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# Wheat Production in India: Trends and Prospects

*Sendhil Ramadas, T.M. Kiran Kumar  
and Gyanendra Pratap Singh*

## Abstract

Trends in Indian wheat production before and after the inception of the All India Coordinated Research Project (AICRP) on wheat have been analyzed to show its significant progress over the years. A brief intercountry comparison of productivity, production and area coupled with regional comparison within India has been attempted to give an idea about the contribution of country and regions, respectively, for global and national food security. The milestones in Indian wheat programme and research outcomes were highlighted post-AICRP along with the vision and strategies set for 2050 against diverse production challenges. Regional disparities, zone-wise production constraints and research programmes for achieving the set production target were briefed. The chapter concludes with possible interventions in strengthening the complete wheat value chain for ensuring food security for the future generation.

**Keywords:** wheat, AICRP on wheat, vision 2050, yield gaps, trends

## 1. Introduction

Cereals play a pivotal role to satisfy the global food demand of growing population, particularly in developing nations where cereal-based production system is the only predominant source of nutrition and calorie intake [1, 2]. The nutrient-rich cereal is grown in diversified environments; globally wheat occupies around 217 million hectares holding the position of highest acreage among all crops with an annual production hovering around 731 million tonnes [3]. Wheat (*Triticum aestivum* L.) is one of the principal cereal crops grown worldwide and one of the important staples of nearly 2.5 billion of world population. Wheat is the major staple food crop, providing almost half of all calories in the region of North Africa and West and Central Asia. Being next to rice, wheat constitutes one of the key sources of protein in least developed countries and middle-income nations and in terms of calories and dietary intake. The crop being cultivated as winter and spring in the world, winter wheat is grown in cold countries like Europe, the USA, Australia, Russian Federation, etc., while spring wheat is grown in Asia and in some parts of the USA.

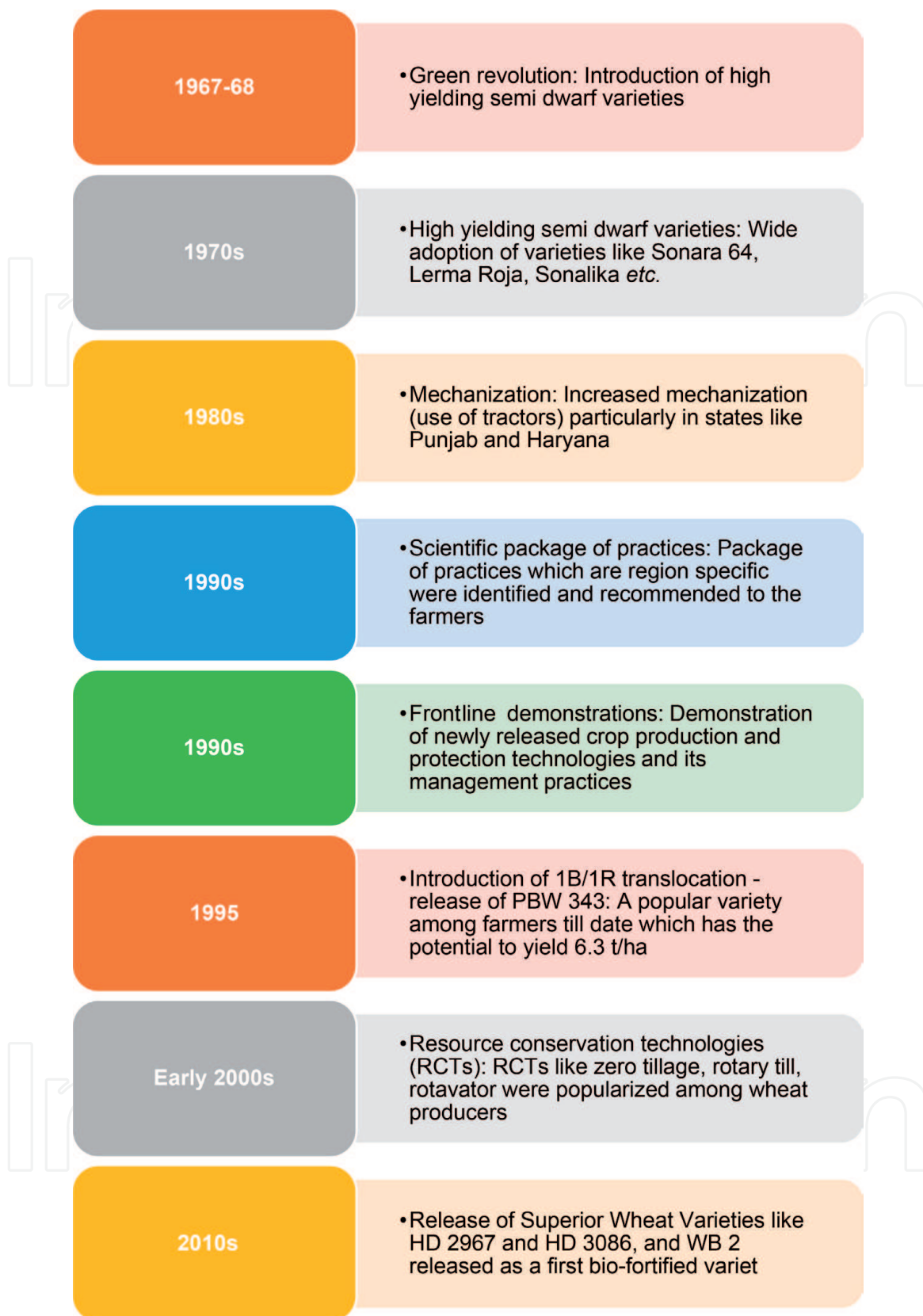
India, being blessed and enriched with a diverse agroecological condition, ensuring food and nutrition security to a majority of the Indian population through production and steady supply particularly in the recent past, is the

second largest producer of wheat worldwide [4–6]. The crop has been under cultivation in about 30 million hectares (14% of global area) to produce the all-time highest output of 99.70 million tonnes of wheat (13.64% of world production) with a record average productivity of 3371 kg/ha [7]. Having a significant share in consumption of food basket with a 36% share in the total food grains produced from India and ensuring not only food security but also nutrition security, wheat is extensively procured by the government and distributed to a majority of the population; it ensures not only food security but also nutrition security. The cereal is one of the cheapest sources of energy, provides a major share of protein (20%) and calorie intake (19%) from consumption. Wheat is accessible across the country and consumed as various processed forms from prehistoric times [4].

After independence, India was net deficit in food production and had to import wheat for domestic consumption. During 1966–1967, India adopted new strategy which led the ‘Green Revolution’, especially in the production of wheat and rice. Coordinated research and several developmental and food security-based programmes in various phases have made the nation to progress closer towards ‘food and nutrition for all’ by achieving record and surplus production of wheat. After the Green Revolution, the nation has maintained strategic distance from famine even during unfavorable weather conditions. The impact of the All India Coordinated Research Project (AICRP) on wheat improvement is explicit and contributed significantly to the nation’s food security [8].

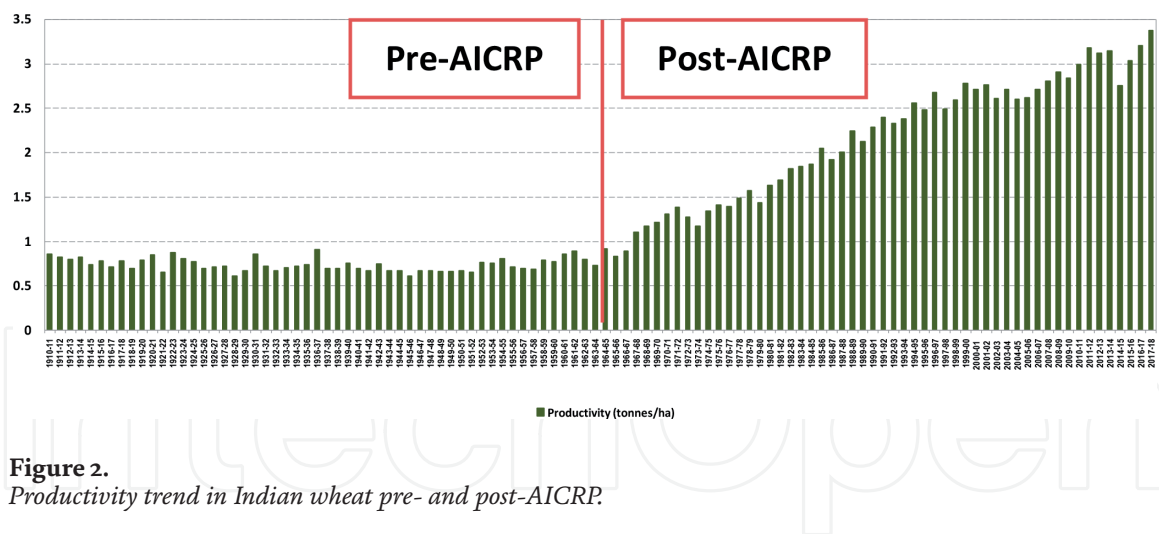
## **2. AICRP on wheat: an overview**

The All India Coordinated Wheat Improvement Project (AICWIP) was started in 1965 at the Indian Agricultural Research Institute (IARI), New Delhi, the nodal centre of the coordinated research. The AICWIP is one of the largest crop improvement network projects which set the dawn for the ‘Green Revolution’ in India. Under this project, several high-yielding wheat varieties have been developed which became extensively popular and adopted by the farming community. For instance, C 306, HD 2009, WL 711, UP 262, HUW 234, HD 2189, WH 147, Lok 1, HI 617 (Sujata), HD 2285, HD 2329, PBW 343, Raj 3765, PBW 502, HD 2733, HD 2967, HD 3086, DBW 17, PBW 550, GW 273, GW 322 and GW 496 in bread wheat and Raj 1555, PBW 34, HI 8498 and PDW 233 in durum wheat were developed and became the popular deliverables of the project. Apart from the aforementioned varieties, viz., NP 4, Kalyansona, Sonalika, Sharbati Sonora, WL 711, HD 1220, HD 1931 ‘SIB’, HD 2009, HD 2172, UP 262, etc., developed through the AICWIP were also cultivated beyond national borders. Several changes happened post inception of the AICWIP, and during 2017, the project has been renamed as the All India Coordinated Research Project (AICRP) on Wheat and Barley with ICAR-Indian Institute of Wheat and Barley Research as its headquarter based at Karnal (Haryana). It is a premier organization under the aegis of ICAR coordinating the multidisciplinary and multilocation testing of varieties in different AICRP centres across the different ecosystems for enhancing and sustaining the wheat production [8]. At present, there are 29 funded centres located in different agroclimatic regions across the country supporting the multidisciplinary research. The project, hitherto, has contributed in the release of around 448 high-yielding improved wheat varieties comprising bread, durum and dicoccum wheat. Over the years, prominent improvements have been made in the development arena post inception of the coordinated project (**Figure 1**).



**Figure 1.**  
*Major developments in the country post inception of the AICRP.*

Since the establishment of the AICRP, the productivity of wheat has increased by 2.5-folds (308%: +2.54 tonnes/ha) as furnished in **Figure 2**. A decadal analysis of productivity growth across major food commodities indicates that wheat production growth has outperformed rice and pulses for the past 5 decades since 1950. Overall scenario indicated that wheat production has grown at 4.72 percent per annum since 1950, the highest among other food grains [9].



**Figure 2.**  
Productivity trend in Indian wheat pre- and post-AICRP.

### 3. Current status of area, production and yield of Indian wheat

In India wheat crop is cultivated in *Rabi* season. It is normally sown during November and harvested between March and April. **Tables 1** and **2** furnish recent scenario in wheat area, production and productivity. The cultivated area under wheat at national level has shown increasing trend, from 29.04 million hectare to 30.54 million hectare with a magnitude of 1.5 million hectare (5%) net gain in terms of area. Uttar Pradesh has largest share in area with 9.75 million hectare (32%), followed by Madhya Pradesh (18.75%), Punjab (11.48%), Rajasthan (9.74%), Haryana (8.36%) and Bihar (6.82%). However, a major expansion in wheat area was observed in the states such as Jharkhand (51%), Madhya Pradesh (27%) and Rajasthan (13%). The sharp rise in minimum support price and government's procurement are the two important drivers which led to significant increase in the area under wheat cultivation [10].

The production of wheat has also showed an increasing trend, from 87.39 to 94.57 million tonnes from 2012–2013 to 2017–2018 with a magnitude of 7.18 million tonnes (8.22%). The major source of this increase in production is mainly attributed to expansion in area followed by marginal increase in productivity. Uttar Pradesh still holds the position of largest producer in the country accounting for about 28 million tonnes which is roughly 30% of the total production. Around 85 million tonnes (90%) of wheat has been produced from traditional wheat-growing regions such as Uttar Pradesh, Punjab, Haryana, Madhya Pradesh, Bihar and Rajasthan [10]. The maximum quantum jump has been noticed in Madhya Pradesh and Jharkhand which almost doubled their production from 9.45–16.32 million tonnes to 0.22–0.38 million tonnes. However, 1.4 million tonnes reduction was noticed in Uttar Pradesh during the same period which is a matter of serious concern.

The national productivity trend for wheat showed a marginal improvement, which has increased from 3009 kg/ha to 3100 kg/ha from 2012–2013 to 2017–2018 (**Table 2**). This rise in productivity is due to adoption of high-yielding varieties coupled with other inputs. The traditional wheat-growing states Punjab and Haryana have highest productivity than the national productivity [10]. The maximum increase in productivity has been observed in nontraditional wheat-growing states like West Bengal (23%), Himachal Pradesh (19.28%) and Assam (16.39%). However, the productivity of Haryana has declined which pose a serious matter of concern.

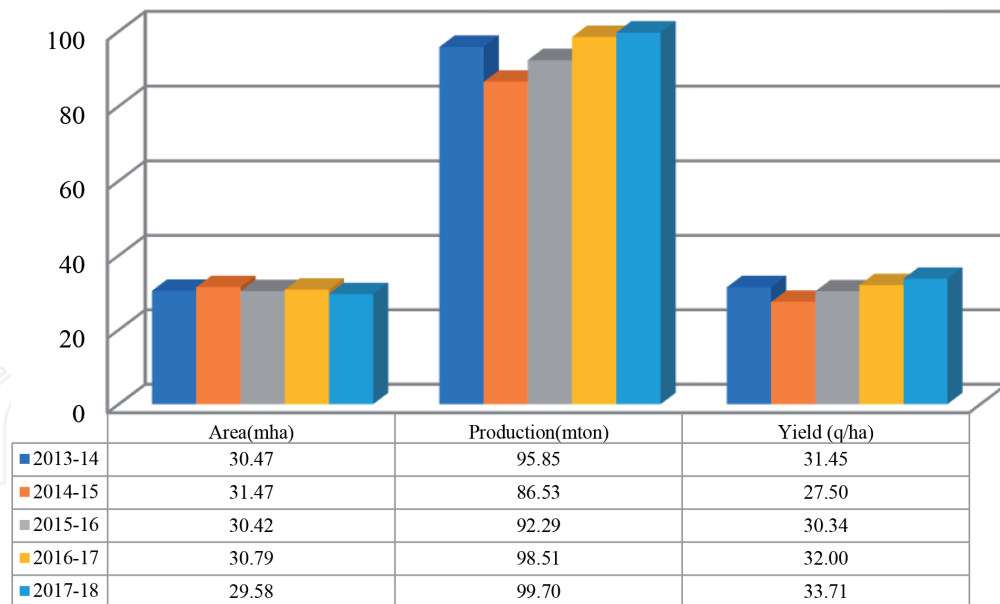
Quinquennial data on wheat area, production and yield for India indicates that there is a variation in crop acreage that declined to 29.58 million hectare (**Figure 3**). However, the production of wheat has increased significantly from 95.85 to 99.70 million tonnes. Increase in production was largely attributed to rise in productivity levels registered across the wheat-growing regions.

State/UT	Area (million ha)		Change (%)	Production (million tonnes)		Change (%)
	2008–2009 to 2012–2013	2013–2014 to 2017–2018		2008–2009 to 2012–2013	2013–2014 to 2017–2018	
Assam	0.05	0.02	-52.35	0.06	0.03	-43.40
Bihar	2.16	2.08	-3.57	4.63	4.86	4.98
Chhattisgarh	0.10	0.10	0.59	0.12	0.14	13.22
Gujarat	1.12	1.09	-2.85	3.20	3.22	0.60
Haryana	2.50	2.55	2.21	11.35	11.24	-0.93
Himachal Pradesh	0.36	0.34	-4.26	0.53	0.66	24.79
Jammu and Kashmir	0.29	0.29	1.83	0.44	0.48	10.52
Jharkhand	0.12	0.19	50.99	0.22	0.38	70.04
Karnataka	0.25	0.19	-25.30	0.23	0.20	-13.23
Madhya Pradesh	4.52	5.73	26.76	9.45	16.32	72.72
Maharashtra	1.01	1.05	4.79	1.61	1.48	-8.27
Punjab	3.52	3.51	-0.40	16.25	16.61	2.21
Rajasthan	2.63	2.98	12.99	8.12	9.31	14.62
Uttar Pradesh	9.66	9.75	0.94	29.33	27.93	-4.77
Uttarakhand	0.38	0.34	-9.89	0.85	0.81	-4.64
West Bengal	0.32	0.29	-8.33	0.85	0.80	-5.94
Others	0.04	0.04	-20.64	0.12	0.12	-3.54
All India	29.04	30.54	5.16	87.39	94.57	8.22

**Table 1.**  
 Statewise quinquennial average of area and production of wheat.

State/UT	2008–2009 to 2012–2013	2013–2014 to 2017–2018	Change (%)
India	3009	3100	3.03
Punjab	4617	4738	2.61
Haryana	4544	4407	-3.01
Others	3083	3331	8.05
Rajasthan	3038	3133	3.12
Gujarat	2845	2922	2.69
Uttar Pradesh	2724	2867	5.23
Madhya Pradesh	2698	2843	5.38
West Bengal	2241	2754	22.90
Uttarakhand	2144	2375	10.76
Bihar	2091	2339	11.87
Jharkhand	1790	2005	12.01
Himachal Pradesh	1602	1911	19.28
Jammu and Kashmir	1511	1656	9.58
Maharashtra	1466	1400	-4.53
Assam	1180	1373	16.39
Chhattisgarh	1149	1328	15.59
Karnataka	914	1057	15.64

**Table 2.**  
 Statewise quinquennial average of wheat yield (kg/ha).



**Figure 3.**  
Quinquennial scenario in area, production and yield of wheat.

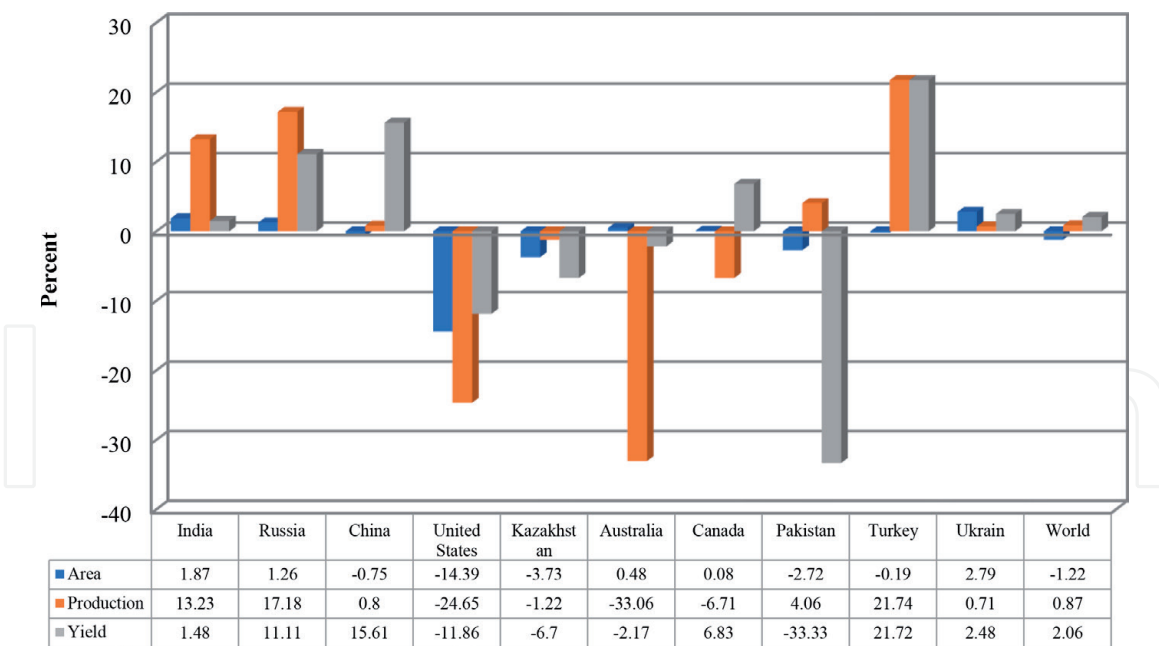
#### 4. Global scenario of area, production and yield of wheat

Wheat is one of the predominant staple foods and a main cereal crop of many diets around the world. **Table 3** furnishes the current scenario of area, production and yield of wheat in the world. Globally wheat is cultivated in an area about

Countries	Area (million ha)	Production (million tonnes)	Yield (tonnes/ha)
China	24.51 (11.14)	134.33 (17.60)	5.48
India	29.58 (14.00)	99.70 (12.91)	3.37
Russia	27.34 (12.43)	84.99 (11.14)	3.11
USA	15.19 (6.90)	47.35 (6.21)	3.12
Canada	8.98 (4.08)	29.98 (3.93)	3.34
Ukraine	6.64 (3.02)	26.98 (3.54)	4.06
Pakistan	8.97 (4.08)	26.67 (3.50)	2.97
Australia	12.25 (5.57)	21.30 (2.79)	1.74
Turkey	7.8 (3.55)	21.00 (2.75)	2.69
Kazakhstan	11.91 (5.41)	14.80 (1.93)	1.24
World	220	763.06	3.47

*Note: Figure within parenthesis indicates the percent to world.*

**Table 3.**  
Area, production and yield of major wheat-producing countries (2017–2018).



**Figure 4.**  
 Annual growth in area, production and yield (2017–2018 over 2016–2017).

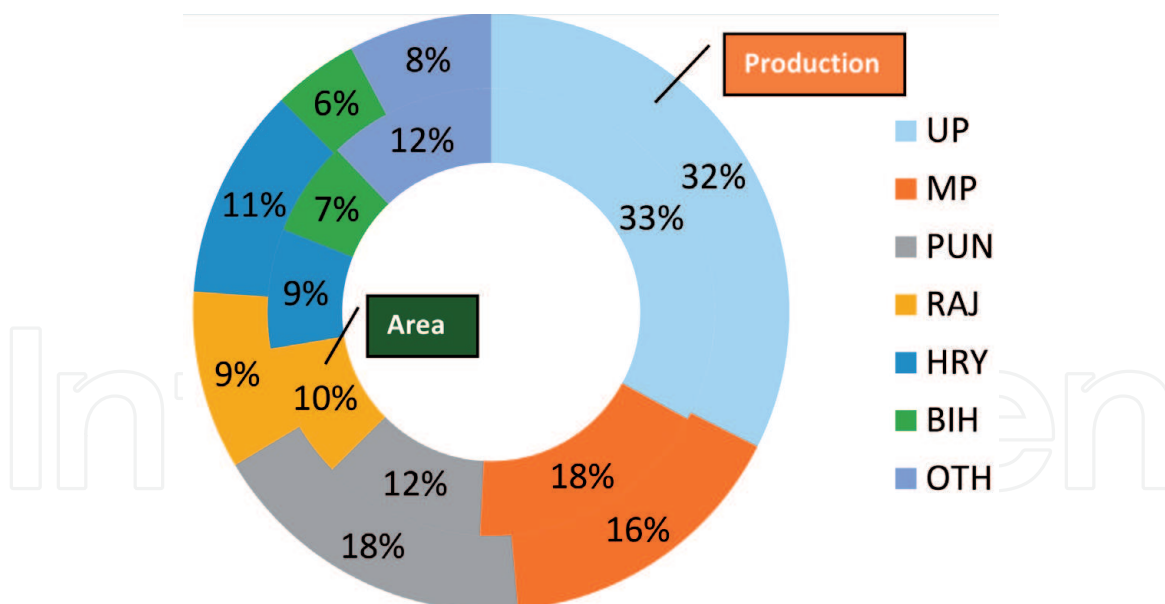
220 million hectares with a record production of 763.06 million tonnes of grain. Maximum area under wheat is in India (14%), followed by Russia (12.43%), China (11.14%) and the USA (6.90%) which altogether accounts for about 45% of global area. However, China is the major producer of wheat with a record production of 136 million tonnes, followed by India (98.51mt), Russia (85mt) and the USA (47.35mt). Around 449 million tonnes (58%) of wheat has been produced from traditional wheat-growing countries like China, India, Russia, the USA, Canada, Ukraine and Pakistan. The average yield per hectare is maximum in New Zealand (10 tonnes/ha), followed by Zambia (7 tonnes/ha) and Mexico (6 tonnes/ha). However, the average wheat yield in major wheat-growing countries is significantly low, and only China has maximum yield (5.48 tonnes/ha) followed by Ukraine, India and the USA. Despite India's productivity being on par with the world average, the per day productivity is relatively high (20 kg/day) in comparison to other countries, viz. the USA, Uzbekistan, Hungary, Poland, Italy, Bulgaria and Romania, which predominantly cultivates winter wheat with crop cycle hovering around 275 days. However, in India, in comparison to its competing country, China, the per day productivity is almost the same. It should be noted that the winter wheat-cultivating countries do not deal with any other crop in a year, while in India, in which spring wheat cultivation occurs around 150 days duration, farmers has the choice to grow at the maximum two sole crops apart from wheat [8].

The global wheat production has increased around 7 million tonnes (0.9%) in the year 2017–2018 in comparison to its past. The major source for the increase in production is mainly attributed to increase in productivity followed by marginal increase in area in major wheat-growing countries (**Figure 4**).

## 5. Regional disparity in Indian wheat production

At the national level, there is a shift in area, production and yield under wheat during 2008–2009 to 2012–2013 vis-à-vis 2013–2014 to 2017–2018. Currently, wheat acreage is around 30 million hectares. Comparing the past two periods, the change was more prominent in wheat production, followed by area and yield (**Tables 1 and 2**). The average change in production was around 9%. The country on an average produced





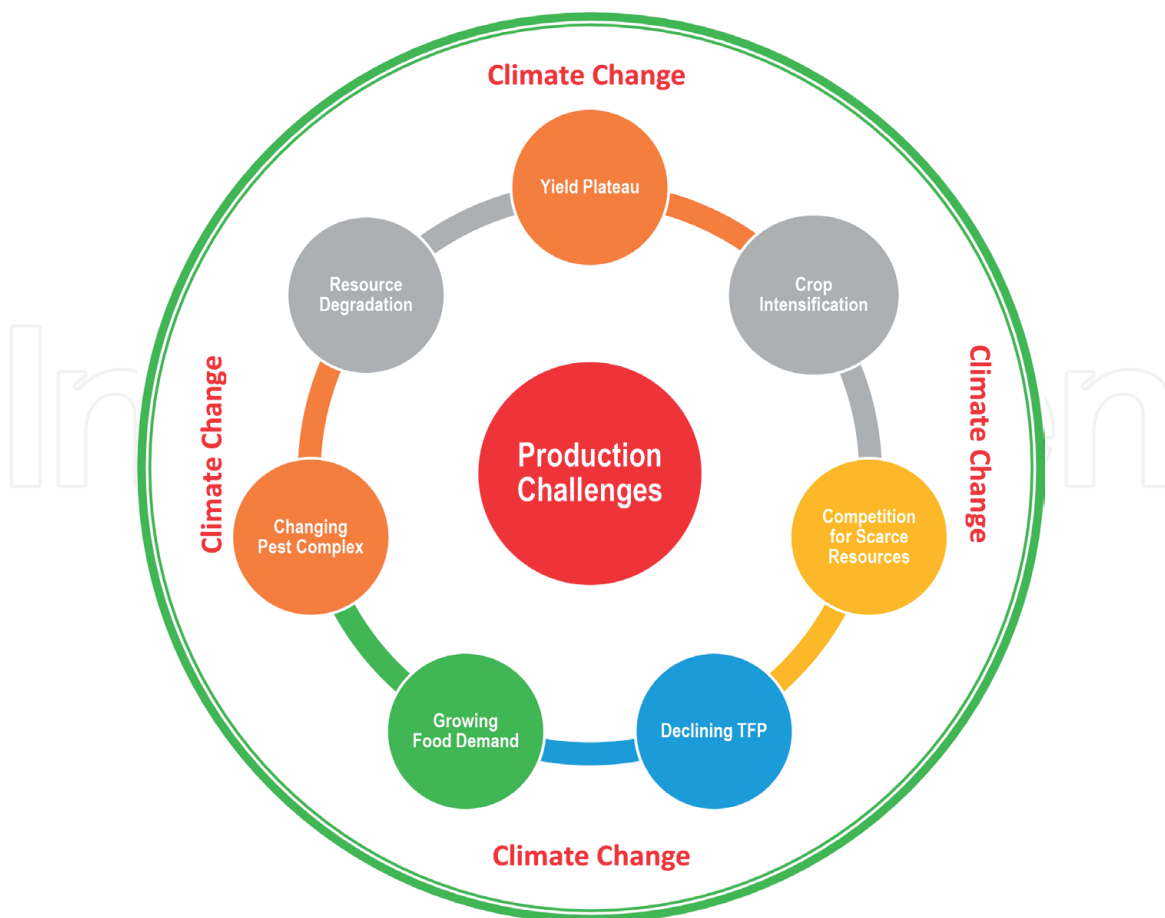
**Figure 5.**  
Statewise comparison of wheat area and production (2017–2018).

7.3 million tonnes more than the past period. The major wheat-growing states like Punjab, Madhya Pradesh and Rajasthan have witnessed positive change in area and yield and production [6]. Surprisingly, Jharkhand registered positive change in area, yield and production, while Haryana and Uttar Pradesh, the major traditional wheat-growing states, witnessed a negative change in production due to negative change in yield. Regional disparities in area and yield had a significant impact on the wheat production. Average production in Madhya Pradesh showed an increase by 6.87 million tonnes, followed by Rajasthan (1.2 million tonnes). However, the production has declined in Uttar Pradesh (1.41 million tonnes) and Haryana (0.11 million tonnes).

Statewise comparison of area and production for 2017–2018 shows that Uttar Pradesh, Punjab, Madhya Pradesh and Haryana were the major contributors to the national production (**Figure 5**). However, Punjab, Haryana and Uttar Pradesh retained the status of higher productivity for many years. The scope for additional production of these states has been limited due to stagnation of wheat acreage and yield. This indicates that these states almost reached their saturation in wheat cultivation and production. Potential exists for states like Rajasthan and Madhya Pradesh to explore for additional wheat production in the coming years. Area under these states has to increase in yield at farmers' field so as to attain higher production. The current production from these states is around 29 million tonnes which has to be doubled by 2050 with an overall production target of 140 million tonnes [11–13].

## 6. Production constraints and challenges for wheat production

Production constraints are manifold and vary from crop to crop and between regions. Burgeoning population vis-à-vis increasing demand for food; growing competition for cultivable land, irrigation water and energy; intensive cropping especially in the Indo-Gangetic Plains resulting in irrational use of resources; pest-environment interaction; reduction of natural resource base; declining total factor productivity; and yield plateau (**Figure 6**) are the prominent challenges put forth against crop production [11–14]. Wheat production not only faces the above routine challenges, but the intensity gets magnified in the context of climate change owing to its vulnerability [15–18].



**Figure 6.**  
*Production challenges in Indian setting.*

## 6.1 Climatic vulnerability

In India a significant part of wheat area is under heat stress, and Gangetic plains and central and peninsular India are the most heat-stressed regions, whereas it is moderate in northwestern parts of Indo-Gangetic Plains [19]. Variability in climate is also one of the biggest environmental threats to Indian agriculture, potentially impacting the wheat production and security. In India, it has been predicted that with every rise in 1°C temperature, the wheat production will be decreased by 4–6 million tonnes. Rainfed wheat will experience a reduction in yield with 9–25% profit loss for every 2–3.5°C rise in temperature [20].

## 6.2 Excessive use of inputs and land resources

After the Green Revolution, the productivity of wheat has been significantly increased with the increase in input usage, plant protection chemicals and irrigated areas. The excessive use of fertilizer, chemicals and irrigation has degraded the fertility of the soil and also caused a reduction in groundwater table. The mono-cropping system led to deterioration in soil quality. If the current trend continues, the country will face a serious problem in utilization of scarce natural resources.

## 6.3 Salt-affected and problematic soils

In India about 4.5 million hectares salt affected area is under wheat cultivation posing a major problem for canal irrigated areas [21]. Even though soil amendments and proper drainage are the more constructive solution, pace of reclamation is not substantial. This will significantly reduce the wheat yield.

## 6.4 Pest and disease complex

As year passes, the pests of wheat have developed some resistance even though controlled under contingent situation. If not, a new range of pests and diseases have been emerging putting a serious constraint on the wheat productivity.

## 6.5 Availability of improved seed

Adoption system and germplasm dissemination in India have been made in formal (organized) and informal (unorganized) ways [22]. Even though new improved varieties are developed and made available to farmers by NARS around, 80% of all seeds are saved by the farmers [19]. Further, a majority of farmers in India have lack of awareness of improved wheat varieties due to weak linkages [19]. The development and diffusion of improved varieties are crucial for achieving target production of wheat.

## 6.6 Price volatility

Volatility in prices of agricultural commodities has received considerable attention in the recent past among producers, consumers and policy makers. Price fluctuations create an uncertain farming situation threatening wheat production and have a negative impact on the welfare of wheat growers. Further, volatility in prices of wheat in international market hinders the smooth flow of trade across nations.

## 6.7 Decline in farm size

Over the years, a visible declining trend in farm holding size has been observed and is another major concern for the nation as a whole. This is caused by fragmentation of farmland owing to nuclear family system and decline in cultivable area due to urbanization. Estimate from the agricultural census (2010–2011) reports that

Zone	Major production constraints
Northern hills zone	Lack of accessibility of seed of newly released variety, <i>Phalaris minor</i> , small land holdings, high cost of inputs, non-availability of farm machinery, yellow rust, birds, lack of knowledge among the farmers about recent technologies, imbalanced use of fertilizer, lack of irrigation facilities
Northwestern plains zone	High cost of inputs, low price of wheat, erratic power supply, <i>Phalaris minor</i> , low organic matter in the soil, poor quality of seeds, non-availability of labour, untimely rain, <i>Chenopodium album</i> , non-availability of electricity
Northeastern plains zone	Small land holdings, inadequacy of seeds of newly released variety, lack of information among the farmers about recently developed new technologies, late sowing, temperature fluctuations during growth, high-priced inputs, poor quality of seeds, non-availability of labour, low organic matter in the soil, non-availability of farm machinery
Central zone	Non-availability of labour, imbalanced use of fertilizer, high temperature at maturity, limited accessibility to seed of newly released variety, temperature fluctuation during crop growth, high cost of inputs, lack of irrigation facilities, small land holding, decline in water table, untimely rain
Peninsular zone	Low price of wheat, irregular power supply, high cost of inputs, non-availability of labour, non-availability of electricity, higher rate of custom hiring, untimely rain, lack of facilities of canal irrigation, poor accessibility to seeds of newly released variety, temperature fluctuation during crop growth

**Table 4.**  
Zone-wise production constraints in wheat.

the average operational holding in India was 1.16 ha. Among major wheat-growing states, average operational holding was highest in the case of Punjab (3.77 ha) and lowest in Bihar (0.39 ha). Declining farm size and conversion of farmland to residential area are the major setbacks with respect to food production in general and wheat production in particular.

## 6.8 Declining total factor productivity

A major concern among policy makers is the declining total factor productivity over the years owing to stagnating yield levels with increased use of inputs and resource services. It is a major concern in the intensive cropping areas wherein rice-wheat is widely under cultivation. This can be countered by adoption of improved technologies coupled with the use of optimal resources.

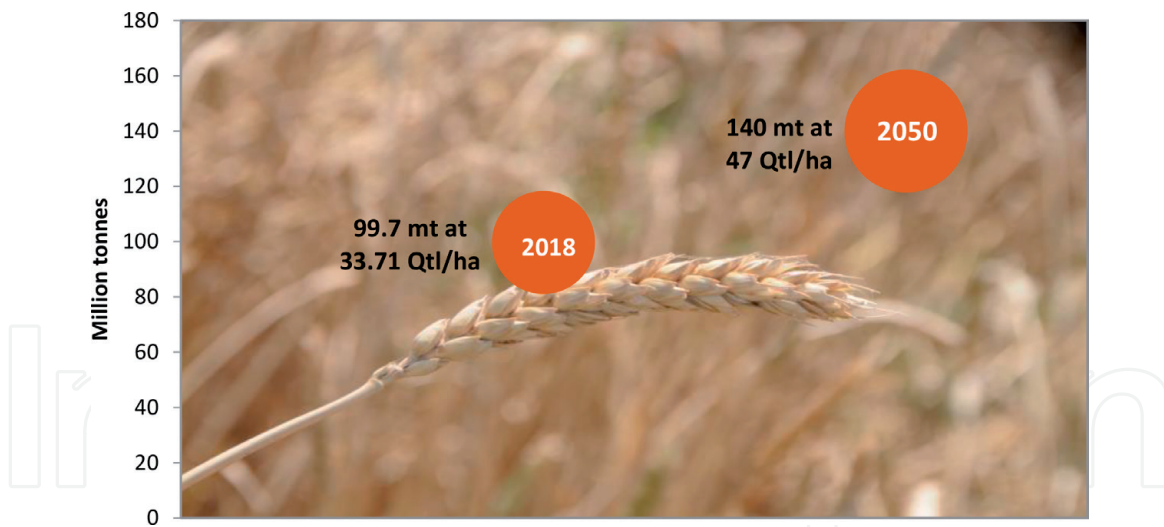
The constraints in wheat production are region-specific (**Table 4**), and it requires setting research priorities to address them. Rust, infestation of weeds such as *Phalaris minor*, wild oat, late sowing, low plant population, etc., were identified as the major constraints across wheat-growing zones.

## 7. Production target set for 2050 and strategies for increasing the productivity

With a limited scope for increasing the crop acreage besides the production threats and challenges at the forefront [12, 13], the production target has been fixed at 140 mt by 2050 (**Figure 7**) [11]. Under stable wheat acreage and given the optimistic production target, the existing average yield has to be increased from 33 to 47 Qtls/ha by 2050. Concerted research should focus to break the yield barriers in gradual manner and develop genotypes tailored for specific wheat-growing regions.

The following are the strategies set for increasing the crop productivity to achieve the set target of 140 million tonnes [9, 23, 24]:

- Improvement of wheat under conventional methods
  - a. Exploitation of heterosis for developing the hybrids
  - b. Pre-breeding programme by broadening the varieties' genetic base
    - i. Capitalizing exotic germplasm and extensive utilization
    - ii. Precision phenotyping of germplasm
    - iii. Mining novel alleles for genes of known function
    - iv. Production of segregating populations for lines of interest identified in primary germplasm screens
    - v. Use of existing landrace x elite segregating populations to identify QTL controlling traits of interest
    - vi. Production of NILs for QTL and allelic variants
    - vii. Assessing agronomic performance of NILs
    - viii. Development of informative genetic markers and their use in commercial wheat breeding programmes



**Figure 7.**  
*Existing production and target for 2050.*

c. Development of new plant types

i. Desired canopy structure

ii. Rapid leaf area development

iii. Rapid nutrient uptake

iv. Increasing lodging resistance (robust stem)

• Biotechnological interventions

a. Marker-assisted breeding

b. Wheat genome sequence and associated genomic tools

i. Allele mining on the basis of probing germplasm sets for specific gene sequences

ii. Innumerable new molecular markers in genomic regions of choice to facilitate large-scale cloning of new genes

iii. A plethora of approaches for understanding the function of each and every gene

iv. Understanding temporal and tissue-specific gene expression in response to developmental and environmental cues

v. Uncovering molecular basis of complex adaptation syndromes including tolerance to various abiotic stresses

vi. Designing of a genome-wide perfect marker system based on SNPs in entire gene space of the species

c. Potential of wheat transgenics and possibilities of greater public acceptance

d. Functional characterization of genome

- Tackling disease resistance
- Tackling abiotic stress-climate change
- Resource management
- Quality improvement
- Policy reorientation [6]
  - a. Price policy
  - b. Seed policy
  - c. Credit policy
- Institutional innovations like e-National Agriculture Market
- Extension: transfer of technology
  - a. Economic assessment of various improved technologies for upscaling and outscaling
  - b. Promotion of resource conservation technologies [25]
  - c. Awareness among farmers of new improved varieties and production technologies for yield as well as income enhancement [26, 27]
  - d. Wheat atlas: creation and updating regional-level database on parameters like area, production, yield, yield gaps and input usage.
  - e. Analysis of benefit-cost ratio (BCR) in wheat production and development
  - f. Access to critical inputs for timely sowing like improved seeds particularly in eastern UP, Bihar, Jharkhand and Chhattisgarh; access to fertilizers, irrigation water and farm machinery [28]
  - g. Infrastructure development (roads, storage structures, market)

## **8. Conclusion**

Agriculture transformation is of utmost importance for regional development. Cutting-edge research involving multidiscipline is the need of the hour and is expected to develop superior genotypes breaking the yield barrier. Despite being cost-intensive, development is mandatory which warrants for higher public and private investment in R&D. In addition, productivity has to be increased through massive efforts from extension personnel who serve as change agents among the farming community. A reorientation in price policy (fair price system benefiting both producers and consumers, deficient payment system to producers for difference between the market and procurement price and cash transfers to producers under colossal loss), seed policy (quality seed production and ensuring its availability for all) and credit policy (timely distribution with minimum

administrative work) is highly required to support the existing production system and to carry forward. Increased access to input and output markets, revamped distributions systems, investment in rural infrastructures and skilling of the rural labour force will help immensely to increase the crop productivity. On the whole, a synergy between research-extension-policy-institutions will play an impending role to achieve the desired level of production as well as to ensure food security for future generation. The realization of the expected increase in production in agriculture will only be possible with high efficiency, high quality, resistance to biotic and abiotic stresses and by offering them to the service of the farmer by improving the stable varieties in breeding programmes.

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