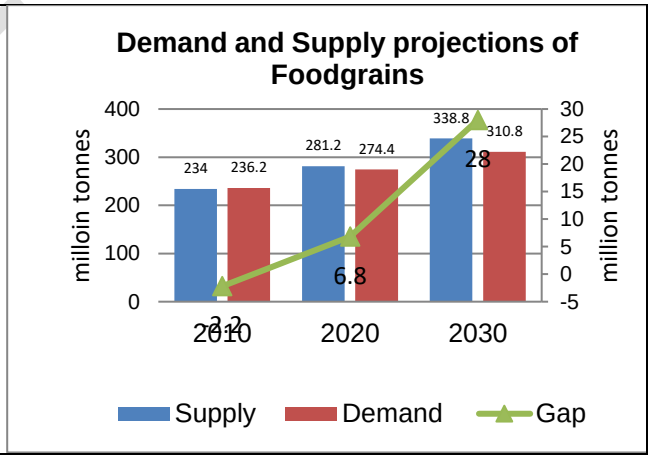


Fig: 13 Demand and Supply projections of Foodgrains
Source: Kumar et. al.2016

India's position in global food security

Among 113 countries India ranked 68th in global food security Index with score of 58.9 (UNDP). The food security at global level is measure in terms of Affordability, Availability, quality and safety and

Sustainability and Adaptation. In terms of affordability India ranks 80th with mean score of 59.3. The affordability is accessed in terms of change in average food costs, proportion of population under global poverty line, inequality-adjusted income index, agricultural trade and food safety net programmesIn terms of average food price the India stood at 81.5 whereas the global mean score is 70.7, in proportion of population under global poverty line India performance is poor with score of 37.4 however mean score stood at 76.6. Likewise, agricultural trade also Country's score is low (45.4) compared to the mean score (67.6). Availability of food also accessed with the different indicators like access to agricultural inputs in which India's score (68) is at par than mean score (57.6). India's performance is poor in agricultural research and development, Sufficiency of supply, political and social barriers to access. However in farm infrastructure, volatility of agricultural production, supply chain infrastructure it performed well. In quality and safety standards and Sustainability and adaptation India ranked 67 and 71 out of 113 countries. Dietary diversity, nutritional standards, micronutrient availability, protein quality and food safety are the parameters of quality and safety. In some parameter of food security index India's performance is good however in some its performance is lower than the average.

4. CONCLUSION

The performance of food nutrition availability and absorption has been investigated in this paper. Food grains are self-sufficient in India. However, due to a shift in consumption patterns, the food basket has changed, and household consumption has shifted towards high-value agricultural commodities. Even with the significant increase in production, access to food remains a serious issue, particularly in light of recent extraordinarily high inflation rates in food commodities and limited access to high-quality diets in large parts of the country. Moreover, smart crops like amaranthus, buckwheat, minor millet, finger millet, proso millet, foxtail millet, and pulses have traditionally been grown in India, making them a valuable source of food and nutrition security. These crops are gradually becoming extinct for various reasons.The availability of foodgrains has increased for the country's population over the years, but looking at the nutritional status, it can be concluded that the calorie intake of households has decreased while that of fats has increased. Despite government programmes such as TPDS, Antyodaya Anna Yojana, and nutrition programmes such as mid-day meals, the percentage of anaemic children (6-59 months) has increased over time.

Furthermore, access to food can be increased by improving the socio-economic conditions of both rural and urban families. Fruits, legumes, nuts, fish, and dairy are all lacking in the Indian diet, even the fact that they are all necessary for healthy development. However, we have achieved surplus production of foodgrains, we need to focus more on achieving income equality in the country because the proportion of the population living below the global poverty line is increasing. As a result, the government should prioritize policies and programmes aimed at making food commodities more affordable to low income people. In addition, the government must focus on the availability and affordability of nutrient-rich food to the population in the economy.

REFERENCES

Annual Report, 2021-22, Department of Food and Public Distribution, Ministry of Consumer Affairs, Food& Public Distribution, Government of India.

Chandrasekhar CP,Ghosh, J. The calorie consumption puzzle. The Hindu Business Line, 2003; 11.

Dastagiri MB. Demand and supply projection for livestock products in India, Policy paper21, National Centre for Agricultural Economics and Policy Research (NCAP), New Delhi. 2004.

Dev SM, Sharma AN. Food security in India: Performance, challenges and policies.Oxfam India Working Papers. 2010

https://www.indiabudget.gov.in/economicsurvey/ebook_es2022/index.html

https://www.fao.org/fileadmin/templates/wsfs/docs/Issues_papers/HLEF2050_Global_Agriculture.pdf

https://nfsa.gov.in/portal/PDS_page

Gavhale SR. Per capita availability of food grains and pressurized agriculture economy in the reform period in India. IRA-International Journal of Management & Social Sciences. 2017;9(2):55-66.

Goyal SK, Singh JP. Demand versus supply of foodgrains in India: Implications to food security [Paper presentation] 13th International IFMA Congress of Farm Management, wageningen, The Netherlands. 2002.

Gulati A,Terway P,Hussain S. Revitalizing Indian Agriculture and Boosting Farmer Incomes. Performance of Agriculture in Uttar Pradesh. Springer; 2021.

Hopper WD. *Food production in India: a perspective*. IDRC, Ottawa, ON, CA. 1976.

https://dfpd.gov.in/pds-tpds.htm

https://wfp.org/countries/india: Around 21.25 percent of the, hunger on global scale.

Joshi PK. Pathways to Improve Food Security and Reduce Poverty in Emerging India. Agricultural Economics Research Review. 2016; *29*(2):171-182.

DFPD. Targeted Public Distribution System. Available online: **http://dfpd.nic.in/public-distribution.htm**

Kumar P, Joshi PK, Mittal S. Demand vs supply of food in India-Futuristic projection. Proceedings of the Indian National Science Academy. 2016;*82*(5):1579-1586.

Mittal S. Structural Shift in Demand for Food: India's prospects in 2020. Indian Council for Research on International Economic Relations (ICRIER), Working Paper. 2006; *184*, 1-35.

NFHS factsheet available at http://rchiips.org/nfhs

Parikh J, Singh C.Extension of MSP:Fiscal and Welfare Implications. 2007. http://planningcommission.nic.in/reports/sereport/ser/ser_msp.pdf

Paroda RS, Kumar P.Food production and demand in South Asia. Agricultural Economics Research Review. 2000; 13(1): 1-24.

Pingali PL. Green revolution: impacts, limits, and the path ahead. Proceedings of the National Academy of Sciences. 2012; 109(31): 12302- 12308.

Staff JA. 2022. https://www.aljazeera.com/news/2022/

Upadhyay RP, Palanivel C. Challenges in achieving food security in India. Iranian journal of public health. 2011; 40(4): 31.

Kini, J. (2022). Multidimensional Food Security Index: A Comprehensive Approach. Asian Journal of Agricultural Extension, Economics & Sociology, 40(12), 317–331. https://doi.org/10.9734/ajaees/2022/v40i121798

Sedoo, I., Arumun, A. S., & Solomon, N. (2019). Effect of Rural-Urban Migration on Food Security of Rural Households in Kwande Local Government Area of Benue State. Asian Journal of Advances in Agricultural Research, 9(4), 1–9. https://doi.org/10.9734/ajaar/2019/v9i430011

Timmer CP. The macro dimensions of food security: economic growth, equitable distribution, and food price stability. Food policy. 2000 Jun 1;25(3):283-95.