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Performance and Prospects of Wheat Market Outlook in India

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ABSTRACT

The study used secondary data on wheat demand and supply and assessed its market performance (1980-2019). Additionally, it compared the market outlook of wheat for 2020-30. The study reported that the wheat supply and demand increased by 3.14 and 2.71 times, respectively, from 1980 to 2020. Production and food demand contributed about 90 per cent each to the supply and demand growth. Spatially, the west, north and east zones remained the primary contributor (>95%) to the market supply of wheat. West zone performed better in area (1.32%) and production growth (3.82%), while the north zone registered highest yield growth of 2.8 t/ha during last 40 years. The same period registered a growth of 9.69 per cent in the net trade of wheat. On the demand side, although the per capita consumption of wheat registered a negative growth (-1.45%), the food demand grew by 2.51 per cent per annum in the past four decades. Market outlook of wheat suggested that the wheat surplus during 2020-30 would be between -3.4 to 32 million tonnes with an average of 20 million tonnes.

INTRODUCTION

Globally, there is a rising concerns on how to feed the growing population with depleting resources and shrinking food production system. Chatterjee et al., (2022) reported a massive loss of agricultural output in the Indian market which was poised to affect market equilibrium of demand and supply. The problem is significant for India as it supports 18 and 37 per cent of global human and livestock population from meagre 2.4 per cent of global land and four per cent of global freshwater resources. For the Indian government, rice and wheat are the obvious choice to address the food security concerns. Wheat, being integral to the National Food Security Act (NFSA), most of the earlier researches emphasized on its production and overlooked other dimensions of supply. Additionally, only a few studies looked comprehensively into its demand and supply sides. Despite the availability of various crop demand and supply outlooks, there exists scarcity of literature comparing them. Timely awareness and training programmes for imparting adequate knowledge to farmers about different recommended wheat cultivation practices and adequate use of different social media such as WhatsApp group of farmers has been advocated (Kumar et al., 2022). Mechanism to create a valuable synthesis between local and research awareness probably leading to a more appropriate modern technology, and increase key stakeholder capacity to interact with new technology has been emphasised for higher productivity (Nain et al., 2012). Against this backdrop, the paper has analyzed the historical performance and compared different outlooks on the demand for and supply of Wheat in India and discussed future strategies for maintaining the demand and supply balance in the country.

METHODOLOGY

The study used secondary data from 1980-2019 and projections of market situation between 2020-30, on elements of demand and supply of Wheat. Area, production, productivity,

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stock change and net trade are supply elements (equation 1), while food, feed, seed, supply chain losses and industrial usage are demand elements (equation 2).

Aggregate Supply = Production + (Beginning Stock – Closing Stock) - (Net Trade) ...(1)

Aggregate Demand = Food Demand + Feed Demand + Seed Demand + Industrial Demand + Supply Chain Wastages ...(2)

The data was compiled from the FAO's food balance sheet (FBS) from 1980 to 2019; NSSO's household consumption expenditure survey (32nd to 68th rounds) and the official website of the Directorate of Economics and Statistics (DES), Government of India (GoI). For performance measurement, it used trends and pattern analysis. The trends were estimated using compound annual growth rate (CAGR) which was calculated as-

$$\text{CAGR (\%)} = [\{\frac{Var_{final}}{Var_{initial}}\}^{(\frac{1}{t})} - 1] * 100$$

Similarly, the pattern of supply was analyzed using spatial dynamics in area, production and productivity (APY) of Wheat and Mean Absolute Percentage Error (MAPE) was estimated to compare various outlooks on Wheat. MAPE was calculated as-

$$\text{Mean Absolute Percentage Error} = \frac{1}{n}\sum_{i=1}^{n} | \frac{\text{At} - \text{Ft}}{\text{At}} |$$

Where, At = Actual/true Value, Ft = Predicted value, n = Number of times the summation iteration happen

Additionally, to analyze the spatial pattern of wheat supply, the study delineated India into six zones, namely East (*Assam, Bihar, Jharkhand, Odisha and West Bengal*), West (*Chhattisgarh, Gujarat, Madhya Pradesh, Maharashtra and Rajasthan*), North (*Haryana, Punjab, Uttar Pradesh and Uttarakhand*), South (*Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and Telangana*), Hills (*Himachal Pradesh and Jammu and Kashmir*) and North-Eastern (*Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura*).

RESULTS AND DISCUSSION

Performance of supply side elements in wheat market

The historical trends over the last four decades in the aggregate supply of Wheat in India suggested about three times increase in the domestic supply of Wheat. Also, during the same period, the domestic supply grew by three per cent per annum. Further, a glance at the sources of domestic supply of Wheat suggested that production alone had contributed more than 90 per cent to the domestic supply of Wheat. Also, the negative values of stock variation indicated that the ending stock was less than the beginning stock for the year, which meant the offtake of Wheat from the food grain management and distribution system was higher than the procurement of Wheat. Higher offtake than the procurement indicated a higher supply of Wheat to the consumers and, thereby, greater availability. Among the different components of the domestic supply of Wheat in India, net trade (export minus import) had attained a maximum compound annual growth rate (CAGR) of 9.69 per cent per annum (Table 1). In comparison, domestic production and stock variation registered a CAGR of 3.07 and 2.28 per cent per annum. The spatial pattern in the area, production and yield of Wheat during 1980-81 to 2020-21 indicated that the northern, western and eastern regions together account for more than 95 per cent of the total cropped area and production in the country. In the growth of the cropped area, except for the northeast and southern zones, all the other zones witnessed positive growth. The western region registered an area growth of 1.32 per cent per annum, followed by the northern (0.68% per annum) and eastern zone (0.47% per annum) zones.

Table 1. Performance of supply-side elements of the wheat market in India

Year	Production (Mt)	Stock variation (Mt)	Net trade (Mt)	Aggregate supply (Mt)
1980-81	31.83	3.20	0.02	35.20
1985-86	44.07	-0.63	0.12	43.32
1990-91	49.85	-9.38	0.08	40.39
1995-96	65.77	-1.00	1.14	63.63
2000-01	76.37	-1.00	1.15	74.22
2005-06	68.64	1.02	0.82	68.83
2010-11	80.80	-0.76	-0.04	80.09
2015-16	86.53	-2.68	0.65	83.20
2019-20	103.60	7.72	0.64	110.67
Absolute growth	3.25	2.41	-3.68	3.14
CAGR (%)	3.07	2.28	9.69	2.98

For the production, a pattern like that of area growth was seen, with the only distinction being the growth rate. The western zone attained growth in wheat production by 3.82 per cent, while the northern and eastern regions attained 2.50 per cent and 2.23 per cent growth during the same period. On observing the growth in the yield of Wheat in India, one can observe that the country has enhanced its wheat yield by 1.62 t ha^{-1} in the past four decades. Further, the northern and western regions remained the top performing zones in augmenting their wheat yield as they witnessed the yield increment of 2.08 t ha^{-1} and 1.91 t ha^{-1}, respectively. In terms of percentage growth in yield during the same period, the western, southern and northern zones gained 2.47, 2.15 and 1.81 per cent growth, respectively (Figure 1).

Performance of demand side elements in wheat market

The per capita food demand has a crucial role in determining the food demand of a commodity. Despite the four-fold increase in the per capita income, the shreds of evidence from different rounds of Household consumption expenditure survey by NSSO suggested that the per capita consumption (PCC) of Wheat remained almost sticky between 4-5 kg per month in both the rural and urban areas over the period after a decline during 1977-1987 (Figure 2). Yadav and Singh (2022) reported the importance of cereals as a staple food in the Indian dietary system. Therefore, the stickiness in the PCC of Wheat could be due to its low-income elasticity as it is a staple component of the Indian dietary system. Over the same period (1980-81 to 2019-20), the overall food demand for Wheat in India increased more than twice. The increased total food demand despite the stagnating per capita consumption was due to population expansion. The growth in the aggregate

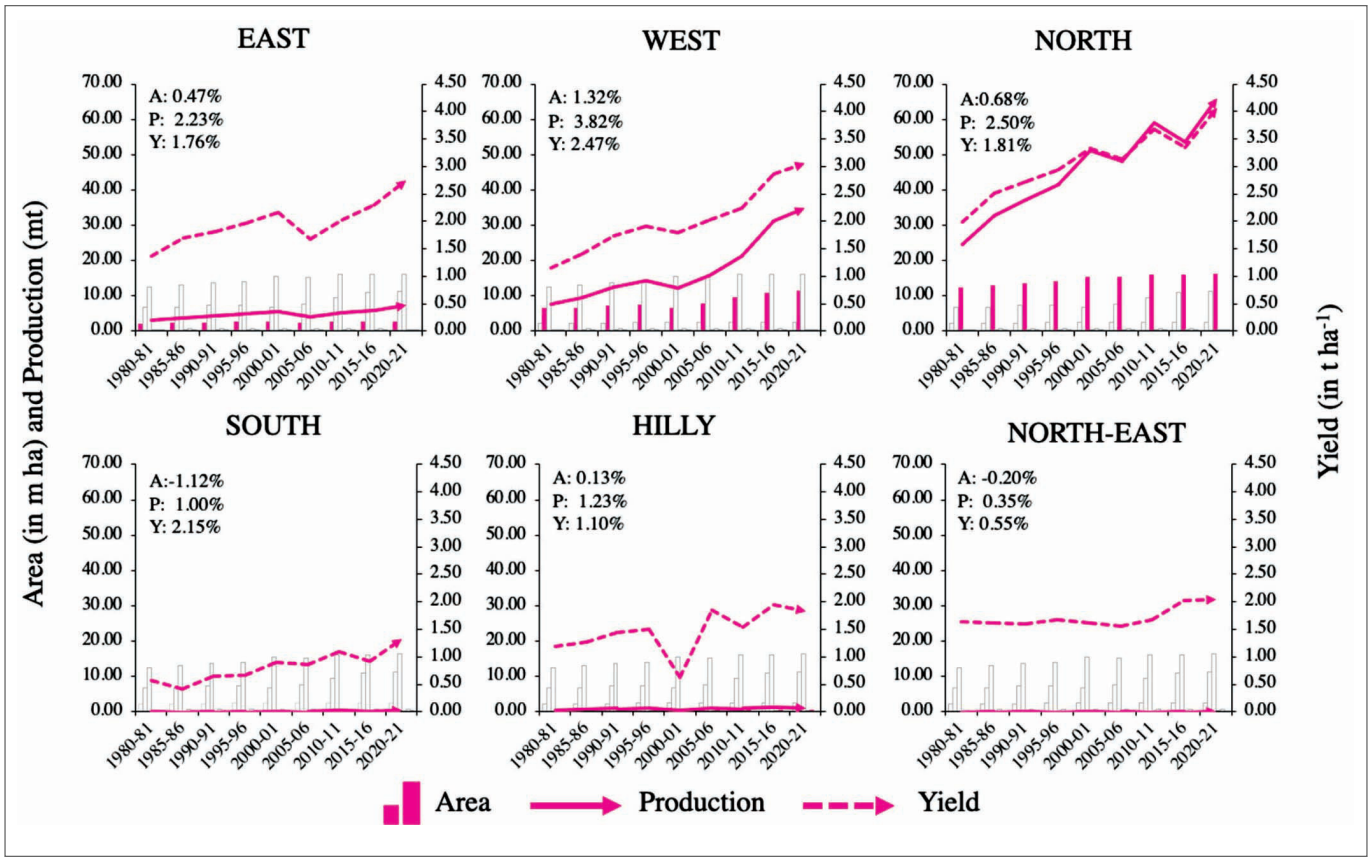

Figure 1. Spatial variation in area, production and yield of Wheat in India (1980-81 to 2020-21)

domestic demand for Wheat showed that the aggregate domestic demand had increased more than twice that of its 1980-81 level during 1980-81 to 2019-20.

During the same period, it had grown at the rate of 2.58 per cent per annum to reach its current level of 95.24 million tons (2019-20). Of the aggregate wheat demand, food demand consisted about 90 per cent of the total demand, while the feed and seed (one to three per cent) and waste, industrial and other (SWIO) demand was seven to nine per cent of the total domestic demand. Further, Wheat's demand and supply data revealed that domestic production alone fulfilled 70 to 90 per cent of the domestic food demand in the past four decades. However, between 1980–1981 and 2019–2020, the demand for Wheat as a feed increased nine times (Table 2).

A significant amount of Wheat had been diverted over the years for feeding livestock and poultry. Also, the same period witnessed a stagnating per capita consumption demand and rising feed demand for Wheat, which indirectly indicated dietary diversification of Indian consumers' food baskets and their transition from cereal-based diets. Vij & Mann (2022) reported a

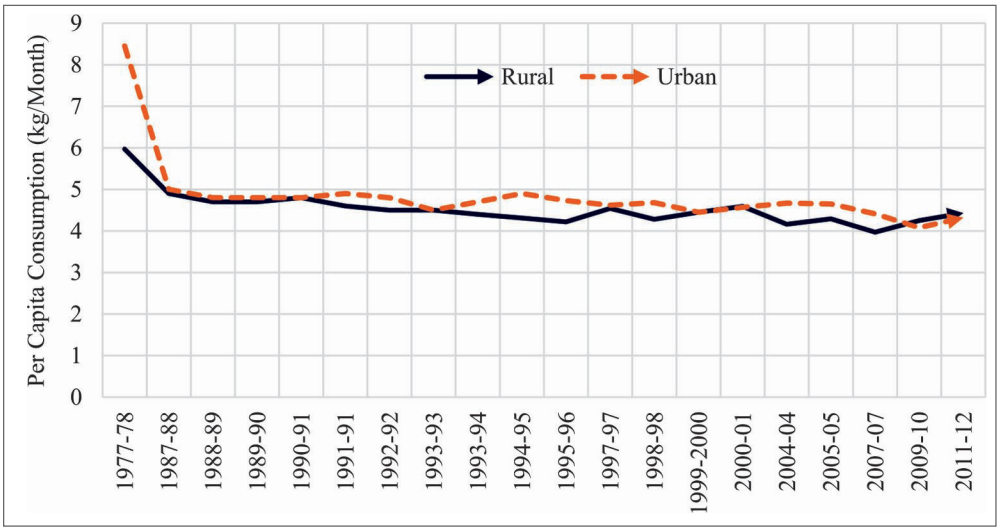

Figure 2. Stickiness in the per capita consumption of Wheat in India

Table 2. Trends in the composition of aggregate demand during 1980-81 to 2019-20 in India

Year	Demand components			Aggregate demand
	Food	Feed	SWIO	
1980-81	31.35	0.38	3.47	35.21
1985-86	37.98	0.53	4.80	43.32
1990-91	35.88	0.60	3.92	40.39
1995-96	58.37	0.79	4.47	63.63
2000-01	68.44	0.92	4.86	74.22
2005-06	62.21	1.19	5.44	68.83
2010-11	72.52	2.97	6.11	81.60
2015-16	77.85	2.50	8.20	88.56
2019-20	82.51	3.50	9.23	95.24
Absolute growth (X)	2.63	9.16	2.66	2.71
CAGR (%)	2.51	5.84	2.54	2.58

similar transition in Punjab. Earlier, several studies reported that, as the income of consumer increases, he/she starts to consume high-value products like milk, meat, eggs etc.

The historical pattern of demand and supply of Wheat in India suggested the growth in the components of demand and supply and the prominent regions supplying Wheat to the domestic wheat markets; however, the pattern of future growth in demand and supply of Wheat in the country is the central question. Hence, the next section is devoted to Wheat's futuristic demand and supply in India.

Market outlook of wheat in India: 2021-2030

To understand the direction of future demand and supply of Wheat in India, we took five projections (Mittal, 2008; Shinoj et al., 2014; Kumar & Joshi, 2016; NITI Aayog, 2018; & OECD-FAO) as these studies projected demand for and supply of Wheat for at least one year during the decade 2021-22 to 2030-31. Of these five studies, NITI Aayog and OECD-FAO provide projections for the maximum number of years from 2021 to 2030. All the projections demonstrated the surplus supply over the domestic demand for Wheat in India. Out of these projections, the projection by Kumar & Joshi (2016) was the most comprehensive as they based their demand projection on the different demand use of the commodity, while their supply projections were based on input usage and output price responsiveness of supply. Contrastingly, the projections by Mittal (2008) were the most conservative among all and underestimated the wheat demand for India during the 2021-2030 duration.

Further, the demand and supply outlook by the NITI Aayog & Shinoj et al., (2014) were close (with about five per cent MAPE) to the projections of Kumar and Joshi for the end of the decade. On the other hand, the OECD-FAO's outlook on demand matched the demand outlook provided by Kumar and Joshi, while their supply outlook had more than 10 per cent higher MAPE. The domestic demand and supply projections indicated that at the beginning of the decade, the domestic supply would range from 91.60 to 132.88 million tones, increasing to more than 135 to 150.99 million tones by the end of the decade (Table 3).

Similarly, the domestic demand for Wheat was predicted to be between 64.30 and 107.69 Mt and 114.60 and 120.12 Mt, respectively, at the start and at the end of the decade. Although these projections were favourable for wheat demand and supply balance in the decade 2021-30, the current wheat production system in India is experiencing the looming challenges of terminal heat stress due to rising temperature, land degradation in the form of salinization and alkalinization, plateauing yield of the most productive lands, expanding population, locust swarm attack during the crop growth stage of wheat crop in western states like Rajasthan and Gujarat etc. Therefore, in the next section, we discussed the future of the Wheat market in India.

Prospects of wheat market in India

Under business-as-usual scenarios, i.e., if the current trends in the demand and supply of Wheat would sustain by the end of the decades, India would be in a position to sponsor its domestic demand of Wheat from its supply sources. The historical growth in per capita consumption of Wheat between 1977-78 to 2011-12 indicated that even after a substantial rise in consumer income, the PCC of Wheat had not changed proportionately. It points to either a minor decline or stagnant PCC of Wheat for food consumption which constitutes the largest share of aggregate demand

Table 3. Future demand and supply of Wheat in India under business-as-usual scenarios

Years	Kumar & Joshi (2016)		Mittal (2008) / Shinoj et al., (2014)*		NITI Aayog (2018)		OECD-FAO	
	Demand	Supply	Demand	Supply	Demand	Supply	Demand	Supply
2020-21	98.30	104.16	-	-	-	107.18	105.39	127.39
2021-22	-	-	64.30- 66.80	91.60	97.12	109.50	107.69	130.24
2022-23							108.29	131.40
2023-24	-	-	-	-	-	-	110.44	134.14
2024-25							111.32	135.61
2025-26	-	-	102.01*	121.89*	-	-	113.26	138.15
2026-27			65.90-69.10	97.90	-	-	114.31	139.83
2027-28	-	-	-	-	-	-	116.08	142.23
2028-29	-	-	-	-	107.08	127.31	117.24	144.04
2029-30	-	-	-	-	108.62	130.00	118.90	146.37
2030-31	114.60	124.56-132.48	-	-	-	-	120.13	148.29
2032-33	-	-	-	-	113.46	138.82	-	-

*Projections of Shinoj et al., (2014)

for the commodity. Thus, the source of future growth in demand for Wheat would be coming from population growth. However, the availability of newer food products like a variety of fast foods like loaves of bread, maggie, pasta, pizza, burgers, sandwiches etc. which are majorly consumed in the urban centres and their penetration into the lower middle to lower strata of the society and rural areas are expected to enhance the home away food demand of Wheat. Further, with increased availability of new wheat-based products and rising consumer income, the satiety in the consumers due to frequent consumption of the traditional wheat product (TWP) may reduce the consumption of Wheat for TWP.

Similarly, the higher consumer earnings, as reported by the earlier studies, would lead to a transition in the food consumption basket from traditional staples to high-value products like animal fats and proteins. Under this paradigm, the feed demand for Wheat would be expected to rise. Kumar and Joshi, 2016 reported a two-fold increase in feed demand for Wheat between 2010 to 2030 from 3.89 to 6.59 million tonnes. However, the production of Wheat for animal consumption has to be thoroughly understood from the point of view of resource use as alternative nutritionally enriched and less input-intensive animal feed crops exist.

Additionally, as the glaciers melt due to rising temperature, the northern, western, eastern and hilly regions are expected to have higher irrigation water availability in wheat growing seasons in future. However, the states like Punjab and Haryana have higher wheat yields; nevertheless, there exists a yield gap among other states in the above zones. Therefore, in such zones, particular emphasis should be given to technology (improved seeds, irrigation infrastructure, soil conservation and so forth), markets, institutions and infrastructure to maintain the resilience of future wheat supply. Further, the resource degradation (land and groundwater) might check the horizontal expansion of the f wheat production system and provoke forced crop diversification. Therefore, Wheat being an essential ingredient of the National Food Security Act (NFSA), efforts must be channelized towards increasing the productivity of Wheat in the potential zones to maintain the sustainability of wheat supply. Additionally, the agricultural extension system has a more significant role in transferring climate-smart production technologies and educating the farmers on mitigation strategies to add resilience to the production system to sustain productivity growth and supply of Wheat in future.

CONCLUSION

The market outlook of Wheat suggested that India would have adequate Wheat to feed its continuously growing population. However, the emerging supply side (weather aberrations, resource depletion, growing incidences of biotic and abiotic stresses etc.) and demand side shocks (population growth, changing taste and preferences, growing income etc.) may put constraints on the future wheat market in India. Amidst the horizontal expansion of the food production system, yield increment would be a significant driver to ensure future food supply. Therefore, technological upgradation and its transfer are crucial for future food supply. Hence, higher investment in research and development and a robust agricultural extension system is essential.

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