

# Performance Assessment of Newly Improved High Yielding Wheat Varieties in the Irrigated Farming Situations of Birbhum District, West Bengal

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Paper No. 806

Received: 12-06-2019

Revised: 18-10-2019

Accepted: 30-11-2019

## ABSTRACT

Wheat is one of the potential crops in Birbhum District from a platter of crops having utility in a crop diversification programme. As crop diversification is one of the major thrust areas of the Rathindra Krishi Vigyan Kendra, the Kendra has taken up the crop diversification programme with newly improved High Yielding (HY) wheat varieties through its Front Line Demonstration (FLD) Programmes for the last couple of years. In Birbhum the average yield of Wheat stood at 2950.20 kg. / ha in 2015-16. This figure shows that there is a lot of scope in improvement in productivity as concerned. So, the main objectives of these demonstration programmes of the Rathindra Krishi Vigyan Kendra were to show the farmers the modern methods of wheat cultivation using resource conservatory technologies thus increasing the production, productivity, net returns and B: C ratio. The results from the FLD Programmes showed us that the highest ever yield was achieved by the newly improved HYV HD – 2824 in the year of 2014-15 with an average yield of 4056.00 kgs. / ha with an yield increase of 21.92 per cent over the local check variety Sonalika (yield – 3330.00 kgs. / ha) and with a B : C Ratio of 2.32. However, the highest yield increase over the local Check Variety Sonalika, Net Income and as well as B: C Ratio were highest in the case of Variety PBW – 343 with a Yield increase of 27.50 per cent, an average Net Income of ₹ 32,049.00 / ha and B: C Ratio of 2.39 in the year of 2016-17. The studies conducted on the performances of the FLDs organized by the Rathindra Krishi Vigyan Kendra on newly improved Wheat Varieties safely point out that HD – 2824 and PBW – 343 are the two HYVs of Wheat which can meet up the growing demands of Wheat Varieties with improved yield and as well as increased income potential for irrigated situations of Birbhum District.

## Highlights

- The present study finds out that cultivation of two newly improved HYV Wheat Varieties viz. HD – 2824 and PBW – 343 have the potential to meet up the growing demands of Wheat Varieties with improved yield and as well as increased income potential suitable for irrigated farming situations of Birbhum District of West Bengal.

**Keywords:** Wheat Variety, Newly improved High Yielding Varieties, Yield, Net Income, B: C Ratio, HD – 2824 and PBW – 343

Wheat is one of the prime cereal crops in the world. Wheat and Wheat based derivatives are among the primary sources of the staple foods all over the world. In India also, Wheat is one of the two dominating Cereals with the other being Paddy. Traditionally, Wheat cultivation in India has been dominated by the northern region of India. Wheat has played a very vital role in stabilizing the food grain production in the country over the past decades beginning from the “Green Revolution” in the late sixties.

However, one of the main problems associated with Wheat cultivation in India is the spacio-temporal stagnation of its production (Pushpa *et al.* 2017). Though, the northern Plains of Punjab, Haryana and Western Uttar Pradesh in India have been

prolific wheat producers producing nearly 70 per cent of the total Indian production, but still there are huge untapped potential for its production in other States like West Bengal, Kerala, Assam, Odisha and Andhra Pradesh with the provision of better irrigation facilities in these areas (Harwinder *et al.* 2016). There is a tremendous scope for area, production and productivity expansion in Wheat in West Bengal and also Birbhum District as a part of the state of West Bengal which will be clear from the table 1.

The table 1 shows us that the area, production and productivity of Wheat in West Bengal is far behind from the top three Wheat producing States of India viz. Uttar Pradesh, Madhya Pradesh and Punjab and also considerably below the national

**Table 1:** Comparative Status of Wheat Cultivation among Various States of West Bengal as regards to Area, Production and Productivity

Year	Location	Area ('000 ha)	Production ('Tonnes)	Productivity (kg. / ha)
2015-16	India	30228	93501.00	3093.00
	Uttar Pradesh	9645	26874.00	2786.00
	Madhya Pradesh	5911	17689.00	2993.00
	Punjab	3499	16081.00	4596.00
	West Bengal	340	960.00	2825.00
	Birbhum District	39.155	115.51	2950.20
2014-15	India	31466	86527.00	2750.00
	Uttar Pradesh	9846	22417.00	2277.00
	Madhya Pradesh	6002	17104.00	2850.00
	Punjab	3505	15050.00	4294.00
	West Bengal	335	939.00	2807.00
	Birbhum District	33.00	101.48	3075.00
2013-14	India	30473.18	95849.83	3145.38
	Uttar Pradesh	9839.00	29890.88	3038.00
	Madhya Pradesh	5380.00	12937.02	2404.70
	Punjab	3512.00	17620.00	5017.10
	West Bengal	332.48	927.84	2790.60
	Birbhum District	28.72	87.42	3044.00
2012-13	India	30003	93506.00	3116.56
	Uttar Pradesh	9734	30302.00	3113.00
	Madhya Pradesh	5300	13133.00	2478.00
	Punjab	3512	16591.00	4724.10
	West Bengal	322	896.00	2765.30
	Birbhum District	30.81	92.00	2986.00
2011-12	India	29865.00	94882.00	3177.03
	Uttar Pradesh	9731.00	30293.00	3113.00
	Madhya Pradesh	4889.00	11539.00	2360.00
	Punjab	3528.00	17280.00	4898.00
	West Bengal	316.00	873.00	2765.30
	Birbhum District	30.44	136.10	2929.00

**Source:** AGRICULTURE - Statistical Year Book India 2017, Ministry of Statistics and Programme Implementation, Govt. of India.

**Internet Source:** <http://mospi.nic.in/statistical-year-book-india/2017>



parameters. However, the productivity of Wheat in West Bengal is not far below the National average, truly speaking it is more or less within a reachable distance to achieve the National Average Productivity. At the same time, it is important to note that the productivity of Wheat is consistently higher in Birbhum District of the State of West Bengal than the State Average and the Birbhum District Wheat productivity is nearer to that of the National Average.

The above mentioned fact points out the potential of Wheat in Birbhum District from a platter of crops having utility in a crop diversification programme. Utilizing this potentiality of Wheat in the irrigated farming situations of Birbhum District, the Rathindra Krishi Vigyan Kendra has taken up the crop diversification programme with newly improved High Yielding (HY) wheat varieties through its Front Line Demonstration (FLD) Programmes for the last couple of years as crop diversification is one of the major thrust areas of the Kendra. In Birbhum the average yield of Wheat stood at 2950.20 kg. / ha in 2015-16. This figure shows that there is a lot of scope in improvement in productivity as concerned. So, the main objectives of these demonstration programmes of the Rathindra Krishi Vigyan Kendra were to show the farmers the modern methods of wheat cultivation using resource conservatory technologies thus increasing the production, productivity, net returns and B: C ratio.

### Objective of the Study

1. To perform a comparative assessment of performances of different High Yielding Wheat Varieties demonstrated by Rathindra Krishi Vigyan Kendra from the year of 2013-14 to 2016 – 17 regarding Bio-Physical attributes viz. Average Numbers of Tillers / Hill and Grains / Ear;
2. To have a comparative assessment of performances of different High Yielding Wheat Varieties demonstrated by Rathindra Krishi Vigyan Kendra from the year of 2013-14 to 2016 – 17 regarding the Yield (Quintal/ha) and Percentage Increase of Yield over the Local Check Variety; and
3. To perform a comparative assessment of performances of different High Yielding

Wheat Varieties demonstrated by Rathindra Krishi Vigyan Kendra from the year of 2013-14 to 2016 – 17 regarding the Economics of Production viz. Gross Cost, Gross Return, Net Return and B: C Ratio with the frame of reference that of the Local Check Variety.

### Methodology

- (A) The High Yielding Wheat Demonstration Programmes organized by the Rathindra Krishi Vigyan Kendra, Palli Siksha Bhavana, Visva-Bharati in the years of 2013-14, 2014-15, 2015-16 and 2016-17 are the time frame of the present study and selected plots of the Partner-Farmers of the aforesaid FLD Programme on Wheat throughout the District of Birbhum were spacio-frame of study.
- (B) The High Yielding Varieties of Wheat under the present Study were HD 2824 and PBW 343 and the Local Check Variety was Sonalika.
- (C) The performances of different High Yielding Wheat Varieties regarding Bio-Physical attributes were measured through Average Numbers of Tillers / Hill and Grains / Ear of the Variety concerned.
- (D) The performances of different High Yielding Wheat Varieties regarding the productivity of the individual Variety were measured through the Average Yield (Quintal / ha) and Average Percentage Increase of Yield over the Local Check Variety.
- (E) The performances of different High Yielding Wheat Varieties as far as the Economics of Production was concerned were measured through the Variety wise Average Gross Cost (₹), Gross Return (₹), Net Return (₹) and B: C Ratio.
- (F) **Economics of Wheat Cultivation Calculation:** The cost of cultivation of Wheat was estimated under various cost concepts as below:  

$$\text{Cost } A_1 = \text{Value of hired human labour} + \text{Value of hired bullock labour} + \text{Value of owned bullock labour} + \text{Value of hired machine labour} + \text{Value of owned machine labour} + \text{Value of seed (both farm produced and purchase)} + \text{Value of insecticide and pesticides} + \text{Value of manure (owned and$$



purchased) + Value of fertilizer + Depreciation on implements and farm buildings + Irrigation charges + Land revenue and other taxes + Value of Interest of working capital + Miscellaneous expenses (artisans etc.).

Cost  $A_2$  = Cost  $A_1$  + Rent paid for leased in land

Cost  $B_1$  = Cost  $A_2$  + Interest on value of own fixed capital assets (excluding land)

Cost  $B_2$  = Cost  $B_1$  + Rental value of owned land and rent paid for leased- in land.

Cost  $C_1$  = Cost  $B_1$  + Imputed value of family labour

Cost  $C_2$  = Cost  $B_2$  + Imputed value of family labour

Cost  $C_3$  = Cost  $C_2$  + Value of management input at 10% of Cost  $C_2$  (As managerial cost) (Source: - <http://eands.dacnet.nic.in>).

**Profitability Aspects Calculation:** For the estimation of profitability, the following income measures were used. a) Net Income = Gross Income – Cost  $C_3$  (Gross Cost) and b) B: C ratio (Benefit cost ratio) = Gross Income / Gross Costs.

The cost concepts were used for estimation of wheat cultivation was adopted by Directorate of Economics and Statistics, Department of Agriculture and Cooperation, and Commission for Agricultural Cost and Price, Ministry of Agriculture and Farmers' Welfare, Govt. of India. The gross income, net income and Benefit: Cost (B: C) Ratio were also worked out using different profitability concepts (Ahirwar *et al.* 2015 and Rathode, 2016). The collected data were processed to work out the various costs and profitability and yield components and bio-physical attributes of different Varieties of wheat under Front Line Demonstration Programmes organized by the Rathindra Krishi Vigyan Kendra from 2013-14 to 2016-17 in the Birbhum District in West Bengal State.



**Fig. 1:** Front Line Demonstrations on Newly Improved HYV Wheat Varieties organized by Rathindra KVK, Birbhum

**Table 2:** Performance of Demonstrations on Wheat organized by the Rathindra KVK over the Years

Year	Thematic area	Name of the technology demonstrated	No. of Farmer	Area (ha)	Yield (q/ha)		% change in yield	Other parameters		Economics of demonstration (₹/ha)			Economics of check (₹/ha)					
					Demonstration	Check		Average Numbers of	Demo	Check	Gross Cost	Gross Return	BCR	Gross Cost	Gross Return	BCR		
2013-2014	Varietal replacement	Timely sown, Irrigated, Medium duration, Yellow, Black and Brown Rust Resistant Var. HD - 2824	13	2.7	39.8	32.9	20.1	Tillers / hill	11.20	8.9	19100	47760	28660	2.50	18000	39480	21480	2.1
					(Sonalitka)	Grains / ear												
2014-2015	Varietal replacement	Timely sown, Irrigated, Medium duration, Yellow, Black and Brown Rust Resistant Var. HD - 2824	37	6.0	40.6	33.3	21.92	Tillers / hill	12.10	8.8	21010	48720	27710	2.32	19800	39960	20160	2.02
					(Sonalitka)	Grains / ear												
2015-2016	Varietal replacement	Timely sown, Irrigated, Medium duration, Yellow, Black and Brown Rust Resistant Var. HD - 2824	05	1.0	39.4		26.3	Tillers/hill	12.10	8.8	21010	47280	26270	2.25	19800	37440	17640	1.89
						Grains/ear												
2016-2017	Varietal replacement	Timely sown, Irrigated, Early, Stripe Rust, Leaf Rust and Karnal Bunt Resistant and Acid Tolerant Var. PBW-343	37	10	37.8	31.2	21.2	Tillers/hill	11.60	8.8	21010	45360	24350	2.16	19800	37440	17640	1.89
					(Sonalitka)	Grains/ear												
2016-2017	Varietal replacement	Timely sown, Irrigated, Early, Stripe Rust, Leaf Rust and Karnal Bunt Resistant and Acid Tolerant Var. PBW-343	64	5.0	39.4	30.9	27.5	Tillers/hill	12.50	7.9	23111	55160	32049	2.39	21880	43260	21380	1.97
					(Sonalitka)	Grains/ear												

## Findings

The results of the Front Line Demonstration (FLD) Programmes organized by the Rathindra Krishi Vigyan Kendra, Palli Siksha Bhavana (Institute of Agriculture), Visva-Bharati is depicted in following Table 2. As far as Bio-Physical Attributes of the different High Yielding Wheat Varieties are concerned, the Table 2 showed us that the Variety PBW – 343 gave the highest average numbers of Tillers / Hill which stood at 12.50 in the year 2016-17 and the Variety HD 2824 gave the highest average numbers of Grains / Ear which stood at 57.20 in the year of 2014 – 15.

The results from the FLD Programmes showed us that the highest ever yield was achieved by the newly improved HYV HD – 2824 in the year of 2014-15 with an average yield of 4056.00 kgs. / ha with an yield increase of 21.92 per cent over the local check variety Sonalika (yield – 3330.00 kgs./ ha) and with a B : C Ratio of 2.32. However the highest yield increase over the local Check Variety Sonalika, Net Returns and as well as B: C Ratio were highest in the case of Variety PBW – 343 with a Yield increase of 27.50 per cent, an average Net Returns of ₹ 32,049.00 / ha and B: C Ratio of 2.39 in the year of 2016-17.

## CONCLUSION

The results from the FLD Programmes on High Yielding Wheat varieties organized by the Rathindra Krishi Vigyan Kendra showed us that the highest ever yield was achieved by the newly improved HYV HD – 2824 in the year of 2014-15 with an average yield of 4056.00 kgs. / ha with an yield increase of 21.92 per cent over the local check variety

Sonalika (yield – 3330.00 kgs. / ha) and with a B : C Ratio of 2.32. However the highest yield increase over the local Check Variety Sonalika, Net Income and as well as B: C Ratio were highest in the case of Variety PBW – 343 with a Yield increase of 27.50 per cent, an average Net Income of Rs. 32,049.00 / ha and B: C Ratio of 2.39 in the year of 2016-17. The studies conducted on the performances of the FLDs organized by the Rathindra Krishi Vigyan Kendra on newly improved Wheat Varieties safely point out that HD – 2824 and PBW – 343 are the two HYVs of Wheat which can meet up the growing demands of Wheat Varieties with improved yield and as well as increased income potential for irrigated situations of Birbhum District of West Bengal.

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