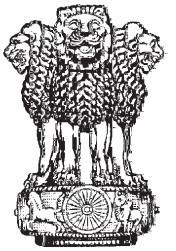
सत्यमेव जयते

RICE – A STATUS PAPER



STATUS PAPER ON RICE

Directorate of Rice Developement

Govt. of India
250A, Patliputra Colony, Patna (Bihar)

सत्यमेव जयते

Dr. J.S. Sandhu
Tel / Fax : 2338 3549
Mob: 9582898978
E-mail : ag.comm@nic.in

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Agriculture Commissioner
Government of India
Ministry of Agriculture
(Department of Agriculture & Cooperation)
Krishi Bhawan, New Delhi-110 001

FOREWORD

Rice is a staple food of majority of the people of India. In many states of the contry, supply of rice has generally kept pace with the increase in demand, largely due to cultivation of high yielding varieties/hybrids, expansion of irrigation potential, use of chemical fertilizers and adoption of improved production technologies. The efforts need to continue to increase production to feed increasing population with adoption of improved package of practices through implementing various Crop Development Schemes/Programme in the country.

The Directorate of Rice Development, Patna has brought out publication “Rice - A Status Paper” and pooled the scattered information related to the rice. The publication deals with general scenario of cropping/growing season, crop production, pests management, varieties/hybrids and different eco-systems, statistical data, post-harvest technology and export of rice. In addition to this, various schemes/programmes are being implemented by the Government of India in different rice growing states. I express my appreciation to Shri Sanjay Lohiya, Joint Secretary (Crops), Dr. D.P. Malik, Additional Commissioner (Crops), Dr. M.C. Diwakar, Director, Directorate of Rice Development, Patna and his team effort in bringing out this valuable publication.

I acknowledge the efforts made in documenting with up to date information on all aspects of rice. The content of the publication is well organized and gives very valuable information related to rice. I am sure that the publication would be immense helpful to the Central and State Governments, Policy makers, researchers, academicians, farming community and other stakeholders.

(J.S. Sandhu)

सत्यमेव जयते

Dr. M.C. Diwakar
Tel./ Fax :
Mob.
E-mail:

निदेशक
भारत सरकार, कृषि मंत्रालय
(कृषि एवं सहकारिता विभाग)
चावल विकास निदेशालय
250–ए, पाटलीपुत्र कॉलोनी,
पटना (बिहार)

Director
Government of India
Ministry of Agriculture
(Department of Agriculture & Cooperation)
250A, Patliputra Colony,
Patna (Bihar)

PREFACE

"Rice– A Status Paper" has been brought out by the Directorate of Rice Development, Patna. The objective of this publication is to organize the scattered informations and also to deal with the recent development of rice verities/hybrids released rice cultivation, basmati rice, rice development programme, and utilization of by-products of rice mills. Rice bran oil can contribute significantly to the national production of edible oil and to reduce exchequer on import of oil. In fact, considerable quantity of rice bran is available at present in the country which can be extracted and can be used as edible oil. Rice production in India has been increased during the last 60 years by 5 times from 20.58 million tonnes (1950-51) to 105 million tonnes during 2011-2012.

This status paper has been compiled and would be immense helpful to the agricultural scientists, planners, traders and farmers as well as Government Organizations and other line Department.

I am grateful to Dr. D. P. Malik, Additional Commissioner (Crops) and Dr. B.B Singh, Consultant, Ministry of Agriculture, Government of India, Krishi Bhawan, New Delhi for constant encouragement, motivation and guiding time to time to bring out this publication. It is my great pleasure to express my sincere thanks Shri Vipin Kumar, Assistant Director, Dr. Arvind Kumar, Senior Technical Assistant, Shri Jintu Das, Senior Technical Assistant and Sri Gopal Chandra Das, Ex-Statistical Investigator who have worked very hard on prepration of this publication. Thanks are also to Dr. Uday Singh Pal and Shri Upendra Kumar Srivastava, T. As. under A3P project who have rendered their assistance in one way or the other in bringing out this publication.

Thanks are also due to Shri Surendra Kumar, Senior Stenographer, Shri Deepak Kumar and Shri Sanjay Kumar Singh, Upper Division Clerks for typing and carrying out correction in Computer.

Place: Patna

Date: January, 2014.

(Dr. M.C. Diwakar)
Director
Directorate of Rice Development
250-A, Patliputra Colony, Patna

Rice in India: A Status Paper

Chapter-I

CROP DESCRIPTION

1.1 Origin of rice

1.1.1 *Oryza Sativa*, it is believed to be associated with wet, humid climate, though it is not a tropical plant. It is probably a descendent of wild grass that was most likely cultivated in the foothills of the far Eastern Himalayas. Another school of thought believes that the rice plant may have originated in southern India, then spread to the north of the country and then onwards to China. It then arrived in Korea, the Philippines (about 2000 B. C.) and then Japan and Indonesia (about 1000 B. C.). When Alexander the Great invaded India in 327 B. C., it is believed that he took rice back to Greece. Arab travelers took it to Egypt, Morocco and Spain and that is how it travelled all across Europe. Portugal and Netherlands took rice to their colonies in West Africa and then it moved to America through the 'Columbian Exchange' of natural resources. But as is traditionally known, rice is a slow starter and this is also true to the fact that it took close to two centuries after the voyage of Columbus for rice to take root in the Americas. Thereafter the journey of rice continues with the Moors taking it to Spain in 700 A. D. and then the Spanish brought rice to South America at the beginning of 17th century.

1.1.2 The journey of rice around the world has been slow, but once it took the root it stayed and became a major agriculture and economic product for the people. In the Indian subcontinent more than a quarter of the cultivated land is under the rice crop (2011-12). It is a very essential part of the daily meal in the southern and eastern parts of India. In the northern and central parts of the subcontinent, where wheat is commonly eaten, rice holds its own importance and is cooked daily as well as on festivals and special occasions.

1.2 History of Rice in India

1.2.1 India is an important centre of rice cultivation. The rice is cultivated on the largest areas in India. Historians believe that while the *Indica* variety of rice was first domesticated in the area

covering the foothills of the Eastern Himalayas (i.e. north-eastern India), stretching through Burma, Thailand, Laos, Vietnam and Southern China. The *japonica* variety was domesticated from wild rice in southern China which was introduced to India. Perennial wild rice still grows in Assam and Nepal. It seems to have appeared around 1400 BC in southern India after its domestication in the northern plains. It then spread to all the fertilsed alluvial plains watered by rivers. Some says that the word rice is derived from the Tamil word *arisi*.

1.2.2 Rice is first mentioned in the Yajur Veda (1500-800 BC) and then is frequently referred to in Sanskrit texts. In India there is a saying that grains of rice should be like two brothers, close but not stuck together. Rice is often directly associated with prosperity and fertility; hence there is the custom of throwing rice at newlyweds. In India, rice is always the first food offered to the babies when they start eating solids or to husband by his new bride, to ensure they will have children.

1.2.3 Key points

- Paddy grains found during excavation at Hastinapur (India) around 1000-750 B.C. considered as an oldest sample in the world.
- Southwest Himalayas has various types and varieties and indicated probable centre of origin.
- **De Condolle (1886) and Watt (1862)** mentioned **south India** is the centre of rice origin.
- **Vavillov** suggested **that India and Myanmar** should be regarded as the centre of origin of cultivated rice.
- According to **D. Chatterjee (1948),** there are altogether **24 species of genus** *Oryza* of which 21 are wild and two viz., *Oryza sativa* and *Oryza glaberrima* are cultivated. *Oryza sativa* is grown in all rice growing areas, but *Oryza glaberrima* is confined to the **West Africa** only. Thus it indicates that there might have been **two centres of origin** of our cultivated rice; South-eastern Asia (India, Myanmar and Thailand) and West Africa.

1.2 Importance of Rice

1.2.1 Rice has shaped the culture, diets and economic of thousand of millions of peoples. For more than half of the humanity " rice is life". Considering its importance position, the United Nation designated year 2004 as the "International Year of rice. Importance of rice are as follows:

a. Rice is an important staple food crop for more than 60 per cent of the world people. In 2008, more than 430 million metric tons of rice was consumed worldwide, according to the USDA.
b. Ready to eat products eg. popped and puffed rice, instant or rice flakes, canned rice and fermented products are produced.
c. Rice straw is used as cattle feed, used for thatching roof and in cottage industry for preparation of hats, mats, ropes, sound absorbents, straw board and used as litter material.
d. Rice husk is used as animal feed, for paper making and as fuel source.
e. Rice bran is used in cattle and poultry feed, defatted bran, which is rich in protein, can be used in the preparation of biscuits and as cattle feed.
f. Rice bran oil is used in soap industry. Refined oil can be used as a cooling medium like cotton seed oil / corn oil. Rice bran wax, a byproduct of rice bran oil is used in industries.

1.3 Scientific Name

1.3.1 The two major rice varieties grown worldwide today are *Oryza sativa var. indica* and *Oryza sativa var. japonica*. The two cultivated rice species, *Oryza sativa* L. and *O. glaberrima* Steud., belong to a species group called *Oryza sativa* complex together with the five wild taxa, *O. rufipogon*, *O. longistaminata* Chev. et Roehr., *O. barthii* A. Chev., *O. glumaepatula* Steud., and *O. meridionalis* Ng. Among these taxa, only *O. rufipogon* produces fertile F_1 hybrids with *O. sativa* and therefore these two species are considered to belong to a single biological species. Together with all circumstantial evidence, this suggests that *O. rufipogon* is the ancestor of *O. sativa*. Similarly, it leaves no doubt that *O. barthii* is the ancestor of African rice *O. glaberrima*. Habit and distribution of different species of rice is given in table 1.1

Table 1.1 Habit and distribution of different species of rice :

Species	Habit	Distribution
Oryza sativa	Annual, cultivated	South and South-east Asia
O. nivara	Annual, wild	South and South-east Asia
O. rufipogon	Perennial, wild	Tropical Asia, Australia
O. glaberrima	Annual, cultivated	Trpical west Africa
O. barthii	Annual, wild	Sub-Saharan Africa
O. longistaminata	Perennial, wild	Tropical west Africa
O. glumaepatula	Parennial, wild	Tropical west Africa
O. meridionalis	Wild	Tropical Australia
O. officinalis	Perinnial, wild	South and South-east Asia
O. minuta	Perennial , wild	The Philippines
O. rhizomatis	Wild	Sri Lanka
O. eichingeri	Wild	Sri Lanka, Tropical Africa
O. punctata	Wild	Tropical Africa
O.latifolia	Wild	Central and South America
O. alta	Wild	Central and South America
O. grandiglumis	Wild	South America
O. australiensis	Wild	Tropical Australia
O. granulata	Wild	Tropical Asia
O. meyeriana	Wild	South-east Asia
O. longiglumis	Wild	Indonesia, Papua New Guinea
O. ridleyi	Wild	South-east Asia, Papua New Guinea
O. schlechteri	Wild	Papua New Guinea
O. brachyantha	Wild	Tropical Africa
P. coarctata	Perennial, wild	South Asia

1.4 Botanical Description

The rice plant is a member of Poaceae (old Gramineae) family. The common cultivated rice plant is an annual which usually grows to a height of a half meter or two meters but there are certain varieties that grow much taller (6-9 metres). Some deep water rice varieties grow with the

gradual rise of the flood water level. Rice plant can be divided into main two parts namely root system and shoot system:

1.4.1 Root system

When a rice grain germinates in a well drained, upland soil the sheath (coleorhizae) emerges. If it germinates in submerged low lands, coleoptile emerges ahead of the coleorhizae. The primary, embryonic roots (radicle) come out through the coleorhiza shortly after it appears. This is followed by two or more secondary roots, all of which develop lateral roots. The embryonic roots later die and are replaced by secondary adventitious roots produced from the underground nodes of the culm.

1.4.2. Shoot System

Collectively applies to all plant part visible above the ground level. It is mainly composed of culms, leaves and inflorescence (panicle).

i. **Culm:** The culm or stem is made up of a series of nodes and internodes. The rice culms are usually hollows except at the nodes. Each node bears a leaf and a bud. Under favorable conditions buds near ground level grow into tillers. The primary tillers give rise to secondary tillers which give rise to tertiary tillers.

ii. **Leaves:** The leaves of rice are sessile in nature. They are borne at an angle, on the culm in two ranks along the stem, one at each node. The leaf blade is attached to the node by the leaf sheath. The rice leaf is similar to that of wheat, but is usually distinguished from it by the length of the ligule. In the rice, ligule is very prominent, usually more than one centimeter. The leaf number is more on a primary tiller than on the secondary and tertiary tillers.

iii. **Panicle:** The rice inflorescence known as panicle is a group of spikelets borne on the uppermost node of the culm. The primary panicle branch is divided into secondary and sometimes tertiary branches. These bear the spikelet.

iv. **Spikelet:** The individual spikelet consists of two outer glumes. All the parts found above the outer glumes are collectively called floret. It consists of a hard covering the two sections of which are known as lemma and palea (the glumes) and the complete flower is

between them. The lemma and palea together are known as the "hull". The rice flower contains six functioning stamens (male organ) and a pistil (female organ). At the base of the flower are two transparent structures known as 'lodicules'. Rice is a self pollinated crop. When rice flower becomes ready to bloom, the lodicules become turgid and push the lemma and palea apart, thus allowing the stamens to emerge outside the open floret. Rupturing of the anthers then leads to the shedding of pollen grains. After the pollen grains are shed on stigma the lemma and palea close.

1.4.3 Grain (Caryopsis): Rice grain develops after pollination and fertilization are completed. The grain is tightly enclosed by the lemma and palea. The dehulled rice grain is known as brown rice as brownish pericarp covers it. The pericarp is the outermost layer which envelopes the caryopsis and is removed when rice is milled and polished. The embryo lies at the ventral side of the spikelet next to the lemma. Adjacent to the embryo is a dot like structure the hilum. The embryo contains the plumule and radicle. The plumule is enclosed by a sheath known as coleoptile and the radicle by the coleorhizae.

1.5 Nutritional value of Rice

1.5.1 Rice is a nutritional staple food which provides instant energy as its most important component is carbohydrate (starch). On the other hand, rice is poor in nitrogenous substances with average composition of these substances being only 8% and fat content or lipids only negligible, i.e., 1% and due to this reason it is considered as a complete food for eating. Rice flour is rich in starch and is used for making various food preperations.

1.5.2 The variability of composition and characteristics of rice is really broad and depends on variety and environmental conditions under which the crop is grown. In husked rice, protein content ranges in between 7per cent to 12per cent. The use of nitrogen fertilizers increases the percentage content of some amino acids.

1.5.3 The comparative nutritional value of cereals in the table 1.2 showed difference in nutritional content of rice bran and raw rice. The brown rice is rich in some vitamins, especially B1 or thiamine (0.34 mg/g), B2 or riboflavin (0.05 mg/g), niacin or nicotinic acid (4.7 mg/g). In contrast, the white rice is poor in vitamins (0.09 mg of vitamin B1, vitamin B2 0.03 mg and 1.4 mg of niacin/g) and minerals as they are found mostly in the outer layers of the grain, which are re-

moved by polishing process, or "bleaching" whereas parboiled rice is rich in these vitamins as a result of their particular process.

Table 1.2: Nutritional value of cereals per 100 grams

Cereals	Protein (gm)	Fat (gm)	HO (gm)	Minerals (gm)	Calcium (mg)	Fiber (gm)	Energy (K cal)
Wheat whole	11.8	1.6	1.2	1.5	41	1.2	346
Wheat flour	12.1	1.7	9.4	2.7	48	1.9	341
Rice bran	13.5	16.2	8.4	6.6	67	4.3	393
Rice (raw)	6.8	0.5	8.2	0.6	10	0.2	345
Rice (par boiled)	8.5	0.6	7.4	0.9	10	0.2	349
Maida	11	0.9	3.9	0.6	23	0.3	348
Bajra	11.6	5.0	7.5	2.3	42	1.2	361
Jowar	10.4	1.9	2.6	1.6	25	1.6	349
Ragi	7.3	1.3	2.0	2.7	344	2.6	328

1.5.4 Cooking procedures can reduce the richness of vitamins and minerals in rice, and in fact, cooking is usually done with water which is then neglected and much of these nutrients dissolve in water and get wasted. Rice is strongly recommended in preparing specific diets against stomach and intestinal disease processes as well as feeding the infants and old people due to its good digestible character.

1.6 Medicinal Value

1.6.1 The immense diversity of rice germplasm is a rich source for many rice based products and is also used for treating many health related maladies such as indigestion, diabetes, arthritis, paralysis, epilepsy and give strength to pregnant and lactating mothers. Ancient Ayurvedic literatures testify the medicinal and curative properties of different types of rice grown in India. Medicinal rice varieties like Kanthi Banko (Chhattisgarh), Meher, Saraiphul & Danwar (Orissa), Atikaya & Kari Bhatta (Karnataka), are very common in India. Few varieties cultivated in restricted pockets of Kerala for their medical properties e.g. Chennellu, Kunjinellu, Erumakkari & Karuthachembavu etc.

1.7 Rice Growing Region in India

1.7.1 Rice is grown under so diverse soil and climatic conditions that it is said that there is hardly any type of soil in which it cannot be grown including alkaline and acidic soils. Rice crop has also got wide physical adaptability. Therefore, it is grown from below sea-level (Kuttanad area of Kerala) upto an elevation of 2000 metres in Jammu & Kashmir, hills of Uttarakhand, Himachal Pradesh and North-Eastern Hills (NEH) areas. The rice growing areas in the country can be broadly grouped into five regions as discussed below:

i. **North-Eastern Region:**This region comprises of Assam and North eastern states. In Assam rice is grown in the Basin of Brahmnaputra River. This region receives very heavy rainfall and rice is grown under rain fed condition.

ii. **Eastern Region:** This region comprises of Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Eastern Uttar Pradesh and West Bengal. In this region rice is grown in the basins of Ganga and Mahanadi rivers and has the highest intensity of rice cultivation in the country. This region receives heavy rainfall and rice is grown mainly under rain fed conditions.

iii. **Northern Region:** This region comprises of Haryana, Punjab, Western Uttar Pradesh, Uttrakhand, Himachal Pradesh and Jammu & Kashmir. The region experiences low winter temperature and single crop of rice from May-July to September-December is grown.

iv. **Western Region:** This region comprises of Gujarat, Maharashtra and Rajasthan. Rice is largely grown under rain fed condition during June-August to October - December.

v. **Southern Region:** This region comprises of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu. Rice is mainly grown in deltaic tracts of Godavari, Krishna and Cauvery rivers and the non-deltaic rain fed area of Tamil Nadu and Andhra Pradesh. Rice is grown under irrigated condition in deltaic tracts.

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Chapter 2

Comparative Analysis

2.1. Rice is one of the most important food crops of India. Major share of rice is cultivated during Kharif season. A small share of rice is grown in rabi /summer season with assured irrigation. Indian rice production largely depends on monsoon rains and only 59 per cent rice area has assured irrigation. The area under rice crop during 1st plan was 30.68 m ha which has reached to 44.01 million hectare during 11th plan which is nearly 42.2 per cent higher than the area of 1st plan. The rice production has registered an appreciable increase from 25.03 m tonnes during 1st plan to 97.05 tonnes during 11th plan, which is nearly 4 times over the 1st plan. The yield was 816 kg/ha during 1st plan and increased to 2224 kg/ha during 11th plan. Rice production shows a steady upward trend during 2005-06 to 2008-09. Production declined during 2009-10 due to severe drought, but it reached to 95.98 m tonnes in 2010-11 and further the highest record of 105.31 million tonnes in 2011-12. Sate wise Area, Production and Yield of Rice during 2007-08 to 2011-12 is given in table 2.1 and Table 2.2 Country wise Area, Production and Yield of Total Rice during 2005 to 2009 is given in table 2.2

Table 2.1 Sate wise Area, Production and Yield of Rice during 2007-08 to 2011-12

A - Area in lakh hectares, P - Production in lakh tonnes, Y - Yield in kg/ha.

Sl No	STATES		2007-08	2008-09	2009-10	2010-11	2011-12
1	Andhra Pradesh	A	39.84	43.87	34.41	47.51	40.96
		P	133.24	142.41	105.38	144.18	128.95
		Y	3344	3246	3062	3035	3146
2	Assam	A	23.24	24.842	24.958	25.704	25.37
		P	33.19	40.085	43.358	47.366	45.163
		Y	1428	1614	1737	1843	1780
3	Bihar	A	35.726	34.96	32.137	28.325	33.24
		P	44.181	55.903	35.993	31.02	71.626
		Y	1237	1599	1120	1095	2155

Sl No	STATES		2007-08	2008-09	2009-10	2010-11	2011-12
4	Chhattisgarh	A	37.524	37.34	36.707	37.025	37.738
		P	54.266	43.918	41.104	61.59	60.284
		Y	1446	1176	1120	1663	1597
5	Gujarat	A	7.59	7.47	6.79	8.08	8.36
		P	14.74	13.03	12.92	14.966	17.9
		Y	1942	1744	1903	1852	2141
6	Haryana	A	10.75	12.10	12.05	12.45	12.35
		P	36.13	32.98	36.25	34.72	37.59
		Y	3361	2726	3008	2789	3044
7	Jammu & Kashmir	A	2.632	2.576	2.599	2.613	2.626
		P	5.613	5.631	4.974	5.077	5.447
		Y	2133	2186	1914	1943	2074
8	Jharkhand	A	16.537	16.836	9.95	7.203	14.69
		P	33.364	34.202	15.384	11.1	31.306
		Y	2018	2031	1546	1541	2131
9	Karnataka	A	14.16	15.14	14.87	15.4	14.16
		P	37.17	38.02	36.91	41.88	39.55
		Y	2625	2511	2482	2719	2793
10	Kerala	A	2.288	2.343	2.34	2.132	2.082
		P	5.285	5.903	5.983	5.228	5.69
		Y	2310	2519	2557	2452	2733
11	Madhya Pradesh	A	15.589	16.823	14.457	16.029	16.62
		P	14.619	15.597	12.606	17.721	22.273
		Y	938	927	872	1106	1340
12	Maharastra	A	15.74	15.22	14.70	15.18	15.41
		P	29.96	22.84	21.83	26.96	28.41
		Y	1903	1501	1485	1776	1841

Sl No	STATES		2007-08	2008-09	2009-10	2010-11	2011-12
13	Odisha	A	44.518	44.547	43.651	42.257	440.045
		P	75.407	68.127	69.175	68.277	58.07
		Y	1694	1529	1585	1616	1450
14	Punjab	A	26.10	27.35	28.02	28.31	28.18
		P	104.89	110.00	112.36	108.37	105.42
		Y	4019	4022	4010	3828	3741
15	Rajasthan	A	1.278	1.334	1.507	1.311	1.343
		P	2.596	2.411	2.283	2.655	2.534
		Y	2031	1807	1515	2025	1887
16	Tamil Nadu	A	17.892	19.318	18.455	19.057	19.038
		P	50.402	51.827	56.652	57.924	74.587
		Y	2817	2683	3070	3040	3918
17	Uttar Pradesh	A	57.09	60.34	51.867	56.57	59.47
		P	117.80	130.97	108.071	119.92	140.22
		Y	2063	2171	2084	2120	2358
18	Uttrakhand	A	2.89	2.96	2.94	2.90	2.8
		P	5.93	5.82	6.08	5.504	5.94
			2052	1966	2068	1901	2121
19	West Bengal	A	57.197	59.357	56.301	49.442	54.337
		P	147.195	150.372	143.407	130.459	146.058
		Y	2573	2533	2547	2639	2688
20	Others	A	10.56	10.65	10.48	11.13	11.132
		P	20.95	21.78	20.21	24.88	24.908
	All India	**A**	**439.144**	**455.374**	**419.185**	**428.625**	**440.068**
		P	**966.929**	**991.824**	**890.931**	**959.797**	**1053.122**
		Y	**2202**	**2178**	**2125**	**2239**	**2393**

Table 2.2 Country wise Area, Production and Yield of Total Rice during 2005 to 2009

A - Area in lakh hectares, P - Production in lakh tonnes, Y - Yield in kg/ha.

Sl No	Country		2005	2006	2007	2008	2009
1	India	A	430.00	437.00	437.7	440.0	418.50
		P	1290.0	1365.10	1445.7	1482.6	1337
		Y	3000	3124	3303	3370	3195
2	China	A	293	293.8	291.791	294.93	298.82
		P	1842.5	1840.7	1873.97	1933.54	1966.81
		Y	6289	6265	6422	6556	6582
3	Bangladesh	A	110	112	107.32	117.41	113.54
		P	400.54	437.29	430.57	469.05	477.24
		Y	3641	3904	4012	3995	4203
4	Indonisa	A	118.01	114	121.476	123.09	128.84
		P	539.84	544	571.57	602.51	643.99
		Y	4575	4772	4705	4895	4998
5	Thialand	A	102	100.73	106.689	102.48	109.63
		P	270	292.69	320.99	304.67	314.62
		Y	2647	2906	3009	2973	2870
6	Vietnam	A	73.4	73.24	72.01	74.14	74.4
		P	363.41	358.27	358.68	387.25	388.95
		Y	4951	4892	4981	5223	5228
7	Myanmar	A	60	72	82.0	82.00	80
		P	220	252	326.1	305.00	326.82
		Y	3667	3500	3977	3720	4085
8	Philippines	A	41.15	41.6	42.729	44.6	45.32
		P	148	153.27	162.4	168.16	162.664
		Y	3597	3684	3801	3770	3589

Sl No	Country		2005	2006	2007	2008	2009
9	Pakistan	A	25	25.72	25.15	29.63	28.83
		P	73.51	81.37	83.03	104.28	103.245
		Y	2940	3164	3301	3519	3581
10	Japan	A	16.8	16.88	16.73	17.00	16.24
		P	109.89	106.95	108.93	110.29	105.925
		Y	6541	6336	6511	6488	6522
11	Brazil	A	39.36	29.75	28.909	28.62	28.72
		P	131.41	115.05	110.61	121.00	126.518
		Y	3339	3867	3826	4228	4405
12	Egypt	A	6.5	6.13	6.684	7.45	7.5
		P	62	65	68.77	72.53	75.0
		Y	9538	10604	10289	9736	10000
13	U.S.A	A	13.53	11.42	11.121	12.04	12.5575
		P	100.12	87.87	89.99	92.4	99.722
		Y	7400	7694	8092	7674	7941
14	Russian Fed.	A	1.25	1.56	1.57	1.6	1.775
		P	4.9	6.86	7.09	7.38	9.13
		Y	3920	4397	4516	4613	5144
15	Others	A	205.12	207.41	206.239	214.56	218.33
		P	90.39	639.64	637.51	689.47	714.774
	Total	**A**	**1535.12**	**1543.24**	**1558.12**	**1589.55**	**1583.00**
		P	**5646.55**	**6346.06**	**6595.910**	**6850.13**	**6852.41**
		Y	**3678**	**4112**	**4233**	**4309**	**4329**

Source : Agricultural Statistics at a glance,2012

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Chapter 3

Released varieties of rice in India

3.1 More than 430 rice varieties and hybrids have been released and notified in India during 1996-2012 for cultivation in different agro-ecological regions of different states. A list of all the rice varieties/hybrids with necessary details of their characteristics, regarding state(s) and agro-ecological zone for which they are recomended has been given in Appendix I.

3.2 The Ramiah Committee (1964), appointed by the Government of India, suggested the following five categories of rice grain based on their length and length-breadth ratioare given herewith:

i. Long Slender (LS)

ii. Medium Slender (MS)

iii. Short Slender (SS)

iv Long bold (LB)

v Short Bold (SB)

3.3 In India, slender grain, in combination with long grain are preferred by the consumers. The categories of rice grain based on the length and breadth ratio are given in Table 3.1.

Table 3.1Categories of rice grain based on length and length-breadth ratio

(proposed by Ramiah Committee, 1964)

Sl . No	Categories	Length (mm)	Length/breadth ratio (mm)
	Long Slender (LS)	6 and above	3 and above
	Medium Slender (MS)	<6	3 and above
	Short Slender (SS)	<6	2.5 -3.00
	Long bold (LB)	6 and above	<3
	Short Bold (SB)	<6	2.5

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Chapter 4

Climatic Requirements

In India rice is grown under widely varying conditions of altitude and climate. Rice cultivation in India extends from 8º N to 35º N latitude and from sea level to as high as 3000 meters above mean sea level. Rice crop needs a hot and humid climate. It is best suited to regions which have high humidity, prolonged sunshine and an assured supply of water. The average temperature required throughout the life period of the crop ranges from 21 to 37º C. Maximum temp which the crop can tolerate 40^0 C to 42^0 C.

4.1 Temperature requirements at different stage

Minimum temperature for sprouting is10^0C, at the time of tillering, the crop requires a high temperature than for growth. Minimum temperature for flowering range from 22-23^0C. Temperature requirement for blooming is in the range of 26.5 to 29.5º C. Minimum temperature for grain formation from 20-21^0C at the time of ripening the temperature should be between 20-25ºC. Photo periodically, rice is a short- day plant. However, there are varieties which are non-sensitive to photoperiodic condition.

4.2 Important growing ecology of rice

Rice farming is practiced in several agro ecological zones in India. No other country in the world has such diversity in rice ecosystems than India. Because the rice cultivation is so widespread in India, four distinct rice ecosystems have been recognized. These are :

- Irrigated Rice Eco System
- Upland Rice Eco System
- Rainfed Lowland Rice Eco System
- Flood Prone Rice Eco System

4.3 Irrigated Rice Eco System: Irrigated ecosystems are the primarily found in East Asia. Irrigated ecosystems provide 75per cent of global rice production. In India, the total area under irrigated rice is about 22.00 million hectares, which accounts about 49.5per cent of the total area

under rice crop in the country. Rice is grown under irrigated conditions in the states of Punjab, Haryana, Uttar Pradesh, Jammu & Kashmir, Andhra Pradesh, Tamil Nadu, Sikkim, Karnataka, Himachal Pradesh and Gujarat. Irrigated rice is grown in bunded (embanked) paddy fields.

4.4 Rainfed Upland Rice Eco System: Upland zones are found in Asia, Africa, and Latin America. In India, the total area under upland rain fed rice in the country is about 6.00 million hectares, which accounts13.5per cent of the total area under rice crop in the country. Upland rice areas lies in eastern zone comprising of Assam, Bihar, Eastern M.P., Orissa, Eastern U.P., West Bengal and North-Eastern Hill region. Upland rice fields are generally dry, unbunded, and directly seeded. Land utilized in upland rice production can be low lying, drought-prone, rolling, or steep sloping.

4.5 Rainfed Lowland Rice Eco System: Rainfed low-land rice is grown in such areas as East India, Bangladesh, Indonesia, Philippines, and Thailand, and is 25per cent of total rice area on global basis. In India, low land rice area is about 14.4 million hectares, which accounts 32.4 per cent of the total area under rice crop in the country. Production is variable because of the lack of technology used in rice production. Rainfed lowland farmers are typically challenged by poor soil quality, drought/flood conditions, and erratic yields

Flood Prone Rice Eco System: Flood-prone ecosystems are prevalent in South and Southeast Asia, and are characterized by periods of extreme flooding and drought. Yields are low and variable. Flooding occurs during the wet season from June to November, and rice varieties are chosen for their level of tolerance to submergence.

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Chapter 5

Basmati rice and its export

5.1 Basmati rice is also known as 'Queen of Rice and Pearl of Rice'. All aromatic rice is not basmati. In addition to aroma, the basmati rice has a combination of specific kernel elongation with minimum breadth wise swelling, fluffiness, palatability, easy digestibility and longer shelf-life. In order to maintain its status as specially rice, the Ministry of Agriculture, Government of India, has provided a set of minimum standards for rice varieties to quality as a Basmati variety. In India Basmati rice is characterized by extra long, superfine slender grains having a length to breadth ratio of more than 3.5, sweet taste, soft texture, delicate curvature and an extra elongation with least breadth-wise swelling on cooking. Basmati Rice gives pleasant flavour after cooking. These superfine best quality of Basmati rice are most preferred specially for Biryani and Pulao preparation on special occasion and also meant for high premium value in the national and international market. Standards for Basmati rice qualification under National Basmati Trials is given in table 5.1 and Standards of ancillary characters of Basmati rice is given in table 5.2

Table 5.1 Standards for Basmati rice qualification under National Basmati Trials

Sl. No.	Parameter**	Value
1.	Minimum average precooked milled rice length (mm)	6.61
2.	Average precooked milled rice breadth (mm)	<2.00
3.	Minimum length/breadth ratio of precooked milled rice (L/B Ratio)	3.50
4.	Minimum average cooked rice length (mm)	12.00
5.	Minimum cooked elongation/precooked rice length ratio	1.70
6.	Average volume expansion ratio	>3.50
7.	Aroma	Present (Quality sensory analysis as panel test*)
8.	Texture of cooked grain high integrity (without bursting on the surface), non-stickiness, tenderness, good taste and good mouth feel	Present (Quality sensory analysis as panel test*)

**The grain sample for analyses will necessarily have to be 'aged' for three months under protected conditions at normal temperature as milled kernel.

* As per approved protocol (Directorate of Rice Research)

Table 5.2 Standards of ancillary characters of Basmati rice

Sl. No.	Parameter	Value
1.	Amylose content range	20-25%
2.	Alkali spreading value range (ASV)	4-7
3.	Minimum brown rice recovery	76%
4.	Minimum milled rice recovery	65%
5.	Minimum head rice recovery	45%

5.2 Traditional Areas of basmati rice cultivation

Basmati rice is mostly grown traditionally in the areas of north and north western part of Indian sub-continent for many centuries. The super-fine best quality of Basmati rice is produced on either side of Indus valley in India. Its different varieties are mostly cultivated in the districts of Karnal, Panipat, Kurukshetra, Kaithal, Amritsar, Fatehgarh, Gurudaspur, Hoshiarpur, Jalandhar, Patiala, Ropar and Sangrur in Punjab; Kangra, Solan, Una, Mandi and Sirmour in Himachal Pradesh; Bundi in Rajasthan and in several districts of Uttar Pradesh. Some important districts of Uttar Pradesh are Saharanpur, Muzaffar Nagar, Piliphit, Bareily, Bijnaur, Moradabad, Jyotibaphule Nagar, Rampur, Raibareily, Sitapur and Udham Singh Nagar; Haridwar and Dehradoon in Uttaranchal. Also, Basmati rice is grown to limited extent in Jammu and Kashmir.

5.3.1 Notified varieties of Basmati rice

Table 5.3Notified varieties of Basmati rice

Varieties	Date of Notification	Name of the Institutions
Basmati 370	361 – 30.06.1973 786 – 02.02.1976	Rice farm, Kalashah Kaku (now in Pakistan)
Type-3 (Dehraduni Basmati rice)	13 19.12. 1978	Rice Research Station, Nagina
Taraori Basmati(HBC-19 or Karnal Local)	1 (E) 01.01.1996	Rice Research Station, (CCS- HAU), Kaul
Basmati 217	4045 24.09.1969	Punjab Agriculture University, Ludhiana (Punjab)
Ranbir Basmati	1 (E) 01.01.1996	Sher-e-Kashmir University, Regional Agriculture Station, R.S. Pura, Jammu

Basmati 386	647 (E) 09.09.1997	Rice Research Station, Kapurthala, Punjab Agriculture University, Punjab
Punjab Basmati –1	596 (E) – 13.04.1984	Punjab Agriculture University, Ludhiana, Punjab
Pusa Basmati –1 IET 10364	915 (E)– 06.11.1989	IARI, New Delhi
Kasturi IET 8580		Directorate of Rice Research, Hyderabad, AP
Haryana Basmati– 1 IET – 10367	793 (E) – 22.11.1991	Rice Research Station, CCS-HAU, Kaul, Haryana
Mahi Sugandha IET – 12601	408 (E) – 04.05.1995	Rice Research Station, RAU, Banswara, Rajasthan
Pusa Basmati– 1121 IET – 18004	1566 (E) – 5.11.2005 2547(E) 29.10.2008	IARI, New Delhi
Improved Pusa Basmati – 1 IET – 18990	1178(E)–20.07.2007	IARI, New Delhi
Vallabh Basmati-22 IET 19492	2187(E) 27.08.2009	MAUB-162
Pusa Basmati – 6, IET – 18005	733(E) – 01.04.2010	IARI, New Delhi
CSR 30	S.O.2126(E)10.9.2012	Ministry of Agriculture

5.4. Export of rice

5.4.1 Basmati Rice: India is exporting Basmati Rice to various countries in the world. A total quantity of 7.087 lakh tones of basmati rice was exported to different countries from India during 2002-03. However, the export increased to 31.781 lakh tonnes during 2011-12, registering an increase 348 per cent during the last 10 years. The export increased during 2010-12 to 2012-13 and a total quantity from 31.45 to 34.61 lakh tones, registering an increase of 10.04 per cent.

The export earnings from basmati rice decreased during 2006-07 over previous year. Thus, export earnings decreased by 8.22 per cent during 2006-07 as compared to 2005-06. During 2002-03 export earnings from the export of basmati rice was Rs. 2054.47 crores, which increased significantly to Rs.18985.37 crores during 2012-13, registering an increase of 824.10 per cent over 2002-03.

5.4.2 Non-Basmati Rice: India is also exporting substantial quantity of non-basmati rice to various countries in the world. However, the export of non-basmati rice has been fluctuating year to year due to Govt. policy. The export of non-basmati rice from India during 2002-03 was 42.59 lakh tonnes, the export rose to 52.86 lakh tones during 2007-08 and it came down to 1.006 lakh tones during 2010-11. The export of non basmati rice again increased during 2012-13 with 66.92 lakh tones of export.

During 2002-03, export earning from the export of non-basmati rice was Rs. 3772.77 crores and it increased to Rs.7410.03 crores during 2007-08 registering the increase of 96.40%. The export earning during 2009-10 & 2010-11 were Rs. 365.3 crores & Rs. 231.29 crores respectively. During 2011-12, export earning of non-basmati rice was Rs. 8659.126 crores the registering the increase in earning to 129.52% over the year 2002-03.

India has exported total rice (basmati and non-basmati rice) to various countries in the world to a tune of 101.53 lakh tones with export earning of Rs.32951.56 crores during 2012-13. Thailand has been the world's leading exporter of basmati and non-basmati rice for decades. However, due to farmers support price policy locally called pledging price, Thai rice exports have fallen during 2012 and it is estimated that India exported 10 million tones of rice both basmati and non-basmati rice which is the largest in the world followed by Vietnam 7.2 million tones and Thailand 6.5 million tones. Export of Basmati and Non Basmati Rice during 1991-92 to2012-13 is given in table 5.4

Table 5.4. Export of Basmati and Non Basmati Rice during 1991-92 to2012-13

Quantity in thousand tones
Value Rs in core

Year	Basmati		Non Basmati		Total	
	Quantity	Value	Quantity	Value	Quantity	Value
1991-92	266.53	499.18	411.94	256.41	678.47	755.59
1992-93	324.79	800.64	255.62	174.96	580.41	975.60
1993.94	527.23	1061.26	565.19	225.46	1092.42	1286.72
1994-95	442.13	865.32	448.5	340.47	890.63	1205.79
1995-96	373.31	850.67	5040.7	3717.41	5414.01	4568.08
1996-97	523.16	1247.64	1989.04	1924.72	2512.20	3172.36
1997-98	593.32	1685.62	1795.74	1985.38	2389.06	3671.00
1998-99	597.79	1876.91	4365.89	4403.85	4963.68	6280.76
1999-2000	638.38	1780.34	1257.79	1345.58	1896.17	3125.92
2000-01	849.02	2154.94	682.27	777.26	1531.29	2932.20
2001-02	667.07	1842.77	1541.49	1331.37	2208.56	3174.14
2002-03	708.79	2058.47	4259.08	3772.77	4967.87	5831.24
2003-04	771.49	1993.05	2640.57	2174.94	3412.06	4167.99
2004-05	1163.00	2823.9	3615.1	3945.02	4778.10	6768.92
2005-06	1166.57	3043.1	2921.6	3178.17	4088.17	6221.27
2006-07	1045.73	2792.81	3702.22	4243.1	4747.95	7035.91
2007-08	1183.36	4344.58	5286.08	7410.03	6469.44	11754.61
2008-09	1556.41	9477.03	931.89	1687.37	2488.3	11164.40
2009-10	2016.87	10889.46	139.54	365.3	2156.41	11254.76
2010-11	2027.62	9781.07	91.759	220.71	2119.379	10001.78
2011-12	3145.225	15335.80	3953.94	22085.84	7099.165	37418.64
2012-13	3461.95	18985.37	6691.69	13930.19	10153.64	32915.56
Source : Agricultural Statistics at a glance ,Custom & DGCIS						

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CHAPTER- 6

Genetic Potential

6.1 Molecular Breeding

There are several ways to alter presently existing rice varieties. Now, marker-assisted methods can be used to select the wanted genes within a species or in transgenic alien genes can be used to get particular traits. Before molecular markers came on the scene, the evaluation of genetic factors associated with dominant traits was done using biometrical methods. The advantage with rice is that, since rice whole genome sequence is readily available it can be used to identify genes that are responsible for significant phenotypic variation.

6.2 Super rice

Scientists at the International Rice Research Institute in the Philippines have developed “Super Rice" a high-yielding rice genotype for the future which increases harvests by 25 percent. It is far less bushy as each plant consists of only 10 stems or so in comparison with 20 to 25 tillers of the traditional rice plant. Besides that, a single super rice plant can produce 2,500 grains of rice compared to 1,500 grains from conventional plant.

6.3 Herbicide Tolerance Rice

Repeated use of herbicides in rice fields often leads to the growth of herbicide resistant weeds. There are hundreds of these weeds and especially *Oryza rufipogon* and *Echinochloa crusgalli* cause the maximum problems. This means that, the rice farmers have to alternatively use several herbicides or mixtures of different herbicides with no guarantee that these herbicides would be harmful to the rice plant as well.

As herbicide tolerance was often due to a single gene, the idea has been to create rice plants with the mammalian P450 enzyme that could detoxify several of these herbicides and make these rice plants tolerant to herbicides. Now, a transgenic rice plant with human gene CYP2B6 not only give good yields but also shows high herbicide tolerance capacity. They could detoxify several herbicides such as thiocarbamates, oxyacetamides and 2, 6-dinitroanilines. Such varieties will be extremely useful in weed control labor costs saving for weeding.

6.4 Insecticides resistance rice variety

Bt proteins have been successful against some insects but have failed against building resistance to larvae of *Scirpophaga incertulans* an important insect in Asian rice fields. To solve this problem the introduction Bt genes into rice is reckoned as a possibility so that they can produce toxins that combat the insects. Like all proteins, Bt toxins are coded for by genes (stretches of DNA found in the cells) and only a single gene encodes each Bt toxin. Other pests that need to be countered are yellow stem border caterpillar, and *Chilo suppressalis* (found in temperate areas). So bio-technology helps in avoiding the use of insecticides that harm both the environment and the farmers.

6.5 Nutrition value

Using genetic engineering techniques rice varieties can be genetically modified to produce beta-carotene (pro-Vitamin A) in the seed endosperm tissue. Golden Rice varieties (having gene that produces vitamin A) are being developed. Although the precise amount of beta-carotene that Golden Rice variety can produce is not clear, the fact remains that it could still be beneficial to millions of people with Vitamin-A deficiency that could possibly lead to blindness. Similarly research is underway to fortify rice with iron using molecular assisted breeding techniques as it could help reduce anemia in women. These efforts are particularly important, as rice being a staple food of the masses.

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Chapter 7

Crop Production Practices

7.1 Methods of rice cultivation

In India rice is mainly grown in two types of soils i.e. (i) uplands and (ii) low lands. The methods of cultivation of rice in a particular region depends largely on factors such as situation of land, type of soils, irrigation facilities, availability of labourers, intensity and distribution of rainfalls. The crop of rice is grown with the following methods:-

(i) Dry or Semi-dry upland cultivation

(a) Broadcasting the seed (b) Sowing the seed behind the plough or drilling.

(ii) Wet or lowland cultivation

(a) Transplanting in puddled fields. (b) Broadcasting sprouted seeds in puddled fields.

7.2 Selection of Seeds

The use of quality seeds in cultivation of rice is an important factor to get better crop yield. Therefore, proper care has to be taken in selecting the best quality seed of the recommended variety. Seeds intended for sowing should satisfy the following requirements:

a. The seed should belong to the proper variety, which is proposed to be grown.

b. The seed should be clean and free from obvious mixtures of other seeds.

c. The seed should be mature, well developed and plump in size.

d. The seed should be free from obvious signs of age or bad storage

e. The seed should have a high germinating capacity.

Before sowing the seed should be treated with fungicides which protects the seed against soil-born fungi and also give a boost to the seedlings establishment and growth.

7.3 Methods of Nursery Raising

There are three major methods of raising nursery - viz.

i. The dry nursery where the dry seed is sown in dry soil. This method is practiced in areas where water is not sufficient to grow seedlings in wet nursery
ii. Wet nursery where sprouted seed is sown on the moist puddled soil. Wet nurseries are preferred under irrigated condition
iii. And the "dapog" method. This method of raising nursery has been introduced in India from Philippines.

"Dapog" method is commonly prevalent in Philippines. The essential feature of this method is to have a very thick stand of the nursery seedlings without any contact with the soil. Generally, seedlings become ready for transplanting in 12 to 14 days.

7.4 Seed Rate

The seed rate naturally influences the growth of the seedlings. Thin sowing gives strong and tillered seedlings, whereas thick sowing provides thin and tall seedlings without tillers. Thin sowing in nurseries is always better and it will produce strong and sturdy seedlings, which can withstand adverse climatic conditions better and produce better yields. Therefore, 40 to 60 grams of seed per square metre should be sown in the nursery beds. About 500 square meter area of nursery is sufficient to transplant one hectare area. In case of late sowing of nursery, the nursery area should be increased to 750-1000 square meter.

7.5 Transplanting

Before transplanting, field should be puddled properly with bullock or tractor drawn puddlers. Puddling helps to kill the weeds and buries them in puddled soils. It also suppresses the germination of weeds in subsequent growing period of crop. Puddling keeps the soil surface in a more even condition, besides creating beneficial physical, biological and chemical conditions for rice plant growth.

Transplanting should be done with proper age of seedlings. In case of short duration varieties, the seedlings should be uprooted from the nursery beds for transplanting, when it is three to four

weeks old. In case of medium and long duration varieties, four to five weeks old seedlings may be transplanted. Always healthy seedlings should be used for transplanting at the four to five leaf stage or when they are about 15-20 cms. High. As far as possible, delayed transplanting should be avoided because it leads to poor tillerings, early flowering of the main tillers and resulting in reduction in yield. In alkaline soils seedlings of 45 days old should be transplanted because old seedlings establish better than young seedlings.

7.6 Spacing

Under good management and adequate nitrogen levels, the optimum spacing for varieties like IR-8 should be around 20 x10 cms both for kharif and rabi crops. With excellent cultural practices, the spacing may be slightly wider, say 20 x15 cms but under sub-normal conditions, the spacing should be slightly narrower, say 15 x10 cms.

7.7 Number of Seedlings per Hill

Transplanting two to three seedlings per hill under normal conditions is enough. The use of more seedlings per hill, besides not of any additional advantage, involves an extra expense on seedlings. In case of transplanting with old seedlings, the number of seedlings per hill can be increased.

7.8 Depth of Planting and Directions of Rows

The high yielding varieties are characterized with high tillering capacity. The high tillering potential of these varieties is, however, best expressed with shallow planting. The tiller buds formed at the basal node are not suppressed in case of shallow plantings. Therefore, the seedlings should be transplanted at 2 to 3 cm depth. Shallow planting gives better yields. The deeper planting results in an increased height of the plants besides delays and inhibits tillering. The crop planted with rows running in the north-south direction generally gives better yield particularly in rabi season.

7.9 Practices in the Direct-Seeded Crops

The success of the direct seeded rice depends entirely on the monsoon rains, besides proper stand of crop. If sowing is done in a properly prepared land, proper stand of crop can be achieved. A

field with fine tilth facilitates the seed to come in contact with the soil moisture after drilling and enables the seed to germinate quickly and uniformly. Thus, an ideal preparation of the land will help to achieve a uniform stand, facilitate weeding and fertilizer practices. Therefore, with proper ploughings of the field and timely sowing, the direct seeded crop generally gives better yield.

7.10 Different Methods of Seeding

Seeding is done in three different ways - viz. (i) drilling i.e. sowing in the furrow behind a plough, (ii) dibbling and (iii) broadcasting. The light soils which generally come into conditions quickly, any method can be adopted. Seeding with drilling method has got a greater advantage over other methods, because of the uniformity of the stand and the control of the population of the plants per unit area. Heavy soils which do not come in conditions quickly, other methods except broadcasting are not feasible. It has been found that drilling or dibbling always gives considerably better yields than broadcasting system.

7.11 Broadcasting Sprouted Seeds in Puddled Land

This method is adopted in an area where agricultural labourers are not easily available for transplanting or some time labourers are very expensive. In this method field is prepared and puddled just like in the case of transplanting. About 100 kg seed is required for one hectare area. In the puddled field sprouted seeds with radical length of one to two milimeter are uniformly broadcast by hand.

7.12 Manure and Fertilizer Application

7.12.1 Organic manures are as much as important for rice cultivation as inorganic fertilizers. In case of upland rice cultivation, the use of bulky organic manure is very much desirable in order to maintain the physical condition of the soil and also to increase the water holding capacity of the soil for maximum utilization of rain water. In upland fields, 10-15 tonnes of well rotten Farm Yard Manure or compost should be applied in one hectare area preferably 4 to 6 weeks before sowing. Organic manures should be spread evenly on the upper surface of the soil and ploughed in to get it well mixed in the soil.

7.12.2 Application of chemical fertilizers depends basically upon (i) fertility status of the field and (ii) previous crop grown and amount of organic manure applied. Before deciding the fertilizer dose, soil test is advised to know the status of the nitrogen, phosphorus and potassium in the soil. After testing the soil, fertilizer dose should be calculated accordingly.

Soil fertility status varies in different agro climatic zones to a considerable extent. Therefore, common fertilizer dose cannot be recommended for all regions. The Department of Agriculture of various states and State Agriculture Universities formulate fertilizer recommendations for rice crop in their states keeping in view the variability in soil fertility and local conditions.

7.12.3 Due to variation in soil fertility, rainfall and climatic condition, a common dose of fertilizer can not be recommended for all regions. However, in general a level of 30 to 40 kg of nitrogen per hectare in kharif and 60 to 80 kg of nitrogen per hectare in rabi appears to be the optimum dose for the *tall indicas* and double that level for the high yielding varieties on soils of average fertility in the southern and eastern regions. In the northern region, where sunshine is available for longer hours, higher dose of nitrogen is beneficial in the kharif season.

7.12.4 The maximum efficiency can be obtained in the direct seeded upland rice by applying 50 per cent nitrogen dose, three weeks after seeding, 30 per cent at 45 days age and the rest at the boot-leaf stage. In order to obtain better results, full dose of phosphorus, potash and half dose of nitrogen should be applied before last puddling. Remaining half dose of nitrogen should be applied in two equal doses, first at tillering stage and second dose at panicle initiation stage.

7.12.5 Application of fertilizer in transplanted rice field is quite different from upland rice. A series of physical, chemical and biological reactions take place in transplanted rice fields due to presence of excess water in the field. In the root zone, anaerobic environment is formed from aerobic condition due to depletion of oxygen in the soil profile, which is responsible for gaseous loss of nitrogen fertilizer due to de-nitrification process.

This anaerobic environment also affects the behavior of phosphorus and micro-nutrients especially iron and manganese.

7.12.6 The soil in the transplanted rice fields after puddling develops two zones in water logged conditions. The upper layer of soils (1 to 10 mm thick) generally receives oxygen periodically from fresh supplies of irrigation water and turns in to brown colour called "Oxidised zone" and reacts like an unflooded upland soil. The remaining lower portion of puddled soil without oxygen is called "reduced zone". When ammonical nitrogen fertilizer is applied in such soils, it gets oxidised to nitrate (NO_3) form in the oxidised zone (upper surface layer of the soil). Afterwards nitrate nitrogen is leached down to the reduced zone and further gets denitrified to gaseous nitrogen. This gaseous nitrogen is lost. If ammonical nitrogen is incorporated in to the reduced zone of the soil, where it is held, the loss can be prevented. Fertilizers containing nitrogen in the nitrate form are more susceptible to loss of nitrogen through leaching and de-nitrification process. Therefore, ammonical form of nitrogen is found more beneficial for rice crop.

7.13 Water Management

The water requirement of rice crop is comparatively higher than any other crop of the similar duration. Assured and timely supply of irrigation water has a considerable influence on the yield of the crop. During the crop growth period, the water requirement is generally high at the initial seedling establishment stage. After the transplanting, water should be allowed to stand in the field at a depth of two to five centimeters till the seedlings are well established. The most critical stage for adequate water availability for rice crop is tillering to flowering and in this period the crop should not be subjected to soil moisture stress. The water supply should be ensured in required amount during panicle initiation to flowering stage. About five centimeters depth of water should be maintained in the field up to the dough stage of the crop. Before harvesting, water should be drained out from the field to allow quick and uniform maturity of grain.

7.14 Harvesting and Threshing

The quality paddy and rice depends to a great extent, on the harvesting of the crop at the correct maturity stage. Harvesting of the crop when it is not fully matured might result in loss of yield

with poor quality grains. If harvesting is delayed, losses may be incurred due to damage by rats, birds, insects, shattering and lodging. Thus, timely harvesting ensures better yield, good quality of grains, consumer acceptance and less breakage when milled. The right stage for harvesting as commonly understood by layman is when panicles turn into golden yellow and the grains contain about 20 per cent moisture. When the moisture in the paddy grains reaches 16-17 percent in the standing crop in the fields, the crop sustains a heavy loss owing to shattering and damage by birds and rodents. The traditional methods of threshing of paddy are trampling by bullocks or lifting the bundles and striking them on the raised wooden platform. Now pedal threshers are being used. Power driven stationary threshers are also used for quick threshing.

7.15 Rice Growing Season in India:

7.15.1 In India rice is grown under widely varying conditions of altitude and climate. Therefore, the rice growing seasons vary in different parts of the country, depending upon temperature, rainfall, soil types, water availability and other climatic conditions. Two or three crops of rice are grown in a year in eastern and southern states due to moderate mean temperatures. In northern and western parts of the country, where rainfall is high and winter temperature is fairly low, only one crop of rice is grown during the month from May to November. There are three seasons for growing rice in India viz. - autumn, winter and summer. These three seasons are named according to the season of harvest of the crop. Autumn rice is known as pre-kharif rice. The sowing of pre-kharif rice is taken up during May to August. However, the time of sowing slightly differs from state to state according to weather condition and rainfall pattern. It is harvested in September-October. Autumn rice crop is known as 'Aus' in West Bengal, 'Ahu' in Assam, 'Beali' in Orissa, 'Bhadai' in Bihar, 'Virippu' in Kerala and 'Kuruvai/kar/ Sornavari' in Tamil Nadu. About 7 per cent of rice crop is grown in this season. The varieties grown during this season are mostly short duration ranging from 90 to 110 days.

7.15.2 The main rice growing season in the country is the 'Kharif'. It is known as winter rice as per the harvesting time. The sowing time of winter (kharif) rice is June-July and it is harvested in November-December. Winter rice is known as 'Aman' in West Bengal, 'Sali' in Assam, 'Sarrad' in Orissa, 'Agahani' in Bihar and Uttar Pradesh, 'Sarava' in

Andhra Pradesh, 'Mundakan' in Kerala and 'Samba/Thaladi' in Tamil Nadu. About 84 percent of the country's rice crop is grown in this season and generally, medium to long duration varieties are grown in this season.

7.15.3 Summer rice is called as Rabi rice. It is known as 'Boro' in Assam and West Bengal, 'Dalua'in Orissa, 'Dalwa' in Andhra Pradesh, 'Punja' in Kerala and 'Navarai' in Tamil Nadu and 'Garma' in Bihar. The sowing time of summer rice is November to February and harvesting time is March to June. The area under summer rice is only 9 per cent and early maturing varieties are mostly grown in this season.

7.15.4 The sowing/harvesting period of autumn, winter and summer rice, region/state-wise are shown below –

Region/ State	**Autumn**		**Winter**		**Summer**	
	Sowing	**Harvesting**	**Sowing**	**Harvesting**	**Sowing**	**Harvesting**
A. Northern Region						
a. Haryana	May-Aug	Sep- Nov				
b. Punjab	May-Aug	Sep- Nov				
c. West U.P	June-July	Sep-Nov				
d. H.P	June-July	Sep-Nov				
e. J& K			Apr-July	Sep-Dec		
B. Western Region						
a. Gujrat			Jun-Aug	Oct-Dec		
b. Maha-rashtra			Jun-Aug	Oct-Dec		
c. Rajash-than			July-Aug	Oct-Dec		

C. North Eastern Region						
a. Assam	Mid Feb-Apr	June-July	June-Aug	Nov-Dec	Dec-Feb	May-June
b. East M.P	June-Aug	Mid Sep-Mid Dec				
c. Orissa	May -June	Sep-Oct	June-Aug	Dec-Jan	Sec-Jan	May-june
d. East U.P	May-July	Sep-Nov	July-Aug	Nov-Dec	Jan-Feb	Apr-June
e. West Bengal	Mar-June (Broadcasting) May-June (Transplant-ing)	July-Nov	Mar-June (Broadcast-ing) May-June (Transplant-ing)	Nov-Dec	Oct-Feb	April- May
D. Southern Region						
a. A. P.	Mar –apr	July-Aug	May-June	Nov-Dec	Dec-Jan	Apr-May
b. Karna-taka	May-Aug	Sep-Dec	June-Oct	Nov-Mar	Dec-Feb	Apr-July
c. Kerala	April-June	Aug-Oct	Sep-Oct	Jan-Feb	Dec-Jan	Mar-Apr
a. Tamil Nadu			Early Samba		Late Samba	
a. Sonavari	April-may	July-Aug	June-July	Nov-Dec	Oct-Nov	Mar-Apr
b. Kar	May-June	Aug-Sep	July-Aug	Dec-Jan	Dec-Jan	Apr-May
			THALADI/Pishanam			
a. Kuruvai	June-July	Sep-Oct	Sep-Oct	Dec-Jan		

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Chapter 8

CROPPING PATTERNS

India has a wide range of soil and climatic conditions and cropping pattern vary widely from region to region and to a lesser extent from one year to another year. In fact for deviding cropping patterns, it is necessary to divide the country into homogeneous regions based on physical, climatological or agronomic. While making division, the climatic index and the soil group may be taken into consideration. The soil and the climate are the important factors for adoption of cropping patterns, hence they constitute a better criterion for crop-zoning. Adoption of high yielding varieties on a large scale, increased use of fertilizers, plant protection chemicals and expansion in irrigated areas led to shifting in areas towards crops in which the impact of improved production technology on yield was apparent. Area under rice as proportion of total cropped area is about 26 per cent (2011-12).

8.1 Rice Cropping Patterns

The cropping pattern in different Agro-climatic zones has been adopted by the farmers after long experience based on suitability of soil, profitability, availability of market and industrial infrastructure and quantum of water available. Techniques such as relay cropping, inter cropping, mixed cropping, minimum tillage, weed control and use of fertilizers and pesticides have helped not only in reducing the cost of cultivation but also in sustaining high level of production over a period of time. Scientific cropping patterns can actually result in increased soil productivity by improving the physical, chemical and micro-biological properties of soils and increasing the fertility status. Some of the rice based cropping patterns being followed in the country are discussed below:

8.1.1 Rice-Rice - Rice This crop rotation is most suitable for areas having high rainfall and assured irrigation facilities in summer months, particularly, in soils which have high water holding capacity and low rate of infiltration. In some canal irrigated areas of Tamil Nadu, a rice cropping pattern of 300per cent intensity is followed. In such areas three crops of rice are grown in a year.

8.1.2 Rice –Rice -Cereals (other than rice) This cropping pattern is being followed in the areas where the water is not adequate for taking rice crop in summer. The alternate cereal crops to rice being grown are Ragi, Maize and Jowar.

8.1.3 Rice –Rice -Pulses In the areas where, there is a water scarcity to take up cereal crops other than rice in summer, the short duration pulse crops are cultivated.

8.1.4 Rice -Groundnut This cropping pattern is being followed by the farmers of Andhra Pradesh, Tamil Nadu and Kerala. After harvesting of rice crop, groundnut is grown in summer.

8.1.5 Rice -Wheat This crop rotation has become dominant cropping pattern in the Northern parts of the country. Among the different cropping patterns followed in the country, rice-wheat cropping pattern is the largest one. The rice-wheat cropping pattern is being practiced in the Indo-Gangetic plains of India since long time.

8.1.6 Rice -Wheat-Pulses In this sequence of cropping pattern, after harvesting of wheat, green gram and cowpea as fodder are grown in the alluvial soil belt of Northern states. Besides, cowpea is grown in red and yellow soils of Orissa and black gram is grown in the black soils.

8.1.7 Rice -Toria-Wheat This crop sequence is commonly followed in Northern parts of the country. A short duration toria crop is raised between the period after harvest of short duration rice and wheat sowing.

8.1.8 Rice -Fish farming system The field with sufficient water availability for a long period and free from heavy flooding are suitable for rice-fish farming system. This system is being followed by the small and marginal farmers in rain fed lowland rice areas. A good rice-fish farming system can be seen in Zero district of Arunanchal Pradesh. The farmers in this region take a modest crop of traditional low yielding rice varieties along with fish culture.

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Chapter 9

Rice Milling and It's Products

9.1 Rice Milling

Paddy in its raw form can not be consumed by human beings. It needs to be suitably processed for obtaining rice. Rice milling is the process which helps in removal of hulls and bran from paddy grains to produce polished rice. Rice forms the basic primary processed product obtained from paddy and this is further processed for obtaining various secondary and tertiary products. The basic rice milling processes consist of Pre Cleaning, De-stoning, Parboiling, Husking, Husk Aspiration (Separating the husk from brown rice/ unhusked paddy), Paddy Separation (Separating the unhusked paddy from brown rice), Whitening (Removing all or part of the bran layer and germ from brown rice), Polishing (Improving the appearance of milled rice by removing the remaining bran particles and by polishing the exterior of the milled kernel), Length Grading (Separating small and large brokens from head rice), Blending (Mixing head rice with predetermined amount of brokens, as required by the customer), Weighing and bagging (Preparing the milled rice for transport to the customer).

9.2 Types of Rice Mill

Many of the rice processing units in India are of the traditional huller type and are inefficient. Modern rice mills are having high capacity and are capital intensive, although efficient small modern rice mills have been developed. Most of the small size mills are huller mills. Other various types are Battery of Huller mills, Huller-cum-Sheller mills, Sheller mills and modern mills. The process for modernization of rice milling industry in the country was initiated in 1970 with a view to obtain higher yields of rice and better quality of by-products such as bran and husk, suitable for edible oil/industrial oil extraction and as a source of fuel respectively.

9.3 Traditional Method

Before the advent of mechanical milling, hand-pounding traditional method of rice milling was in practice. In fact, hand-pounding rice has got more nutritive value as compared to machine milling rice. In hand-pounding, a variety of implements is used such as:

- Mortor and Pestle
- Dhenki
- Hand Stone (Chakki)

9.4 Mechanical Method

With the introduction of mechanized mills, hand-pounding method has steadily decreased because it could not compete with machine mills. The conventional mills in use can be categorized into three main types:

- Huller mills
- Sheller-Huller mills
- Sheller cum Cone Polisher mills.

9.5 Rice Products

Rice is the primary source of carbohydrates and protein besides, rice also contains small quantities of fat, ash, fibre and moisture. Vitamins and mineral are present largely in bran and germ. Its byproducts form important components of poultry and dairy feed. The byproducts which we get from paddy milling are rice bran and husk. The amount of rice bran is approximately five per cent of paddy processed. The rice bran is a pericarp or outer cuticle layer that remains beneath the hull. It gets removed during the milling process. About two decades back, rice bran was considered almost a waste and hence most of it was burnt. It is now viewed to have high nutritive value. Being rich in protein and natural Vitamin B, rice bran is used as a cattle feed. The rice bran processing has now gained momentum, with increasing consumer demand for bran oil, extracted from bran.

9.6 Use of Rice and it's by products like rice husk, rice bran and paddy straw

Rice plant produces approximately 50 per cent rough rice and another 50 per cent straw on weight basis. The rough rice, on milling, produces brown rice, milled rice, germ, bran, broken and husk. Each of these components has unique properties and can be used in a number of ways. The utilization pattern of these components directly or as derivatives decides the extent of value addition in rice.

9.6.1. Utilization of Rice Straw

At farmers levels, rice straw is mainly used for thatching, as cattle feed and the woody portion as fuel. Sometimes a portion of the straw is ploughed back in to the soil to be reused as bio-fertilizer. In handicraft industry, rice straw is used in making certain fancy products like bags, wall hanging etc. Rice straw along with others fibrous materials can be used to prepare pulp for making boards and papers. Rice straw is cut in to pieces and then used for making beds for growing mushroom.

9.6.2 Utilization of Paddy

Paddy is mainly used for consumption as whole milled rice either in raw or parboiled condition.

Beaten rice is a value added products made from paddy and is popular in all parts of India. People of all age groups from all sections like it and thus it is a mass consumption item. Paddy when directly propped in hot sand produces a white expanded product called khai. After removing the husk, it is consumed as a snack food.

9.6.3 Utilization of brown rice

When the outer most layer of paddy (husk) is removed, the resultant product is the brown rice. It is rich in vitamin B_1, B_2, B_3, B_6 and iron as compared to polished white rice. Brown rice can be stored well in hermetic storage or freezing condition.

9.6.4 Utilization of polished white rice

Polished white rice is mainly consumed as a staple food after cooking. A few value added product like quick cooking rice and rice cake can be produced from this white rice.

9.6.5 Utilization of parboiled rice

Parboiled rice is also consumed as a staple food in many parts of India. Value of this product mainly depends on its quality in terms of size (short & long), colour, texture, smell etc. The few value added products that can be made from parboiled rice are: quick

cooking parboiled rice and puffed rice. Furthur value can be added to the puffed rice by making puffed rice balls with jaggery and other ingredients.

9.6.6 Utilization of rice broken

The broken rice which brings one third the value of whole rice grain in the market for direct consumption such as in the form of Idli/ Dosa or sold as poultry feed. This low value material can be converted into several value added products like rice noodles, vermicelli, rice alcohol, rice flour and rice ethanol. Rice flour is used in many foods including baby foods, chips and crackers. The unique properties of rice flour also make it a prime candidate for producing resistant starch, a food ingredient that acts like a fiber in the human body and thus provides the health benefits of fiber. Gluten free rice bread is a highly popular value-added product made from rice broken on old rice stocks in Japan.

9.6.7 Utilization of rice husk

Potential availability of rice husk in the country as a by-product of milling industry is about 24 million tons annually. As a renewable resource, its proper utilization would add enough value to the rice crop. The two major components like carbon & silica present in the rice husk make it possible to develop several value added products.

(a) Direct use of husk

Use of husk for production of thermal energy using various types of furnaces is quite common these days.Some other uses of husk areas soil mulch, poultry litter, making particle board, insulation material, packing material etc.

(b) Products based on carbon compounds

It is possible to convert the carbon compounds by a process similar to dry distillation of wood such as producer gas, furfural, activated charcoal, lignins, oxalic acid and bear like beverage.

(c) Products based on silica content

Silica is extracted from rice husk either in the form of sodium silicate or by burning the husk as fuel to produce ash, which mostly contains silica. Crude ash obtained from husk fired furnace is used as insulation covers for steel ingots, abrasives in metal cleaning, carrier for fungicides, insecticides and catalysts, floor sweeping aid, light weight refractory bricks, lime silica bricks and sodium silicate. High purity silica for production of sintered glass ware can be obtained from husk ash by acid leaching. High purity silicon powder can be produced by reducing the high purity husk silica by metals like magnesium or calcium.

9.6.8 Utilization of rice bran:

Rice bran is the most valuable by-product of rice milling industry. It contains 18-20 % of fat, 14-15 % protein and to some extent of minerals and vitamins. Usually solvent extraction method is employed to extract oil from rice bran. Maximum cash benefit is therefore possible through judicious use of rice bran in a variety of ways. The crude rice bran oil can be used for manufacturing of soap, enamel paints, varnishes, detergent, metal soap and squalene (for skin disease) can be extracted from crude bran oil.

The edible grade rice bran oil can be prepared by refining the crude oil in order to make the refining process economical, the oil may either be extracted or the bran should be stabilized immediately after its removal from brown rice. The free fatty acid of rice bran other wise increases very rapidly owing to the presence of lipase making the oil uneconomical for refining. Stabilization can be done either by acid treatment or dry/wet heat treatment. De-oiled bran is most commonly used as animal feed or as fertilizer.

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Chapter 10

Pest, Diseases and Weeds of Rice

10.1 Insect Pests of Rice

Crop Stage	Insect Pests	Control measures
Nursery	Stem-borer, gall midge, thrips, root-knot nematode, root nematode and white tip nematode	• For insect-pests and nematodes, apply Phorate 10 G @ 12.5 kg/ha or Fipronil 0.3 G @ 33 kg/ha of nursery, 5 to 7 days before pulling the seedlings for transplanting or spray with Chlorpyriphos 20 EC @ 2,500 ml/ha or Quninalphos 25 EC @ 2,000 ml/ha. • In the stem-borer endemic areas, install pheromone traps with 5 mg lure @ 8 traps/ha for pest monitoring and 20 traps/ha for direct control through mass trapping • In gall midge/stem-borer-endemic areas apply phorate 10 G/ha 5 to 7 days before pulling the seedlings for transplanting.
Vegetative stage	Stem-borer	• Clipping of leaf tips of the seedlings at the time of transplanting will help in destruction of egg masses. • Clean cultivation and destruction of stubbles. • Apply Cartap 4 G @ 25 kg/ha or Phorate 10 G @ 10 kg/ha or Fipronil 0.3 G @ 25 kg/ha or Chlorpyriphos 10 G @ 10 kg/ha. • Install pheromone traps with 5 mg lure @ 8 traps/ha for pest monitoring or 20 traps/ha for direct control through mass trapping. Replace lures at 25 to 30 days interval during the crop period. • Inundative release of egg parasitoid, *Trichogramma japonicum* 5 to 6 times @ 100,000 adults/ha starting from 15 days after transplanting.
	Gall midge	• Apply Fipronil 0.3 G @ 25 kg/ha or Phorate 10 G @ 10 kg/ha
	Green leafhopper	• Spray Carbaryl 50 WP @ 900 g ha or BPMC 50 EC @ 600 ml/ha or Acephate 50 WP @ 700 g/ha or Ethofenprox 10 Ec @ 500 ml/ha or Imidacloprid 200 SL @ 125 ml/ha or Thiamethoxam 25 WG

		@ 100 g/ha or Clothianidin 50 WDG 30 g/ha. Alternatively, apply Phorate 10 G @ 12.5 kg/h or Fipronil 0.3 G @ 25 kg/ha.
	Hispa	• Spray Triazophos 40 EC @ 400 ml/ha or Phosalone 35 EC @ 850 ml/ha or Chlorpyriphos 20 EC @ 1,500 ml/ha or Quinalphos 25 EC @ 1,200 ml/ha or Ethofenprox 10 EC @ 450 ml/ha or Fipronil 5 SC @ 600 ml/ha
	Leaf folder	• Spray Chlorpyriphos 20 EC @ 1,500 ml/ha or Cartap 50 WP @ 600 g/ha or Quinalphos 25 EC @ 1,200 ml/ha or Acephate 50 WP @ 700 g/ha or Fipronil 5 SC @ 600 ml/ha or Phosalone 35 EC @ 850 ml/ha or Carbaryl 50 WP @ 900 g/ha or Triazophos 40 EC @ 400 ml/ha or apply Cartap 4 g @ 25 kg/ha • Inundative release of egg parasitoid, Trichogramma chilonis 5 to 6 times @ 100,000 adults/ha starting from 15 days after transplanting
	Whorl maggot	• Apply Fipronil 0.3 G @ 25 kg/ha or Chlorpyriphos 20 EC @ 1,500 ml/Ha
	Case worm	• Drain water from the field and spray Carbaryl 50 WP @ 900 g/ha or apply Carbaryl dust @ 30 kg/ha
	Mealy bug	• Spot application of Phorate 10 G granules
Reproductive Stage	Stem-borer	• Spray Cartap 50 WP @ 800 g/ha or Chlorpyriphos 20 EC @ 2,000 ml/ha or Quinalphos 25 EC @ 1,600 ml/h
	Brown planthopper, White backed planthopper	• Spray Imidacloprid 200 SL @ 125 ml/ha or Thiamethoxam 25 WG @ 100 g/ha or Ethofenprox 10 EC @ 500 ml/ha or Acephate 50 WP @ 950 g/ha or BPMC 50 EC @ 600 ml/ha or Carbaryl 50 WP @ 900 g/ha
	Green leafhopper	• Spray Imidacloprid 200 SL @ 125 ml/ha or Thiamethoxam 25 WG @ 100 g/ha or Ethofenprox 10 EC @ 500 ml/ha or Acephate 50 WP @ 950 g/ha

		or BPMC 50 EC @ 600 ml/ha or Carbaryl 50 WP @ 900 g/ha
	Leaf folder	• Spray Cartap 50 WP @ 800 g/ha or Chlorpyriphos 20 EC @ 2,000 ml/ha or Phosalone 35 EC @ 1,100 ml/ha or Quinalphos 25 EC @ 1,600 ml/ha or Triazophos 40 EC @ 500 ml/ha or apply Cartap 4 G @ 25 kg/ha
	Ear-cutting caterpillar/ cut worm	• Spray Quinalphos 25 EC @ 1,600 ml/ha or Chlorpyriphos 20 EC @ 2,000 ml/ha or Carbaryl 50 WP @ 1,500 g/ha or Phosalone 35 EC @ 1,100 ml/ha
	Leaf/Panicle mite	• Spray Sulphur wettable powder @ 3 g/litre, Dicofol @ 5.0 /ml/litre or Profenophos 50 EC @ 2.0 ml/litre water.
	Gundhi bug	• Spray Carbaryl 50 WP @ 1,500 g/ha during afternoon hours. • Dust Malathion or Carbaryl @ 30 kg of the formulation/ha

10.2 Important diseases

Disease/Crop stage/season	States/Places endemic	Control measures
Leaf blast Nursery and vegetative Kharif and rabi	Leaf blast is favoured by the low night temperature (22-28 ^{o}C), high relative humidity (>95%), dew deposit, leaf wetness for more than 10 hours and high nitrogen. The disease is a serious problem in upland, irrigated and hilly ecosystems. In high rainfall zones (rainfall >_1,500 mm) of north and north-eastern India, the disease is prevalent during June-September. In Western and Central India (rainfall around 1,000 mm) the disease occurs during August-October. In Southern India blast mainly occurs in dry season during November-February. During kharif season, the disease is preva-	• In endemic areas, adopt seed treatment with Tricyclazole 75 WP @ 2 g/kg or Carbendazim 50 WP @ 1 g/kg. • Spray Tricyclazole 75 @ 0.6 g/litre or Carpropamid 30 SC @ 1ml/litre. Or Isoprothiolane 40 EC @ 1.5 ml/litre or Iprobenphos 48 EC @ 2ml/litre or Propiconazole 25 EC @ 1ml/ litre or Kasugamycin-B 3 SL @2.5 ml/litre or Carbendazim 50 WP @ 1 g/litre.

	lent throughout the rice-growing areas in India especially in Himachal Pradesh, Uttarakhand, Jharkhand, Madhya Pradesh, Chhattisgarh, Asom, Tripura, West Bengal, Orissa, parts of Maharashtra, Andhra Pradesh, Kerala, Karnataka and Tamil Nadu. During rabi season, the disease is prevalent in Southern States like Andhra Pradesh, Tamil Nadu, Karnataka. The disease is also common on boro rice in the states of Asom, Tripura, Eastern Uttar Pradesh, Orissa and West Bengal.	• Grow resistant / tolerant varieties like Rasi, IR 64, Prasanna, IR 36, Vikas, Tulasi, Sasyasree etc.
Neck blast Flowering and after kharif/rabi	The neck blast phase of the disease is prevalent in the states like Andhra Pradesh, Asom, Chhattisgarh, Himachal Pradesh, Karnataka, Orissa and Uttarakhand. The disease is of common occurrence in boro rice in the states of Asom and Tripura.	• Spray Tricyclazole 75 WP @ 0.6 g/litre or Carpropamid 30 SC @ 1 ml/litre or Isoprothiolane 40 EC @ 1.5 ml/litre or Iprobenphos 48 EC @ 2 ml/litre or Propiconazole 25 EC @ 1 ml/litre or Carbendazim 50 WP @ 1 g/litre.
Sheath blight Maximum tillering, panicle initiation to booting stage kharif/rabi.	Sheath blight is a serious problem in coastal and high rainfall areas. The disease is mostly prevalent in areas where the relative humidity is very high (above 95%), the temperature is moderate (28-32 ^{0}C) and N application is high. The disease is prevalent in moderate to severe form in states like Andhra Pradesh (coastal), Asom, Bihar, parts of Chhattisgarh, Orissa, eastern Uttar Pradesh, West Bengal, Kerala, Haryana and Punjab. In boro season the disease has been observed regularly in moderate form in the states of Asom, Bihar, eastern Uttar Pradesh.	• Spray Validamycin 3 L @ 2.5 ml/litre or Thifluzamide 24 SC @ 0.75 g/litre or Hexaconazole 5 EC @ 2 ml/litre or Propiconazole 25 EC @ 1ml/ litre or Carbendazim 50 WP @ 1g/litre • Reduce or delay the top-dressing or nitrogen fertilizer and apply in 2-3 splits
Brown spot Vegetative stage	Brown spot is problem mainly during kharif season especially in uplands and hill ecosystem. The disease also assumes a serious proportion in irrigated ecosystem especially in ill-managed plots. The disease is predomi-	• In endemic area, adopt seed treatment with Carbendazim (12%) + Mancozeb (63%) combination 75 WP @ 2 g/kg or Carbendazim 50 WP @ 2

Kharif/rabi	nant in Jharkhand, eastern Uttar Pradesh, Bihar, Chhattisgarh, tarai region of West Bengal, Orissa, Asom, Tripura, Uttarakhand and Punjab. The boro rice the disease has been recorded in the states of Asom, Bihar and eastern Uttar Pradesh.	g/kg or spray Carbendazim 50WP @ 1g/litre or Chlorothalonil 75 WP @ 2g/litre or combination of Carbendazim or Mancozeb (63%) 75 WP @ 2 g/litre or Mancozeb 75 WP @ 2.5 g/litre • Growing of resistant/tolerant varieties like Rasi, Jagnanath, IR 36 etc.
False smut Post-flowering stage Kharif	False smut of rice has emerged as a major disease in the recent years. The incidence of the disease is particularly more on hybrid varieties. The incidence of the disease is more in those years when spells of wet weather coincide with the heading stage. The disease is favoured by the prevalence of relatively low temperature and high humidity with moderate rainfall well distributed during the period of flowering. The incidence of the disease is more in states like Haryana, Punjab, Uttarakhand, Bihar, Chhattisgarh, Gujarat, Jharkhand, Orissa, Uttar Pradesh, Himachal Pradesh, Jammu and Kashmir, Maharashtra and Tamil Nadu.	• Spray Propiconazole 25 EC @ 1 ml/litre or Chlorothalonil 75 WP @ 2 ml/litre or Copper oxychloride at around flowering.
Sheath rot and grain discoloration Post-flowering stage Kharif	Sheath rot and grain discolouration are especially more in crops affected by stem-borer, rice tungro disease and various other biotic and abiotic stresses. In cytoplasmic male sterile lines (A lines) where the emergence of the panicles is poor, the incidence of sheath rot is very high. Grain discolouration of rice has become a serious problem in recent years especially when there is post-flowering rain. A variety of micro-organisms, viz. *Drechslera Oryzae, Sarocladium oryzae, Alternaria padwickii, Curvularia spp., Epicoccum sp., Fusarium moniliforme* etc. have been found asso-	• In endemic area adopt seed treatment with Mancozeb 75 WP @ 2.5 g/kg or Captan 50 WP • Spray Mancozeb 75 WP @ 2.5 g/kg or Propiconazole 25 EC @ 1 ml/litre or Hexaconazole 5 EC @ 2 ml/litre or Thiophanate methyl 70 WP @ 1 g/litre.

	ciated with the grain discolouratrion. These problems have become wide spread in states like Andhra Pradesh, Tamil Nadu, Kerala, Orissa, Jharkhand, Bihar, West Bengal, Asom, eastern Uttar Pradesh, Gujarat, Haryana, Punjab, Uttarakhand and Chhattisgarh.	
Stem rot Panicle initiation to booting Kharif	Stem rot of rice has become an important disease of rice causing substantial loss due to increased lodging. The disease is favoured by high N fertilizers, high relative humidity, high temperature and waterlogging conditions. The disease is more in early planted crop because of high temperature and relative humidity prevailing during the susceptible stage of the crop. The disease is prevalent in Haryana, Bihar, Uttarakhand and Andhra Pradesh.	• Burning the rice stubbles after harvest. • Draining out the field. • Addition of organic manure reduces the disease. • Spray Iprobenphos 48 EC @ 2 g/litre of Carbendazim 50 WP @ 1 g/litre or Thiophanate methyl 70 WP 1 g/litre or Isoprothiolane 40 EC @ 1.5 ml/litre. • Growing of resistant varieties like Jalmagna, Latisali, Pankaj, Rasi, etc.
Foot rot/ **Bakanae** Vegetative Stage Kharif	Though the disease is of limited occurrence, it has potentiality to be highly serious. The disease is prevalent in Haryana, Tamil Nadu and Andhra Pradesh.	• Seed dressing with Captafol 80% @ 4 g/kg or Mancozeb 75 WP @ 2.75 g/kg. • When observed in nursery, spray Carbendazim 50 WP @ 1 g/litre
Bacterial blight Pre-tillering to mid-tillering and panicle initiation to booting Kharif	Bacterial blight is essentially a monsoon season disease. The intensity of the disease is much influenced by rainfall, cloudy, drizzling and stormy weather and high nitrogen fertilizer. The disease is prevalent in moderate to severe form in almost all the rice-growing areas during the monsoon season. The disease is prevalent in coastal Andhra Pradesh, Tamil Nadu, Kerala, Punjab, Ha-	• Apply judicious level of fertilization (60-80 kg N/ha with required level of potass-ium) without sacrificing the yield. Apply N in 3-4 splits. • Avoid field to field irrigation. • Avoid insect damage to the crop. • Destroy infected stubbles and

	ryana, Uttarakhand, Uttar Pradesh, Gujarat, parts of Maharashtra, Chhattisgarh, Bihar, West Bengal, Orissa and Asom.	weeds. • Avoid shade in the field. • Grow resistant/tolerant varieties like Ajaya, IR 64, Radha, Pantdhan 6, Pantdhan 10.
Rice tungro disease Nursery, tillering Kharif	Rice tungro disease is the most important virus disease of rice. It has been reported from many rice-growing areas of India. The disease is prevalent in Tamil Nadu, West Bengal, parts of Andhra Pradesh and Orissa.	• Remove and destroy infected plants and apply additional nitrogen for early recovery. • Incorporate Phorate 10 G @ 12-15 kg/ha or Fipronil 0.4 G @ 25 kg/ha or nursery in top 2-5 cm layer of the soil before sowing of sprouted seeds. If such incorporation is not possible, broadcast the recommended insecticides 4-5 days after showing in a thin film of water and allow this water to seep completely. • In the main crop, spray Carbaryl 50 WP @ 0.65 litre/ha or Fipronil 5 EC @ 1 litre/ha. • Grow resistant/tolerant variet-ies like Nidhi, Vikramarya, Radha, Annapurna, Triveni etc.

10.3 Weeds of Rice

(i) Grasses, Sedges and broad leaves weeds in upland rice

Sl.No.	Botanical Name	Common Name	Family
Grasses			
1.	Echinochloa colonum Echinochloa crusgali	Bansawan	Gramineae
2.	Cynodon dactylon	Doob grass	Gramineae
3.	Eleusine indica	Bankodo	Gramineae
4.	Dactyloctenium aegyptium	Makra	Gramineae
5.	Setaria glauca	Bottle grass	Gramineae
Sedges			
6.	Cyperus rotundus	Motha	Cyperaceae
Broad leaves			
7.	Caesulia axillarics	Thukaha(Gurguja)	Compositeae
8.	Eclipta alba	Bhangaria	Compositeae
9.	Euphoribia herita	Bari dudhi	Enphorbiaceae
10.	Solanum nigrum	Ban makoy	Solanaceae
11.	Leucces aspera	Gumma	Labiatae
12.	Phyllanthus niruri	Hazardana	Euphorbiaceae
13.	Lippia nodiflora	Mokana	Verbenaceae

(ii) Recommended dose and application time of Herbicides in Upland rice

Sl.No.	Herbicides	Recommended dose (Kg a.i. ha^{-1})	Application time
1.	Butachlor	1.5	Pre-emergence
2.	Pretilachlor	1.0	Pre and early emergence
3.	Pyrazosulfuronethyl	40 g	Pre and early post emergence
4.	Oxyflurofen	1.5	Pre-emergence
5.	Anilofos	0.2-0.4	Pre-emergence
6.	Trifluralin	1.5	Pre-plant
7.	2,4-D	1.0-1.5	Post emergence
8.	Thiobencarb	1.0-1.5	Post emergence
9.	Propanil	2-3	Post emergence
10.	Bentazone	2.0	Post emergence
11.	Phenoxaprop-p-ethyle	100 g	Early post emergence

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Chapter 11

STORAGE

11.1 Rice storage facilities take many forms depending on the quantity of grain to be stored, the purpose of storage, and the location of the store. In general, it is recommended that rice for food purposes be stored in paddy form rather than milled rice as the husk provides some protection against insects and helps to prevent quality deterioration. However, when rice is stored as brown rice, 20% less storage capacity is needed

The requirements for a good storage system include

- Prevention of moisture re-entering the grain after drying
- Protection from insects, rodents and birds
- Ease of loading and unloading.
- Efficient use of space
- Ease of maintenance and management.

11. 2 Safe Storage Conditions for Grain

Safe storage of rice for longer periods is possible if three conditions are met:

- Grain is maintained at moisture levels of 14% or less and seed is stored at 12% or less
- Grain is protected from insects, rodents and birds
- Grain is protected from re-wetting by rain or imbibing moisture from the surrounding air.

Grain and seed stored at moisture contents above 14% may experience the growth of molds, rapid loss of viability and a reduction in eating quality. The following table shows the 'safe' moisture content required for different storage periods.

Storage period	Required moisture content for safe storage	Potential problems
2 to 3 weeks	14 – 18 %	Molds, discoloration, respiration loss
8 to 12 months	12- 13 %	Insect damage
More than 1 year	9 % or less	Loss of viability

A rule of thumb for seed is that the life of the seed will be halved for every 1% increase in moisture content or a 5^{o}C increase in storage temperature.

11.3 Grain Storage systems

Grain storage systems can be classified as

(a) Bag storage system In most parts of Asia grain is stored in 40-80 kg bags made from either jute or woven plastic. Depending on the size of storage, these bags are normally formed into a stack. When using bag storage consideration needs to be given to the following:

- Jute bags should not be stacked higher than 4 m and plastic bags 3 m. Plastic bags are more slippery and the stacks will be less stable
- Bags should be stacked under cover e.g. under a roof, in a shed or granary or under water proof tarpaulins
- A one meter gap should be left between and around stacks and 1.5 meters clearance between the top of the stack and the roof
- Bags should be stacked on pallets or on an above ground structure to avoid the possibility of absorbing moisture from the floor.
- Bags should not be stacked on a bed of rice husks or bags filled with rice husks, as these are difficult to keep free from insect infestation.
- Bags should be stacked so that fumigation can be undertaken easily. The dimensions of the stacks should be set to facilitate sealing with a single fumigation sheet.

- The efficiency of bag storage can be improved if a plastic liner bag is used inside the existing storage bag especially for seed and milled rice

- Some farmers use bag storage in outside granaries, which have been constructed from timber or mud/cement or large woven bamboo or palm leaves.

(b) Bulk storage At farm level grain is often stored in bulk in small outside granaries or in woven baskets or containers made from wood, metal or concrete, which are located under or inside the house. These storages vary in capacity from 200-1000 kg. Losses from insects, rodents, birds and moisture uptake are usually high in traditional bulk storage systems.

(c) Hermetic Sealed storage Sealed or hermetic storage systems are a very effective means of controlling grain moisture content and insect activity for grain stored in tropical regions. Sealed storage containers come in all shapes and sizes. They may range from a small plastic container, a sealed 200-liter drum to the more complex and costly sealed plastic commercial storage units. Recent technological advances in plastic manufacturing have led to the development of PVC liners that provide the required durability to climate, gas permeability and physical properties that enable airtight storage for extended periods of time.

For storage of small seed lots a variety of plastic bags or packages can be used. Different types of plastic have different resistance against transmission of water vapor. Glass jars, hard PVC or bags containing aluminum liners or a gas barrier will provide the best protection against moisture re-entry.

11.4 Major Storage Pests in Rice

Rice storage pests include insects, pathogens, rodents and birds. These pests cause losses through a combination of feeding, spoiling and contamination of both paddy and milled grain.

Many different species of insects are found in rice but only a few are major pests. Insects in stored rice can be classified as either primary or secondary insects. **Primary Insects:** These are insects whose larvae feed entirely within the kernels of the grain. These include the rice weevil, angoumois grain moth and lesser grain borer. **Secondary Insects** are insects

that feed from the outside of the grain even though they may chew through the outer coat and devour the inside. Two of the more prevalent secondary insects are the Saw-toothed Grain Beetle and the Rust-red flour beetle

11.5 Management of storage insects

The management of stored grain pests should be done in a sequential and integrated manner. An effective pest control system involves

- Harvesting, drying and storage of clean dry grain
- Disinfecting the storage system and
- Controlling or preventing pest infestation during the storage period.

11.6 Harvesting, drying and storage

Grain must be dried to at least 14% moisture (wet basis) and seed grain should be dried to12% moisture before storage. Grain needs to be harvested and dried so that it will not cause cracking of the grain, as cracked grains are easier for insects to infest. This requires:

- Harvesting and threshing at the correct stage of maturity (20-25% moisture content)
- Drying the grain at a rate and temperature that will not damage the grain. The first stage of drying from 25% moisture to 18% can be done at high temperatures e.g. above 50-60^{o}C. After this the grain needs tempering or cooling for at least 4 hours. Drying from 18% to 14% moisture should be much slower and the temperature should not exceed 42^{o} C.

11.7 When sun drying, the grain should be spread in thin layers, 2-5 cm, and turned every 1-2 hours. When sun-drying seed, the grain should be turned more often and not exposed to temperatures above 42^{o}C. If high temperatures occur the seed should be dried in the shade. New grain should not be stored near older grain unless all insects have been eliminated from the older grain.

It is preferable to store grain as paddy or rough rice as this is less susceptible to insect attack than milled rice. Parboiled rice is also less susceptible to damage than raw rice.

11.8 Grain stores must have a damp proof floor and have waterproof walls and roof. It is preferable to be able to seal the storage so fumigation is possible should the need arise. Sealing the storage also helps exclude rodents and birds. Where grain is to be stored in bags, the bags should be stacked on pallets at least 50 cm away from the walls. Hermetic storage systems have proved to be an effective means of storing grain.

11.9 Disinfesting the storage system

Disinfestations require a systematic and thorough cleaning of all sources of infestation before storage. Old grain residues in the storehouses, grain bins, harvesting and threshing equipment should be treated, removed or destroyed.

Storage containers, structures and equipment can be treated with:

- Malathion (50 EC) at 5 ml /20 lit. of water @20 ml/m^2
- Fenitrothion (50 EC) at 5 ml/lit. of water @20 ml/m^2
- Deltamethrin (2.5% WP) at 1.5 g/lit. of water @20 ml/m^2

If thorough cleaning of containers is not possible, the containers may need to be sealed and fumigated with phosphine. All second hand bags should be examined and where necessary treated with either a fumigant, insecticide or dipped in boiling water. Solutions of Malathion (50EC) and Fenitrothion (50EC) at 5 ml/20 lit. of water and Deltamethrin (2.5% WP) at 1.5 g/lit. of water @20 ml/m2 can be used for dipping the bags.

11.10 Controlling infestations within the grain

Consumers are increasingly demanding grain that is free from live insects and free from chemical residues caused by controlling pests. While many chemical sprays are registered for rice, some markets will not accept grain treated with these registered chemicals. Farmers should al-

ways check with buyers to ensure that the pest control methods intended for use will be acceptable.

The first step in controlling any infestation is to determine the level of infestation and then select an appropriate method for control. All storage should be checked, preferably every fortnight, and at least monthly. Random samples need to be taken from all grain and tested for infestation. If there are more than 4 insects per kg some form of treatment is required. A simple rule of thumb for the number of bags to be sampled is to use the square root of the lot size. For example if there are 100 bags in the lot, samples should be taken from 10 bags.

11.11 Keeping Rodents Out

The requirements of preventive rodent control must be taken into account whenever new stores are being built. Particular attention should be paid to doors, ventilation openings, brickwork and the junctions between the roof and the walls. Repair any damage to the store immediately! This applies especially to the doors.

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Chapter 12

RICE DEVELOPMENT PROGRAMMES

A brief description of various Rice Development Schemes implemented in the past is given below:

12.1 Special Rice Production Programme (SRPP)

On the basis of experience gained and constraints identified in different blocks during the implementation of the Pilot Project in 1984-85, a full fledged Centrally Sponsored "Special Rice Production Programme-SRPP" was started from 1985-86. The objective of the scheme was to bring the substantial increase in the productivity of low productivity areas. For implementation of the scheme, 1/5th of the total number of blocks in the States of Assam, Bihar, Eastern Madhya Pradesh, Orissa, Eastern Uttar Pradesh and West Bengal were taken up. Before taking up the scheme, the block-wise plans were prepared and based on the needs of each block different programmes were taken up. As the constraints vary from block to block, the programme of work across the block also vary. The programme was implemented in 420 selected blocks instead of 417 selected initially as the Government of West Bengal implemented the programme in 70 selected blocks. Under the scheme, programmes were taken up to improve the supply of inputs like quality seeds, fertilizers, pesticides, plant protection equipments, farm implements and technology, programme requiring short-term measures for taking up the other works for the improvement of the irrigation, drainage and development of infrastructure facilities were also included.

During 1986-87, the scheme was extended to 10 additional blocks of Assam State. State of Tripura was also included during 1988-89 and 9 blocks of the State were identified for the implementation of the scheme. In all, the SRPP was implemented in 439 blocks of the 7 Eastern States. The funding pattern under the scheme was 50:50 sharing basis between the Government of India and concerned State Government.

12.2 Special Food grains Production Programme (SFPP)-RICE

Consequent to the mid-term appraisal of the 7th Five Year Plan a Centrally Sponsored "Special Foodgrains Production Programme (SFPP)" was launched with a view to achieve the minimum

food production of 166 million tonnes during 1988-89 and 175 million tonnes for the terminal year 1989-90 of the 7th Five Year Plan. For implementation of SFPP-Rice, 106 potential districts in 13 States i.e. 6 SRPP States – Assam (3),Bihar (13), Madhya Pradesh (11), Orissa (5), Uttar Pradesh (21), West Bengal (7) and other 7 States-Andhra Pradesh (8), Gujarat (4), Haryana (5), Karnataka (8), Maharashtra (7), Punjab (3) and Tamil Nadu (8) were identified. The implementation unit of the SFPP-Rice Programme was district and all the areas in the identified districts were covered for the implementation of the programme. SFPP was 100 percent funded by the Government of India.

12.3 Integrated Programme For Rice Development (IPRD)

SRPP and SFPP-Rice were merged on the recommendations of the Planning Commission and unified scheme "Integrated Programme for Rice Development (IPRD)" was implemented from 1990-91. 4 additional states namely Goa, Himachal Pradesh, Jammu & Kashmir and Kerala and 1 Union Territory of Pondicherry were covered under the Scheme. Whereas the SRPP was implemented in the identified blocks and SFPP-Rice in the identified districts, the IPRD was implemented in all the districts of the States covered under the programme. The funding pattern under the scheme was modified to 75:25 to be shared between the Government of India and the concerned State Government.

From the year 1991-92, the scheme was further extended to 5 more additional states namely Arunachal Pradesh, Manipur, Meghalaya, Mizoram and Nagaland. Thus, the scheme was implemented in 23 States namely Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Punjab, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal and Union Territory of Pondicherry.

The State Governments were provided the flexibility to choose the most suitable components out of the approved components under IPRD namely distribution of certified seeds, micro-nutrients (zinc sulphate), herbicides, pesticides, PP equipments, seed treating chemicals, farm implements, supply to power tiller to small and marginal farmers and allocate funds to each components keeping in view of the specific constraints to rice production in the State and overall limited to Rs.57.44 lakh per district. Besides, field demonstrations and training programmes for farmers

and farm labourers were also included under the scheme for effective transfer of crop production technology.

12.4 Integrated Cereals Development Programme in Rice Based Cropping System Areas (ICDP-RICE)

The On-going Integrated Programme for Rice Development (IPRD), Special Foodgrains Production Programme-Wheat and Special Foodgrains Production Programme-Maize and Millets Schemes have been modified. Schemes are as Integrated Cereals Development Programme in Rice Based Cropping System Areas (ICDP-Rice), Integrated Cereals Development Programme in Coarse Cereals Based Cropping System Areas (ICDP-Coarse Cereals) and Integrated Cereals Development Programme in Wheat Based Cropping System Areas (ICDP-Wheat). In an area, only one scheme is being implemented and there is no overlapping in the implementation of the scheme of ICDP-Rice, ICDP-Coarse Cereals and ICDP-Wheat. The objective of the modified scheme is to increase the overall productivity of cereals under specific crop based systems as a whole as against the individual crop approach.

The ICDP-Rice was implemented in 1200 identified blocks of 16 States namely Andhra Pradesh (120), Arunachal Pradesh (20), Assam (75), Bihar (220), Goa (4), Kerala (55), Eastern Madhya Pradesh (90), Manipur (12), Meghalaya (12), Mizoram (8), Nagaland (12), Orissa (115), Tamil Nadu (140), Tripura (8), Eastern Uttar Pradesh (180), West Bengal (125) and one Union Territory of Pondicherry (4).

12.5 High Yielding Varieties

The Central Sector Rice Seed Minikit Programme including propagation of improved production technology has played vital role in increasing area under high yielding varieties and also in demonstration of improved crop production technology to the farmers. This scheme has contributed in increasing rice production and productivity. The high yielding varieties Programme was initiated during 1966-67 and the Directorate of Rice Development, Govt. of India commenced monitoring the scheme of high yielding varieties in a systematic manner from 1970 onward. The total area under rice during 1969-70 was 37.68 million ha in which the area under high yielding varieties (H.Y.V.) was about 4.34 million ha Thus, the share of H.Y.V was 4.5 per cent of the

total area under rice in the country during 1969-70. But due to the successful implementation of the scheme, the area under H.Y.V increased significantly from 4.34 million ha during 1969-70 to 33.10 million ha during 1999-2000. The increase in area under H.Y.V registered more than 8 folds during the past 30 years. During 1969-70 only 16 H.Y.V. were released / notified for cultivation and there after, due to the concerted efforts of research 639 varieties of rice have been released and notified so far. Those varieties have been popularised at the farmers field through rice minikit programme which was initiated during 1971-72 and continued up to 9th plan period. Thus, the percentage of area under high yielding varieties has been increased from 11.5 per cent in 1969-70 to 79 per cent during 1999-2000. The plan-wise area under H.Y.V of rice is given below:

Plan		Area (in 000 ha.)
4th Plan	(1969-70 to 1973-74)	7098.2
5th Plan	(1974-75 to 1978-79)	13986.4
6th plan	(1980-81 to 1984-85)	20255.4
7th Plan	(1985-86 to 1989-90)	24263.7
8th Plan	(1992-93 to 1996-97)	30905.6
9th Plan	(1997-98 to 2001-2002)	33147.4

With a view to increase the rice production and productivity in the country, the Government of India have been implementing from time to time various rice development programmes in all rice growing States through the Directorate of Rice Development, Patna. The details of the schemes implemented up to 9th Five Year Plan are given below:

12.6 Rice Seed Minikit Programme

Seed is the basic input for increasing production and productivity. Therefore, maintenance of genetic purity through seed replacement is essential for stabilising the yield levels. In addition to the supply of certified seeds of high yielding varieties of rice to the farmers, seed minikits of re-

cently released location specific high yielding varieties were being distributed to the farmers at nominal cost under Central Sector Rice Seed Minikit Programme since 1972 for popularisation of varieties and seed multiplication at the farmer's field level. This programme has helped in spread of recently released varieties and in coverage under high yielding varieties.

A number of recently released location specific high yielding varieties of rice spread through Central Sector Rice Seed Minikit Demonstration Programme during the IX Five Year Plan are given in Table - 9.

During the 9th Five Year Plan more emphasis was given on popularisation of location specific high yielding varieties of rice released/notified during the last 3 years for the favourable rainfed and irrigated areas and 5 years for the problematic areas like rainfed upland & lowland, coastal saline, saline-alkaline lands, high altitude cold stress areas. A total number of 33 lakh seed mini-kits of 419 location specific high yielding varieties of rice were distributed in different rice growing States during the 9th Five Year Plan.

12.7 State Level Training Programme On Rice Production Technology

With a view to disseminate the latest rice production technology to the Extension Officers of the State Governments, State Level Training Programme on Rice Production Technology was organized Continuously since 1975-76. The training programmes was conducted at ICAR Research Centres and State Agriculture Universities for three days duration with 30 participants up to 9th Five Year Plan period. An assistance limited to Rs. 22,900/- was given to the organising centres for conducting training programes.

12.8 Special Orientation Training Programme On Rice Production Technology

In addition to the State Level Training Programme, a Special Orientation Training Programme on Rice Production Technology was also organised at the State Agricultural Universities and Indian Council of Agricultural Research (I.C.A.R.) Institutes. The duration of training programme was for 5 days with 20 participants. The financial assistance of Rs.35,000/- was given to the organizer for each training course. This training programme was initiated during the year 1997-98 with a view to disseminate the latest rice production technology. This training programme was conducted at the following Centres / Universities for different type of rice:

Sl. No.	Name of the Centre/University	Type of rice
1.	G. B. Pant University of Agri. & Technology, Pantnagar	Basmati Rice
2.	Bidhan Chandra Krishi Vishwavidyalaya, Kalyani.	Boro Rice
3.	Directorate of Rice Research, Hyderabad	Hybrid Rice
4.	Directorate of Rice Research, Hyderabad	Irrigated Rice
5.	Central Rice Research Institute, Cuttack	Rainfed Rice
6.	I.C.A.R. Research Complex for NEH Region, Shillong.	Rice Production Technology

12. 9 Macro Management Scheme Of Agriculture

The Government of India has initiated Macro Management Scheme of Agriculture. This is a Centrally Sponsored Scheme. The objective of this scheme is to aim at all round development in agriculture through Work Plans prepared by the respective State keeping in view the following aspects:

(a) Reflection of local needs/crops/regions specific/priorities etc.

(b) Providing flexibility and autonomy to States.

(c) Optimum utilization of scarce financial resource.

(d) Maximization of returns and

(e) Removal of regional imbalances.

The Govt. of India has merged 27 Centrally Sponsored Schemes into Macro Management Mode. The previous pattern of Centrally Sponsored Schemes (C.S.S.) was lacking in various flexibility resulting in large amount of unutilized balances with the State Governments. The present Macro Management approach will provide more flexibility to State Governments to develop and pres-

sure programmes on the basis of regional priorities. The outlay of the Work Plan would be shared by the Centre and the States in the ratio of 90:10. In the case of North-Eastern States, the entire expenditure will be borne by the Government of India. Macro Management Scheme will be implemented in all States and Union Territories. The following 27 C.S.S. have been integrated into Macro Management mode:

1. Assistance to Weaker Section.
2. Assistance to women Co operatives.
3. Non- overdue Cover Scheme.
4. Agri. Cerdit Stabilisation Fund.
5. Special Scheme for SC/ST.
6. Integrated Cereal Development Programmes in Rice Based Cropping System Areas.
7. Integrated Cereal Development Programmes in wheat Based Cropping System Areas.
8. Integrated Cereal Development Programmes in Coarse Cereals Based Cropping System Areas.
9. Special Jute Development Programme.
10. Sustainable Development of Sugarcane Based Cropping System Areas.
11. Balanced and Integrated use of Fertilizer.
12. Promotion of Agricultural Mechanization among Small Farmers.
13. Integrated Development of Tropical, Arid & Temperate Zone Fruits.
14. Production and Supply of Vegetable seeds.
15. Development of Commercial Floriculture.
16. Development of Medicinal and Aromatic Plants.
17. Development of Roots and Tuber Crops.
18. Development of Cocoa and Cashew.
19. Integrated Programme for Development of Spices.

20. Development of Mushroom.
21. Use of Plastics in Agriculture.
22. Bee keeping.
23. National watershed Development Project for Rainfed Areas.
24. Schemes for Foundation & Certified Seed Production of Vegetable Crops.
25. Soil Conservation in Catchments of River Valley Projects and Flood Prone Rivers.
26. Reclamation and Development of Alkali Soils.
27. State Land use Boards.

12.9 NATIONAL FOOD SECURITY MISSION'

The National Development Council (NDC) in its 53rd meeting held on 29th May, 2007 adopted a resolution to launch a Food Security Mission comprising rice, wheat and pulses to increase the production of rice by 10 million tons, wheat by 8 million tons and pulses by 2 million tons by the end of the Eleventh Plan (2011-12). Accordingly, a Centrally Sponsored Scheme, 'National Food Security Mission', has been launched from 2007-08 to operationalize the above mentioned resolution.

The National Food Security Mission until XI Plan had three components (i) National Food Security Mission - Rice (NFSM-Rice); (ii) National Food Security Mission - Wheat (NFSM-Wheat); and National Food Security Mission - Pulses (NFSM-Pulses).

Mission Objectives

- Increasing production of rice, wheat and pulses through area expansion and productivity enhancement in a sustainable manner in the identified districts of the country;
- Restoring soil fertility and productivity at the individual farm level;
- Creation of employment opportunities; and
- Enhancing farm level economy (i.e. farm profits) to restore confidence amongst the farmers.

Strategy

To achieve the above objectives, the Mission would adopt following strategies:

i. Implementation in a mission mode through active engagement of all the stakeholders at various levels.

ii. Promotion and extension of improved technologies i.e., seed, Integrated Nutrient Management including micronutrients, soil amendments, IPM and resource conservation technologies along with capacity building of farmers.

iii. Flow of fund has been closely monitored to ensure that interventions reach the target beneficiaries on time.

iv. Various interventions proposed could be integrated with the district plan and targets for each identified district.

v. Constant monitoring and concurrent evaluation for assessing the impact of the interventions for a result oriented approach by the implementing agencies was followed.

Area of Operation of Food Security Mission: NFSM-rice was implemented in 136 identified districts of 14 states during 11th Plan. Further it was decided to includes Uttaranchal and North Eastern except Assam under this mission during 2012-13. List of identified district during 11th plan are given below:

NFSM-RICE DISTRICTS

State District	State District	State District
Andhra Pradesh	**Assam**	**Bihar**
1. Adilabad	1. Barpeta	1. Araria
2. Guntur	2. Bongaigaon	2. Bhanka
3. Khammam	3. Darrang	3. Champaran (East)
4. Krishna	4. Dhemaji	4. Champaran (West)
5. Mahaboobnagar	5. Goalpara	5. Darbhanga
6. Medak	6. Karbi-Anglong	6. Gaya
7. Nalgonda	7. Kokrajhar	7. Katihar
8. Nellore	8. Lakhimpur	8. Kishanganj
9. Srikakulam	9. Morigon	9. Madhubani
10. Visakhapatnam	10. Nalbari	10. Madhepura
11. Vizianagarm	11. Sonitpur	11. Muzaffarpur
	12. Nagaon	12. Nalanda
	13. Tinsukia	13. Saharsa
		14. Samastipur
		15. Sitamarhi
		16. Siwan
		17. Supaul
		18. Zamui
Chhattisgarh	**Jharkhand**	**Karnataka**
1. Dantewara	1. Simdega	1. Belgaum
2. Janjgir-Champa	2. Singhbhum(W)	2. Shimoga
3. Jashpur	3. Ranchi	3. Uttarakannada
4. Kawardha	4. Gumla	4. Dakshin Kannada
5. Korba	5. Hazaribagh	5. Udupi
6. Koriya	**Gujarat**	6. Hassan
7. State District State District	1. Dohad	7. Raichur
8. Raigarh	2. Panchmahal	**Kerala**
9. Raipur		1. Palakad
10. Raj Nandgaon		
11. Sarguja		

Madhya Pradesh	Tamil Nadu	West Bengal
1. Anuppur	1. Nagapattinam	1. 24 Parganas (South)
2. Damoh	2. Pudukkottai	2. Cooch-Behar
3. Dindori	3. Ramanathapuram	3. Dinajur (North)
4. Katni	4. Sivagangai	4. Howrah
5. Mandla	5. Thiruvarur	5. Jalpaiguri
6. Panna	**Uttar Pradesh**	6. Midnapur (East)
7. Rewa	1. Azamgarh	7. Midnapur (West)
8. Satna	2. Badaun	8. Purulia
9. Shahdol	3. Bahraich	
Maharashtra	4. Ballia	
1. Bhandara	5. Balrampur	
2. Chandrapur	6. Banda	
3. Gadchiroli	7. Bareilly	
4. Gondia	8. Basti	
5. Nasik	9. Deoria	
6. Pune	10. Fatehpur	
Orissa	11. Gonda	
1. Bolangir	12. Gorakhpur	
2. Jajpur	13. Ghazipur	
3. Dhenkanal	14. Hardoi	
4. Angul	15. Mainpuri	
5. Kalahandi	16. Mau	
6. Nawapara	17. Mirzapur	
7. Keonjhar	18. Raebareli	
8. Malkangiri	19. Rampur	
9. Nawarangpur	20. Saharanpur	
10. Phulbani	21. Shivasti	
11. Boudha	22. Siddharthnagar	
12. Nayagarh	23. Sitapur	
13. Deoghar	24. Sonbhadra	
14. Jharsuguda	25. Sultanpur	
15. Sundargarh	26. Unnao	

COMPONENT-WISE PATTERN OF ASSISTANCE ON INPUTS UNDER NFSM-RICE (2007-08 to 2011-12)

S.l. No	Components	Pattern of assistant
1	Demonstration of improved package of practices	Rs. 2,500 per demonstration of 0.4 ha
2	Demonstration on System of Rice Intensification	Rs. 3,000 per demonstration of 0.4 ha
3	Demonstration on hybrid rice technology	Rs. 3,000 per demonstration of 0.4 ha
4	Support for promotion of hybrid rice seed (a) Assistance for production of hybrid rice seed (b) Assistance for distribution of hybrid rice seed	Rs. 1,000 per qtl or 50% of the cost, whichever is less Rs. 2,000 per qtl or50% of the cost, whichever is less
5	Assistance for distribution of HYVs Seed	Assistance @ Rs. 5 per kg or 50% of the cost. whichever is less
6	Seed Mini kits of High yielding varieties	Full cost of the seed
7	Incentive for micro nutrients (in deficient soils)	Assistance @ Rs. 500 per ha or 50% of the cost, whichever is less
8	Incentive for liming in acid soils	Assistance @ Rs. 500. per ha or 50% of the cost, whichever is less
9	Incentive for cono weeder and other farm imple-ments	Assistance @ Rs.3,000 per farmer or 50% of the cost, whichever is less
10	Assistance for plant protection chemicals and bio-pesticides	Assistance @ Rs. 500 per ha or 50% of the cost, whichever is less
11	Farmers' Training (a) Training of farmers at FSS pattern	Rs. 17,000 per training (Full cost)

12	Awards for best performing District	Rs. 5.0 lakh per year(Full cost)
13	International exposure for technical knowledge enrichment to technical staff of Central and State Governments	Rs. 1.0 crore per year for initial two years
14	Incentive for video conferencing, mass media campaign and publicity of the National Food Security Mission	Rs. 25 crore during first year and Rs. 50 crore/year in remaining period
15	Miscellaneous Expenditure a) Project Management Team and other miscellaneous expenses at district level b) Project Management Rs. 13.87 lakh per Team and other State per year miscellaneous expenses at State level c) Miscellaneous expenses Rs. 84.56 lakh per at National level year	Full cost Rs. 6.36 lakh per district per year
16	Zero Seed Till Drill	Assistance @. 5 0 % of the cost limited to Rs 15,000/ per machine. whichever is less
17	Multi crop planters	Assistance @. 5 0 % of the cost limited to Rs 15,000/ per machine. whichever is less
18	Seed drills	Assistance @. 50 % of the cost limited to Rs 15,000/ per machine. whichever is less
19	Rotavators	Assistance @. 50 % of the cost limited to Rs 30,000/ per machine. whichever is less

20	Incentive for disel pump set	Assistance @. 50 % of the cost limited to Rs 10,000/ per machine. whichever is less
21	Distribution of power weeder	Assistance @. 5 0 % of the cost limited to Rs 15,000/ per machine. whichever is less
22	Knap sack sprayer	Assistance @. 5 0 % of the cost limited to Rs 3,000/ per machine. whichever is less

Modified Component-wise pattern of assistance under National Food Security Mission – (NFSM)-Rice (2012-13)

S.l No	Components	Pattern of assistant
1	Demonstration of improved package of practices	
	i. Cluster Demonstrations by the state in collaboration with ICAR/ SAUs/ IRRI on direct seed rice / line transplanting/ SRI (target 1.5 % of area of district)	Rs.7500/- per ha
	ii. Cluster Demonstrations on hybrid rice (one cluster of 100 ha. target 0.5 % of the district)	Rs.7500/- per ha
	iii. Cluster demonstration on Swarna Sub-I/ Sahbhagi dhan of 100 ha each	Rs.7500/- per ha
	iv. Frontline Demonstration by ICAR/ SAUs on hybrid/varities (cluster of minimum 10 ha each)	Rs.7500/- per ha.
2	Support for promotion of hybrid rice seed a) Assistance for distribution of hybrid rice seed	Rs. 1,000 per qtl or 50% of the cost, whichever is less Rs. 2,000 per qtl or50% of the cost, whichever is less
3	Assistance for distribution of HYVs Seed	Assistance @ Rs. 5 per kg or 50% of the cost. whichever is less

4	Incentive for micro nutrients (in deficient soils)	Assistance @ Rs. 500 per ha or 50% of the cost, whichever is less
5	Incentive for liming in acid soils	Assistance @ Rs. 500. per ha or 50% of the cost, whichever is less
6	Assistance for plant protection chemicals and bio-pesticides	Assistance @ Rs. 500 per ha or 50% of the cost, whichever is less
7	Incentive for cono weeder and other farm imple-ments	Assistance @ Rs.3,000 per farmer or 50% of the cost, whichever is less
8	Zero Seed Till Drill/Multi-crop Planter Seed Drill	Assistance @. 5 0 % of the cost limited to Rs 15,000/ per machine. whichever is less
9	Rotavator	Assistance @. 50 % of the cost limited to Rs 30,000/ per machine. whichever is less
10	Distribution of power weeder	Assistance @. 5 0 % of the cost limited to Rs 15
11	Incentives on zero till Multi-crop planter	Assistance @. 5 0 % of the cost limited to Rs 15
12	Incentives for Laser Land Levelers	Assistance @. 5 0 % of the cost limited to Rs 15
13	Incentive for Ridge Farrow Planter	Assistance @. 5 0 % of the cost limited to Rs 15
14	Knap sack sprayer (Manual and power operated)	Assistance @. 5 0 % of the cost limited to Rs 3,000/ per machine. whichever is less
15	Incentive for pump set	Assistance @. 50 % of the cost limited to Rs 10,000/ per machine. whichever is less
16	Farmers' Training Cropping system based training (Four session of group of 30 farmers one before Kharif, one each during Kharif and rabi crops and one after rabi harvest)	Rs 3500/-per session Rs. 17,000 per training

12.10 Bringing Green Revolution in Eastern India

An Inter ministerial task force was constituted in December 2009 under the chairmanship of Secretary (Agriculture) to make short-term and medium-term recommendations on efficient management of water, power and other inputs to maximize agricultural production on a sustainable basis including that of the Eastern India. The major recommendation of task force was for promoting efficiency in water management and encouraging innovative precision farming practices in consultation with the state Governments. It made specific recommendations for improving the rice productivity in the Eastern States through development of appropriate infrastructure with a view to stabilize rice based cropping system in the Eastern states.

Selection of States and Districts: The interventions proposed would be implemented in non-NFSM districts of the states of Assam, Bihar, Eastern U.P, Chhattisgarh, Jharkhand, West Bengal and Orissa. Nearly 54 % of the total districts (97 out of 183) that are not covered under NFSM would be eligible under the programme.

The programme consisted a bouquet of three broad categories of intervention (i) Block demonstration of rice and wheat –short term strategy; (ii) Asset building activities (iii) Site Specific Activities for enhancing agriculture production and productivity

i. **Block demonstration of rice:** The objective of the demonstrations has been aimed at improving seed replacement rate, promotion of line sowing/ planting coupled with promotion of plant nutrient and plant protection technologies. Quality seed recommended for the area could be promoted to cover entire area of the unit. Package of practices proposed for scientific crop management under the demonstrations for different ecologies of rice along with physical and financial targets to the states were provided. It was proposed to promote hybrid rice technologies in 40 units of 1000 hectares each. Every farmer in these units could be encouraged to take up at least 0.40 hectares under hybrid rice. In case of rice, identified progressive farmers for a set of 100 hectares each, were provided two drum seeders free of cost which could be used for facilitating the sowing of rice lines by all the farmers included in the unit. It is expected that concept of custom hiring in the area would be popularized while at the same time it would give additional incentive to the identified progressive farmers for coordinating various implementation activities. The cost per ha is given in **Annexure I**

ii. Asset building activities: Nearly 17 per cent of the funds are allocated for these activities. Asset building activities proposed would mainly focus on water management activities such as construction of shallow tube wells, dug well/ bore wells and distribution of pump sets, drum seeders, Zero till seed drills. The state wise detail is given in Annexure II.

iii. Site Specific Activities for enhancing agriculture production and productivity: Nearly 19 per cent of the funds are allocated to the states for taking up site specific activities assisting in enhancing the agriculture production such as improving quality of electric power supply, construction/ renovation of field/ irrigation channels, institution building for inputs supply etc.

ANNEXTURE-I

Cost per hectare (Rs.)

Sl. No	Activity	Rainfed Upland Rice	Rainfed Lowland rice			Irrigated Rice		Remark
			Shallow lowland (0-15cm)	Medium deep water (25-50cm)	Deep Water (50-100 cm)	Traditional	Hybrid Rice	
1.	Deep Ploughing and Land preparation	1500	1500	1500	1500	1500	1500	Extra cost if any will be met by the farmer
2.	Seed*	2000	2000	2000	2000	1000	2000	• Seed costRs 25/Kg • 80 Kg/ha for rainfed upland rice and shallow low land rice-direct seeding • 100 Kg/ha for direct seeding and 40Kg/ha for transplanted rice under medium deep water and deep water rice(Average is 70Kg/ha); • 40Kg/ha forirrigated rice and • 15Kg/ha for Hybrid rice and cost of hybrid rice is Rs.150/Kg
	Direct seeding (Line sowing by drum seeder)/transplanting	1500	1500	1500	1500	1500	1500	• Only labour cost • Direct line sowing in rainfed upland & shallow low land • **50% areais direct seeding & 50% transplanted-medium deep & deep water rice • 100% transplanting for irrigated rice
3.	Seed treatment	120	120	105	105	60	25	• Bavistin @ 2.5g/Kgseed; Rate of

								Bavistin Rs.600/Kg
4.	**Micro-Nutrient**							
	Zink	875	875	875	875	875	875	• 25Kg/ha;Cost of Rs.35/Kg
	Boron	275	275	275	275	275	275	• 5Kg/ha;Cost of Rs. 55/Kg
5.	Weed Mana-gem- ent	640	640	640	0	640	640	• Pretlachlor 1.6 lt/ha;cost Rs. 400/lt. • For SRI-Conoweeder, manual
6.	Plant protection	700	700	700	700	700	700	
7.	**Staff cost/Hand holding**							One staff for 1000 ha and he will be paid Rs.1000 as honorariumand Rs.1000/ month for mobilityfor a period of six month. It comes out to be Rs. 123/ha for one staff forone paddy season.
	Honorarium	6	6	6	6	6	6	
	Mobility	6	6	6	6	6	6	
8.	**Progressive farmers**							**Progressive Farmer Cost:** One progressive farmer for ebvery 100 hectare will be paid Rs. 1000 as honorariumand Rs.1000/ Month for mobility for a period of six month. It comesout to beRs.120/Ha for one farmer for one paddy season.
	Honorarium	60	60	60	60	60	60	
	Mobility	60	60	60	60	60	60	
9.	Provision of Drum seeder	70	70	70	70	70	70	Each progressive farmer will be provided two drumseeder whose-cost is Rs.3500 for one.
10.	Travel cost for KVK	100	100	100	100	100	100	For meeting the POL/TA/DA of KVK Scientists.

ANNEXTURE-II

State		Demonstration		Asset Building (Water Structure)								
	Rice area (Lakh ha.)	Total Financial Require-quire-ment	Nos.of demon-stration	Shallow Tubewell (Nos.)	Financial requirement (Unit cost Rs.12000)	Pump set (Nos.)	Financial requirement (Unit cost Rs.10000)	Dugwells /Borewell (Nos.)	Financial requirement (Rs. 30,000)	Total	Site specific needs (Fin.)	Total fund re-quire ments
Assam	23.59	1973	26	5000	600	5000	50		0	650	709	3332
Bihar	33.6	2809	37	6000	720	6000	60		0	780	1010	4599
Chhattisgarh	37.41	3127	41	0	0	7000	70	4000	1200	1270	1124	5522
Jharkhand	15.2	1271	17	4000	480	6000	60	3000	900	1440	457	3168
Odisha	44.62	3731	49	4500	540	5000	50	2000	600	1190	1341	6262
Eastern U.P	32	2675	35	6000	720	9000	90		0	810	962	4447
West Bengal	57.82	4834	64	4000	480	4000	40		0	520	1738	7092
GOI							0				0	400
Total	**244.24**	**20420**	**269**	**29500**	**3540**	**42000**	**420**	**9000**	**2700**	**6660**	**7340**	**34820**

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Chapter 13

Important website

S.No.	Institute	Address
1.	**Philippine Rice Research Institute** Pan-Philippine Highway, Science City of Muñoz, Philippines Phone:+63 44 456 0285	*www.phil**rice**.gov.ph*
2.	**International Rice Research Institute** Pili Dr, College, Los Baños 4031, Philippines Phone:+63 2 580 5600	www.irri.org
3.	**Directorate of *Rice Research* (DRR)** Rajendra Nagar Andhra Pradesh 040 2459 1217. Project Director pdrice@drricar.org **Fax No:** +91-40-24591217	*www.drricar.org*
4.	**Rice Research Institute, Kala Shah Kaku (Rrik) Gujarawala** **Telephone** 042-7980368, 042 290368 **Fax** 042-290361	director_rriksk@yahoo.com http://www.tcdc.gov.pk/rice_ri_lhr/index.htm
5.	**Tamil Nadu Rice Research Institute** Thanjavur District Tamil Nadu, India Telephone: 0435-2472098 (Off.) 2472108 (Director-Per) 2472298 (Yard), Fax: 0435-2472881	E-Mail: dirtrri @tnau.ac.in www.tnau.ac.in
6.	**Central Rice Research Institute** Director Central Rice Research Institute Cuttack (Orissa) 753 006, India Phone: +91-671-2367757; PABX: +91-671-2367768-783 Fax: +91-671-2367663	*www.crri.nic.in* Email: directorcrri@sify.com | crrictc@nic.in
7.	**Central Rainfed Upland Rice Research** Station (CRURRS) Sub-Station Officer-In-Charge Central Rainfed Upland Rice Research Station (CRURRS) Hazaribagh (Jhanrkhand) Phone: +91-6546-222263, Fax: +91-6546-223697	Email: crurrs.hzb@crri.in , | crurrs.hzb@gmail.com

8.	**Regional Rainfed Lowland Rice Research Station (RRLRRS)**	Officer-In-Charge Regional Rainfed Lowland Rice Research Station (RRLRRS) Gerua, Dist. Kamrup (Assam) Phone: +91-361-2820370, Fax: +91-361-2820370
9.	***Bangladesh Rice Research Institute*** *Director General Bangladesh Rice Research Institute Gazipur 1701, Bangladesh Phone*: (880-2) 9252736; 9257401-05. Fax: (880-2) 9261110	**http://www.brri.gov.bd**
10.	**Rice Research Station** **Address:** 1373 Caffey Road, Rayne, LA-70578 **Contact Info:** Phone: (337) 788-7531, Fax: (337) 788-7553	
11.	**Rice Experiment Station** P.O. Box 306 , Biggs, CA 95917 *Shipping Address:* Rice Experiment Station 955 Butte City Highway (Hwy 162) Biggs, California 95917 *Tel. No.:* (530) 868-5481, *Fax No.:* (530) 868-1730	*Email Address:* ricestation@crrf.org http://www.plantsciences.ucdavis.edu
12.	**China National Rice Research Institute** (CNRRI)	http://english.caas.net.cn
13.	**China National Rice Research Institute**	http://www.cnrri.org
14.	**Hybrid Rice Research Network India** Directorate of Rice Research Rajendranagar, Hyderabad - 500 030 Fax # 040-4015308 (EPABX Ph # - 4015036-39, 4013109, 4013111-12);	http://www.hybridriceindia.org
15.	**West Africa Rice Development Association**	www.warda.org
16.	**Food and Agriculture Organization of the United Nations**	(www.fao.org
17.	**Africa Rice Research Institute/ Centre**	http://www.africarice.org/
18.	**All-Russian Rice Research Institute** ARRRI, p/o Belozernoe, Krasnodar, Russia, 350921. Telephone: +7 (861) 2-294-149; Fax: 2-294-149.	E-mail: arrri_kub@mail.ru http://eng.whoiswho.su/Krasnodar/?RiceResearchInstitute

19.	**Rice research institute japan**	*www.**rice**.or.jp*
	Australian Centre for International Agricultural Research (ACIAR) 38 Thynne Street, Fern Hill Park BRUCE ACT Phone: 61 2 6217 0500 | Fax: 61 2 6217 0501 ABN 34 864 955427	http://aciar.gov.au
20.	**Bayer CropScience** Bayer Crop Science Limited, **Bayer House, Central Avenue,**, **Hiranandani Gardens, Po-wai,**.**Mumbai - 400076.** **Tel.: 022-2571 1234**, **Fax: 022-25705940**	http://www.bayergroupindia.com
21.	**PHI Seeds Private Limited** Babukhan Millenium Centre III Floor, 6-3-1099/1100 Rajbhavan Road Somajiguda Ph : 91 - 40 - 30434400 Hyderabad - 500 082 Andhra Pradesh	http://www.pioneer.com/india

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Appendix I

Variety wise, Parentage, year of Notification, Duration, Eco-system, Salient features & recommended for cultivation in different States from 1996 to 2012

Sl. No.	Name of variety	Parentage	Year of Notification	Duration (in days)	Eco-System	Salient Features	Recommended for cultivation
1	Pusa 834 (IET-11674)	IR-50 x PP 33 BP	1996	105-110	Irrigated, early	Grains - long bold.	Andhra Pradesh and Karnataka
2	Pant dhan-12 (IET-10955)	Govind x UPR 201-1-1	1996	124	Irrigated, early	Medium statures, grains – long slender, resistant to BLB, BLS, & BPH; Yield: 50-55 Q/ha.	Uttar Pradesh
3	Ratnagiri-3 (IET-11384)	CR-57-MR 1523 x IR 36 x RTN 68	1996	135-140	Irrigated med.	Grains – long bold, resistant to blast, BLB & tolerant to GM.	Maharashtra
4	Karjat-2 (IET-12331)	Phalguna x Chlorothalonil 75 WP @ Prakash	1996	130-140	Irrigated med.	Grains – long slender.	Maharashtra
5	Karjat-3 (IET-12481)	IR-36 x Karjat 35-3	1996	105-110	Scented	Grains – short bold & scented.	Maharashtra
6	IET-7564	IRAT x N 22	1996	110	Rainfed uplands	Grains – long slender.	Karnataka
7	Amrut (IET-7991)	M 63-83 x RP 79-5 x R.N 21	1996	100 -110	Rainfed uplands	Grains-long bold.	Karnataka
8	Turanta Dhan	Sattar x Rasi	1996	70-75	Rainfed uplands	Dwarf (70-80 cm), grains – long bold, resistant to blast. Yield:20-30 Q/ha	Bihar

9	Birsa Dhan-105 (IET-12050)	Fine Gora x IET 2832	1996	85-90	Rainfed uplands	Dwarf (70 cm), grains - short bold, white, resistant to blast, BLB, helminthosporium, SB & GM: Yield: 32-35 Q/ha.	Bihar
10	Birsa Dhan-106 (IET-12052)	Bala x Black Gora x OS 36 x CH 1039	1996	90-95	Rainfed uplands	Dwarf(75-80cm), grains -short bold, white, resistant to blast, SB, GM, moderately resistant to blast, BLB, helminthosporium & resistant to drought; Yield: 35-40 Q/ha.	Bihar
11	Birsa Dhan-107	Gora Mutant x IAC 125	1996	90-95	Irrigated mid early	Dwarf (65-70 cm), grains - short bold, white, resistant to blast, BLB, SB,G M, drought, moderately resistant to helminthosporium; Yield: 30-35 Q/ha.	Bihar
12	Birsa Dhan-201 (IET- 9789)	TN 1 x Brown Gora	1996	105-115	Rainfed uplands	Semi, dwarf, grains – long bold, white, & resistant to blast & SB, suitable for summer rice; Yield: 30-35 Q/ha.	Bihar
13	Birsa Dhan-202	Jaya x BR-34	1996	125	Irrigated medium	Grains - long bold, medium white, resistant to blast; Yield: 35 - 40 Q/ha.	Bihar
14	Vaidehi	Pureline selection from Beldar (TCA-48)	1996	150-160	Semi deep water	Tall, grains - long bold, resistant to blast BLB, tolerant to drought; Yield: 30-35 Q/ha.	Bihar
15	Gautam (IET-13439)	Rasi mutant	1996	125-130	Irrigated mid-early	Dwarf (70 cm), grains – long bold, white; Yield: 6.8 Q/ha.	Bihar
16	Shakuntala (IET-11183)	Pankaj x BR-8	1996	140-145	Rainfed shallow low land	Tall, grains – medium slender, resist. To blast; Yield: 35-45 Q/ha.	Bihar

17	Taraori basmati	Pureline selection from local Basmati	1996	155	Scented	Tall, grains - long slender, scented; Yield: 21Q/ha.	Haryana
18	Ranbir Basmati (IET-11348)	Pureline selection from basmati 370-90-95	1996	120 -125	Scented	Grains – long slender, scented.	Jammu & Kashmir
19	Karnataka Hybrid Rice-1 (KRH –1)	IR 58025 A x IR 9671 R	1996	120-125	Irrigated medium lands	Yield: 60 Q/ha	Kanataka
20	Nidhi (IET-9994)	Sona x ARC 14529	1997	120-125	Irrigated early	Semi dwarf (95 cm), grains- long slender, resist. to blast, RTV, tolert to GLH, WBPH & BPH; Yield: 40 Q/ha.	Tamil Nadu, Pondicherry & West Bengal
21	Pusa-677 (IET-12617)	Pusa 312 xTKM-9	1997	77-85	Irrigated early	Semi dwarf (80-95 cm), grains- medium slender, resist. to neck blast, BS, leaf scald, mod.rest. to leaf blast, BLB & Sh.R.	Tamil Nadu, Karnataka, Andhra Pradesh & M.Pradesh
22	ASD-19 (IET-10436)	Lalnakanda x IR 30	1997	120-132	Irrigated medium land	Semi dwarf (108 cm), grains -medium slender, white, AWA, resistant to blast & BPH; Yield: 58 Q/ha.	Tamil nadu
23	ADT-42 (IET-13239)	AD 9246 x ADT 29	1997	110-115	Irrigated medium	Semi dwarf, grains - long slender, white resit. to blast and tolert. to BPH; Yield: 56 Q/ha.	Tamil Nadu
24	CORH-1 (IET- 12561)	IR-62829 A x IR 10198-66-2 R	1997	110-115	Irrigated medium lands	Semi dwarf, grains - medium slender, white, moderately resistant to Sh.B, BS, BPH, GLH, RTV & BPH; Yield: 60 Q/ha.	Tamil Nadu

25	PMK-2 (IET-13971)	IR- 13564-149-3 x ASD 4	1997	110-115	Irrigated early	Semi dwarf(80-95 cm), grains - medium bold, white, resistant to BPH, moderately resistant to RTV, blast, BS,GLH, & BPH; Yield: 32 Q/ha	Tamil Nadu
26	TPS-3 (IET-10522)	RP-31x49-2 x (LMN)	1997	124-139	Irrigated medium	Semi dwarf (88-100cm), grains - short bold white, resistant to blast & LF; Yield: 56 Q/ha	Tamil nadu
27	Shyamala (IET-12561)	R 60-2713 x R 2386	1997	130-140	Rainfed shallow low lands	Semi dwarf (80-90 cm), grains - long slender, mod. resistant to leaf blight & GM; Yield: 28 Q/ha.	Madhya Pradesh
28	Poornima (IET-12284)	PoorvaxIR 8608- 298	1997	100-105	Rainfed uplands	Semi dwarf(90-100 cm), grains - long slender, white, resistant to major diseases & pests; Yield: 30 Q/ha.	Madhya Pradesh
29	Jitendra (IET-10526)	Selection from land races	1997	Late	Rainfed deep water	Tall (160 -170 cm) , grains - long slender , white, resistant to neck blast , BPH, WBPH, mod. resist. to GM & LF; Yield: 50 Q/ha.	West Bengal and Uttar Pradesh
30	Purnendu (IET-10029)	Patnai 23 x Jaladhi 2	1997	150-160	Rainfed semi deep water	Tall (140-150 cm), grains -short bold, white resistant to Sh B, Sh.R, LF, SB & moderately resistant to GM; Yield: 53 Q/ha.	West Bengal
31	Vijetha (IET-13967)	MTU 5249 x MTU 7014	1997	120 –125	Irrigated medium	Semi dwarf (115 cm), grains – medium slender, AWA tolerant to BPH & blast; Yield: 67 Q/ha.	Andhra Pradesh

32	Basmati-386	Selection from Local material	1997	155	Irrigated	Tall (180 cm), grains - long slender, mild aroma, susceptible to SB, BPH, LF, BB & Sh.B; Yield: 21-35 Q/ha.	Punjab
33	COR-46 (TNAU BPHR-8)	T -7 X IR-20	1997	125-130	Irrigated	Tall (115-125 cm), grains - long slender, AWA, resistant to BPH, moderately resistant to Sh.R & blast; Yield: 60 Q/ha.	Tamil Nadu
34	ASD-20 (IET-13181)	IR 18348-38-3 x IR 25863-61-3-2 x IR 58	1997	105-115	Irrigated medium	Semi dwarf (89 cm), grains – long slender, white resistant to SB,LF, Sh.R, moderately resistatnt to blast & RTV; Yield: 67 Q/ha.	Tamil Nadu
35	Barh Avarodhi (IET-11295)	Madhukar x Sona	1997	145-155	Shallow deep water	Grains - slender, white, resistant to neck blast, brown spot & blight; Yield: 25-30 Q/ha.	Uttar Pradesh
36	Malviya Dhan-36	Mutant of 'Mahsuri'	1997	130-135	Medium & low lands	Grains - medium slender, white, resistant to major diseases; Yield: 42-45 Q/ha.	Uttar Pradesh
37	PHB-71	RF 1301 X RM 1401	1997	130-135	Irrigated medium	Semi dwarf (115-120 cm), grains - long slender, white tolerant to blast, BPH & GM; Yield: 87 Q/ha.	Haryana, Tamil Nadu , Karnataka & Uttar Pradesh
38	APHR-1	IR-58025A x Vajram (R)	1997	130-135	Irrigated medium	Semi dwarf (110 cm), grains – long slender, white, AWA ; Yield: 35 Q/ha.	Andhra Pradesh
39	APRH-2	IR-62829 A x MTU 9992 (R)	1997	120-125	Irrigated medium	Semi dwarf (100 cm), grains – long slender, white , AWA;Yield: 45 Q/ha	Andhra Pradesh

40	MDU-5	O.glaberrma x Pollali	1997	95-100	Cold tolerant	Dwarf (85-90 cm), grains-medium slender, white, resistant to drought, suitable for dry and transplanted condition.	Tamil Nadu
41	Ashwani (KR-5-142)	N 22 x Cauvery	1997	96-110	Rainfed early	Dwarf (60-70 cm), grains – short bold, AWP; Yield: 30-31 Q/ha.	Uttar Pradesh
42	VL Dhan-61 (IET-13485)	Jaya x Tapoo-cho- Z	1997	125-130	Hill rice irrigated	Grains - long bold & resistant to blast.	Uttar Pradesh
43	Triguna (IET-12875)	Swarna dhan x RP 1579- 38	1997	120-125	Irrigated medium	Grains - long slender, tolerant to BPH & GM.	Andhra Pradesh
44	IET-8116	Vikram x Andrewsali	1997	125-130	Irrigated medium	Grains – long bold.	Karnataka
45	Krishna Hamsa (IET –9219)	Rasi x Fine Gora	1997	145-155	Irrigated medium early	Semi dwarf, grains - long slender, long fine; Yield: 50-56 Q/ha.	Andhra Pradesh/West Bengal
46	DRRH-1	IR 58025 x IR 40750R	1997	125-130	Irrigated medium	Grains – long slender; Yield: 7.3 Q/ha.	Andhra Pradesh
47	Karnataka Rice Hb-2 (KRH-2)	IR 58025 A x KMR 3 A	1997	130-135	Irrigated medium	Grains - long bold; Yield: 7.40 Q/ha.	Karnataka
48	Indur Samba (PDR-763) (IET- 13799)	BPT 5204 x Surekha	1997	120-125	Rainfed shallow low land	Grains – medium slender, tolerant to GM; Yield: 55 Q/ha.	Andhra Pradesh
49	Keshava (IET-14002)	WGL 28712 x IR 36-1996	1997	120-125	Rainfed shallow low land	Grains – long slender, super fine, tolerant to GM; Yield: 60 Q/ha.	Andhra Pradesh

50	Shiva (WGL-3943) (IET-12799)	Phalguna x IR 50	1997	130-135	Rainfed shallow low land	Grains - long slender, resistant to blast, GLH & GM; Yield: 55 Q/ha.	Andhra Pradesh
51	Sonamani (CR-644) (IET-11365)	Velki x Mahsuri	1997	145-155	Rainfed shallow low land	Grains – short bold.	Orissa
52	Tapaswini (IET-12168)	Jagannath x Mahsuri	1997	135	Irrigated medium	Grains - medium slender, tolerant to WBPH, BB, moderately tolerant to LF & GM; Yield: 55 Q/ha.	Orissa
53	Dhala Heera (IET-11411)	CR-404 – 48 x CR 289-1208	1997	80	Rainfed upland	Grains - short bold & resistant to RTV., GM, GLH, WBPH & blast; Yield: 35 Q/ha	Orissa
54	Radhi (CRM-40) (IET-12413)	Swarnaprabha mutant	1997	120	Irrigated early	Grains – long bold & tolerant to blast & BPH; Yield: 45 Q/ha.	Orissa
55	Narendra usar-2	IRRI Line F2	1997	130	Saline-alkaline soil	Grains – long bold; Yield: 45 Q/ha.	Uttar Pradesh
56	Luit (TTB-127-216-2) (IET-13622)	Heera x Annada	1997	90 –100	Rainfed lowlands	Grains – medium bold & resistant to blast; Yield: 35 Q/ha	Assam and A&N Island
57	Jalprabha (IET-11870)	Selection from compo-site	1997	165-180	Deep water	Grains – short bold.	West Bengal
58	Saraswathi (IET- 11271)	Pankaj x Patnai 23	1997	160-170	Semi deep water	Grains- long bold.	West Bengal

59	Jamini (IET- 12133)	BG 280-112 x PTB 33	1997	135 –150	Rainfed upland	Semi dwarf, grains – short bold; Yield: 50-55 Q/ha.	West Bengal
60	Jawahar Rice 3-45 (IET-13623)	IR 36 x Lohandi	1997	80-95	Rainfed upland	Grains – long bold & resistant to blast; Yield: 18-25 Q/ha.	Madhya Pradesh
61	Khanika (IET-12055)	Jaya x CR 237- 1	1997	75-90	Rainfed upland	Grains – long slender.	West Bengal
62	Pooja (IET-12241)	Vijaya x T.141	1999	140-150	Rainfed shallow low lands	Grains – medium slender, resistant to blast.	Andhra Pradesh, Madhya Pradesh,
63	VL.Dhan-81 (IET-13792)	CH 988 x HPU 741	1999	120-130	Hill rice ir-rigated	Grains – long bold & resistant to blast.	Hills of Uttar Pra-desh,
64	CSR-13 (IET-10348)	CSR 1 x Basmati 370 x CSR 5	1999	115-130	Irrigated Saline-alkaline soil	Grains - long slender, resistant to blast.	Haryana and Uttar Pradesh
65	Vagad dhan	M 63 –83x Cauvery	1999	90-105	Rianfed uplands	Grains- long bold	Rajasthan
66	Pant shankar Dhan-1	UPR 195-178 A x UPR 192-133R	1999	115 –120	Irrigated medium	Grains – long slender; Yield: 68 Q/ha.	Uttar Pradesh
67	Narendra Shankar-Dhan-2	IR 58025A x NDR 3026-3-1-R	1999	125 –130	Irrigated medium	Grains – long slender; Yield: 62 Q/ha.	Uttar Pradesh
68	CORH-2	IR 58025A x C 20 R	1999	120 –125	Irrigated medium	Grains – long slender; Yield: 63 Q/ha.	Tamil Nadu

69	ADTRH-1	IR 58025A x IR 66 R	1999	130 –135	Irrigated medium	Grains - long slender; Yield: 71 Q/ha.	Tamil Nadu
70	WGL 3962 Bhadrakali	Phalgunax IR-36	1999	135	Irrigated medium	Grains - medium slender, resistant to GM; suitable for late planting;Yield:55-60 Q/ha.	Andhra Pradesh
71	Gurjari (IET-10750)	Asha x Kranti	1999	150-160	Irrigated medium	Grains - long bold & resistant to blast.	Gujarat
72	Lemaphou	Tall indica x Lawagin	1999	125-130	Hill rice ir-rigated	Grains - long bold.	Manipur
73	Akutiphou	Langphou x IR-1364-37-3-1	1999	120-130	Hill rice ir-rigated	Grains – long bold & resistant to blast.	Manipur
74	ADT-43 (IET-14879)	IR-50 x Imp. White ponni	1999	110	Irrigated early	Dwarf (87 cm), grains - medium slender, white, resistance to GLH, moderately resis-tance to BPH, SB & GM;Yield: 56 Q/ha.	Tamil Nadu
77	TKM-11	C22 x BJ1	1999	110 –120	Irrigated early	Semi dwarf (90-100 cm), grains - me-dium slender, mod. resist. to GLH,BLB; Yield: 40 Q/ha.	Tamil Nadu
76	Lalithagiri (IET-13198)	Badami x IR-1966 -364	1999	95	Rainfed upland	Semi dwarf, grains - medium bold, white, resistant to blast & tolerant to BPH; Yield: 25-35 Q/ha.	Orissa
77	Uydyagiri (IET-12136)	IRAT 138 x IR 13543-66	1999	95	Irrigated medium	Semi dwarf, grains - medium bold, red; Yield: 25-35 Q/ha.	Orissa
78	Mahanadi (IR- 13356)	OR 1301-13x IR 19661-131-1-3-1 x Savitri	1999	150	Rainfed shallow lowland	Semi dwarf, grains - medium bold, white; Yield: 45-65 Q/ha.	Orissa

79	Indravati	IR-56 x OR-142-99	1999	150	Rainfed shallow low land	Semi dwarf, grains – medium bold , white ; Yield: 45-65 Q/ha.	Orissa
80	Prachi (IET-12786)	IR 9764-45-2-2 x OR 149-3-2	1999	155	Rainfed shallow low	Semi dwarf, grains - medium bold, white, photosensitive; Yield: 45-65 Q/ha.	Orissa
81	Ramchandi (IET-13354)	IR 17494-32-2-2-1 x Jagannath	1999	155	Rainfed shallow low	Semi dwarf, grains - medium bold, white, photosensitive; Yield: 45-65 Q/ha	Orissa
82	Ketekijoha (IET-14390)	Savithri x Bhadshabhog	1999	145-160	Rainfed shallow low	Grains – medium slender, resistant to blast.	Assam
83	Pamindra (IET-11875)	Pankaj x Nagoba	1999	145-150	Rainfed shallow low	Grains - medium bold, resistant to blast.	Assam
84	Golak (IET-11898)	Jhingasail x CN 644	1999	150-160	Semi deep water	Tall (160-170 cm), grains -long bold, golden; resistant to blast, RTV & BPH; Yield: 30 Q/ha.	Orissa,West Bengal, Assam and Bihar
85	Sudhir (IET-10543)	FR 13A x CNM 539	1999	150-160	Semi deep water	Tall (140-150 cm), grains - long slender, resistant to Sh.R, Sh.B, brown spot, blast BLB, LF, WBPH & SB; Yield: 27 Q/ha.	West Bengal, Assam, Bihar and Uttar Pradesh
86	Sunil (IET-11896)	OC 1393 x B 1047-b-Pn-18-1-4	1999	150-160	Deep water	Tall (135-145 cm), grains-long slender, white, resistant to blast, Sh. R, Sh.B, brown spot,BLB,LF, WBPH&SB; Yield: 40 Q/ha.	West Bengal

87	Padmanth (IET-11876)	Pankaj x Jagannath x Nagoba	1999	145-170	Deep water	Grains-long bold.	Assam
88	Neeraja (IET-11865)	Selection from land rac-es	1999	150-160	Deep water	Tall (180-200 cm), grains -long bold, yellowish, AWA; resistant to BPH & GM; Yield: 35 Q/ha.	West Bengal
89	Satyaranjan (IET-14453)	IET 9711 x IET 11162	1999	130-135	Rainfed shallow low land	Tall (113 cm), grains – medium slend-er, white, resistant to blast, LF,GM, WBPH, BPH, susceptible to BLB & Sh.B; Yield: 40 Q/ha.	Assam
90	Basundhra (IET 14453)	IET 9711 x IET 11161	1999	130-135	Rainfed shallow low land	Semi dwarf (107 cm), grains – medium slender, white, resistant to blast, BLB, GM, BPH, SB, LF susceptible to Sh.B.; Yield: 40 Q/ha.	Assam
91	Jayamati (IET 13253)	Jaya x Mahsuri	1999	130-170	Rainfed shallow low land	Tall (130 cm), grains - medium slender, white suitable for Boro, resistant to blast, BLB, SB & GM, susceptible to Sh. B; Yield: 65 Q/ha.	Assam
92	Kharaveli (IET 13253)	Daya x IR 13240- 108-2-2-3	1999	125	Irrigated medium	Semi dwarf, grains - medium slender, white, tolerant to BPH; Yield: 35-50 Q/ha.	Orissa
93	Sebati (IET 11786)	Daya X IR 36	1999	125	Irrigated medium	Semi dwarf, grains - medium slender, white, resistant to blast; Yield: 35-50 Q/ha.	Orissa
94	Gajapathi (IET 13251)	OR 136-3 x IR 13429-196-1-120	1999	130	Irrigated medium	Semi dwarf, grains - medium slender, white, tolerant to BPH; Yield: 35-50 Q/ha.	Orissa

95	Konark (IET 1009)	Lalat x OR 135-3-4	1999	125	Irrigated medium	Semi dwarf, grains - medium slender, white, tolerant to BPH; Yield: 35-50 Q/ha.	Orissa
96	Surendra (IET 12815)	OR 158-5 x Rasi	1999	135	Irrigated medium	Semi dwarf, grains – medium bold, white; Yield: 35-50 Q/ha.	Orissa
97	Bhoi (IET 12443)	Gauri x RP 825 – 45-1-3	1999	125	Irrigated medium	Semi dwarf, grains - medium bold, white, resistant to blast & BLB; Yield: 35-50 Q/ha.	Orissa
98	Pavithra (MO-13) (IET 13983)	Surekha x MO5	1999	115-120	Irrigated medium	Grains - medium bold, tolerant to GM.	Kerala
99	Panchami (MO-14) (IET 14760)	Pothana x MO 5	1999	115-120	Irrigated medium	Grains - medium bold, tolerant to GM.	Kerala
100	Remanica (MO-15) (IET 13981)	Mutant of MO1	1999	100-105	Irrigated medium	Grains – short bold, resistant to BPH & GM.	Kerala
101	Uma (MO-16) (IET 14758)	MO6 x Pokkali	1999	115-120	Irrigated medium	Grains - medium bold, tolerant to GM, resistant to GM & BPH.	Kerala
102	Revathy (MO-17) (IET 15322)	Culture 12814 x MO-6	1999	105-110,	Irrigated medium	Grains - medium bold MB, tolerant to BPH. resistant to BPH.	Kerala
103	Karishma (MO-18) (IET 15095)	MO1 x MO 6	1999	115-120	Irrigated medium	Grains - medium bold, resistant to BPH, iron toxicity, & GM.	Kerala

104	Krishna Anja-na (MO-19) (IET 15096)	MO1 x MO 6	1999	105-110	Irrigated medium	Grains – medium bold, resistant to BPH, iron toxicity.	Kerala
105	Vivek dhan-62 (IET 14621)	China 4 x BG 367-4	2000	125-135	Hill rice ir-rigated	Grains – short bold, resistant to blast, neck blast, Sh.R, & tolerant to low temperature; Yield: 46 Q/ha.	All India
106	Hybrid 6201 (PA 103) (IET 16438)	CO2 x MO1	2000	125-130	Irrigated medium	Grains – long bold, resistant to blast, & tolerant to SB, BPH & LF; Yield: 62 Q/ha.	All India
107	Narendra Usar-3 (IET 14657)	Leaungya 1148 x IR 9129-20g -2-2-2-1 x IR 18272 -27-3-1	2000	125-140	Irrigated Saline al-kaline	Dwarf, grains - long slender, resistant to BLB, Sh.B, Sh.R & BLS.	Uttar Pradesh
108	Karnataka - Hill Paddy-5 (IET 15718)	Intan x IET 7191	2000	150-155	Upland di-rect	Dwarf (85-90 cm), grains - medium bold, resistant to blast; Yield: 35-40 Q/ha.	Karnataka
109	Hemavathi (DWR-4107) (IET 13943)	Introduction from Ban-gladesh	2000	160-165	Deep water	Semi-dwarf (100-110 cm), grains - me-dium slender, white, resistant to blast, leaf & neck blast; Yield: 45-50 Q/ha.	Karnataka
110	Sravani (NLR-33359) (IET 14876)	Selection from IR 50	2000	115-120	Irrigated	Dwarf (80-85 cm), grains-long slender, white; resistant to blast, helminthospo-rium, tolerant to BLB, susceptible to RTV; Yield: 60 Q/ha.	Andhra Pradesh

111	Somasila (NLR-33358) (IET 13932)	Selection from IR 50	2000	90	Rainfed upland	Dwarf (80-85 cm), grains - medium slender, white, AWA, resistant to blast, resistant to helminthosporium, tolerant to BLB susceptible to RTV; Yield: 60 Q/ha.	Andhra Pradesh
112	Swathi (NLR-33057) (IET 11582)	IR 36 x MTU-4569	2000	120-125	Rainfed shallow low land	Dwarf (8-85 cm), grains - long slender, white, AWA, resistant to blast, tolerant to helmintho-sporium & BLB, suscept-ible to RTV, SB, LF, RH , rice thrips & BPH; Yield: 60 Q/ha.	Andhra Pradesh
113	Vedagiri (NLR-33641) (IET 14328)	NLR 9672-96 x IET 7230	2000	150-155	Rainfed shallow low land	Semi dwarf (107 cm), grains –medium slender, tolerant to SB, GM & RTV; resistant to blast; susceptible to BPH & LR; Yield: 60 Q/ha.	Andhra Pradesh
114	Maruteru San-nalu (MTU-1006) (IET 14348)	Pureline selection from Oodasannalu	2000	150-165	Rainfed upland irri-gated	Dwarf (90-95cm), grains – medium slender, white, AWA, susceptible to blast & SB; Yield: 20-30 Q/ha.	Andhra Pradesh
115	Cottondora Sannalu (MTU-1010) (IET 15644)	Krishnaveni x IR 64	2000	120	Irrigated medium land	Semi-dwarf (108 cm), grains – long slender, white, AWA, resistant to blast & tolerant to BPH ; Yield: 74 Q/ha.	Andhra Pradesh
116	Bharani (NLR30491)	IR 36 x IR 2508	2000	120-125	Irrigated medium	Dwarf (70-75 cm), grains - long slend-er, white, AWA, resistant to helmin-	Andhra Pradesh

	(IET 12630)				land	thosporium & RTV, tolerant to GF & SB , susceptible to blast, LF, RH & BPH ; Yield: 60 Q/ha.	
117	Deepti (MTU 4870) (IET 8100)	Sowbhagya x ARC 6650	2000	150	Irrigated medium land	Semi-dwarf (110 cm), grains - medium slender, white, AWA, tolerant to BPH; Yield: 55-60 Q/ha.	Andhra Pradesh
118	Srikakulam Sannalu (RGL 2537) (IET 16023)	T-145x CR 1014	2000	155-160	Rainfed shallow low land	Semi-dwarf (110-120 cm), grains - long slender, white, AWA; resistant to blast, GM & SB; Yield: 55-63 Q/ha.	Andhra Pradesh
119	Vasundhara (RGL-2538) (IET 16085)	Phalguna x IET 6858	2000	130-135	Rainfed shallow low land	Semi dwarf (100-105), grains - long slender, tolerant to RTV & blast, resis-tant to Plant hopper & GM; Yield: 55-60 Q/ha.	Andhra Pradesh
120	Early Samba (RNRM-7) (IET 15845)	Mutant of BPT 5204	2000	130-135	Irrigated medium land	Dwarf (80-90 cm), grains - medium slender, white, tolerant to SB; Yield: 60-65 Q/ha.	Andhra Pradesh
121	Surya (BPT-4358)	Sona Mahsuri x ARC 6650	2000	145	Irrigated	Semi-dwarf (100 cm), grains - long slender, white tolerent to BPH & WBPH; Yield: 60 Q/ha.	Andhra Pradesh
122	CO-47 (IET-14298)	IR 50 x CO 43	2000	110-115	Irrigated medium land	Dwarf (80-92cm), grains - medium slender, resistant to blast, moderately susceptible to all hoppers.	Tamil Nadu

123	Subramaniya Bharathi (PY-6) (IET 14728)	IR 19661 x CR 1009	2000	135-140	Irrigated medium land	Tall (120 cm), grains - medium slender, white, AWA, resistant to blast & GM; Yield: 55 Q/ha.	Pondicherry
124	Bhagirathi (IET11272)	Jhingasail x Patnai 23	2000	150-160	Semi deep water	Tall (170-180 cm), grains - short bold, tolerant to Sh.B & SB; Yield: 46 Q/ha.	West Bengal
125	Mahananda (IET 11910)	IR 36 x Patnai 23	2000	155-160	Semi deep water	Tall (140-145 cm), grains -short bold , white , resistant to blast , Sh.R, Sh.B, BS, BLB & LF , tolerant to WBPH & GM ; Yield: 25-30 Q/ha.	West Bengal
126	Sashi (IET-14105)	IR 50 x Patnai 23	2000	140-145	Rainfed shallow low land	Semi dwarf (115 cm), grains – long slender, resistant to blast, Sh.B, Sh.R, BPH & BLB; Yield: 45 Q/ha.	West Bengal
127	Satabdi (IET-4786)	CR 10-114 x CR 10115	2000	112-115	Irrigated medium land	Semi dwarf, grains - long slender, white, resistant to Sh.B, BB & Sh.R; Yield: 35-56 Q/ha.	West Bengal
128	PNR-519	Tainang-3mutant x Basmati -370 x PNR-417-3	2000	85-115	Irrigated upland	Semi-dwarf (100 cm) , grains- long slender, brown, resistant to blast , Sh.B, BS, SB, GM, LF & WM; Yield: 55 Q/ha.	West Bengal
129	Sahyadri	IR-58025Ax BR-827-35-3-1-1-1R	2000	120-130	Irrigated medium land	Semi dwarf (115-120 cm, grains - long slender, white, resistant to blast, leaf scald & SB; Yield: 60-65 Q/ha.	Maharashtra

130	ADT-44 (IET 14099)	Selection from OR 1128-7-1	2000	150-160	Irrigated	Semi dwarf (112 cm), grains - short bold, white , AWP, resistant to blast, GLH, SB, BS & LF; Yield: 62 Q/ha.	Tamil Nadu
131	Parag-401 (PBNR-90-3-401)	PrabhavatixBasmati-370	2000	110-112	Upland Irrigated	Dwarf (68-72 cm), grains - long slender, white, resistant to neck blast, SB & LF; Yield: 36 Q/ha.	Maharashtra
132	Anjali (IET-16430)	RR-19-2 x RR –149-1129	2002	9 0-95	Rainfed direct seeded	Semi dwarf (85-100 cm), grains - short bold, white, moderately tolerant to drought, resistant to BS, moderately resistant to blast & Sh.R; Yield: 20-30 Q/ha.	Bihar , Jharkhand, Orissa, Assam & Tripura
133	Karnataka Rice Hybrid-2 (KRH –2)	IR-58025 A x KMR – 3R	2002	125-130	Irrigated timely sown	Semi dwarf (102 cm), grains - long slender, white, tolerent to LB, BS, & other diseases; Yield: 75-85 Q/ha.	All India
134	KAUA 4-4-2 (HARSHA)	M. 210XPTB 28	2002	NA	Rainfed low lands/ uplands	Dwarf (86cm), grains - long bold, red, non-longing, resistant to WBPH, LF, moderately resistant to SB & low susceptible to blast; Yield : 45-50 Q/ha.	Kerala
135	SARALA CR-260-77 (IET-10279)	CR-151XCR-1014	2002	155	Water logged situation	Grains – medium slender, white; Yield : 45-50 Q/ha.	Orissa
136	Mugad Sugandha-1 (IET-13549)	Selection from a basmati RP- ST – 328	2002	130-135	Rainfed transplanting	Dwarf (65 cm), grains – long slender, moderate resistant to blast, moderate tolerant to LR; Yield : 32-35 Q/ha.	Karnataka

137	KAUM 57-18-1-1(K18) (IET 15096)	MO1 x MO6	2002	Early, irrigated	Irrigated	Dwarf (85-90 cm), short duration , grains – medium bold, red , tolerant to Sh. B and Sh.R. , resistant to BPH & GM ; Yield : 50-55 Q/ha.	Kerala
138	RM-1 (IET-14083) Mangala Mahsuri	Selection from Mahsuri	2002	NA	NA	Tall (123 cm), grains - short bold, medium tillering plant , susceptible to blast & Sh. B., moderately resistant to SB and blue beetle , low incidence of GF and WM ; Yield : 50-55 Q/ha.	Kerala
139	KAU – 87117 (Karuna)	CO-25 x H4	2002	150-160	Wet land	Tall (147 cm), grains – long slender, red, moderately resistant to Sh.B, and blast, SB; Yield: 45-50 Q./ha.	Kerala
140	Deepthi (WND-III)	Pure line selection from Edavaka	2002	150-160	130-135	Tall (123 cm), grains – long slender, red, medium duration, resistant to Udbatta and moderately resistant to blast, LR and SB; Yield: 40 Q/ha.	Kerala
141	KAUM – 57-9-1-1(K16)	MOI x MO6	2002	NA	Irrigated	Semi dwarf (90-95 cm.), grains – medium bold, red, resistant to BPH, moderately resistant to GM, tolerant to Sh.B, and Sh.R.; Yield : 50-55 Q/ha.	Kerala
142	KAUM – 45-20-1 (IET-15322)	Cul.12814 x MO6	2002	Short duration	Irrigated	Dwarf (90-93 cm.), grains –medium bold, red, resistant to BPH, tolerant to Sh. B and Sh. R; Yield : 50-55 Q/ha.	Kerala

143	KAUM – 42-6-3 (IET-14758)	MO6x Pokkali	2002	Medium duration	Irrigated	Dwarf (90-93 cm), grains - medium bold, red, resistant to GM and BPH, tolerant to Sh.B., Sh.R.; Yield : 65-70 Q/ha.	Kerala
144	KAUM- 20-19-4 (IET-13981)	Mutant to MO1	2002	Early	Irrigated	Dwarf (90-93 cm), grains - medium bold, red, resistant to BPH, tolerant to Sh.B. & Sh.R.; Yield: 55-60 Q./ha.	Kerala
145	KAUM-61-6-1-1-2 (IET-14260)	Pothana x MO5	2002	Medium	Irrigated	Semi dwarf (90-95 cm), grains - medium bold, red, resistant to GM & BPH, tolerant to Sh. B. & Sh. R.; Yield: 60-70 Q/ha.	Kerala
146	KAUM-59-29-2-1-2 (IET-13983)	Surekha x MO5	2002	Medium	Irrigated & Specially suited for GM areas	Semi dwarf (90 -95 cm), grains - medium bold, red, resistant to GM & BPH, tolerant to Sh. B. & Sh.R. ; Yield: 60-70 Q/ha.	Kerala
147	Makaram (KTR-2)	Evolved by mass selection & bulk progeny testing from local cherady	2002	160-175	Irrigated	Semi dwarf (111 cm), grains - medium bold, red, no major diseases & pests; Yield : 52 Q/ha.	Kerala
148	KAUM- 4-2 (Harsha)	M-210 x PTB 28	2002	Early	Rainfed lowlands & uplands	Dwarf (86 cm), grains – long bold, white, susceptible to blast, resistant to WBPH and LF, moderately resistant to earhead bug , blue beetle & S.B; Yield : 45-50 Q/ha.	Kerala

149	Kumbhan (KTR-3)	Evolved by mass selection and bulk progeny test from local cherady	2002	165-178	NA	Semi dwarf (95 cm), grains – medium bold, red, tolerant to lodging, no major pests & diseases; Yield : 47 Q/ha.	Kerala
150	Vandana / RR-167-982	C-22 x Kalakeri	2002	Early	Rainfed upland	Tall (95-155 cm), grains – long bold, white, mod. Resist to termite & SB, blast & BS; Yield: 25-30 Q/ha.	Orissa
151	Jagabandhu	Savitri x IR 4819 Sel. X IR 27301 Sel.	2002	150	Deep water	Semi dwarf (103 cm), grains -medium bold, white, mod. Resist to lodging, shattering ,	Orissa
152	Dhanrasi (IET 15358)	B32 Sel.4/ O. Rufipogonl /B 127	2002	Late duration	Rainfed shallow low land condition	Semi dwarf; grains - short bold; tolerant to water logged, resist. To blast, neck blast mod. Resist, to BLB, BS, Sh.B, Sh.R. and RTV, GM-5, LF & SB; Yield : 50-65 Q/ha	Karnataka, Maharashtra, Tamil Nadu, and Andhra Pradesh
153	RH-204 (Ex PH204)	F32 X M11	2002		Irrigated condition	Dwarf (90-95 cm); Yield : 75-80 Q/ha	Coastal region of A.P., South Karnataka, and Tamil Nadu, Haryana, Rajasthan, Uttranchal.
154	Shah Sarang-1 (RCPL 1-87-8)	Mirikrack X Rasi	2002	Medium in kharif and late in boro	Rainfed low land upto 1000 m SL	Semi dwarf (95cm); grains – short bold; mod, resist,to blast and S B; Yield: 40-42 Q/ha	Meghalaya

155	Lum Pnah-1 (RCPL 1-87-4)	IR-29 X Ngoba	2002	Medium in kharif & late in boro	Rainfed low land and upto 1000 m. MSL	Semi-dwarf (80-85cm); grains - S B, Seed Coat White, mod, resist, to blast and SB; Yield : 40-42 Q/ha	Meghalaya
156	Bha Lum-1 (RCPL-1-27)	PSN X Line No.6131	2002	Medium	Rainfed upland upto 800 m. MSL,	Intermediate (105-115 cm); grains - long bold, highly resist. to blast, mod. resist. to SB;Yield : 35-38 Q/ha	Meghalaya
157	Bha Lum-1 (RCPL-1-27)	PSN X Line No.6131	2002	Medium	Rainfed upland upto 800 m. MSL,	Intermediate (105-115 cm); grains - long bold, highly resist. to blast, mod. resist. to SB;Yield : 35-38 Q/ha	Meghalaya
158	Bha Lum-1 (RCPL-1-27)	PSN X Line No.6131	2002	Medium	Rainfed upland upto 800 m. MSL,	Intermediate (105-115 cm); grains - long bold, highly resist. to blast, mod. resist. to SB;Yield : 35-38 Q/ha	Meghalaya
159	Bha Lum-2 (RCPL- 1-29)	PSN X Line No 6131	2002	Medium	Rainfed Upland upto 800 m.	Intermediate (100-110 cm); grains - long bold, highly resist. to blast, mod. resist. to SB;Yield : 30-35 Q/ha	Meghalaya
160	GR-8	Selection from local germination	2002	Extra early (70-80)	Rainfed upland (Drilled)	Semi tall; grains - Very coarse, In rainfed drilled, rice disease and Pests problem; Yield : 10-15 Q/ha	Gujarat

161	Dandi (IET 14906)	PNL-2 X IET-8320	2002	Mid Late	Irrigated	Tall; grains - coarse and bold, resist. to BLB, BL, S.B.,WBPH, LF; Yield : 45-50 Q/ha	Gujarat
162	Tholakari (MTU-1031)	MTU 2077/ CR 316-639	2002	Late (155)	Irrigated	Semi dwarf; grains-medium slender, tolerant to BLB and BPH; Yield : 60 Q/ha	Andhra Pradesh
163	Godavari (MTU-1032)	MTU 2077/ CR 316-639	2002	Late (150)	Irrigated	Semi dwarf ; grain-medium bold, tolerant to BLB and BPH; Yield : 60 Q/ha	Andhra Pradesh
164	Shanthi (IET-12884, RP 2633-15-2-3)	Ratna X IR-36	2002	120-130	Limited irrigation	Semi dwarf (90 cm); grains-long slender, resist, to blast, mod, resist, to Sh. R., brown spot and, WBPH; Yield : 50 Q/ha.	Andhra Pradesh
165	JGL-1798 (Jagtial Sannalu)	Samba Mahsuri/Kavya	2002	120-125 (Kharif) 140-50 (Rabi)	Irrigated areas of Telangana Zones	Semi dwarf; grains – medium slender, tolerance to blast, BLB and Sh.B., resist. to GM; Yield : 51.5 Q/ha .	Andhra Pradesh
166	JGL-384 (Polasa Prabha)	Sambha Mahsuri/Kavya	2002	130-135 (kharif) 150-165 (Rabi)	Irrigated areas of Telangana zones	Semi dwarf ; grains - medium slender, Field tolerance to BPH, blast , BLB, GM and BPH; Yield : 54 – 62 Q/ha.	Andhra Pradesh
167	CSRC (S) 2-1-7 (IET-13428)	Pankaj/NC 678	2003	-	Coastal Saline Soils	Semi dwarf; Salt tolerance (6.0 -8.0 dsm -1), resist. to LB, BS, BLB, R.T.V., Sh.R., Sh.B., GLH, WBPH and mod. resist. to SB; Yield : 30-40 Q/ha.	Coastal Saline Soils of Zone-III, IV & V i.e. West Bengal, Orissa, Kerela and Andhra Pradesh

168	CSRC (S) 2-1-7 (IET-13428)	Pankaj/NC 678	2003	-	Coastal Saline Soils	Semi dwarf; Salt tolerance (6.0 -8.0 dsm -1), resist. to LB, BS, BLB, R.T.V., Sh.R., Sh.B., GLH, WBPH and mod. resist. to SB; Yield : 30-40 Q/ha.	Coastal Saline Soils of Zone-III, IV & V i.e. West Bengal, Orissa, Kerela and Andhra Pradesh
169	HPR 1156 (IET-16007)	IR 32429-122-3-1-2/ IR 31868-64-2-3-3-3	2003	112 - 127	Rainfed upland	Semi tall; grains – long slender, tolerant to drought, resist. to blast, LF. and rice hispa; Yield: 28.5 Q/ha.	Meghalya, Himachal Pradesh and Uttranchal
170	GR-104	GR-101 x Basnati370-4-5-2	2003	Late 130-140	Irrigated	Tall; grains - long slender, resistant to leaf and neck blast, resist. to BLB, mod. resist. to LF & WBPH; Yield : 40-50 Q/ha.	Gujarat
171	PNR-546 (IET-11347)	PNR-125-2 (Induced mutant line from Pusa 150)/PNR-130-2 (Induced mutant line from Basmati -370)	2003	90-95 (Kharif) 110-115 (Boro)	Irrigated	Semi dwarf (100 cm); grains - fine long slender, aromatic, tolerance for BS, leaf blast, Sh.B, BLB, SB, WBPH, GM (Bio hype-1); Yield : 38 -43 Q/ha	West Bengal
172	Swati (IET-12 888)	Br-51/ Culture 23332-2	2003	Medium	Boro cultivation	Grains - Awn less, tolerant to leaf blast & LF; Yield : 71 Q/ha.	Tripura
173	Kali Khasa	Pure line selection from local aromatic tall indica	2003	Medium 128-130	Rainfed shallow low land	Semi dwarf; grains- long slender , resist. to blast, BS and Sh.R; Yield : 35 - 40 Q/ha	Tripura

174	HKR-126	Namsagni 19/IR4215-301-2-2-6 IR-5953-162-1-3	2003	Medium 135-140	Lows hills sub-tropical zone	Semi dwarf (95-98 cm) grains - long slender, mod. susceptible to BLB, mod. resist.to blast, Glume blotch, resist to stem rot;Yield : 30 Q/ha	Himachal Pra-desh
175	BR-2655	(BR 10 X BR 4) X (BR7 X Palghar 84-3) BR-2655-9-3-1	2003	Late	Irrigated maidan areas of southern Karnata-ka	Medium tall; grains – medium bold, tolerant to blast and SB ; Yield : 65-75 Q/ha	Karnataka
176	Sharavathi (IR 57773)	[FRR 843 -3/ IR38784 -137 -2-5-5] X [FRR 843-3 / IR 38787 -26-2-2-3]	2003	Late	Hill zone of Karna-taka	Tall (130-135 cm); grains - bold, dark brown , tolerance to blast disease; Yield : 50-55 Q/ha.	Karnataka
177	Sharavathi (IR 57773)	[FRR 843 -3/ IR38784 -137 -2-5-5] X [FRR 843-3 / IR 38787 -26-2-2-3]	2003	Late	Hill zone of Karna-taka	Tall (130-135 cm); grains - bold, dark brown, tolerance to blast disease; Yield : 50-55 Q/ha.	Karnataka
178	SYE-2001	SYE-75 X IR-52	2003	Mid late	Irrigated trans-planted	Dwarf; grains - short bold, mod. res-ist. to blast, BLB, BS, WBPH, BPH and GM;Yield : 45 – 50 Q/ha.	Maharashtra
179	Jaldi Dhan-13	Kagalikai/JD-8* (*With wide compati-bility gene)	2003	Extra early	Rainfed uplands	Semi dwarf; grains –long bold, res-ist.to neck blast, BS., WBPH, BPH and GM; Yield : 60 – 72 Q/ha.	West Bengal

180	Palghar-2	IR-5X Zinnia-63	2003	Medium	Medium to high rainfall area	Semi dwarf; grains -long slender, mod. Susceptible to blast, resist, to neck blast, BS, SB, store pest, WBHP, BPH and GM; Yield : 30-35 Q/ha.	Maharashtra
181	Bhudeb (CN1035-61) (IET 14496)	Pankaj/IR 38699-49-3-1-2// IR 41389-20-1-5	2003	Late	Rainfed deep water areas	Semi tall; grains - long slender, golden colour, mod. Resist to Sh.B., Sh. R. and SB, resist. to BLB, BPH, GM; Yield : 31-41 Q/ha.	West Bengal
182	SKL-8 (SKL-11-28-29-55)	RP (W) 6-17 Z X Eshwarkora	2003	Late	Irrigated transplanted	Dwarf, grains - long slender, mod. resist. to blast and blight, resist to GM, BPH, GLH, WBPH, SB LF; Yield : 40-45 Q/ha.	Maharashtra
183	GIRI	IR-36/ Bhasamanik	2003	Late	Shallow water	Semi tall; grains - long slender; Yield: 45 Q/ha.	West Bengal
184	CSRC (s) 11-5-0-2 (IET 13422) UTPALA	Pankaj /Jhingasail	2003	Medium 140	Rainfed /irrigated & Coastal ecosystem	Semi tall; grains - long slender, resist. to BLB, Sh.R, Sh. B., mod. resist to neck blast, R.T.V, resist to WBPH and GLH, SB and BPH; Yield: 37- 48 Q /ha.	West Bengal
185	SKL-8 (SKL11-28-29-55)	RP (W) 6-13/EshwarKora	2004	145-148	Irrigated	Dwarf (95-98 cm); grains- long slender, good cooking quality, mod. resist. to blast, blight, GB, BPH, WBPH, GLH, SB, LF; Yield: 40-50 Q/ha.	Maharashtra

186	JR-503 (Ri-cha) (IET-16782)	Mahsuri/ Basmati 370	2004	130	Irrigated/ Rain fed	Medium height (95-100 cm); grains - long slender, resist. to leaf blast, mod. resist. to WBPH & BPH; Yield : 40 Q/ha.	All India
187	Pusa Su-gandh -5 (IET-17021)	Pusa 3A/ Haryana Basmati	2004	125-130	Irrigated	Semi dwarf (90-100 cm); grain - long slender; resist.to BS, GM (biotype-5), mod. resist. to blast, BLB & LF; Yield: 47.5 Q/ha.	All India
188	Suruchi 5401 (MPH 5401)	PMS 79/ PR 319	2004	130-135	Irrigated	Semi dwarf (90-100 cm); grain – me-dium slender; resist. to leaf blast, GM, LF and BPH;Yield: 70-80 Q/ha.	All India
189	Sugandhama-ti (IET 16775)	Pusa Basmati/ IET 12603	2004	144	Irrigated	Semi dwarf (98 cm); grain-long slender, strong scented; mod. resist. to leaf blast, neck blast and BS; Yield: 43 Q/ha.	All India
190	NDR 8002 (IET15848)	IR- 67493-M-2 (IR-5359-26-4-2-1-3/PSBRC-60)	2004	135-140	Irrigated/ Rain fed	Semi dwarf (105-115 cm); mod. res-ist. to blast, WBPH; Yield: 45-55 Q/ha.	Madhya Pradesh and Andhra Pra-desh
191	Rajendra Mahsuri-1 (RAU 83-500)	BR-51-46/Mahsuri	2004	140-150	Medium to shal-low low-land	Semi dwarf (100-110 cm); grains – medium slender, good milling quality, mod. resist. to BLB, Sh.B, Sh.R., BS, plant hopper, LF and SB; Yield: 55 Q/ha.	Bihar
192	GR-9	Sathi 34-36/CR-544-1-2	2004	90-100	Rainfed upland	Semi tall, grains- medium; Yield: 23-25 Q/ha.	Gujarat

193	PKV Maka-rand (Sye-4-32-5-8)	Indrayani/SYE-3-43-57	2004	120-126	-	Semi dwarf (85-90 cm); grain - medium slender, mild aroma, good cooking quality resist. to blast, BLB, mod. resist. to GM;Yield: 35-40 Q/ha.	Maharashtra
194	PKV-SKL-3-11-25-30-36 (IC 400211)	Daya/ SKL-6	2004	126-128	Irrigated	Medium dwarf ; grain - medium slender, good cooking quality; highly resist. to blast, BLB, resist. to GM (biotype-1 & biotype-4) BPH; Yield: 45-50 Q/ha.	Maharashtra
195	Indra Dhan-1 (IET 15376)	Madhuri/ Surekha	2004	130-135	Irrigated/ rainfed	Semi tall (90-100cm); grains – medium slender; mod. resist. to Sh.B, BS, resit. to GM; Yield: 36 Q/ha.	Chhattisgarh
196	PBNR 93-1 (Parbhani Avishkar)	PrabhabatiBPBN1/ Karnal local (Basmati type)	2004	100-115	Upland irrigated	Semi dwarf (60-65 cm); Scented grains, better cooking quality than Parag & Sugandha; resist. to SB, mod. resist to blast & LF; Yield: 34-36 Q/ha.	Maharashtra
197	PR-118	/ PR 11/	2004	158 (Late)	Lowland irrigated	Semi dwarf (140 cm); grain - medium slender, res./mod. resist. to most of the Patho types of *Xanthomonas oryza* , susceptible to SB, LF & WBPH; Yield: 69-72 Q/ha.	Punjab
198	Super Basmati	Basmati320/ IR 661	2004	145	Irrigated	Semi tall (113 cm); grains -extra long slender, susceptible to SB, LF & WBPH; Yield: 31 Q/ha.	Punjab

199	GR-7	GR-3/Basmati 370 6-6-3-1-1	2004		Irrigated	Non lodging, grains - medium slender with mild aroma, rest. to BLB, blast, mod. rest. to WBPH, SB and LF; Yield: 45-50 Q/ha.	Gujarat
200	Narendra 8002 (NDR 8002) (IET 15848)	IR60290-CPA 5-1-1-1-1/ IR 52533-52-2-1-2-1-B-2-3	2005	135-140	Lowland	Medium dwarf (105-115); grains - slender, lodging resist., tolerant to shattering, mod. resit. to blast, BS, BLB & WBPH; Yield: 55 Q/ha.	Andhra Pradesh, Madhya Pradesh and Chhattisgarh
201	Pusa 1121 (Pusa Sugandha-4)	Pusa 614-1-2/ Pusa 614-2-4-3	2005	135-140	Irrigated saline soils	Medium (97.3 cm); grains - slender, excellent cooking quality, mod. resit. to RTV, Sh.R, Sh.B & BLB; Yield: 55-65 Q/ha.	Andhra Pradesh and Kerala
202	DRRH-2 (IET 18076)	IR 68897A/ DR 714-1-2R	2005	116	Irrigated	Semi dwarf (90 cm); grains - slender, lodging resistant., resit. to LF, neck blast and RTV, mod. resit. to Sh.R BS & WBPH; Yield: 54 Q/ha.	Uttranchal, Haryana, West Bengal and Tamil Nadu
203	Jarava (IET- 15420)	B-32-Sela 4/ Oryza rufipogon/ B 29-6	2005	116	Coastal saline areas	Semi dwarf (105-110 cm); grains – short bold, tolerant to high salinity, suitable for late planting, , resit. to blast, neck blast, Sh.R, mod. resit. to Bacterial blight, RTV, BS, resit. to plant hopper and LF; Yield: 33-45 Q/ha.	West Bengal, A&N Island, Pondicherry.
204	Naina (CSR-36)	CSR 13/Panvel-2/ IR-36	2005	105-109	Irrigated alkaline	Semi dwarf (95-105 cm); grains-long slender, tolerant to alkalinity, mod.	Haryana and Pondicherry

	(IET 17340)				area	tolerant to Zn deficiency, resit. to RTV, Sh.R, mod. resit. to blast, BLB, GLH, WBPH & LF; Yield: 39 Q/ha.	
205	Birsamati	IR-36 / BR 9	2005	130	Rainfed/ Irrigated	Semi dwarf (95-100 cm); grains – Slender, resist. to blast, BLB,BS & SB; Yield: 40-45 Q/ha.	Jharkhand
206	Birsa Vikas Dhan - 110	Kalinga III/ IR 64	2005	95	Rainfed upland	Medium tall (90-95 cm); grains - long slender, mod. resist. to blast, BLB, BS, borer and GB; Yield: 30-35 Q/ha.	Jharkhand
207	Birsa Vikas Dhan - 109	Kalinga III/ IR 64	2005	85-90	Rainfed upland	Medium tall (90-95 cm); grains - long slender, mod. resist. to blast, BLB, BS, borer and GB.	Jharkhand
208	Hazari Dhan	IR-42/IR-5853-118-5	2005	115-120	Rainfed	Semi dwarf; grains - long slender, highly resist. to blast, mod. resist. to BLB, BS, Sh.R, resist. to SB, WBPH & GB ; Yield: 35-40 Q/ha.	Jharkhand
209	Sada bahar	BRRI SAIL/ IR-10181-58-3-1	2005	100-105	Rainfed uplant	Grains – long bold, resist to blast, BLB, BS & SB; Yield: 30-35 Q/ha.	Jharkhand
210	ADT(R) 46	ADT 38/Co 45	2005	135	Irrigated	Semi dwarf; grains - long slender, resist. to SB and LF; Yield: 62 Q/ha.	Tamil Nadu
211	TKM (R) 12	TKM 9/ TKM 11	2005	Early	Upland	Semi tall (95-105 cm); grains – medium slender, mod. resist. to SB, LF, blast and BS; Yield: 30 Q/ha.	Tamil Nadu

212	PMK (R) 3	UPLRI 7/ Co 43	2005	Early	Rainfed/Semidry	Grains – long bold, tolerant to LS, LB, Sh.R, resist to WBPH, tolerant to LF, SB; Yield: 25-40 Q/ha.	Tamil Nadu
213	Malviya Basmati-1 (HUBR 2-1)	HBR 92/Pusa Basmati/Kasturi	2005	125-130	Irrigated	Semi dwarf (100 cm); tolerant to BLB, blast and SB;Yield: 40-45 Q/ha.	Uttar Pradesh
214	Malviya Dhan-3022 (HUR 3022)	IR 36/HR 137	2005	105	Irrigated/ Rainfed	Semi dwarf (100 cm); grains – long slender, fine, tolerant to BLB, SB, resist. to leaf and neck blast; Yield: 50-55 Q/ha.	Uttar Pradesh
215	Malviya Dhan-2 (HUR 3022)	IR 36/HR 137	2005	100-105	Irrigated/ Rainfed	Semi dwarf (100 cm); grains - long slender, fine tolerant to BLB, SB, resit. to leaf and neck blast; Yield: 50-55 Q/ha.	Uttar Pradesh
216	HKR-47	12193-1/HKR-120	2005	135	Irrigated	Semi dwarf (116 cm); grains - long slender; Yield: 80 Q/ha.	Haryana
217	JR-201 (Rashmi)	IR-36/JR-75	2005	95	Irrigated	Dwarf , grains - long slender, resist. to blast , Sh.R, GM-1, SB, mod. resist. to bacterial streak & WBPH; Yield: 30 Q/ha.	Madhya Pradesh
218	VTL-6	Cheruvirittu/ IR/Jaya	2005	105-110	Costal Saline area	Semi tall (115-120 cm), grains - medium, tolerent to salinity, acidity & water stagnation:, Yield : 35-45 Q/ha.	Kerala

219	Salimar Rice-1	CH 1007/ IET-1444	2005	Medium	High altitude	Resistant to Blast; Yield: 60 Q/ha.	Jammu & Kashmir
220	Kohsaar	Shinei/Jinmasari	2005	Early	Irrigated High altitude	Cold tolerant disease, mod. resistant to blast; Yield: 40 Q/ha.	Jammu & Kashmir
221	Ehnghat-1	RP-4-14/R-711	2005	Early	-	Semi dwarf (85-90 cm) grains - long slender, mod. resist. to leaf blast & bacterial blight, resist. to GM.	Maharashtra
222	Birsa Dhan-108	KR-5-142 X Pani Dhan-2	2006	70 (Extra early)	RainfedUpland	Plant height – 115-120 cm; grains – medium bold; resistant to blast, SB and GB, mod. resistance to BS; Yield: 50-52 Q/ha	Jharkhand
223	Bhutnath (CSRC (S) 5-2-2-5) (IET-12855/11354)	SR 26 B/ Pankaj	2006	108 Medium maturity	Coastal rainfed areas	Plant height – 112 cm; grains – long slender, awn absent, milling recovery 70.25%, mod. resist.to leaf blast, neck blast, Sh.B, RTV, Sh. R and BS. mod. resistant to SB, LF; Yield : 40 Q/ha	All India
224	KHP-9	Intan X IET 7191	2006	165-170 Long duration	Low lands of hill zone	Plant height – 115-120 cm; grains – medium bold; tolerant to blast disease;Yield: 50-52 Q/ha	Karnataka
225	Tunga (IET-13901)	Progeny of (Pankaj X Mahsuri) X TKM 6	2006	150-155	Mid lands of hill zone	Plant height – 90-100 cm; grains - long slender; tolerant to blast and BLB; Yield: 50-52 Q/ha	Karnataka

226	Barani Deep (NDR 1025-2) (IET-13194)	C 1064-5/IR 9129-320-3-3-3/IR 54	2006	95-100	Rainfed upland/ irrigated	Plant height –75-85 cm; tolerant to BLB , Sh. R. , LF , mod. rest. to sh.B; Yield: 30-40 Q/ha	Uttar Pradesh
227	Jogesh (OR-1519-2) (IET-15169)	CR 544-1-3-4 (IET 10974) / NDR 1008 (IET 10978)	2006	89 (Early)	Rainfed / irrigated uplands	Plant height –92 cm; resistant to BS , neck blast, mod. rest. to blast and Sh.B Yield: 30-40 Q/ha	Orissa
228	Sidhanta (ORS 102-4) (IET-15296)	Jajati/Annapurna	2006	96 (Early)	Rainfed / irrigated uplands	Plant height –103 cm; grains – short bold; resistant to BS, neck blast, mod. rest. to neck BLB, RTV, and Sh.R; Yield - 34.32 Q/ha	Orissa
229	Varshadhan (CRLC-899) (IET-15296)	IR 31432-8-3-2 / IR 31406-3-3-3-1/IR 26940-3-3-3-1	2006	155-160	Low land (suitable for late planting)	Plant height –150 cm; grains – long bold; mod. resistant to neck blast, BLB, and Sh.R; Yield: 35-40 Q/ha	Orissa
230	Uphar 9OR 1234-12-1) (IET 17318)	Mahalaxmi/IR 62	2006	162 (Late)	Shallow & semi-deep water	Plant height –124 cm; grains - short bold; resistant to Sh B, BLB,RTV and Sh R; Yield: 35.84 Q/ha	Orissa
231	Pratikshya (ORS 201-5) (IET-15191)	Swarna /IR 64	2006	142 (Mid Late)	Irrigated/ Rainfed medium (suitable for late sown)	Plant height –105 cm; grains – medium slender; mod. resistant to BS, Sh. R, Sh.B, LF and WBPH resistant to GMI and SB (white ear); Yield: 48.48 Q/ha	Orissa

232	Ajay (CRHR-7) (IET- 18166) (Hybrid)	CRMS 31A X IR 42266-29-3R	2006	125-130	Irrigated	Plant height –107 cm; grains – long slender; resist. to blast and WBPH mod. resist. to tungro and WBPH; Yield: 60-65 Q/ha	Orissa
233	Ketekijoha	Badsabhog/ Savitri (CR 1009)	2006	140-145	Rainfed lowland	Plant height –130 cm; grains - medium slender; mod. resist. to Sh.B, SB, GM and BLB; Yield: 35-40 Q/ha	Orissa
234	Rajalaxmi (CRHR-5) (Hybrid)	CRMS 32A X IR 42266-29-3R	2006	125-130	Irrigated	Plant height –105 cm; grains - long slender; tolerance to blast & BB, SB, BPH/ WBPH and GM; Yield: 55-60 Q/ha	Orissa
235	Naveen (CR-749-20-2) (IET-14461)	Sattari X Jaya	2006	115-130	Rainfed upland, medium land and irrigated	Plant height –105 cm; grains – medium bold; resist. to blast & mod. resist. to Sh.B, BS and SB.; Yield: 50-60 Q/ha	Orissa
236	Geetanjali (CRM-2007-1) (IET-17276)	Basmati 370	2006	130-135	Medium land and irrigated	Plant height –110-115 cm, semi-dwarf; grains – long slender; resistance to neck blast & mod. resistance to GM;Yield: 50-60 Q/ha	Orissa
237	JKRH-401 (IET-181981) (JKRH-2000)	RV-2A X RV-44R	2006	140	Irrigated	Plant height –115 cm, semi-tall; grains – long bold; mod. resistance to neck blast, BS, Sh.R, Sh.B, BLB & RTV, WBPH,GM and SB; Yield: 62 Q/ha	Bihar, Orissa and West Bengal

238	Shusk Samrat (NDR 1045-2) (IET-17458)	C 1064-5/Kalari/ IR 54	2006	100-105 (Early)	Upland (Direct seeded), mod. drought tolerant	Plant height –95-100 cm, semi-dwarf; grains – long bold; mod. resistance to BS, Sh. B, Sh.R, mod. resistance to SB, GM, LF and WM; Yield: 30-35 Q/ha	Bihar, Orissa and Uttar Pradesh
239	Virender (IET-17901) (RR347-2)	RR 19-2/RR 149-1129	2006	90-95 (Early)	Upland (Direct seeded) tolerant to drought	Plant height – 85-100 cm, semi-dwarf; grains – short bold; mod. resistance to BS, Sh. R, GM biotype 1and mod. resistance to GM biotype 4 SB and LF;Yield: 25-30 Q/ha	Orissa, Gujarat
240	VL Dhan-86 (VL97-3861) (IET-16863)	VL Dhan 16 X VL Dhan 221	2006	90-95 (Early)	Irrigated	Plant height –112 cm, semi-dwarf; grains: MB; resistance to leaf and neck blast (major diseases), tolerance to LF, SB, rice hispa and plant hoppers ; Yield: 50 Q/ha	Himachal Pradesh, Uttrakhand
241	Shivam (IET-17868) (RR-272-829)	CR 314-5-10 (Open Florat mutant) natural cross	2006	115-125	Irrigated	Plant height 95–110 cm, semi-dwarf; grains – short bold; highly resist to blast, GM biotype 4, SB & LF, mod. resist. to BS, Sh.R; Yield: 45-50 Q/ha	Uttar Pradesh, Bihar, Jharkhand and Assam
242	Haryana Shankar Dhan-1 (HKRH-1)	IR 58025A/ BR 827-35-K2	2006	139	Irrigated	Plant height 122 cm, semi-dwarf; grains – long slender; mod. resistant to neck blast, BS, WBPH, SB & LF, susceptible to BLB and Sh. R; Yield: 82.82 Q/ha	Haryana

243	VL Dhan 209	Himdhan/K39/ VL Dhan 211	2006	160-165	Rainfed upland	Plant height 110-115 cm, semi-tall; grains – medium bold; resistance to leaf blast, SB neck blast & LF, tolerance to BLS, leaf scald; Yield: 18.79 Q/ha	Uttarakhand
244	VL Dhan 65	Himalaya 2/ VL Dhan 16	2006	130-135 (Me-dium)	Irrigated	Plant height 125-130 cm, semi-tall; grains: long slender; resistance to leaf blast, neck blast, BLS , tolerance to LF, tolerance to SB & leaf scald; Yield: 53 Q/ha	Hilly areas of Uttarakhand
245	Sahyadri-2 (KJTRH-3) (IET-17661) Hybrid	IR-58025A X kJTR-2	2006	115-120	Irrigated	Plant height 105-110 cm, semi-tall; grains – long slender; resist. to blast, BLB, highly resist. to false smut, mod. resist. to TRV, Sh.R, BS, mod. susceptible to Sh.B and leaf scald; Yield: 70 Q/ha	Maharashtra
246	Sahyadri-3 (KJTRH-12) (IET-18829)	IR-58025A X KJTR-3	2006	125-130	Irrigated	Plant height 115-120 cm, semi-tall; grains - long slender; resistant to blast, neck blast mod. resist. to BLB, BS, Sh.B and Sh.R;Yield: 65-75 Q/ha	Maharashtra
247	HPR 2143	HPR 9020-2-2-2-1-1-1 Phul Patas/ HUP 741	2006	125-135	Irrigated	Plant height 87-105 cm, grains - long slender; highly resist. to neck blast, resist. to leaf blast, brown spot BLB leaf folder and rice hispa. Yield: 38-62 Q/ha	Himachal Pra-desh

248	HPR 1068	IR 53455-Nag- 11-1-1-2-1-3 IR 42015-83-3-2-2/ IR 9758-K2	2006	120-125	Irrigated 1500 m above msl in mid hills.	Plant height 82 cm, grains - long bold; highly resist. to neck blast, mod. susceptible to leaf blast. Yield: 44-46 Q/ha	Himachal Pradesh
249	Bhrigu Dhan	Chucheng/ Daval / Matali	2006	105-115	Irrigated above 1200 m high altitudes	Semi dwarf, grains – Short Bold and red; resist. to leaf & neck blast, brown spot and sheath rot.Yield: 39-30 Q/ha	Himachal Pradesh
250	Vivek Dhan 154	VL Dhan 221X VL 24	2006	100-110	Rainfed upland	Semi tall (95-110 cm) resist. to leaf blast , neck blast, brown leaf spot and leaf scald; Yield: 20-25 Q/ha	Uttranchal
251	Pant Sugandh Dhan 15 (IET 14132) (UPRSBS 92-4)	Basmati 370/Sadri/Baharal/Muskan 41	2006	140-145	Irrigated	Medium ht. (116-120 cm), grains – Long Slender and red ; mod. resist. to leaf blast, neck blast, sheath rot, tolerance to bacterial blight, SB and LF; Yield: 35-41 Q/ha	Uttranchal
252	Pant Sankar Dhan -3 (UPHR 10100) (Hybrid)	UPRI 95-17A/UARI 93-287R	2006	126	Irrigated	Semi dwarf. (115 cm), grains – Long Slender and red ; mod. resist. to BLB, blast, BS, RTV, Sh. B, kernel bunt, SB, BPH, WBPH and LF. Yield: 61-6.6 Q/ha	Uttranchal

253	Pant Sugandh Dhan – 17 (IET 17263) (UPR 2879-98-105)	Pusa basmati 1 as female & UPRM 500 as male parent	2006	135-140	Irrigated	Semi dwarf. (102-115 cm), grains – Long Slender; resit. to Sh. R., Sh. B, mod. resist. leaf & neck blast., tolerance to SB, LF and hispa pests. Yield:38- 40 Q/ha	Uttranchal
254	VL Dhan-207 9Vl 97-9729)	VL Dhan 206 X Annadda	2006	160-165	Rainfed	Semi tall. (110-115 cm), resist. to leaf blast, neck blast, BLS, leaf scald SB & LF.Yield: 20-24 Q/ha	Uttranchal
255	VL. Dhan 208 (VL 97-9632)	VR 410-19 X VR 212	2006	160-165	Rainfed	Semi tall. (105-110 cm), resist. to leaf blast, neck blast, BLS, leaf scald SB & LF.Yield: 20 - 25 Q/ha	Uttranchal
256	VL. Dhan 85 (IET-16455) (VL-3613)	HPU 799 X VL 221	2006	118-120	Irrigated Hilly areas	Semi tall. (115-125 cm), resist. to SB & LF; Yield: 52.12 Q/ha	Uttranchal
257	ADT (R)- 48 (AD 951280	IET 11412/ IR 64	2006	98-102	Irrigated/ Rainfed	Semi dwarf. (70-85 cm), tolerant to BLB, RTP, blast & Sh.B., mod. tolerant to thrips, BPH, WBPH & GM; Yield: 48.0 Q/ha	Tamil Nadu
258	Onam	Kochuvithu X TN(1) X Thriveni	2006	95	Rainfed/drought tolerant	Semi tall (105 cm), tolerant to blast & Sh.B., BPH;Yield: 40.25 Q/ha	Kerala
259	Bhagya	Thadukkan X Jaya	2006	95- 100	Rainfed/drought tolerant	Semi tall (115 cm), mod. Tolerant to blight, SB, leaf roller & case worm. Yield: 43.50 Q/ha	Kerala

260	Sagara	Mass selection from Orumundakan local	2006	-	-	Tall (165 cm), Tolerant to blast, Sh.B, SB and susceptible to LF. Yield: 49.83 Q/ha	Kerala
261	Dhanya	Jaya X Ptb - 4	2006	165	Rainfed/drought to-lerant	Tall (165 cm), mod. resit. to blast, Sh.B, blast SB and LF. Yield: 43.0 Q/ha	Kerala
262	PTB – 45 (Matta Triveni)	Reselection from Tri-veni (PTB-38)	2006	Early	Irri-gated/Rainfed	Tall (82 cm), grains : Long Bold, mod. resit. to neck blast, brown spot, SB and resit. to BPH. Yield: 50 - 55 Q/ha	Kerala
263	PTB – 49 (Kairaly)	IR 36 X Jyothi	2006	110-115	Irri-gated/Rainfed	Tall (90 cm), grains : Long Bold, multiple resit. to leaf blast, neck blast, GM biotypes GM-1 & GM-4, WBPH and GM-1;Yield: 50 - 55 Q/ha	Kerala
264	PTB – 50 (Kanchana)	IR 36/ Pavizham	2006	100-110	Irri-gated/Rainfed	Tall (88 cm), grains : Long Bold, mod. resit. to leaf blast, Sh. B., brown spot, RTV & SB;Yield: 50 - 55 Q/ha	Kerala
265	PTB – 51 (Aathira)	BR 51-46-1/Cul 23332-2	2006	125-130	Irri-gated/Rainfed	Tall (110 cm), grains : Short Bold, mod. resit. to leaf blast, neck blast, Sh. B. and tolerant to GM, BPH & WBPH.;Yield: 55 - 60 Q/ha	Kerala
266	PTB – 52 (Aiswarya)	Jyothi/ BR 51-46-1	2006	125-130	Irri-gated/Rainfed	Tall (108 cm), grains : Long Bold, mod. resit. to leaf blast, neck blast, Sh. B. and tolerant to GM-1 & 2, BPH;Yield: 55 - 60 Q/ha	Kerala

267	Swetha (IET – 14735)	IR 50/C 14-8	2006	135-140	Irrigated	Tall (106 cm), grains: Short Bold, low susceptible to blast, BS, Sh. B., Sh R and resist. to GM & SB. Yield: 42.40 Q/ha	Kerala
268	Dhanu	Mutant of Ptb. 20	2006	159	-	Semi tall (123 cm), grains : Short Bold, mod. tolerant to blast, Sh. B, BS & SB.;Yield: 71.88 Q/ha	Kerala
269	Gouri (MO 20)	MO 4 (Bhadra) (Cul. 2533)	2006	115-120	-	Med. tall (94 cm), grains : Medium Bold, resit. to Sh. R, stack burn, BS, BPH and mod. resist. to Sh.B, GM & SB.; Yield: 60-65 Q/ha	Kerala
270	Varsha (PTB 56)	M 210// M.210/ PTB 28)	2006	115-120	-	Med. tall (96 cm), grains : Long Bold, low susceptible to Sh. B, blast , resist. to WBPH.;Yield: 45-50 Q/ha	Kerala
271	Chingam	Mutant of Ptb-9 X Mutant (IR-8 X Ptb-8)	2006	95-100	Rainfed	Semi tall (147 cm), tolerant to Short Bold, mod. tolerant to Sh.B & LS. Yield: 39.70 Q/ha	Kerala
272	PRH-122 (IET-17248) (Ganga)	IGP- 6998 (a) X IGP-6893	2006	125-130	Irrigated	Plant height 100-105 cm, grains: Long Slender, resit. to leaf blast, mod. resit. to RTV, Sh B, tolerant to LF, SB & WBPH; Yield: 56.0 Q/ha	Uttranchal, Punjab, Haryana, UP, Orissa, Bihar, Nagaland
273	Birsa Dhan - 108	KR-5-142 X Pani Dhan-2	2006	Extra early (70 days)	Rainfed	Semi tall (95-100 cm), grains: Long Slender, resit. to blast, BLB, SB, Gundhi bug , mod. resit. to BS. Yield: 30-35 Q/ha	Jharkhand

274	JKRH-401 (IET-181981) (JKRH-2000) (Hybrid)	RV-2A X RV- 44R	2007	140	Irrigated	Semi tall (115 cm), grains: Long Bold, mod. resit. to leaf blast, neck blast, BS, Sh.R, Sh.B, BLB, RTV, WBPH, GM & SB.Yield: 62.0 Q/ha	West Bengal, Bihar, Orissa
275	Varundhan	Pure line selection from Junjen - 4	2007	140-145	Irrigated	Semi dwarf (81cm), grains: Short Bold, resit. to leaf & neck blast, BS & Sh.R.;Yield: 32.10 Q/ha	Himachal Pra-desh (Hilly areas above 1000 m MSL)
276	PAU-201	PR 103/ PAU 1126	2007	144	Irrigated	Semi dwarf (101cm), grains: Long Slender, resit. to BB, mod. resit. to WBPH and susceptible to Sh.B, SB & LF.; Yield: 46-50 Q/ha	Punjab
277	Improved Pu-sa Basmati-1 (IET- 18990) (Pusa 1460-01-32-6-7-67)	Pusa Basmati-1// Pusa Basmati-1/ IRBB55	2007	135	Irrigated	Semi dwarf (95 cm), grains: Long Slender, resit. to BB, leaf folder, Whorl maggot, rice thrips, rice hispa & GLH.; Yield: 37.0 Q/ha	Delhi, Punjab, Jammu & Kashmir Uttrak-hand
278	Pant Dhan 18 (IET 17920) (UPRI 99-1)	IR 25394-3-57// RD 23// IR 27316-96/// SPRLR 77205-3-2// SPRLR 79234-51-2 Pedigree- SPR 85163-5-1-2-4	2007	105-135	Irrigated	Semi dwarf (114 cm), grains: Long Slender, mod. tolerant to leaf folder, SB & BPH.; Yield: 112. 6 Q/ha	Bihar, West Bengal, Orissa, Chhatisgarh, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala

279	Abhishek (IET-17868 (RR- 272-829)	CR 314-5-10 (Open Florat mutant)	2007	127	Irrigated	Semi dwarf (95-110 cm), grains: Short Bold, highly resit. to blast, GM (biotype 4), mod. resit. to BS, Sh.R, leaf folder, SB & LF. Yield: 45-50 Q/ha	U.P., Bihar, Jharkhand, Assam
280	PY - 7	Hybridization & pedigree selection from cross IR 50 X Co 43	2007	125-130	Irrigated	Plant height 100-105 cm, grains: Medium Slender, resit. to RTV, mod. resit. to blast, BS, Sh R, tolerant to SB & LF.;Yield: 20.0 Q/ha	Tamil Nadu
281	GR-12	GR-4 X IR-64/ 6-6-1-3	2007	120-125	Irrigated	Plant height 115-120 cm, grains: Medium Slender, resit. to mod. resit. to BLB, SB, neck blast & WBPH. Yield: 45-50 Q/ha	Gujarat
282	Karjat - 5	BR 827-35-3-1-1-1	2007	125-130	Irrigated	Plant height 110-120 cm, grains: Long Bold, resit. to neck blast, LF, BS, Sh R, WM, SB, BPH & WBPH. Yield: 45-50 Q/ha	Maharashtra
283	Karjat - 6	Heera/ Karjat- 184	2007	130-135	Irrigated	Semi dwarf (95-100 cm), grains: Short Slender, mod. resit. To leaf blast, neck blast, BLB, SB & LF. Yield: 35-40 Q/ha	Maharashtra
284	Bhogavari	RP-ST-328, Selection from Basmati Composite	2007	110-115	Irrigated	Plant height 85-90 cm, resist. to blast, neck blast mod. resist. to leaf scald, SB; Yield: 35-40 Q/ha	Konkan, western Ghat zone, Maharashtra

285	Samaleshwari (IET-17455, R 1027-2282-2-1)	R 370-37/R308-6	2007	105-112	Rainfed uplands	Plant height 85-90 cm, semi-tall; grains – medium slender; resist. to GM biotype 1, mod. resist. to blast, tolerant to BS and neck blast; Yield: 32 Q/ha	Chhattisgarh
286	Chandrahasi-ni (IET 16800, R 979-1528-2-1	Abhaya/Phalguna	2007	120-125	Rainfed uplands	Plant height 85-90 cm, semi-tall; grains - medium slender; mod. resist. to neck blast, BS , Sh.R, tolerant to GM biotype 1, mod. resist. to BPH, LF and WBPH; Yield: 46.33 Q/ha	Chhattisgarh
287	Jaldubi (IET 17153, AR 1023)	Selection from AR 1023	2007	130-140	Direct seeding rainfed shallow & SDW	Plant height 140-150 cm, semi-tall; grains - medium fine; resistant to blast, GM biotype 1; Yield: 53.19 Q/ha	Chhattisgarh, Madhya Pradesh
288	Indira Sona	IR 58025A X R-710-437-1-1	2007	Medium	Irrigated	Plant height 110-115 cm, semi-tall; grains - medium fine; tolerant to blast, resistant to GM biotype 1; Yield: 60-65 Q/has	Chhattisgarh
289	Pardhiva (NLR 33892)	NLR 27999 (Tikka-na)/ MTU 4870 (Deepthi)	2007	Late (De-layed planting)	Irrigated	Plant height 110-135 cm, Blast en-demic areas of southern zone where people prefer both grain and fodder. Yield: 60-65 Q/ha	Andhra Pradesh

290	Indra (MTU 1061)	PLA 1100/MTU 1010	2007	Late	Irrigated	Plant height 115 cm, semi-dwarf; grains - medium slender; tolerant to BPH, BLB and GM biotype 1; Yield: 48-65 Q/ha	Andhra Pradesh
291	Sree Kurma	BPT 5204/ IR 54	2007	150-155 (Late)	Rainfed lowland	Plant height 105-110 cm, semi-dwarf; grains – medium slender; high toler-ance to GM biotype 4, low incidence of SB; Yield: 43-52 Q/ha	Andhra Pradesh
292	Warangal Sannalu (WGL32100) (IET 18044)	Diyva X BPT 5204	2007	Medium	Irrigated	Plant height 105-110 cm, semi-dwarf; grains – medium slender; Yield: 65-70 Q/ha	Andhra Pradesh Bihar, Orissa
293	Phule Radha	T(N)-1 X Kolamba 540	2007	110-115 Early	Irrigated	Plant height 90-95 cm, semi-dwarf; grains-short slender; resist. to BLB, mod. rest. to blast and scald; Yield: 35-40 Q/ha	Maharashtra
294	JRH-5 (Hybr-id)	IR 68897A x JRR (N) 65	2007	105-108	Irrigated/ rainfed	Plant height 110-115 cm, semi-dwarf; grains-long slender; susceptible to false smut, low incidence of BLB, no major pest observed; Yield: 60-80 Q/ha	Madhya Pradesh
295	JRH-4 (Hybr-id)	IR 68886A x JRR (N) 65	2007	105-108	Irrigated/ rainfed	Plant height 110-115 cm, semi-dwarf; grains – long bold; susceptible to false smut, low incidence of BLB, no major pest observed; Yield: 60-80 Q/ha	Madhya Pradesh

296	ADT(R) 47	ADT 43/ Jeeragasamba	2007	Early	Irrigated	Plant height 80-100 cm, semi-dwarf; grains –medium slender; Yield: 61.57 Q/ha	Tamil Nadu
297	TPS (R) 4	TPS (R) 4 (TP 1093) developed by hybridization of TS 29	2007	95 (Early)	Irrigated	Plant height 90 cm, semi-dwarf; grains – medium bold; tolerant to blast, BS, Sh.B, SB, LF, BPH and GLH; Yield:.59-80 Q/h	All India
298	RMD (R) 1	Selection from TGR 75	2007	100-105	Rainfed	Plant height 95-100 cm, semi-dwarf; grains-long bold; tolerant to BLB and Sh.R, resist. to SB and LF; Yield : 42 Q/ha	All India
299	CORH -3	TNAU CMS 2A/ CB 87R	2007	115-120	Irrigated	Plant height 96cm, semi-dwarf; grains – medium slender; tolerant to RTD, blast, WBPH, BPH and resistant to GLH; Yield : 65 Q/ha	All India
300	Rajendra Sweta	NA	2007	135-140	Irrigated	Grains - fine Yield : 45 Q/ha	Bihar
301	Rajendra Suwasini	NA	2007	120-122	Irrigated	Grains - medium slender, good aroma Yield : 50 Q/ha	Bihar
302	Rajendra Mahsuri	NA	2007	150-155	Lowland	Grains - medium slender, tolerant to Sh.B & bacterial blight Yield : 50 - 60 Q/ha	Bihar
304	Rajendra Kasturi	NA	2007	120	Irrigated	Grains - short fine, good aroma Yield : 45 - 50 Q/ha	Bihar

305	Pant Dhan – 19 (IET-17544)	BG 132/ UPRI 95-141	2007	130	Irrigated	Plant height 95-100 cm, semi-dwarf; res. to lodging & shattering, mod. res. to leaf blast, bacterial blight, LF, BLB, Sh.R.; Yield : 65 - 70 Q/ha	Punjab, Haryana, Gujarat, Maharashtra
306	Hybrid - 6129 (HRI-152) (IET 18815)	6C02 / 6M 10	2007	120	Irrigated	Plant height 102 cm, semi-dwarf; grains – long slender; Better N responsive, suitable to intermittent drought effected conditions, not suitable for salt affected, water logged conditions. Yield : 60 - 80 Q/ha	Tamil Nadu, Pudducherry, Punjab
307	PAU - 201	PR 103/ PAU 1126	2007	144	Low land Irrigated	Plant height 101 cm, dwarf; grains - long slender; res. to bacterial blight, susceptible to Sh.B; Yield : 46 - 50 Q/ha	Punjab
308	Pariphou	Phougak/Neela	2007	100-110	Irrigated/ Rainfed	Mod. resit. to blast, BLB, SB, GM, case worm; Yield: 57.0 Q/ ha	Manipur
309	Akshayadhan (IET19367)	BR827-35/ SC109-2-2	2008	135	Irrigated	Plant height 95-100cm, semi-dwarf; grains – long bold; resist. to neck blast, rice tungro, Sh.R & BS; mod. res.to WBPH; Yield:.54 Q/ ha	Jharkhand, A.P., Karnataka, T. N.
310	Vardhan (IET 18940)	Swarna/ 9314 (BR 827-35)	2008	125	Irrigated	Plant height 91-95 cm, semi dwarf; grains – short bold; resist. to leaf blast, rice tungro, WBPH: Yield: 50 Q/ ha	Uttrakhand, Haryana, Jharkhand, U. P.

311	CR Dhan 40 (IET 19253)	N 22/RP 20-5	2008	95-99	Rainfed upland	Plant height 100-110 cm, tall; grains – short bold; mod. resist. to BS, blast, resit. to GM biotype 1 mod. resist. to GM biotype 4, WBPH; mod. resit. to SB & LF; Yield:.30-35 Q/ ha	Jharkhand & Maharashtra
312	Sampada (IET 19424)	Vijaya/C 14-8	2008	100-109	Irrigated	Plant height 90-100 cm, tall; grains – medium slender; mod. resist. to neck blast, RTV, BLB, Sh. R & Sh.B; Yield: 52 Q/ ha	Bihar, Chhattis-garh, Maharash-tra, T. N. , Kerala
313	MTU 1075 (IET 18482) (Pushyami)	MTU 2716/ MTU 1010	2008	135-140	Irrigated lowland	Plant height 108 cm, semi dwarf; grains – long slender; tolerant to leaf blast, BLB, Sh.B ; tol. to WBPH, BPH & leaf folder;Yield: 60 Q/ ha	A.P., T. N., Gu-jarat, Maharash-tra
314	Gontra Bid-han-1 (IET 17430)	-	2008	118	Irrigated	Plant height 95-100 cm, semi dwarf; grains – medium slender; tolerant to Sh.B, Sh.R, mod. resist. toBPH: Yield: 50 Q/ ha	Punjab, W. B.
315	Karma Mah-suri (IET 19991)	Mahsuri/ R 296-260	2008	125-130	Irrigated	Plant height 90- 95 cm, semi dwarf; grains – medium slender; tolerant to BS,BPH, WBPH resist. to GM bio-type 1, 4 & 5;Yield: 50 Q/ ha	Chhattisgarh
316	PKV HMT	Selection from HMT Sona	2008	135-140	Irrigated	Plant height 85-90 cm, dwarf; grains – short slender; moderate to blast & BLB;Yield: 40-45 Q/ ha	Maharashtra

317	AAUDR-1 (IET 19258)	Sathi- 34 X Dadri Ko-lam	2008	85-95	Rainfed upland	Plant height 110-120 cm, semi tall; grains - Medium coarse; tolerance to submergence; Yield: 40-45 Q/ ha	Gujarat
318	Jaldi Dhan-6 (IET 14359)	Dular Mutant/ Nagina 22 mutant	2008	65-75 (extra early)	Rainfed upland	Plant height 100 cm, dwarf; grains-medium bold; suitable for contingency crops; mod. tolerance to BS, leaf blast, Sh. B, BLB,SB,WBPH& GM; Yield: 30 Q/ ha	Orissa
319	Nua Kalajee-ra (IET 18393)	Landrace of Kalajeera	2008	Late	Rainfed lowland / late Irri-gated	Plant height 140 cm, dwarf; grains-short bold; mod susceptible to Sh.B, BLB, SB, PH, GB, mod. resist. to leaf blast, Sh.R, resist. to RTV; Yield: 30 - 33 Q/ ha	Orissa
320	Phule Sa-mrudhi	Indrayani X Sonsali	2008	125-130	Irrigated	Plant height 72 cm, dwarf; grains – long slender; mod. resit. to leaf blast, neck blast & SB; Yield: 40-45 Q/ ha	Maharashtra
321	CR Dhan- 10 (IET 18312)	PHB-71	2008	136	Rainfed lowland/ Irrigated	Plant height 110-120 cm, semi dwarf; grains-long slender; tolerance to submer-gence; resit. to neck blast, Sh.R, YSB, mod. resit. to GM, WM; Yield: 50-60 Q/ ha	Orissa
322	CR Boro Dhan-2 (IET 17612)	Mutant 01- China-45	2008	125-130	Boro/rabi summer Irrigated	Plant height 90 cm, semi dwarf; grains – medium slender; tolerance to submergence; resit. to blast, BLB, to-lerant to Sh.B, SB, BPH; Yield: 50-56 Q/ ha	Orissa

323	CR Dhan-70 (IET 11904)	Pure line selection	2008	165	Semi deep water	Plant height 160-200 cm, tall; grains - medium slender; mod. tolerance to submergence, blast, Sh.B, BPH, GM-1, SB, tolerant to false smut, WBPH; Yield: 27.6 -50 Q/ ha	Orissa
324	CR Sugandh Dhan-3 (IET 18395)	Selection from landrace Dhusara	2008	Late	Rainfed lowland	Plant height 142 cm, tall; grains – medium slender; mod. resist. to neck blast, Sh.R, RTV, mod. resit. to GM; Yield: 30 -33 Q/ ha	Orissa
325	Manaswini (IET 19905)	Swarna / Lalat	2008	125-132	Irrigated Rainfed	Plant height 100 cm, semi dwarf ; grains – long slender; resist. to BS, GM-1, mod. resit. to RTD, blast, Sh.B, WBPH, BPH;Yield: 47 Q/ ha	Orissa
326	Pusa Basmati 6 (Pusa 1401-97-7-1-4) (IET 18005)	Pusa Basmati-1 / Pusa 1121-92-8-2-7-1	2008	Medium	Irrigated	Plant height 85-90 cm, semi dwarf ; grains - extra long slender; mod. resit. to leaf blast, RTV ; Yield: 38 Q/ ha	Haryana, Uttarakhand
327	AMAL-MANA (IET 14199/18250)	Pankaj X SR 26 B	2008	140	Costal saline area	Plant height 140 cm, tall ; grains - extra long slender; mod. resit. to leaf blast, BS, Sh.B; res. to SB, LF, whorl maggot, case worm; Yield: 40 Q/ ha	West Bengal, Orissa, Andhra Pradesh
328	GK 5003 (IET 18160)	(GK 5003 A X GK 5003 B) X GK 5003 R	2008	128	Irrigated	Plant height 100-107 cm, semi dwarf ; grains - long slender; resit. to leaf	Andhra Pradesh, Karnataka

						blast, neck blast ; mod. res. to Sh.B, BS, WBPH; Yield: 68 Q/ ha	
329	Sahyadri – 4 (IET 18610) (Hybrid)	iR- 58025A X KJTR-4 (KJT- 15-35-18-3-2) R Pedigree of KJT-15-35-3-2	2008	115-120	Irrigated	Plant height 94-110 cm, semi dwarf ; grains - long slender; resit. to leaf blast, neck blast ; mod. res. to Sh.B, BS, SB, G.B, leaf folder, W.M; Yield: 60 Q/ ha	Punjab, Harya-na, West Ben-gal, U.P., Maha-rashtra
330	Narendra Mayank (NDR – 9830144) (IET 18055) (IR-68828-24- NDR-1-1-1-1)	IR 60185-B-25-2-2 / IR 57519-PMI-5-3-2-2 // IR 55008-10-3-3 - 3-3	2008	140-145 (Late)	Lowland	Plant height 140-140cm, tall ; grains - long slender; resit. to Sh.B, Sh.R, neck blast, RTV stem borer, leaf folder, W.M; Yield: 55 Q/ ha	Uttar Pradesh
331	Narendra Jal Pushp (NDR-9830135) (IET- 17972)	IR 43470-7-3-5-1 / PSBRC 60// IR 57492-123-3-2-2-2	2008	140-145 (Late)	Irrigated Lowland	Plant height 135-140cm, tall ; grains – long bold; resit. to leaf blast, RTV, plant hopper, leaf folder, G.M., mod res. to neck blast, brown spot, SH.B, Sh.R , BPH, WBPH, stem borer; Yield: 55 Q/ ha	Eastern U.P. & Bundelkhand region
332	Narendra Jal Pushp (NDR-9830135)	IR 43470-7-3-5-1 / PSBRC 60// IR 57492-123-3-2-2-2	2008	140-145 (Late)	Irrigated Lowland	Plant height 135-140cm, tall ; grains – long bold; resit. to leaf blast, RTV, plant hopper, leaf folder, G.M., mod	Eastern U.P. & Bundelkhand region

	(IET- 17972)					res. to neck blast, brown spot, SH.B, Sh.R , BPH, WBPH, stem borer; Yield: 55 Q/ ha	
333	Narendra Dhan (NDR – 9830132)	CT 9993-5-10-1-M / PSBRC 60// IR 55714- PMI-5-1-2	2008	135-140 (Medium late)	Lowland	Plant height 140-145cm, medium tall ; grains – long bold; resit. to leaf blast, RTV, mod res. to BLB, Sh.B, neck blast, , BPH, WBPH, GLH, SB; leaf folder;Yield: 45 - 50 Q/ ha	Uttar Pradesh
334	RC Maniphou-7	Mutant culture from Punshi	2008	130-135	Irrigated	Semi dwarf (100 cm), grains – Long medium, mod. resist. to leaf blast, Sh.B & SB ;Yield: 67.0 Q/ ha	Manipur
335	RC Maniphou-6	CH 988 X IR-24	2008	115-130	Irrigated	Tall (120-130 cm), grains – Long medium, mod. resist. to leaf & neck blast, Sh.B & SB ;Yield: 40-50 Q/ ha	Manipur
336	Maniphou-10	Prasad X IR - 24	2008	125	Irrigated	Tall (120-130 cm), grains – Long medium, resist. to blast, mod. resist. to Sh.B;Yield: 65.0 Q/ ha	Manipur
337	KKL (R)-1	CR 1009/ ADT 39	2008	150-155	Irrigated	Tall (130 cm), grains– MS, mod. resist. to Sh.R;Yield: 55.0 Q/ ha	Pudducherry, T.N.
338	PKV Khamang (Sye-116-53- 22-6)	SYE-34-5-40 X Basmati- 370	2008	128-137	Irrigated	Semi dwarf (90 cm), grains– SS, mod. resist. to leaf & neck blast, BLB, tolerant to BPH, GLH, SB, LF and WBPH;Yield: 40-45 Q/ ha	Maharashtra

339	Karjat-7	Patel-3 X KJT 9-333	2008	115-120	Irrigated	Semi dwarf (99 cm), grains– LS, resist. to LF, neck blast, BPH, mod. resist. to blast & BLB. Yield: 45-50 Q/ ha	Maharashtra
340	Co (R) 48	CO 43/ ASD 19	2008	130-135	Irrigated	Plant ht. 115-120 cm, grains– MS, tolerant to SB;Yield: 13-14 Q/ ha	Tamil Nadu
341	CAVR-1	Leimaphou X BR-1	2008	130-135	Irrigated	Plant ht. 100-110 cm, grains– MS, tolerant to rice blast, BLB and GM. Yield: 55-60 Q/ ha	Manipur
342	IET- 14845	Vijaya X C-14-8 RPP 12-33-3-2-2	2008	140-145	Irrigated Coastal zone	Plant ht. 105-110 cm, grains– MB, tolerant to rice blast, and GM. Yield: 40.0 Q/ ha	Karnataka
343	Malaviya Sugandh-105 (HUR-105)	Mutant of MPR 7-2	2008	130-135	Irrigated	Semi dwarf (100-102 cm), grains - LS; tolerant to leaf & neck blast, BS, SB ; Yield: 41.27 Q/ ha	Uttar Pradesh
344	Malaviya Sugandh-4-3 (HUR-4-3)	Mutant of Lanjhi	2008	135-140	Irrigated	Semi dwarf 90-100 cm, grains -LS; resist. to leaf roller & BPH, mod. resist. to BLB.;Yield: 39.0 Q/ ha	Uttar Pradesh
345	JRH-8	IR 68897A X NPT 29	2008	110	Rainfed/ Irrigated	Plant ht. 84 cm, grain- MS. Yield: 75.80 Q/ha	Madhya Pradesh
346	Vallabh Basmati-22 (IET19492) (MAUB-162)	Pusa 1121 X Type-3	2009	130-135	Irrigated	Plant ht. 95 cm, grain- MS, mod. resist. to Sh.R, BLB and WBPH. Yield: 63.38 Q/ha	Uttar Pradesh, Haryana

347	CO(R) 50 (IET 19321) (CB01001)		2009	130-135	Irrigated	Yield: 54.66 Q/ha	All India
348	DRH-775 (IET 19741)	DRH 775A/ DRH 775R	2009	Medium early	Irrigated	Plant ht. 105-108 cm. resit. to leaf blast & neck blast, mod. rest. to RTV, tolerant to. WBPH & stem borer. Yield: 70-75 Q/ha	Chhattisgarh, Jharkhand, West Bengal
349	91H97228 (HRI 157) (IET 19511)	6CO21/ 6MO21	2009	Medium (135)	Irrigated	Plant ht. 109 cm. resit. to BPH, WBPH, mod. rest. to BS, RTV, Non lodging, non-shattering. Yield: 65.0 Q/ha	Uttar Pradesh, Madhya Pra-desh, Chhattis-garh, Gujarat, Karnataka, Pud-ducherry
350	PAC 835 (PAC 80035) (IET 18178) (Hybrid)	835 A X 835 R	2009	130	Irrigated	Semi tall (105-110 cm), grains – MS, resist. to leaf blast, GLH, mod. resist. to. RTV, BLB. Yield: 56.20 Q/ha	Orissa, Gujarat
351	PAC 837 (PAC 85037) (IET 19746) (Hybrid)	837A X 837R	2009	130	Irrigated	Semi dwarf (100 cm), grains – SB, resist. to leaf blast, mod. resist. to. RTV, BLB.Yield: 63.20 Q/ha	Gujarat, Chhat-tisgarh, Jammu & Kashmir, Andhra Pradesh, Karnataka

352	Swarana-Sub 1(CR2539-1) IET- 20266		2009		Submer-gence	Developed at IRRI, Philippines and received under ICAR- IRRI collabor-ative	Orissa, Uttar Pradesh
353	IET 19487 (RP 4631-46-6-5-1-1-1)	CSR 3/ Kasturi	2009	130-135	Irrigated	Semi dwarf (105-110 cm), grains – LS, resist. to neck blast, RTD, BLB, Sh.R, Sh.B, mod. resist. to. BPH, WBPH.;Yield: 36.33 Q/ha	Orissa, Gujarat, Kerala
354	DRRH-3 (DRRH-44) (IET 19543)	APMS 6A/ RPHR 1005	2009	131	Irrigated	Semi dwarf (98-102 cm), grains – MS, mod. resist. to leaf & neck blast, tolerance to WBPH. Yield: 60 - 65 Q/ha	Madhya Pra-desh, Orissa, Uttar Pradesh, Gujarat, Andhra Pradesh
355	RPHR 25-104-1-2 (IET 20010)	BPT 5204/ KMR-3	2009	136	Irrigated	Plant ht. (115-118 cm), grains – MS, mod. resist. to leaf blast, BLB & Sh.R ;Yield: 54 - 68 Q/ha	Gujarat, Andhra Pradesh
356	Narendra Usar Dhan 2008 (IET-18699)	TCCP 266-249-B-B-3/ IR-262-43-8-1	2009	130	Irrigated	Semi tall (114 cm), grains – LB, mod. resist. to Sh.R, Sh.B, leaf blast, bac-terial blight SB & LF. Yield: 45 - 50 Q/ha	Coastal saline areas of Orissa, Andhra Pradesh, West Bengal
357	Srisatya (RGL 1880)	RGL 1231/ Phalguna/ RGL 1231/ IR 36	2009	110-120	Irrigated	Semi dwarf, grains – LS, resist. blast, low incidence of to Sh.B, BLB & SB, tolerant to GM biotype 4; Yield: 40.0 Q/ha	Coastal areas of Andhra Pradesh

358	Amara (MTU 1060)	PLA 1100/ MTU 1010	2009	115-120	Irrigated	Semi dwarf (115 cm), grains – MS, tolerant to BPH,BLB, GM biotype 4, low incidence of to SB. Yield: 65.0 Q/ha	BPH endemic & flood tolerant areas of Andhra Pradesh
359	Nellore Mahsuri (NLR 34449)	IR 72/ BPT 5204	2009	120-125	Irrigated	Dwarf (70-85 cm), grains – MS, resist. to leaf blast and tolerant to neck blast; Yield: 60.0 Q/ha	Blast endemic areas of Andhra Pradesh
360	Ramappa (WGL-3985) (IET 17856)	Kavya X AC-20	2009	125-130	Irrigated	Semi dwarf (87- 90 cm), grains – MS, resist. to GM biotypes 1,3 & 4. Yield: 60- 70 Q/ha	Andhra Pradesh
361	Phule Samruddhi (VDN-99-29)	Indrayani X Sonsali	2009	125-130	Irrigated	Semi dwarf (72 cm), grains – LS, mod. resist. to leaf, neck blast & SB. Yield: 40- 45 Q/ha	Maharashtra
362	HKR-127 (HKR 95-222)	PAU 21-93-1/HKR 120	2009	139	Irrigated	Semi dwarf (121 cm), grains – LS, mod. resist. to False smut.	Haryana
363	PTB-58 (IET-17608)	KR Gamma rays irradiated seed of PTB-20	2009	139	Irrigated	Semi dwarf (105-130 cm), grains – MB, mod. resist. to blast, Sh.B, LF, SB & gall fly.Yield: 39.68 Q/ha	Kerala
364	MGD 101	Teqing/Binam// Teqing///Teqing	2009	125-130	Rainfed	Semi dwarf (100-110 cm), grains – MB, resist. to leaf blast, neck blast, mod. resist. to. LF.	Karnataka
365	GK 5003 (IET 18160)		2009	128	Irrigated	Resit. to leaf blast, neck blast, lodging resit. and non-shattering. Yield: 68 Q/h	All India

366	Chinsurah Rice (IET 19140) (CNI 383-511)	Pankaj/ IET 4786	2010	135-140	Rainfed	Semi dwarf (115-120 cm), grains – LS, tolerance to abiotic stresses. Yield: 55.0 Q/ha	Andhra Pradesh, Tamil Nadu, Gujarat, Orissa, West Bengal
367	IGKVR-1 (IET 19569)	R 320-300/ Chepti-gurmatia	2010	Mid early	Irrigated/Rainfed	Semi dwarf (90-95 cm), grains –LB, mod. resist. to LF, Sh.B, BS and tolerant to GM.;Yield: 51.0 Q/ha	Chhattisgarh, Madhya Pradesh, Orissa
368	IGKVR-2 (IET 19795)	Mahamaya/ NSN 5	2010	Mid early	Irrigated/Rainfed	Semi dwarf (105-112 cm), grains – LS, tolerant to BB, Sh.B , Sh.R. resist. to GM.Yield: 50.0 Q/ha	Chhattisgarh, Madhya Pradesh, Orissa
369	CR Dhan 401 (REETA) (IET 19969)	Savitri / IR 44	2010	145-150	Irrigated	Semi dwarf (110 cm), grains –MS, resist. to leaf blast, SB, leaf folder, mod. tolerance to neck blast, brown spot, Sh.B, Sh.R, GLH, WBPH, rice thrips.	Orissa, West Bengal, Andhra Pradesh, Tamil Nadu
370	CR Boro Dhan 2 (IET 17612)	China	2010	135-140	Irrigated	Semi dwarf (87-90 cm), grains –MS, cold tolerance, resist. to blast, SB, tolerance to Sh.B, BS yellow stem borer.	Orissa
371	CR Dhan 601 (IET 18558)	Jaya / IR 64	2010	160	Irrigated	Semi dwarf (87-90 cm), grains –MS, resist. to leaf blast, mod. resist. to Sh.R, BS, tolerance to yellow stem borer, GLH, LF.	Boro areas of Orissa, West Bengal, Assam

372	CR Dhan 501 (IET 19189) (CR 2008-111)	Savitri/ Padmini	2010	152	Irrigated	Semi dwarf (87-90 cm), grains –LB, mod. resist. to LF, BS, neck blast. & LF.Yield: 40.0 Q/ha	Uttar Pradesh, Assam
373	Rajalaxmi (IET 19600) (CRHR-5)	CRMS 32A/ IR 4266-29-3R	2010	125-130	Irrigated	Semi dwarf (105-110 cm), grains –LS, mod. resist. to Leaf blast RTV, Sh.B & GLH.Yield: 55-70 Q/ha	Orissa and Boro areas of Assam
374	CR Dhan 701 (CRHR-32) (IET 20852)	CRMS 31A/ CRL 22	2010	142	Irrigated	Medium tall (117 cm), grains –MS. Yield: 50.0 Q/ha	Bihar, Gujarat
375	RC Mani-phou 11 (IET 20193)	Prasad/ IR 24	2010	132-135	Irrigated	Semi dwarf (100-105 cm), grains –LS, resist. to blast, mod. resist. to neck blast, BS, BPH. Yield: 56-80 Q/ha	Meghalaya, ma-nipur
376	VAMSAD-HARA (RGL-11414)	JGL-4146 X MTU-7029	2010	145-160	Irrigated (Coastal)	Semi dwarf (100-105 cm), grains –MS, tolerant to BLB, GM biotype 4, SB resist. to blast, mod. resist. to neck blast, BS, BPH. Yield: 55-70 Q/ha	Andhra Pradesh
377	Akshaya	BPT 4358/IR-64	2010	145-150	Irrigated	Semi dwarf (95-105 cm), grains –MS, tolerant to blast & BPH. N responsive up to 200 kg/ha. Yield: 60-70 Q/ha	Andhra Pradesh
378	JGL 11470 (Jagital Mah-suri)	JGL 418/ Gedongibe-ton	2010	135-140	Irrigated	Semi dwarf (83-97 cm), grains –MS, tolerant to Sh.B, leaf blast, BS, RTV &. GM biotypes 1,3,4,5&6 Yield: 60-75 Q/ha	Andhra Pradesh

379	JGL 3855 (Karimnagar Samba)	Sambs Mahsuri/ ARC 5984//Kavya	2010	135-145	Irrigated	Semi dwarf (98-104 cm), grains –MS, tolerant to blast, BS, resist. to GM biotypes 1,&3 Yield: 69.0 Q/ha	Andhra Pradesh
380	Bhavapuri Sannalu	BPT 5204/ CR 15 MR 1523	2010	Late	Irrigated	Semi dwarf (110-120 cm), grains-MS, tolerant to blast, & BPH. Yield: 67.0 Q/ha	Andhra Pradesh
381	Sugandha Samba (RNR-2465)	Early Samba/ RNR-19994	2010	130-135	Irrigated	Semi dwarf (110-120 cm), grains –MS, tolerant to leaf blast, neck blast & Sh.R .Yield: 57.64 Q/ha	Andhra Pradesh
382	VTL - 8	IR 47310-94-4-3-1 X CSR 10	2010	115	Coastal saline areas	Semi dwarf (130-135 cm), grains –MB, pests & diseases are below threshold level.Yield: 40-42 Q/ha	Kerala
383	MO 21	IET 4786/MO 8 (Aruna)	2010	100-110	Irrigated	Semi dwarf (98 cm), grains –LB, mod. resist. to Sh.B, Sh.R BLS, BPH, GM. Yield: 55.0 Q/ha	Kerala
384	Rajendra Bhagwati	RAU 1397-18-3-7-9-4-2	2010	110-115	Upland/ Midland	Semi dwarf (100-110 cm), grains –LB, mod. resist. to Sh.B, Sh.R BS, LF, SB. Yield: 45.0 Q/ha	Bihar
385	ANNA (R) 4	Pant dhan 10 X IET 9911	2010	105-110	Rainfed/ Upland	Semi dwarf (95-100cm), grains-LS, not resit. to any pest & disease. Yield: 30.0 Q/ha	Tamil Nadu
386	CO (R) 49	C 20/ RNR 52147	2010	130-135	Irrigated	Semi dwarf (85-90 cm), grains –MS, mod. resit. to blast, BLB, RTD, Sh.B, Sh R, Yellow stem borer, GLH. Yield: 50.0 Q/ha	Tamil Nadu

387	GAR-13 (IET- 20930)	GR-11 X IET-14726/22-1-8-1-1-1	2010	125-135	Irrigated	Semi dwarf (127- 123 cm), grains – SS, resit. to leaf and neck blast, BLB, false smut, SB, WBPH, LF. Yield: 55- 65 Q/ha	Gujarat
388	NAUR -1	GR - 4 X Pusa-2- 48-24	2010	120-125	Irrigated	Semi dwarf (117- 125 cm), grains – LS, resit. to BLB, blast, Sh.R, SB. Yield: 59. 98 Q/ha	Gujarat
389	Ratnagiri-4 (RTN 49-1-1-2) (IET-20980)	G 11 X IR 64	2010	125-130	Irrigated	Semi dwarf (100- 108 cm), mod. resit. to leaf & neck blast, BLB, BPH, WBPH, GLH and SB. Yield: 45-50 Q/ha	Maharashtra
390	Karjat- 184	TN 1/ Kolamba 540	2010	100-105	Irrigated	Semi dwarf (80-85 cm), grains –MS, mod. resit. to BPH, WBPH and LF. Yield: 25-30 Q/ha	Konkan region of Maharashtra
391	Ratnagiri-24 (RTN 49-1-1-2) (IET-20980)	-	2010	105-110	Irrigated	Semi dwarf (105 cm), grains –MS, mod. resit. to leaf blast, BLB, BPH. Yield: 35- 40 Q/ha	Maharashtra
392	Indam 200-017 (IET 20419) Hybrid	IAHS 24A/IASN 707 R	2011	125-130	Irrigated	Semi dwarf (120-125 cm), grains – LB, mod. resit. to blast, brown spot & leaf folder; rest. to. SB Yield: 66. 40 Q/ha	Maharashtra
393	CSR 30(88-H5-1-1-2 (IET 14720)	BR4-10/ Basmati 386 (Pak basmati)	2011	150-155	Irrigated/ Sodic stress	Tall (155-160 cm), grains – LS, mod. tolerant. leaf folder& WBPH. Yield: 30 - 35 Q/ha	Haryana

394	Sahbhagi dhan (IET 19576) (IR 74371-70-1-1-CRR-1)	IR 55419-04*2. Way Rarem (IR 55419-04 (IR 12979-24-1 (Brown)/ UPRLRi5)	2011	105-110	Rainfed Upland	Dwarf (85-90 cm), grains – LS, rest. to leaf blast; mod. rest. to SB & leaf folder. Yield: 38 - 45 Q/ha	Jharkhand, Orissa
395	27P11 (IET 19766)	R 826F/ R 849	2011	132	Irrigated	Semi tall(115-120 cm), grains –MS, resit. to leaf blast; mod. rest. to neck blast, Sh.R, Sh.B & BS. Yield: 60- 70 Q/ha	Karnataka, Maharashtra
396	Luna Sampad (IET 19470)	Mahsuri X Chakra-kanda	2011	105-110	Low land Coastal	Semi tall(115-120 cm), grains –SB, resit. to blast; mod. rest. to Sh.B, BS; tolerant to yellow stem, BPH & LF. Yield: 36- 42 Q/ha	Andhra Pradesh
397	REETA (IET 19969)	Savitri/ IR 44	2011	145-150	Rainfed lowland/ Irrigated Late	Semi dwarf(110 cm), grains –MS, resit. to leaf blast, SB, LF; mod. rest. to neck blast, BS Sh. B, Sh.R tolerant to yellow stem, BPH & LF; mod. tolerance to GLH, WBPH rice thrips. Yield: 5 4.0 Q/ha	Orissa
398	MANDAKINI (OR 2077-4) (IET 17847)	Ghanteswari/ IR 27069	2011	95-102	Rainfed/ Irrigated upland	Semi tall(122 cm), grains –MS, resit. to neck blast, LF, leaf blast; mod. rest. to Sh. B, Sh.R, RTV, GM-1, SB, BHP tolerant to yellow stem, BPH, WM, BPH . Yield: 25.83 Q/ha	Orissa

399	Nua Chini-kamini (IET 18394) (CR 2580)	Landrace Chinikamini from Orissa	2011	115-120	Rainfed lowland/ Irrigated late	Tall(140 cm), grains –SB, resit. to neck blast, Sh.R, RTV, GM, SB; mod. rest. to leaf blast, BS, leaf blast. Yield: 32 - 35 Q/ha	Orissa
400	Phalguni (IET 18720) (CRAC-2224-1041)	Doubled Haploid de-rived from KRH-2 Rice Hybrid	2011	117	Submer-gence to-lerant	Semi tall (100 cm), grains –LS, resit. to leaf blast, GM, leaf folder, mod. rest. to Sh.R, RTD, BS, Sh.B; YSB, WBPH, BPH, GLH. Yield: 50 - 60 Q/ha	Orissa
401	Luna Suvarna (IET 18697)	Mahsuri (IET 18697)	2011	145-150	Coastal saline	Semi tall (130 cm), grains –MS, resit. to blast, Sh.B, mod. rest. to BS, YSB, Tolerant to LF; Yield: 35 - 40 Q/ha	Orissa
402	MRUNALI-NI (OR 1898-18) (IET 18649)	Mahalaxmi/OR 633-7	2011	145-150	Rainfed/ Irrigated lowland	Semi tall (117 cm), grains –SB, resit. to neck blast, leaf blast, mod. rest. to Sh.B, RTV, Sh.R, BLB, GM-1,SB, BPH, LF, WM; Yield: 56. 54 Q/ha	Orissa
403	TEJASWINI (OR 1912-22) (IET 20005)	Swarna/ Lalat	2011	132-137	Rainfed/ Irrigated	Semi dwarf (107 cm), grains –LB, Tolerant to moisture stress. Yield: 48.98 Q/ha	Orissa
404	Motigold (NP 1024)	PRN 55/ PRN 14	2011	Medium	Irrigated/ Rainfed	Semi dwarf , grains –MS, Tolerant to GLH, blast, BS ;Yield: 48.27 Q/ha	Andhra Pradesh
405	Sonal (NP 3114)	N6 X PRN 48	2011	Medium	Irrigated	Semi dwarf ; Tolerant to blast, BS BPH, WBPH, GM-1&4; Yield: 58.14 Q/ha	Andhra Pradesh

406	NDR 2065 (IET 17476)	Pant Dhan-4/ Saket 4// NDR 2018	2011	120-125	Irrigated	Semi dwarf (105-110 cm), grains – LB, resit. to Sh. R, mod. rest. to BLB, Sh.B & BS. Yield: 50- 55 Q/ha	Uttar Pradesh
407	Narendra Sugandha Dhan NDR 6093 (IET 19768)	NDR 637/ Type -3	2011	125-130	Irrigated	Semi dwarf (98 cm), grains –LS, Aromatic; mod. rest. to Sh.B & BLB. S.B. Yield: 35- 40 Q/ha	Uttar Pradesh
408	Narendra Usar Dhan NDRK 50002 (IET 19667)	NDRK 5024 /NDR 423	2011	120-125	Usar Soil (pH 8.5)	Semi dwarf (96 cm), grains –MB; rest. to Sh.R, mod. rest. to Sh.B, BS & BLB, S.B., LF & plant hopper. Yield: 45- 5 0 Q/ha	Uttar Pradesh
409	SJR 5 (IET 19972)	-	2011			Yield: 55- 60 Q/ha	Jammu, Harya-na, T.N & All India
410	VNR 2245 (IET 20716) (VNR-204)	VNR-F51/VNR-RB 242	2011	120-125	Irrigated	Semi dwarf (105-110 cm), grains – LS; rest. to blast neck blast, mod. rest. to RTV, Sh.R, BS & LF, GLH & WM.; Yield: 70.23 Q/ha	Chhattisgarh, T.N.
411	VNR 2355 plus (IET 20735) (VNR-202)	VNR-F51/ VNR – RB66	2011	130-135	Irrigated	Semi dwarf (100-105 cm), grains – MS; mod. rest. to blast, neck blast, BLB, Sh.B., Sh.R, BS & LF, GLH & WM.; Yield: 59.56 Q/ha	Uttar Pradesh, Uttrakhand, W.B. Maharash-tra & T. N.

412	IGRKVR 1244 (R1244- 1246-1-605-1) (IET 19796)	Mahamaya / Abhaya	2011	125-130	Irrigated	Semi dwarf (107-112cm), grains –LS; rest. to leaf blast, RTV neck blast, GM, BPH, S.B. Yield: 45.38 Q/ha	Chhattisgarh
413	Indira Barani Dhan-1 (RF-17-38-70) (IET 21205)	Swarna/ IR 42253	2011	111-115	Rainfed shallow lowland	Semi dwarf (110-110cm), grains –LS; Tolerance to neck blast, bacterial blight, GM biotype 1, S.B. Yield: 43.57 Q/ha	Chhattisgarh
414	CR Dhan 500 (IET 20220)	Ravana/ Mahsuri	2012	158-163	Deep wa-ter	Tall (140-155cm), grains –MS; mod. resist. to leaf blast, neck blast, BS, GM-1 & 5, SB, WM; resit. to rice thrips, leaf folder; Yield: 33 - 40 Q/ha	Orissa, Uttar Pradesh
415	TRY 3	ADT 43/ Jeeraga Samba	2012	-	Irrigated	Semi tall (130 cm); mod. resist. to Sh.R, Sh.B., BS, leaf folder, SB, BPH.; Yield: 58.33 Q/ha	Tamil Nadu
416	ADT 49	CR 1009/ Jeeraga-sambs	2012	130-137	Irrigated	Semi tall (130 cm); grain - MS; mod. resist. to Sh.R, Sh.B., BS. Yield: 61.73 Q/ha	Tamil Nadu
417	ADT 49	BPT 5204/ CR 1009	2012	145-158	Irrigated	Semi tall (106-121 cm); grain - MS; mod. resist. to BS, resit. to SB. Yield: 59.45 Q/ha	Tamil Nadu
418	Hybrid CO 4	COMS 23 A/ CB 174R	2012	130-145	Irrigated	Semi tall (120-130 cm); grain - MS; resist. to blast BS, mod. resit. to Sh.B., Sh.R & RTD, WBPH, GLH. Yield: 73.48 Q/ha	Tamil Nadu

419	Gujarat nand Rice-2 (IET 21614)	Gurjari ((IET 10750)X IET – 14714/ 1-1-4-1-3-2	2012	118-124	Irrigated	Semi tall (110-125 cm); grain - LS; resist. to false smut, mod. resit. to Sh.R, BLB, SB, LF & WBPH. Yield:48.0 Q/ha	Gujarat
420	Punjab Basmati - 2	Basmati 386/ Super Basmati	2012	140	Lowland /Irrigated	Semi tall (125 cm); grain - LS; Susceptible to major disease, SB & LF; Yield: 31.56 Q/ha	Punjab
421	Mugad Siri-1253 (SIRI-1253 / IET-19803)	BPT- 5204 X Kavya	2012	135-140	Rainfed midland	Semi dwarf (80-85 cm); grain - MS; mod. resit. to leaf blast, neck blast & BPH; Yield: 45-50 Q/ha	Karnataka
422	US 382 (IET 20727) Hybrid	F1/M418	2012	125	Irrigated	Semi dwarf (104 cm); grain - LB; resit. to leaf blast, GM 6; mod. resit. to neck blast, RTV, LF & WBPH. Yield: 67.0 Q/ha	Tripura, Madhya Pradesh, Karnataka
423	27P31 (IET 21415) Hybrid	R834F/R872	2012	125-130	Irrigated	Semi dwarf (115-120 cm); grain - LB; resit. to leaf blast, neck blast, ; mod. resit. to Sh.R, RTV & WBPH. Yield: 80-90 Q/ha	Jharkhand, Maharashtra, Karnataka, Tamil Nadu
424	27P61 (IET 21447) Hybrid	R822F/ R873	2012	132	Irrigated	Semi dwarf (100-105 cm); grain - MS; resit. to leaf blast, neck blast, BS ; mod. resit. to BPH, WBPH, GM-B5, SB & LF Yield: 60-70 Q/ha	Chhattisgarh, Gujarat, Andhra Pradesh, Karnataka

425	25P25 (IET 21401) Hybr-id	R81F/ R842	2012	120	Irrigated	Semi dwarf (105-115 cm); grain - MS; tolerance to SB, LF, BS ; mod. resit. to leaf blast & neck blast LF Yield: 60-70 Q/ha	Uttarakhand, Jharkhand, Kar-nataka
426	JKRH 3333 (IET 20759) Hybrid	JKRA 1047/ JKRR 10092	2012	135-140	Irrigated	Semi dwarf (110-115 cm); grain - MS; tolerance to WBPH, BS, RTV; mod. resit. to neck blast. Yield: 5.98 Q/ha	West Bengal, Bihar, Chhattis-garh, Gujarat, Andhra Pradesh
427	Arize Tej (HRI 169)(IET 21411) Hybrid	C002/ M012	2012	125	Irrigated	Semi dwarf (115-120 cm); grain - LS; tolerance to leaf blast, BS, Sh.R, RTV, GM, LF & SB. Yield: 70.0 Q/ha	Bihar, Chhattis-garh, Gujarat, Andhra Pradesh, Tamil Nadu
428	Vidya (NDGR 201) (IET 20048)	Not applicable	2012	140-145	Semi-deep/ Rainfed low land	Semi dwarf (116-120 cm); grain - SB; mod. resit. to BS & SB. Yield: 35- 40 Q/ha	Uttar Pradesh, Bihar
429	Kanak (CN 1272-55-105) (IET 19886)	Swarna/ IR 36// Mo-han/ Khitish	2012	145	Irrigated	Tall (125-130 cm); grain - SB; resit. to neck blast, GM-4; mod. resit. to leaf blast, BS, BLB, Sh.R, Sh. B, LF & SB.; Yield: 54.79 Q/ha	West Bengal, Bihar, Odisha, Maharashtra, Andhra Pradesh, Karnataka
430	Sujala (CNR-2) (IET 20235)	Patnai-23/ IR- 29429	2012	Late 140-145	Low land	Semi tall (115-120 cm); grain - SB; resit. to neck blast, tolerance to abiot-ic stress.;Yield: 52.62 Q/ha	Bihar, Chhattis-garh, Maharash-tra, Gujarat

431	PNPH 24 (IET 21406) Hybrid	PRN 1A (IR 58025)/ PRN 24R	2012	127	Irrigated	Semi dwarf (95-100 cm); grain - LS; tolerance to drought. Yield: 58.0 – 69.0 Q/ha	Bihar, West Bengal, Orissa
432	NPH 924-1 (IET 21255) Hybrid	NSPL 2A (IR 58025)/ PAB 52R	2012	Medium	Irrigated Boro	Semi dwarf (95-100 cm); grain – LS. Yield: 62.0 – 67.0 Q/ha	West Bengal, Assam

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Abbreviation used

AWA – Abdominal White Absent

AWP - Abdominal White Present

BB – Bacterial Blight

BLB - Bacterial leaf Blight

BLS – Bacterial Leaf Streak

BPH – Brown Plant Hopper

BS – Brown Spot

Cm – Centi Metre

FS – False Smut

GB – Gundhi Bug

GF – Gall Fly

GH – Grass Hopper

GM – Gall Midge

GLH –Leaf Hopper

GPH - Green Plant Hopper

GSV – Grassy Stunt Virus

Ha – Hectare

LB – Leaf Blight

LF - Leaf Folder

LH – Leaf Hopper

LPH - Leaf Plant Hopper

LR – Leaf Roller

LT – Leaf Thrips

LB – Long Bold

LS –Long slender

MS – Medium Slender

MB – Medium Bold

Q – Quintal

RH – Rice Hispa

RLH – Rice Leaf Hopper

RS – Rice Skiper

RTV – Rice Tungro Virus

Sh.R – Sheath Rot

Sh.B – Sheath Blight

RH – Rice Hispa

SS – Short slender

SB – Stem Borer

WM – Whorl Maggot

WBPH – White Backed Plat Hopper