STATUS PAPER
ON
WHEAT

सत्यमेव जयते

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FOREWORD

Wheat stands equally with Maize ensuring global food security. India achieved the feat of "deficit to surplus" status with the introduction of Mexican dwarf wheat that brought the great Green revolution in India during the sixties. One third of the Indian population depends on wheat as their main food. India is the second largest producer of wheat after China claiming the position of a significant stakeholder in Global wheat production. During the XI plan period (2007-08 to 2011-12), the country experienced steep increase in total foodgrains production. Being one of the major contributors of country's total foodgrains production, wheat production was recorded to be 93.5 million tonnes reaped from an area of 29.65 million ha with a productivity level of 3119 kg/ha (4th Adv. estimate of GoI, 2012-13). The level of production was further augmented to an all time record figure of 95.85 million tonnes during the year 2013-14 (3rd Adv estimate of Govt of India)

The Directorate of Wheat Development, Ghaziabad has pooled information from various sources and brought out this publication " Status Paper on Wheat" covering various aspects of cropping season, zonal classification viz, 6 zones spread over the entire country, levels of crop production, pests and disease management, varietal development, post harvest status and export status etc. in respect of Wheat. Besides, status of various ongoing schemes and programmes of the Government for enhancing production and productivity of Wheat in the country that have been documented in the publication. My sincere word of appreciation is therefore attributed to the team of Govt of India officials comprising Shri Sanjay Lohiya, Joint Secretary(Crops), Dr. D.P.Malik, Addl. Commissioner(Crops) and Dr. G. K. Choudhury, Director, Directorate of Wheat Development, Ghaziabad and his entire team for their tireless efforts in bringing out this publication.

I acknowledge the efforts made in documentation of various aspects of wheat cultivation and production in an well organized and systematic manner. I hope the publication will definitely be helpful for the State and Central Governments, policy makers, Extension workers, academicians and researchers besides various stakeholders including farming community as a whole.

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PREFACE

Wheat is the major constituent of the global food security along with maize and is therefore attracts the attention of our policy maker, scientists, development worker, grower and marketing agencies in terms of production and productivity are concerned. India ranks second in terms of production and is presently reaping record production of 95.85 million ton from an area of about 30 million ha. The giant leap of production per se had been the consolidated efforts of the farms at the top and the development workers, policy makers and scientists.

Although, there had been the quantum jump in production during the 11th Five Year Plan, there remaining a dearth of availability adequate information in a complied form to refer. Question raised ever now and then by individual in every sector about the Status of Wheat variety there suitability to different climatic zones the recommended packages and practices, the pest and disease problem and storage and marketing have forced us to comment us a bunch of information.

The problems of Yellow Rust of Wheat have been a great threat to Wheat as it may be adequately stated that “More yield more threats of Rust”. Directorate of Wheat Development have been actively involved in collaboration with the Directorate of Wheat Research (ICAR), Karnal and States to carry out survey and surveillance in various parts of the country including Ladakh region for the past few years. The growing awareness among the growers may thus be envisaged as the outcome of such survey and surveillance.

Directorate of Wheat Development, Ghaziabad is indebted to Dr. J. S. Sandhu, Agriculture Commissioner, Shri Mukesh Khullar, Former Joint Secretary (Crops), Shri Sanjay Lohiya, Present Joint Secretary (Crops), for there impressive encouragement in bringing out this Status paper. Sincere gratitude is extended to Smt A. Neeraja, Former Director (Crops) for her encouragement in materialising the progress of Status paper.

Last but not the least deep gratitude is extended to Shri Narender Kumar, Jt Director, Dr. P. P. Singh, Senior Technical Assistant, Shri Vipin Kumar Singh and Shri Subrata Sarkar, Technical Assistants whose sincere efforts have materialised in bringing out this Status paper.

(Dr. G.K. Choudhury)

ACRONYMS

A3P	Accelerated Pulses Production Programme
AICRP	All India Coordinated Research Project
AICWIP	All India Coordinated Wheat Improvement Project
APEDA	Agricultural and Processed Food Products Export Development Authority
ATMA	Agricultural Technology Management Agency
AVT	Advance Varietal Trial
BE	Budget Estimate
BGREI	Bringing Green Revolution to Eastern India
CACP	Commission for Agricultural Costs and Prices
CDD	Crop Development Directorate
CHA	Chemical Hybridisation Agents
CGMS	Cytoplasmic Genetic Male Sterility
CSC	Central Seeds Committee
CVRC	Central Varietal Release Committee
CYMMIT	International Maize and Wheat Improvement Center
CZ	Central Zone
DAC	Department of Agriculture and Cooperation
DAS	Day after Sowing
DGFT	Director General of Foreign Trade
DSR	Direct Seeded Rice
DWR	Directorate of Wheat Research
EC	Emulsifiable Concentrates
FAP	Food and Agriculture Organisation
FCI	Food Corporation of India
FIRB	Furrow Irrigated Raised Bed-Planting
FLDs	Front Line Demonstrations
FYM	Farm Yard Manure
GoI	Government of India
HYV	High Yielding Variety
IARI	Indian Agriculture Research Institute
ICAR	Indian Council of Agricultural Research
ICRADA	International Crop and Research for Dry Areas
ICRISAT	International Crops Research Institute for the Semi - Arid Tropics
ICT	Information & Communication Technology
IFPRI	International Food Policy Research Institute
IGP	Indo-Gangetic Plain
INM	Integrated Nutrient Management

IPM	Integrated Pest Management
IVTs	Initial Verietal Trials
IW/CPE	Irrigation water/Cumulative Pan Evaporation
KVK	Krishi Vigyan Kendra
MAS	Molecular Assisted Selection
MOA	Ministry of Agriculture
MSP	Minimum Support Price
NABARD	National Bank for Agriculture and Rural Development
NBPGR	National Bureau of Plant Genetic Resources
NIVTs	National Initial Varietal Trials
NLMOT	National Level Monitoring Team
NCDC	National Co-operative Development Corporation
NCAER	National Council of Applied Economics Research
NDC	National Development Council
NEPZ	North Eastern Plains Zone
NFSM	National Food Security Mission
NHZ	Northern Hill Zone
NMAET	National Mission on Agriculture Extension and Technology
NMSA	National Mission on Sustainable Agriculture
NPT	New Plant Type
NSC	National Seeds Corporation
NSS	National Sample Survey
NSSO	National Sample Survey Organisation
NWPZ	North Western Plains Zone
PZ	Peninsular Zone
RCTs	Resources Conserving Technologies
RE	Revised Estimate
RKVY	Rashtriya Krishi Vikas Yojana
RWCS	Rice-Wheat Cropping System
SAMB	State Agricultural Marketing Board
SAU	State Agriculture University
SFCI	State Farms Corporation of India
SHZ	Southern Hill Zone
SMF	Small Marginal Farmers
SRR	Seed Replacement Rate
SSC	State Seed Corporation
SVRC	State Varietal release Committees
WUE	Water Use Efficiency
ZT	Zero Tillage

CONTENT

ANNEXURES

EXECUTIVE SUMMARY

Wheat (*Triticum* spp.) belongs to the genus *Triticum* of the Poaceae (Gramineae) family originally from the Levant region of the Near East and Ethiopian Highlands, but now cultivated worldwide. The three species of wheat namely, *Triticum aestivum* (bread wheat), *Triticum durum* (macaroni wheat) and *Triticum dicoccum* (Emmer or Khapli wheat) grown on commercial basis in the Indian subcontinent from pre-historic times with share of production in percent 95%, 4% and 1% respectively, are being cultivated in the country.

Wheat is a very adaptable crop and is grown under the wide range of soil & climatic conditions. The crop is most successfully grown between latitude of 30^0 N & 60^0 N and between 27^0 S & 40^0 S. In India it is grown mostly in the plains where as in the hills it is cultivated in mountainous region of North India & Nilgiris and Palani hills in South India. For convenience of testing & finding out the correct adaptability the country is divided into six different wheat growing zones namely Northern Hill Zone (NHZ), North Western Plains Zone (NWPZ), North Eastern Plains Zone (NEPZ), Central Zone (CZ), Peninsular Zone (PZ), and Southern Hill Zone (SHZ). The zone -wise total percentage of Acreages of wheat crop are 2.9%, 40.1%. 33.2%, 18.1%, 5.4% and 0.4% respectively.

Wheat is used by human beings in form of flour for making Chapaties, Semolina and Pasta products. It is also used for preparation of bread, biscuits, cookies, cracks, noodles, dalia, maida, vermicelli, etc. Wheat straw is also used for the animal feed as fodder and for packaging materials. The Wheat contains nearly carbohydrates 70%, protein 12%, fat 1.7%, minerals 2.7%, fiber 2% and moisture 12%.

Wheat is world's leading cereal crop, cultivated near about 216.6 million hectares with a production of 674.88 million tonnes of grain with 3115 kg/ha productivity (2012-13). India (29.90 million ha) ranks first in area coverage followed by China (24.13 million ha), while in production China stands first (120.50 million tonnes) and India ranks second (94.8 million tonnes). As regard the average yield of wheat in the world per hectare, France (75 qtls/ha) ranks first followed by Germany (73 qtls/ha).

Wheat (Triticum spp.) is the second most important winter cereal in India after rice. The share of Wheat in total food grain production is around 36.25% and share in area is about 24.83 % of the total area under food grains. The area under wheat during 2013-14 was 31.13 million ha with a production of 95.85 million tonnes and productivity of 30.6qtl/ha (3^{rd} Advance Estimates 2013-14, DAC). About 99.5% of the wheat production comes from Uttar Pradesh, Punjab, Haryana, Madhya Pradesh, Rajasthan, Bihar, Maharashtra, Gujarat, Karnataka, West Bengal,

Uttarakhand, Himachal Pradesh and Jammu & Kashmir and remaining contributed by rest of the States.

The total production increased to the magnitude of more than six folds from roughly 12.3 million metric tons in 1964-65 to an estimated 95.85 million metric tons in 2013-14. This feat was achieved as a result of a strong research back up that facilitated the development of improved high yielding varieties of wheat resistant to diseases with stable performance.

All India Coordinated Wheat Improvement Project (AICWIP) working in close collaboration with Rockfellar Foundation as was desired by Dr. Norman E. Borlaug. It recognizes and overviews inter-disciplinary collaborations between various cooperating centers and helps to promote close inter institutional linkages, international and intra-national exchange of materials and is finding solution to specific problems. The main strength and approach of AICWIP is multi-disciplinary and multi-locational type of comprehensive research and testing of newly developed genotypes besides taking care of germplasms evaluation through various national and international nurseries. The real breakthrough in wheat revolution started after introduction of Mexican varieties and breeding materials in the country and free flow of material to the wheat coordinating centres. Since its inception of (1965) the wheat programme, both the Central Varietal Release Committee (CVRC) and State Varietal Release Committee (SVRC) has released about 375 Wheat varieties so far. Out of these, 316 were bread wheat, 49 durum wheat and 5 dicoccum wheat besides 5 Triticales were developed.

The genetic breakthrough of Indian wheat research achieved during the pre and post green revolution era such as Terminal heat tolerance, Adult Plant Resistance (APR) and Durable Rust Resistance (DRR), Karnal Bunt Resistant (KBR), Genetic adaptation of wheat to Salt tolerance, Genetic bio-fortification, use of Transgenic and Gene Exchange and hybridization etc.

The sole responsibility for production of breeder seeds is coming under the preview of Indian Council of Agricultural Research (ICAR) & State Agricultural Universities (SAUs). Further, the responsibility for production of foundation and certified seeds are by State Seeds Corporations/State Department of Agriculture to the extent of 40% of the requirement, National level seed agencies have the responsibility of 40% & Private seed sectors have the responsibilities of remaining 20% of the requirement. The present average Seed Replacement Rate (SRR) of wheat crop is about 32.6 % (2011) against the targeted 33%. This is because of the fact that large quantities of farm saved seeds are being used by the wheat farmers across the country.

Wheat is grown mainly in cropping sequences like Rice-Wheat, Jowar-Wheat, Bajra-Wheat, Maize-Wheat, Pulse-Wheat, Cotton-Wheat, Soybean-Wheat etc. in different parts of the country under irrigated condition. Under rainfed condition, fallow-Wheat is most common,

but sometimes short duration pulse crops may precede Wheat in assured rainfall areas. Some of the important problems are: Depletion of Ground Water Resources, Decline in Soil Fertility, Decline in Factor Productivity, Rising Problem of Insect-pest and Disease Complex and Shift in Weed Flora.

North-Western parts of the Indo-Gangetic Plain (IGP), suggested for infusion of a complimentary set of new agricultural technologies to boost productivity growth. These Resource Conserving Technologies (RCTs) such as Zero and rotary tillage, Furrow Irrigated Raised Bed (FIRB) & Surface Seeding which are sustaining and enhancing the productivity of the rice-wheat system at reduced cost of production, are backed-up by the new research findings conducted in participation with farmers.

To facilitate procurement of food grains, Food Corporation of India (FCI) and various State Agencies in consultation with the State Govt. establish a large number of purchase centres at various mandis and key points. The Govt. policy of procurement of Food grains has the broad objectives of ensuring Minimum Support Price (MSP) to the farmers and also ensuring availability of food grains to the weaker sections at affordable prices. About 280.23 lakh tonnes wheat has been procured on MSP Rs. 1400 per quintal by the various procurement agencies of the country during the marketing year 2014-15.

With a view to supplement the efforts of the State Departments of Agriculture in increasing the production and productivity, the Ministry of Agriculture, Govt. of India are implementing National Food Security Mission, Bringing Green Revolution to Eastern India (BGREI), National Mission on Sustainable Agriculture (NMSA), National Mission on Agriculture Extension and Technology (NMAET), Rashtriya Krishi Vikas Yojana (RKVY), New Crop Insurance Scheme & Crop loan at low interest rate (4%) to the farmers in the country.

Besides, Krishi Karman Award has been provided to the State Governments by Ministry of Agriculture, Government of India for increase the production of wheat and several awards like ICAR Norman Borlaug Award, Chaudhary Devi Lal Outstanding All India Coordinated Research Project Award, Vasantrao Naik Award for Outstanding Research Application in Dry land farming systems, Jagjivan Ram Abhinav Kisan Puruskar /Jagjivan Ram Innovative Farmer Award (National/Zonal), N.G. Ranga Farmer Award for Diversified Agriculture have also been provided to the Scientists/Research scholars for development of area specific improved production technology on wheat and wheat based cropping system in the country.

Though, the total production increased to the magnitude of more than six folds from roughly 12.3 million metric tons in 1964-65 to an estimated 95.85 million metric tons in 2013-14. In future, to meet the growing demand of wheat in the country and to explore the possibility of increase the production & productivity of wheat the following researchable as well as developmental issues may be flagged.

- Enhancing yield and adaptability of wheat varieties under changing climatic conditions.
- Creation of new variability from un-utilized genetic resources.
- Utilizing molecular approaches for precision breeding.
- Enhancing seed production for increased seed replacement of older varieties.
- Adopting suitable screening assays for heat stress tolerance, water and nutrient use efficiency to facilitate large scale germplasms evaluation.
- Initiating breeding for heat stress tolerance and water use efficiency on the basis of physiological indices and molecular markers.
- Exploring the possibility of transgenic approach for abiotic stress tolerance.
- Host resistance – identification of new and diverse sources of resistance with emphasis on multiple disease/pest resistance.
- Devise eco-friendly management strategies for disease and pest control and promote IPM.
- Integrating molecular tools for understanding variability in pathogens.
- Develop and fine-tune the package of practices and varieties specific to RCTs - zero tillage, bed planting, need based application of nutrients (N) using leaf colour charts and remote sensing based crop canopy sensors etc.
- Evaluating the long term effect of tillage and residue management options on soil properties, pest dynamics and productivity of wheat.
- Focused attention on integrated nutrient, integrated weed management and water management.
- Diversification/intensification of rice-wheat and other wheat based systems to improve profitability and sustainability.
- Special emphasis on conservation agriculture to address the issue of climate change and ill-effects of residue burning.
- Development of product specific varieties with enhanced nutritional quality.
- Understanding genetic and molecular basis of quality traits
- Development of micro level tests to expedite the breeding efforts
- Enhancing bio-availability of micronutrients (Fe and Zn) by reducing anti-nutritional factors and increasing antioxidant activities.
- Faster dissemination of improved technologies developed for increasing wheat productivity.
- Data base of farmers for bulk SMS message during crop period.

CROP DESCRIPTION

1: CROP DESCRIPTION

1.1 Scientific Name: Triticum spp.

Triticum sphaerococcum- Indian wheat
Triticum aestivum- common Bread Wheat
Triticum durum- Macaroni wheat
Triticum dicoccum- Emmer Wheat.

1.2 Origin of the crop:

Wheat is cultivated since pre-historic times in the world. From all possible records, it seems that its center of origin is South Western Asia. It is believed that Aryans brought wheat grains to India and since then it is being grown in India. Records from ancient China show that it is raised there since 2700 BC, and it was also known to Egyptians and inhabitants of Switzerland as early as Stone Age. The Centers of origin of Triticum species are given below.

Table- 1.1: Centers of origin of Triticum species

Species (Ploidy level)	Common name	Centre of origin
aestovum (6x)	Bread wheat	Central Asia, North East
docpccum (6x)	Emmer wheat	Abyssinia
durum (4x)	Macaroni wheat	Near East, Mediterranean Region Abyssinia

Source: Zeven and Zhukovsky (1975) amd Hawkes (1982)

1.3 Importance: Wheat is the one of the staple foods of north Indian population. Wheat grains are ground in to flour (atta) and consumed mostly in the form of chapati or leavened bread. Soft wheat is used for making chapati, bread, cake, biscuits, pastry and other bakery products whereas hard wheat is used for manufacturing rawa, suji, and sewaya. In areas where rice is a staple food grain, wheat is also eaten in the form of puri etc. It is also used for making cakes and sweet meats etc. Wheat grain is used for preparing starch. Wheat straw is used as fodder, padding material and mulching material.

1.4 Morphology: Wheat is an annual plant belonging to the family Poaceae (Gramineae).

1.4.1: Roots – Wheat plant consists of two sets of roots viz seminal roots and clonal roots (crown roots). Seminal roots arise from germinating seedlings and the crown roots arise from the basal node of plant. The crown roots form the permanent root system while the seminal roots dry after about 30 days of the seedling emergence.

1.4.2: Stem: - Wheat stem (culm) is erect, cylindrical, jointed and smooth. The solid joints are termed as nodes which separate the plant into sections known as internodes and these nodes/internodes are differentiated when plants start elongating. The lower internodes are shorter while the upper ones are progressively longer. The main culm produces branches at the base close to the ground called the tillers (primary) and the tillers produce the additional tillers known as secondary and tertiary tillers.

1.4.3: Leaves: Wheat leaves consist of two parts, the leaf sheath which encircles the stem and the blade that bends away from the stem. The foliage arrangement on culm is opposite.

1.4.4: Inflorescence: The inflorescence is called ear or spike. Three to five florets are arranged in spikelets on rachis node. Each floret contains three anthers (androecium) and one ovary (gynoecium) bearing bifurcated feathery stigma. Cleistogamous condition i.e. pollination takes place in closed flower favours self pollination. But out crossing to the extent of 5% many take place depending upon the floral morphology of varieties.

1.4.5: Seed: Wheat seed is called caryopsis with a thin walled pericarp enclosing single seed coat and testa is fused with pericarp. The seed shape is oval and the colour is red, white or amber.

1.5: India's global position, Crop Species grown and their distribution: Currently, India is second largest producer of wheat in the world after China with about 15% share in total world's wheat production. Currently, India is surplus in wheat production and in a position to export. Three species of Wheat namely, (i) *T. aestivum*, (ii) *T. durum and (iii) T. diococcum* are being cultivated in the country, the details are as under:

Table- 1.2: Wheat Species-wise contributions in production in India

Sl. No.	Species	Percentage share of Production	Major growing areas
1.	*T. aestivum*	95%	Major growers are Uttar Pradesh, Punjab, Haryana, Rajasthan, Bihar, West Bengal, Assam, Parts of Madhya Pradesh, Himachal Pradesh, Jammu & Kashmir, Gujrat, Maharashtra, Uttarakhand and Chattisgarh
2.	*T. durum*	4%	The durum cultivation is confined to Madhya Pradesh, Maharashtra, Gujrat, Southern Rajasthan and few locations in Punjab.
3.	*T. diococcum*	1%	Karnataka, Maharashtra & Tamil Nadu

1.6: Nutritional value:

Wheat is used by human being in the form of flour for making Chapaties, Semolina and Pasta products. It is also used for preparation of bread, biscuits, cookies, cracks, noodles, dalia, maida, vermicelli, etc. Wheat contains about 70% carbohydrates, 12% protein, 1.7% fat, 2.7% minerals, 2% fiber and 12% moisture.

1.6.1: Quality Parameters:

Significant nos of wheat grain samples are analysed every year under All India Coordinated trials. These are evaluated during the research trials(2nd Year AVT). The promising specific genotypes the have been evaluated for specific wheat products so far are as follows:

Table- 1.3: Product-wise Quality Wheat Varieties

Product for which evaluated	Qualifying Score	Promising quality wheat varieties or genotypes
Chapati	8.0 out 10	C-306, Raj-3765, HD-2285, PBW-226, PBW-175, K-8027, K-9107, MACS-6145, UP-262, NW-1014, HUW-234, HUW-533, LOK-1, Sujata, HI-1500, HW-2004, DL-788-2, GW-173, GW-273, G-322, Raj-3077, HD-2833
Bread	More than 575 ml loaf volume	HS-240,VL-738,HD-2285,PBW-396,HD-277,HD-2733,NW-2036,LOK-1, GW-120,GW-173,GW-496,HI-977,HD-2189,HD-2501,HD-2781,DWR-162, DWR-195,MACS-2496,NE-5439
Biscuit	More than 8.0 spread factor	Sonalika, UP-2425, HS-490
Pasta	More than 6.5 score out of 9.0	PDW-233, WH-896, PBW-34, HI-8498, HD-4672, Raj-1555, A---30-1, MACS-2846, DDK-1009, NP-200

The parameters considered important for determining wheat quality are the grain Protein Content, ß - Carotene Content, Hectolitre Weight, Sedimentation Value, Moisture content, Gluten(wet,dry and gluten index), Grain Hardness index/appearance, Test weight, Alkaline Water Retention Capacity and Yellow Berry Incidence.

Hard wheat (*T.aestivum*) with strong gluten content are the main quality requirements for bread making. For biscuit making, the requirements are Low protein with weak gluten content found in *diococcum* type of wheat or soft what and for chapatti making, the requirements are medium to high protein and medium gluten .Hard type of wheat (*T.durum*) with strong gluten, high protein with high ß - Carotene Content are required for Pasta and traditional products making.

The Indian bread wheat or aestivum and pasta or durum wheat varieties possess low levels of grain iron (27-55 ppm), and zinc (20-50 ppm). Therefore, there is a requirement of enhancing the iron, zinc and micronutrient content in wheat through biofortification. With an objective of developing biofortified wheat, many cultivars or genotypes have been identified or developed for cultivation through implementation of suitable breeding strategies. Some promising cultivars recently identified for best quality and nutritional parameters are as follows:

Table- 1.4: Parameter-wise Quality Wheat Varieties

Parameters	**Promising types of** *T.aestivum*	**Promising types of** *T.durum*
Sedimentation Value	HS576, HS536, HPW349, HPW399, HD3117, PBW688, UAS348, MP3288, K1116, NI5439	MACS3929, A-9-30-1, UAS446, GW1292
Grain Hardness Index	UP2848, HD3070, C306, HD2888, BRW3723, HD3123, MACS6568, NIAW1415, COW(W)1, HW4042 (-90), VL967, HS490, VL3001	PDW291, HI8739, UPD94, A-9-30-1, AKDW2997-16, UAS446 (-90)
Yellow Pigment	VL907, HS542, PBW373, NW2036, UAS334	MACS3929, HI8713, DDW23, MPO1255, HI8735
Iron	K8027, HD2888, MP3288, DBW93, NIAW1415, NI5439, HW5224, COW(W)1, HW2044, HW5216	MPO1244, HI8627, HI8742, UAS446, GW1292
Zinc	HS578, HUW668, WH1136, UP2845, HW2044, HW5216, HW4013, HW5237, HW1900	HI8736, WHD948, NIDW699

1.7: Wheat Growing zones and crop distribution in India: Based on soil characterization, rainfall, temperature and terrain, six main Agro-climatic zones for wheat cultivation in India have been identified. The classification of wheat growing zones & details of Zone-wise area coverage of wheat are given below:

Table- 1.5: Agro-climatic Zones of Wheat in India

Sl. No.	Zones	States/regions covered	Approx Area during 2013-14 (million ha)
1	**Northern Hill Zone (NHZ)**	Hilly areas of Jammu & Kashmir(except Jammu, Kathua and Samba districts), Himachal Pradesh (except Una & Paonta valley), Uttarakhand (excluding Tarai region) & Sikkim	0.8
2	**North Western Plains Zone (NWPZ)**	Punjab, Haryana, Western Uttar Pradesh (except Jhansi Div), Rajasthan(excluding Kota & Udaipur div), Delhi, Tarai region of Uttarakhand, Una & Paonta valley of Himachal Pradesh, Jammu, Samba & Kathua districts of Jammu & Kashmir and Chandigarh.	11.5
3	**North Eastern Plains Zone (NEPZ)**	Eastern Uttar Pradesh (28 dist), Bihar, Jharkhand, West Bengal, Assam, Odisha and other North Eastern states (except Sikkim)	11.1
4	**Central Zone**	Madhya Pradesh, Gujarat, Chhattisgarh, Kota & Udaipur Div of Rajasthan& Jhansi Div of Uttar Pradesh.	6.08
5	**Peninsular Zone**	Maharashtra, Tamil Nadu (except Nilgiris & Palani Hills), Karnataka & Andhra Pradesh	1.6
6	**Southern Hill Zone (SHZ)**	Nilgiris & Palani Hills of Tamil Nadu	0.1
		Total	**31.18**

Wheat is grown in India on an area of about 31.18 Million ha. with a production of 95.91 Million tonnes and productivity of 3.1 t/ha (2013-14). Analysis of area, production and productivity of wheat during the last decade (1999-2000 to 2013-14) indicated that the major wheat producing states that achieved the average productivity of 3t/ha and above are Uttar Pradesh (98.56 lakh ha), Punjab (35 lakh ha), Haryana (25.22 lakh ha), Rajasthan(30.80 lakh ha). The significantly contributing states are Madhya Pradesh (57.92 ha), Bihar (22.57 lakh ha), Jharkhand (1.73 lakh ha), Gujarat(13.51 lakh ha), West Bengal (3.35 lakh ha) and Uttarakhand (3.48 lakh ha) are with the productivity category range of 2-3 t/ha. Maharashtra (10.97 lakh ha), Jammu & Kashmir (2.93 lakh ha) and Himachal Pradesh (3.56 lakh ha) are largely rainfed wheat growing states and have little more than 1.5 t/ha productivity. These States contribute about 99% of total wheat production in the country. Remaining States namely, Karnataka, Assam, Chhattisgarh, Delhi and other North Eastern States contribute only about rest 1 % of the total Wheat production in the country and are below 2t/ha productivity. The record production of 95.91 million tonnes of wheat in the country (4th Advance Estimate, DES, GoI, 2013-14) against the targeted production of 92.50 million tonnes during 2013-14 from an area of 31.3 million ha with the average productivity of 3.05 tonnes/ha is the significant achievement in wheat production in the country *(Annexure I)*.

COMPARATIVE ANALYSIS

2: COMPARATIVE ANALYSIS

2.1: Area, Production and Yield of major Wheat growing states in India:

Wheat is the main cereal crop in India and in respect of area it occupies first rank and in production its second rank after China. The global wheat area is around 216.64 million hectares with a production of around 674.88 million tonnes during 2012-13. The major wheat producing countries are China, India, Russian Federation, United States of America, France, Canada, Germany, Pakistan, Australia, Ukraine, Turkey, Kazakhstan, United Kingdom, Iran, Poland, Egypt, Argentina, Italy, Romania, Spain, Syria and Bangladesh. The Area, Production and Yield of wheat in major wheat growing countries vis-à-vis the world as a whole is presented below:

Table-2.1: Comparative statement of Area, Production and yield of Wheat in major wheat growing countries of the world

(Area in million ha, Production in million tonnes and yield in kg/ha.)

Year	APY	World	China	India	Russian federation	USA	Australia
2008	**A**	**223.56**	**23.62**	**28.02**	**26.07**	**22.54**	**13.55**
	P	**689.95**	**112.46**	**78.57**	**63.77**	**68.03**	**21.40**
	Y	**3086**	**4762**	**2807**	**2446**	**3018**	**1579**
2009	**A**	**225.62**	**24.29**	**27.75**	**26.63**	**20.18**	**13.50**
	P	**685.61**	**115.12**	**80.68**	**61.74**	**60.31**	**21.66**
	Y	**3039**	**4739**	**2907**	**2318**	**2989**	**1603**
2010	**A**	**217.22**	**24.26**	**28.46**	**21.64**	**19.27**	**13.51**
	P	**653.65**	**45.18**	**80.80**	**41.51**	**60.06**	**22.14**
	Y	**3009**	**4749**	**2839**	**1918**	**3117**	**1639**
2011	**A**	**220.90**	**24.27**	**29.07**	**24.84**	**18.50**	**13.50**
	P	**701.40**	**117.41**	**86.87**	**56.24**	**54.41**	**27.41**
	Y	**3175**	**4838**	**2989**	**2265**	**2942**	**2030**
2012	**A**	**216.64**	**24.14**	**29.90**	**21.28**	**19.83**	**13.90**
	P	**674.88**	**120.58**	**94.88**	**37.72**	**61.76**	**29.91**
	Y	**3115**	**4995**	**3173**	**1773**	**3115**	**2151**

Source: Agril Statistics at a glance. MoA,DAC,GoI(2013)

A comparison of Area, production and yield indicated that, despite a minor decline in the global area under the crop, there was a significant increase in production of the crop with an increase in yield over the years. Among the major wheat producing countries, China, India and Australia recorded increase in production and productivity whereas Russian Federation and USA had the declined production despite the fact that there was an increase in yield level.

In the domestic scenario, the states viz. Uttar Pradesh, Madhya Pradesh, Punjab, Rajasthan, Bihar, Haryana, West Bengal, Maharashtra and Gujarat have been the major wheat growing states in the country. The

State-wise area production and yield of various states (1999-2000 to 2013-14) of the country are presented in Annexure-I. The largest acreage and highest production of wheat is in Uttar Pradesh but the highest average yield (5029 Kg/ha.) was observed in Haryana followed by Punjab (4898 kg/ha.) during 2011-12 although a decline in productivity was noticeable in the following years in these states. The yield in UP, Haryana and Punjab during 2013-14(4th Adv. Est.)were 3037, 4544 & 4617 kg/ha respectively . The significant yield increase with area increase was noticeable during 2013-14 in case of MP only with 2405 kg/ha (57.9 lakh ha) from a level of 2360 kg/ha(48.89 lakh ha) during 2011-12.

During 2013-14 (Annexure I) it was observed that Madhya Pradesh occupied the highest area next to Uttar Pradesh followed by Punjab, Rajasthan, Haryana, Bihar, Gujarat, Maharashtra, Himachal Pradesh, West Bengal, Karnataka and Jammu & Kashmir. In terms of production, Uttar Pradesh ranked the first position followed by Punjab, Haryana, Madhya Pradesh, Rajasthan, Bihar, Gujarat, Maharashtra, West Bengal, Uttarakhand, Himachal Pradesh, Jammu & Kashmir and contributing 99% of production. As regards productivity, Punjab (4573 Kg/ha.) was the leading state followed by Haryana (4452 Kg/ha.) Rajasthan (3175 Kg/ha.), Uttar Pradesh (3113 Kg./ha.), Gujarat (2986 Kg/ha.), West Bengal (2817 Kg/ha.), Madhya Pradesh (2478 Kg/ha.), Bihar (2427 Kg/ha.), Uttarakhand (2341Kg/ha.) etc.

Wheat is grown in India on an area of about 31 Million ha. with a production of 95.91 Million tonnes and productivity of 3.1 t/ha (2013-14). A comparative analysis of area, production and productivity of wheat during the last decade (1999-2000 to 2013-14) indicated that during 2013-14 the major wheat producing States achieved the average productivity of 3t/ha and above are Uttar Pradesh (98.56 lakh ha) with 9.9% increase over 1999-2000 , Punjab (35 lakh ha) with 3.23% increase over 1999-2k, Haryana (25.22 lakh ha) with 13.3% increase over 1999-2000, Rajasthan(30.80 lakh ha) with 23.4% increase over 1999-2000. The significant contributing states are Madhya Pradesh (57.92 ha) with 29% gain in yield over 1999-2000, Bihar (22.57 lakh ha) with 2.9% gain in yield over 1999-2000, Jharkhand (1.73 lakh ha) with 26.5% gain in yield over 2000-2001, Gujarat(13.51 lakh ha) with 27.7% gain in yield over 1999-2000, West Bengal (3.35 lakh ha) with 19.9% gain in yield over 1999-2000 and Uttarakhand (3.48 lakh ha) with 28.6% gain in yield over 2000-2001 are with the productivity category of 2 t/ha and above. Maharashtra (10.97 lakh ha), Jammu & Kashmir (2.93 lakh ha) and Himachal Pradesh (3.56 lakh ha) are largely rainfed and have more than 1.5 t/ha productivity. These States contribute about 99% of total wheat production in the country. Remaining States namely, Karnataka, Assam, Chhattisgarh, Delhi and other North Eastern States contribute only about rest 1 % of the total Wheat production in the country and are below 2t/ha productivity. The record production of 95.91 million tonnes of wheat in the country (4th Advance Estimate, DES, GoI, 2013-14) against the targeted production of 92.50 million tonnes during 2013-14 from an area of 31.3 million ha with the average productivity of 3.05 tonnes/ha (*Annexure I*).

2.2: Area, Production and Yield status of major Wheat growing countries:

Wheat is being cultivated in nearly 216.6 million hectares in the world with a production of 674.88 million tonnes of grain and productivity of 3115 kg/ha (FAOSTAT, 2012-13). Highest area coverage was in India followed by China, Russian Federation, U.S.A., Australia, Kazakhstan, Canada, Pakistan, Turkey, Iran, and Ukraine. The major wheat producing countries are China (17.07%), India (14.06%), U.S.A. (9.15%), France (5.97%), Russian Federation (5.59%), Australia, Canada, Pakistan, Germany, Turkey and Ukraine. The highest productivity was attained in France (75 qtls/ha), followed by Germany (73 qtls/ha), U.K. (66 qtls/ha), Egypt (65 qtls/ha), China (49 qtls/ha), Poland (41 qtls/ha), Italy (40 qtls/ha), India's (31 qtls/ha), U.S.A (31 qtls/ha)

and Argentina (29 qtls/ha). India's share in world wheat area is about 13.8%, whereas it occupies 14.06% share in the production but ranks 8th position in productivity (Annexure II).

2.3: Wheat Yield Gap with other countries:

Despite India's significant share in global wheat area the total production there is marginal increase in productivity, when compared between India and World with 31.73 qtls/ha and 31.15 qtls/ha respectively. Highest productivity was found in France (75.99 qtls/ha) followed by Germany (73.28 qtls/ha), U.K. (66.57 qtls/ha), Egypt (65.16 qtls/ha), China (49.95 qtls/ha), Poland (41.2 qtls/ha), Italy (40.16 qtls/ha), whereas India's (31.73 qtls/ha) rank is 8th in productivity. With the increased pressure on cultivable land, there is hardly any scope for expansion of area under wheat in our country. The main emphasis would be on increasing the productivity of wheat by adopting the improved cultivation practices, improved technologies and quality inputs for which vast potentialities still have been remaining untapped yet.

2.4. State-wise yield potential recorded under Frontline Demonstrations (FLD) in All India Coordinated Research Project (AICRP) vis-à-vis National/State Average and yield gap analysis:

An analysis of yield gap (Annexure III(a) to III(l)) in wheat in major wheat growing states viz., Bihar, Gujarat, Madhya Pradesh, Uttar Pradesh, Maharashtra, Rajasthan and Uttarakhand for the last ten years (2003-04 to 2012-13) indicated that despite possibilities of higher yield potentialities, there have been consistent yield gaps in these states mostly ranging from 1 to 2 t/ha or even more. The gap was found to be wider in the states of Himachal Pradesh and Jammu & Kashmir where the gap was ranging from the level of 1 t/ha onwards which continued to be widened and showed increasing trend over the years. The narrow yield gap (< 1 t/ha) was recorded in Punjab and Haryana and West Bengal which indicates that there is relatively little scope for increasing productivity in these states with the existing technology.

FLDs under AICRP project conducted during 2012-13 in various centers show that there is a huge gap between state average yield vis-à-vis national yields. The average yield of FLDs center was both Improved varieties (39.12 qtls/ha) is higher than the National average (31.13 qtls/ha). Highest results in FLDs were found in Punjab with 53.06 qtls/ha in FLDs conducted centers whereas state average is 49.95 qtls/ha followed by Haryana center (51.4 qtls/ha) whereas state average is 48.19 qtls/ha. It implies that there remains a good opportunity to increase the production of our country by focusing on the Madhya Pradesh, Uttar Pradesh, Maharashtra and Assam (Annexure III (a) TO III(l)). Comparison of 564 nos of wheat FLDs conducted in various states during 2013-14 indicated that although there was the highest yield about 5 t/ha or more was recorded in Haryana (54.63 q/ha) followed by Punjab (52.36 q/ha), Rajasthan(50.59 q/ha) Delhi(50.54 q/ha) and Uttar Pradesh (49.73 q/ha) but maximum yield gain with the demonstrated technologies was observed in Madhya Pradesh with 43.53 q/ha(41.65%) followed by J&K with (33.18%), Jharkhand (30.64%), Chhattisgarh (23.07%), Assam(22.76%), Himachal Pradesh (21.71%), West Bengal(19.42%), Bihar (15.07%), Maharashtra(15.05%), Rajasthan(14.93%), Delhi(13.52%), Karnataka (13.18%), Uttar Pradesh (8.87%) and Gujarat(6.11%). This indicated that there is a near plateau situation in yield in the states of Punjab, Haryana and Rajasthan which needs to be finer tuned to break the yield barrier but ample scope still remains to attain even higher yield gain in states like Madhya Pradesh, Bihar, Uttar Pradesh and Maharashtra.

2.5. Demand and supply scenario of wheat in India:

Wheat represents one of the most widely grown cereal crop for global food security with an average global harvest of about 674.88 million tonnes of grain during 2012-13. India stands second after China in terms of production of wheat. During the past few years particularly during period of the XI Five year plan,

India witnessed a steep increase in wheat production and productivity. Country achieved a record production of 95.91 million tonnes with more than 3t/ha productivity during 2013-14 (4th Advance Estimate, DES, GoI), the beginning of the 12th Five Year Plan.

The projected demand and supply scenario of wheat(DAC,MOA,GoI,2013) indicated that the projected demand of wheat during 2016-17 will be 89 million tones which is expected to be increased to a level of 98 million tones during 2020-21 as against an anticipated actual production or projected supply of 93-104 million tones thereby indicating a huge marketable surplus of wheat in the country.

It was revealed during the deliberations in the 53rd All India Wheat Workshop (2014) that annual productivity growth rate of wheat during post 2000 period is about 1.6% (which is also confirmed by a publication on medium term outlook by NCAER ,2013); the existing or projected population growth during the period 2010-2050 would be 0.8. Besides, there is a decline in the status of stagnation in wheat productivity observed after 1998-99. As such, with this annual output growth of 1.6% till 2050, the per capita availability shall be just 34% which is envisaged to be the requirement to maintain the sustainability of wheat production. The present challenge is therefore to sustain this 1.6% growth till 2050. The comparative analysis of demand and supply scenario involving both historical and projections towards 2050 indicated that India may achieve the targeted 140 million tonnes of wheat by 2050 for which there is the requirement of maintaining at least 1% annual growth rate in wheat productivity over 2012-13 and 2013-14 (53rd All India Wheat Workshop, 2014).

2.6: Export-import status of Wheat :

Export of Indian wheat is increasing from the year 2001-02 onwards. The maximum export of wheat from India was in the year 2003-04 with 40.93 lakh tones of value of Rs. 1459.82 crores. The export was thereafter was in a declining trend till 2010-11. However bumper wheat production in the country during 2011-12 witnessed an increasing trend of Indian wheat export (7.41 lakh tones worth Rs.1023.27 crores). The export of Indian wheat was observed to be at an all time record of 66.64 lakh tones during 2012-13 that was worth Rs.14,416.9 crores (Annexure IV). India exported 55,62,374.75 MT of wheat to various countries (viz. Bangladesh, Korea, Indonesia, United Arab Emirates, Yemen and Oman) worth Rs. 9261.60 crores during the year 2013-14 (Ref. APEDA, 2014).

The major importers of Indian wheat are Bangladesh, United Arab Emirates, Philippines, Yemen, Vietnam, Malaysia, Indonesia, Iraq, Singapore, Bahrain, Sri Lanka, etc. India is also exporting quality Durum Wheat to countries like Philippines, Bangladesh, Oman, Singapore, Sudan, etc., whereas Wheat seed is being exported to Oman, Vietnam, Malaysia, etc.

Looking to the stock of wheat available with the country, there is vast potential for export of wheat to other countries for human consumption and also for industrial purposes.

- Durum potential for export: Out of 3 species of Triticum, durum is having more potential in terms of exports to other countries. Some of the factors making durum for making export are its increasing global demand, value addition potential, better price in market and resistance to Karnal bunt.

- The dry and hot environment of Madhya Pradesh, Gujarat, Maharashtra, Karnataka and Southern Rajasthan are most suited for durum cultivation. These areas offer quality production of durum but at the same time production is less and hence difficult to compete in the export market.

Varietal Development

3: VARIETAL DEVELOPMENT

Since inception of the wheat programme (1965), both the Central Varietal Release Committee (CVRC) and State Varietal Release Committee (SVRC) has released about 375 wheat varieties so far. Out of these, 316 were bread wheat, 49 durum wheat and 5 dicoccum wheat besides 5 Triticales were developed. The All India Coordinated Wheat and Barley Improvement Project conducts a number of well-organized multi-location yield trials for different production conditions. The testing has contributed in release of wheat varieties suited to different environments and growing situations.

Prominent Wheat cultivars of pre-2000 era: The prominent ones of pre 2000 era were Kalyansona (1967), Sonalika (1965), Lerma Rojo(1965), Chhoti Lerma(1967), Arjun (1975), C 306(1965), WL 711(1977), UP 262(1977), LOK 1 (1981), HUW 206(1983), HUW 234 (1985), HD 2189(1979), HD 2329 (1982), HD 2285(1983), Raj 3077(1989), WH 147(1978), Sujata (1983), VL 421(1979), VL 616 (1986), HS 240 (1989), HS 295(1992), UP 2338(1994), PBW 343(1995), Raj 3765(1995) in bread wheat and Raj 1555(1982), PBW 34(1985), HI 8381(1994), HI 8498(1999), PDW 233(1995) and PDW 291(2004) in durum wheat.

Prominent Wheat cultivars of post-2000 era: The post 2000 released varieties were PBW 502(2003), GW 322(2002), GW 496(2002), DBW 39(2010), HD 2987 (2011), HD 2985(2011), KRL 213(2012),PBW 644(2012), WH 1105 (2013) and HD 3059(2013) were among the bread wheat varieties. Varieties like HI 8663 (2007), MPO 1215 (2009), PDW 314(2010) and UAS 415 were prominent among the released durum wheat varieties. The post 2000 varieties have also been developed and released for high altitude area are viz. VL 804(2002),VL 829(2002) and VL 892(2007).

Prominent Wheat Cultivars for salinity/alkalinity affected areas: Varieties like KRL 210(2009) and KRL 213(2009) were varieties developed for salt affected soils during the period after 2000. Varieties for suppressive (salt affected) soils, harsh conditions (central India), hot and humid environments prevailing in north eastern region have also been developed. Varieties have also been released for moisture stress conditions, both in bread and durum wheat.

Table-3.1: Wheat and Triticale varieties released in India during 1965-2010

Species	No. of varieties Released by		Total
	CVRC	SVRC	
Bread wheat *(Triticum aestivum)*	206	110	316
Durum wheat *(Triticum durum)*	25	24	49
Dicoccum wheat *(Triticum diococcum)*	05	-	05
Triticale	04	01	05
Total	240	135	375

Source: DWR, Karnal

3.1: Wheat varieties released and notified by Central & State Variety Release Committee:

The detailed list of wheat varieties released and notified by Central & State Variety Release Committee during 1995 to 2013 for growing under various production conditions are presented at *Annexure V*.

CLIMATIC REQUIREMENT

4: CLIMATIC REQUIREMENT

Wheat is mainly grown during Rabi season and has wide adaptability. It can be grown not only in the tropical and sub-tropical zones, but also in the temperate zone and the cold tracts of the far north, beyond even the 60^{O} North altitude. Wheat can tolerate severe cold and snow and resume growth with the setting in warm weather in spring . It can be cultivated from sea level to an altitude of 3300 meters.

The most favourable climatic condition for wheat cultivation is cool and moist weather during the vegetative growth period followed by dry, warm weather for the grain to mature and ripening. The optimum temperature range for ideal germination of wheat seed is 20-25 ^{0}C .Warm and damp climatic conditions are not suited for wheat growing.

During the heading and flowering stages, excessively high or low temperatures and drought are harmful to wheat. Cloudy weather, with high humidity and low temperatures is conducive for rust attack. Wheat plant requires about 25-30 ^{0}C optimum average temperature at the time of ripening. The temperature at the time of grain filling and development are very crucial for yield. Temperatures above 25 ^{0}C during this period tend to depress grain weight. The congenial temperature for various growth stages of wheat crop is as under:

Table- 4.1: Temperature requirements at different Growth stages

Growth stages	Temperature requirements
Germination	20 to 25°C mean daily
Accelerated growth	20 to 23°C mean daily
Proper grain filling	23 to 25°C mean daily

4.1: Effect of temperature on Wheat Yield:

Temperature requirement may slightly differ from one variety to another at the time of germination. The critical minimum temperature for wheat crop is from 3.5 to 5.5 ^{0}C, optimum 20-25 ^{0}C and the maximum is around 35 ^{0}C. If temperature is more than 30 ^{0}C at the time of maturity, it leads to forced maturity and yield loss. An UN report (Anon, 2011) stated that the earth will be warmer by 2.4^{0}C by the year 2020 and the crop yield in India may fall by upto 30% by then.

Instances in India are there indicating that the terminal heat creates a significant yield reduction in wheat. Therefore, maintaining the optimum sowing time and growing ideal cultivars may manage the problem to some extent. Conventional breeding processes generally aimed at diseases resistance, quality improvement and ultimately yield enhancement. In view of the climate change impact particularly that of temperature rise, these breeding programmes need to be focused to develop heat tolerant varieties. Low temperature during the initial stage and high temperature at later maturity stage lead to the completion of major part of wheat growth cycle.

In the North western India, it has been observed that considering every gain weighs 40 mg, every degree C rise in mean temperature during the terminal reproductive phase beyond 17^0C causes a loss of yield to the tune of 2.5q/ha*. This is due to the fact that the crucial advanced reproductive phase is affected by rising temperature results in poor grain filling, shorter earhead, lesser 1000 grain weight and ultimately lower production.

4.2: Recommendation for cultivation of Wheat in view of climatic change:

Due to climate change, there is an overall reduction in crop yield and the various crop production stages right from sowing to harvesting and threshing are badly affected. It ultimately causes decline in water resources and soil organic matter. Some preventive measures given as below for minimize the loss by climatic change.

- Modification in Agronomy of crop- Manipulation of sowing dates/optimisation to minimise the effect of temperature/soil moisture on germination, panicle initiation, panicle sterility etc.
- Diversification of farming- shifting from sole cropping of wheat to diversified system i.e. sowing of wheat mixed with gram, mustard, pea etc. or intercropping with mustard, gram etc.
- Use of zero seed-cum-fertilizer drill – this is energy –cum-resource conservation technology.
- Inclusion of green manures crop in the cropping system to build up the nutrient status of the soil resulting its soil health sustainability.
- Inclusion of high yielding rainfed/heat tolerant wheat varieties in the cropping system to tackle the related problem.
- Use of mechanization in farming- This will help in timely execution of agricultural operations and will save from the vagaries of climate.
- Use of light irrigations in the event of terminal temperature rise.
- Judicious use of water, adoption of Integrated Nutrient Management (INM), Integrated Pest Management (IPM) and Conservation Agriculture practices.
- Use of System of Wheat Intensification (SWI) technique has been emerging as a technique to ensure quick germination as well as in economizing the use of water. The technique needs to be authenticated by research findings yet.
- Use of hydrogel- an indigeneous semisynthetic superabsorbent polymer developed by Indian Agricultural research Institute, New Delhi recommended for reducing moisture stress resulting in reduced irrigation and fertigation requirement of crops.

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**(Ref. Heat wave of March,2004-Impact on Agriculture, Samra and Gurbachan Singh, 2004 pub by ICAR)*

GENETIC POTENTIALITY ADVANCEMENT

5: GENETIC POTENTIALITY ADVANCEMENT

5.1: Genetic breakthrough for yield improvement:

All India Coordinated Wheat Improvement Project (AICWIP) is the nodal agency for applied wheat research in India. The advent of dwarf wheat and initiation of AICWIP took place simultaneously in India during 1965. It provided a strong platform for working in close collaboration with Rockfellar Foundation as was desired by Dr. Norman E. Borlaug. It recognizes and overviews interdisciplinary collaborations between various cooperating centers and helps to promote close inter institutional linkages, international and intra-national exchange of materials and is finding solution to specific problems. The main strength and approach of AICWIP is multidisciplinary and multilocational type of comprehensive research and testing of newly developed genotypes besides taking care of germplasm evaluation through various national and international nurseries. The real breakthrough in wheat revolution started after introduction of Mexican varieties and breeding materials in the country and free flow of material to the wheat coordinating centers.

The AICWIP through their 31 centres located across the country using multidisciplinary and multilocational approach as modus operandi was able to evolve number of wheat varieties that are disease and pest resistance , fertilizer responsive and high yielding growing under different production conditions. Promising genotypes have been evolved by the collaborative efforts are for making chapattis, Bread, Biscuit and Pasta products . The genetic breakthrough of Indian wheat research achieved during the pre and post green revolution era are as follows:

5.1.1. Basic Research: .

Maintenance of genetic variability in India was sustained during the process of development of elite lines of wheat so as to minimize the risk caused by narrow genetic base. During pre Green Revolution era, broadly selection process was in practice; but during 1905 in Pusa (Bihar) and in 1907 at Loyallpur (in now Pakistan) breeding programme was initiated. Programme of rust resistance was initiated later in Shimla. Development of newer wheat varieties till 1965 was mainly through (i) introduction, (ii)selection and (iii) hybridization among local races. However, during the post Green Revolution era, Dr. NE Borlaug brought specific lines of wheat from CIMMYT, Mexico and evaluated them through the specific breeding programme in India. Resultantly, varieties viz., Lerma Rojo 64A, Sonora 64 and PV18 were evaluated through SAUs and ICAR System as highly photo-insensitive, short duration, input responsive and high yielder and released in India. Consequently, the wheat production in India was increased from 11.4 million tonnes (1966-67) to 29 million tonnes (1976-77) period referred to as Green Revolution era.

The Mexican dwarf wheat varieties exhibit shorter coleoptiles growth as compared to that of Indian tall ones which led the Indian scientists to maintain the shallow depth of sowing and the optimum depth was recommended to be 5-7 cm. With the active cooperation of various centres under

AICWIP, varieties of breadwheat, durum wheat and dicoccum wheat have been developed through their mulilocation and multidisciplinary trials across the country. Again, through the process of characterization and evaluation of germplasms, more than 13000 accessions have been evaluated so far in collaboration with National Bureau of Plant Genetic Resources (NBPGR), Directorate of Wheat Research (DWR) and other cooperating centres and ultimately many promising germplasms have been identified and for varietal development for specific traits which are as follows:

5.1. Identified Germplasms Line for various Tolerances

Identified traits	Some Germplasms lines identified/developed
Alkalinity/salinity Tolerance	AKAW 3717,DW 1367,HUW 13,KRL 13,KRL 22,KRL20,KRL82, KRL 99, WH 701,WH 1052, WH 1043 etc
Heat/drought Tolerance	AKAW 3129, HD 2185, HD 2815, K 9993, Raj 3754, MP 3054 etc.
Triple dwarf	K 783-1, K 921-1, K 941-1 etc
High tillers per meter	GW 03-01, UP 2727, Raj 4147, AKAW 2344, NIAW 1112 etc.
Grains per spike(more than 80)	AKAW 2264, AKAW 2591, GW 03-5, GW 03-2, WR 798 etc.
Longer spikes(more than 15cm)	IC 78933, VL 17, IC 296727 etc.
Early maturing	AKAW 2862-1, DWR 1001, DWR 240, GW 1189, GW 9912, NIAW 1268 etc.
Higher 1000 grain weight (more than 45 g)	WR 887, WR 1201, WR 1202, Raj 4111-1, UP 2677, UP 2425, UP 2496, WR 1201, WR 1202, GW 2001-9 etc
High Protein	IC 45437, HS 431, IC 57579 etc.

5.1.2. Significant Genetic Breakthrough for Yield Improvement of Wheat:

Terminal Heat Tolerance is one of the important traits for grain filling which ultimately determines the yield improvement factor. In all wheat growing situations, particularly under late sown situations of eastern India, the terminal heat stress makes a barrier towards achieving desired yield of wheat. After development of C 306 variety during the sixties but with a slow deceleration in yield of the variety, there was a quest for newer varieties tolerant to terminal heat stress. Development of newer varieties like PBW 343 and Raj 3765 during mid nineties has paved the way towards achieving higher yield of wheat. Use of molecular markers for heat tolerance has been a genetic tool for development of heat tolerant varieties .

Adult Plant Resistance (APR) and Durable Rust Resistance (DRR) are the main concern in Indian wheat cultivation in respect of achieving higher yield. Indian wheat programme contributed through introgressing the APR gene *Lr34* in conjugation with other resistant genes which have contributed to the durability of Leaf and Stripe rust to a number of Indian wheat varieties viz., HD2189. Bread wheat cultivars viz., GW 322 and NIAW 34 showed APR to most virulent

and predominant pathotypes of leaf rust. Indian breeding program have been able to develop wheat varieties viz., HD 2937, HPW 251, HS 461, HUW 598, PBW 561, PBW 574, PBW 575, PBW 579, PDW 300, VL 882, VL 892 and WH 1021 that showed APR to both leaf and stripe rusts of wheat. Durable resistance to stem rust of bread wheat variety HD 2009 has been attributed to *Sr2* and *Sr30* and several other minor APR genes. The overall resistance gene *Sr31* has been the major one protecting the Indian bread wheat varieties including the durum varieties like HD 4672 and HI 8498 from the dreaded Stem Rust including *Ug99*. However, as a future protection for any possible threat from stem rust including *Ug99*, Indian breeding programme envisages rebuilding the gene complex like *Sr2* complex for varietal development. With these there was a stability in wheat yield looking ahead for further enhancement.

Karnal Bunt (KB) is another serious problem in achieving higher wheat yield. Quarantines imposed by several countries have jeopardized free trade of wheat from the countries where KB is prevalent. Indian breeding programme could achieve the significant success in containing the disease (seed/soil borne) after development of the most versatile variety PBW 343 during 1995. The disease is most prevalent in the NWPZ and resistance breeding is the answer to the disease. Higher degree of KB resistance by accumulating diverse genes (additive gene action) was obtained to develop resistant varieties. Some of these varieties were PBW 502 and Raj 1482 besides PBW 343,PBW34, PDW233 etc..

Genetic adaptation of wheat to Salt tolerance attracts attention to wheat growers for yield improvement. Genetic and physiological parameters of selection were worked more precisely and intensively by Central Soil Salinity Research Institute (CSSRI), Karnal which led to the development and release of a salt tolerant variety KRL 1- 4 during 1990 followed by KRL 19, KRL 210 and KRL 213 in the following years which registered higher yields in saline/sodic areas.

Wheat is being made nutritionally rich through Genetic Biofortification making higher nutrients contents in grains viz, Iron, Zinc and Boron . quality wheat breeding programme initiated during post 1999-2000 era has helped in developing good quality wheat for different end products like chapatti, bread etc. such product specific varietal development is considered to be a genetic breakthrough in Indian wheat breeding programme. Collaborative breeding programme focused on transferring genes governing Zn and Fe from specific lines to high yielding elite ones and varieties like PBW 343 was developed. The research on Genotype x Environment (G x E) interaction programme is ongoing to develop newer nutritionally rich cultivars.

5.1.3. Recent Genetic breakthrough in improving Wheat yield and quality

Recently, promising varieties were evaluated by DWR, Karnal (ICAR) under National Initial Varietal Trials (NIVTs), Initial Varietal Trials (IVTs) and special trials. Among 311 entries evaluated under NIVTs and 36 entries evaluated in IVTs, as many as 80 (45 bread wheat and 35 durum wheat) of these were found high yielding and disease resistant. The promising entries are as under:

Table- 5.2: Varieties Evaluated under NIVTs and Special Trials

Zone	TS,I	LS,I	TS,R	TS,RI
NIVT/IVT				
NHZ	HS 583	-	HS 583	-
NWPZ	PBW-707, PBW-709,NW - 6029, NW-6036,HD-3159, HD-3160, DW32(d), DDW31(d), MACS-3949(d), MACS-4024(d), UAS 452(d)	DBW 147, HD- 3165, PBW-716, WH-1179	K1-317, HD-3174, HI-1605, HD-3172, NW-6035, DBW-153	NW-6035,HD-3171, BRW-3753, PBW-721
NEPZ	-	-	HD 3171, K-1317, WH 1167	-
CZ	GW463,HI1603, NIAW 2313, HI8759(d)	CG 1015, PBW718	HUW689, HI1605, JAUW621, HI87649d), GW1316(d), GW1315(d), MACS4020(d), HI8765(d)	K1317,RKD268(d), DDW33(d), DDW34(d), MACS4020(d), GW1314(d), HI8766(d), HI8763(d)
PZ	UAS361, UAS360, HD3164, HI8759(d), MACS3949(d), UAS453(d), MACS4024(d), WHD955(d), HI8757(d), HI8761(d), GW1309(d), GW1311(d), UAS452(d)	UAS364, HI1604, HI8756(d)	PBW721, K1315, HD3174, HI8765(d), GW1315(d)	HI1605, JWS712, MACS3970(d), HI8762(d), MACS3972(d)
SHZ				HW5801

TS,I=Timelysown Irrigated: LS,I=Latesown Irrigated: TS,R=Timelysown Rainfed: TS,RI=Timelysown Restricted Irrigated,

During 2013-14, evaluation of National and International Nurseries/Trials were done. Eight nurseries and two segregating stock nurseries were constituted by DWR and evaluated across the country for genetic enhancement of specific genetic stocks/lines. The salient features of these nurseries were as under:

Table- 5.3: Evaluation of Genetic Stock/Line in National and International Nurseries/Trials

Nurseries	Some Promising genetic stocks evaluated	Remarks
National genetic Stock Nursery(NGSN)	MP3288(116), JWS134(114), Raj4390(111)	Evaluated for tillers/m^2>110
	HPW355(56), HUW640(55), DBW58(54), WH1080, UP2797(53), PBW658, HD3058, HI8715(d), HI8713(d), VL941, NW5013 etc.	Evaluated for Grains/spike >50
	PHS1108, MACS3744, Lok Bold(55), DL1012(51) etc.	Evaluated for 1000 grain weight >50 gms.
Yield Component Screening Nursery (YCSN) Short duration screening nursery (SDSN)	DBPY11-2(d), Raj4265, GW-2010-272 etc	Evaluated for tillers/m^2>86
	AKAW4731, AKAW4739,GW -2010-287	Evaluated for Grains/spike >56
	GW-2010-272, GW-2010-281 etc.	Evaluated for 1000 grain weight >47 gms for breadwheat
	GW2010-275, GW2010-277, NIDW760 etc.	Evaluated for 1000 grain weight >50 gms for durum wheat
	Raj 4274 (for NEPZ & PZ), DL1058(for PZ)	Evaluated for tolerance to high temperature during grain filling stage.
Drought Tolerance Screening Nursery (DTSN)	NIAW1994,WH1126, Raj 4356 (for NEPZ; PBW674, WH1126, DBW74, Raj4356 (all for CZ); PBW675,WH1098, WH1126, GW2010-345(all for PZ)	Evaluated for tolerance to drought.
Salinity - Alkalinity Tolerance Screening Nursery (SATSN)	WH1309, WS1301, LBP-2013-24, KRS 1301, KRS 1303,KLP 1221, WA 1304.	Evaluated for tolerance to salinity and Alkalinity
Quality Component Screening Nursery (QCSN)	GW2010-385(d), GW09-232(d) etc.	Evaluated for Protein content (14-14.3%range)
	GW2010-389, QLD28, QLD50 etc.	Protein yield(g/ m^2)ranging from 52-56
	GW2010-389, QLD49, QLD53 etc.	Evaluated for sedimentation value (ml).
	GW 2010-304(d), GW 2009-246(d), Raj3307(d),GW2010-318(d) etc	Evaluated for Grain hardness index(85-89 range) .
	Qld28,QLD49,QLD54 QBP12-11 etc.	Evaluated for Grain hardness index (15-25 range) .
	Raj4138, GW2009-246(d), QLD51, QLD58 etc.	Evaluated for Test weight(kg/ml) with 80-81 range

5.1.4: Hybridisation involving wild species and Yield Improvement in wheat: .

Importance of wide crosses were actually initiated in early 1940s. Some particular inter-specific crosses involving wild species led to the development of specific genetic stocks. A typical example is the development of the variety C286 is the result of an interspecific cross Type1/Khapli/C250. Niphad4 in western India was derived from the cross Motia(durum)/Khapli/NP4 (aestivum). MACS9 was derived from T. polonivum /T. durum crosses. Some important genetic stocks developed through interspecific crosses involving wild species are as follows:

Table- 5.4: Important Genetic Stocks developed through Interspecific Crosses

Genetic stock	Wild species involved	Favourable traits or characteristics incorporated
1. WR 740	*T.sphaerococcum*	Drought & heat tolerance, high tillering, round grains
2. ISD 215	*T.turgidum* *T.carthlicum*	High protein, resistance to stem rust
3. WR 196	*T.turgidum* *T.carthlicum*	Early maturing, higher test weight
4. WR 95	*T.turgidum* *T.carthlicum*	Higher grains/spike/unit area
5. ISD 8	*T.carthlicum* *T.turgidum*	High tillering , increased grain hardness
6. Pusa T 3336	*Agropyron species*	Leaf blight, Higher test weight

5.2: Use of Advance tools for Genetic improvement:

5.2.1. New Plant Type (NPT) Approach:

Efforts made to genetically architecture a new plant type to have higher Harvest Index and biomass and ultimately higher yield which was carried out through introgressing the desired traits. Varieties like Vaishali and Vidisha are the examples of such NPT approach. Many other genotypes were developed that have higher test weight, higher grains per spike, good root system, higher biomass etc. were developed through this NPT approach.

5.2.3. Use of Transgenics and gene exchange for wheat improvement:

Introductions from different countries have made significant achievements in Indian wheat improvement programme through recombination breeding. These introductions were used directly for various traits such as sources of disease resistance, drought and heat tolerance, salinity tolerance, early maturing, long spikes more than 15 cm, higher yield etc. A few of these introductions are EC 477993 (WESLEY) from USA was for stem rust resistance, high quality and higher yield potential. Accessions viz., EC 514345-79 for high protein and -carotene in Durum wheat and EC 514380 514404 for drought and

heat tolerance in wheat were imported from ICARDA. Some important accessions from different countries are indicated at *ANNEXURE-IX*.

On the other hand, India exported number of germplasm to other countries . These included accessions of *T.aestivum, T.durum , T.diococcum* and other related species viz., *T. Spherococcum, T.turgidum* etc. The countries to which Indian germplasm were exported included Afganisthan, Argentina, Australia, Egypt, France, Germany, Yugoslavia, Morocco, UAE, UK, USA etc.

5.3. Hybrid Wheat:

Hybrid wheat is an area wherein technologies tend to be used as an advanced tool to achieve a genetic breakthrough in breaking the yield barriers in wheat. The activities of research on evolution of hybridization in wheat though initiated earlier in the country, however, the success is yet to be recorded. These research activities included primarily on use of Cytoplasmic Genetic Male Sterility (CGMS) approach and Chemical Hybridisation Agents (CHA). Use of CHA approach was observed to be there with some inherent problems and therefore, found not practically feasible and uneconomical. On the other hand, the CGMS approach was the primary focus of such hybridization programme but the Cytoplasmic genetic male sterility and fertility restoration – the two most important components in developing hybrids in the CGMS approach is yet to achieve a success.

SEED SCENARIO

6: SEED SCENARIO

6.1: State-wise share of Govt and private sector seed agencies in seed production/supply:

The Planning Commission once indicated with regard to seeds- *"Despite a huge institutional framework for seed production both in the public and private sector, availability of good quality seeds continues to be a problem for the farmers. As a result, they prefer to rely on farm saved seeds; seed replacement rate continues to remain in the range of 2-10 per cent in certain states for certain crops, which is much below the desired level of 20 per cent for most crops. As is well known, seed replacement rate has a strong positive correlation with the productivity and production of crops. There is a need to rejuvenate the seeds sector through revamping the public sector seed companies, including the State Seed Corporations".*

The National Seed Policy of Govt of India entrusts major responsibility for production of foundation and certified seeds is assumed by State seeds corporations/State department of Agriculture to the extent of 40% of the requirement. National level seed agencies have the responsibility of 40%. Private seed sectors have the responsibilities of remaining 20% of the requirement.

6.2: State-wise Seed Replacement Rate (SRR) of Wheat :

Seed Replacement Rate (SRR) is the percentage of area sown out of total area of crop planted in the season by using certified/quality seeds other than the farm saved seed. There is a strong co-relation between the seed replacement rate and the yields.

Analysis of SRR in wheat in the country from 2001 onwards indicates that the present average Seed Replacement Rate of wheat crop is about 32% (2011)(*Annexure-VI*). The SRR in all the Wheat growing states shows an increasing trend. The steep increase of 30% or more was noticeable from 2010 onwards in all the wheat growing states which may well be correlated as one of the main reasons for record wheat productions of more than 90 million tonnes from 2010 onwards. The SRR varies from state to state depending upon the availability. Highest SRR (2011) is about 45.9% in the state of Maharashtra. During 2012, highest SRR (41.00%) as against 33.72% during 2010-11 was noticeable in case of Uttar Pradesh (Ref. Wheat varietal profile of India, 2013) . The states like Jammu & Kashmir, Gujarat and Madhya Pradesh are lagging behind in achieving the higher SRR. Inclination of farmers towards the older varieties led to the low market demand of seeds of a recommended specified variety which ultimately resulted in low breeders seed indent by the states which is reflected in the reduced SRR. The breeders seed indent and production of most popular wheat varieties during 2013-14 is presented in the later part of this section. A large quantity of farm saved seeds are also being used by the wheat farmers across these states that prevented the newer varieties to imbibe into the system. Besides, massive awareness programme for seed and varietal replacement to shun away from cultivating age old varieties, induce a break in the disease and pest dynamics and boosting the per ha yield of the crop, the states are required to adopt suitable planning for production of breeder's, foundation and certified seeds of desired varieties to meet the demand. Breeders seed indent of a particular variety will thus materialize the purpose in the states.

6.3: State-wise Critical gap in requirement and share of seed production by Govt and private sector seed agencies :

6.3.1: Seed Requirement of Wheat during XII Five Year Plan (2012-13 to 2016-17)

The responsibility for the production of breeder seed in the country lies with the National Agricultural Research System (NARS) of the country. All the States in the country have Agricultural Universities, State Farms and other assets, which need to be utilized for production of quality seeds (foundation and certified seeds). Considering the total wheat area of 31 million ha (2013-14) in the country distributed over the major wheat growing states viz., Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Uttar Pradesh, Uttarakhand & West Bengal including some minor states, the total certified seed requirement of different recommended wheat varieties (with 33% SRR) was worked out to be around 103.17 lakh quintals against which the calculated availability would be around 90 lakh quintles. As such there is a projection of deficit of around 13 lakh quintals of certified seeds (Ref. Wheat Varietal Profile of India, 2013) at national level. The detailed requirement of certified seeds vis-à-vis availability are placed at *Annexure-VII*.

6.3.2: State-wise (Major wheat growing states) total seed requirement vis-à-vis agency wise allocation for targets of seed production:

The country reaped a record wheat harvest of 95.91 million tonnes from an area of more than 31 million hectares. With the average Seed replacement rate of around 22% for the past decade, the requirement of certified seeds is broadly around 31 million tonnes. Since farmers used to sow their farm saved seeds to a large extent, the SRR is not being hiked due to the availability of such farm saved seeds thus indulging to the practice of maintenance breeding of varieties their own choice. Such a practice induces genetic segregation coupled with admixture of looking identical phenotypes resulting in either not being able to reap the near potential yield, build up of disease and weeds or stagnant yield of cultivar. Requirement of quality seed material is therefore of utmost importance. With a target of enhancing yield level of wheat under the targeted average SRR of 33% the requirement of seeds and production targets of wheat seeds for various seed agencies as per the guidelines and norms of National Seed Policy of Govt of India, the state-wise requirement are calculated and placed at Annexure-VIII.

6.3.3: State-wise (Major wheat growing states) & Variety-wise area coverage & total seed requirement :

The State-wise and Variety-wise requirement of Certified seeds of wheat in various states were worked out (Annexure IX). Altogether 19 varieties are in high demand with 33% SRR and about 16 varieties revealed high demand with 25% SRR in the states. Out of more than 300 varieties released so far by the Central Varietal Release Committee (CVRC) as well as State Varietal Release Committee (SVRC) so far, about 50% are there in the active chain of seed production in the farmers fields. Despite the fact that some varieties were developed

and released decades back and due to their stress tolerant characteristics, the versatile nature of specific cultivars, the varieties still remained in the choice list of farmers even if such varieties have become disease prone or comparatively poor yield. Such varieties are Lok-1 (1981), PBW-343 (1995), UP-262 (1977), WH-147 (1978) etc. Seed production and availability in India are a complex system in India comprising both formal (by Govt regulated system of seed production and distribution) and informal components (use of farm saved seeds procured by farmers and spreading farmer to farmer or even state to state). Variety-wise spread of wheat crop in various major wheat growing states indicated that although farmers are in the process of adopting newer varieties with identical or little higher economic yields, still older varieties with withdrawn or no recommendation are still remaining under cultivation in the farmers fields.

6.3.4: Variety-wise Total seed requirement, availability & gap (Recommended *vs* Non-recommended/slated for replacement):

As indicated earlier there are more than 350 varieties of wheat released for cultivation in various wheat growing zones in the country in about 312 lakh ha of area of which about 50% of these varieties are in the active chain of seed production. A large area around 5-7 million ha of wheat area are still under coverage of older or non-recommended varieties. These varieties are still persistent due to one or another factor like stress resistance/tolerance, heat tolerance, good quality, disease resistance and/or absence of other suitable alternatives in respect of their versatile nature.

6.4: Production of breeders' seeds:

The indent for **production of breeders seeds** of desired varieties decides the production of foundation seeds and ultimately ensures the availability of certified seeds. The Central agencies get a share of these breeders seeds aiming at fulfilling the demand of foundation seeds as well as certified seeds of varieties. The target of production of exact quantity of breeders seeds during 2013-14 was 21111.07 qtls for 156 varieties. The highest indented target was 1313.88 qtls of HD 2967. Other indented varieties for **NWPZ** besides HD2967 were DBW17, PBW550, HD3043, Raj4037, DPW 621-50 and HD 2851. The varieties viz., K0307,Raj 4120 and HD2733 were the highest indented in the **NEPZ** during the year. In the **Central Zone (CZ)**, GW322 was highest indented followed by GW366, GW273, HD2932, MP4010 and HD2864. Thhe wheat variety Raj 4037 was highest indented in the **Peninsular Zone**. Varieties viz., HPW236, HPW349, HPW155 were the highest indented in the **NHZ**. The breeder seed indent and production of most popular top ten wheat varietie during 2013-14were as follows:

Table- 6.1: Variety-wise Breeder Seed Indent and Surplus Production durinjg 2013-14

Variety	Zone	State	Year of release	Indent (Qtl)	Production (Qtl)	Surplus(+) or deficit(-)
HD2967	NWPZ	Punjab, Haryana, Western UP, parts of Rajasthan & parts of Himachal Pradesh	2010	1313.88	1946.70	+
GW322	CZ	Gujarat, MP & parts of Rajasthan	2002	1162.20	1177.50	+
DBW17	NWPZ	Punjab, Haryana, Western UP, parts of Rajasthan & parts of Himachal Pradesh	2006	1010.98	1076.50	+
GW366	CZ	MP, Gujarat & parts of Rajasthan	2006	833.95	861.10	+
PBW550	NWPZ	Punjab, Haryana, Western UP, parts of Rajasthan & parts of Himachal Pradesh	2008	757.30	804.00	+
GW273	CZ	MP, Gujarat & parts of Rajasthan	1998	750.00	798.60	+
Lok 1	CZ	MP, Gujarat & parts of Rajasthan	1981	729.30	760.80	+
HD3043	NWPZ	Punjab, Haryana, Western UP, parts of Rajasthan & parts of Himachal Pradesh	2012	689.60	138.30	-
Raj4037	CZ	MP, Gujarat & parts of Rajasthan	2004	648.00	717.60	+
DPW 621-50	NWPZ	Punjab, Haryana, Western UP, parts of Rajasthan & parts of Himachal Pradesh	2011	621.37	1047.15	+

Barring HD3043 (2012) among the total 22 varieties indented during 2013-14, the breeders seeds production of all other varieties were surplused. The varieties which were with highest indent for breeders seeds production , were more than 10 years old except HD3043 (2012), HD2967(2010) and DPW621-50 (2011) all recommended for the NWPZ. Eleven(11) more varieties were also indented during 2013-14 which were Raj4120(2008), K0307(2006), PBW343(1994), HD2733(2001) for the NEPZ and varieties HD2932(2008)& HD2189(1979) were the indented for Peninsular Zone during the year. Breeders seed indent for the varieties viz., HPW236 (2009), HPW155 (2003), HPW249 (2010), HPW349 (2013) and HS507 (2010). Thus except the varieties viz., HD2967 (2010) and DPW621-50(2011) for NWPZ and HPW349 (2013) & HPW249 (2010) both for NHZ, all other varieties indented for breeders seeds production during 2013-14 were old (more

than 10 years) hence defeating the objective of varietal diversification as adopted during the All India workshop held in Kanpur two years back.

As against the targeted quantity of 19880.47 qtls, a total quantity of 22492.21 qtls of breeders seed was produced during 2013-14, thus a surplus of 1381.14 qtls of indented quantities of breeders seed production was recorded.

Deficient production of breeders seeds was recorded in forty seven (47) wheat varieties during 2013-14. Such varieties were HD3043(2012), HD2864(2005),C306(1965), MP1203(2009), HD2987(2011), PBW590(2008), MP3173(), HD2932(2008), HD2189(1979), MPO1215(2010), MP1202(2010), MP1142(), HI1563(1999) and HD2985(). The major deficit production of breeders seeds were observed during 2013-14 for 6 major varieties indented , only three varieties viz., HD3043(2012), HD2987(2011) and HD2985(2011) were the recent ones and rest were old(more than 10 Years). The deficient Breeders seed production (as in 2013-14) of 9 most recent wheat varieties were as follows:

Table- 6.2: Variety-wise Breeder Seed Indent and Deficit Seed Production during 2013-14

Variety	Zone	States	Year of release	DAC indent	Prodn. (qtls) (qtl)	Deficit producti-on (qtls)
HPW349	NHZ	Parts of J&K, Parts of Himachal Pradesh, Uttarakhand	2013	90.00	84	6.00
DBW71	NWPZ	Punjab, Haryana, Western UP, parts of (Rajasthan & Himachal Pradesh)	2013	42.00	31.80	10.20
HD3043	NWPZ	Punjab, Haryana, Western UP, parts of (Rajasthan & Himachal Pradesh)	2012	689.60	138.30	551.30
HD2987	NWPZ	Punjab, Haryana, Western UP, parts of (Rajasthan & Himachal Pradesh)	2011	224.80	54.50	170.30
HI1563	CZ	MP, Gujarat & parts of Rajasthan	2011	195.00	134.60	60.40
HD2985	NWPZ	Punjab, Haryana, Western UP, parts of (Rajasthan & Himachal Pradesh)	2011	96.60	44.00	52.60
WHD943(d)	NWPZ	Punjab, Haryana, Western UP, parts of (Rajasthan & Himachal Pradesh)	2010	102.20	64.00	36.20
NIAW1415	PZ	Maharashtra, Karnataka	2011	5.00	4.80	0.20
HPW249	NHZ	Parts of J&K, Parts of Himachal Pradesh, Uttarakhand	2010	60.00	40.00	20.00

While looking at the status of the most recently released wheat varieties, it was observed that some varieties remained in the state of without any production of breeders seeds during 2013-14 despite availability of an indent. These varieties were as under:

Table- 6.3: Variety-wise Breeder Seed Indent and Not Produce during 2013-14

Variety	Zone of recommendation	States covered	Year of release	Allocation of indent(qtl)
MP 3336	CZ	MP,Gujarat & parts of Rajasthan	2013	16.0
UAS428	PZ	Maharashtra, Karnataka	2012	2.00
Raj MR-1	NWPZ	Punjab, Haryana, Western UP, parts of (Rajasthan & HP)	2011	5.00
MP3288	CZ	MP, Gujarat & parts of Rajasthan	2011	29.00
MPO 1215	CZ	MP, Gujarat & parts of Rajasthan	2010	104.00
MP1202	CZ	MP, Gujarat & parts of Rajasthan	2010	92.00

The non recommended wheat varieties or specific varieties being either old ones or their susceptibility to biotic/abiotic stresses as well as stagnating or declining yield level are still being grown in some zones or states. The cultivation of older varieties prone to incidence of disease and pests results in yield loss. These varieties need to be phased out from the existing seed production chain to promote recent varieties under different production conditions. The details of varieties not recommended for cultivation are presented in Annexure-X. The varieties viz., HI 1563 recommended for Central zone (Madhya Pradesh, Gujarat and parts of Rajasthan) and WH1080 for NWPZ (Punjab, Haryana, Western Uttar Pradesh, parts of Rajasthan & Himachal Pradesh) both released for cultivation during 2011. In spite of being the most recent ones, these varieties were not included in the indent for breeders seeds by the states. The varieties need to be include in seed production chain for wide adoption in the recommended zones.

6.5. Suggested measures for addressing the lower Seed Replacement Rates (SRR) in States :

The Seed Replacement Rates (SRR) is comparatively higher in states like Punjab, Haryana, Uttar Pradesh, West Bengal, Bihar. On the other hand the SRR is lower in states like Himachal Pradesh, Gujarat and Jammu & Kashmir. In order to enhance the SRR in the states the following measures may be suggested:

- Indent of Breeders Seeds of desired varieties should be adequately placed by the concerned states; older and disease susceptible varieties should be extracted out from the seed chain and indenting such varieties should be stopped. Multiplication of Foundation and certified seeds of specific varieties in respective zones/states should be adequately planned
- Provisions of incentives under specific schemes like National Food Security mission(NFSM) should be encashed to upkeep the pace of varietal replacement in a focused manner.

GOOD CROP PRODUCTION PRACTICES

7: GOOD CROP PRODUCTION PRACTICES

7.1: Climatic requirement

Wheat is grown in all types of climatic conditions i.e. tropical, sub-tropical and temperate. In India, major wheat is under cultivation in areas in the sub-tropical region. The cool and sunny winter is very conducive for growth of wheat crop. The range of temperature required for optimum growth and development of wheat is as under:

Table- 7.1: Temperature requirements at different Growth stages

Growth stages	Temperature requirements
Germination	20 to 25°C mean daily
Vegetative growth	20 to 23°C mean daily
Grain filling	23 to 25°C mean daily

7.2: Soil requirement

Wheat can be grown on all kinds of soils, except the highly alkaline soils and water logged conditions. Soils with clay loam or loam texture, good structure and moderate water holding capacity are ideal for wheat cultivation. Durum wheat is preferably sown on medium to fine textured soils.

7.3: Agronomic Practices

- **Land Preparation**

The Wheat crop requires a well pulverized but compact seed bed for good uniform germination. One deep ploughing with soil turning plough followed by two harrowing and planking is desirable .

- **Seed and Sowing**

The optimum time of Sowing, Spacing & Seed Rate normally under specific production conditions are as follows:

Table- 7.2: Sowing Time and Seed Rate

Sowing Condition	Seed rate (kg/ha)	Time of sowing	Spacing (cm)
Irrigated Timely sown	100	10-25 November	20-23
Irrigated Late sown	125	25 Nov.-25 Dec.	15-18
Rainfed timely sown	100	25 Oct.-10 Nov.	20-25

Table- 7.3: Zone-wise Recommended Sowing Time

Wheat Zones	Optimum sowing time
Northern Hills Zone (NHZ)	First Fortnight of November
Nort Western Plains Zone (NWPZ)	-do-
Nort Eastern Plains Zone (NEPZ)	Mid November
Central Zone (CZ)	-do-
Peninsular Zone (PZ)	First Fortnight of November
Southern Hills Zone (SHZ)	Last Week of November

- **Seed treatment & sowing**

To ensure good germination and establishment of diseased free crop stand seeds must be treated with fungicide like Thirum or Bavistin 50WP @ 2.5 g/kg seed. Where there is problem of loose smut treat the seeds with Carbendazim (Bavistin 50WP) @ 2.5 g/kg seed or Carboxin (Vitavax 75 WP) @ 1.5g/kg seed to facilitate speedy germination in case of late sowings. Seeds may be soaked overnight followed by drying in shed before sowing. The seeds should be placed 5-6 cm deep below the soil where sufficient soil moisture is available to enable germination. Use of biofertilisers like *Trichderma viridi* (@ 80 gms for every 10 gms of seeds) and *Azotobacter* & PSB culture (@ 200 gms per 10 kgs of seeds) help for better plant stand at intial stage of the crop.

7.4: Wheat Varieties

Central Agriculture Research Institutions and State Agriculture Universities has developed many varieties of Wheat suitable for different zones, regions, states and production conditions. The significant recent varieties that were released during the last 10 years include HD3043(2012), HD2967(2010), DBW71(2013), HD2987(2011) and DPW621-50(2011) recommended for the NWPZ. For the NEPZ, the recent varieties include Raj 4120(2008), K0307(2006), HD2985(2009), HPW349(2013) etc. The varieties viz., MP1202(2010), MP3336(2013), MP3288(2011) were among the recent ones in the central zone. UAS428 (2012) and NIAW1415(2011) were among the recently released varieties for the Peninsular Zone. For the Northern Hills Zone, HPW249(2010), HPW(349) were the prominent ones. The details of these new improved varieties is given in the *Annexure- V.*

7.5: Fertilizer management- recommended doses for different ecologies, micro-nutrients, organic manures, application methods

Manures and fertilizers both play important roles in wheat cultivation. Use of Farm Yard Manure (FYM) improves the general physical condition and structure of the soil and its capacity to hold water. About 10 to 15 tons of FYM or compost should be applied 4 to 6 weeks before sowing and

worked well into the soil. A crop of wheat yielding 50 quintals of grain per ha. removes 100 to 150 kg nitrogen, 70 to 80 kg phosphorus and 125 to 150 kg potash from the soil. The response of a given variety of wheat to application of fertilizer, however, varies from field to field and from locality to locality which should be regulated in accordance with the soil test value for the respective nutrients .

The recommended per hectare dose of nitrogen normally ranges from 120-150 kg under irrigated condition and half the dose under rainfed conditions in NWPZ and NEPZ. In other zones, the dosage of nitrogen ranges from 90-120 kg under irrigated and 60 kg per ha under rainfed conditions. The dosage of phosphorous and potash have been recommended to be 60 kg P2O5 and 40 kg per ha. The recommended dosage of various major nutrients for wheat are as under:

Table- 7.4: Zone-wise Fertilizers recommendations for Wheat Crop

Zones	Sowing Conditions	Fertiliser dosage and Time of application
NWPZ & NEPZ	Irrigated timely sown	150:60:40 Kg NPK /ha 1/3 N and P+K at sowing time and 2/3 N at 1st node stage i.e. 35-40 DAS
	Irrigated late sown	120:60:40 Kg NPK /ha 1/3 N and P+K at sowing time and 2/3 N at 1st node stage i.e. 35-40 DAS
	Rainfed	60:30:20 Kg NPK /ha at time of sowing
NHZ, CZ, PZ & SHZ	Irrigated timely sown	120:60:40 Kg NPK /ha 1/3 N and P+K at sowing time and 2/3 N at 1st node stage i.e. 35-40 DAS
	Irrigated late sown	90:60:40 Kg NPK /ha1/3 N and P+K at sowing time and 2/3 N at 1st node stage i.e. 35-40 DAS
	Rainfed	60:30:20 Kg NPK /ha at time of sowing

In light soils, deficiency of micronutrients (like Zinc, Mn, Sulphur) in wheat fields particularly in the Rice-Wheat system (R-W System). The general recommendation in the concerned micronutrient deficient soils is as follows:

Table- 7.5: Recommended Dose of Micronutrients

Name of deficient micronutrient	Recommended Micronutrient combination to be applied	Application dosage	Application methods and frequency
Zinc	Zinc Sulphate	@ 25 kg/ha	At sowing once in a year in R-W system
	Foliar spray	0.5% zinc sulphate solution	2-3 sprays at 15 days interval in standing Zn deficient crop.
Manganese	Manganese sulphate	0.5% Manganese sulphate solution	2-3 sprays at weekly interval at 2-4 days before first irrigation
Sulphur	Gypsum	@250 kg/ha of Gypsum	At land preparation

7.6: Irrigation management:

The total water requirement of wheat crop is 450-650 mm, which need to be provided over first 100 days of crop growth uniformly. The loss of water through evaporation and transpiration from the wheat field i.e. evapotranspiration which directly influences the growth and yield of the crop. There is the need for 6 irrigations for wheat in general. However, in sandy loam soil 6-8 irrigations may be required whereas in heavy clay soil 3-4 irrigations are considered to be sufficient. The optimum time of irrigating wheat crop based on the physiological stages is one of the most important recommended methods of scheduling irrigation. Irrigations should be done at right time to minimize evaporation losses. The recommended time of irrigation is as below:

Table- 7.6: Irrigation Requirements at different Stages

Status of Irrigation	Critical Crop Development Stage	Approximate date after sowing
1st Irrigation	At crown root initiation stage	20-25 days
2nd Irrigation	At tillering stage	40-45 days
3rd Irrigation	At node formation/late jointing or booting stage	60-65 days
4th Irrigation	At heading/flowering stage	80-85 days
5th Irrigation	At milk formation stage	100-105 days
6th Irrigation	At grain filling/dough stage	115-120 days

Irrigating the crop at the critical growth stages (each ranging from 6-8 cm depth) increases the yield of wheat significantly. Depending upon the availability of water, irrigation is recommended to be scheduled for specific critical physiological growth stages of the crop as follows:

Table- 7.6: Irrigation Recommendation under Limited Irrigation Availability

Water availability for	Crown Root Initiation stage (20-25 DAS)	Tillering stage (40-45 DAS)	Node formation/late jointing or booting stage (60-65DAS)	Heading/flowering stage (80-85DAS)	Milk stage (100-105 DAS)	Dough stage (115-120 DAS)
1 irrigation	✓					
2 irrigations	✓			✓		
3 irrigations	✓		✓		✓	
4 irrigations	✓	✓	✓		✓	
5 irrigations	✓	✓	✓	✓	✓	
6 irrigations	✓	✓	✓	✓	✓	✓

DAS= Days after sowing

Microirrigation :

Sprinkler and drip irrigation techniques are the micro irrigation technologies that lead to substantial savings of water in irrigating wheat. In areas of water scarcity or very limited water availability for irrigation, such micro-irrigation techniques are useful in improving the Water Use Efficiency (WUE) and the cost of production as a whole. The practice of sprinkler irrigation are in practice in Haryana in the NWPZ, Gujarat and Madhya Pradesh in Central Zone(CZ) and Maharashtra Peninsular Zone(PZ). Sprinkler and drip irrigation systems recorded significant yield for NWPZ (IW/CPE ratio of 1.20)with 5.3 t/ha, for CZ(IW/CPE ratio of 0.60) with 4.5 t/ha and for PZ ((IW/CPE ratio of 0.80) with 4.5 t/ha.(Ref. DWR,Karnal,2013-14). However, the initial high cost of the system and the higher recurring maintenance cost poses a hindrance particularly for the Small & Marginal Farmers (SMF).

7.7. Resource Conservation in Wheat Cultivation

7.7.1. Laser Land Leveller:

Recommendation is there for levelling of the land by Laser land leveler that makes the field ideal for uniform moisture distribution to be available for wheat crop's root zone. It increases the WUE by about 35-45% and Increased Nutrient Use efficiency by about 15-25% and with the yield advantage of more than 15%.

7.7.2. Surface Seeding Technology

In wheat growing areas where the soil remains moist for a long time after harvesting of Rice crop because of which the tillage operations becomes not possible to be taken up in time. In such areas as in eastern

part of Indo-gangetic plains of India, dry or soaked wheat seeds can be sown a few days before or immediately after the harvest of the Rice crop under moist/ saturated soil conditions. This system of 'surface seeding' in wheat is most suitable for low land areas where the water received at a time advanced growth stage of wheat. The method , ideal for Rice – Wheat rotation, controls weeds, conserves resources and reduces cost of cultivation.

7.7.3. Zero- Tillage (ZT) Technology

Rice/Direct Seeded Rice (DSR)-Wheat system is one of the major and dominant cropping systems that occupied approximately 11 million hectares area in the Indo-Gangatic plains . To induce timely sowing of wheat within the range of optimum limit and to take advantage of available soil moisture for initial stand establishment, sowing wheat with the Zero Till Ferti-cum-Seed Drill can be practiced. The practice is picking up in the Indo-gangetic plains but not recommended for heavy clay type soils. The technique can be adopted in Rice-Wheat system in particular as a constituent of Conservation Agriculture practices.

7.7.4. Furrow Irrigated Raised Bed-Planting (FIRB) System

The FIRB method helps in saving irrigation water upto 40% and increase Nutrient Use Efficiency (NUE) and other inputs for economic crop production. Various versions of the machine suitable for sowing of wheat and other crops on raised beds have been developed by different groups working on FIRB system. The method is also ideal for Rice – Wheat rotation for reduced cost of cultivation owing to reduced of basic inputs like seeds, fertilizer to the tune of 25%, increased Water Use Efficiency (WUE), management of obnoxious weeds like Phalaris minor and ultimately resource conservation.

7.7.5. Rotary Tillage Technology:

The Rotary Tillage Machine is a combination of rotary tiller, seed cum fertilizer drill and a light planker cum driving wheel and is advantageous over conventional tillage as the machine, completely pulverizes the soil, the seeding is done simultaneously, soil moisture is conserved and saves energy and time. The rotary-till-drill machine named as DWR Rotavator-cum-Drill is suitable for sowing wheat both under normal and late sown conditions and economizes on fuel and the all important time especially when wheat sowing is delayed after Rice harvest, particularly of Basmati type Rice. By this machine, sowing of wheat is completed in a single tractor operation leading to substantial savings on diesel consumption and time required for conventional field preparation.

7.8: Weed management:

7.8.1: Important Weed Flora:

The pre-dominant weeds are mostly annuals and associated with wheat crop are *Anagallis arvensis* (Krishananeel), *Argemone mexicana* (Satyanashi), *Asphodelus tenuifolius* (Piazi), *Avena ludoviciana* (Jangli Jai), *Cannabis sativa* (Bhang), *Carthamus oxycantha* (Pohli), *Chenopodium album* (Bathu), *Cirsium arvense* (Kateli), *Convolvulus arvensis* (Hirankhuri), *Cornopus didymus* (Pitpapra), *Euphorbia jelioscopia* (Dudhi), *Fumaria parviflora* (Gajri), *Lathyrus aphaca* (Matri), *Malva parviflora* (Gogisag), *Medicago denticulata* (Maina), *Malilotus alba* (Metha), *Phalaris minor*(Mandushi/Gulidanda), *Poa annua* (Poa ghas), *Polygonum plebejum* (Raniphul), *Polypogon monspeliensis* (Lomar ghas), *Rumex retroflex* (Jangli palak), *Spergula arvensis* (Bandhania), *Vicia sativa* (Chatri/Gegla).

Phalaris minor is the dominant weed of wheat in rice-wheat system found in NWPZ. Sometimes its population is so high (2000-3000 plants / m2) that farmers are forced to harvest the wheat crop as fodder.

Isoproturon (Arelon) was recommended for the control of *Phalaris minor* in 1980s. It remained effective for almost a decade. But sole dependence on this herbicide resulted in the development of resistance to Isoproturon in controlling *Phalaris minor*. In zero tillage fields, the intensity of *Rumex* and *Malwa parviflora* is increasing and intending to become a problem in the coming years. Therefore, there is the requirement of strict vigilance regarding weed flora shift due to changes in tillage practices.

7.8.2: Weed Management Practices

Various practices of weed management can be grouped into three broad categories namely cultural and preventive; physical or mechanical; and chemical weed control. These practices are as under:

7.8.2.1: Cultural and Preventive

Cultural practices such as time and method of sowing, crop density and geometry, crop varieties, dose, method and time of fertilizer application, time and method of irrigation have pronounced effect on crop-weed interference. Some of these factors are use of clean wheat seeds that is free from weed seeds, early sowing of wheat (before 15 Nov.), adoption of closer row spacing (18 cm), adoption of cris-cross sowing to increase population density of the wheat plants, placement of basal dose of fertilizer 2-3 cm below the seed, sowing of wheat on Furrow Irrigated Raised Bed System (FIRBS) to reduce weed population, pulling out weeds before seed setting for curbing seed bank of weeds, keeping bunds & irrigation channels free from weeds, introduction of either Berseem or Oat for Fodder, as a crop rotation and sown once in three years, stimulate emergence of Phalaris by giving light irrigation followed by weed control with non-selective herbicides like Glyphosate or cultivation followed by sowing of wheat, zero tillage offer a way to manage Phalaris and grow fast growing and robust varieties of wheat for smothering impact on weeds.

7.8.2.2: Mechanical Control

Removal of weeds by various tools & implements including hand weeding. It is not feasible where weeds resemble morphologically to crop e.g. *P. minor* & *Avena ludoviciana* before flowering. Also, mechanical weed control becomes difficult in broadcast sown wheat. However, mechanical control can be practiced effectively when wheat is sown on FIRBS as this system facilitates tractor mounted implements usage.

7.8.2.3: Chemical Control

Chemical weed control is in practice because of less labour involvement and no mechanical damage to the crop that happens during manual weeding hence cost effective. Moreover, the control is more effective as the weeds even within the rows are killed which invariably escape, because of morphological similarity to wheat, during mechanical control. The following Weedicides schedule has been found effective in controlling the Isoproturon resistant population of *Phalaris minor*. Out of the four new herbicides found effective against Phalaris, two namely Sulfosulfuran and Metribuzin were effective against both grassy and non-grassy weeds, whereas Clodinafop and Fenoxaprop were specific to grassy weeds. The recommended herbicides for controlling different categories of weeds are as under:

Table- 7.8: Recommended Doses of Herbicides

Type of weeds to be managed	Herbicides recommended	Time of application	Dosage (g a.i./ha)
Grassy weeds	Clodinafop(Topik 15WP)	Post-em. at 30-35 DAS	60
	Fenoxaprop-ethyl (Puma Super 10EC)	Post-em. at 30-35 DAS	100-120
	Pinoxaden (Axial 5EC)	Post-em. at 30-35 DAS	35-40
	Sulfosulfuron (Leader 75 WG)	Post-em. at 30-35 DAS	25
	Isoproturon (Arelon 75WP)	Post-em. at 30-35 DAS	1000
	Pendimethalene (Stomp 30EC)	Pre-em. at 1-3 DAS	1000-1500
Broadleaved weeds	2,4-D-E (Weed war 38 EC)	Post-em. at 30-35 DAS	500
	Metsulfuron (Algrip 20WP)	Post-em. at 30-35 DAS	4
	Carfentrazone (Affinity 50WDG)	Post-em. at 30-35 DAS	20
	Pendimethalene (Stomp 30EC)	Pre-em. at 1-3 DAS	1000-1500
Both Grassy+ Broadleaved Weeds together	Isoproturon (Arelon 75WP+ 2, 4 -D-E (Weedwar 38EC)	Post-em. at 30-35 DAS	750+500
	Sulfosulfuron 75% +Metsulfuron 5% (Total 80 (75+5)WDG	Post-em. at 30-35 DAS	30+2
	Mesosulfuron + Iodosulfuron (Atlantis 3.6 (3+0.6)WDG	Post-em. at 30-35 DAS	12+2.2

7.9: Plant protection:

Incidence of diseases and pests normally donot occur in wheat in severity except rusts. Rusts are the dreaded ones caused by fungal infestation. Among the three types of rusts in wheat, Stripe or Yellow rust and Stem or black rust, if allowed to continue uncontrolled for few days, can cause 100% loss of wheat. The leaf or brown rust on the other hand, may cause 60% loss. Rusts along with other diseases occur in different locations of the country through survival in alternate hosts. The hotspot locations of different diseases are as follows:

Table- 7.9: Identified Hotspot of Wheat Diseases

Disease	**Hot spot locations**
Stripe rust	DhaulaKuan, Ludhiana, Gurdaspur, Karnal, Yamunanagar, Ambala, Nawashar, Ropar, Almora, Palampur and Wellington
Leaf rust	Ludhiana,Karnal,Hissar, Delhi, Pantnagar, Durgapura, wellington, Mahabaleshwar and Dharwad
Stem rust	Indore, Powerkheda, Junagad, Vijapur, wellington, Mahabaleshwar, pune and Niphad
Karnal bunt	DhaulaKuan, Ludhiana, Gurdaspur, Karnal, Pantnagar and Hissar
Loose smut	Ludhiana, Karnal, Hissar, Delhi, Almora and Pantnagar
Flag smut	Hissar, Durgapura and Ludhiana
Hill Bunt	Palampur and Almora
Head Scab	Karnal, Gurdaspur and Dhaulakuan
Leaf blight	Ludhiana, Karnal, Faizabad,Varanasi,Kalyani,Pusa(Bihar) and wellington
Powdery Mildew	Almora, Simla, Palampur, Ranichauri, Pantnagar, Dhaulakuan, Wellington and Kaul
Foot rot	Dharwad and Sagar

(Ref. DWR,karnal)

Rusts: For the management of Rusts, Crop health surveillance , apart from providing decision making tool for taking up the plant protection measures, also provides information on the occurance and spread of the disease in a locality and on the specific cultivar(s) with the pathotypes emerged. Based on different modules formulated and validated at farmers' fields, the following package are recommended for management of rusts particularly yellow rust in Northern India:

- Use of high yielding diseases resistant Wheat varieties; Stripe rust resistant varieties are HD2967, WH1105, HD3086, DBW88, DBW71, HD3059, WH1021, WH1080, HD3043, DBW90, HS507, HPW349 and HS 542.

- Timely sowing in Zero-till or well prepared field with application of recommended doses of fertilizes;
- Application of 0.1% solution of Tilt (Propiconazole 25EC) or Tebuconazole 250EC @ 500 ml/ha immediately after the appearance of any of the diseases i.e. Rust/foliar blight and powdery mildew. The spray should be at 15-20 days interval. Prophylactic spray in the adjacent areas should also be done.

Karnal Bunt : The disease caused by Tilletia indica, a basidiomyceteous fungal disease was first reported from Karnal in Haryana in 1931.Karnal Bunt disease perpetuate year after year through seeds, soil and air borne inoculums. Integrated management approach is the ideal measure to manage the disease. Under cultural approach, crop rotation, fallowing the land, non cultivation of wheat for more than 3 years which may extend till 7 years , adequate irrigation and balanced fertilizer application besides seed treatment with with Carboxin or Carbendazim @ 1.25 g/Kg of seed and Tricoderma harzianum @ 2 g/ Kg of seed may be adopted. Spraying Propiconazole at heading stage, although does not eradicate the disease but induces more than 71% control of Karnal Bunt. Some biocontrol agents like *Trichoderma viride, T.harzianum, T. lingorum, Gliocladium deliquscens etc.* may control the disease. Growing resistant varieties is the most effective way in managing the disease. Over the years , number of KB resistant varieties have been developed and released for cultivation . Prominent KB resistant varieties recommended for cultivation in various zones are:

- **For NHZ**: HS 420(2003), VL829(2002), VL892(2007), HS375(2003).
- **For NWPZ**: PBW527(2004), PDW314-d(2010), HD2687(1999), PBW 590(2008), HD2967(2009), DPW-621-50 (2011).
- **For NEPZ**: NW1012(1997), NW 2036(2003), K 9006(1998),K 8434 (2001), Halna (2001), K9533 (2002), HD 2643 (1997), HP 1744(1997), NW 1014(1998), HI 1563 (1999), PBW343(2000)
- **For central Zone(CZ)** : HI8381(1995), HI 8737 d(2014), DBW110(2014), PBW524(2004), Raj 3765(1996).
- **For peninsular Zone(PZ)**: UAS 428(2012).

Loose Smut: The disease caused by Ustilago tritici is one of the major diseases of wheat that occur in the NWPZ states. Treatment of seeds with systemic fungicide viz., Carboxin or Carbendazim (Bavistin) @ 1.25 g/Kg of seed and Tricoderma harzianum @ 2 g/ Kg of seed manages the disease.

Insect-Pests incidence: Wheat crop in India is relatively free from epidemics of insect-pests. However, incidence of Shoot fly, Brown wheat mite and Aphids are not uncommon. Termites have been a problem in some areas which can be controlled by seed treatment with Chlorophyriphos 20 EC @ 4 ml/Kg of seed in Termite infested area.

The IPM approach would help in reduction in cost of production, more economic access of food to the poor and conservation of the resilience and integrity of ecosystems.

7.10: Harvesting, threshing and storage

Fields should be total dry and harvesting should be done when *the ears are sufficiently dry and* the grain moisture content is around 14 to 20%. The harvested crop is thereafter threshed and sundried to a moisture level of around 10-12% for safe storage. Grains should be in galvanized beans and fumigate it with aluminum

phosphide @ 01 tablet (3g of each) or EDB @ 3 ml/100 kg of grains. The crop is harvested in different periods in various zones/states. The zone wise harvesting period of wheat and threshing techniques adopted are as under:

Table- 7.10: Zone-wise Time of Harvesting & Threshing

Wheat growing Zone	Harvesting period	Method of harvesting and threshing
NWPZ	Mid April to April end	Mechanized harvesting through Combined harvester on custom hiring basis in most cases; also by reaper binder and threshing by mechanical threshers in some areas.
NEPZ	Last week of March to April	Generally manual har vesting; however, use of combines are observed in vast areas of wheat in West Bengal. Reaper binders are also being introduced. Mechanical threshers are used.
Central Zone (CZ)	End of February to March	Mostly manual harvesting. Mechanical threshers are used.
Peninsular Zone (PZ)	Later February till end of February	Mostly manual harvesting. Mechanical threshers are used.
Northern Hill Zone(NHZ)	May-June	Mostly manual harvesting. Mechanical threshers are used.
Southern Hill Zone (SHZ)	February	Mostly manual harvesting. Indigenous manual threshing is in practice.

CROPPING SYSTEM

8: CROPPING SYSTEM

8.1: Prevalent wheat cropping systems:

Wheat is grown mainly in cropping sequences like Rice-Wheat, Jowar-Wheat, Bajra-Wheat, Maize-Wheat, Pulse-Wheat, Cotton-Wheat, Soybean-Wheat etc. in different parts of the country under irrigated condition although Rice-Wheat system is the most common. Under rainfed condition, fallow-Wheat is most common, but sometimes short duration pulse crops are also grown. Growing water guzzling crop of rice creates depletion of ground water thereby reducing the availability for irrigation. Besides, non judicious and imbalanced application of fertilisers makes the system less sustainable. The prevalent cropping systems in major wheat growing states are as under:

Table-8.1: Prevalent cropping system involving wheat in major Wheat growing states

Sl. no.	State	Prevalent wheat based Cropping systems	Total area under wheat (lakh ha)	Percentage of irrigation under wheat crop (%)
1	Bihar	Rice-Wheat, Maize-Wheat, Sesame –Wheat	22.6	93.2
2	Chhattisgarh	Soybean-Wheat, Rice-Wheat, Sorghum-Wheat, Cotton-Wheat	1.0	73.6
3	Gujarat	Groundnut-Wheat, Maize-Wheat, Rice-Wheat, Cotton-Wheat, Pigeon Pea-Wheat	13.5	90.8
4	Haryana	Rice-Wheat, Sorghum-Wheat, Cotton-Wheat, Bajra-Wheat, Maize-Wheat	25.0	99.4
5	Himachal Pradesh	Maize-Wheat	3.7	20.6
6	Jammu & Kashmir	Rice-Wheat, Maize-Wheat	2.9	28.7
7	Jharkhand	Rice-Wheat	1.7	89.1
8	Karnataka	Groundnut-Wheat	2.1	56.7
9	Madhya Pradesh	Rice-Wheat, Sorghum-Wheat, Soybean-Wheat, Cotton-Wheat,	57.9	87.1
10	Maharashtra	Soybean-Wheat, Bajra-Wheat, Rice-Wheat, Cotton-Wheat	11.0	73.9
11	Punjab	Rice-Wheat, Cotton-Wheat, Maize-Wheat,	35.1	98.8
12	Rajasthan	Sorghum-Wheat, Maize-Wheat, Bajra-Wheat	28.1	98.1
13	Uttar Pradesh	Rice-Wheat, Bajra-Wheat, Sorghum-Wheat, Sugarcane-Wheat	99.6	98.1
14	West Bengal	Rice-Wheat	3.4	95.9
		All India Average	312.0	92.1

Ref. DES, DAC, MoA, Govt of India, 2013

8.2: Preference of farmers for rice-wheat cropping system:

The western part (Punjab, Haryana and Western Uttar Pradesh) of Rice-Wheat belt of Indo-Gangetic Plains, where wheat is the predominant crop, provides a favourable environment through assured irrigation for both rice and wheat crops. The overall rice and wheat yields here are almost twice the yields obtained in the eastern states of Indo-Gangetic Plains. Wheat requires about 400 mm of water for irrigation to cater the need of the irrigation at all 6 critical growth stages. Availability of water for irrigation in these areas, mechanized farming including mechanized harvesting & threshing, longer shelf life, assured procurement & minimum support price and higher economic returns of the system are the main reasons for the farmers of NWPZ to stick to the rice-wheat system. The eastern Indo gangetic plains of NEPZ have abundance of water for irrigation. .The popularity of the Rice – wheat system in the NEPZ states can also be attributed to most of the similar reasons as in NWPZ. However, the increasing trend of mechanization resulting in comparatively lesser cost of cultivation, extending boundaries of assured procurement and higher MSP add to the reasons for the preference of the farmers. Madhya Pradesh in the Central Zone is emerging as one of the main wheat growers of the country. Availability of provisions of more irrigations under restricted irrigation conditions and assured procurement and higher Minimum Support Price with enhanced bonuses leading to higher economic returns of Rice-Wheat system lured the farmers to incline towards the system.

The existing buffer stock norm of Govt of India indicates the requirement of 11.2 million tonnes of wheat as on 1st January every year. Wheat constituted little more than 50% of the stock of foodgarins (34.38 million tonnes) in the central pool as on 1st January of the current year (Ref. Agri statistics at a glance, 2013, Govt of India). As such surplus wheat is available in the national food basket signifying the contribution of the farmers growing wheat.

8.3: Problem in prevalent cropping system:

While considering the sustainability of Rice-Wheat Cropping System (RWCS) of the country, it has been observed that the rice and wheat yields are either stagnant or yet to reach their potential. Swaminanthan (2002) indicated that Punjab, Haryana Western Uttar Pradesh regions (a major part of RWCS belt of India), which today serve as India's food basket, may become very food insecure in another 20 years . As such there is wide concern about the sustainability of this system. Some of the important issues are :

i. **Depletion of Ground Water Resources:** Though ground water is a natural bounty with highest possible irrigation efficiency, whereas the development of surface water irrigation potential is a very costly affair entailing even the loss of productive land in networking of canals along with the associated problem of water logging, salinity, etc. North Western part of India (Haryana and Punjab) with Rice-Wheat cropping system is a typical example of such declining Ground water which is due to its overexploitation and brackish nature in some areas.

ii. **Decline in Soil Fertility:** Simultaneous increase in nutrient mining and imbalanced fertilizers application are damaging the soil fertility status so far as the quality of soil resources, environmental pollution and cost of production are concerned. Out of 16 plant nutrients, C, H and O being contributed by air and water, rest 13 are taken up from soil. Presently, farmers apply nitrogen, phosphorus and zinc (in some cases) only i.e. for other 10 nutrients there is no replenishment towards soil bank. The status of potash and various micronutrients is declining and may not be sufficient to meet the requirement of the crop in near future due to their lack of replenishment.

In the major rice-wheat system areas of North-West India, soil carbon has decreased from 0.05 in 1960's to 0.02% in the late 1990's. Such a decline is prevalent throughout the RWCS in India. There is perceptible decrease in the efficiency of chemical fertilizers as such.

iii. **Decline in Factor Productivity:** While yields are stagnating and even declining or unable to reach the potential status in certain cases, input use pattern reflects progressive increase in nutrient demand, more application of pesticides and also strain on water front. This implies that input use efficiency is decreasing with simultaneous increase in cost of production. The higher cost of production in any crop increases the risk probabilities. The net income from Rice-Wheat Cropping System is declining and farmers are finding hard to maintain their per unit economic returns . Reduction in cost of production through various means viz., operational costs involving land preparation, mechanization in sowing, intercultural and harvesting/threshing including Resource conservation Technologies in Conservation Agriculture practices may augment the farmers income out of their crop fields.

iv. **Rising Problem of Insect-pest and Disease Complex:** The lush green crops of rice and wheat with liberal use of nitrogenous fertilizers and constant favourable condition becomes a paradise for building up an insect-pest and disease complex. Under the circumstances farmers tend to act on the advice of dealers, are adding complexity to the situation. This situation is further deteriorated by monoculture. Some of important issues are

- **Incidence of Rusts (Stripe rust)** has been growing a major concern & occurs only in the peak growing season of the crop. Massive awareness and spray operations of Propiconazole including growing resistant varieties of wheat answers the threat. Spraying of Propiconazole and Tebuconazole in alternate seasons are also recommended to escape any build up of resistance.
- **Karnal Bunt** is another problem that comes on the way of achieving higher productivity and marketing. Resistant varieties have been developed but the wheat fields where the disease occurred have been suggested to be kept out of wheat cultivation at least for three years and simultaneously soil and seed treatment need to be carried out even in other nearby areas.

v. **Problem of weeds and their management:** Weed is one of the major biotic constraints in wheat production as they compete for nutrients ,moisture, light and space. Weeds are associated with specific crops and the most critical stage of crop-weed competition remains within 30-35 days after sowing. Improved cultural practices led to build up of the difficult weed *Phalaris minor*.

- Phalaris minor is one of the threats in wheat production. The obnoxious weed was found to have built up resistance to the most effective weedicide- isoproturon. Application of other herbicides viz., Sulfosulfuron or Leader, Clodinafop, Pinoxaden and fenoxaprop have been the most effective measure to contain the grassy weed to grow.
- Integrated Weed Management combines nos of effective weed control measures which involves maintaining the optimum plant density, maintaining optimum time of sowing, proper spacing, adequate recommended fertilizer and irrigation water management in combination with chemical methods i.e. application of herbicides leads to effective management of weed species thus prevents any weed shift flora.

8.4: Suggested alternate cropping system:

In Rice-Wheat Cropping System (RWCS) much of the problem relates to rice and it is the most remunerative crop in the kharif season with probably no alternative at present. Apart from the core districts are

tempting to grow rice under sub-optimal conditions which is more damaging to the quality of natural resources. Delay in harvest of rice further delays sowing of wheat that results in yield reduction. While retaining rice in Kharif season, early varieties maturing in 95-105 days after transplanting will facilitate diversification within the RWCS as replacement of wheat with crops including short duration ones (mustard-summer moong, pea-potato, toria-sunflower, potato-sunflower, toria-potato, potato-onion, pea-cucurbits, raya-cucurbits, etc.). The alternative crop sequences with pulses and oilseeds will save the resources and may be equally profitable as well as soil fertility improvement. In case where rice is yet to be kept in the cropping system as inevitable introduction of direct seeded rice(DSR) may be the ultimate option to arrest the resource depletion.

Intercropping wheat in sugarcane is another viable option. Sugarcane alone is a remunerative crop and also there is enough scope of addition of wheat through intercropping. Growing wheat after sugarcane also existed in areas like Western UP and is also a profitable cropping system. The system is therefore found to create yield enhancement of wheat and ultimately enhance the total income of the farmers.

8.5: Means to stabilize and sustain the rice-wheat cropping system:

There has been depletion of natural resources in RWCS and also in reversible limits thus sustainability of the system is in question. The necessary measures are therefore need to be taken to stabilize the system. Some of the measures are as under:

a. **Zero Tillage:** Zero tillage as breakthrough in wheat cultivation. The long duration rice cultivation before wheat usually overlaps the following wheat season thereby induces delayed sowing of wheat. Zero tillage reduces the time taken for land preparation besides economizing the cost of production resulting in increasing the margin of profit for the wheat growers. Additionally, wed infestation is also reduced in zero tillage areas.

b. **Green Manuring:** There is a fallow period of 45-50 days between harvest of wheat and transplanting of rice which is sufficient to raise a very good green manure crop. Though any leguminous crop can be used for green manuring but Sesbania aculeata is best fit. It grows well even on marginal soils, could accumulate about 250 q ha^{-1} biomass in seven weeks. Its incorporation in the soil can contribute 60-80 kg N ha^{-1}. The carbon and nitrogen ratio is ideal for rapid decomposition and nitrogen availability is as fast as from urea. Green manuring alone is sufficient to meet all the nitrogen need of Basmati rice, whereas in other varieties it is possible to skip the basal dose.

c. **Crop Residue Management:** Due to short turn-around period between two crops in RWCS, crop residue management is a serious problem. Wheat residue management becomes a problem if a third crop (rice/ moonbeam/cowpea/fodder) is taken during summer. Since it is very crucial to sustain the RWCS and in conservation tillage it is worth to retain 30% of the crop residues.

d. **Integrated Pest and disease Management (IPM):** I Wheat is comparatively a safe crop as far as pest incidence is concerned

e. **Judicious Water Management:** Water-Use-Efficiency in Rice-Wheat Cropping System (RWCS) is generally low. Water management in RWCS can be optimized by appropriate soil management to reduce percolation, proper scheduling of irrigation, use of ground water and utilization of rain water. Thus, proper use of water resource may enhance the water productivity.

f. **Direct Seeded Rice (DSR)** in rice - wheat growing system may reduce the water use 30% & increase the Water Use Efficiency (WUE) of the system as a whole without sacrificing the yield at the end.

WHEAT PRODUCTS

9: WHEAT PRODUCTS

9.1: Industrial use of Wheat product and by-product,

9.1.1: Wheat Products:

The main consumable products out of wheat are Wheat Bran (Chokar), whole Wheat Flour (Atta), Fine Wheat Flour (Maida), Semolina-Coarse & Fine (Suji & Rawa) Macaroni product etc.

9.1.2: Bye-Products :

We may consider using wheat bye products, mainly stalks, for the products viz, (1) Geotextiles, (2) Filters, (3) Sorbents, (4) Structural composites, (5) Non-structural composites, (6) Molded products, (7) Packaging, and (8) Combinations with other materials. Wheat straw is also used as cattle feed.

9.1.3. Use of Wheat in manufacturing other products:

- **Straw Particle Board (wood)**: Primary uses of strawboard include ready to assemble furniture, flooring a, foundation for lamination and kitchen cabinets.
- **Wheat starch in Paper making:** Wheat starch makes paper stronger.
- **Adhesives:** Many types of Starch is used as an adhesive on postage stamps and is used to hold the bottom of paper grocery sacks together. Polymers, Packing peanuts, Plastic Bags, Plastic film, eating utensils and molded items (biodegradable) Packaging, foams and insulation (biodegradable, starch-based),Reinforcing agents in rubber products , Charcoal, Cups, Fine paper products (carbonless copy paper),Fuels, Golf Tees, Insulation Medical swabs, Roofing and other building materials, Textile finishing agents, Wood substitute in composite building materials.
- **Cosmetics and Pharmaceutical products:** Wheat starch could be substituted in significant volumes for current materials if probed commercially viable. Hair conditioners, Moisturizers, Liquid laundry detergents and Water-soluble inks.
- **Starch replacing fat in desserts:** Researchers have found when wheat starch replaces fat in frozen desserts, the desserts not only are lower in fat, but also are creamier and tastier than the same product without wheat starch.
- **Milk replacers:** Egg white substitutes, non-dairy products including whipped toppings, creamers Co-binder in food and non-food packaging, A carrier of the controlled release of pesticides or flavors.

9.2: Products derived from main product and by-product and their uses

9.2.1: Wheat Food products

Table-9.1: Generic Type of Wheat food products

Type of Wheat	Products
Hard Wheat derived	White pan breads, White specialty breads, Wheat breads
Wheat-other mixtures	Rye and pumpernickel breads, Mixed grain breads
Soft Wheat	Crackers, Cookies, Cakes, Pie crusts, Puff pastries, Doughnuts, Refrigerates dough
Durum Wheat	Pasta products
Wheat breakfast cereals	Traditional hot cereals, Instant traditional hot cereals, Ready to eat cereals, Miscellaneous cereals

Table-9.2 : Traditional products made from different species of Wheat

Type of Wheat	Products
Bread	Chapati/ Roti/ Phulka, Tandoori Roti, Rumali Roti, Naan, Kulcha, Bhatura, Pizza, Kachori, Samosa, Matthi, Namakpara, Papad, Prantha, Paysam, Balusai, Jalebi, Ghewar, Phirni, Sawainan, Chikki, Vattayappam, Palappam, Shahitoast, Noodles, Laddu
Durum	Chapati, Paramtha, Dhebra, Bhakri, Porridge, (salted&sweet), RawaIdli, Rawa Puttu, Khichdi etc.
Diococcum	Culadi ki Laddu, Godi Huggi, Sweet pan cake, Madal etc.

9.2.2: Processed Wheat

9.3: Bakery Flours

Bakery Flours	Applications
Wheat Flour For Luxury Bread	Premium quality luxury bread making wheat flour with high strength and protein.
Wheat Flour For Bread	High quality bread making wheat flour with moderate strength and protein content. Suitable for French baguette and all bread types.
Wheat Flour For Bread	High quality bread and all purpose flour.
Wheat Flour For Bread	Darker coloured, bread making wheat flour. Suitable for Indian type and flat breads.
All Purpose Wheat Flour	A perfect balance of flour strength and cost effectiveness. Suitable for all applications.
Wheat Flour For Wet Noodle	High elastic character with low ash content. Specially designed wet noodle.
Wheat Flour For Instant Noodle	Lower strength and protein content. Mainly suitable for Cake, confectionary and instant noodle.
Wheat Flour For Industrial use	Industrial wheat flour for animal feed.
Wheat Barn	The by-product of wheat milling, used in the animal feed.

9.2.2.1: Special Applications

Bread Mix with Oats, Multi Grain Bread Mix, Bread Mix with Wheat Bran.

9.2.2.2: Feed Products

- Wheat Midds Animal feed, Wheat Midds Pellets Animal feed, Red Dog Animal feed Wheat Germ Animal vitamins. Second Clear Flour Pet food, animal feed, plywood industry, vital wheat gluten. Durum Second Clear Pet food

2.3: Wheat Milling Products

- **White flour** is the finely ground endosperm of the wheat kernel.
- **All-purpose flour** is white flour milled from hard wheats or a blend of hard and soft wheats.
- **Bread flour** is white flour that is a blend of hard, high-protein wheats and has greater gluten strength and protein content than all-purpose flour.
- **Cake flour** is fine-textured, silky flour milled from soft wheats with low protein content.
- **Self-rising flour**, also referred to as phosphated flour, is a convenience product made be adding salt and leavening to all-purpose flour.

- **Pastry flour** has properties intermediate between those of all-purpose and cake flours. It is usually milled from soft wheat for pastry-making, but can be used for cookies, cakes, crackers and similar products.
- **Semolina** is the coarsely ground endosperm of durum, a hard spring wheat with a high-gluten content and golden color. It is hard, granular and resembles sugar. **Durum flour** is finely ground semolina. It is usually enriched and used to make noodles.
- **Whole wheat, stone-ground and graham flour** can be used interchangeably; nutrient values differ minimally. Either grinding the whole-wheat kernel or recombining the white flour, germ and bran that have been separated during milling produces them. Their only differences may be in coarseness and protein content. Insoluble fiber content is higher than in white flours.
- **Gluten flour** is usually milled from spring wheat and has a high protein (40-45 percent), low-starch content. It is used primarily for diabetic breads, or mixed with other non-wheat or low-protein wheat flours to produce a stronger dough structure. Gluten flour improves baking quality and produces high-protein gluten bread.

Table-9.4: Suitable Wheat Varieties for Different Wheat Products

Wheat Product	Wheat Varieties
Chapati	C 306, Raj 3765, HD 2285, PBW 226, PBW 175, PBW 373, K 8027, LOK 1,MACS 6145, K 9107, UP 262, NW 1014, HUW 234, HUW 533, HD 2833,Sujata, HI 1500, HW 2004, DL-788-2, GW 173, GW 273, GW 322, GW 496
Bread	HS 240, VL 738, PBW 396, HD 277, HD 2733, NW 2036, LOK 1, GW 173, GW190, GW496, HI977, HD 2189, HD 2501, DWR 162, DWR 195, PBW 533
Biscuit	Diococcum varieties
Pasta	Durum varieties PDW 233, WH 896, PBW 34, HI 8498, HD 4672, MACS 2846, Raj 1555, A-9-30-1, DDK 1009, NP 200

The quality requirements for each end-product have been defined and grain hardness, protein content and gluten strength have been noted as key components in wheat quality. Molecular markers associated with gluten strength in durum wheat have been identified using recombinant inbred lines. Micro level tests useful in breeding for evaluating early segregating generations such as solvent retention capacities and sedimentation tests have been developed for improving wheat quality. Germplasm lines with desirable quality traits have been identified and being used in breeding programme. Nap Hal, the unique Indian land race of wheat has been well characterized at molecular and rheological level and registered at National Gene bank for use in biscuit making quality.

CROP DEVELOPMENT PROGRAMME INVOLVING WHEAT CROP AND WHEAT BASED SYSTEMS

10: CROP DEVELOPMENT PROGRAMME INVOLVING WHEAT CROP AND WHEAT BASED SYSTEMS

10.1: Brief description of important Crop Development programmes involving Wheat crop:

With a view to supplement the efforts of the State Departments of Agriculture in increasing the production and productivity status of wheat, the Ministry of Agriculture, Govt. of India are implementing following crop development programmes:

10.1.1: National Food Security Mission (NFSM):

In view of the resolution adopted by the National Development Council (NDC), a Centrally Sponsored Scheme of 'National Food Security Mission' was launched from Rabi, 2007-08 in the country to enhance the production of additional 20 million tonnes of food grains. Out of this, an additional production of wheat was targeted to be 8 million tonnes by the end of XI Plan through implementation of the component NFSM-Wheat during XI Plan period.

During 12th Five Year Plan, the National Food Security Mission is continued to be implemented in the same 27 states of the country with a target of additional production of 25 million tons of food grains. NFSM-Wheat, one of the five components of NFSM during the 12th plan is under implementation in 125 identified districts of 11(eleven) states viz, Bihar, Gujarat, Haryana, Punjab, Uttar Pradesh, Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh, Maharashtra, Rajasthan and Uttarakhand with the target of additional production of 8 million tonnes of wheat.

The main interventions of the mission are Need based inputs with proven technology (Seeds of improved varieties, Nutrients like Fe and Zn, Soil Ameliorants like Gypsum etc., Bio- fertilizers viz., Azotobacter etc., Plant Protection chemicals), Farm Machineries & implements viz., sprayers, pumpsets, rotavators etc., Water efficient tools and capacity building of farmers. A cafeteria of crop specific interventions (bio-fertilizers, nutrients, plant protection chemicals, weedicides etc.) has been inducted to enable the states to choose interventions relevant to that particular Agro-climatic zone for demonstrations. A cafeteria of crop specific interventions (biofertilisers, nutrients, plant protection chemicals, weedicides etc) has been inducted to enable the states to choose interventions relevant to the particular agro-climatic zone for demonstration of improved crop production technologies.

The aim of the Mission was to increase production of rice, wheat and pulses through area expansion and productivity enhancement; restoring soil fertility and productivity; creating employment opportunities; and enhancing farm level economy to restore confidence of farmers of targeted districts.

10.1.2. Bringing Green Revolution to Eastern India (BGREI):

The program of "Bringing Green Revolution to Eastern India (BGREI)" was launched in 2010-11 to address the constraints limiting the productivity of "Rice Based Cropping Systems" the aim of the BGREI is to harness the water potential for enhancing agriculture production in eastern India comprising seven States namely; Assam, Bihar, Chhattisgarh, Jharkhand, Odisha, Eastern Uttar Pradesh (Purvanchal) and West Bengal. The main objectives of the programme are : Yield maximization of rice and wheat per unit area by improving agronomy; water harvesting and conservation; water utilization. The programme was extended till the terminal period of XI plan period and is also expected to be continued further on year to year basis as a sub-programme under RKVY.

BGREI comprised three broad categories of interventions: (i) block demonstrations; (ii) asset building activities such as construction of check dams, minor irrigation tanks and other water resources development works; and (iii) site specific activities for facilitating petty works such as construction/renovation of irrigation channels/electricity for agricultural purposes in a cluster approach for convenience and cost effectiveness and(iv) market support. BGREI promoted adoption of new seed varieties, farm machines, nutrients, pesticides and knowledge based intervention as developed for different agro-climatic zones of eastern India.

The allocation of funds as made during the year (2013-14) was (i)Demonstrations in Clusters(50% of State allocation), (ii) Asset Building(20% allocation), (iii) Site Specific Activities (20% allocation) and (iv) Marketing Support (10% allocation). The programme is also being continued during 2014-15 in all the seven states of eastern India (Assam, Eastern Uttar Pradesh, Bihar, Odisha, Jharkhand, Chhattisgarh and west Bengal). Wheat crop is also embraced in the programme. Altogether 29 districts (13 districts in Bihar, 1 district in Eastern Uttar Pradesh and 15 districts in west Bengal) are included in the programme and identified as wheat districts under the programme also targeting wheat crop based implementation.

10.1.3: National Mission on Sustainable Agriculture (NMSA):

NMSA was launched during 2014 and has four major programme components e.g. 'Rainfed Area Development', 'Soil Health Management', 'On Farm Water Management' and 'Climate Change and Sustainable Agriculture Modelling and Networking'. NMSA also targets the states in which the major wheat growing states are also included with the provision of above components. The programme covers all districts of all states of the country, hence, all the wheat growing states are automatically covered under the programme. Therefore, consideration of the programme in mitigating impact of climate change in wheat crop in a system is of importance once the programme reveals its outcome. Provision for assistance in the form of input upto 50% of the cost limited to Rs.10,000/- per ha for wheat based cropping systems under the sub-component of Integrated Farming System of Rainfed Area Development(RAD) has been made. Besides, assistance for Resource Conservation, vermi-compost, reclamation of problem soils(alkaline), construction of borewells/recharge of defunct wells/activation of water lifting devices and formation of Farmer Producer Organisations (FPOs) and their trainings in wheat growing states are also being provided under the mission.

On-farm water management with provision of assistance under micro irrigation including drip irrigation, and sprinklers with drainage systems are also included in the mission which is also operational in wheat growing states.

10.1.4: National Mission on Agriculture Extension and Technology (NMAET):

The NMAET has been envisaged as the next step towards this objective through the amalgamation of these schemes. The Mission Document has been prepared in keeping with the recommendations of the Working Group of the Planning Commission and suggestions and inputs received from extensive consultation with stakeholders, particularly farmers. The common threads running across all 4 Sub-Missions in NMAET are Extension and Technology. These sub-missions are (i) Sub Mission on Agricultural Extension (SMAE), (ii) Sub Mission on Seed Production(SMSP), (iii) Sub mission on Agricultural Mechanisation (SMAM) and (iv) Sub mission on Plant Protection (SMPP). The aim of the Mission is to restructure and strengthen agricultural extension to enable delivery of appropriate technology and improved agronomic practices to farmers. The major wheat growing states of the country are also covered under the programme. The strategies of these mission activities are interactive methods of information dissemination, use of Information & Communication Technology (ICT), popularisation of modern and appropriate technologies, capacity building and institution strengthening to promote mechanisation, availability of quality seeds, plant protection etc. and encourage aggregation of Farmers into Farmers Interest Groups (FIGs) to form Farmer Producer Organisations (FPOs). The seed village programme under Sub-Mission for Seed and Planting Material (SMSP) is dedicated for production of seeds to be certified and to be made available in a state or locality. The major wheat growing states have also been brought under these submissions.

10.1.5: Rashtriya Krishi Vikas Yojana (RKVY):

One of the basic objectives of RKVY is to incentivize investments in agriculture and allied sectors by linking state wise allocation of RKVY funds to the increased share of State plan expenditure in agriculture and allied sectors. This has helped in stepping up allocation to crops & priorities, reducing yield gaps, maximisation of farmers returns and bringing quantifiable changes in production and productivity. Under this programme, for the stream RKVY (Production growth) the major wheat growing states viz., Bihar, Gujarat, Haryana, Punjab, Uttar Pradesh, Madhya Pradesh, Jharkhand, Chhattisgarh, Karnataka, Uttarakhand, West Bengal, Himachal Pradesh, Jammu & Kashmir and Rajasthan have been taking up programmes on integrated development of wheat crop also. Under this programme, the interventions adopted were broadly for provision for purchase of breeders and certified seeds by farmers, production of foundation and certified seeds, seed treatment, FFS at demonstration sites besides other provisions like pest management, mechanisation, farmers study tour etc pertaining to wheat growers.

10.1.6. Gramin Bhandaran Yojana:

Government of India initiated a Rural Godown Scheme (Gramin Bhandaran Yojna) in collaboration with NABARD and National Cooperative Development Corporation (NCDC) to construct Rural Godowns in order to facilitate storage facilities at the farm gate level. The produce is stored by a scientific method so that the wastage and deterioration of grain are avoided or reduced to a minimum. The construction of godowns are sanctioned through NABARD and NCDC with the total capacity upto the desired levels which includes construction, renovation and expansion of existing godowns. The main objectives of the Rural Godown Scheme are as under :

- To prevent distress sale of food grains and other agricultural produce immediately after harvest.
- To reduce quantitative and qualitative losses due to storing of food grains in substandard storage.
- To reduce pressure on transport system in the post harvest periods of peak supply.
- To help the farmers in getting pledge loans against their stored produce to meet immediate financial requirement.

SPECIAL INITIATIVES TAKEN FOR ENCOURAGING THE CULTIVATION OF WHEAT

11: SPECIAL INITIATIVES TAKEN FOR ENCOURAGING THE CULTIVATION OF WHEAT

11.1: Minimum Support Price (MSP):

The Minimum Support Prices (MSP) for wheat (fixed by the Department of Agriculture & Cooperation, Govt of India) since 2007-08 to 2013-14 are at *Annexure-XI*.

Table- 11.1: Year-wise Minimum Support Price of Wheat

(Rs. Per Qtl.)

Crop Year	MSP of Wheat
2007-08	1000
2008-09	1080
2009-10	1100
2010-11	1120*
2011-12	1285
2012-13	1350
2013-14	1400
2014-15	1450

* An additional Rs.50/- per qtl was awarded as bonus by the Govt; State Govt viz., Punjab, Haryana, UP, MP have provided enhanced bonus per quintal on year to year basis.

11.2: Agency wise quantities of crop procurement during last ten years in the states:

To facilitate procurement of food grains, Food Corporation of India (FCI) and various State Agencies in consultation with the State Govt. establish a large number of purchase centres.

Food Corporation of India (FCI), the nodal central agency of GOI, along with other State Agencies undertakes procurement of wheat. Procurement under Price Support is taken up mainly to ensure remunerative prices to the farmers for their produce which results into higher production and productivity. Before the harvest during each Rabi / Kharif Crop season, the Govt. of India announces the minimum support prices (MSP) for procurement on the basis of the recommendation of the Commission for Agricultural Costs and Prices (CACP). State-wise procurement of wheat from 1991-92 to 2013-14 (*Annexure XII*) indicated that wheat still occupies a significant position in procurement status and the year 2012-13 could record the highest ever record procurement in prime states viz, Punjab, Haryana and Uttar Pradesh. In the following years, although Uttar Pradesh showed a decline in procurement, the total procurement of wheat for the entire country during 2013-14 maintained the level of 250 plus lakh tones. The buffer stock norms wheat of Government of India indicates that the buffer stock is required to be maintained at 11.2 million tones as on 1st January. The central pool stock of 34.38 million tones was about 35% more than that of previous year. This status of stock of 34.38 million tonnes in the central pool during 2013 indicated that the stock is 3 times more than the buffer hence surplus availability of wheat in the national food grains basket. The procurement status Such a surplus wheat is reflected to the higher procurement in the central pool which may be attributed to the higher remunerative support price level of wheat.

11.3. Prevalent Marketing Channels of Wheat :

Marketing channel is a route through which the produce from the farm reaches to the ultimate consumer. The most common channels for marketing of wheat for consumption are:

1. **Farmer ⇨ Consumer**
2. **Farmer ⇨ Village Trader ⇨ Consumer**
3. **Farmer ⇨ Wholesaler ⇨ Retailer ⇨ Consumer**
4. **Farmer ⇨ Village Trader ⇨ Wholesaler ⇨ Retailer ⇨ Consumer**
5. **Farmer ⇨ Wholesaler ⇨ Miller ⇨ Retailer ⇨ Consumer**

Food Corporation of India (FCI) is the main agency for procurement, maintenance of buffer stock and distribution of wheat. The main institutional marketing channels for wheat are as under:

1. **Farmer ⇨ (FCI, State Govt. Co-operatives) Govt. Agency ⇨ Fair Price Shop ⇨ Consumer**
2. **Farmer ⇨ Co-operative Marketing Society ⇨ Retailer ⇨ Consumer**
3. **Farmer ⇨ (FCI, State Govt. Co-operatives) ⇨ Private Trader ⇨ Export.**

The total costs or the marketing costs incurred by the producer – seller and by the various intermediaries involved in the sale and purchase of the produce till the commodity reaches the ultimate consumer include initial handling charges, assembling charges, storage and transport cost, handling charges by wholesaler and retailer besides other expenses on secondary services. Such market costs can be reduced by increasing the efficiencies of various market interventions.

Food Corporation of India (FCI) issues uniform specifications of procurement which is updated from time to time in a need based manner. The latest such specifications issued by them are normal mature dried clean grains with normal size, shape, colour and luster free from obnoxious smell, free from admixture of toxic and weed seeds like Argemone Mexicana and Lathyrus in any form besides under the control of Food safety and standards act of Govt of India and in a merchantable condition. The agency further specifies mandatory clauses like grains presented for procurement should be within the moisture content of 12 to 14%, within the overall limit of any foreign matter, within the limit of damaged grains or ergot infestation (limit 0.05 %). In cases of stocks having living infestation including weevil (maximum limit1%), there will be a cut of Rs.2/- per quintal charged as fumigation charges. The permissible limits of different refractions in Fair Average Quality of wheat grains for procurement are 0.75% foreign matter, 2% each of other food grains & damaged grains, 4% slightly damaged grains and 6% shriveled and broken grains.

11.4. Steps taken by Govt. Organizations / Agencies to Provide Marketing Services and inducing producer's share in consumer Rupee(with reference to wheat):

Table- 11.2: Organistions & their Services

Sl. no	Name of the Organization / Agencies (Nodal)	Services/action Provided
1	Directorate of Marketing and Inspection (DMI) NH-4, CGO Complex, Faridabad – 121001 Website:www.agmarknet.nic.in	Govt of India Issues manual on standards and grades for sale of wheat which is offered on the basis of variety, wholesomeness, appearance, colour, presence of foreign matter, damaged & broken grains, admixture, presence of foreign matter, moisture and also meeting the requirements of Food safety and Standards Act of Govt of India.
2	Food Corporation of India (FCI), Barakhamaba Lane, Cannaught Place, New Delhi-110001 Website : www.fciweb.nic.in	Procurement of foodgrains for effective price support operations for safeguarding the interest of the farmers, distribution of foodgrains (wheat) throughout the country for Public Distribution System, especially to Below Poverty Line (BPL) population, maintains satisfactory level of operational/buffer stocks of foodgrains including wheat to ensure contribution to National Food Security. Food Corporation of India issues the procurement standards and updates periodically which is thereafter incorporated in the manual on standards of GoI.
3	Central Warehousing Corporation (CWC), 4/1 Siri Institutional Area, Opp. Siri Fort New Delhi-110016 Website : www.fieo.com/cwc/	CWC follows the same level of grades and standards of FCI and the provisions of the manual issued by Govt of India. However, the organisation have, in addition, categorised the wheat grains in respect of weevil infestation for storage of wheat grains in their godowns: upto 1% (Grade A), above1% upto 4%(Grade B), above 4% upto 7% (Grade C) and above 7% upto 15%(Grade D). It also assists industries in the development of scheduled agriculture products(including wheat) related industries for export and provides financial assistance to these industries.
4	Agricultural and Processed Food Products Export Development Authority (APEDA) NCUI Building 3, Siri Institutional Area August Kranti Marg, New Delhi 110016 Website : www.apeda.com	APEDA is mandated also with the export promotion and development of cereal and cereal products wherein wheat is one of the main constituents. APEDA also imparts training in the various aspects of industries, functionaries related to the scheduled products including wheat and wheat products.
5	National Co-operative Development Corporation (NCDC) 4, Siri Institutional Area, New Delhi-110016 Website: www.ncdc.nic.in	NCDC has the mandate of Planning, promoting and financing programmes for production, processing, marketing & storage, export and import of agricultural produce including wheat, food stuffs, certain other notified commodities including financial support to cooperatives also dealing wheat.

11.5. State-wise market arrivals (Wheat):

Market Arrivals of wheat during the past decades indicated that the steepest increase in arrivals was in the state of Madhya Pradesh although the highest quantity was recorded in the state of Punjab followed by Madhya Pradesh and Haryana due to higher production reaped during the recent years.

Among the major wheat growing states the arrivals recorded steep increase for the state of Punjab followed by Haryana and Madhya Pradesh. Although Punjab continued to be at the top of the procurement status during 2012-13, but the trend was reversed with the realistic status that, Madhya Pradesh surpassed the procurement status during 2013-14 followed by Punjab and Haryana. Thus it may be concluded that among the major wheat growing states, the leading contributors were Madhya Pradesh , Punjab and Haryana due to their higher production reaped. The State-wise market arrival of Wheat during the years of the 11th Plan periods and during 2012-13 and 2013-14 are given at *(Annexure XIV)*

11.6. Important markets in India (Wheat):

The important domestic markets for wheat are as follows:

Table- 11.3: State-wise Important Wheat Market

Sl no.	State	Number	Name of markets
1.	Bihar	13	Patna City, Bihta, Ara, Buxar, Goplaganj, Mothihari, Chalia, Chhapra, Maharajganj, Nirmati, Tribeniganj, Munger, Raxaul.
2.	Chhattisgarh	20	Ambikapur, Vaikunthpur, Raipur, Durg, Bilaspur, Kanker, Surajpur, Dogragadh, Rajnandgaon, Sarguja, Koriya.
3.	Uttar Pradesh	16	Puwayan, Etah, Barreilly, Shahjahnapur, Hardoi, Bulandshahar, Pilibhit, Varanasi, Gorakhpur, Kanpur, Agra.
4.	Haryana	19	Ambala, Panchkula, Yamunanagar, Karnal, Panipat.
5.	Karnataka	58	Bangalore, Belgaum, Bijapur, Dharwad, Gadag.
6.	Punjab	144	Ajnala, Amritsar, Bhikiwind, Khanna,
7.	Madhya Pradesh	5	Ujjain, Guna, Gwalior, Sehore, Sagar
8.	Maharashtra	20	Pune, Kalyan, Solapur, Ulhasnagar, Dhule, Kolhapur, Nagpur, Nadurbar, Ahmednagar,
9.	Gujarat	33	Ider, Kapadganj, Nadiad, Modasa, Himatnagar, Barala, Palanur, Dhanera, Mehsana
10.	Meghalaya	1	Phulbari
11.	Rajasthan	11	Kota, Alwar, Jaipur, Sriganganagar, Dausa, Hanumangarh, Sikar, Baran, Bundi, Bharatpur.
12.	Uttarakhand	12	Kashipur, Kiccha, Khaima, Sitarganj, Gadarpur
13.	West Bengal	68	Jhant Pakari, Simlapal, Katulpur, Bishnupur, Ahmednagar, Belapur, Dubrajpur
14.	Delhi (NCT)	2	Narela, Nazafgarh.
	All India	444	

SOURCE : Important Markets of Major Agricultural Commodities in India-(MRPC Report No.32, 2000 of DMI).

11.7. Important International Markets for Wheat Trading: There are numbers of markets for wheat trading across the globe in various countries. The important wheat trading centres in some major wheat growing countries are as follows:

Table- 11.4: Important International Trading Agencies of Wheat

Sl.No	Country	Important Wheat Trading Agency
1.	USA	1. Minneapolis grain exchange (MGE)
		2. Kansas City Board of trade(KCBT)
		3. Chicago Board of Trade (CBOT)
2.	Canada	4. Winnipeg Commodity Exchange
3.	Bulgaria	5. Sofia Commodity Exchange
4.	Australia	6. Australian Wheat Board (Now Agrium Asia Pacific Ltd)

11.8.: Storage of harvested Wheat grains:

Wheat is main staple food for majority population, hence stored from one season to the other. Safe storage facilitates better price realization (+ 25 per cent) by extending marketing duration. There are many factors influencing storage loss in wheat which are moisture, temperature, insects, rodents, quality status before storage, types of storage bin/containers, sanitation, use of fumigants/pesticides, type of damage before storing the grain (like fress and webbing, exit holes, darkened kernels and damaged kernels), mechanical factors and other general conditions like location of storage etc.

Harvested grains normally contain 20 per cent moisture . For safe storage, maintenance of around 12-14 per cent grain moisture content is recommended. Higher moisture content resulted in musty odour, discolouration and lower flour yield. It is therefore necessary that an equilibrium moisture content for wheat around 13 per cent at 70 per cent RH (Relative Humidity) be maintained. For longer duration storage rolling in to years, the grain moisture should be 11 to 12 per cent coupled with suitable treatment for stored grain pests & diseases.

Indian farmers retain more than 50 per cent of their harvested grains for human consumption, cattle feed, seed, etc. Grains are generally stored in simple granaries constructed from locally available materials like paddy straw, split bamboo, reeds, mud and bricks. However, improper storage leads to damage due to factors like birds, rodents, insects like weevil, beetles and moth and fungus infestation. The various measures to protect the stored grain wheat are:

Prophylactic measures: Spraying Malathion 50EC (1 litre in 100 litres of water) in every 15 days; spraying DDVP 76 EC (1 litre in 150 litres of water) on walls & floors when required; Spraying Deltamethrin2.5 WP (1 kg in 25 litres of water)on walls and floors.

Curative Treatments: Use of chemicals like Aluminium phosphide @ 2-3 tablets per tonne in covered stocks controls infestation. For rodents, rat cage, use of bails with coagulants or rat burrow fumigation by aluminium phosphide are effective.

Preventive Measures: At farm level may be dry (12-14% moisture),clean and grains with good appearance which prevents the insect-pests and fungus etc to build up. Recommended chemicals in prescribed dosage has to be applied.

11.9: Provisions for credit:

11.9.1: Provisions for Agricultural Credit:

Bank credit is available to the farmers in the form of short-term credit for purchasing consumable inputs and in the form of medium-term/long–term credit for financing capital investment in agriculture andallied activities. Loans are also available for storage, processing and marketing of agricultural produce.

Kisan Credit Card:

The Kisan Credit Card (KCC) is a pioneering credit delivery innovation for providing adequate and timely

credit to farmers under single window, with flexible and simplified procedure, adopting whole farm approach, including the short-term, medium term and long term credit needs of the borrowers for agriculture and allied activities and a reasonable component for consumption needs.

Progress in implementation of the KCC Scheme:

Since launching in August 1998, more than 10.09 crore Kisan Credit Cards issued by Cooperative Banks, Regional Rural Banks and Commercial Banks put together. The scheme is being implemented in all States and Union Territories (except Chandigarh, Daman & Diu and Dadra & Nagar Haveli) with all Cooperative Banks, RRBs and Commercial Banks participating. The Kisan Credit Cards (KCC) issued so far in the major wheat growing states of the country is placed at *Annexure XVI. (Source: NABARD, GoI)*

11.10: Crop insurance.

Agriculture in India is highly susceptible to risks like droughts and floods.

The National Crop Insurance Scheme (NCIS) or the Rashtriya Fasal Bima Karyakram has the objective of providing insurance coverage to farmers in the event of failure of notified crops, to encourage farmers to adopt improved package and to help stabilize income of farmers in disaster years. The programme has the components such as the Modified National Agriculture Insurance Scheme (MNAIS) and the Weather based Crop Insurance Scheme (WBCIS) and are also under implementation in the major wheat growing states viz., Bihar, Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Madhya Pradesh, Jammu & Kashmir, Jharkhand, Karnataka, Maharashtra, Punjab, Rajasthan, Uttar Pradesh, West Bengal .

Wheat, among the cereals is also covered under the programme. Ten years historical data is considered adequate for setting premium rates, fixing indemnity limit and threshold yield of the concerned crop.

All farmers of wheat growing states including the individual farmers/sharecroppers/tenant farmers/ contract farmers/group of farmers engaged by Non-Government Organisations (NGOs)/Self Help Grouprs (SHGs) etc are covered under the programme. The sum Insured would be at least equal to the amount of crop loan sanctioned/advanced, which may extend up to the value of the threshold yield of the insured crop at the option of the insured farmers.

The premium rates are worked out on actuarial basis. The premium required to be paid by the farmers is subsidised as follows:

Table- 11.5: Premium slab and Subsidy on Premium

Premium slab	Subsidy by central and state Govt on 50:50 basis and premium payable by farmers
Upto 2%	NIL
>2-5%	40% subject to minimum net premium of 2%
>5-10%	50% subject to minimum net premium of 3%
>10-15%	60% subject to minimum net premium of 5%
>15%	75% subject to minimum net premium of 6%

However, the premium rates is capped at 9% of the sum assured in case of wheat being the rabi annual crop.

The scheme operates on "Area Approach" i.e., defined areas for damage by widespread calamities. For localized risks, like hailstorms, landslides, the claims will be on individual basis and for all others, there will be the area approach.

Under the second category of Weather Based Crop Insurance Schemen(WBCIS), the financial losses out of weather aberrations like drought/deficit rainfall, flood/excess rainfall, heat(temperature), frost etc.

WORKSHOPS, CONFERENCES AND SEMINARS

12: WORKSHOPS, CONFERENCES AND SEMINARS

National:

12.1: All India Coordinated Wheat Improvement Project (AICWIP) Workshop:

The annual All India workshop on wheat involving wheat Workers from across the country is being held every year. The exchange of ideas amongst the Scientists from ICAR Institutes, SAUs and the Development Workers and Policy Makers of the Govt of India besides participation of states brings out comprehensive recommendations after detailed deliberations. The future course of research and Development activities including the Front Line Demonstrations are also being planned in the workshops. Besides, a varietal Identification Committee meets every year during the workshop to identify suitable varieties across the country to be forwarded to the Central Varietal Release Committee for recommendation.

12.2: Brainstorming sessions on Rust:

Special Brainstorming meeting is being held every year to combat the menace of biotic and abiotic stresses that come on the way of higher productivity. The sessions are being attended by the scientists, Development workers from States, SAUs and Central & ICAR Research Institutions. These sessions bring out specific strategies and recommendations like quick varietal replacement, awareness and control measures for rusts and Karnal Bunt every year to boost the productivity of wheat and managing the yellow rust menace.

12.2.1: Task Force on Rust:

In order to combat the menace of Yellow Rust of wheat , a Task Force has been constituted under the Chairmanship of Deputy Director General (Crop Science) of ICAR for monitoring of the spread of the disease that may be taken up by **i)** Plant Protection Advisor through Central IPM Centres; **ii)** Directorate of Wheat Development and **iii)** DWR through respective KVKs, AICRP centres and NCIPM. There are about 64 Trap nurseries (under the control of DWR, Karnal) spread all over the wheat growing zones of the country to track the incidence of rusts and appearance of specific pathotypes. The major supplementary information on the incidence of rusts in various locations and areas of the zones are also gathered by DWR (ICAR), Karnal and the DWD (DAC), Govt of India every year. The Task Force is thus fed with latest information about the occurrence of rust and their pathotypes. The information are collated jointly by the Directorate of Wheat development, Ghaziabad representing the Govt of India and the Directorate of Wheat research (ICAR). Upon the recommendation of the Task Force, immediate advisories are being issued every year by the Directorate of Wheat Development, Ghaziabad (DWD) along with Directorate of Extension collated with that generated by DWR through mass-media to farmers. The intensively surveyed for Yellow rust every year are shown as under:

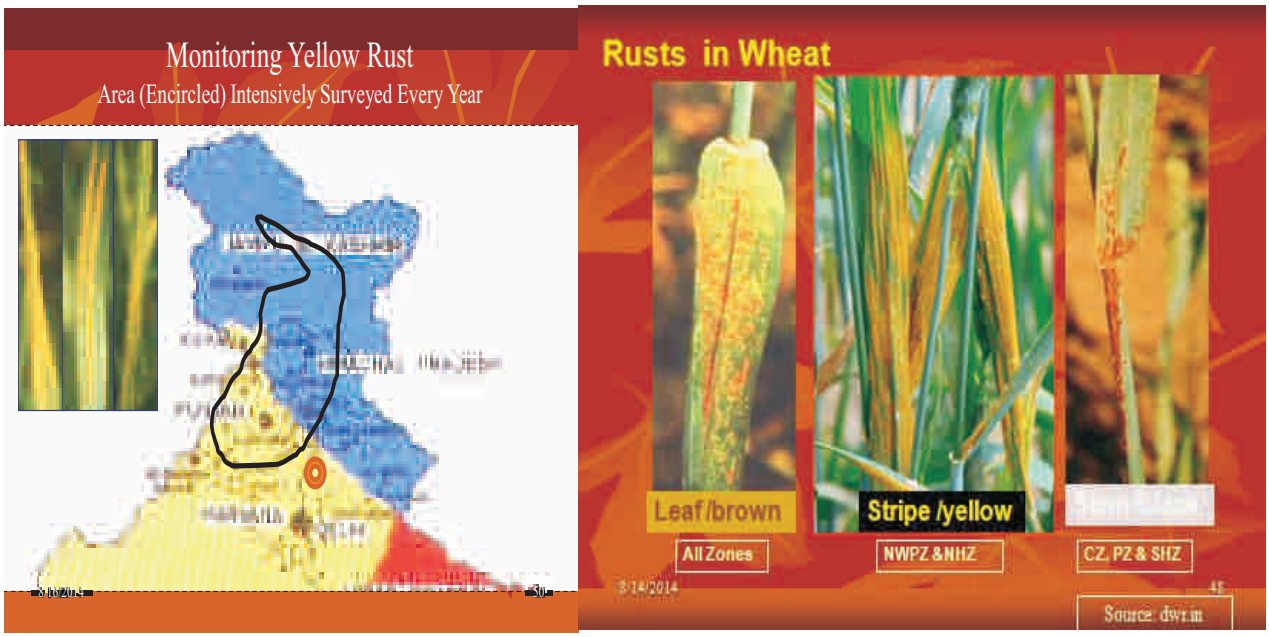

Plate: Yellow rust surveillance and different types of rusts

Plate: A typical yellow rust affected wheat plant(Var.DBW 17) observed in HP

International

12.3. Borlaug Global Rust Initiative (BGRI): At the international Level, the annual workshops on Rust menace in particular are being organized by Borlaug Global Rust Initiative (BGRI) in countries across the Globe. BGRI is the international rust monitoring body for advocating Durable Rust resistance in Wheat with the financial support of Bill and Melinda Gates Foundation of USA with is HQ at Cornell University of USA. The workshops are being attended by the Scientists from DWR, ICAR, Karnal and the Official of the Directorate of Wheat Development, Govt of India, Ghaziabad. The BGRI is involved in the process of global tracking the incidence of various rusts including the dreaded Ug99 including possibilities of incidence in India, and neighbouring countries. BGRI also collaborates their activities with ICARDA and CIMMYT in the process and analyses the measures to combat the same.

International Crop and research for Dry Areas(ICARDA) conducts periodical workshops to boost the productivity of Wheat crop in dry areas across the Globe with its HQ at Beirut. Participants from the Development and Research Institutes participate in these workshops when organized. ICARDA specifically addresses the issue of growing specific cultivars of wheat in moisture limiting areas besides exchange of germplasms through their international programme.

The Centro Internacional de Mejoramiento de Maiz Y Trigo, Mexico (CIMMYT) and a member of Consultative research group at global level also organizes and or sponsors workshops/seminars/conferences at international level where mass interaction takes place among the global wheat workers. Indian Development officials led by Agriculture Commissioner (where Directorate of Wheat Development was a member) represented a delegation during 2011 visited the CIMMYT , Mexico. The organization is the main global coordinating agency in the CGIAR system in the research and development of wheat in the region.

Plate: Nobel Lauret Dr. Norman E. Borlaug, Father of Indian Green Revolution

IMPORTANT WEBSITES & LINKAGES

13: IMPORTANT WEBSITES & LINKAGES

A. RESEARCH & DEVELOPMENT IN WHEAT:

13.1: National Linkage:

For Research and Development of wheat in the country strong linkage have been established in the country through national and international institutions which is involved in the process of research and development for increase the production and productivity of wheat. The Important National Linkages involved in wheat research & Development and their Websites are as follows:

Table- 13.1: Websites of Important National Organisations

SL No.	Name of National Organizations	Website
1	Indian Council of Agricultural Research, New Delhi	**www.icar.org.in**
2	Department of Biotechnology (DBT), Government of India, New Delhi	**dbtindia.nic.in**
3	Department of Science and Technology (DST), Government of India, New Delhi	**dst.gov.in**
4	Council of Scientific and Industrial Research (CSIR)	**www.csir.org.in**
5	State Agricultural Universities (SAUs)	(Detailed list at *Annexure-XV)*

13.1.1. Indian Council of Agricultural Research (ICAR):

The Indian Council of Agricultural Research (ICAR) is an autonomous organisation under the Department of Agricultural Research and Education (DARE), Ministry of Agriculture, Government of India. The Council is the apex body for co-ordinating, guiding and managing research and education in agriculture including wheat crop. Directorate of Wheat Research which is main centre of ICAR responsible over all research & development of varieties as well as production technologies of wheat in the country. **(www.icar.org.in, www.dwr.in.)**

13.1.2. Department of Biotechnology (DBT), Government of India, New Delhi:

Department of Biotechnology (DBT), set-up under the Ministry of Science and Technology and play a vital role in the development of modern biotechnological development in the country. DBT also provides the funds to the agricultural universities & research organizations for development of suitable technologies for agriculture including Wheat crop (**dbtindia.nic.in.**)

13.1.3 Department of Science and Technology (DST), Government of India, New Delhi:

Department of Science & Technology (DST) was established in May 1971, with the objective of promoting new areas of Science & Technology and to play the role of a nodal department for organising, coordinating and promoting S&T activities in the country. Recently, DST has released durum wheat variety MACS 3125 for peninsular zone and variety MACS-6145 is possess excellent grain quality and resistance and recommended for NEPZ under rainfed conditions. (**dst.gov.in.**)

13.1.4. Council of Scientific and Industrial Research (CSIR) :

Council of Scientific and Industrial Research (**CSIR**) plays a vital role in research and development of agricultural crops including wheat through different research projects in the country. (**www.csir.org.in**.)

13.1.5. State Agricultural Universities (SAUs):

State Agricultural Universities are mandated with Teaching Research & Extension in the respective states in which they are located and in their designated areas or region. These SAUs located in different location conduct research programme on wheat under AICRP & Volunteer Centres for Research & Development of New wheat crop & improve package of practice for the crop. The SAUs located in various wheat growing states are given at *Annexure XV*.

13.2: International Linkage:

Table- 13.2: Websites of Important International Organisations

SL No.	Name of International Organizations	Website
1.	Centro Internacional de Mejoramiento de Maiz Y Trigo (CIMMYT), El Batan, Mexico.	**www.cimmyt.org**
2.	International Center for Agricultural Research in the Dry Areas (ICARDA), Beirut, Lebanon.	**www.icarda.org**
3.	International Food Policy Research Institute (IFPRI), Washington, U.S.A.	**www.ifpri.org**
4.	International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria.	**www.iita.org**
5.	International Water Management Institute (IWMI), Colombo, Sri Lanka.	**www.iwmi.cgiar.org**
6.	Food and Agriculture Organisation, Rome, Italy.	**www.fao.org**

13.2.1 : International Maize and Wheat Improvement Center (CIMMYT):

The International Maize and Wheat Improvement Center (CIMMYT), Mexico is the world's premier centre for research, development and training in maize and wheat and in farming systems for those two essential food crops. Among the activities of CIMMYT's Global Wheat Programmes, it provides diverse, high-yielding wheat varieties that withstand biotic and abiotic stresses, conduct research to help farmers to exploit the

full potential of improved cultivar and side by side conserving soil and water resources, explore new market opportunities for smallholder farmers. CIMMYT provides training opportunities in wheat breeding and its management research. *(www.cimmyt.org)* globally.

13.2.2 International Center for Agricultural Research in the Dry Areas (ICARDA):

The International Center for Agricultural Research in the Dry Areas (ICARDA) was established in 1977. It is one of the centers supported by the CGIAR. ICARDA's mandate is to promote agricultural development including wheat crop or cropping system in the dry areas of developing countries through research and development activities in dry areas of the wheat growing regions of the world.. ICARDA and CGIAR together continues to provide scientific expertise to governments of susceptible countries, but, a new scheme, called the Global Stripe Rust Initiative offers a 'toolkit' to help countries develop action plans to fight stripe rust (including surveillance, planning and awareness, building capacity, and crop research).It also co-ordinate stripe-related research, bring policymakers and scientists together at meetings and conferences to discuss effective strategies, and help their partners manage fast-track crop science and seed delivery systems, and breed rust-resistant varieties of wheat. Scientists in plant breeding programs will be trained to improve efficiency and effectiveness. The newly created Regional Cereal Rust Research Center a partnership between the Turkish government and ICARDA set up in Izmir to act as a science hub for stripe rust-resistance will monitor rust outbreaks, directly advising national breeding programmes to improve cohesion between scientists working on them. The Centre is currently screening some 16,000 wheat types sent from all over the world in trials to test rust resistance and susceptibility of varieties. Its biosafety facility, currently under construction, will be fully operational in 2015 *(www.icarda.org)* .

13.2.3 International Food Policy Research Institute (IFPRI), Washington, U.S.A:

The International Food Policy Research Institute (IFPRI) seeks sustainable solutions for ending hunger and poverty. Founded in 1975, IFPRI is a member of the CGIAR Consortium, a global research partnership for a food secure future. IFPRI's 2013-2018 strategy highlights six strategic research areas: Ensuring Sustainable Food Production. Promoting Healthy Food Systems, Improving Markets and Trade, Transforming Agriculture, Building Resilience, Strengthening Institutions and Governance. IFPRI considers wheat the most significant constituent of global food security and focuses its research initiative towards wheat also. IFPRI Research Report -115 sheds light on these critical issues through an analysis of wheat policy reform in Egypt. *(www.ifpri.org)*

13.2.4 Food and Agriculture Organisation (FAO), Rome, Italy:

An inter-governmental international organization, FAO has 194 Member Nations, two associate members and one member organization, the European Union. Its employees come from various cultural backgrounds and are experts in the multiple fields of activity . Headquartered in Rome, Italy, FAO is present in over 130 countries. The UN body also takes care of global food security hence wheat is a constituent.

The organization addresses problems associated with wheat at the global standard which includes the information on global food prices and maintains the global statistics.

B. FARMERS ADVISORY SERVICES:

13.3: Indian Agricultural Web Sites of Advisory service to the farmers

National level advisories are generally released by the Government of India and its departments from time to time for wheat crop also. ICAR and the State Agril Universities also issue advisories at times of need. In addition many Govt and non Govt organizations are also engaged in issuing advisories on wheat crop particularly in the major wheat growing states of the country which are as under:

Table- 13.1: Websites of Important Agricultural Advisory Services

Sl. No.	Name of Organisation/Agency	Website
1	AKS Software Limited, New Delhi	http://www.kisan.net
2	Krishi World Website Portal	http://www.krishiworld.com
3	National Informatics Centre, New Delhi (on behalf of GoI)	http://www.nic.in/agrico
4	National Bank for Agriculture and Rural Development, Mumbai	http://www.nabard.org
5	AgriWatch, the monthly journal published from New Delhi	http://www.agriwatch.com
6	Department of Agriculture, Govt of Maharashtra	http://www.agri.mah.nic.in
7	Department of Agriculture & Cooperation, Ministry of Agriculture, Govt of India, New Delhi	http://www.agricoop.nic.in
8	Indian Council of Agricultural Research, New Delhi	http://www.icar.org.in
9	Mahindra Kisan Website	http://www.mahindrakisanmitra.com

AWARDS AND SCHOLARSHIPS

14: AWARDS AND SCHOLARSHIPS

The awards given to development officials, policy planners and scientists for their contribution are as follows:

14.1. Awards by ICAR (Research):

Table- 14.1: Awards by ICAR

Name of the award	Field on which award is given	Awarding Dept/Agency/Instt.
1. ICAR Norman Borlaug Award	To recognize a scientist, who has provided a breakthrough for agriculture through a new insight that has created high potential value for the future the Norman Borlaug Award has been constituted.	Indian Council of Agril research (ICAR)
2. Chaudhary Devi Lal Outstanding All India Coordinated Research Project Award	To recognize outstanding performance of the AICRP and its cooperating centers and to provide incentive for outstanding performance in terms of linkages and research output and its Impact	Indian Council of Agril research (ICAR)
3. Vasantrao Naik Award for Outstanding Research Application in Dry land farming systems	To promote outstanding research and application in priority aspects of dry land farming systems & water conservation, an Annual Award of rupees one lakh is to be given away to a scientist or extension worker.	Indian Council of Agril research (ICAR)
4. Jagjivan Ram Abhinav Kisan Puruskar /Jagjivan Ram Innovative Farmer Award (National/Zonal)	To recognize the outstanding contributions of innovative farmers for initiatives in development adoption, modification and dissemination of improved technology and practices for increased income with sustainability.	Indian Council of Agril research (ICAR)
5. N.G. Ranga Farmer Award for Diversified Agriculture	To recognize outstanding contribution of innovative farmers for diversified agriculture.	Indian Council of Agril research (ICAR)

14.2. Institutionalized award to state Govts for outstanding performance in Food grains production:

14.2.1: Krishi Karman Award

Krishi Karman Awards were instituted in 2010-11 for recognising the meritorious efforts of the States in food grains production. The awards are given to the best performing States in two broad sets. One for total food grains production and the other for individual foodgrain crops of Rice, Wheat, Pulses and Coarse Cereals. There are three awards for total foodgrains production, Category-I for States where total foodgrains

production exceeds 10 million tonnes, Category-II for States where total foodgrains production is between 1 and 10 million tonnes and Category-III for States with total foodgrains production less than 1 million tonnes. Each award winning State gets a trophy, a citation and a cash award of Rs. 2 crore. For individual crops of Rice, Wheat, Pulses and Coarse Cereals, award winning States get a trophy, a citation and a cash award of Rs. 1 crore. States of Madhya Pradesh, Odisha, Manipur have been selected for Total Foodgrains in Category I, II & III, respectively while Chhattisgarh, Bihar, Jharkhand and Andhra Pradesh have been selected for Rice, Wheat, Pulses & Coarse Cereals, respectively. President of India gave away the awards on 10th February, 2014. Commendation awards was given to 8 States for achieving production higher than their highest in last 5 years, viz., Uttar Pradesh and West Bengal in Foodgrains for Category-I; Arunachal Pradesh, Meghalaya, Mizoram and Tripura in Foodgrains for Category-III; Maharashtra in Rice; and Assam in Pulses, Punjab and Haryana are also being felicitated for achieving consistently high productivity in Wheat and Rice and their contribution to the national food security.

14.3. National level award to the officials of DAC, Ministry of Agriculture for outstanding contribution, 2011:

A National level award for outstanding contribution to the National Agricultural scenario was given to 8 distinguished Development Officials of DAC, MOA, Govt. of India. The award was given during 2011. Director, Directorate of Wheat Development, Ghaziabad was one of them of 8 officials to bag the award during the year 2011 for outstanding contribution for the agricultural development in the country and contribution to the programme of National Food Security Mission through active assistance to the National Mission Director of the Mission..

14.4: Important websites for scholarships:

The following are some of the important websites for reference in view of award of scholarships for research programmes embracing wheat.

Table- 14.2: Websites related to Scholarships

Website	Organisation/Instt/Deptt.	Areas of Scholarship/fellowship for
www.icar.org.in	Indian Council of Agril research (ICAR)	Research on crops and crop related to wheat (Junior/senior)
www.csir.org.in	Council of Scientific and Industrial research(CSIR)	Scientific research including wheat
www.ugc.ac.in	University Grants Commission(UGC)	UGC fellowship for scientific research including wheat
www.manage.gov.in	MNAGE, Hyderabad, GoI	Post graduate diploma & training
www.cimmyt.org	CIMMYT, Mexico, CGIAR	Post doctoral research and training

RESEARCH

AND

DEVELOPMENT

ISSUES

15: RESEARCH AND DEVELOPMENT ISSUES

15.1: For crop specific Research & Development issues like e.g. varieties, production technologies farm implements, climate change and product development, value addition, marketing etc.,

Crop Improvement

1. Bridging the regional variation on yield gap of wheat; bridging yield gap and breaking the yield barrier to raise the productivity in NEPZ and enhancing the yield potentiality to 7-8 tonnes/ha in NWPZ. Development of suitable cultivars and comparative study in Farmers field through development approach.
2. Enhancing yield and adaptability of wheat varieties under changing climatic conditions, resistance to biotic and abiotic stress; development of cultivars for the Rice-Wheat System of Eastern India to fit them into a specifically cropping system(s).
3. Enhancing seed production of newer varieties for increased seed replacement of older varieties in a location specific approach of R&D. Increased production of breeders seeds of newer varieties and put to the seed production chain.
4. Exploring the possibility of transgenic approach for abiotic stress tolerance.

Crop Protection

1. Survey-surveillance, crop health monitoring and tackling new races of rusts.
2. National repository of pathotypes of different rust pathogens.
3. Epidemiological studies in relation to changing climatic scenario.
4. Host resistance – identification of new and diverse sources of resistance with emphasis on multiple disease/pest resistance. Search for the alternate host through pathogen-host-environment relationship.
5. Awareness creation for different disease (rust in particular) management.
6. Devise eco-friendly management strategies for disease and pest control and promote IPM.
7. Integrating molecular tools for understanding variability in pathogens.
8. Managing leaf blight in eastern, central and peninsular zones and Karnal bunt for western India.

Resource Management

1. Develop and fine-tune the package of practices and varieties specific to RCTs - zero tillage, Furrow Irrigated Raised Bed Planting System (FIRBS).
2. Evaluating the long term effect of tillage and residue management options on soil properties, pest dynamics and productivity of wheat.
3. Focused attention on Use of Micro irrigation system
4. Special attention and use of Site specific Nutrient Management tools for balanced fertilizer application.
5. Diversification/intensification of rice-wheat and other wheat based systems to improve profitability and sustainability.

6. Integrated weed management strategies for wheat.
7. Special emphasis on conservation agriculture to address the issue of climate change and ill-effects of residue burning. Awareness campaign for prevention of residue burning.

Quality Improvement

1. Development of product specific varieties with enhanced nutritional quality- to study the aspect of bio-fortification; development of cultivars rich in micronutrients suited to various production conditions.
2. Understanding genetic and molecular basis of quality traits

Transfer of technology

1. Crop advisory through various mass communication means.
2. Ensure availability of improved inputs

Promotion of use of Biofertilisers.

ANNEXURES

State wise Area, Production and Yield of Wheat from 1999-2000 to 2013-14

Area in Lakh ha, Production in Lakh Tonnes and Yield Kg/ha *Annexure-I*

Sl.No.		1999-2000			2000-01			2001-02		
	State/ UT	A	P	Y	A	P	Y	A	P	Y
1	Andhra Pradesh	0.14	0.09	667	0.14	0.08	571	0.14	0.09	643
2	Arunachal Pradesh	0.04	0.05	1308	0.04	0.06	1409	0.04	0.05	1395
3	Assam	0.76	0.98	1289	0.70	0.86	1219	0.72	0.85	1181
4	Bihar	21.45	46.87	2186	20.68	44.38	2146	21.26	43.91	2065
5	Chhatisgarh	0.00	0.00		0.78	0.80	1022	0.98	1.04	1057
6	Gujarat	4.82	10.20	2116	2.86	6.49	2268	4.70	11.45	2435
7	Haryana	23.17	96.50	4165	23.55	96.69	4106	23.00	94.37	4103
8	Himachal Pradesh	3.71	5.83	1574	3.63	2.51	693	3.67	6.37	1738
9	Jammu & Kashmir	2.46	4.34	1768	2.81	1.49	529	2.59	3.43	1325
10	Jharkhand	0.00	0.00		0.64	1.04	1626	0.65	1.15	1765
11	Karnataka	2.61	2.18	833	2.66	2.44	917	2.61	1.99	763
12	Madhya Pradesh	46.62	86.85	1863	33.11	48.69	1471	37.04	60.01	1620
13	Maharashtra	10.49	14.36	1369	7.54	9.48	1257	7.76	10.77	1388
14	Manipur	0.00	0.00		0.00	0.00		0.00	0.00	
15	Meghalaya	0.04	0.07	1628	0.04	0.07	1643	0.03	0.05	1714
16	Nagaland	0.05	0.13	2500	0.05	0.10	2000	0.06	0.15	2500
17	Odisha	0.06	0.08	1305	0.09	0.13	1466	0.07	0.11	1514
18	Punjab	33.88	159.10	4696	34.08	155.51	4563	34.20	154.99	4532
19	Rajasthan	26.50	67.32	2540	23.10	55.47	2402	22.88	63.89	2793
20	Sikkim	0.08	0.13	1580	0.07	0.10	1403	0.08	0.10	1273
21	Tamil Nadu									
22	Tripura	0.01	0.02	1846	0.01	0.02	2000	0.01	0.03	2083
23	Uttar Pradesh	94.00	259.76	2764	92.39	251.68	2724	92.56	254.98	2755
24	Uttarakhand	0.00	0.00		3.79	7.15	1885	3.80	7.35	1933
25	West Bengal	3.64	8.51	2336	4.26	10.59	2485	4.34	9.62	2215
26	D & N Haveli	0.01	0.01	1500	0.01	0.01	1600	0.01	0.01	2000
27	Delhi	0.34	0.31	919	0.28	0.98	3522	0.26	0.92	3510
28	Others									
	All India	274.86	763.69	2778	257.31	696.81	2708	263.45	727.66	2762

Source: DES, DAC, GOI.

Contd.

Area in Lakh ha, Production in Lakh Tonnes and Yield Kg/ha *Annexure-I*

Sl.No.		2002-03			2003-04			2004-05		
	State/ UT	A	P	Y	A	P	Y	A	P	Y
1	Andhra Pradesh	0.11	0.14	1273	0.12	0.07	583	0.09	0.05	556
2	Arunachal Pradesh	0.04	0.06	1537	0.04	0.06	1500	0.04	0.09	2023
3	Assam	0.69	0.78	1130	0.70	0.73	1043	0.64	0.68	1066
4	Bihar	21.31	40.41	1896	20.77	36.89	1776	20.28	32.63	1609
5	Chhatisgarh	0.93	0.99	1063	1.06	1.09	1024	0.97	0.82	853
6	Gujarat	4.36	8.57	1966	7.60	20.37	2681	7.27	18.06	2482
7	Haryana	22.67	91.88	4053	23.15	91.14	3937	23.22	90.58	3901
8	Himachal Pradesh	3.59	4.96	1379	3.61	4.98	1380	3.62	6.84	1890
9	Jammu & Kashmir	2.44	4.02	1646	2.55	4.59	1804	2.48	4.74	1910
10	Jharkhand	0.64	1.04	1625	0.75	1.18	1573	0.63	1.50	2381
11	Karnataka	2.47	1.48	598	2.32	0.96	415	2.42	1.79	740
12	Madhya Pradesh	33.82	49.23	1456	40.91	73.65	1800	41.36	71.77	1735
13	Maharashtra	7.60	9.84	1295	6.65	7.78	1170	7.56	10.16	1344
14	Manipur	0.00	0.00		0.00	0.00		0.00	0.00	
15	Meghalaya	0.03	0.05	1741	0.01	0.02	1667	0.01	0.02	1778
16	Nagaland	0.08	0.17	2125	0.10	0.20	2000	0.08	0.13	1585
17	Odisha	0.05	0.06	1261	0.05	0.08	1471	0.04	0.05	1250
18	Punjab	33.75	141.75	4200	34.44	144.89	4207	34.82	146.98	4221
19	Rajasthan	18.01	48.78	2709	21.03	58.76	2794	20.10	57.07	2839
20	Sikkim	0.06	0.09	1413	0.06	0.08	1421	0.06	0.08	1456
21	Tamil Nadu	0.00	0.00		0.00	0.00		0.00	0.00	
22	Tripura	0.01	0.02	2000	0.01	0.05	4250	0.01	0.03	2545
23	Uttar Pradesh	90.94	236.12	2596	91.50	255.67	2794	90.00	225.14	2502
24	Uttarakhand	4.11	7.50	1825	3.97	7.45	1877	3.94	8.03	2038
25	West Bengal	4.05	8.87	2189	4.26	9.86	2315	4.00	8.42	2103
26	D & N Haveli	0.01	0.01	2000	0.01	0.01	2000	0.01	0.01	1833
27	Delhi	0.20	0.80	4005	0.29	1.02	3515	0.18	0.71	3944
28	Others									
	All India	251.96	657.61	2610	265.95	721.56	2713	263.83	686.37	2602

Contd.

Area in Lakh ha, Production in Lakh Tonnes and Yield Kg/ha *Annexure-I*

Sl.No.		2005-06			2006-07			2007-08		
	State/ UT	A	P	Y	A	P	Y	A	P	Y
1	Andhra Pradesh	0.11	0.09	818	0.10	0.09	900	0.09	0.08	889
2	Arunachal Pradesh	0.04	0.06	1525	0.04	0.06	1575	0.04	0.05	1472
3	Assam	0.50	0.54	1074	0.60	0.67	1117	0.56	0.71	1268
4	Bihar	20.04	32.39	1617	20.50	39.11	1908	21.63	44.50	2058
5	Chhatisgarh	1.02	0.91	886	0.92	0.92	1002	0.93	0.99	1059
6	Gujarat	9.16	24.73	2700	12.01	30.00	2498	12.74	38.38	3013
7	Haryana	23.04	88.57	3844	23.76	100.55	4232	24.62	102.36	4158
8	Himachal Pradesh	3.59	6.79	1894	3.62	5.02	1385	3.67	5.04	1376
9	Jammu & Kashmir	2.48	4.44	1790	2.60	4.92	1893	2.78	4.96	1782
10	Jharkhand	0.58	0.78	1340	0.84	1.29	1529	0.86	1.40	1621
11	Karnataka	2.53	2.17	858	2.69	2.05	762	2.76	2.61	946
12	Madhya Pradesh	36.93	59.58	1613	39.93	73.26	1835	37.42	60.33	1612
13	Maharashtra	9.33	13.00	1393	12.31	16.31	1325	12.53	20.79	1659
14	Manipur									
15	Meghalaya	0.01	0.01	1714	0.01	0.01	2000	0.01	0.01	1833
16	Nagaland	0.01	0.02	1583	0.02	0.01	867	0.02	0.02	1067
17	Odisha	0.03	0.05	1364	0.04	0.06	1487	0.06	0.09	1554
18	Punjab	34.68	144.93	4179	34.67	145.96	4210	34.88	157.20	4507
19	Rajasthan	21.24	58.65	2762	25.65	70.56	2751	25.92	71.25	2749
20	Sikkim	0.07	0.09	1385	0.07	0.09	1385	0.05	0.05	1000
21	Tamil Nadu	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!
22	Tripura	0.01	0.03	2636	0.01	0.02	1800	0.01	0.02	1900
23	Uttar Pradesh	91.64	240.74	2627	91.98	250.31	2721	91.15	256.79	2817
24	Uttarakhand	3.95	6.45	1633	3.91	8.01	2049	3.97	8.14	2050
25	West Bengal	3.67	7.74	2109	3.51	8.00	2282	3.53	9.17	2602
26	D & N Haveli	0.01	0.01	1833	0.01	0.01	1833	0.01	0.01	1833
27	Delhi	0.18	0.79	4339	0.18	0.78	4341	0.18	0.76	4354
28	Others									
	All India	264.84	693.55	2619	279.95	758.07	2708	280.39	785.70	2802

Contd.

Area in Lakh ha, Production in Lakh Tonnes and Yield Kg/ha *Annexure-I*

Sl.No.		2008-09			2009-10			2010-11		
	State/ UT	A	P	Y	A	P	Y	A	P	Y
1	Andhra Pradesh	0.14	0.16	1143	0.10	0.10	1000	0.10	0.13	1300
2	Arunachal Pradesh	0.03	0.05	1576	0.03	0.05	1505	0.04	0.06	1595
3	Assam	0.50	0.55	1090	0.58	0.64	1087	0.45	0.53	1179
4	Bihar	21.58	44.10	2043	21.93	45.71	2084	21.04	40.98	1948
5	Chhatisgarh	0.89	0.93	1040	1.12	1.22	1086	1.11	1.27	1144
6	Gujarat	10.91	25.93	2377	8.78	23.52	2679	12.74	40.19	3155
7	Haryana	24.62	108.08	4390	24.92	105.00	4213	25.15	116.30	4624
8	Himachal Pradesh	3.60	5.47	1520	3.53	3.27	928	3.57	5.46	1530
9	Jammu & Kashmir	2.79	4.84	1735	2.89	2.90	1003	2.91	4.46	1535
10	Jharkhand	1.00	1.54	1541	1.00	1.73	1738	0.96	1.58	1642
11	Karnataka	2.69	2.47	918	2.83	2.51	887	2.55	2.79	1094
12	Madhya Pradesh	37.85	65.22	1723	42.76	84.10	1967	43.41	76.27	1757
13	Maharashtra	10.22	15.16	1483	10.81	17.40	1610	13.07	23.01	1761
14	Manipur							0.02	0.05	2500
15	Meghalaya	0.00	0.01	1750	0.00	0.01	1773	0.00	0.01	1791
16	Nagaland	0.01	0.02	1500	0.02	0.02	1200	0.03	0.05	1712
17	Odisha	0.05	0.07	1396	0.04	0.06	1450	0.03	0.04	1458
18	Punjab	35.26	157.33	4462	35.22	151.69	4307	35.10	164.72	4693
19	Rajasthan	22.95	72.87	3175	23.94	75.01	3133	24.79	72.14	2910
20	Sikkim	0.06	0.08	1345	0.05	0.06	1135	0.03	0.03	1023
21	Tamil Nadu	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	500
22	Tripura	0.01	0.01	2000	0.01	0.01	1984	0.00	0.01	2025
23	Uttar Pradesh	95.13	285.54	3002	96.68	275.18	2846	96.37	300.01	3113
24	Uttarakhand	3.98	7.97	2003	3.95	8.45	2139	3.79	8.78	2316
25	West Bengal	3.07	7.65	2490	3.16	8.47	2680	3.17	8.74	2760
26	D & N Haveli	0.01	0.01	1833	0.01	0.01	1500	0.00	0.00	2231
27	Delhi	0.17	0.74	4351	0.21	0.93	4352	0.26	1.11	4340
28	Others									
	All India	277.52	806.79	2907	284.57	808.04	2839	290.69	868.74	2989

Contd.

Area in Lakh ha, Production in Lakh Tonnes and Yield Kg/ha *Annexure-I*

Sl.No.		2011-12			2012-13			2013-14 (Fourth Adv Est)		
	State/ UT	A	P	Y	A	P	Y	A	P	Y
1	Andhra Pradesh	0.08	0.11	1375	0.1	0.1	1250	0.1	0.1	1000
2	Arunachal Pradesh	0.04	0.07	1757						
3	Assam	0.53	0.60	1147	0.3	0.4	1304	0.4	0.3	821
4	Bihar	21.42	47.25	2206	22.1	53.6	2427	22.6	50.8	2251
5	Chhatisgarh	1.09	1.33	1227	1.0	1.4	1396	1.0	1.3	1304
6	Gujarat	13.51	40.72	3014	10.2	29.4	2875	13.5	36.5	2703
7	Haryana	25.22	126.86	5030	25.0	111.2	4452	25.0	118.0	4722
8	Himachal Pradesh	3.57	5.96	1671	3.6	6.1	1671	3.7	5.4	1451
9	Jammu & Kashmir	2.96	5.00	1689	2.9	4.6	1595	2.9	4.6	1589
10	Jharkhand	1.59	3.03	1908	1.6	3.2	1944	1.7	3.6	2058
11	Karnataka	2.25	1.93	858	2.3	1.8	796	2.1	2.3	1075
12	Madhya Pradesh	48.89	115.39	2360	53.0	131.3	2478	57.9	139.3	2405
13	Maharashtra	8.43	13.13	1558	7.7	11.8	1528	11.0	16.0	1460
14	Manipur	0.02	0.05	2498						
15	Meghalaya	0.00	0.01	1564						
16	Nagaland	0.03	0.05	1711						
17	Odisha	0.01	0.02	1644	0.0	0.0	1894	0.0	0.0	1606
18	Punjab	35.28	172.80	4898	35.1	165.9	4724	35.1	170.4	4848
19	Rajasthan	29.35	93.20	3175	30.6	92.8	3028	28.1	89.2	3175
20	Sikkim	0.03	0.03	1060						
21	Tamil Nadu	0.00	0.00	0				0.0	0.0	
22	Tripura	0.00	0.01	2000						
23	Uttar Pradesh	97.31	302.93	3113	97.3	303.0	3113	99.6	302.5	3038
24	Uttarakhand	3.69	8.78	2379	3.6	8.6	2396	3.5	8.4	2425
25	West Bengal	3.16	8.73	2765	3.2	9.0	2786	3.4	9.5	2802
26	D & N Haveli	0.00	0.00	1929						
27	Delhi	0.20	0.85	4349						
28	Others				0.3	0.8	3361	0.3	0.9	3336
	All India	298.65	948.82	3177	300.0	935.1	3117	311.9	959.1	3075

Source: DES, DAC, GOI.

Area, Production and Yield of Wheat Crop in various Countries in 2012

Annexure II

Area - '000 Hectares
Production - '000 Tonnes
Yield - Kg/Hectare

Country	Area	Production	Yield	Production (%)
World	216639	674884	3115	100
China	24139	120580	4995	17.87
India	29900	94880	3173	14.06
Russian Federation	21278	37720	1773	5.59
U.S.A.	19826	61755	3115	9.15
France	5303	40301	7599	5.97
Canada	9353	27013	2888	4
Germany	3061	22432	7328	3.32
Pakistan	8666	23517	2714	3.48
Australia	13902	29905	2151	4.43
Ukraine	5630	15763	2800	2.34
Turkey	7530	20100	2670	2.98
Kazakhstan	13464	13307	988	1.97
U.K.	1992	13261	6657	1.96
Iran	7000	13800	1971	2.04
Poland	2090	8610	4120	1.28
Egypt	1350	8796	6516	1.3
Argentina	3700	11000	2973	1.63
Italy	1850	7430	4016	1.1
Romania	1992	5298	2659	0.78
Spain	1759	4650	2644	0.69
Syrian	1600	1600	2313	0.24
Bangladesh	400	1030	2575	0.15

Source: DES, DAC, GOI.

State wise yield potential recorded under FLDs vis-à-vis National/State average yield and Gap Analysis

Annexure III(a)

State wise performance of improved Wheat varieties during 2006-07

Sl.No.	State	Mean Yield (qtl/ha)		Yield Gain (%)	State-wise Avg. Yield (qtl)	Gap Between FLDs and State Average Yield	
		Improved	Check			(qtl/ha)	%
1	UP	-	-	-	27.21		
2	HP	23	20	15.00 NS	13.85	9.15	39.78
3	J&K	30.24	21.11	43.25***	18.93	11.31	37.4
4	Bihar	35.69	32.16	10.98***	19.08	16.61	46.54
5	Jharkhand	15.41	13.41	14.91**	15.29	0.12	0.78
6	Punjab	-	-	-	42.1	-	-
7	Haryana	47.63	45.61	4.43***	42.32	5.31	11.15
8	Uttarakhand	32.48	19.52	66.39***	20.49	11.99	36.92
9	Gujarat	39.7	37.6	5.59 NS	24.98	14.72	37.08
10	MP	27.48	16.66	64.95***	18.35	9.13	33.22
11	Chhattisgarh	25.22	17.53	43.87***	10.02	15.2	60.27
12	Maharashtra	32.54	30.15	7.93 NS	13.25	19.29	59.28
13	Karnataka	36.12	32.03	12.77**	7.62	28.5	78.9
14	West Bengal	-	-	-	22.82		
15	Assam	29.05	23.65	22.83**	11.17	17.88	61.55
16	Rajasthan	43.53	39.82	9.32**	27.51	16.02	36.8
17	Tamilndu	28.94	-	-			

* Significant at 10%, ** Significant at 5%,*** Significant at 1%, NS- Not significant

State wise performance of improved Wheat varieties during 2007-08

Annexure III(b)

Sl.No.	State	Mean Yield (qtl/ha)		Yield Gain (%)	State-wise Avg. Yield (qtl)	Gap Between FLDs and State Average Yield	
		Improved	Check			(qtl/ha)	%
1	UP	46.12	40.8	13.04***	28.17	17.95	38.92
2	HP	24.41	21.61	12.96***	13.76	10.65	43.63
3	J&K	21.22	17.83	19.01***	17.82	3.4	16.02
4	Bihar	39.79	31.72	25.44***	20.58	19.21	48.28
5	Jharkhand	38.04	27.01	40.84***	16.21	21.83	57.39
6	Punjab	49.03	47.39	3.46***	45.07	3.96	8.08
7	Haryana	48.77	47.54	2.59**	41.58	7.19	14.74
8	Uttarakhand	34.55	29	19.14*	20.5	14.05	40.67
9	Gujarat	46.01	43.65	5.41***	30.13	15.88	34.51
10	MP	39.04	25.31	54.25***	16.12	22.92	64.75
11	Chhattisgarh	30.13	20.92	44.02***	10.59	19.54	64.85
12	Maharashtra	36.42	31.1	17.11***	16.59	19.83	54.45
13	Karnatak	40.2	34.42	16.79***	9.46	30.74	76.47
14	West Bengal	27.98	21.27	31.55***	26.02	1.96	7.01
15	Assam	25.87	20.87	23.96***	12.68	13.19	50.99
16	Rajasthan	42.25	38.3	10.31***	27.49	14.76	34.93
17	Tamilnadu	27.09	-	-		27.09	100

* Significant at 10%, ** Significant at 5%,*** Significant at 1%, NS- Not significant

State wise performance of improved Wheat varieties during 2008-09

Annexure III(c)

Sl.No.	State	Mean Yield (qtl/ha)		Yield Gain (%)	State-wise Avg. Yield (qtl)	Gap Between FLDs and State Average Yield	
		Improved	Check			(qtl/ha)	%
1	UP	45.87	40.19	14.13***	30.02	15.85	34.55
2	HP	23.91	18.5	29.24***	15.2	8.71	36.43
3	J&K	31.69	23.45	35.14***	17.35	14.34	45.25
4	Bihar	39.83	35.41	12.48***	20.43	19.4	48.71
5	Jharkhand	38.4	26.22	46.45***	15.41	22.99	59.87
6	Punjab	50.46	45.08	11.93***	44.62	5.84	11.57
7	Haryana	54.24	52.26	3.79**	43.9	10.34	19.06
8	Uttarakhand	31.94	24.28	31.55NS	20.03	11.91	37.29
9	Gujarat	36.4	34.34	6.00***	23.77	12.63	34.7
10	MP	38.89	32.64	19.15***	17.23	21.66	55.7
11	Chhattisgarh	40.97	27.82	47.27***	10.4	30.57	74.62
12	Maharashtra	27.06	23.66	14.37*	14.83	12.23	45.2
13	Karnatak	40.3	34.1	18.18***	9.18	31.12	77.22
14	West Bengal				24.9		
15	Assam	29.52	26.41	11.77***	10.9	18.62	63.08
16	Rajasthan	41.46	35.7	16.13***	31.75	9.71	23.42
17	Tamilnadu	31.2	-	-		31.2	100

* Significant at 10%, ** Significant at 5%,*** Significant at 1%, NS- Not significant

State-wise Analysis/Difference between FLDs and State Average Yield of Wheat during 2009-10

Annexure III(d)

Sl.No.	State	Mean Yield (qtl/ha)		Yield Gain (%)	State-wise Avg. Yield (qtl)	Gap Between FLDs and State Average Yield	
		Improved	Check			(qtl/ha)	%
1	Assam	27.68	21.37	29.53***	10.87	16.81	60.73
2	Uttarakhand	31.58	22.43	40.79**	21.39	10.19	32.27
3	H.P.	18.18	14.65	24.10***	9.28	8.9	48.95
4	J &K	27.28	24.52	11.26***	10.03	17.25	63.23
5	U.P.	42.69	38.82	9.97***	28.46	14.23	33.33
6	W B	27.87	23.35	19.36***	26.8	1.07	3.84
7	Bihar	40.37	35.45	13.88***	20.84	19.53	48.38
8	Jharkhand	35.58	29.32	21.35***	17.38	18.2	51.15
9	Punjab	47.52	43.88	8.30***	43.07	4.45	9.36
10	Delhi	43.4	40.4	7.43***	43.52	-0.12	-0.28
11	Haryana	49.28	47.62	3.49***	42.13	7.15	14.51
12	Rajasthan	42.47	36.53	16.26***	31.33	11.14	26.23
13	Gujarat	38.85	35.3	10.06***	26.79	12.06	31.04
14	M P	35.6	27.4	29.93***	19.67	15.93	44.75
15	Chhattisgarh	32.49	24.03	35.21***	10.86	21.63	66.57
16	Maharashtra	27.87	24.42	14.13**	16.1	11.77	42.23
17	Karnataka	37.55	31.85	17.90***	8.87	28.68	76.38
18	Tamil Nadu	31.11				31.11	100

* Significant at 10%, ** Significant at 5%,*** Significant at 1%, NS- Not significant

State-wise Analysis/Difference between FLDs and State Average Yield of Wheat during 2010-11

Annexure III(e)

Sl.No.	State	Mean Yield (qtl/ha)		Yield Gain (%)	State-wise Avg. Yield (qtl)	Gap Between FLDs and State Average Yield	
		Improved	Check			(qtl/ha)	%
1	Assam	28.8	23.09	24.73*	11.79	17.01	59.06
2	Uttarakhand	33.61	25.05	34.17**	23.16	10.45	31.09
3	H P	31.31	25.52	22.69***	15.3	16.01	51.13
4	J & K	30.87	24.37	26.67***	15.35	15.52	50.28
5	U P	45	37.96	18.54***	31.13	13.87	30.82
6	W B	20.6	18.6	10.75NS	27.6	-7	-33.98
7	Bihar	41.18	36.86	11.72***	19.48	21.7	52.7
8	Jharkhand	23.89	16.01	49.22***	16.42	7.47	31.27
9	Punjab	48.95	46.01	6.39***	46.93	2.02	4.13
10	Delhi	50.84	44.53	14.17***	43.4	7.44	14.63
11	Haryana	49.09	47.19	4.03***	46.24	2.85	5.81
12	Rajasthan	44.51	36.32	22.55***	29.1	15.41	34.62
13	Gujarat	36.33	32.82	10.69***	31.55	4.78	13.16
14	M P	42.11	32.86	28.15***	17.57	24.54	58.28
15	Chhattisgarh	42.11	20.71	103.33***	11.44	30.67	72.83
16	Maharashtra	34.77	30.96	12.31***	17.61	17.16	49.35
17	Karnataka	39.51	35.01	12.85***	10.94	28.57	72.31
18	Tamil Nadu	36.77				36.77	100

* Significant at 10%, ** Significant at 5%,*** Significant at 1%, NS- Not significant

State-wise Analysis/Difference between FLDs and State Average Yield of Wheat during 2011-12

Annexure III(f)

Sl.No.	State	Mean Yield (qtl/ha)		Yield Gain (%)	State-wise Avg. Yield (qtl)	Gap Between FLDs and State Average Yield	
		Improved	Check			(qtl/ha)	%
1	Assam	31.3	23.1	35.50NS	11.47	19.83	63.35
2	Uttarakhand	42.96	33.28	29.09***	23.79	19.17	44.62
3	H P	29.8	24.14	23.45**	16.71	13.09	43.93
4	J&K	31.24	26.48	17.98***	16.89	14.35	45.93
5	UP	48.44	42.56	13.82***	31.13	17.31	35.73
6	W B	31.67	27.51	15.12***	27.65	4.02	12.69
7	Bihar	43.07	37.54	14.73***	22.06	21.01	48.78
8	Jharkhand	33.83	27.51	22.97***	19.08	14.75	43.60
9	Punjab	58.54	53.31	9.81**	48.98	9.56	16.33
10	Delhi	56.38	52.57	7.86**	43.49	12.89	22.86
11	Haryana	59.19	55.37	6.90***	50.3	8.89	15.02
12	Rajasthan	46.73	39.69	17.74***	31.75	14.98	32.06
13	Gujarat	40.84	36.04	13.32*	30.14	10.7	26.20
14	Madhya Pradesh	44.9	33.39	34.47***	23.6	21.3	47.44
15	Chhattisgarh	29.3	22.11	32.52***	12.27	17.03	58.12
16	Maharashtra	32.96	28.9	14.05*	15.58	17.38	52.73
17	Karnataka	36	31.33	14.91***	8.58	27.42	76.17
18	Tamil Nadu	36.65					

* Significant at 10%, ** Significant at 5%,*** Significant at 1%, NS- Not significant

State-wise Analysis/Difference between FLDs and State Average Yield of Wheat during 2012-13

Annexure III(g)

Sl.No.	State	Mean Yield (qtl/ha)		Yield Gain (%)	State-wise Avg. Yield (qtl)	Gap Between FLDs and State Average Yield	
		Improved	Check			(qtl/ha)	%
1	Assam	39.02	35.5	9.92	13.04	25.98	66.58
2	Bihar	40.01	36.56	9.44	24.27	15.74	39.34
3	Chhattisgarh	30.49	22.01	38.53	13.96	16.53	54.21
4	Gujarat	41.23	36.52	12.9	28.75	12.48	30.27
5	Haryana	51.4	48.19	6.66	44.52	6.88	13.39
6	HP	32.58	28.52	14.24	16.71	15.87	48.71
7	J&K	34.19	26.92	27.01	15.95	18.24	53.35
8	Jharkhand	36.39	26.37	38	19.44	16.95	46.58
9	Karnataka	33.96	29.06	16.86	7.96	26	76.56
10	Maharashtra	38.64	31.69	21.93	15.28	23.36	60.46
11	MP	40	28.74	39.18	24.78	15.22	38.05
12	Punjab	53.06	49.95	6.23	47.24	5.82	10.97
13	Rajasthan	43.25	38.32	12.87	30.28	12.97	29.99
14	Tamilnadu	31.26					
15	UP	45.48	40	13.7	31.13	14.35	31.55
16	Uttarakhand	40.15	32.26	24.46	23.96	16.19	40.32
17	West Bengal	32.56	28.46	14.41	27.86	4.7	14.43

* Significant at 10%, ** Significant at 5%,*** Significant at 1%, NS- Not significant

State-wise Analysis/Difference between FLDs and State Average Yield of Wheat during 2013-14

Annexure III(h)

Sl.No.	State	Mean Yield (qtl/ha)		Yield Gain (%)	State-wise Avg. Yield (qtl)	Gap Between FLDs and State Average Yield	
		Improved	Check			(qtl/ha)	%
1	Assam	25.84	21.05	22.76***	8.21	17.63	68.23
2	Bihar	37.33	32.44	15.07***	22.51	14.82	39.70
3	Chhattisgarh	26.51	21.54	23.07***	13.04	13.47	50.81
4	Delhi	50.54	44.52	13.52***			
5	Gujarat	43.77	41.25	06.11*	27.03	16.74	38.25
6	Haryana	54.63	53.7	01.73 NS	47.22	7.41	13.56
7	HP	28.76	23.63	21.71***	14.51	14.25	49.55
8	J&K	31.55	23.69	33.18***	15.89	15.66	49.64
9	Jharkhand	30.06	23.01	30.64***	20.58	9.48	31.54
10	Karnataka	34.18	30.2	13.18***	10.75	23.43	68.55
11	Maharashtra	33.78	29.36	15.05*	14.6	19.18	56.78
12	MP	43.53	30.73	41.65***	24.05	19.48	44.75
13	Punjab	52.36	51.07	02.53 NS	48.48	3.88	7.41
14	Rajasthan	50.59	44.02	14.93***	31.75	18.84	37.24
15	Tamilnadu	24.96	-	-			
16	UP	49.73	45.68	08.87***	30.38	19.35	38.91
17	Uttarakhand	40.35	32.76	23.17 NS	24.25	16.1	39.90
18	West Bengal	34.31	28.73	19.42***	28.02	6.29	18.33

*** Significant at 1 percent level, ** Significant at 5 percent level, * Significant at 10 percent level, NS– Non-significant

Source: DWR, Karnal

State-wise Average Yield of Wheat

Yield in qtl/ha *Annexure: III(i)*

Sl.No.	State	State-wise Avg. Yield													
		2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14 (Ad Est)
1	Assam	12.19	11.81	11.30	10.43	10.66	10.74	11.17	12.68	10.9	10.87	11.79	11.47	13.04	8.21
2	Bihar	21.46	20.65	18.96	17.76	16.09	16.17	19.08	20.58	20.43	20.84	19.48	22.06	24.27	22.51
3	Chhattisgarh	10.22	10.57	10.63	10.24	8.53	8.86	10.02	10.59	10.4	10.86	11.44	12.27	13.96	13.04
4	Delhi	35.22	35.10	40.05	35.15	39.44	43.39	43.41	43.54	43.51	43.52	43.4	43.49	NS	NS
5	Gujarat	22.68	24.35	19.66	26.81	24.82	27.00	24.98	30.13	23.77	26.79	31.55	30.14	28.75	27.03
6	Haryana	41.06	41.03	40.53	39.37	39.01	38.44	42.32	41.58	43.9	42.13	46.24	50.3	44.52	47.22
7	Himachal Pradesh	6.93	17.38	13.79	13.80	18.90	18.94	13.85	13.76	15.2	9.28	15.3	16.71	16.71	14.51
8	J&K	5.29	13.25	16.46	18.04	19.10	17.90	18.93	17.82	17.35	10.03	15.35	16.89	15.95	15.89
9	Jharkhand	16.26	17.65	16.25	15.73	23.81	13.40	15.29	16.21	15.41	17.38	16.42	19.08	19.44	20.58
10	Karnataka	9.17	7.63	5.98	4.15	7.40	8.58	7.62	9.46	9.18	8.87	10.94	8.58	7.96	10.75
11	Madhya Pradesh	14.71	16.20	14.56	18.00	17.35	16.13	18.35	16.12	17.23	19.67	17.57	23.6	24.78	24.05
12	Maharashtra	12.57	13.88	12.95	11.70	13.44	13.93	13.25	16.59	14.83	16.1	17.61	15.58	15.28	14.6
13	Punjab	45.63	45.32	42.00	42.07	42.21	41.79	42.1	45.07	44.62	43.07	46.93	48.98	47.24	48.48
14	Rajasthan	24.02	27.93	27.09	27.94	28.39	27.62	27.51	27.49	31.75	31.33	29.1	31.75	30.28	31.75
15	Tamilndu	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	5	NS
16	Uttar Pradesh	27.24	27.55	25.96	27.94	25.02	26.27	27.21	28.17	30.02	28.46	31.13	31.13	31.13	30.38
17	Uttarakhand	18.85	19.33	18.25	18.77	20.38	16.33	20.49	20.5	20.03	21.39	23.16	23.79	23.96	24.25
18	West Bengal	24.85	22.15	21.89	23.15	21.03	21.09	22.82	26.02	24.9	26.8	27.6	27.65	27.86	28.02

NS: Not Significant

State-wise Average Yield of Wheat Frontline Demonstration *Yield in qtl/ha* *Annexure: III (j)*

Sl.No.	State	WFLDs Avg Yield													
		2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
1	Assam	11.87	21.71	27.85	39.79	25.48	21.30	29.05	25.87	29.52	27.68	28.80	31.30	39.02	25.84
2	Bihar	44.92	40.42	35.23	34.79	38.40	34.45	35.69	39.79	39.83	40.37	41.18	43.07	40.01	37.33
3	Chhattisgarh	NA	17.14	NA	25.49	31.18	24.65	25.22	30.13	40.97	32.49	42.11	29.30	30.49	26.51
4	Delhi	45.58	48.51	NA	51.65	50.43	47.33	NA	NA	NA	43.40	50.84	56.38	NA	50.54
5	Gujarat	50.50	43.54	35.04	45.90	40.09	44.27	39.70	46.01	36.40	38.85	36.33	40.84	41.23	43.77
6	Haryana	53.04	50.37	48.15	46.53	46.07	46.15	47.63	48.77	54.24	49.28	49.09	59.19	51.40	54.63
7	Himachal Pradesh	26.83	NA	28.28	24.89	25.20	23.18	23.00	24.41	23.91	18.18	31.31	29.80	32.58	28.76
8	J&K	32.10	NA	NA	NA	NA	NA	30.24	21.22	31.69	27.28	30.87	31.24	34.19	31.55
9	Jharkhand	NA	NA	NA	39.66	44.33	42.44	15.41	38.04	38.40	35.58	23.89	33.83	36.39	30.06
10	Karnataka	41.65	41.57	35.80	36.00	36.45	37.97	36.12	40.20	40.30	37.55	39.51	36.00	33.96	34.18
11	Madhya Pradesh	40.11	34.43	38.01	30.22	39.44	28.83	27.48	39.04	38.89	35.60	42.11	44.90	40.00	43.53
12	Maharashtra	33.54	28.63	27.10	34.35	40.87	32.63	32.54	36.42	27.06	27.87	34.77	32.96	38.64	33.78
13	Punjab	52.88	48.55	45.68	51.47	44.28	43.62	NA	49.03	50.46	47.52	48.95	58.54	53.06	52.36
14	Rajasthan	NA	59.90	37.60	33.62	44.14	38.54	43.53	42.25	41.46	42.47	44.51	46.73	43.25	50.59
15	Tamilndu	NA	NA	34.39	23.66	24.62	23.59	28.94	27.09	31.20	NA	36.77	36.65	31.26	24.96
16	Uttar Pradesh	45.69	38.77	41.31	40.81	42.73	46.37	NA	46.12	45.87	42.69	45.00	48.44	45.48	49.73
17	Uttarakhand	48.66	30.64	34.95	31.31	35.37	34.45	32.48	34.55	31.94	31.58	33.61	42.96	40.15	40.35
18	West Bengal	32.14	19.39	15.38	38.08	19.38	29.22	NA	27.98	NA	27.87	20.60	31.67	32.56	34.31

NA: FLDs not conducted

State-wise Wheat Yield Gap Between FLDs and State Average Yield

Yield in qtl/ha *III(k)*

Sl.No.	State	Gap Between FLDs and State Average Yield													
		2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
1	Assam	-0.32	9.90	16.55	29.36	14.82	10.56	17.88	13.19	18.62	16.81	17.01	19.83	25.98	17.63
2	Bihar	23.46	19.77	16.27	17.03	22.30	18.28	16.61	19.21	19.40	19.53	21.70	21.01	15.74	14.82
3	Chhattisgarh	NA	6.57	NA	15.25	22.64	15.79	15.20	19.54	30.57	21.63	30.67	17.03	16.53	13.47
4	Delhi	10.36	13.41	NA	16.50	10.99	3.94	NA	NA	NA	-0.12	7.44	12.89	NA	NA
5	Gujarat	27.81	19.18	15.37	19.08	15.27	17.27	14.72	15.88	12.63	12.06	4.78	10.70	12.48	16.74
6	Haryana	11.98	9.34	7.62	7.16	7.06	7.71	5.31	7.19	10.34	7.15	2.85	8.89	6.88	7.41
7	Himachal Pradesh	19.90	NA	14.49	11.10	6.31	4.24	9.15	10.65	8.71	8.90	16.01	13.09	15.87	14.25
8	J&K	26.81	NA	NA	NA	NA	NA	11.31	3.40	14.34	17.25	15.52	14.35	18.24	15.66
9	Jharkhand	NA	NA	NA	23.93	20.52	29.04	0.12	21.83	22.99	18.20	7.47	14.75	16.95	9.48
10	Karnataka	32.48	33.94	29.82	31.85	29.05	29.39	28.50	30.74	31.12	28.68	28.57	27.42	26.00	23.43
11	Madhya Pradesh	25.40	18.23	23.45	12.22	22.09	12.70	9.13	22.92	21.66	15.93	24.54	21.30	15.22	19.48
12	Maharashtra	20.96	14.75	14.15	22.65	27.43	18.69	19.29	19.83	12.23	11.77	17.16	17.38	23.36	19.18
13	Punjab	7.25	3.23	3.68	9.40	2.07	1.82		3.96	5.84	4.45	2.02	9.56	5.82	3.88
14	Rajasthan	NA	31.97	10.51	5.68	15.75	10.93	16.02	14.76	9.71	11.14	15.41	14.98	12.97	18.84
15	Tamilndu	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26.26	NA
16	Uttar Pradesh	18.45	11.22	15.35	12.87	17.71	20.10	NA	17.95	15.85	14.23	13.87	17.31	14.35	19.35
17	Uttarakhand	29.81	11.31	16.70	12.54	14.99	18.12	11.99	14.05	11.91	10.19	10.45	19.17	16.19	16.1
18	West Bengal	7.29	-2.76	-6.51	14.93	-1.65	8.13	NA	1.96	NA	1.07	-7.00	4.02	4.70	6.29

State-wise Wheat Average Yield of last fourteen years of FLDs and State Yield

Yield in qtl/ha *Annexure: III (I)*

Sl.No.	State	Avg of last fourteen years (2000-01 to 2013-14)		
		WFLDs Avg Yield	State-wise Avg Yield	Yield Gap
1	Assam	27.51	11.23	16.27
2	Bihar	38.96	20.02	18.94
3	Chhattisgarh	29.64	10.83	18.81
4	Delhi	49.41	40.77	8.64
5	Gujarat	41.60	26.32	15.28
6	Haryana	50.32	42.69	7.64
7	Himachal Pradesh	26.18	14.65	11.53
8	J&K	30.04	15.59	14.45
9	Jharkhand	34.37	17.35	17.02
10	Karnataka	37.66	8.30	29.36
11	Madhya Pradesh	37.33	18.45	18.88
12	Maharashtra	32.94	14.45	18.49
13	Punjab	49.72	44.68	5.04
14	Rajasthan	43.74	28.85	14.88
15	Tamilndu	29.38	NA	NA
16	Uttar Pradesh	44.54	28.40	16.14
17	Uttarakhand	35.93	20.68	15.25
18	West Bengal	27.38	24.70	2.68

Year-wise Export and Import of wheat

Annexure IV

Year	Export		Import	
	Physical (Quantity in 000 tonnes)	Financial (value in crores)	Physical (Quantity in 000 tonnes)	Financial (value in crores)
2001-02	2649.38	1330.21	1.35	0.84
2002-03	3671.25	1759.87	…..	
2003-04	4093.08	2391.15	0.46	0.25
2004-05	2009.35	1459.82	…..	
2005-06	746.18	557.53	…..	
2006-07	46.64	35.35	6079.56	5850.49
2007-08	0.24	0.24	1793.21	2657.51
2008-09	1.12	1.46	0.01	0.01
2009-10	0.03	0.06	164.38	
2010-11	0.4	0.7	185.28	255.85
2011-12	740.75	1023.27	0.02	0.08
2012-13 (P)	6471.98	10488.35	2.94	6.03

Source: FCI, New Delhi.

YEARWISE RELEASED WHEAT VARIETIES

(A) CENTRAL RELEASE VARIETIES

Annexure V

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Production Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
1	DL 803-3(Kanchan)	1995	IARI, New Delhi	Timely sown, irrigated condition	Madhya Pradesh, Gujarat, part of Rajasthan (excluding the districts of Alwar, Bharatpur & Sriganganagar) and Bundelkhand region of UP.	CZ	50	Plants are waxy, good grain appearance with amber hard grains, desirable 1000grain weight (40 g) high protein content (13 %), good for chapati making qualities. Resistance to leaf & stem rust
2	DWR – 195 (Anuradha)	1995	DWR, Karnal	Late sown, irrigated condition	Karnataka, Maharastra. A.P, and Tamil Nadu	PZ	-	-
3	Malavshree (HI-8381)(Durum)	1995	IARI,Indore	Timely sown, irrigated condition	Madhya Pradesh, Gujarat, part of Rajasthan (excluding the districts of Alwar, Bharatpur & Sriganganagar) and Bundelkhand region of UP.	CZ	50-55	Medium late,Ears pubescent withn black awns. Very bold amber grains having good beta-carotene and protein content.Highly resistant leaf & stem rusts and Loose smut and tolerant to Karnal bunt..
4	U P-2338	1995	GBPUAT, Pantnagar	Timely sown, irrigated condition	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ		-
5	WH-896[*durum*]	1995	CCS HAU, Hissar	Timely sown, irrigated condition	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ	-	-
6	Dewa (K – 9107)	1996	CSAUAT, Kanpur	Timely sown, irrigated condition	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	45	Posses desirable Protein content with bold and hard grains, better chapati making quality, good quality straw for cattles. High degree of resistance to rusts and tolerance to leaf blight.
7	Indra (K – 8962)	1996	CSAUAT, Kanpur	Late sown, irrigated condition	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	25 – 30 (under rainfed condition)	Grains are amber, medium bold and semi hard to hard and possess good chapati making quality. Tall type variety (115 cm) with added advantage of straw.

Contd.

(A) CENTRAL RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Production Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
8	PBW- 343	1996	PAU, Ludhiana	Timely sown, irrigated condition	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P.(Paonta Valley & Una Distt.)	NWPZ	50	Wide adaptability, high degree of resistance to rusts (brown & yellow) and tolerance to Karnal Bunt. The grains are amber, semi hard to hard, good straw strength resulting in high degree of lodging tolerance.
9	Raj-3765	1996	RAS, Durgapura, Jaipur	Late sown, irrigated condition	Punjab, Haryana, Rajasthan (excluding kota & udaipur), Western Uttar Pradesh, Tarai of Uttarakhand and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ	35 – 40	Light green, non waxy leaves, dusty white ear colour at the time of maturity. Amber and semi hard grains, good for chapati making. Resistance to leaf & stripe rusts and tolerant to karnal bunt.
10	Jagdish (HP-1761)	1996	IARI, Pusa Bihar	Timely sown, irrigated condition	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	42	-
11	Amar (HW-2004)	1997	IARI, New Delhi	Timely sown, irrigated condition	Madhya Pradesh,Gujarat, part of Rajasthan (Kota and Udaipur Div.) and U.P. (Jhansi Div.)	CZ	25 – 30	Good grain appearance with amber hard grains, medium 1000 grain weight (39 g) and desirable protein content, suitable for chapati making purposes.
12	DDK 1001(*diococcum*)	1997	UAS, Dharwad	Timely sown, irrigated condition	Maharashtra, Andhra Pradesh, Karnataka, Goa & plains of Tamil Nadu	PZ	46	
13	Ganga (HD 2643)	1997	IARI, New Delhi	Late sown, irrigated condition	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	35 – 40	Waxy ear head, amber grains with hard texture, possess good chapati making quality. Resistance to leaf & stripe rusts and and tolerant to karnal bunt & leaf blight.
14	PBW – 373	1997	PAU, Ludhiana	Very late sown, irrigated condition.	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P.(Paonta Valley & Una Distt.)	NWPZ,	42	High yielding and disease resistant variety possessing late heat tolerance.
15	Rajeshwari (HP 1744)	1997	IARI, New Delhi	Late sown, irrigated condition	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	35-40	Early maturity (110 days), plants are waxy, resistant to brown & yellow rusts and foliar blight. Amber grains with hard texture, suitable for chapati making.
16	Swapnil (JWS -17)	1997	JNKVV Regional Res. Station., Sagar (MP)	Timely sown, irrigated condition	Madhya Pradesh,Gujarat, part of Rajasthan (Kota and Udaipur Div.) and U.P. (Jhansi Div.)	CZ	-	-

Contd.

(A) CENTRAL RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Production Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
17	DL 788-2	1997	IARI, New Delhi	Late sown, irrigated condition	Madhya Pradesh,Gujarat, part of Rajasthan (Kota and Udaipur Div.) and U.P. (Jhansi Div.)	CZ	35 – 40	Early maturity, waxy plants at maturity, high 1000 grain weight (43 g) with desirable protein content. Amber hard grains, suitable for chapati making. Resistance to leaf & stem rusts.
18	VL 738	1997	VPKAS, Almora	Timely sown, irrigated condition	Hilly regions of J & K (except Jammu & Kathua Distt.), Hills of H.P. (except Paonta Valley & Una Distt.) and Uttarakhand.	NHZ	-	-
19	Narendra Wheat – 1012 (NW-1012)	1997	NDUA&T, Faizabad	Timely sown, irrigated condition	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	45	Good grain appearance with amber and semi hard grains, good for chapati preparation, brown rust & leaf blight and tolerant to kurnal bunt & loose smut, ideal resistance to genotype for zero tillage.
20	Bhavani (HW-1085)	1998	IARI, RS, Wellington	Irrigated, timely sowing	Nilgiris, Tamil Nadu	SHZ	61	Medium early maturing, semi-dwarf, medium bold. Leaf, Stem & Yellow rust resistance.
21	Gomti (K-9465)	1998	CSAUAT, Kanpur	Late sown, irrigated condition	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	30-35	Resistant to karnal bunt, rusts, leaf blight and loose smut. Amber, hard to semi hard and bold grains (1000 grain weight 42 gm) , good chapati making quality, heat tolerant, making quality, heat tolerant, also good for very late sown irrigated.
22	GW 273	1998	WRS, GAU, Vijapur	Irrigated, timely sowing	Madhya Pradesh, Gujarat, part of Rajasthan (excluding the districts of Alwar, Bharatpur & Sriganganagar) and Bundelkhand region of UP.	CZ		Medium early maturing, semi-dwarf, bold seed. Multiple disease resistance.
23	HS 365	1998	IARI, RRS , SHIMLA	Rainfed, timely sowing	Hilly regions of J & K (except Jammu & Kathua Distt.), Hills of H.P. (except Paonta Valley & Una Distt.) and Uttarakhand. Very high altitude.	NHZ	15-20	Medium early maturing semi-dwarf, bold seed. Drought tolerance.
24	MACS 2846 [*durum*]	1998	Agakar Research Institute, Pune	Timely	Maharashtra, Andhra Pradesh, Karnataka, Goa & plains of Tamil Nadu	PZ	35	Palnt height 84 cm, early maturing (107 days).
25	NW 1014	1998	NDUA&T, Faizabad	Irrigated, late sowing	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ		Medium early maturing, semi-dwarf, medium bold. Rust resistance.
26	HI 1563	1999	IARI, RS Indore	Irrigated, late sowing	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ		Medium late maturing, semi-dwarf, bold seed. Leaf and stem rust resistance.

Contd.

(A) CENTRAL RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Production Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
27	Malavshakti (HI-8498) (durum)	1999	IARI Regional Research Station, Indore.	Timely sown , rainfed condition.	Madhya Pradesh, Gujarat, part of Rajasthan (excluding the districts of Alwar, Bharatpur & Sriganganagar) and Bundelkhand region of UP.	CZ	50	Medium early(120days) with good thermo-tolerance. Glabrous, white ears. Uniform, very bold grains with high protein content and high ß–carotene content. Resistant to leaf rust.
28	Malviya-468 (HUW-468)	1999	BHU Varanasi	Timely sown, irrigated condition	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	50	Good grain appearance (amber & hard) and good chapati makingquality. Resistant to Rusts and Leaf Blight anf tolerant to Karnal Bunt and Loose Smut. Also suitable for late sowing up -to 15 th Dec.
29	Shresth (HD-2687) UP -2425	1999 1999	IARI, New Delhi GBPUAT, Pantnagar	Timely	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P. (Paonta Valley & Una	NWPZ	50	Wider adaptability, lodging resistant, tolerance to brown & yellow rusts, bears amber, hard, lustrous & attractive grains (1000 grains wt.-39g)
30				Late sown, irrigated condition	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P.(Paonta Valley & Una	NWPZ	-	
31	HD-4672 (duram) Malav Ratna	1999	IARI New Delhi	Timely sown , rainfed condition.	Madhya Pradesh, Gujarat, part of Rajasthan (excluding the districts of Alwar, Bharatpur & Sriganganagar) and Bundelkhand region of UP.	CZ	35	Medium late maturity and white at maturity. Ears glabrous & black awned. Grains very bold, having good quality traits. Highly resistant to stem & leaf rusts.
32	K – 9644 (Atal)	1999	CSAUAT, Kanpur	Rainfed, TS, Low fertility	Maharashtra, Andhra Pradesh, Karnataka, Goa & plains of Tamil Nadu	PZ	35-40	Resistant to all 3 rusts, tolerant to leaf blight, smut, karnal bunt and high temperature, protein content- 12% with good lysine contents.
33	HW 2044	2000	IARI, RRS , Willington	Irrigated, timely sowing	Nilgiris, Tamil Nadu, High altitude all situations	SHZ		Medium late, tall and Rust resistance.
34	KRL-19	2000	CSSRI, Karnal	Irrigated, timely sowing	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P. (Paonta Valley & Una	NWPZ, NEPZ & CZ	40	Medium late maturing, semi-dwarf. Salinity/alkalinity tolerance.
35	PBW – 373#	2000	PAU, Ludhiana	Very late sown, irrigated condition.	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	42	High yielding and disease resistant variety possessing late heat tolerance.

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(A) CENTRAL RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Production Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
36	PBW – 396	2000	PAU, Ludhiana	Timely	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ, NEPZ & CZ	34	
37	PBW- 343#	2000	PAU, Ludhiana	Timely sown, irrigated condition	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	50	Wide adaptability, high degree of resistance to rusts (brown & yellow) and tolerance to Karnal Bunt. The grains are amber, semi hard to hard, good straw strength resulting in high degree of lodging/ heat tolerance.
38	PBW 396	2000	PAU, Ludhiana	Rainfed, timely sowing	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ	36-40	Medium late maturing, semi-dwarf, medium bold. Drought tolerance.
39	PBW-443	2000	PAU, Ludhiana	Timely sown, irrigated condition	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	40	-
40	GW – 1139 (durun)	2001	GAU, Vijapur	Timely sown , rainfed condition.	Madhya Pradesh, Gujarat, part of Rajasthan (excluding the districts of Alwar, Bharatpur & Sriganganagar) and Bundelkhand region of UP.	CZ	-	
41	HD 2733	2001	IARI Regional Research Station, Indore.	Irrigated, timely sowing	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	46-50	Medium late maturing, semi-dwarf, bold seed. Leaf rust & leaf blight resistance.
42	HUW-510	2001	BHU Varanasi	Late sown restricted irrigation	N.Karnataka, S. Maharastra. A.P, and Tamilnadu	PZ	-	

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(A) CENTRAL RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Production Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
43	G W-322	2002	GAU, Vijapur	Irrigated, Timely sown condition	N.Karnataka, S. Maharastra. A.P, and Tamilnadu Madhya Pradesh,Gujarat, part of Rajasthan (Kota and Udaipur Div.) and U.P. (Jhansi Div.)	PZ&CZ	41-45	Broad waxy leaves, amber, semi hard bold & lustrous grains giving better appearance, good for chapati & bread making. Heat tolerance, leaf and stem rust resistance.
44	H W-2045	2002	IARI	Late sown restricted irrigation	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	45	Amber grains with hard texture, suitable for chapti making, resistant to rusts & foliar blight due to its earliness & short delayed senescence.
45	HD-2781	2002	IARI, New Delhi	Timely Sown	Maharashtra, Andhra Pradesh, Karnataka, Goa & plains of Tamil Nadu	PZ	-	
46	Lok-45[$]	2002	WRS, Lok Bharti, Bhavnagar	Irrigated, Late sown condition	Maharashtra, Andhra Pradesh, Karnataka, Goa & plains of Tamil Nadu	PZ	43	Intermediates growth habit, early maturity (94 days), amber,semi-hard and medium grains (1000 grains wt.-41g).
47	VL 804	2002	VPKAS Almora	Rain fed or restricted irrigated, timely sowing	Hilly regions of J & K (except Jammu & Kathua Distt.), Hills of H.P. (except Paonta Valley & Una Distt.) and Uttarakhand.	NHZ	36-40	Late maturity (170 days), Ears tapering and white at maturity, amber, semi-hard grains, smaller grains (1000 grain wt.-36g), highly resistant to yellow & brown rust
48	M P- 4010	2003	JNKVV,	Irrigated, late sowing	Madhya Pradesh,Gujarat, part of Rajasthan (Kota and Udaipur Div.) and U.P. (Jhansi Div.)	CZ		Early maturity (108 days), amber, hard and medium grains (1000 grains wt.-40g).
49	DBW-14	2003	DWR, Karnal	Irrigated, Late sown condition	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	43	Early maturity (102 days), amber & hard grains, 1000 grains wt.-40g.

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(A) CENTRAL RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Production Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
50	GW-1189*	2003	WRS, GAU, Vijapur	Timely sown, irrigated condition	Maharashtra, Andhra Pradesh, Karnataka, Goa & plains of Tamil Nadu	PZ	-	-
51	HD-2833*	2003	IARI, New Delhi	Late sown, irrigated condition	Maharashtra, Andhra Pradesh, Karnataka, Goa & plains of Tamil Nadu	PZ	-	All rust resistant
52	HI- 1500 (Amrita)	2003	IARI Regional Research Station, Indore.	Rainfed, Low fertility condition .	Madhya Pradesh,Gujarat, part of Rajasthan (excluding the districts of Alwar, Bharatpur & Sriganganagar) & Bund- elkhand region of UP. Terminal heat tolerance	CZ	16	Semi -erect type, days to maturity (120 days), amber, hard and bold grains (1000 grains wt.-42g)
53	HPW-155*	2003	CSKHPKVV, Palampur	Rainfed, Timely sown, Low fertility, High Altitude condition	Hilly regions of J & K (except Jammu & Kathua Distt.), Hills of H.P. (except Paonta Valley & Una Distt.) and Uttarakhand.	NHZ	-	-
54	HS- 375 (Himgiri)	2003	IARI Regional Station, Shimla	Timely sown, Summer season	Hilly regions of J & K (except Jammu & Kathua Distt.), Hills of H.P. (except Paonta Valley & Una Distt.) and Hills of U.P. (except Tarai area) Very high altitude	NHZ	27	Amber, semi-hard and very bold grains (1000 grains wt.-50g)
55	HS-420 (Shivalik)	2003	IARI Regional Station, Shimla	Late sown, Restricted irrigation	Hilly regions of J & K (except Jammu & Kathua Distt.), Hills of H.P. (except Paonta Valley & Una Distt.) and Hills of U.P. (except Tarai area)	NHZ	26-30	Erect type, amber, semi-hard and smaller grains (1000 grains wt.-35g). Late maturing, semi-dwarf, medium bold seed. Drought tolerance, rusts resistance.
56	MACS-6145	2003	ARI, MACS, Pune	Rainfed, Timely sown condition	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	-	Medium late maturing, tall, bold seed. Loose smut resistance, drought tolerance.
57	MP- 4010	2003	JNKVV, Gwalior	Irrigated, Late sown condition	Madhya Pradesh, Gujarat, part of Rajasthan (excluding the districts of Alwar,Bharatpur & Sriganganagar) & Bund- elkhand region of UP.	CZ	40	Early maturity (108 days), amber, hard and medium grains (1000 grains wt.-40g). Terminal heat tolerance
58	NIDW-295*	2003	MPKV, ARS, Niphad	Timely sown, irrigated condition	Maharashtra, Andhra Pradesh, Karnataka, Goa & plains of Tamil Nadu	PZ	-	-

Contd.

(A) CENTRAL RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Production Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
59	NW-2036	2003	NDUA&T, Faizabad	Irrigated, Late sown condition	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	43	Intermediates growth habit, early maturity (108 days), amber, semi-hard and smaller grains (1000 grains wt.-36g). Medium early maturing, semi-dwarf, medium bold. Karnal bunt, loose smut & leaf blight resistance.
60	UP-2565*	2003	GBPUAT, Pantnagar	Late sown, irrigated condition	Maharashtra, Andhra Pradesh, Karnataka, Goa & plains of Tamil Nadu	PZ	-	-
61	VL-829	2003	VPKAS, (Almora)	Early sown , Rainfed, Low fertility condition .	Hilly regions of J & K (except Jammu & Kathua Distt.), Hills of H.P. (except Paonta Valley & Una Distt.) and Hills of U.P. (except Tarai area)	NHZ	29	Semi-spreading type, Late maturing (208 days), Amber, semi hard & bold grains (1000 grains wt.-45g). Late maturity, semi-dwarf, medium bold seed. Leaf rust & Yellow rust resistance.
62	HD 2824	2004	IARI, New Delhi	Irrigated, timely sowing	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	51-55	Medium late maturing, semi-dwarf, bold seed. Resistance to three rust & loose smut.
63	HD-2864¥	2004	IARI, New Delhi	Late sown, irrigated condition	Madhya Pradesh,Gujarat, part of Rajasthan (Kota and Udaipur Div.) and U.P. (Jhansi Div.)	CZ	41.7	Resistant to leaf & Stripe rusts, heat tolerance, high grain hardness leading to more flour recovery, good chapatti and bread making quality.
64	HI-8627¥	2004	IARI,RS, Indore	Timely sown, Rainfed/Restricted Irrigated condition	Madhya Pradesh,Gujarat, part of Rajasthan (Kota and Udaipur Div.) and U.P. (Jhansi Div.)	CZ	16.7 (Rainfed) 25.8	High degree of resistance to leaf & Stripe rusts and foot rot, bold lustrous grains with low yellow berry content, good protein, beta carotene & iron content.
65	PBW-502	2004	PAU, Ludhiana	Timely sown, irrigated condition	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P.(Paonta Valley & Una Distt.)	NWPZ	-	-
66	PBW-524¥	2004	PAU, Ludhiana	Late sown, irrigated condition	Madhya Pradesh,Gujarat, part of Rajasthan (Kota and Udaipur Div.) and U.P. (Jhansi Div.)	CZ	40.7	High degree of resistance to Stripe & leaf rusts, Karnal Bunt, better bread sore & bread loaf volume.

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(A) CENTRAL RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Production Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
67	PBW-524¥	2004	PAU, Ludhiana	Late sown, irrigated condition	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	35.8	High degree of resistance to leaf & Stripe rusts, bolder grains, best chapatti making quality.
68	PBW-527¥	2004	PAU, Ludhiana	Timely sown/Rainfed condition	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ	34.7	High degree of resistance to Stripe & leaf rusts.
69	PDW-291 (durum)¥	2004	PAU, Ludhiana	Timely sown, irrigated condition	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ	48.5	Higher level of resistance to rusts, Karnal Bunt, Loose Smut, Flag smut & Head scab diseases, better lodging resistance, high beta carotene content & low yellow berry content
70	RAJ-4037	2004	ARS, RAU, Durgapura	Timely sown, irrigated condition	Maharashtra, Andhra Pradesh, Karnataka, Goa & plains of Tamil Nadu	PZ	-	Medium early maturing, semi-dwarf, medium bold. High protein.
71	SKW-196¥	2004	SKUAST, Srinagar	Timely sown, Rainfed/Restricted Irrigated' Higher Hills condition	Hilly regions of J & K (except Jammu & Kathua Distt.), Hills of H.P. (except Paonta Valley & Una Distt.) and Uttarakhand.	NHZ	22.9	Resistant against stripe rust and field resistance against leaf rust.
72	VL-832	2004	VPKAS, Almora	Rainfed, Timely sown, Low fertility , High Altitude condition	Hilly regions of J & K (except Jammu & Kathua Distt.), Hills of H.P. (except Paonta Valley & Una Distt.) and Uttarakhand.	NHZ	-	Late maturing, semi-dwarf, bold seed. Rust resistance.
73	DBW 16^	2005	DWR, Karnal	Irrigated, late Sown condition	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ	56.4	Better resistance of leaf rust and leaf blight.
74	DDK 1025 Dicoccum^	2005	UAS, Dharwad	Irrigated, Timely sown condition	N.Karnataka, S. Maharastra. A.P, and Tamilnadu CHO digestibility and more total dietary fiber.	PZ	42.4	Medium late maturing, semi-dwarf, Medium bold seed
75	HD 2864	2005	IARI Regional Research Station, Indore.	Irrigated, late sowing	Madhya Pradesh,Gujarat, part of Rajasthan (Kota and Udaipur Div.) and U.P. (Jhansi Div.)	CZ	36-40	Medium early maturing medium tall, medium bold seed. Heat tolerance. Leaf rust resistant.

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(A) CENTRAL RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Production Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
76	HD 2888^	2005	IARI, New Delhi	Rainfed, Timely sown condition	Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region Resistance to leaf & stem rust & Leaf blight.	NEPZ	23.3	Medium late maturing, semi-dwarf, medium bold seed
77	HI 1531^	2005	IARI,RS, Indore	Timely sown, Rainfed and Restricted irrigated conditions	Madhya Pradesh,Gujarat, part of Rajasthan (Kota and Udaipur Div.) and U.P. (Jhansi Div.)	CZ	23.6	Medium late maturing, semi-dwarf, bold seed. Stem & leaf rust resistance, drought tolerance
78	HI 8627(d)	2005	IARI, RS Indore	Irrigated, timely sowing	Madhya Pradesh, Gujarat, part of Rajasthan (Kota and Udaipur Div.)	CZ	18.5	Medium late maturing, semi-dwarf, bold seed. Thermo-insensitive, pasta
79	K 9423	2005	CSAUAT, Kanpur	Rainfed, Late Sown	Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region Resistance to leaf & stem rust & Leaf blight.	NEPZ		Medium late maturing, semi-dwarf, medium mold seed. Drought tolerance.
80	NIAW 917 ^	2005	ARS, Niphad	Irrigated, Timely sown condition	Maharashtra, Andhra Pradesh, Karnataka, Goa & plains of Tamil Nadu	PZ	45.3	
81	PBW 533^	2005	PAU, Ludhiana	Irrigated, Late sown condition	Maharashtra, Andhra Pradesh, Karnataka, Goa & plains of Tamil Nadu	PZ	40.4	Suitable for bread and buiscut
82	AKDW 2997-16(d)	2006	PDKV, Akola	Rainfed, timely sowing	N.Karnataka, S. Maharastra. A.P, and Tamilnadu	PZ	11.58	Medium late maturing, medium dwarf, medium bold Seed. Good pasta quality
83	GW-366<	2006	JAU, Junagarh	Irrigated, Timely sown condition	Madhya Pradesh,Gujarat, part of Rajasthan (Kota and Udaipur Div.) and U.P. (Jhansi Div.)	CZ	51.7	

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(A) CENTRAL RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Production Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
84	HD 2833	2006	IARI Regional Research Station, New Delhi	Irrigated,Late sown	N.Karnataka, S. Maharastra. A.P, and Tamilnadu	PZ	26-30	Medium late maturing, semi-dwarf, bold seed. Late heat tolerance.Resistance to Yellow,black,Brown rust.
85	K0307<	2006	CSAUAT, Kanpur	Timely sown High fertility condition	Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region	NEPZ	45.6	Medium late maturing, Semi-dwarf, bold seeded. Heat tolerance
86	PBW 533	2006	PAU, Ludhiana	Irrigated, late sowing		PZ		Late sown, Medium fertility, Irrigated & restricted irrigation condition.
87	TL- 2942<	2006	PAU, Ludhiana	Rainfed, timely Sown condition	Hilly regions of J & K (except Jammu & Kathua Distt.), Hills of H.P. (except Paonta Valley & Una Distt.) and Uttarakhand.	NHZ	26.1	
88	DBW 17<	2007	DWR, Karnal	Irrigated, Timely sown condition	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ	49.03	
89	DDK-1029<	2007	UAS, Dharwad	Irrigated, Timely sown condition	N.Karnataka, S. Maharastra. A.P, and Tamilnadu	PZ	42.7	
90	HI 1544	2007	IARI, RS Indore	Irrigated, late sowing	Madhya Pradesh, Gujarat, part of Rajasthan (Kota and Udaipur Div.)	CZ	47.7	Medium late early maturing, semi-dwarf, bold seed. Drought tolerance
91	HI 8498(d)	2007	IARI, RS Indore	Irrigated, timely sowing	Madhya Pradesh, Gujarat, part of Rajasthan (Kota and Udaipur Div.)	CZ	46-50	Medium late maturing, semi-dwarf, bold seed. Leaf & stem rust resistance, pasta.

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(A) CENTRAL RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Production Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
92	Raj 4083	2007	ARS, Durgapur, Jaipur	Irrigated Late sowing	N.Karnataka, S. Maharastra. A.P, and Tamilnadu	PZ	41.5	Medium early maturing, semi-dwarf, medium bold seed. Terminal heat tolerance.
93	WH-1021	2007	CCS HAU, Hissar	Late sown, Medium fertility Irrigated condition	Punjab, Haryana, Rajasthan (excluding kota & udaipur), Western Uttar Pradesh, Tarai of Uttarakhand and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ	39.0to 62.5 Q/Ha	Medium early maturing, Semi-dwarf, medium bold seed. High hectoliter weight Leaf & yellow rust resistance.
94	HD 2932	2008	IARI Regional Research Station, Indore.	Irrigated, late sowing	Central (MP, Chhatishgarh, Gujrat, Kota & Udaipur divisions of Rajasthan) and Penninsular (Maharastra and Karnataka) zones	CZ & PZ	CZ-41.7 q/ha and PZ-43.3q/ha	Suitable for late sown conditions. Average seed yield is CZ – 41.7 q/ha, PZ - 43.3 q/ha Adult plant resistance against brown and yellow rust, High zinc content Wider adaptability
95	HI- 8663(d)	2008	IARI, RS Indore	Timely sown, High fertility irrigated condition	Maharashtra and Karnataka	PZ	45.4 to 71.5 Q/Ha	Medium late maturing, semi-dwarf, bold seed. Good pasta quality
96	HI-1544	2008	IARI,RS, Indore	Timely sown, High fertility irrigated condition	Madhya Pradesh, Gujarat, part of Rajasthan (Kota and Udaipur Div.)	CZ	47.7 to 62.4 Q/Ha	
97	HPW-251	2008	CSKHPKVV, Palampur	Early sown, Low fertility Rainfed condition	Hills of H.P. and Uttarkhand	NHZ	34-4 to 57.1 Q/Ha	Late maturing, semi-dwarf, bold seed. Good chapati quality.
98	PBW 527	2008	PAU, Ludhiana	Rainfed, timely sowing	Punjab, Haryana, Rajasthan (excluding kota & udaipur), Western Uttar Pradesh, Tarai of Uttarakhand and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ		Medium late maturing, semi-dwarf, medium bold. Karnal bunt resistance, drought tolerance.
99	PBW-550	2008	PAU, Ludhiana	Timely sown, High fertility irrigated condition	Punjab, Haryana, Delhi, Rajasthan (excluding kota & udaipur), Western Uttar Pradesh, Tarai of Uttarakhand and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ	47.7 to 62.4 Q/Ha	

Contd.

(A) CENTRAL RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Production Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
100	VL-892	2008	VPKAS, Almora	Late sown, Medium fertility restricted irrigation condition	Hills of H.P. and Uttarkhand	NHZ	37.6 to 59.0 Q/Ha	Medium maturing, semi-dwarf, medium bold seed. Leaf rust, yellow rust, loose smut & hill bunt resistance
101	AKAW 3722	2008	PDKV, Akola	Rainfed, timely sowing	N.Karnataka, S. Maharastra. A.P, and Tamilnadu	PZ		Medium late maturing, medium dwarf, medium bold seed. Leaf & stem rust resistance
102	HS – 490	2008	IARI, RRS , SHIMLA	Late sown restricted irrigation	Hilly regions of J & K (except Jammu & Kathua Distt.), Hills of H.P. (except Paonta Valley & Una Distt.) and Uttarakhand.	NHZ	31	
103	MACS 2971(dic)	2008	Agakar Research Institute, Pune	Irrigated, Timely sown condition	N.Karnataka, S. Maharastra. A.P, and Tamilnadu Madhya Pradesh,Gujarat, part of Rajasthan (Kota and Udaipur Div.) and U.P. (Jhansi Div.)	PZ & CZ	46.5	Medium early maturing, semi-dwarf, bold seed. Good chapati quality, pasta, semolina
104	PBW 550	2008	PAU, Ludhiana	Irrigated, late sowing,	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ		Medium early maturing, semi-dwarf, medium bold seed. Good chapati & bread quality.
105	PBW 590	2008	PAU, Ludhiana	Irrigated, late sowing	Punjab, Haryana, Rajasthan (excluding kota & udaipur), Western Uttar Pradesh, Tarai of Uttarakhand and parts of H.P. (Paonta Valley Una Distt.)	NWPZ	37	Medium early maturing, semi-dwarf. Leaf & yellow rust, flag smut resistance.
106	PBW 596	2008	PAU, Ludhiana	Rainfed, timely sowing	N.Karnataka, S. Maharastra. A.P, and Tamilnadu	PZ	37	Medium early maturing, semi-dwarf, Leaf rust resistance.
107	UAS – 415 (D)	2008	UAS, Dharwad	Irrigated, Timely sown condition	N.Karnataka, S. Maharastra. A.P, and Tamilnadu	PZ	49.6	
108	RAJ - 4120	2009	ARS, Durgapur, Jaipur	Timely sown Irrigated condition	Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region	NEPZ	47.5	Medium late maturing, bold seed. Heat tolerance, Stem rust resistance

Contd.

(A) CENTRAL RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Production Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
109	CBW 38	2009	DWR, Karnal	Irrigated, timely sowing	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	44.4	Medium late maturing, medium bold Seed. Rust resistance
110	HS 490	2009	IARI, RRS , SHIMLA	Restricted irrigated, late sowing	Hilly regions of J & K (except Jammu & Kathua Distt.), Hills of H.P. (except Paonta Valley & Una Distt.) and Uttarakhand.	NHZ	31	Medium late maturing. Good biscuit quality
111	MP 1203	2009	JNKVV, Gwalior	Irrigated late sowing	Madhya Pradesh,Gujarat, part of Rajasthan (Kota and Udaipur Div.) and U.P. (Jhansi Div.)	CZ	41.2	Medium early maturing, semi-dwarf. Terminal heat tolerance.
112	MPO 1215(d)	2009	JNKVV,Powerkheda	Irrigated, timely sowing	Madhya Pradesh,Gujarat, part of Rajasthan (Kota and Udaipur Div.) and U.P. (Jhansi Div.)	CZ	47.8	Medium late maturing, semi-dwarf. Terminal heat tolerance, pasta.
113	HD 2967	2009	IARI Regional Research Station, Indore.	Irrigated, timely sowing	NEPZ States and NWPZ States	NEPZ & NWPZ		Medium late maturing, bold seeded. Rust resistance.
114	DBW 39	2010	DWR, Karnal	Irrigated, timely sowing	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	44.1	Medium late maturing, semi-dwarf, bold seed. Leaf rust, foot rot & flag smut resistance.
115	MACS 6222	2010	ARI, MACS, Pune	Irrigated, timely sowing	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ		Medium early maturing, semi-dwarf, bold seed. Leaf & yellow rust resistance.

Contd.

(A) CENTRAL RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Production Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
116	PDW 314(D)	2010	PAU, Ludhiana	Timely sown irrigated condition	Punjab, Haryana, Rajasthan (excluding kota & udaipur), Western Uttar Pradesh, Tarai of Uttarakhand and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ	5030 kg//ha	Medium late maturing, semi-dwarf. Karnal bunt resistant.
117	VL_907	2010	VPKAS, Almora	Timely sown, Rainfed/Restricted Irrigated'	Hilly regions of J & K (except Jammu & Kathua Distt.), Hills of H.P. (except Paonta Valley & Una Distt.) and Uttarakhand.	NHZ	4430 kg/ha - at IR , 2790 kg/ha at RF	Medium late maturing, Semi-dwarf, medium bold seed. Fe, Cu, Zn Rich.
118	HD 2987	2011	IARI Regional Research Station, Indore.	Rainfed & restricted irrigated, timely sowing	N.Karnataka, S. Maharastra. A.P, and Tamilnadu	PZ	20-22(rainfed), 30-32(irrigated)	Medium late maturing. Drought tolerance.
119	HS 507(Pusa Suketi)	2011	IARI, RRS , SHIMLA	Timely sown, Irrigated'	Hilly regions of J & K (except Jammu & Kathua Distt.), Hills of H.P. (except Paonta Valley & Una Distt.) and Uttarakhand.	NHZ	46-47	Medium late maturing, semi-dwarf. Leaf blight, Karnal bunt and rust resistance.
120	WHD 943 (D)	2011	CCS HAU, Hissar	Timely sown, irrigated condition	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ	4820 kg/ha	Medium late maturing, semi-dwarf, bold seed. Good pasta quality.
121	DPW 621-50	2011	DWR, Karnal	Irrigated, timely sowing	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ		Medium late maturing, semi-dwarf, medium bold seed. Leaf & yellow rust resistance
122	HD 2985	2011	IARI Regional Research Station, Indore.	Irrigated, late sowing	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ		Medium early maturing. Heat tolerance.

Contd.

(A) CENTRAL RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Production Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
123	MP 3288	2011	JNKVV, Gwalior	Rainfed, timely sowing	Madhya Pradesh,Gujarat, part of Rajasthan (Kota and Udaipur Div.) and U.P. (Jhansi Div.)	CZ		Medium late maturing. Good chapati & bread quality
124	NIAW 1415	2011	ARS, Niphad	Irrigated, timely sowing	N.Karnataka, S. Maharastra. A.P, and Tamilnadu	PZ		Medium late maturing, semi-dwarf, medium bold. Chapati quality with >13% Protein.
125	WH 1080	2011	CCS HAU, Hissar	Rainfed/restricted irrigated, timely sowing	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ		Semi-dwarf, medium late, medium bold seed Rust resistance, drought tolerance
126	HD 3043	2012	IARI Regional Research Station, Indore.	Rainfed & restricted irrigated, late sowing	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	42.8	Medium late maturing, semi-dwarf, bold seed. Drought tolerance & resistance to leaf & yellow rust.
127	KRL 210	2012	CSSRI,Karnal	Irrigated, timely sowing	NEPZ States and NWPZ States	NEPZ & NWPZ		Medium late maturing, semi-dwarf, bold seed. Salinity/alkalinity tolerance.
128	KRL 213	2012	CSSRI,Karnal	Irrigated, timely sowing	NEPZ States and NWPZ States	NEPZ & NWPZ		Medium late maturing, semi-dwarf, bold seed. Salinity/alkalinity tolerance.
129	AKAW 4627	2012	PDKV, Akola	Irrigated, late sowing	N.Karnataka, S. Maharastra. A.P, and Tamilnadu	PZ	36-40	Early maturing, medium dwarf, medium bold Seed. Drought tolerance
130	HPW 349	2012	CSKHPKVV, Palampur	Irrigated/rainfed, timely sowing	Hilly regions of J & K (except Jammu & Kathua Distt.), Hills of H.P. (except Paonta Valley & Una Distt.) and Uttarakhand.	NHZ		Late maturing. Drought tolerance, rusts resistance.

Contd.

(A) CENTRAL RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Production Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
131	PBW 644	2012	PAU, Ludhiana	Rainfed/restricted irrigated, timely sowing	Punjab, Haryana, Rajasthan (excluding kota & udaipur), Western Uttar Pradesh, Tarai of Uttarakhand and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ		Medium late maturing, semi-dwarf, bold seed. Stem rust & leaf rust resistance.
132	UAS 428	2012	UAS, Dharwad	Irrigated, timely sowing		PZ		Medium late maturing, semi-dwarf, bold seed. Karnal bunt resistance.
133	HD 3059	2013	IARI, New Delhi	Irrigated, late sowing	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ		Medium early maturing, medium bold seed. Leaf & yellow rust resistance.
134	HI 8713(d)	2013	IARI, RS Indore	Irrigated, timely sowing	Madhya Pradesh, Gujarat, part of Rajasthan (Kota and Udaipur Div.)	CZ		Medium late maturing, semi-dwarf, bold seed. Rust resistance, High yellow pigment make it suitable for making pasta products.
135	HW 5216	2013	IARI, RRS , Willington	Irrigated, timely sowing	Nilgiris, Tamil Nadu, High altitude all situations	SHZ		Medium early maturing, semi-dwarf, medium bold. Black & brown Rust resistance.
136	WH 1105	2013	CCS HAU, Hissar	Irrigated, timely sowing	Punjab, Haryana, Delhi, Rajasthan, Western Uttar Pradesh, parts of J & K (Jammu & Kathua Distt.) and parts of H.P. (Paonta Valley & Una Distt.)	NWPZ		Medium late, Semi-dwarf, medium bold seed. Rust resistance. Early maturing with higher yiel , Stripe rust resistance.

Contd.

Varieties Identified during 53rd All India Wheat Research worlker's Meet at Jabalpur (23rd August, 2014)

(A) CENTRAL RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Production Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
1	DBW-107	2014	DWR , Karnal	Irrigated, Late Sown	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	41.3	Tolerant to heat stress,higher disease resistant.
2	HP3118	2014	IARI, New Delhi	Late Sown, Irrigated Condition	Area stretching from Eastern UP onwards upto the Far eastern states viz., Bihar, Orissa, West Bengal, Assam & Plains of NE region.	NEPZ	41.71	Resistance to Strip and leaf rust.
3	HI 8737(d)	2014	IARI,RS Indore(MP)	Highly fertile,Timely Sown, Irrigated Condition	Madhya Pradesh,Gujarat, part of Rajasthan (Kota and Udaipur Div.) and U.P. (Jhansi Div.)	CZ	53.4	Resistance to Karnal Bunt.
4	DBW-110	2014	DWR,Karnal	Timely Sown, Restricted Irrigated Condition	Madhya Pradesh,Gujarat, part of Rajasthan (Kota and Udaipur Div.) and U.P. (Jhansi Div.)	CZ	39	Resistance to Brown and Black rust.
5	UAS-446	2014	ARS,UAS,Dharwad	Restricted Irrigated Condition	Karnataka, Maharastra. A.P, and Tamilnadu	PZ	18.3	
6	UAS-347	2014	ARS,UAS,Dharwad	Rainfed Condition	Karnataka, Maharastra. A.P, and Tamilnadu	PZ	18.4	

Contd.

(B) STATE RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Production Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
1.	Parbhani – 51	1996	MKV, Parbhani	Timely sown, irrigated condition,	Maharashtra State.	PZ	-	Heat tolerant variety
2.	PDW – 233 (*durum*)	1997	PAU, Ludhiana	Timely sown, irrigated condition	Punjab State	NWPZ	47	-
3.	MACS-2694 (*durum*)	1997	Agharkar Research Institute, Pune	Timely sown, irrigated condition	Maharashtra State	PZ	-	-
4.	TL-1210 (Triticale)	1997	PAU, Ludhiana	Timely sown irrigated condition	Punjab	NWPZ	-	-
5.	NIAW-34	1997	MPKV, Niphad	Late sown, irrigated condition	Maharashtra State	PZ	36	-
6.	PBW-373	1997	PAU, Ludhiana	Late sown, irrigated condition	Punjab	NWPZ	42	High yielding and disease resistant variety possessing late heat tolerance.
7.	DWR-185 (*durum*)	1998	UAS, Dharwad	Timely sown, irrigated condition	Karnataka	PZ	43	-
8.	Sonak	1998	CCSHAU, Hissar	Late sown, very late sown, irrigated condition	Haryana	NWPZ	-	-

Contd.

(B) STATE RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
9.	Surbhi (HPW-89)	1998	HPKVV, Palampur	Timely sown, rainfed condition	Himachal Pradesh	NHZ	-	-
10.	Ujiar (K-9006)	1998	CSUAT, Kanpur	Timely sown, irrigated condition	Uttar Pradesh-East	NEPZ	45-50	Amber, semi-hard grains with good chapati making quality, 1000 grain wt.-38g, resistant to different rusts, tolerant to karnal bunt.
11.	UP-2382	1999	GBPUAT, Pantnagar	Late sown, irrigated condition	UP state excluding hills.	NWPZ	-	-
12.	HI-1454 (Abha)	2000	IARI, Regional Station, Indore	Late sown, irrigated condition	Madhya Pradesh	CZ		Plants waxy, brown chaff and double dwarf in height. Stable high yield with good grain traits.
13.	HI-1418 (Naveen Chandausi)	2000	IARI, Regional Station, Indore	Late sown, irrigated condition	Madhya Pradesh	CZ		Medium early in maturity. Ears white and glabrous. Grains medium bold, amber and lustrous. Good for chapati making.
14.	Gangotri (K-9162)	2001	CSUAT, Kanpur	Late sown, irrigated condition	Uttar Pradesh	NEPZ	35-40	Early maturity (100 days), Amber, semi-hard & bold grains, 1000 grain wt.-43, good chapati making quality, high degree of tolerance to brown & yellow rusts, high degree of heat tolerance.
15.	Prasad (K-8434)	2001	CSUAT, Kanpur	Timely sown, irrigated condition under saline/alkaline soil	Uttar Pradesh	NEPZ	35-40	Early maturity (115 days), amber, semi-hard grains, 1000 grains wt.-42g, excellent bread/chapati making quality. Resistant to all 3 rusts, tolerant to leaf blight, karnal bunt , smut and high temperature. Protein content 12-13% with optimum lysine content.

Contd.

(B) STATE RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
16.	Halna (K-7903)	2001	CSUAT, Kanpur	Late / very late sown, irrigated condition	Uttar Pradesh	NEPZ	Late sown-35-40 Very Late Sown-25-30	Slightly suitable for saline/alkaline soils, amber, semi-hard grains, 1000 grains wt.-38g. Resistant to all 3 rusts, tolerant to leaf blight, karnal bunt , tolerant to high temperature. Protein content -13% with optimum lysine content.
17.	NIAW-301	2002	MPKV, Niphad	Timely sown, irrigated condition	Maharashtra State	PZ	43	White ears at maturity, 1000 grain wt. (43g), amber, medium hard grains
18.	WH-711	2002	CCSHAU, Hissar	Timely sown, irrigated condition	Haryana	NWPZ	59	Late maturity (145 days), Amber, hard grains, 1000 grain wt. (43g)
19.	WH-912	2002	CCSHAU, Hissar	Timely sown, irrigated condition	Haryana	NWPZ	55	Amber, hard and bold grains(1000 grain wt. 46g), long awns, late maturity (145 days),
20.	Naina (K-9533)	2002	CSUAT, Kanpur	Late sown, irrigated condition	Uttar Pradesh	NEPZ	40-45	Amber, semi-hard grains, 1000 grains wt.-39g. Resistant to all 3 rusts, tolerant to smut, leaf blight & karnal bunt, tolerant to high temperature. Protein content 12.5-13% with good lysine content.
21.	Raj- 3777	2003	RAU, Durgapura, Jaipur	Late sown, irrigated condition	Rajasthan State	-	-	-
22.	VL-802	2003	VPKAS, Almora	Timely sown, irrigated/ Rainfed condition	Uttarakhand hills	NHZ	-	-
23.	PDW – 274 (*durum*)	2003	PAU, Ludhiana	-	Punjab State	NWPZ	-	-

Contd.

(B) STATE RELEASE VARIETIES

Sl. No	Cultivar	Year of release/ Notification	Originating Breeding Institute	Recommended for			Av. Yield under optimum conditions (Qlts.ha.)	Special Features
				Conditions	States/Area/Region	Agro-climatic Zone		
1	2	3	4	5	6	7	8	9
24.	MACS-3125 (*durum*)	2003	Agharkar Research Institute, Pune	Timely sown, irrigated condition	Maharashtra State	PZ	45	Early maturity (115 days), yellow ears at maturity, amber, hard & bold grains(1000 grains wt.-46),
25.	MPO-1106 (durum) Sudha	2003	JNKVV, ZARS, Powarkheda,	Timely sown, irrigated condition	Madhya Pradesh	CZ	-	Early maturity (113 days), broad leaves, white, medium & dense ears, long awns. Amber, lustrous, bold & very attractive grains (1000 grains wt.-50g).
26.	HI-1479 (Swarna)	2003	IARI, Regional Station, Indore	Timely sown, irrigated condition	Madhya Pradesh	CZ	-	Combines early maturity and high yield with rust resistance. Ears are white and glabrous. Long, bold & amber grains having good chapati traits.

State-wise Seed Replacement Rate (SRR) of Wheat crop

Annexure VI

YEAR	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Gujarat	20	19.5	22.1	25.4	27.4	24.8	23.9	25.7	26	25.7	26.5
Maharashtra	25	29	41	41	41	41	42	42	43.8	39.6	45.9
Rajasthan	11.2	21.8	14.5	15.9	19.4	19.1	26	32.6	30.6	25.5	30.5
M.P.	5.6	6.5	6.3	8.8	15.1	13.1	18.4	18.5	14.5	21.4	30.3
U.P.	15.3	16.4	17	19	21.4	24.1	26.8	32.4	39.6	41.6	40.9
Haryana	17.9	18	20.2	21	21.8	23.3	24	26	34.1	33.7	33.8
Punjab	7	7	7	10	11	13	19	26	35.4	37.2	38.8
H.P.	16.7	17.9	14	14	14	13.7	14	31	30.6	31.7	26.9
J&K	10	10.9	8.6	9.4	10.7	10.7	12.4	10.8	19.6	29.8	26.1
Odisha	40.4	40.1	34.2	19.6	20.9	17.4	24.8	28.4	41.8	30	39
W.B	30	32	34	35	36	37	38	38.5	39.5	41	43.4
Bihar	8.4	8.7	8.7	10	11	11	15	24	25.6	29.2	34.8
All India	13	13	13	16.5	17.6	21.8	25.2	26.8	31.9	32.6	32.6

Source:Seed Division, DAC, GOI.

STATE-WISE REQUIREMENT AND AVAILABILITY OF CERTIFIED SEEDS OF RECOMMENDED WHEAT VARIETIES

Annexure VII

State	Variety	Requirement (Qtls)	Availability (Qtls.)
BIHAR	DBW 16	9000	9170
	DBW 17	69000	59144
	HD 2733	16000	16152
	HD 3043	4000	4109
	HD 2428	2000	2835
	HD 2833	4000	4224
	Raj 3077	200	900
	Raj 3765	300	1078
	Raj 4120	5000	4298
	Shatabdi (K 0307)	27000	27086
	UP 2338	12000	12000
	UP 2382	500	2300
	UP 2425	500	3564
	UP 2526	1000	4850
	UP 2565	3000	6618
	UP 2572	2000	5350
	WH 711	5000	51303
	WR 544	500	1863
	Others	584000	
Total Bihar		745000	216844

CHHATTISGARH	Amar (HW 2004)	843	245
	DL 803	2000	9700
	Gujarat Wheat 496	125	1264
	GW 173	133	43
	GW 273	3000	30110
	GW 322	2370	1068
	GW 366	2176	3549
	Harshita	100	196
	HD 2894	105	246
	HD 2851	330	737
	HI 1418	80	274
	HI 1454	245	0
	HI 8627	250	336
	HW 273	112	0
	JW 3288	40	49
	K 9107	12	0
	Lok-1	6000	10981

Contd.

	Variety	Requirement (Qtls)	Availability (Qtls.)
CHHATTISGARH	Malav Shakti	1395	906
	MP 4010	2200	4353
	Mukta	50	0
	Narendra Wheat 1012	20	424
	PBW 343	930	283
	PBW 373	170	50
	Purna	658	756
	Pusa Prachi	479	0
	Pusa Wheat 111	176	1485
	Ratan	212	8
	Urja	1700	1588
	Vidisha	4485	8672
	WH 1025	179	52
	WH 147	3425	6308
Total Chhattisgarh		34000	83683

GUJARAT	GW 503	750	750
	GW 504	50	450
	GW 1139	100	100
	GW 173	17650	17650
	GW 190	50	55
	GW 273	10500	10741
	GW 274	6000	7000
	GW 322	2860	2860
	GW 323	11140	11500
	GW 366	2870	2870
	GW 367	330	500
	HD 2189	3000	3000
	HD 2190	200	200
	Tapovan	100	100
	Others	390400	
Total Gujarat		446000	57776

HARYANA	DBW 17	250000	240938
	DPW 621-50	1000	583
	HD 2894	55000	56573
	HD 2733	1000	1399
	HD 2851	200000	218237

Contd.

	Variety	Requirement (Qtls)	Availability (Qtls.)
HARYANA	PBW 373	35000	36314
	PBW 502	60000	66387
	PBW 509	5000	3238
	PBW 550	13000	14530
	PBW 590	1000	765
	Raj 3077	12000	12160
	Raj 3765	35000	35752
	UP 2338	5000	5260
	WH 711	119000	144804
	WH 1021	5000	4072
	WH 147	30000	3835
	WH 542	5000	4834
Total Haryana		832000	849681

HIMACHAL PRADESH	DBW 17	8000	
	DPW 621-50	5000	
	HD 2967	5000	
	HPW 155	12500	12500
	HPW 211	15000	15000
	HPW 236	9000	9000
	PBW 644	1000	
	Raj 3777	10500	8500
	VL 829	8700	8700
	WH 1080	2000	
	Others	40300	
Total Himachal Pradesh		117000	53700

JAMMU&KASHMIR	DBW 16	1190	1190
	HS 240	3550	3550
	HS 295	880	880
	HS 365	100	0
	HS 420	100	100
	PBW 154	3000	3000
	PBW 175	6630	6630
	PBW 373	800	800
	PBW 396	840	840
	PBW 502	1000	1000
	PBW 509	1000	1000

Contd.

	Variety	Requirement (Qtls)	Availability (Qtls.)
JAMMU&KASHMIR	PBW 550	5150	7850
	PBW 590	1120	1120
	Raj 3077	18380	18380
	Raj 3765	15360	15360
	SKW 196	2500	2500
	VL 804	200	200
	VL 892	500	500
	WH 1021	1000	1000
	Others	33700	
Total Jammu & Kashmir		97000	65900

JHARKHAND	DBW 17	31050	43200
	HD 2643	2000	1500
	HD 2733	4510	4510
	HUW 234	4000	4000
	K 9107	5244	2980
	HD 2824	2345	2225
	HD 2888	1500	1500
	Shatabdi (K 0307)	5351	4962
	DL 788-2	1000	700
Total Jharkhand		57000	65577

MADHYA PRADESH	Amar (HW 2004)	13571	584
	Amrita (HI 1500)	21012	5426
	GW 496	600	3536
	GW 173	10170	248
	GW 273	81373	29125
	GW 322	301730	190854
	GW 366	108943	102123
	Harshita	8400	7240
	HD 2733	795	2140
	HD 2189	1500	9814
	HD 2864	6703	3301
	HI 1077	515	0
	HI 1418	14896	4009
	HI 1454	4520	0
	JW 3020	10083	8384
	HI 8498	5989	0

Contd.

	Variety	Requirement (Qtls)	Availability (Qtls.)
MADHYA PRADESH	HD 4672	6220	151
	HI 8381	5989	0
	HUW 510	1108	0
	MP 1202	3787	5703
	MP (JW) 3173	6246	3151
	MP 1142	2324	0
	MP 1203	1525	2134
	MP 3011	22528	11625
	MP 4010	23210	18011
	PBW 343	2625	1254
	PBW 373	600	98
	PBW 550	150	3100
	HI 8663	1773	11431
	HI 1544	21748	79825
	HD 2932	3894	747
	Raj 3777	5140	253
	Raj 3765	2000	5510
	Raj 6560	1930	2604
	Shudha	9735	3761
	Sujata	18535	1635
	Swapnil	3310	1290
	Swarna	2250	1170
	Vidisha	2754	556
	WR 544	1482	0
	Others	1169337	
Total Madhya Pradesh		1911000	520793

MAHARASHTRA	GW 496	62500	62365
	HD 2189	41000	41420
	Lok-54	1000	1270
	MACS 6222	800	850
	MACS 2496	750	658
	MACS 3125	5500	5635
	HI 8498	1000	1113
	NIAW 301	4500	4695
	NIDW-15	200	155
	HI 8663	500	490
	HI 1544	3500	3495

Contd.

	Variety	Requirement (Qtls)	Availability (Qtls.)
MAHARASHTRA	Raj 3077	500	500
	Tapovan	2500	145
	WH 147	500	500
	Ohters	237250	
Total Maharashtra		362000	123291

PUNJAB	DBW 17	80000	91572
	DPW 621-50	200000	215848
	HD 2733	40000	59832
	HD 2967	200000	201312
	PBW 343	70000	76373
	PBW 373	20000	22761
	PBW 502	100000	105040
	PBW 550	300000	366014
	PBW 590	25000	27937
	HD 2932	6000	7945
	WH 542	40000	47884
	WL 711	10000	13800
	Others	64000	
Total Punjab		1155000	1236318

RAJASTHAN	DBW 17	5000	5233
	GW 173	3000	3759
	GW 273	5000	9667
	GW 366	2000	2752
	HD 2329	3000	5906
	HD 2851	15000	16947
	HI 8498	5000	5531
	PBW 343	34000	48545
	PBW 373	1000	1472
	PBW 502	35000	36131
	PBW 550	20000	22864
	HD 2932	100	1021
	Raj 3777	1000	1069
	Raj 3765	75000	80058
	Raj 4037	370000	396551
	Raj 4120	4000	4025
	Raj 6560	2000	2502

Contd.

	Variety	Requirement (Qtls)	Availability (Qtls.)
RAJASTHAN	WH 711	30000	42280
	WH 147	15000	15831
	Others	391900	
Total Rajasthan		1017000	702144

UTTAR PRADESH	CBW 38	30000	31455
	DBW 16	30000	38078
	DBW 14	20000	21257
	DWB 17	120000	206846
	K 9162	80000	81809
	GW 273	20000	20243
	K 7903	80000	78487
	HD 2733	80000	86555
	HD 2851	20000	20865
	HD 2864	30000	25410
	HUW 234	80000	89023
	K 9423	50000	32190
	KRL 19	40000	40140
	HUW 510	25000	26175
	HUW 468	20000	25763
	Narendra Wheat 2036	20000	21738
	Narendra Wheat 1012	20000	20692
	Narendra Wheat 1014	20000	21584
	PBW 154	80000	191240
	PBW 226	5000	5147
	PBW 343	100000	368916
	PBW 373	120000	192822
	PBW 396	80000	80954
	PBW 443	343000	270517
	PBW 502	355000	506019
	PBW 509	80000	820001
	PBW 533	60000	50263
	PBW 550	300000	425253
	PBW 590	140000	151340
	Raj 3777	20000	22118
	Raj 3077	20000	20225
	Raj 3765	80000	80560
	Shatabdi (K 0307)	100000	66887

Contd.

	Variety	Requirement (Qtls)	Availability (Qtls.)
UTTAR PRADESH	UP 2338	80000	99066
	UP 2382	50000	45486
	UP 2425	20000	23290
	UP 2565	20000	24556
	VL 892	20000	24382
	WH 711	275000	406766
	WH 1025	20000	20314
	WH 147	60000	21732
	WH 416	20000	20200
	WH 542	20000	22625
Total Uttar Pradesh		3253000	4848989

UTTARAKHAND	DBW 17	6000	10000
	HS 365	4200	1150
	PBW 343	2200	16000
	PBW 373	2300	13238
	PBW 502	2000	11675
	PBW 550	4500	6550
	HD 2687	1700	1302
	UP 1109	1500	106
	UP 2338	2200	8100
	UP 2425	2700	1315
	UP 2526	3700	3814
	UP 2572	4640	4602
	VL 829	4700	1465
	VL 738	6200	824
	VL 804	3900	53
	VL 802	2700	768
	VL 832	3400	552
	VL 892	4500	1921
	Others	51960	
Total Uttarakhand		115000	83435

WEST BENGAL	DBW 14	5500	5500
	DBW 15	2000	2000
	K 9107	10500	14500
	K 9108	5500	5500
	HUW 468	9500	9500

Contd.

	Variety	Requirement (Qtls)	Availability (Qtls.)
WEST BENGAL	Narendra Wheat 2036	6000	6000
	Narendra Wheat 2037	1500	1500
	Narendra Wheat 1012	5500	5500
	Narendra Wheat 1013	500	500
	PBW 343	10000	12615
	PBW 344	5000	4000
	PBW 443	4500	4500
	PBW 444	1000	1000
	HD 2824	10500	12500
	HD 2888	10500	13500
	Shatabdi (K 0307)	10500	10500
	Sonali	9500	13710
	Sonalika	3000	6000
Total West Bengal		111000	128825

Others States	Others States	Others States	Others States
	UP 262	1466	0
	Sonalika	5821	500
	PBW 373	10000	10000
	PBW 343	8536	8536
	MACS 6222	2500	3050
	Lok-2	51	4646
	Lok-1	11975	4458
	HD 2190	55	55
	HD 2189	630	660
	DWR 196	815	815
	DWR 195	2840	1548
	DWR 186	95	95
	DWR 185	1920	2025
	DWR 163	1025	1025
	DWR 162	16771	22084
	DBW 40	50	50
	DBW 39	450	600
Total Others		65000	60147
Grand Total		10317000	9097103

Source: DWR, Karnal.

State-wise Total Seed Requirement vis-a-vis Certified seed production targets by various seed agencies

Annexure VIII

State	Crop Area (lakh ha)	Total seed reqmt (Lakh Qtls.)			Qnty of seed to be produced (Lakh Qtls.) by (based on 33%SRR)			
		100%SRR	25%SRR	33%SRR	NSC/SFCI (40%)	SSC/SDA (40%)	Pvt agencies (20%)	Total
Bihar	22.57	22.57	5.64	7.45	2.98	2.98	1.49	7.45
Chattisgarh	1.02	1.02	0.26	0.34	0.13	0.13	0.07	0.34
Gujarat	13.51	13.51	3.38	4.46	1.78	1.78	0.89	4.46
Haryana	25.22	25.22	6.31	8.32	3.33	3.33	1.66	8.32
HP	3.56	3.56	0.89	1.17	0.47	0.47	0.23	1.17
Jharkhand	1.73	1.73	0.43	0.57	0.23	0.23	0.11	0.57
J&K	2.94	2.94	0.74	0.97	0.39	0.39	0.19	0.97
Karnataka	1.98	1.98	0.50	0.65	0.26	0.26	0.13	0.65
Maharashtra	10.97	10.97	2.74	3.62	1.45	1.45	0.72	3.62
MP	57.92	57.92	14.48	19.11	7.65	7.65	3.82	19.11
Punjab	35.00	35.00	8.75	11.55	4.62	4.62	2.31	11.55
Rajasthan	30.81	30.81	7.70	10.17	4.07	4.07	2.03	10.17
UP	98.58	98.58	24.65	32.53	13.01	13.01	6.51	32.53
Uttarakhand	3.48	3.48	0.87	1.15	0.46	0.46	0.23	1.15
WB	3.35	3.35	0.84	1.11	0.44	0.44	0.22	1.11
Total	**312.64**	**312.64**	**78.16**	**103.17**	**41.27**	**41.27**	**20.63**	**103.17**

Source: Seed Division, DAC, GOI.

Variety-wise and State-wise Normal Seed Requirement of Wheat in major Wheat growing States and other States

Annexure IX

Sl. No.	Variety	Normal seed reqmt(lakh qtls)															With	With
		Bihar	C'garh	Gujarat	Haryana	Jharkhand	J&K	MP	Maharashtra	Punjab	Rajasthan	UP	Uttarakhand	WB	Others	Total	25%SRR	33% SRR
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*
1	**PBW 343**	10.79	0.00	0.00	9.25	0.00	0.00	0.10	0.00	1.46	1.37	8.55	0.00	0.00	0.00	31.52	**7.88**	**10.40**
2	**PBW 550**	1.99	0.00	0.00	1.30	0.00	0.00	0.10	0.00	7.11	0.40	10.53	0.00	0.00	0.00	21.43	**5.36**	**7.07**
3	**HD 2967**	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	7.48	0.00	1.15	0.00	0.00	0.00	8.88	**2.22**	**2.93**
4	**LOK 1**	0.21	0.00	1.03	0.00	0.00	0.00	9.38	2.12	0.00	2.25	0.21	0.00	0.00	0.00	15.20	**3.80**	**5.02**
5	**PBW 502**	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	3.80	0.11	6.81	0.00	0.00	0.00	10.83	**2.71**	**3.57**
6	**GW 322**	0.00	0.10	0.11	0.00	0.00	0.00	9.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.15	**2.54**	**3.35**
7	**DBW 17**	0.00	0.00	0.00	2.50	0.00	0.00	0.00	0.00	3.25	0.30	3.44	0.00	0.00	0.00	9.49	**2.37**	**3.13**
8	**K 0307**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.70	0.00	0.00	0.00	8.70	**2.18**	**2.87**
9	**WH 711**	2.36	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	7.46	**1.87**	**2.46**
10	**UP 2338**	0.10	0.00	0.00	0.46	0.00	0.00	0.00	0.00	0.00	0.00	7.10	0.00	0.00	0.00	7.66	**1.92**	**2.53**
11	**PBW 509**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.00	6.44	0.00	0.00	0.00	6.86	**1.72**	**2.26**
12	**Raj 4037**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.70	0.00	0.00	0.00	0.00	6.70	**1.68**	**2.21**
13	**DPW-621-50**	0.00	0.00	0.00	0.76	0.00	0.00	0.00	0.00	5.24	0.00	0.00	0.00	0.00	0.00	6.00	**1.50**	**1.98**
14	**PBW 373**	3.37	0.00	0.00	0.40	0.00	0.00	0.03	0.00	0.60	0.20	1.35	0.00	0.00	0.00	5.95	**1.49**	**1.96**
15	**GW 366**	0.00	0.04	0.20	0.00	0.00	0.00	5.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	5.28	**1.32**	**1.74**
16	**HUW 234**	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	5.10	**1.28**	**1.68**
17	**PBW 443**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.61	0.00	0.00	0.00	3.61	**0.90**	**1.19**
18	**HD 2932**	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	2.48	0.40	0.00	0.00	0.00	0.00	3.08	**0.77**	**1.02**
19	**NW 1014**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.05	0.00	3.05	**0.76**	**1.01**
20	**Raj 3765**	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.78	0.82	0.00	0.00	0.00	3.00	**0.75**	**0.99**
21	**HUW 510**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.80	0.00	0.00	0.00	2.80	**0.70**	**0.92**
22	**C 306**	0.00	0.04	0.12	0.40	0.00	0.00	1.56	0.00	0.00	0.55	0.10	0.00	0.00	0.00	2.77	**0.69**	**0.91**
23	**K 9423**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.57	0.00	0.00	0.00	2.57	**0.64**	**0.85**
24	**Raj 3077**	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	2.40	0.00	0.00	0.00	0.00	2.50	**0.63**	**0.83**
25	**K 7093**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.42	0.00	0.00	0.00	2.42	**0.61**	**0.80**
26	**GW 496**	0.00	0.00	2.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.33	**0.58**	**0.77**
27	**HD 2985**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.25	0.00	0.00	0.00	2.25	**0.56**	**0.74**
28	**Raj 1482**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.24	0.00	0.00	0.00	0.00	2.24	**0.56**	**0.74**
29	**HD 2733**	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.06	0.00	0.82	0.00	0.00	0.00	2.57	**0.64**	**0.85**
30	**WH 147**	0.00	0.00	0.00	0.20	0.00	0.00	1.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.02	**0.51**	**0.67**

Contd.

Variety-wise and State-wise Normal Seed Requirement of Wheat in major Wheat growing States and other States

Sl. No.	Variety	Normal seed reqmt(lakh qtls)															With	With
		Bihar	C'garh	Gujarat	Haryana	Jharkhand	J&K	MP	Maharashtra	Punjab	Rajasthan	UP	Uttarakhand	WB	Others	Total	25%SRR	33% SRR
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
31	**UP 2382**	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.03	0.00	0.00	0.00	1.18	**0.30**	**0.39**
32	**HI 1500**	0.00	0.00	0.00	0.00	0.00	0.00	1.51	0.00	0.00	0.10	0.00	0.00	0.00	0.00	1.61	**0.40**	**0.53**
33	**HI 8498**	0.00	0.01	0.00	0.00	0.00	0.00	1.13	0.00	0.00	0.34	0.00	0.00	0.00	0.00	1.48	**0.37**	**0.49**
34	**MP 4010**	0.00	0.01	0.00	0.00	0.00	0.00	1.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.28	**0.32**	**0.42**
35	**Sujata**	0.00	0.04	0.00	0.00	0.00	0.00	1.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.35	**0.34**	**0.45**
36	**PBW 590**	0.70	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	1.20	**0.30**	**0.40**
37	**UP2382**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.18	0.00	0.00	0.00	1.18	**0.30**	**0.39**
38	**UP 262**	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.10	0.29	0.99	**0.25**	**0.33**
39	**DBW 16**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.00	0.00	0.09	0.83	**0.21**	**0.27**
40	**K 9162**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.82	0.00	0.00	0.00	0.82	**0.21**	**0.27**
41	**MP 3211**	0.00	0.00	0.00	0.00	0.00	0.00	0.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.81	**0.20**	**0.27**
42	**PBW 596**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.00	0.00	0.00	0.80	**0.20**	**0.26**
43	**PBW 396**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.00	0.00	0.00	0.80	**0.20**	**0.26**
44	**HI 1418**	0.00	0.00	0.00	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73	**0.18**	**0.24**
45	**HD 2189**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.65	**0.16**	**0.21**
46	**JW 3020**	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	**0.16**	**0.21**
47	**HUW 510**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.71	**0.18**	**0.23**
48	**HW 2004**	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	**0.18**	**0.23**
49	**SONALIKA**	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51	**0.13**	**0.17**
50	**HD 2851**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.50	**0.13**	**0.17**
51	**PBW 533**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.50	**0.13**	**0.17**
52	**HD 4672**	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.46	**0.12**	**0.15**
53	**KRL 19**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.00	0.00	0.00	0.45	**0.11**	**0.15**
54	**WH 283**	0.00	0.00	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45	**0.11**	**0.15**
55	**HI 1531**	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	**0.11**	**0.14**
56	**HD 894**	0.00	0.00	0.00	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41	**0.10**	**0.14**
57	**PBW 154**	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	**0.10**	**0.13**
58	**WH 542**	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	**0.10**	**0.13**
59	**Raj 4083**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.40	**0.10**	**0.13**
60	**DBW 39**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.38	**0.10**	**0.13**

Contd.

Variety-wise and State-wise Normal Seed Requirement of Wheat in major Wheat growing States and other States

Sl. No.	Variety	Normal seed reqmt(lakh qtls)															With	With
		Bihar	C'garh	Gujarat	Haryana	Jharkhand	J&K	MP	Maharashtra	Punjab	Rajasthan	UP	Uttarakhand	WB	Others	Total	25%SRR	33% SRR
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
61	**JWS 17**	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	**0.08**	**0.11**
62	**HD 2864**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.25	**0.06**	**0.08**
63	**HUW 468**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.20	**0.05**	**0.07**
64	**DBW 14**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.21	**0.05**	**0.07**
65	**JW 3173**	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	**0.08**	**0.10**
66	**HI 1479**	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	**0.07**	**0.09**
67	**NW 2036**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.00	0.22	**0.06**	**0.07**
68	**K 9533**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.20	**0.05**	**0.07**
69	**HS 295**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.18	**0.05**	**0.06**
70	**HPW 251**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.17	**0.04**	**0.06**
71	**VL 829**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.18	**0.05**	**0.06**
72	**VL 892**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.24	**0.06**	**0.08**
73	**Raj 4083**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.24	**0.06**	**0.08**
74	**Raj 6560**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.24	**0.06**	**0.08**
75	**MP 1142**	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	**0.05**	**0.07**
76	**VL 802**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.14	**0.04**	**0.05**
77	**MP 1203**	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	**0.04**	**0.05**
78	**VL 802**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.14	**0.04**	**0.05**
79	**HPW 42**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.11	**0.03**	**0.04**
80	**NIAW 301**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.20	**0.05**	**0.07**
81	**HPW 251**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.17	**0.04**	**0.06**
82	**MP1142**	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	**0.04**	**0.05**
83	**HPW 147**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	**0.03**	**0.03**
84	**VL 804**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.12	**0.03**	**0.04**
85	**HS 365**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.09	**0.02**	**0.03**
86	**MP 1202**	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	**0.03**	**0.04**
87	**MP 1203**	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	**0.03**	**0.03**
88	**VL 616**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.13	**0.03**	**0.04**
89	**KRL 14**	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	**0.03**	**0.03**
90	**WH 1021**	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	**0.03**	**0.04**

Contd.

Variety-wise and State-wise Normal Seed Requirement of Wheat in major Wheat growing States and other States

Sl. No.	Variety	Normal seed reqmt(lakh qtls)															With	With
		Bihar	C'garh	Gujarat	Haryana	Jharkhand	J&K	MP	Maharashtra	Punjab	Rajasthan	UP	Uttarakhand	WB	Others	Total	25%SRR	33% SRR
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*
91	**MACS 6222**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.10	**0.03**	**0.03**
92	**MACS 3125**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.10	**0.03**	**0.03**
93	**MACS 2694**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.10	**0.03**	**0.03**
94	**PBW 644**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.09	**0.02**	**0.03**
95	**NIDW 15**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.06	**0.02**	**0.02**
96	**NIDW 295**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.05	**0.01**	**0.02**
97	**NIAW 1415**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.05	**0.01**	**0.02**
98	**AKAW 381**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.07	**0.02**	**0.02**
99	**NIAW 34**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.06	**0.02**	**0.02**
100	**MACS 2971**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.06	**0.02**	**0.02**
101	**MACS 3125**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.05	**0.01**	**0.02**
102	**UP 2565**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.06	**0.02**	**0.02**
103	**UP2554**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.05	0.00	0.00	0.00	0.05	**0.01**	**0.02**
104	**UP 2526**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.05	0.00	0.00	0.00	0.05	**0.01**	**0.02**
105	**UP 2382**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.05	**0.01**	**0.02**
106	**WH 1025**	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	**0.02**	**0.02**
107	**WH 1080**	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	**0.02**	**0.02**
108	**WR 544**	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	**0.01**	**0.02**
109	**HPW 89**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	**0.01**	**0.01**
110	**HPW 155**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	**0.03**	**0.03**
111	**HPW 184**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.07	**0.02**	**0.02**
112	**HS 240**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	**0.01**	**0.01**
113	**HS 277**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	**0.01**	**0.01**
114	**HS 420**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	**0.01**	**0.01**
115	**KUNDAN**	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	**0.01**	**0.01**
116	**Others**	0.61	0.38	9.72	2.70	1.73	2.94	19.30	7.21	0.00	10.25	13.71	2.32	3.20	4.25	78.32	**19.58**	**25.84**
Total		**22.57**	**1.02**	**13.51**	**25.22**	**1.73**	**2.94**	**57.92**	**10.97**	**35.00**	**30.81**	**98.58**	**3.48**	**3.35**	**5.54**	312.64	**78.16**	**103.17**

Source: DWR, Karnal.

Contd.

State-wise (Major States) list of Non-recommended Wheat Varieties/varieties slated for replacement and their availability of seeds *Annexure-X*

STATES	VARIETIES	TOTAL SEED AVAILBILITY (Qtls)
BIHAR	Lok-1	0
	HUW 234	0
	UP 262	14438
	Sonalika	2500
	PBW 154	0
	Kundan	0
CHHATTISGARH	C 306	64
	Sujata	895
	PBW 154	0
GUJARAT	Lok-1	10350
	C 306	12251
	GW 496	232500
	WH 147	0
HARYANA	C 306	12251
	PBW 343	224395
	WH 283	8948
	KRL 1-4	0
MADHYA PRADESH	Lok-1	421277
	C 306	3910
	Raj 3077	0
	WH 147	30019
	Sujata	0
MAHARASHTRA	Lok-1	212310
	HD 2189	0
	AKAW 381	0
PUNJAB	PBW 343	76373
RAJASTHAN	Lok-1	85971
	C 306	9610
	Raj 3077	112222
	Raj 1482	75225
	KRL 1-4	0
UTTAR PRADESH	Lok-1	20776
	C 306	0
	HUW 234	89023
	UP 262	27079
	KRL 1-4	0
UTTARAKHAND	VL 616	583
WEST BENGAL	UP 262	18500
OTHERS	UP 262	8336
	Sonalika	40000
	HS 240	0

Source: DWR, Karnal.

Minimum Support Price (MSP) including additional incentives (Bonus) on procurement of Wheat

Annexure XI

(Price in Rupees per Quintal)

Year (crop Year)	Year (Marketing Year)	Price announced by Govt.
1994-95	1995-96	360
1995-96	1996-97	380
1996-97	1997-98	475
1997-98	1998-99	510
1998-99	1999-2000	550
1999-2000	2000-01	580
2000-01	2001-02	610
2001-02	2002-03	620
2002-03	2003-04	630
2003-04	2004-05	630
2004-05	2005-06	640
2005-06	2006-07	700
2006-07	2007-08	850
2007-08	2008-09	1000
2008-09	2009-10	1080
2009-10	2010-11	1100
2010-11	2011-12	1170
2011-12	2012-13	1285
2012-13	2013-14	1350
2013-14	2014-15	1400

Source:DES, DAC, GOI.

Annexure XII

Year-wise Procurements of Wheat

Lakh Tonnes

State/ Year	Punjab	U.P.	Haryana	Rajasthan	Others	All India
1991-1992	44.89	4.97	13.72	0.22	-	63.8
1992-1993	64.94	21.28	34.54	4.96	2.63	128.35
1993-1994	72.85	14.06	30.47	0.65	0.66	118.69
1994-1995	72.99	13.02	31.02	4.54	1.7	123.27
1995-1996	56.41	2.61	20.22	2.29	-	81.53
1996-1997	59.61	6.18	22.9	3.2	1.09	92.98
1997-1998	61.46	21.41	31.58	6.67	5.4	126.52
1998-1999	78.31	12.61	38.7	6.37	5.44	141.38
1999-2000	94.24	15.45	44.97	5.39	3.5	163.55
2000-2001	94.24	15.45	44.98	5.34	3.51	163.52
2001-2002	105.6	24.48	64.09	6.76	5.41	206.34
2002-2003	98.63	21.11	58.88	4.61	7.01	190.24
2003-2004	89.38	12.13	51.22	2.59	2.69	158.01
2004-2005	92.4	17.41	51.15	2.79	4.2	167.95
2005-2006	90.1	5.6	45.29	1.59	5.27	147.85
2006-2007	69.46	0.49	22.29	0.02	0	92.26
2007-2008	67.8	5.46	33.5	3.84	0.68	111.28
2008-2009	99.41	31.38	52.37	1.52	42.21	226.89
2009-2010	107.25	38.42	69.24	-	38.91	253.82
2010-2011	102.09	16.45	63.47	4.76	38.36	225.13
2011-2012	109.58	34.61	69.28	13.03	56.84	283.34
2012-2013	128.34	50.62	86.65	19.57	95.05	380.23
2013-2014	108.97	6.83	58.73	12.68	63.71	250.92
2014-2015	116.41	6.28	64.95	21.59	71.00	280.23

Source: FCI, New Delhi.

Sources of Transgenics in wheat

Annexure-XIII

Accession	Country wherefrom imported & introduced	Specific Traits targetted/ introduced
EC 514345-79	ICARDA,Beirut	Durum wheat with high protein & β-carotene
EC 514380 514404	ICARDA,Beirut	Drought & heat tolerance
EC 633778-84	Syria	PBW 343 new version lines carrying genes resistant to Ug99 and stripe rust
EC 664600	Argentina	Hard red winter wheat,excellent yield,good bread & Lr47 gene
EC 478016(AC PATHFINDER)	Canada	Resistance to loose smut race T26, strong gluten
EC 478017(AC NAVIGATOR)	Canada	Superior gluten & rust resistant
EC 498861-62	Canada	Hard red, spring wheat with Lr21 & Lr34, resistance to leaf rust
EC 633777	Canada	Adapted to drier region,resistance to loose smut
EC 592591	China	High yield,broad adaptation,resistance to rusts,cold,drought tolerant,early maturing,good quality
EC 596303-08	South Africa	NILs, for resistance to Russian wheat aphid, *Diuraphis noxia*
EC477993 (WESLEY)	USA	Stem rust resistance with superior bread and yield potential
EC 479375-77	USA	Soft red winter wheat, Resistance to Powdery Mildew and leaf rust
EC 498860	USA	Resistance to stripe rust, speckled snow mold, dwarf bunt
EC 524892 (ZAK)	USA	High grain yield,adult plant resistance to stripe rust & leaf rust
EC 527045 (TARA)	USA	Spring wheat, high grain yield, superior grain quality, adult plant resistance to stripe rust,leaf rust
EC 528127 (SABBE),EC 528128 (PAT)	USA	Winter wheat,excellent straw strength and yield potential,resistance to powdery mildew,septoria leaf blotch,stripe rust
EC 533525 (SISSON)	USA	Early maturing,soft,red,winter wheat
EC 533532 (INTRADA)	USA	winter wheat ,good bread
EC 533533 (WAHOO)	USA	Hard,red,winter wheat, good milling & baking quality

Contd.

Accession	Country wherefrom imported & introduced	Specific Traits targetted/ introduced
EC 538959(NUSKY)	USA	Hard,white,winter wheat, good milling & baking quality
EC 538234-35	USA	Salinity tolerance
EC 538958(BIGSKY)	USA	Winter wheat,high protein & rust resistance
EC 540847(OUTLOOK)	USA	Spring , hard wheat,high yield,good bread & resistance to aphid,stem rust
EC 541269	USA	Winter type, high tolerance to acidic soil, soil borne mosaic
EC 541276(CALEDONIA)& EC 541277 (RICHLAND)	USA	Winter ,high grain yield,resistance to loose smut,soft
EC 541278-79	USA	Hard red winter wheat, higher grain yield,resistance to lodging,stem rust
EC 541281(DELORIS)	USA	Winter red, high yielding
EC 589389	USA	Resistance to leaf rust,stem rust genes isogenic lines Lr37,Yr17,Sr 38
EC 589390	USA	Resistance to leaf rust,stem rust genes isogenic lines LR47
EC 589391	USA	Resistance to leaf rust,stem rust genes isogenic lines YR36
EC 589421	USA	High yield,wide adaptation,resistance to rusts,lodging and low temperature
EC 592592	USA	Stem rust resistance genetic stock
EC 596664	USA	High yield,good quality and resistance to stripe rust
EC 596665	USA	High yield,resistance to local races of stripe rust,Hessian fly, good for pasta
EC 596302	USA	High yield,drought tolerant,resistance to stripe rust,glume blotch
EC 631734	USA	Translocation line chr.5 softness genes Pin a & Pin b from *T. monococcum*
EC 632071	USA	Hard red winter,resistant to Biotypes 1 & 2 of Russian wheat aphid, semi dwarf, medium maturity
EC 638278	USA	Allien disomic addition line with resistance to Fusarium head blight
EC 671601	USA	Hard red spring,high protein,good bread,resistance to stripe rust,(Lr 34/ Yr18 & Lr37/Yr17/Sr38 clusters)
EC 671602	USA	Soft white spring,early maturing,high yield,waxy with end use quality properties, resistance to Hessian fly, stripe rust(Local races)
EC 673058	USA	Hessian fly resistance(gene H 25) , early maturing,dwarf,high temperature tolerance adult plant resistance to stripe rust.Excellent for baking cookies & Asian noodles
EC 673059	USA	Semi dwarf, excellent yield and milling quality,stripe rust resistance
EC 676671	USA	Hard red winter wheat,high yield,disease resistance & good quality

Source: DWR,Kernal.

Market arrival of Wheat in various states during 2004-05 to 2013-14

Annexure: XIV

(in tonnes)

State	Market Arrivals (01/04/2004-31/03/2005	Market Arrivals (01/04/2005-31/03/2006	Market Arrivals (01/04/2006-31/03/2007	Market Arrivals (01/04/2007-31/03/2008	Market Arrivals (01/04/2008-31/03/2009	Market Arrivals (01/04/2009-31/03/2010	Market Arrivals (01/04/2010-31/03/2011	Market Arrivals (01/04/2011-31/03/2012	Market Arrivals (01/04/2012-31/03/2013	Market Arrivals (01/04/2013-31/03/2014
Bihar	70792.85	46699.11	26296.29	3571.20	20955.00	68.60	0.00	0.00	4050.00	3523.60
Gujarat	655825.54	486593.54	988294.22	719783.15	1687559.94	1182560.72	1231249.24	1910622.93	1429614.53	1891305.62
Haryana	998193.57	1827388.12	2165395.57	2838975.89	5647969.39	7419965.79	8577220.31	6841536.61	8231709.81	5096073.45
Jharkhand	71912.90	88351.53	67643.50	32954.50	57415.05	104486.78	63756.93	27202.95	33010.58	49855.46
Karnataka	100428.00	80768.00	65745.00	51463.62	53763.80	48384.60	62161.50	67852.70	82173.10	71674.00
Madhya Pradesh	68894012.77	1115856.53	1802384.28	1278552.62	1347202.60	3665999.69	4672547.47	6612077.93	8279357.45	9111127.54
Maharashtra	199384.00	342296.40	391942.10	414354.10	389952.22	426208.20	599618.20	642189.80	568265.99	480132.87
NCT of Delhi	98955.20	616313.55	1475913.81	231035.13	200432.50	118273.89	113606.32	110758.93	76536.05	63624.31
Punjab	2760014.87	4007022.32	4903959.73	3689298.01	14312306.86	13185526.23	18785368.42	9623939.04	10149124.16	7873025.93
Rajasthan	637503.20	478766.73	1044763.50	1075334.84	2027700.05	1639406.48	2001453.47	3081427.59	3135331.21	3014797.34
Uttar Pradesh	1989682.89	25047874.31	4264492.69	1960880.37	2916347.38	2719774.61	4593606.53	5623180.86	4604361.08	4671425.91
Uttrakhand	127114.92	7238611.92	64929.28	55653.96	184341.83	138818.66	76548.60	78465.95	151239.01	140111.71
West Bengal	21668.50	31735.70	59624.05	36052.60	145903.20	46465.15	106355.86	129331.62	144411.01	127994.71
Total	**76625489.21**	**41408277.76**	**17321384.02**	**12387909.99**	**28991849.82**	**30695939.40**	**40883492.85**	**34748586.91**	**36889183.98**	**32594672.45**

State Agricultural Universities in wheat growing states

Annexure-XV

Sl No.	Name, email & website	Address	Telephone/Fax No.
1	Anand Agricultural University Website: http://www.aau.in Email: vc@aau.in, vc_aau@yahoo.com	Anand 388110, Gujarat	02692-261273 Fax: 02692-261520
2	Bidhan Chandra Krishi Viswavidyalaya Website: http://www.bckv.edu.in Email:bckvvc@gmail.com,sarojsanyal@yahoo.co.in	Mohanpur, Nadia-741252, West Bengal	033-25879772, 03473-222666 Fax:03473-222275
3	**Bihar Agricultural University** Website: http://www.bausabour.ac.in Email: vcbausabour@gmail.com	Sabour, Bhagalpur 813210, Bihar	0641-2452606 Fax:0641-2452604
4	**Birsa Agricultural University** Website: http://www.baujharkhand.org Email: vc_bau@rediffmail.com	Kanke, Ranchi-834006, Jharkhand	0651-2450500 Fax:0651-2450850
5	**Chandra Shekar Azad University of Agriculture & Technology** Website:http://www.csauk.ac.in Email: vc@csauk.ac.in	Kanpur-208002, Uttar Pradesh	0512-2534155 Fax:0512-2533808
6	**Chaudhary Charan Singh Haryana Agricultural University** Website:http://www.hau.ernet.in Email: vc@hau.ernet.in	Hisar-125004, Haryana	01662-231640, 284301 Fax:01662-234952
7	**CSK Himachal Pradesh Krishi Vishvavidyalaya** Website: http://www.hillagric.ac.in Email: vc@hillagric.ac.in	Palampur-176062, Himachal Pradesh	01894-230521 Fax:01894-230465
8	**Dr Panjabrao Deshmukh Krishi Vidyapeeth** Website: http://www.pdkv.ac.in Email: vc@pdkv.ac.in	Krishinagar,Akola-444104, Maharashtra	0724-2258365 Fax:0724-2258219
9	**Govind Ballabh Pant University of Agriculture & Technology** Website: http://www.gbpuat.ac.in **Email:**vcgbpuat@gmail.com	Pantnagar-263145,Distt Udham Singh , Nagar , Uttaranchal	05944-233333,233500 Fax: 05944-233500
10	**Indira Gandhi Krishi Vishwavidyalaya** Website: www.igau.edu.in Email: vcigkv@gmail.com	Krishak Nagar, Raipur-492006, Chhattisgarh	0771-2443419 Fax:0771-2442302, 2443121

Contd.

State Agricultural Universities in wheat growing states

Sl No.	Name, email & website	Address	Telephone/Fax No.
11	**Jawaharlal Nehru Krishi Viswavidyalaya** Website: http://www.jnkvv.nic.in,Email: gkalloo_jnkvv@yahoo.co.in	Krishi Nagar, Adhartal Jabalpur-482004, Madhya Pradesh	0761-2681706 Fax:0761-2681389
12	**Junagadh Agricultural University** Website: http://www.jau.in Email: vc@jau.in	Univ. Bhavan, Motibagh Junagadh-362001, Gujarat	0285-2671784 Fax:0285-2672004
13	**Maharana Pratap Univ. of Agriculture & Technology** Website: http://www.mpuat.ac.in Email: vc@mpuat.ac.in	Udaipur, Rajasthan 313001	0294-2471101 Fax:0294-2470682
14	**Mahatma Phule Krishi Vidyapeeth** Website: http://mpkv.mah.nic.in Email: vcmpkv@rediffmail.com	Rahuri-413722, Maharashtra	02426-243208 Fax:02426-243302
15	**Marathwada Agricultural University** Website: http://www.mkv2.mah.nic.in Email: vcmau@rediffmail.com	Parbhani-431402, Maharashtra	02452-223002 Fax:02452-223582
16	**Narendra Deva University of Agriculture & Technology** Website:http://www.nduat.ernet.in **Email:**vc_nduat2010@yaho.co.in	Kumarganj, Faizabad -224229, Uttar Pradesh	05270-262097, 262161 Fax:05270-262097
17	**Punjab Agricultural University** Website: http://www.pau.edu Email: vcpau@pau.edu	Ludhiana-141004, Punjab	0161-2401794 Fax:0161-2402483
18	**Rajendra Agricultural University** Website: http://www.pusavarsity.org.in **Email:** : vcrau@sify.com	Pusa, Samastipur 848125, Bihar	06274-240226 Fax:06274-240255
19	**Rajmata Vijayraje Sciendia Krishi Vishwa Vidyalaya** Website: http://www.rvskvv.nic.in Email: vcrvskvv@gmail.com	Race Cource Road, Gwalior 474002 Madhya Pradesh	0751-2467673 Fax: 0751-2467673
20	**Sardar Vallabhbhai Patel University of Agriculture and Technology** Website: http://www.svbpmeerut.ac.in **Email:**vc_agunivmeerut@yahoo.com	Modipuram, Meerut - 250110 Uttar Pradesh	0121-2888522, Fax:0121-2888505

Contd.

State Agricultural Universities in wheat growing states

Sl No.	Name, email & website	Address	Telephone/Fax No.
21	**Sardarkrushinagar-Dantiwada Agricultural University**	Sardar Krushinagar, Distt	02748-278222
	Website: http://www.sdau.edu.in Email: vc@sdau.edu.in	Banaskantha, Gujarat-385506	Fax:02748-278261
22	**Sher-E-Kashmir Univ of Agricultural Sciences & Technology** Website: http://www.skuast.org **Email: vc@skuast.org**	Railway Road, Jammu 180009, J&K	0191-2263714 Fax:0191-2262073
23	**University of Agricultural Sciences, Dharwad** Website: http://www.uasd.edu **Email:** vc_uasd@rediffmail.com	Dharwad-580005, Karnataka	0836-2447783, Fax:0836-2448349
24	**Uttar Banga Krishi Viswavidyalaya** Website:http://www.ubkv.ac.in Email: vcubkv@gmail.com, vcubkv@rediffmail.com	P.O. Pundibari, Dist. Coach Bihar-736165,West Bengal	03582-270141, 270013 Fax:03582-270249

Source: ICAR, New Delhi.

Statewise numbers of Kisan Credit Cards(KCC) issued		
Sl.no	**State**	**Total no of KCCs issued**
1	Bihar	5214514
2	Gujarat	3795934
3	Haryana	2885780
4	J&K	130077
5	Jharkhand	1649561
6	Karnataka	7113967
7	Madhya Pradesh	7598472
8	Maharashtra	10701278
9	Punjab	2863553
10	Rajasthan	7068731
11	Uttar Pradesh	21517513
12	Uttrakhand	920530
13	West Bengal	4789851
	All IndiaTotal	**120307780**

Source: Agril statistics at a glance,2013