CHAPTER – I

INTRODUCTION

1.1 Background

Before focusing on the agricultural sector development in India, let us first briefly look at the overall economic development process of the country since 1947 to date. It is found that India suffered a relatively low economic growth rate of around 3.5 per cent per annum till the late 1970s, with large fluctuations due to influence of the agricultural sector growth, which largely depended on the monsoon situation. Indian economy then experienced some improvement in the 1980s because of the government's liberalization policies and a relatively high growth rate attained by agricultural sector during the decade. And finally, after full-scale economic liberalization in 1991, economic growth rates in India accelerated to a very high level (usually more than 6.00% and even more than 8.00 %) after the mid – 2000s) until recently.

It is well known that the agricultural sector growth during British colonial regime, especially the crop sector, was totally stagnant or even negative growth was recorded during the first half of the 2th Century *(Blyn, 1966; Kurasaki 1999).* This pattern, however, was reversed at the independence in 1947. The serious economic and political crisis, which India faced in the mid – 1960s triggered big conversion of agricultural policy of the government. It emphasized technological innovation and started to introduce new agricultural technologies from abroad. And it was a fortunate coincidence for India that mid—1960 was the time when new seed-fertilizer technologies started to diffuse. In particular, it was luckily found that wheat HYVs (Mexican semi-dwarf wheat varieties) were quite suitable for the climate conditions in the northern India such as Punjab and within a decade or so India attained food self-sufficiency except for some drought years. It can be called the first 'wave' of the Green Revolution in India. The first wave of the Green Revolution (GR) in India had limitations because the diffusion of the same was

confined to wheat crop and that to in northern India such as Punjab, Haryana and the western part of Uttar Pradesh. The decade of the 1980s witnessed a very favourable growth rate in the agricultural sector. The most important factor behind the overall rapid growth of the agricultural sector in India was a widespread diffusion of private tube-wells. The diffusion of tube wells in formerly rain-fed areas enabled to grow HYV wheat instead of rabi crops and in the monsoon season (kharif crops) the yield of rice was increased substantially by switching the varieties from traditional to modern types (HYVs). Thus, the highly productive rice-wheat cropping pattern was adopted in a wide area of rural India, especially in the Gangetic Basin. Furthermore, in some places with a plenty of rainfall such as West Bengal, double cropping of HYV rice was widely disseminated.

Indian economy was plunged into a new development stage after the 1990s. First, the critical period for the preparation of full-scale non-agricultural sector's development was over by the end of the 1980s, when broad based agricultural development based on the 2nd Green Revolution took place. Because of the limited space, some key facts and issues, which Indian agriculture faced after the 1990s, can be mentioned as following:

i. The agricultural sector growth rate declined to 2.50 per cent per annum on average after the 1990s. The fatigue of agricultural sector and rural economy is becoming a serious social problem especially compared to the rapid growth of non-agricultural sectors mainly in urban areas. Although the government is setting the growth rate target of agricultural sector at 4.00 per cent, it may be quite difficult to realize it.
ii. Because of the declined per capita consumption of cereals (especially for rice) and also because of the failure of food management policies of the government, India became a major exporter of rice since the mid- 1990s.
iii. Subsidies for agricultural inputs such as chemical fertilizer, irrigation and electricity have been rapidly increasing since the 1980s until the present day.

In nutshell, the 1st Green Revolution witnessed during early 70's culminated in tremendous yield increase through four basic elements of production system viz., semi-dwarf high yield varieties of rice and wheat, extensive use of irrigation, fertilizers and agro-chemicals. However, after tremendous growth there had been a distinct slowdown in agricultural growth rate since the mid-1990s. The agricultural production is experiencing a plateau, which had adversely affected the livelihood base of the farming community at large. As the availability of arable land for agriculture would reduce in future due to urbanization, the only way out could be expected through productivity route. In fact, the country needs a 2nd Green Revolution *(Thakur, 2009).*

Today agriculture sector is contributing 19.00 per cent to the total GDP at factor cost at current prices in the year 2010-11 (RE) as against 17.80 per cent in 2009-10, 17.60 per cent in 2008-09 and 15.60 per cent in 2007-08. The public sector expenditure in agriculture and allied sectors during 11th Five Year Plan reveals that it has been declining since 2008-09 till 2009-10. Thus, supply side has improved substantially with subdued public investment in agriculture sector. The growth in agriculture sector in the 11th Five Year Plan (2007-08 to 2011-12) on the basis of advance estimates is likely to be 3.30 per cent as against 2.20 per cent achieved during 10th Five Year Plan (2002-2007). The year 2011-12 has been remarkable in terms of record production of food grains of 257.44 MT. This is the testimony of the major initiatives in crop husbandry invoked in the agriculture sector during 11th Five Year Plan, which had helped to accelerate growth remarkably.

A strategic initiative **'Bringing Green Revolution in Eastern India' (BGREI)** to develop high potential Eastern Region of the country for food grain production has been initiated since 2010-11. The programme is being implemented as a sub-scheme of Rashtriya Krishi Vikas Yojana (RKVY) in seven eastern states namely Assam, Bihar, Chhattisgarh, Jharkhand, Odisha, Uttar Pradesh (Eastern) and West Bengal. The objective of the programme is to increase the productivity of rice based cropping system in the resource rich eastern region by intensive cultivation through promotion of recommended agriculture technology and package of practices by

addressing the underlying constraints of different agro-climatic sub-regions. Most of the activities taken up under BGREI programme during 2010-11 are short term strategies that are crop specific and development oriented. The programme for 2011-12 include a bouquet of three broad categories of interventions, viz., Block demonstrations of rice and wheat, asset building activities for water conservation and utilization such as construction of shallow tube wells, dug well/bore wells and distribution of pump sets, drum seeders, zero till seed drills and site specific activities for facilitating the petty works such as construction/renovation of field/irrigation channels/electric power supply for agriculture purposes, institutional building for inputs supply etc. In order to sustain the productivity gain, a total of 269 block demonstration of rice, each of 1000 hectares was proposed to be implemented in five agro-ecological sub-regions namely rainfed uplands, rainfed low lands (shallow low land, medium, deep water) and irrigated rice (traditional, hybrid). The objective of the demonstration was to improve seed replacement rate (SRR), promote line sowing/planting coupled with promotion of plant nutrient and plant protection technologies. It was proposed to promote hybrid rice technologies in 40 units of 1000 hectares each. Every farmer in these units was to be encouraged to take up at least 0.40 hectare under hybrid rice. In case of wheat, emphasis on use of zero till seed drills was proposed to be conducted. Package of practices proposed under the demonstrations includes provision of seed, sowing operation, seed treatment and weedicide.

In order to ensure effective implementation of the programme, district wise scientific resources drawn from ICAR-SAU system were roped in besides 3 tier monitoring system put in place at National, State and District levels. Institutional support for technical backstopping has been arranged through Central Rice Research Institute (CRRI), Cuttack, besides provision of honorarium to Progressive Farmers (PFs) and field staff of the State Department of Agriculture concerned as a stop gap arrangement for extension support at the field level.

CHAPTER – II

RATIONALE, OBJECTIVES AND METHODOLOGY OF EVALUATION OF BGREI PROGRAMME

2.1 Rationale of Evaluation Study of BGREI

Being enthused by the overwhelming response to BGREI program at all the levels in the BGREI states and the prospects of crop production reported to have surpassed all the previous records of rice production in the Crop Division of the Department of Agriculture & Co-operation decided to conduct the "End-term Evaluation of BGREI Programme."

In above backdrop the Crop Division of the Ministry of Agriculture, Government of India has assigned this study to be undertaken in all the seven BGREI states through Agro-Economic Research Centres located in these states. Accordingly Agro-Economic Research Centre for Bihar & Jharkhand, T M Bhagalpur University, Bhagalpur has undertaken this study in Bihar and Jharkhand states. Now the programme has completed its two years of implementation by the terminal year of 11th Five Year Plan (2011-12), so it is high time to conduct the study with a view to assess the actual performance of the programme during the implementation both at the macro and micro levels. This would help the concerned states to devise the strategic action plan in conformity with the identified constraints at the grass root levels.

2.2 Objectives of the Study

The study has following specific objectives:

i. *To observe crop response to promoted technologies.*
ii. *To evaluate impact of various interventions of Block demonstrations to drive growth in the yield of rice and wheat.*
iii. *To identify gaps, if any, between recommended, promoted and implemented technologies.*
iv. *To explore effectiveness of technical backstopping, and;*
v. *To examine the effectiveness of the provision of progressive farmers and SDA staff entrusted with BGREI Programme.*

2.3 Data base and Research Methodology

Considering the diversity in rice production across the districts, five districts representing each of the five agro-ecological regions in both the states were selected for obtaining farmers' response about the programme. Farm household survey was conducted with the help of structured schedule. The schedule was consisted of both structured and open ended questions. The latter were used for collecting data on the perception of farmers on certain aspects of BGREI programme. In order to collect secondary data on various aspects of the programme, a list of variables were identified for collection from the states, districts, CRRI, Cuttack and DAC, MoA, GoI.

The study is exclusively focused on evaluation of Block Demonstrations of rice to the extent possible besides understanding the planning and implementation strategies adopted by the states. The sample units of demonstrations have been selected from 5 rice ecologies namely; rainfed uploads, rainfed shallow low land, rainfed medium deep water rainfed deepwater and irrigated. At the first stage of sampling, one district is selected from each of the five rice ecologies considering the concentration of demonstrations in the district. In the second stage, one representative block of one block demonstration is selected following the same procedure. At the third stage, total number of 10 beneficiaries and 5 non-beneficiaries are selected at random from each selected block. In sum a total of 50 beneficiaries and 25 non-beneficiaries spread over 5 selected BGREI districts from each of the two states are covered in the study (table 2.1).

Table No. 2.1: Distribution of Sample by Ecologies, States, Districts and Blocks.

Ecology	Rainfed Upland	Rainfed Shallow Low Land	Rainfed Medium Deep water	Rainfed Deep Water	Irrigated
State	**Bihar**				
Districts	Lakhisarai	Patna	Gopalganj	Begusarai	Jehanabad
Blocks	Suryagarha	Paliganj	Kochayakot	Begusarai	Makdumpur
No. of Beneficiary Respondents	10	10	10	10	10
No. of Non-beneficiary Respondents	5	5	5	5	5
Sample Size	50 beneficiaries, 25 non-beneficiaries = 75				
State	**Jharkhand**				
Districts	Pakur	Bokaro	Godda	Jamtara	Sahebganj
Blocks	Maheshpur	Petarwar	Basantrai	Fatehpur	Barharwa
No. of Beneficiary Respondents	10	10	10	10	10
No. of Non-beneficiary Respondents	5	5	5	5	5
Sample Size	50 beneficiaries + 25 non-beneficiaries = 75 farm households				

2.4 Statistical Analysis of Primary Data

Data collected from the sample farm households was analyzed by adopting casual forecasting methods by devising following econometric models:

(a) Mean Difference Test

The particular form is: $z = (\bar{x}_1 - \bar{x}_2) / \sigma \left(\frac{1}{N_1} + \frac{1}{N_2}\right)^{1/2}$

Where, z = Standard Normal Variate

$\bar{x}_1$ = Mean of Series 1 (say of beneficiaries)

$\bar{x}_2$ = Mean of Series 2 (say of non-beneficiaries)

σ = Standard Deviation

N_1= Number of Observations in Series 1 (say of beneficiaries)

N_2= Number of Observations in Series 2 (say of non-beneficiaries)

(b) Multiple Regression Analysis (Linear)

Form of Regression Model

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + e;$$

Where, Y = Yield per hectare (productivity)

a = Constant

$b_1 - b_7$ = Coefficients

X_1 = Costs of Micro-nutrients (imputed value in case of beneficiary farms)

X_2 = Costs of Seeds (imputed value in case of beneficiary farms)

X_3= Other Costs (total costs *less* 1 & 2)

X_4= Dummy for Ecological Region 1

X_5 = Dummy for Ecological Region 2

X_6= Dummy for Ecological Region 3
X_7 = Dummy for Ecological Region 4
e = error term

(c) Qualitative forecasting

Analysis of the auxiliary information relating to input delivery mechanisms, monitoring mechanism at various levels, technical backstopping, yield gap analysis, homogeneity test (Rho), cost benefit analysis, documentation, reporting and utilization of sanctioned funds have also been considered under the study.

2.5 Statistical analysis of the secondary data

The time series data of area, production & yield of rice and wheat for the period 2005-06 to 2011-12 was analysed using regression analysis to compute Compound Growth Rates (CGR) by way of exponential smoothening (Base Year-QE: 2009-10=100). In regression analysis, LOGEST calculates an exponential curve that fits the data and returns an array of values that describes the curve.

y = b*m^x

Where; the dependent y-value is a function of the independent x-values. The m-values are bases corresponding to each exponent x-value, and b is a constant value.

2.6 Limitations

Survey research method often depends upon the ability of the Field Investigator as to what extent he/she is able to collect the requisite data and information. Besides Investigator's ability, much depends on the co-operation of randomly selected respondents. It is, however, simple but very difficult to create. The limitations encountered during the study mentioned below are mainly intended to bring further improvement.

i. The sample size is not adequate besides being unequal representation between beneficiary and non-beneficiary respondents.
ii. Initial timeline of the study during which the field work completed was too short for such an exhaustive study.
iii. Sourcing of secondary data from all the concerned was not equal.

iv. The study was launched very late in Bihar & Jharkhand states due to late deployment of field personnel that too for very short period (35 days).

v. The Centre also needs capacity of research faculties and infrastructure building in adoption of modern techniques of evaluation.

vi. Farmers' presumptions prevail in collection of data due to lack of recording of information and data related to agricultural operations, etc.

CHAPTER – III

RAINFALL AND GROWTH IN AREA, PRODUCTION AND YIELD OF RICE AND WHEAT

3.1 Bihar

3.1.1 A Brief Profile of the State

Bihar is the third most populous state in India with a population of 10,38,04,637 persons {(Census – 2011 (P)}, contributing 8.58 per cent to total population of the country. Out of the total population 52.20 per cent are male and 47.80 per cent female. The state is a densely populated region, with no less than 11.02 persons living per sq. km of its area, which is much above the national average (3.82 persons/sq km). About 41.40 per cent of the population lived below poverty line (Planning Commission in 2004-05). As 9 out of 10 people on an average live in villages, poverty is more visible in rural areas.

Traditionally, Bihar's economy is dominated by the agricultural sector. The state has a geographical area of 93.60 lakh hectares. Bihar falls in the riverine plane of the Ganga basin area. Because of the topographical nature, the proportion of total land put to agricultural use here is high as compared to other states of India. In 2008-09 the area under forest was at 6.60 per cent and the area under non-agricultural use at 17.80 per cent. The area under net sown area is 59.60 per cent. Cropping intensity is 1.38 per cent. The total irrigated area is 49.20 hectares that accounts for about 88.00 per cent of the net sown area. But the irrigation efficiency of MMI schemes was 42.50 per cent in 2010-11.

3.1.2 Rainfall

The pattern of distribution of rainfall over time and space is crucial for agricultural production. History of droughts and floods even in high or moderate rainfall areas reveals the misery of crop production. In other words, rainfall dispersal impacts all the sectors commensurately. The quantum of rainfall and its distribution are positively correlated with agricultural production of the states. Rainfall pattern,

therefore, tests the truth of the estimation of agriculture production by the states in conjunction with other parameters like crop cutting experiments, market arrivals and farm prices.

In order to analyze the impact of rainfall on BGREI and NFSM programmes in BGREI districts, regression analysis of disaggregated quantum of rainfall for the period 2010-11 to 2011-12 (reference period of this study) at district level has been made and is presented in table 3.1. The rainfall data in respect of newly created districts namely; Lakhisarai, Nawada, Sheohar and Sheikhpura has not been compiled distinctively by Indian Meteorological Department (IMD). The analysis of rainfall data shows variability during 2010-11 and 2011-12 impacting area, production and yield of rice in the state.

Table No. 3.1: District wise monthly rainfall data during the year 2010 & 2011 in Bihar.

Sl.	District	Year	Factor	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly
(1) BGREI Districts																
1	AURANGABAD	2010	R/F	0	0	0	0	0	45.2	199.5	152.6	124.3	48	0.0	0.0	569.6
			Dep	**-100**	**-100**	**-100**	**-100**	**-100**	**-64**	**-34**	**-46**	**-40**	-12	**-100**	**-100**	
		2011	R/F	10	3.5	0.0	12.5	7.5	175.7	141.8	413	236.3	0.7	0	0.0	1001
			Dep	**-45**	**-69**	**-100**	119	**-48**	44	**-51**	63	22	**-98**	**-100**	**-100**	
2	BHAGALPUR	2010	R/F	0	4.2	4	2.2	65.7	105.8	234.3	195.6	127.5	19.9	5.3	0.7	765.2
			Dep	**-100**	**-59**	**-61**	**-90**	9	**-45**	**-24**	**-27**	**-42**	**-78**	4	**-77**	
		2011	R/F	2.4	3.1	33	73.9	89.5	332.2	179.1	358.8	152.6	39.9	0	0	1264.5
			Dep	**-86**	**-70**	224	219	37	68	**-38**	37	**-33**	**-55**	**-100**	**-100**	
3	BEGUSARAI	2010	R/F	0	0	0	0	0	0	284	230	196	107	0	0	817
			Dep	**-100**	-	-	-	-	-	0	**-21**	0	106	**-100**	**-100**	
		2011	R/F	0	9	19.5	2.5	123	377.5	286.5	306.3	202	55	0	0	1381.3
			Dep	**-100**	7	48	**-86**	152	145	-3	20	-6	-13	**-100**	**-100**	
4	BHABHUA	2010	R/F	0	0	0	0	22.3	7.9	199.6	241.5	151.7	3.7	0	0.5	627.2
			Dep	**-100**	**-100**	**-100**	**-100**	7	**-94**	**-38**	**-25**	**-32**	**-93**	**-100**	**-89**	
		2011	R/F	0.5	1.3	0	0	0	225	119.3	322.4	260.8	0	0	0.0	929.3
			Dep	**-98**	**-92**	**-100**	-	-	72	**-62**	8	3	**-100**	**-**	**-100**	
5	BHOJPUR	2010	R/F	0	0	0	0	0	22.8	245.3	119	145.1	39.1	0	0	571.3
			Dep	-	-	-	-	-	**-80**	-17	**-56**	**-36**	**-25**	-	-	
		2011	R/F	0	0	0.0	0	0	186.6	33.9	257.9	166.4	0.0	0.0	0	644.8
			Dep	-	-	-100	-	-	72	-90	-7	-18	**-100**	**-100**	-	
6	BUXAR	2010	R/F	0	0	0	0	0	25.4	93.4	297.6	127.6	58.4	0	0.0	602.4
			Dep	-	-	-	-	-	**-76**	**-67**	22	**-34**	-8	-	**-100**	
		2011	R/F	0	0.1	1.6	2.4	20.9	403.6	81.2	197.4	155.6	0.0	0.0	0.0	862.8
			Dep	-	**-99**	**-76**	**-35**	19	264	**-72**	**-25**	**-22**	**-100**	**-100**	**-100**	
7	GOPALGANJ	2010	R/F	0.0	0.0	0.0	0.0	0	64.4	259.8	253.4	224.6	81	0.0	0.0	883.2
			Dep	**-100**	**-100**	**-100**	**-100**		**-57**	-15	-8	5	38	**-100**	**-100**	
		2011	R/F	3	0	3.1	12.2	37.9	174.4	293.2	289.9	98.2	0.0	0.0	0.0	911.9
			Dep	**-80**	**-100**	**-56**	-2	20	12	-5	-5	**-55**	**-100**	**-100**	**-100**	
8	JAHANABAD	2010	R/F	0.0	6	0.0	0.0	15.3	90.5	184.3	181.1	69.3	55.4	0.0	0.0	601.9
			Dep	**-100**	**-41**	**-100**	**-100**	**-33**	-15	**-30**	**-30**	67	24	**-100**	**-100**	
		2011	R/F	5	0.0	0.0	6	27.7	310	184.9	327.7	257.9	0.2	0.0	0.0	1119.4
			Dep	**-61**	**-100**	**-100**	**-54**	20	176	**-28**	28	31	**-99**	**-100**	**-100**	
9	KHAGARIA	2010	R/F	0	0	0	5	48.1	106.6	132.2	128.5	167.4	32.3	0	0	620.1
			Dep	-	-	-	-73	5	-45	-57	-59	-27	-62	-100	-100	
		2011	R/F	0.0	2.1	20.7	19.3	81.1	250.6	197.9	252.6	88.4	6.3	0.0	0.0	919
			Dep	**-100**	**-50**	169	25	75	36	**-36**	-15	**-67**	**-92**	**-100**	**-100**	
10	MUNGER	2010	R/F	0	0	0.0	0.0	0	267.6	724.7	294.8	501.8	101.6	1	0.2	1891.7

			Dep	-	-	**-100**	**-100**	-	66	135	7	143	19	**-78**	**-94**	
		2011	R/F	0.9	1.8	56.9	19.4	68.6	18.2	56.8	239	132	24.5	0.0	0.0	618.1
			Dep	**-93**	**-74**	469	36	53	**-89**	**-82**	-12	**-43**	**-66**	**-100**	**-100**	
11	**PATNA**	**2010**	R/F	0.9	7	0.0	0.0	81.3	63.4	208.9	212	105.9	91.9	0.5	0.0	771.8
			Dep	**-95**	**-37**	**-100**	**-100**	173	**-52**	**-29**	**-20**	**-50**	44	**-90**	**-100**	
		2011	R/F	0.5	4.1	7.1	14.1	506	262.9	141.3	334.6	343.6	3.1	0.0	0.0	1617.3
			Dep	**-96**	**-56**	**-26**	74	92	110	**-58**	27	58	**-94**	**-100**	**-100**	
12	**PURNEA**	**2010**	R/F	0.0	0.0	0.0	30.6	241.3	431.7	690.2	353.3	302	42.3	0.6	0	2092
			Dep	**-100**	**-100**	**-100**	-2	107	72	79	18	20	**-58**	**-92**	**-100**	
		2011	R/F	3	13.5	14.1	111	257.1	303.2	693.8	437.4	465.4	1.8	2.6	2.1	2305
			Dep	**-97**	50	9	229	111	24	60	29	57	**-98**	**-68**	**-70**	
13	**ROHTAS**	**2010**	R/F	0.0	7.6	0.0	0.0	35.8	52.5	197.3	233.5	171.1	31.7	1.1	0.0	730.6
			Dep	**-100**	**-64**	**-100**	**-100**	127	**-55**	**-38**	**-25**	**-28**	**-33**	**-84**	**-100**	
		2011	R/F	3.9	2.4	0	8.6	24.9	266	89.5	407.2	264.4	0.0	0.0	0.0	1066.9
			Dep	**-70**	**-81**	**-100**	46	79	196	**-67**	46	39	**-100**	**-100**	**-100**	
14	**SARAN**	**2010**	R/F	1.9	0.0	0.0	0.0	65.4	84.9	278.7	157.9	144.1	67.2	0.0	0.0	800.1
			Dep	**-89**	**-100**	**-100**	**-100**	95	**-33**	-18	**-48**	**-40**	4	**-100**	**-100**	
		2011	R/F	5	2.5	3.5	24.7	78.6	255.6	260	221.5	359.1	0.7	0.0	0.0	1211.2
			Dep	**-69**	**-73**	**-59**	166	121	92	**-22**	**-24**	67	**-99**	**-100**	**-100**	
15	**VAISHALI**	**2010**	R/F	0.0	0.0	0.0	0.0	0	68	134.6	149.3	114.7	105.8	0.0	0.0	572.4
			Dep	**-100**	**-100**	**-100**	**-100**	-	**-51**	**-58**	**-45**	**-45**	50	**-100**	**-100**	
		2011	R/F	0.0	1.1	0.0	19.6	57.6	191.5	198.2	188.8	401.9	11.9	0.0	0.0	1070.6
			Dep	**-100**	**-87**	**-100**	34	115	39	**-47**	**-34**	80	**-84**	**-100**	**-100**	
BGREI districts		**2010**	R/F	**0.2**	**1.7**	**0.3**	**2.5**	**38.3**	**95.8**	**271.1**	**213.3**	**178.2**	**59.0**	**0.6**	**0.1**	**861.1**
		2011	R/F	**2.3**	**3.0**	**10.6**	**21.7**	**92.0**	**248.9**	**197.2**	**303.6**	**239.0**	**9.6**	**0.2**	**0.1**	**1128.2**
Sl.	District	Year	Factor	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	**Yearly**
NFSM Districts																
1	**ARARIA**	**2010**	R/F	0.0	0.0	0.0	17.2	97.5	218.3	590.8	203	288.4	41.7	0	0	1456.9
			Dep	**-100**	**-100**	**-100**	**-67**	**-31**	-11	25	**-44**	3	**-47**	**-100**	**-100**	
		2011	R/F	8	3.4	16.6	25.5	214.8	234.8	608	282.5	456.5	8	3	0	1861.1
			Dep	**-42**	**-58**	8	**-31**	88	-14	37	**-20**	64	**-90**	**-59**	**-100**	
2	**EAST CHAMPA-RAN**	**2010**	R/F	0.0	0	0.0	8.8	226.8	64.1	333.9	299.9	154.6	83.4	0.0	0.7	1172.2
			Dep	**-100**	-	**-100**	**-46**	359	**-60**	-8	8	**-28**	6	**-100**	**-83**	
		2011	R/F	1.5	14.8	13.1	9.3	140	186.9	420.6	231.9	370.6	4.7	6	0.0	1399.4
			Dep	**-88**	53	68	**-30**	185	14	19	**-22**	80	**-94**	36	**-100**	
3	**WEST CHAMPARAN**	**2010**	R/F	0.5	0	0	0	0	158.6	486	608.9	454.5	74.2	0.0	0.0	1782.7
			Dep	**-98**	-	-	-	-	**-31**	11	67	71	6	**-100**	**-100**	
		2011	R/F	0.0	26.7	6.3	25.8	167.1	139.1	514.4	432.4	192.2	0.0	1.4	0.0	1505.4
			Dep	**-100**	147	**-51**	41	197	**-39**	15	24	**-23**	**-100**	**-73**	**-100**	
4	**DARBHANGA**	**2010**	R/F	0	0	0	0	0	117.6	283.9	248.9	115.5	22.6	0	0	788.5
			Dep	-	-	-	-	-	**-23**	-7	-11	**-44**	**-68**	-	-	
		2011	R/F	0	10.1	26.3	19.7	136.7	155.9	312.5	210.6	376.7	13.4	0.5	0.0	1262.4

			Dep	-	6	114	-8	128	-1	5	**-26**	102	**-80**	**-94**	**-100**	
5	**GAYA**	**2010**	R/F	0.2	3.4	0	0	25.8	97.8	202.7	202.9	50.3	91	6.4	2.8	683.3
			Dep	**-99**	**-80**	**-100**	**-100**	68	**-22**	**-36**	**-36**	**-74**	51	39	**-26**	
		2011	R/F	6	3	0.1	32.9	18.2	393.3	133.2	419.8	244.7	8.5	0	0	1259.7
			Dep	**-59**	**-72**	**-99**	439	1	207	**-55**	54	36	**-84**	**-100**	**-100**	
6	**JAMUI**	**2010**	R/F	0.0	0	0	0	0	121.4	214.1	231.5	102.3	43.3	0	0	712.6
			Dep	**-100**	-	-	**-100**	-	**-30**	**-32**	-14	**-54**	**-50**	-	-	
		2011	R/F	0	0.0	0.0	23.3	31.6	202.7	128.7	296.6	131.4	1.3	0.0	0.0	815.6
			Dep	-	**-100**	**-100**	148	-10	24	**-59**	17	**-41**	**-98**	**-100**	**-100**	
7	**KATIHAR**	**2010**	R/F	0.0	0	0.0	0.0	47	144.4	176	117.9	168.6	24.1	0.0	0.0	678.0
			Dep	**-100**	-	**-100**	**-100**	**-55**	**-35**	**-51**	**-59**	**-31**	**-74**	**-100**	**-100**	
		2011	R/F	0.0	3.3	6.7	16.3	112.2	263.5	180	182.7	197.7	3.2	0.0	0.0	965.6
			Dep	**-100**	**-55**	**-27**	**-34**	17	24	**-50**	**-32**	**-27**	**-96**	**-100**	**-100**	
8	**KISHANGANJ**	**2010**	R/F	0.0	0.0	0.0	0.0	0	658	762.6	418.2	373	41.4	45.4	0.0	2298.6
			Dep	**-100**	**-100**	**-100**	**-100**	-	66	35	-6	1	**-53**	909	**-100**	
		2011	R/F	3	2.1	17	100.2	132.7	207.5	902	372.9	584.2	0	39	2	2362.6
			Dep	**-71**	**-74**	-3	94	-15	**-44**	56	**-20**	69	**-100**	474	**-57**	
9	**MADHUBANI**	**2010**	R/F	0.0	0.0	0.0	0.0	0	68.4	173.7	159.8	95	20.9	0	0	517.8
			Dep	**-100**	**-100**	**-100**	**-100**	-	**-63**	**-48**	**-43**	**-50**	**-67**	-	-	
		2011	R/F	0	11.9	3.4	43.8	243.5	132.3	251.7	159.8	249.2	7.9	1.7	0.0	1105.2
			Dep	-	25	**-63**	42	207	**-29**	**-33**	**-43**	30	**-90**	**-70**	**-100**	
10	**MADHEPURA**	**2010**	R/F	0.0	0.0	0.0	0.0	156.4	131.7	219.6	133.3	173.8	5	0.0	0.0	819.8
			Dep	**-100**	**-100**	**-100**	**-100**	66	**-39**	**-45**	**-54**	**-29**	**-94**	**-100**	**-100**	
		2011	R/F	1	2	1	21.5	148.5	267.3	251.2	151.5	248.9	2.7	0.0	0.0	1095.6
			Dep	**-92**	**-79**	**-92**	**-27**	76	26	**-33**	**-50**	-4	**-96**	**-100**	**-100**	
11	**MUZAFFARPUR**	**2010**	R/F	1.6	1.8	0.0	0.0	62.3	87.3	254	207.1	140.1	81.8	0.0	1.1	837.1
			Dep	**-91**	**-84**	**-100**	**-100**	9	**-45**	**-27**	**-25**	**-37**	15	**-100**	**-68**	
		2011	R/F	3.4	7.8	8	28.3	105.1	260.8	279.1	247.1	424.6	21	0.0	0.0	1385.2
			Dep	**-75**	-12	10	113	95	62	-14	-15	110	**-67**	**-100**	**-100**	
12	**NALANDA**	**2010**	R/F	0.0	0.0	0.0	0.0	22.4	84.8	160	276.7	141.4	47.2	0.0	0.0	732.5
			Dep	**-100**	**-100**	**-100**	**-100**	-14	**-35**	**-47**	5	**-30**	-18	**-100**	**-100**	
		2011	R/F	0	3	4.8	12.6	37.4	354.2	154.8	504.8	377.2	3.6	0.0	0.0	1452.4
			Dep	**-100**	**-67**	**-47**	107	34	178	**-45**	92	86	**-93**	**-100**	**-100**	
13	**SAHARSA**	**2010**	R/F	0.0	0	0	0	0	143	495.9	212.9	197.3	72.1	0	0	1121.2
			Dep	**-100**	-	-	-	-	**-32**	34	**-21**	**-21**	3	-	-	
		2011	R/F	0	21.9	11.8	69.6	227.6	216.7	326.8	274.4	173.4	6	32.6	0.0	1360.8
			Dep	-	101	-8	76	113	-13	**-37**	**-22**	**-40**	**-94**	781	**-100**	
14	**SAMASTIPUR**	**2010**	R/F	0.0	0.0	0.0	0.0	51.1	44.5	176.1	162	76.8	48.2	0	0	558.7
			Dep	**-100**	**-100**	**-100**	**-100**	15	**-72**	**-41**	**-36**	**-67**	**-30**	-	-	
		2011	R/F	0	0.7	8.6	41.2	110.6	204	202.4	339.7	174	3.7	0.0	0.0	1084.9
			Dep	-	**-91**	**-21**	171	159	16	**-36**	18	**-29**	**-94**	**-100**	**-100**	
15	**SITAMARHI**	**2010**	R/F	0	0	0	0	0	59	177.7	183.8	69.8	53	0	0	543.3
			Dep	-	-	-	-	-	**-71**	**-55**	**-37**	**-63**	**-26**	-	-	
		2011	R/F	0	3.9	0	0	114.3	209.6	482.9	205.9	440	4.2	21.4	0	1482.2
			Dep	-	**-54**	-	-	60	4	22	**-33**	145	**-94**	449	**-100**	
16	**SIWAN**	**2010**	R/F	0	0	0	0	0	25.3	266.3	157.3	343	72.1	0	0	864.0

			Dep	-	-	-	-	-	**-81**	-18	**-47**	49	43	-	-	
		2011	R/F	0	7.3	4.4	18.8	51.7	246.9	117.8	238	128.4	0	0	0	813.3
			Dep	-	**-42**	**-55**	96	88	80	**-65**	-17	**-47**	**-100**	**-100**	**-100**	
17	**SUPAUL**	**2010**	R/F	0	0	0	11	250.2	100.1	262.6	107.4	141.6	20.7	0.2	0	893.8
			Dep	**-100**	-	-	**-63**	205	**-52**	**-29**	**-60**	**-37**	**-70**	**-96**	**-100**	
		2011	R/F	1.4	4.1	5.8	67.5	153.8	204.2	366.7	258.5	209	10.1	10.3	0	1291.4
			Dep	**-82**	**-53**	**-54**	193	85	2	-2	-4	0	**-86**	129	**-100**	
NFSM Districts		**2010**	R/F	**0.1**	**0.3**	**0.0**	**2.2**	**55.3**	**136.7**	**308.0**	**231.3**	**181.5**	**49.6**	**3.1**	**0.3**	**968.3**
		2011	R/F	**1.4**	**7.4**	**7.9**	**32.7**	**126.2**	**228.2**	**331.3**	**282.9**	**292.9**	**5.8**	**6.8**	**0.1**	**1323.7**
Bihar State		**2010**	R/F	**0.2**	**1.0**	**0.1**	**2.3**	**46.8**	**116.3**	**289.6**	**222.3**	**179.9**	**54.3**	**1.8**	**0.2**	**943.4**
		2011	R/F	**1.9**	**5.2**	**9.3**	**27.2**	**109.1**	**238.5**	**264.3**	**293.3**	**265.9**	**7.7**	**3.5**	**0.1**	**1226.0**

Source: www.imd.gov.in

RF = Actual rainfall in mm; Dep. = Rainfall departure in %

3.1.3 Area, Production and Yield (APY) of Rice Crop in BGREI Districts

The APY of rice crop is BGREI and NFSM districts for the period 2010-11 and 2011-12 have been presented in table Nos. 3.2, 3.3 & 3.4. The Compound Growth Rate (CGR) of rice area in BGREI districts showed decline of (-) 3.7 (exponential decay) during kharif-2010 in the range of (-) 0.5 per cent in Rohtas district to 30.5 per cent in Jehanabad district due to deficient rain. The districts which registered growth in rice areas during kharif – 2010 are Begusarai (4 %), Bhojpur (5.5 %), Gopalganj (1.6%), Khagaria (2.8%), Munger (1%) and Sheohar (3.1%). The decline in the growth of rice area in BGREI districts during kharif 2011 slowed down to a level of (-) 2.3 per cent in the range of (-) 18.3 per cent to 4.6 per cent due to deficit rainfall. The districts which witnessed decline in growth of rice area (exponential decay) during kharif 2011 are Bhagalpur (-) 8.9 per cent, Bhabhua (-) 3.5%, Buxar (-) 4.4 per cent, Jehanabad (-) 16.4 per cent, Lakhisarai (-)18.3 per cent, Patna (-) 9.6 per cent, Purnea (-) 4.8 per cent, Rohtas (-) 1.0 per cent, Saran (-) 2.8 per cent, Sheikhpura (-) 9.4 per cent and Vaishali (-) 7.0 per cent. The growth in remaining 7 districts grew in varying proportion than that of previous year.

The CGR of rice production in BGREI districts indicates a decline of (-) 7.4 per cent during kharif 2010 in the range of (-) 2.4 per cent in Bhojpur district to (-) 33.8 per cent in Lakhisarai district due to deficient rain. The districts which registered growth in rice production during kharif 2010 are Begusarai (9.6%), Gopalganj (9.4%), Nawada 1.2%) and Purnea (0.9%). The rice production during khrif – 2011 grew by 0.2 per cent exponentially indicating modest growth in 10 districts in the range of 0.6 per cnt in Rohtas district to 23.6 per cent in Begusarai district. The districts which have recorded decline in the growth of rice production during kharif – 2011 are Bhagalpur (-) 4.0 per cent, Bhabhua (-) 3.7% per cent, Buxar (-) 5.2 per cent, Jehanabad (-) 8.4 per cent, Lakhisarai (-) 23.4 %, Munger (-) 7.5 per cent, Patna (-) 6.2 per cent, Saran (-) 0.8 per cent and Sheikhpura (-) 13.9 per cent.

The CGR of rice yield in BGREI districts indicates a decline of (-) 3.9 per cent during kharif 2010 in the range of (-) 0.2 per cent in Saran district to (-) 18.7 per cent in Munger district due to deficient rain. The districts which have registered growth in

rice yield during kharif – 2010 are Begusarai 5.4 per cent, Gopalganj 7.7 per cent, Jehanabad 6.6 per cent, Nawada 3.8 per cent and Purnea 7.1 per cent. The rice yield during kharif – 2011 grew by 2.6 per cent exponentially indicating modest growth in 15 districts in the range of 1.6 per cent in Rohtas district to 18.9 per cent in Begusarai district. The districts which recorded decline in the growth of rice yield during kharif 2011 are Bhabhua (-) 0.2 per cent, Bhojpur (-) 1.9 per cent, Buxar (-) 0.8 per cent, Lakhisarai (-) 6.2 per cent, Munger (-) 8.2 per cent and Sheikhpura (-) 4.9 per cent.

The CGR of rice area in BGREI districts indicates decline of (-) 2.3 per cent during Summer – 2011 in the range of (-) 0.5 per cent in Madhepura district to (-) 12.7 per cent in Kishanganj district except 4 districts which have registered growth in rice area i.e., Araria (0.1%), Madhubani (2.5%), Saharsa (2.1%) and Khagaria district (2.8%). The growth in rice area in BGREI districts was reduced by (-) 1.7 per cent during summer 2012 in the range of (-) 0.9 per cent in Madhepura district to (-) 8.2 per cent in Katihar district which recorded decline of (-) 2.0 per cent in rice yield except 4 districts which have registered growth in rice area i.e., Araria (0.7%), Madhubani (1.6%), Saharsa (2.9%) and Khagaria (0.8%).

The CGR of rice production in BGREI districts 'indicates exponential growth of 1.0 per cent during summer – 2011 which improved to 5.3 per cent in summer – 2012. The BGREI districts which have shown decline in the growth of production of rice during summer – 2011 are Katihar (-) 5 per cent, Kishanganj (-) 13.2 per cent, Madhepura (-) 6.9 per cent, Supaul (-) 3.8 per cent and Khagaria (-) 10.5 per cent. The BGREI districts which witnessed decline in the growth of production during summer – 2012 are Katihar (-) 1.7 per cent, Kishanganj (-) 0.1 per cent, Madhepura (-) 3.5 per cent and Supaul (-) 2.4 per cent.

The CGR of rice yield in BGREI districts indicates exponential growth of 3.3 per cent during Summer – 2011 in the range of 2.7 per cent in Saharsa district to 13.4 per cent in Madhubani district except 4 districts which registered decline in the growth of rice yield i.e., Kishanganj (-) 0.5 per cent, Madhepura (-) 6.4 per cent, Supaul (-) 0.4 per

cent and Khagaria (-) 12.9 per cent. The growth in rice yield in BGREI districts grew to 7.2 per cent during Summer – 2012 due to better monsoon rain except in Madhepura district which recorded decline of (-) 2.0 per cent in rice yield.

It is further interesting to note that the state has included 7 (seven) districts namely; Araria, Katihar, Kishanganj, Madhubani, Madhepura, Saharsa and Supaul under both BGREI & NFSM programmes. The effects of rainfall, weather and physiographic factors exhibit typical trend witnessing upward vertical growth in production despite reduction in area and acceleration of yield in the state, yet variability exists in all the indices across districts. The rice crop in the state is solely dependent on monsoon rain despite a sound ground water resource. Rainfall not only helps to meet moisture requirement of the crop, it also sets the desired ambience exhibiting coolness and humidity needed for rice growth.

The CGR of rice area in NFSM districts showed decline of (-) 1.2 per cent during 2010-11, which was reduced to (-) 0.1 per cent in 2011-12 due to improved conditions of rainfall in the state. The districts which registered reduction in growth of rice are Banka (-) 0.9 per cent, East Champaran (-) 4.6 per cent, West Champaran (-) 4.4 per cent and Gaya (-) 1.2 per cent. The districts which registered growth in rice areas during 2010-11 are Begusarai 4 per cent, Bhojpur 5.5 per cent, Gopalganj 1.6 per cent, Khagaria 2.8 per cent, Munger 1 per cent and Sheohar 3.1 per cent. The reduction in growth of rice areas in NFSM districts during 2011-12 slowed down to a level of (-) 2.3 per cent in the range of (-) 18.3 per cent to 4.6 per cent due to improved rainfall. The districts which witnessed reduction in growth of rice areas during 2011-12 are Bhagalpur (-) 8.9 per cent, Bhabhua (-) 3.5 per cent, Buxar (-) 4.4 per cent, Jehanabad (-) 16.4 per cent, Lakhisarai (-) 18.3 per cent, Patna (-) 9.6 per cent, Purnea (-) 4.8 per cent, Rohtas (-) 1 per cent, Saran (-) 2.8 per cent, Sheikhpura (-) 9.4 per cent and Vaishali (-) 7 per cent. The growth in remaining 7 (seven) districts reveals that positive scenario in varying proportion than that of previous year.

The CGR of rice production in NFSM districts indicates a reduction in growth by 0.3 per cent during 2010-11 due to deficient rain. There are 11 (eleven) NFSM districts

which registered growth in rice production during the year 2010-11 in the range between 0.2 per cent in Muzaffarpur to 30.5 per cent in Samastipur district. Remaining 7 (seven) NFSM districts recorded decline in the growth of rice production in the range that varied between (-) 3.8 per cent in Supaul district to (-) 14.3 per cent in Siwan district. Rice production during the year 2011-12 grew by 8.8 per cent exponentially indicating modest growth in 13 districts in the range of 3.8 per cent in Jamui district to 40.1 per cent in Samastipur district. The districts which have recorded reduction in the growth of rice production during the year 2011-12 are Katihar (-) 1.7 per cent, Kishanganj (-) 0.1 per cent, Madhepura (-) 3.5 per cent, Siwan (-) 2.5 per cent and Supaul (-) 2.4 per cent.

The CGR of rice yield in NFSM districts indicates a growth of 0.9 per cent during the year 2010-11 which registered steep increase of 10 times touching a level of 9 per cent in the year 2011-12. There are 12 (twelve) NFSM districts, which have registered growth in rice production during the year 2010-11 in the range between 0.7 per cent in Muzaffarpur to 26.9 per cent in Samastipur district. The remaining 6 (six) NFSM districts recorded reduction in the growth of rice production in the range between (-) 0.4 per cent in Supaul district to (-) 12 per cent in Siwan district. The NFSM districts witnessed modest growth in 16 districts in the range of 0.1 per cent in Supaul district to 33.8 per cent in Samastipur district. The districts which have recorded reduction in the growth of rice production during the year 2011-12 are Madhepura (-) 2.6 per cent and Siwan (-) 0.5 per cent.

Table No. 3.2: District wise per cent CGR of rice area during 2010-11 & 2011-12 in Bihar (Base year: QE: 2009-10=100)

Sl	District	Rice area('000' ha)								
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11*	2011-12$	CGR: 2010-11	CGR: 2011-12
BGREI Districts (*Kharif* season)										
1	ARWAL	26.9	0	33.5	35.6	23.6	26.8	26.4	-	-
2	AURANGABAD	118.1	171.1	169.9	166.0	121.4	132.2	176.9	-1.4	1.3
3	BHAGALPUR	47.9	48.2	41.7	41.5	40.5	31.7	26.8	-7.1	-8.9
4	BEGUSARAI	24.5	24.5	25.3	21.2	29.6	29.8	29.3	4.0	4.0
5	BHABHUA	108.1	133.1	133.1	136.5	81.7	98.7	111.3	-5.3	-3.5
6	BHOJPUR	85.2	85.5	106.5	106.2	103.9	110.6	106.8	5.5	4.3
7	BUXAR	78.3	82.5	86.5	76.7	62.3	56.9	73.6	-7.1	-4.4
8	GOPALGANJ	91.0	75.8	91.8	86.5	90.0	92.5	90.8	1.6	1.3
9	JAHANABAD	46.4	84.7	52.7	57.8	11.3	12.0	53.9	-30.5	-16.4
10	KHAGARIA (K+S)	19.3	22.2	25.6	23.6	19.8	25.5	20.5	2.8	0.8
11	LAKHISARAI	31.6	24.5	37.2	39.6	36.5	3.6	17.2	-23.9	-18.3
12	MUNGER	24.8	30.0	31.5	31.7	29.5	27.0	29.5	1.0	0.8
13	NAWADHA	44.7	73.3	75.0	75.0	51.5	46.2	66.5	-2.5	-0.4
14	PATNA	85.9	88.0	86.0	88.3	45.9	49.7	60.4	-12.5	-9.6
15	PURNIA (K+S)	120.2	120.9	116.6	112.3	108.3	85.2	98.4	-5.8	-4.8
16	ROHTAS	195.6	166.7	195.8	166.2	189.0	181.3	170.9	-0.5	-1.0
17	SARAN	87.4	86.8	87.1	81.5	76.4	74.0	78.0	-3.6	-2.8
18	SHEOHAR	21.8	23.7	23.5	22.2	21.6	28.8	29.9	3.1	4.6
19	SHEIKHPURA	22.5	39.3	32.2	30.6	14.0	9.2	31.1	-19.6	-9.4
20	Vaishali	59.6	59.6	57.4	57.6	52.9	32.9	46.3	-9.1	-7.0
	***Kharif* BGREI Total**	1340.1	1440.4	1509.0	1456.6	1209.6	1154.8	1344.3	-3.7	-2.3
BGREI Districts (Summer season)										
1	ARARIA	122.0	138.6	132.2	132.2	137.5	123.3	139.4	0.1	0.7
2	KATIHAR	112.7	106.5	106.1	104.3	102.4	58.2	77.0	-9.3	-8.2
3	KISHANGANJ	102.5	82.8	80.8	84.0	92.2	36.8	79.3	-12.7	-7.8
4	MADHUBANI	169.1	158.9	190.4	191.0	183.1	184.7	179.8	2.5	1.6
5	MADHEPURA	78.4	78.3	84.9	53.1	84.3	79.3	71.5	-0.5	-0.9
6	SAHARSA	84.2	84.7	82.1	77.7	92.3	93.3	98.8	2.1	2.9
7	SUPAUL	111.6	102.1	109.1	97.6	106.3	87.7	98.4	-3.4	-2.5
8	KHAGARIA (K+S)	19.3	22.2	25.6	23.6	19.8	25.5	20.5	2.8	0.8
9	PURNIA (K+S)	120.2	120.9	116.6	112.3	108.3	85.2	98.4	-5.8	-4.8
Summer BGREI		**920.2**	**895.0**	**927.8**	**875.9**	**926.3**	**774.1**	**863.0**	-2.3	-1.7
BGREI TOTAL		**2120.8**	**2192.3**	**2294.6**	**2196.5**	**2007.8**	**1818.1**	**2088.4**	-3.0	-2.0

Table 3.2 contd…

Sl	District	Rice area ('000' ha)								
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11*	2011-12$	CGR: 2010-11	CGR: 2011-12
NFSM Districts										
1	ARARIA (C*)	122.0	138.6	132.2	132.2	137.5	123.3	139.4	0.1	0.7
2	BANKA	96.9	99.4	100.5	97.0	116.1	83.5	100.2	-0.9	-0.4
3	CHAMPARAN(E)	193.4	212.9	213.7	216.4	215.1	137.5	194.1	-4.6	-3.0
4	CHAMPARAN(W)	167.3	168.9	178.7	178.3	147.8	132.0	173.9	-4.4	-2.0
5	DARBHANGA	86.5	74.9	96.7	100.5	108.0	79.0	63.7	2.0	-2.5
6	GAYA	54.3	54.6	134.0	124.6	54.6	50.8	88.6	-1.2	1.5
7	JAMUI	38.7	50.3	48.2	41.6	44.5	37.2	49.3	-2.0	0.2
8	KATIHAR (C*)	112.7	106.5	106.1	104.3	102.4	58.2	77.0	-9.3	-8.2
9	KISHANGANJ (C*)	102.5	82.8	80.8	84.0	92.2	36.8	79.3	-12.7	-7.8
10	MADHUBANI (C*)	169.1	158.9	190.4	191.0	183.1	184.7	179.8	2.5	1.6
11	MADHEPURA (C*)	78.4	78.3	84.9	53.1	84.3	79.3	71.5	-0.5	-0.9
12	MUZAFFARPUR	124.9	139.4	159.7	156.8	133.2	124.9	133.2	-0.4	-0.7
13	NALANDA	102.8	95.0	98.2	87.3	96.8	75.4	127.0	-4.5	0.6
14	SAHARSA (C*)	84.2	84.7	82.1	77.7	92.3	93.3	98.8	2.1	2.9
15	SAMASTIPUR	83.3	70.2	82.3	104.0	77.4	91.1	109.7	2.8	4.7
16	SITAMARHI	72.1	92.5	53.7	82.1	103.2	111.8	105.3	8.8	8.1
17	SIWAN	111.4	106.8	112.3	111.0	109.2	91.1	103.7	-2.7	-2.0
18	SUPAUL (C*)	111.6	102.1	109.1	97.6	106.3	87.7	98.4	-3.4	-2.5
Total NFSM		1131.6	1164.9	1278.0	1299.4	1205.8	1014.4	1248.8	-1.2	-0.1
Bihar State		3252.4	3357.1	3572.6	3496.0	3213.7	2832.5	3337.2	-2.4	-1.3
All India		43659.8	43813.6	43914.4	45537.4	41918.3	42862.4	43974.4	-0.5	-0.2

Source: DES, State/GOI.

NB: 1. 2010-11: Final estimate.*

2. 2011-12$: 4th Advance estimate.

3. APY data has been fixed to DES, GOI indices using appropriate algorithm.

C: Common districts across BGREI & NFSM;*

K+S: Kharif +Summer rice

Table No. 3.3: **District wise per cent CGR of rice production during 2010-11 & 2011-12 in Bihar (Base year: QE: 2009-10=100)**

Sl	District	Rice production ('000' tons)								
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11*	2011-12$	CGR: 2010-11	CGR: 2011-12
BGREI Districts (*Kharif* season)										
1	ARWAL	41.0	0	62.0	62.215	33.0	48.9	70.9	-	-
2	AURANGABAD	150.6	442.7	423.4	240.569	161.8	189.0	511.8	-6.8	3.7
3	BHAGALPUR	48.8	113.7	42.2	56.193	58.7	30.6	71.3	-10.9	-4.0
4	BEGUSARAI	6.7	33.6	1.4	24.619	17.6	10.5	44.9	9.6	23.6
5	BHABHUA	213.3	309.4	317.4	267.235	76.8	183.0	340.7	-13.6	-3.7
6	BHOJPUR	195.6	225.8	271.2	314.218	123.5	230.7	308.2	-2.4	2.2
7	BUXAR	177.9	186.1	246.6	180.533	89.9	101.9	227.0	-14.0	-5.2
8	GOPALGANJ	46.5	89.1	71.5	105.826	75.0	89.3	162.3	9.4	14.6
9	JAHANABAD	38.4	153.1	90.8	145.344	17.1	16.0	133.3	-25.9	-8.4
10	KHAGARIA (K+S)	18.6	18.9	3.9	12.225	5.6	14.2	26.4	-10.5	3.1
11	LAKHISARAI	24.3	56.0	115.2	80.603	45.3	1.6	28.9	-33.8	-23.4
12	MUNGER	33.3	59.3	56.6	46.881	33.4	12.3	54.8	-17.9	-7.5
13	NAWADHA	25.7	146.9	152.4	148.475	58.2	48.9	171.3	1.2	9.4
14	PATNA	130.3	144.3	89.8	135.438	50.3	65.5	147.2	-16.2	-6.2
15	PURNIA (K+S)	116.4	116.8	113.9	137.775	146.5	104.0	172.0	0.9	4.3
16	ROHTAS	464.2	466.1	439.7	459.975	446.8	305.2	647.5	-6.0	0.6
17	SARAN	112.2	96.7	121.2	117.461	81.7	95.2	119.7	-3.8	-0.8
18	SHEOHAR	13.8	12.1	8.4	20.108	12.8	8.1	66.9	-4.5	16.9
19	SHEIKHPURA	19.7	93.8	56.3	69.65	12.6	4.5	61.3	-31.5	-13.9
20	Vaishali	59.6	46.1	32.2	91.06	50.6	21.9	91.9	-10.0	1.0
***Kharif* BGREI Total**		1936.8	2810.6	2716.4	2716.4	1597.1	1581.4	3458.5	-7.4	0.2
BGREI Districts (Summer season)										
1	ARARIA	85.9	140.9	59.1	159.432	155.9	130.0	238.4	10.1	14.8
2	KATIHAR	139.8	137.7	87.9	144.205	155.2	82.4	139.5	-5.0	-1.7
3	KISHANGANJ	91.1	74.6	59.8	91.223	62.3	34.7	148.1	-13.2	-0.1
4	MADHUBANI	66.3	139.7	83.6	220.113	277.6	103.8	257.5	16.3	18.2
5	MADHEPURA	91.9	88.8	122.5	45.778	97.1	64.3	88.1	-6.9	-3.5
6	SAHARSA	86.0	85.5	72.4	71.363	110.0	102.8	167.8	4.8	10.5
7	SUPAUL	138.5	120.7	148.5	105.126	128.2	109.3	124.3	-3.8	-2.4
8	KHAGARIA (K+S)	18.6	18.9	3.9	12.225	5.6	14.2	26.4	-10.5	3.1
9	PURNIA (K+S)	116.4	116.8	113.9	137.775	146.5	104.0	172.0	0.9	4.3
Summer BGREI		834.6	923.6	751.7	987.2	1138.3	745.3	1362.1	1.0	5.3
BGREI TOTAL		2636.4	3598.5	3350.3	3553.6	2583.4	2208.5	4622.2	-5.1	1.6

Sl	District	Rice production('000' tons)								
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11*	2011-12$	CGR: 2010-11	CGR: 2011-12
NFSM Districts										
1	ARARIA (C*)	85.9	140.9	59.1	159.432	155.9	130.0	238.4	10.1	14.8
2	BANKA	123.9	256.9	239.8	215.838	204.1	169.8	343.6	2.2	7.7
3	CHAMPARAN(E)	174.0	163.6	50.6	299.973	108.2	88.0	338.3	-7.9	5.6
4	CHAMPARAN(W)	195.4	166.0	86.8	352.642	186.5	166.2	366.4	2.7	9.9
5	DARBHANGA	84.9	64.6	41.5	129.588	92.8	76.0	100.7	4.9	6.0
6	GAYA	13.2	80.0	293.0	220.397	60.5	56.6	250.0	19.2	26.4
7	JAMUI	14.4	88.1	80.6	71.441	28.6	15.9	90.0	-8.2	3.8
8	KATIHAR (C*)	139.8	137.7	87.9	144.205	155.2	82.4	139.5	-5.0	-1.7
9	KISHANGANJ (C*)	91.1	74.6	59.8	91.223	62.3	34.7	148.1	-13.2	-0.1
10	MADHUBANI (C*)	66.3	139.7	83.6	220.113	277.6	103.8	257.5	16.3	18.2
11	MADHEPURA (C*)	91.9	88.8	122.5	45.778	97.1	64.3	88.1	-6.9	-3.5
12	MUZAFFARPUR	72.2	94.0	13.0	205.195	47.3	63.8	265.8	0.2	17.1
13	NALANDA	40.8	226.2	117.6	121.5	90.4	83.4	305.8	2.5	14.5
14	SAHARSA (C*)	86.0	85.5	72.4	71.363	110.0	102.8	167.8	4.8	10.5
15	SAMASTIPUR	20.1	40.9	8.3	157.294	77.1	49.1	196.1	30.5	40.1
16	SITAMARHI	24.8	63.4	27.2	121.023	93.3	40.0	148.6	15.5	22.5
17	SIWAN	95.6	147.2	109.4	141.748	27.1	84.8	173.6	-14.3	-2.5
18	SUPAUL (C*)	138.5	120.7	148.5	105.126	128.2	109.3	124.3	-3.8	-2.4
Total NFSM		859.1	1390.8	1067.8	2036.6	1016.0	893.6	2578.8	-0.3	8.8
Bihar State		3495.5	4989.3	4418.1	5590.3	3599.3	3102.1	7201.0	-3.8	3.7
All India		91793.4	93355.3	96692.9	99182.4	89093	95979.8	104322.0	0.3	1.3

Source: *DES, State/GOI.NB:*

1. 2010-11: Final estimate.*

2. 2011-12$: 4th Advance estimate.

3. APY data has been fixed to DES, GoI indices using appropriate algorithm.

C: Common districts across BGREI & NFSM;*

K+S: Kharif +Summer rice

Table No. 3.4: District wise per cent CGR of rice yield during 2010-11 & 2011-12 in Bihar (Base year: QE: 2009-10=100)

Sl	District	Rice yield (Kg/ha)								
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11*	2011-12$	CGR: 2010-11	CGR: 2011-12
BGREI Districts (*Kharif* season)										
1	ARWAL	1524	2000	1853	1747	1395	1822	2686	-0.7	4.5
2	AURANGABAD	1275	2587	2493	1449	1332	1429	2894	-5.4	2.3
3	BHAGALPUR	1020	2358	1013	1354	1450	966	2665	-4.0	5.3
4	BEGUSARAI	272	1376	55	1164	593	353	1531	5.4	18.9
5	BHABHUA	1973	2324	2384	1958	940	1855	3060	-8.8	-0.2
6	BHOJPUR	2295	2643	2546	2960	1189	2085	2887	-7.5	-1.9
7	BUXAR	2271	2255	2850	2355	1443	1790	3087	-7.5	-0.8
8	GOPALGANJ	511	1175	779	1223	833	965	1788	7.7	13.0
9	JAHANABAD	828	1807	1723	2513	1511	1337	2472	6.6	9.5
10	KHAGARIA (K+S)	966	850	151	517	282	556	1287	-12.9	2.3
11	LAKHISARAI	767	2284	3093	2033	1244	455	1683	-12.9	-6.2
12	MUNGER	1343	1976	1797	1478	1134	457	1859	-18.7	-8.3
13	NAWADHA	575	2004	2033	1980	1129	1058	2574	3.8	9.8
14	PATNA	1516	1640	1044	1534	1095	1319	2438	-4.3	3.8
15	PURNIA (K+S)	968	967	977	1227	1352	1220	1748	7.1	9.6
16	ROHTAS	2373	2797	2245	2768	2363	1683	3790	-5.6	1.6
17	SARAN	1283	1115	1391	1441	1070	1288	1535	-0.2	2.0
18	SHEOHAR	630	510	359	904	594	281	2237	-7.3	11.8
19	SHEIKHPURA	879	2388	1748	2279	905	484	1974	-14.8	-4.9
20	Vaishali	999	773	562	1580	957	666	1986	-1.0	8.6
***Kharif* BGREI Total**		1445	1951	1800	1865	1320	1369	2573	-3.9	2.6
BGREI Districts (Summer season)										
1	ARARIA	704	1017	447	1206	1134	1054	1711	10.0	14.0
2	KATIHAR	1240	1293	829	1382	1515	1415	1812	4.8	7.1
3	KISHANGANJ	889	902	740	1086	676	943	1869	-0.5	8.3
4	MADHUBANI	392	879	439	1152	1516	562	1432	13.4	16.3
5	MADHEPURA	1173	1134	1443	861	1151	811	1232	-6.4	-2.6
6	SAHARSA	1021	1008	883	919	1191	1101	1698	2.7	7.4
7	SUPAUL	1241	1183	1361	1077	1205	1246	1264	-0.4	0.1
8	KHAGARIA (K+S)	966	850	151	517	282	556	1287	-12.9	2.3
9	PURNIA (K+S)	968	967	977	1227	1352	1220	1748	7.1	9.6
Summer BGREI		907	1032	810	1127	1229	963	1578	3.3	7.2
BGREI TOTAL		1243	1641	1460	1618	1287	1215	2213	-2.1	3.6

Table 3.4 contd…

Sl	District	Rice yield (Kg/ha)								
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11*	2011-12$	CGR: 2010-11	CGR: 2011-12
NFSM Districts										
1	ARARIA (C*)	704	1017	447	1206	1134	1054	1711	10.0	14.0
2	BANKA	1278	2584	2385	2225	1758	2034	3429	3.2	8.1
3	CHAMPARAN(E)	900	769	237	1386	503	640	1743	-3.4	8.8
4	CHAMPARAN(W)	1168	983	486	1978	1262	1258	2107	7.5	12.2
5	DARBHANGA	981	863	429	1289	860	962	1580	2.9	8.7
6	GAYA	243	1465	2187	1769	1109	1114	2822	20.6	24.5
7	JAMUI	372	1753	1672	1719	643	427	1825	-6.3	3.6
8	KATIHAR (C*)	1240	1293	829	1382	1515	1415	1812	4.8	7.1
9	KISHANGANJ (C*)	889	902	740	1086	676	943	1869	-0.5	8.3
10	MADHUBANI (C*)	392	879	439	1152	1516	562	1432	13.4	16.3
11	MADHEPURA (C*)	1173	1134	1443	861	1151	811	1232	-6.4	-2.6
12	MUZAFFARPUR	577	674	81	1309	355	511	1995	0.7	18.0
13	NALANDA	397	2381	1197	1392	934	1107	2408	7.3	13.8
14	SAHARSA (C*)	1021	1008	883	919	1191	1101	1698	2.7	7.4
15	SAMASTIPUR	241	582	101	1513	996	539	1788	26.9	33.8
16	SITAMARHI	344	685	507	1474	904	358	1411	6.2	13.4
17	SIWAN	858	1379	974	1277	248	931	1673	-12.0	-0.5
18	SUPAUL (C*)	1241	1183	1361	1077	1205	1246	1264	-0.4	0.1
Total NFSM		759	1194	836	1567	843	881	2065	0.9	9.0
Bihar State		1075	1486	1237	1599	1120	1095	2158	-1.4	5.1
All India		2102	2131	2202	2178	2125	2239	2372	0.9	1.5

Source: DES, State/GOI.NB: 1. 2010-11: Final estimate.*
2. 2011-12$: 4th Advance estimate.
3. APY data has been fixed to DES, GOI indices using appropriate algorithm.

C: Common districts across BGREI & NFSM;*
K+S: Kharif +Summer rice

3.1.4 Area, Production and Yield (APY) of Wheat Crop in BGREI Districts

The APY of wheat crop in BGREI districts for the period 2010-11 and 2011-12 have been presented in table Nos. 3.5 to 3.7. The CGR of wheat area in BGREI districts indicates exponential growth of 3.1 per cent during Rabi 2010-11, which came down to 2.5 per cent in Rabi 2011-12. The BGREI districts, which have shown reduction in growth of wheat areas during Rabi 2010-11 are Arwal (-) 0.4 per cent, Gaya (-) 3.6 per cent and Sheohar (-) 3 per cent. The BGREI district which witnessed reduction in the growth of wheat area during Rabi 2011-12 is Gaya (-) 3.8 per cent.

The CGR of wheat production in BGREI districts indicates exponential growth of 4.1 per cent during Rabi 2010-11 which came down to 4 per cent in Rabi 2011-12. The BGREI districts which have shown reduction in the growth of wheat production during Rabi 2010-11 are Arwal (-) 8.1 per cent and Patna (-) 2.6 per cent. The BGREI districts, which witnessed reduction in growth of wheat production during Rabi 2011-12 are Arwal (-) 7.1 per cent, Gaya (-) 0.5 per cent, Patna (-) 1.2 per cent and Siwan (-) 0.3 per cent.

The CGR of wheat yield in BGREI districts indicates exponential growth of 7.6 per cent during Rabi 2010-11, which came down to 6.5 per cent in Rabi 2011-12. The BGREI districts, which have shown reduction in the growth of wheat production during Rabi 2010-11 are Arwal (-) 8.1 per cent, Aurangabad (-) 2.7 per cent, Bhojpur (-) 2.7 per cent, Jehanabad (-) 1.8 per cent, Lakhisarai (-) 7.8 per cent and Patna (-) 3.8 per cent. The BGREI districts, which witnessed refuction in the growth of wheat production during Rabi 2011-12 are Arwal (-) 7.6 per cent, Bhojpur (-) 3.3 per cent, Jehanabad (-) 2.1 per cent, Lakhisarai (-) 6.7 per cent, Patna (-) 2.8 per cent and Siwan (-) 1.6 per cent.

The CGR of wheat area in NFSM districts indicates similar exponential growth of 0.4 per cent during Rabi 2010-11 and Rabi 2011-12 also. The NFSM districts, which have shown reduction in the growth of wheat areas during Rabi 2010-11 are Bhagalpur (-) 1.5 per cent, Banka (-) 0.3 per cent, West Champaran (-) 1.4 per cent, Jamui (-) 3.3 per cent, Katihar (-) 5.2 per cent, Khagaria (-) 0.9 per cent, Kishanganj (-) 1.8 per cent, Madhepura (-) 3.3 per cent, Munger (-) 3.3 per cent, Nalanda (-) 3.7 per cent, Purnea (-) 1.5 per cent, Saran (-) 0.9 per cent and Supaul (-) 1.7 per cent. The NFSM districts, which witnessed reduction in the growth of wheat areas during rabi 2011-12 are the same as in case of rabi 2010-11 with an addition of Darbhanga (-) 0.8 per cent.

The CGR of wheat production in NFSM districts indicates exponential growth of 5.2 per cent during rabi 2010-11, which declined to 5.1 per cent in rabi 2011-12. Thus, there is not much change in the growth pattern during both the consecutive years. The NFSM districts, which have shown reduction in growth of wheat areas during

Rabi 2010-11 are Jamui (-) 2.6 per cent, Khagaria (-) 0.3 per cent, Munger (-) 3.8 per cent, Nalanda (-) 6.3 per cent and Rohtas (-) 0.3 per cent. The NFSM districts, which witnessed reduction in the growth of wheat areas during rabi 2011-12 are Banka (-) 1.3 per cent, Jamui (-) 4.8 per cent, Khagaria (-) 0.3 per cent, Munger (-) 4.3 per cent, Nalanda 3.1 per cent and Sheikhpura (-) 1.6 per cent.

The CGR of wheat yield in NFSM districts indicates similar exponential growth of 4.7 per cent during rabi 2010-11 and rabi 2011-12. The NFSM districts, which have shown reduction in the growth of wheat yield during rabi 2010-11 are Bhabhua (-) 2.2 per cent, East Champaran (-) 0.8 per cent, Jamui (-) 0.1 per cent, Khagaria (-) 0.2 per cent, Munger (-) 1.4 per cent, Nalanda (-) 2.7 per cent, Rohtas (-) 0.3 per cent and Sheikhpura (-) 4.4 per cent. The NFSM districts, which witnessed reduction in the growth of wheat production during rabi 2011-12 are Banka (-) 0.7 per cent, Bhabhua (-) 1.1 per cent, Khagaria (-) 0.8 per cent, Munger (-) 1.9 per cent, Nalanda (-) 0.6 per cent and Sheikhpura (-) 5.5 per cent.

Table No. 3.5: District wise per cent CGR of wheat area during 2010-11 & 2011-12) in Bihar (Base year: QE: 2009-10=100.

Sl	District	Wheat area ('000' ha)								
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11*	2011-12$	CGR: 2010-11	CGR: 2011-12
BGREI Districts										
1	ARWAL	11.3	11.0	11.3	11.2	10.8	11.1	11.4	**-0.4**	**0.04**
2	AURANGABAD	47.9	50.6	65.3	95.4	101.6	56.2	58.0	**9.8**	**4.5**
3	BEGUSARAI	52.6	52.0	53.8	53.4	62.2	52.8	54.4	**1.6**	**1.0**
4	BHOJPUR	55.3	74.2	77.2	77.7	76.6	77.3	79.7	**5.2**	**4.3**
5	BUXAR	62.2	59.5	83.9	77.6	81.1	83.0	85.6	**6.8**	**5.8**
6	GAYA	60.7	72.7	60.1	60.2	63.7	50.9	52.6	**-3.6**	**-3.8**
7	GOPALGANJ	82.5	83.0	82.9	78.8	83.5	83.6	86.2	**0.1**	**0.6**
8	JAHANABAD	20.7	32.4	28.5	32.8	33.3	34.1	35.2	**8.1**	**6.8**
9	LAKHISARAI	21.4	29.6	28.5	30.7	27.3	49.8	51.4	**12.3**	**13.8**
10	PATNA	60.0	56.9	61.1	56.6	61.6	61.6	63.6	**0.8**	**1.2**
11	SAHARSA	42.6	42.0	43.4	41.0	41.9	44.2	45.6	**0.3**	**1.0**
12	SIWAN	95.4	90.1	99.0	95.4	105.6	94.6	97.6	**1.1**	**0.8**
13	SHEOHAR	15.5	13.9	16.6	10.4	10.3	16.4	17.0	**-3.0**	**0.5**
BGREI districts total		**628.0**	**667.8**	**711.6**	**721.2**	**759.4**	**715.6**	**738.3**	**3.1**	**2.5**
NFSM districts:										
1	ARARIA	50.7	56.8	51.4	58.0	48.7	57.5	59.3	**0.8**	**1.6**
2	BHAGALPUR	46.0	43.6	47.8	41.9	41.5	43.8	45.2	**-1.5**	**-0.7**
3	BANKA	23.3	28.4	32.4	31.5	27.1	23.7	24.4	**-0.3**	**-1.4**
4	BHABHUA	65.7	60.2	65.9	58.5	68.0	69.6	71.8	**1.5**	**2.1**
5	CHAMPARAN(E)	98.4	97.3	106.6	107.9	100.5	102.8	106.0	**0.9**	**1.0**
6	CHAMPARAN(W)	78.7	82.5	81.7	80.6	81.6	71.7	74.0	**-1.4**	**-1.7**
7	DARBHANGA	64.0	66.3	82.3	79.8	80.8	61.1	63.0	**0.9**	**-0.8**
8	JAMUI	9.6	11.6	14.0	14.1	11.7	7.6	7.8	**-3.3**	**-5.8**
9	KATIHAR	44.7	34.8	36.2	38.4	35.1	30.4	31.3	**-5.2**	**-4.8**
10	KHAGARIA	37.4	31.8	34.6	34.3	33.8	33.9	35.0	**-0.9**	**-0.3**
11	KISHANGANJ	22.6	21.4	21.8	22.1	20.3	20.5	21.1	**-1.8**	**-1.3**
12	MADHUBANI	87.7	81.0	90.7	94.1	102.2	95.3	98.4	**3.3**	**2.9**
13	MADHEPURA	36.2	36.1	42.1	35.7	26.7	35.6	36.7	**-3.3**	**-1.6**
14	MUNGER	19.2	18.0	19.0	19.1	17.4	15.5	16.0	**-3.3**	**-3.3**
15	MUZAFFARPUR	85.9	84.4	102.2	97.8	102.2	94.2	97.2	**2.9**	**2.1**
16	NALANDA	82.3	81.1	68.3	67.0	70.0	69.2	71.4	**-3.7**	**-2.5**
17	NAWADHA	38.8	44.6	52.4	51.9	52.2	59.5	61.3	**7.7**	**7.2**
18	PURNIA	46.6	45.7	42.7	39.1	46.8	42.1	43.5	**-1.5**	**-1.0**
19	ROHTAS	131.1	134.0	127.8	131.1	130.6	132.1	136.3	**0.0**	**0.4**
20	SAMASTIPUR	51.9	50.7	52.3	61.1	60.3	61.8	63.7	**4.5**	**4.2**
21	SARAN	87.7	86.9	94.5	95.4	93.9	78.5	81.0	**-0.9**	**-1.6**

22	SHEIKHPURA	15.8	20.2	21.1	20.0	22.3	21.2	21.8	**5.0**	**4.1**
23	SITAMARHI	53.2	67.3	66.2	67.1	61.2	62.6	64.6	**1.6**	**1.3**
24	SUPAUL	53.9	50.1	52.0	42.8	48.7	50.5	52.1	**-1.7**	**-0.5**
25	VAISHALI	44.2	47.2	44.8	48.1	50.1	47.4	48.9	**1.7**	**1.5**
NFSM districts		**1375.7**	**1381.9**	**1450.9**	**1437.2**	**1433.9**	**1387.9**	**1431.8**	**0.4**	**0.4**
Bihar State		**2003.7**	**2049.7**	**2162.5**	**2158.3**	**2193.3**	**2103.5**	**2170.1**	**1.3**	**1.1**
All India		**26483.6**	**27994.5**	**28038.6**	**27752.4**	**28457.4**	**29068.6**	**29902.2**	**1.5**	**1.6**

Source: DES, State/GOI, NB: 1. 2010-11: Final estimate.*
2. 2011-12$: 4th Advance estimate.
3. APY data has been fixed to DES, GOI indices using appropriate algorithm.

Table No. 3.6: **District wise per cent CGR of wheat production during 2010-11 & 2011-12 in Bihar (Base year: QE: 2009-10=100).**

Sl	District	Wheat production ('000' tons)								
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11*	2011-12$	CGR: 2010-11	CGR: 2011-12
BGREI Districts										
1	ARWAL	25.8	25.3	23.5	20.0	23.4	15.5	18.1	**-8.1**	**-7.09**
2	AURANGABAD	63.5	98.4	109.0	107.2	123.4	90.9	106.2	**7.3**	**5.5**
3	BEGUSARAI	104.4	107.6	106.7	105.2	119.1	112.5	131.5	**1.9**	**3.2**
4	BHOJPUR	163.6	178.6	223.9	211.1	256.8	161.2	188.4	**2.8**	**1.3**
5	BUXAR	139.9	115.7	218.9	221.4	196.5	195.4	228.3	**9.8**	**9.0**
6	GAYA	82.4	147.5	126.4	132.6	141.5	89.9	105.1	**1.0**	**-0.5**
7	GOPALGANJ	153.5	195.6	141.1	123.1	165.9	227.5	265.7	**3.9**	**7.8**
8	JAHANABAD	35.1	67.8	59.2	72.3	64.5	54.0	63.1	**6.5**	**5.1**
9	LAKHISARAI	40.1	69.6	66.2	55.8	45.2	70.5	82.4	**3.9**	**6.7**
10	PATNA	146.0	116.3	132.8	146.9	122.5	115.5	135.0	**-2.6**	**-1.2**
11	SAHARSA	33.6	77.2	75.6	70.4	84.6	81.8	95.6	**14.2**	**12.8**
12	SIWAN	183.9	179.6	215.1	208.2	300.0	152.9	178.6	**1.7**	**-0.3**
13	SHEOHAR	6.7	18.0	23.7	22.0	27.9	36.1	42.1	**31.7**	**28.6**
BGREI districts total		**1178.6**	**1397.2**	**1522.2**	**1496.2**	**1671.4**	**1403.7**	**1640.0**	**4.1**	**4.0**
NFSM districts:										
1	ARARIA	36.8	37.7	81.8	64.7	90.9	112.5	131.4	**25.6**	**24.4**
2	BHAGALPUR	63.3	69.5	84.4	79.8	99.7	90.6	105.8	**8.4**	**8.3**
3	BANKA	31.9	49.9	70.0	88.0	52.8	34.2	40.0	**2.1**	**-1.3**
4	BHABHUA	151.8	124.0	122.7	125.3	151.8	134.9	157.6	**0.1**	**1.8**
5	CHAMPARAN(E)	121.4	187.2	263.2	157.3	74.0	249.9	292.0	**0.9**	**7.2**

6	CHAMPARAN(W)	95.7	150.1	177.8	230.6	171.0	154.6	180.6	**9.1**	**7.1**
7	DARBHANGA	82.3	119.0	195.0	184.3	171.8	114.6	133.8	**8.0**	**4.6**
8	JAMUI	10.8	16.6	21.7	13.1	19.4	9.1	10.6	**-2.6**	**-4.8**
9	KATIHAR	23.5	41.7	53.7	67.7	65.3	74.5	87.1	**23.4**	**20.8**
10	KHAGARIA	70.2	44.8	65.3	26.8	113.7	46.9	54.8	**-0.3**	**-0.3**
11	KISHANGANJ	19.1	26.2	19.6	26.5	22.9	20.0	23.4	**0.4**	**0.8**
12	MADHUBANI	68.8	123.6	147.2	148.3	221.0	181.7	212.3	**20.8**	**17.7**
13	MADHEPURA	41.4	50.0	59.7	79.0	60.3	55.1	64.3	**6.7**	**5.6**
14	MUNGER	30.7	31.7	37.8	34.4	34.9	22.5	26.2	**-3.8**	**-4.3**
15	MUZAFFARPUR	128.2	154.0	241.8	190.4	176.0	186.2	217.5	**6.0**	**6.1**
16	NALANDA	149.6	147.7	122.0	108.4	108.7	116.3	135.9	**-6.3**	**-3.1**
17	NAWADHA	56.5	91.3	117.3	112.7	99.0	96.7	113.0	**8.6**	**7.5**
18	PURNIA	45.3	58.5	59.8	62.8	101.9	66.5	77.7	**10.9**	**9.0**
19	ROHTAS	326.0	310.5	309.8	335.6	312.6	311.9	364.4	**-0.3**	**1.3**
20	SAMASTIPUR	105.0	134.6	122.0	140.9	162.7	131.7	153.9	**5.4**	**5.1**
21	SARAN	172.1	193.9	210.8	234.9	217.8	175.3	204.8	**1.6**	**1.3**
22	SHEIKHPURA	32.3	39.3	40.8	42.4	52.4	27.6	32.3	**0.3**	**-1.6**
23	SITAMARHI	70.3	111.1	113.4	137.9	106.4	91.5	106.9	**4.0**	**2.9**
24	SUPAUL	49.7	88.4	85.0	79.4	90.2	62.5	73.1	**3.3**	**1.9**
25	VAISHALI	77.8	113.0	105.7	142.7	122.3	126.5	147.8	**8.8**	**8.5**
NFSM districts		**2060.4**	**2514.2**	**2928.2**	**2913.9**	**2899.4**	**2693.9**	**3147.3**	**5.2**	**5.1**
Bihar State		**3239.0**	**3911.4**	**4450.4**	**4410.0**	**4570.8**	**4097.6**	**4787.3**	**4.8**	**4.7**
All India		**69354.5**	**75806.7**	**78570.2**	**80679.4**	**80803.6**	**86874.0**	**93903.6**	**3.9**	**4.4**

Source: DES, State/GOI.NB: 1. 2010-11: Final estimate.*

2. 2011-12$: 4th Advance estimate.

3. APY data has been fixed to DES, GOI indices using appropriate algorithm.

Table No. 3.7: **District wise per cent CGR of wheat yield during 2010-11 & 2011-12 in Bihar (Base year: QE: 2009-10=100).**

Sl	District	Wheat yield (Kg/ha)								
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11*	2011-12$	CGR: 2010-11	CGR: 2011-12
BGREI Districts										
1	ARWAL	2285	2305	2364	1790	2150	1397	1582	**-8.1**	**-7.56**
2	AURANGABAD	1327	1945	1889	1124	1210	1617	1831	**-2.7**	**0.5**
3	BEGUSARAI	1986	2068	2106	1969	1908	2133	2415	**0.1**	**2.0**
4	BHOJPUR	2960	2407	3261	2717	3337	2087	2363	**-2.7**	**-3.3**
5	BUXAR	2249	1946	2964	2853	2410	2355	2667	**2.4**	**2.5**
6	GAYA	1357	2030	2391	2201	2204	1765	1999	**4.3**	**2.9**
7	GOPALGANJ	1861	2358	1931	1563	1968	2722	3083	**3.3**	**6.7**
8	JAHANABAD	1692	2095	2362	2207	1930	1584	1794	**-1.8**	**-2.1**
9	LAKHISARAI	1878	2348	2641	1817	1652	1416	1603	**-7.8**	**-6.7**
10	PATNA	2434	2046	2472	2594	1981	1875	2124	**-3.8**	**-2.8**
11	SAHARSA	787	1836	1977	1717	2009	1849	2094	**13.4**	**11.2**
12	SIWAN	1928	1993	2468	2187	2820	1616	1830	**0.1**	**-1.6**
13	SHEOHAR	435	1295	1583	2118	2683	2195	2486	**35.3**	**27.6**
BGREI districts total		**1877**	**1359**	**1583**	**2118**	**2683**	**1962**	**2221**	**7.6**	**6.5**
NFSM districts:										
1	ARARIA	726	698	1665	1116	1858	1956	2215	**23.9**	**21.8**
2	BHAGALPUR	1375	1675	2702	1906	2391	2069	2343	**8.2**	**7.0**
3	BANKA	1369	1846	2452	2794	1940	1445	1636	**1.6**	**-0.7**
4	BHABHUA	2310	2160	2117	2150	2221	1939	2196	**-2.2**	**-1.1**
5	CHAMPARAN(E)	1234	2018	2795	1458	733	2432	2754	**-0.8**	**5.3**
6	CHAMPARAN(W)	1216	1910	2382	2862	2074	2156	2442	**9.9**	**8.2**
7	DARBHANGA	1285	1883	2947	2311	2118	1876	2124	**5.9**	**4.3**
8	JAMUI	1127	1498	1758	929	1654	1202	1361	**-0.1**	**0.2**
9	KATIHAR	525	1257	1687	1762	1854	2455	2781	**29.0**	**25.8**
10	KHAGARIA	1876	1479	2144	783	3345	1382	1565	**-0.2**	**-0.8**
11	KISHANGANJ	844	1287	996	1200	1122	977	1107	**1.4**	**1.4**
12	MADHUBANI	785	1601	1842	1576	2146	1906	2159	**15.9**	**13.5**
13	MADHEPURA	1142	1452	1613	2217	2253	1548	1753	**9.4**	**6.4**
14	MUNGER	1601	1853	2260	1798	1998	1453	1645	**-1.4**	**-1.9**
15	MUZAFFARPUR	1493	1825	2365	1946	1721	1976	2238	**3.0**	**3.8**
16	NALANDA	1816	1821	1786	1619	1552	1681	1904	**-2.7**	**-0.6**
17	NAWADHA	1455	2048	2238	2170	1895	1627	1842	**0.8**	**0.3**
18	PURNIA	972	1280	1403	1606	2179	1578	1787	**12.6**	**10.1**

19	ROHTAS	2487	2317	2423	2560	2393	2361	2674	**-0.3**	**0.9**
20	SAMASTIPUR	2025	2657	2332	2305	2696	2132	2414	**0.8**	**0.8**
21	SARAN	1963	2231	2231	2463	2319	2233	2529	**2.5**	**2.9**
22	SHEIKHPURA	2042	1942	1934	2124	2347	1305	1478	**-4.4**	**-5.5**
23	SITAMARHI	1321	1651	1712	2055	1739	1461	1655	**2.4**	**1.6**
24	SUPAUL	922	1765	1634	1857	1852	1239	1403	**5.1**	**2.4**
25	VAISHALI	1760	2394	2359	2965	2442	2666	3020	**7.0**	**6.9**
NFSM districts		**1498**	**1819**	**2018**	**2028**	**2022**	**1941**	**2198**	**4.7**	**4.7**
Bihar State		**1617**	**1908**	**2058**	**2043**	**2084**	**1948**	**2206**	**3.5**	**3.6**
All India		**2619**	**2708**	**2802**	**2907**	**2839**	**2989**	**3140**	**2.4**	**2.7**

Source: DES, State/GOI.NB: 1. 2010-11: Final estimate.*

2. 2011-12$: 4th Advance estimate.

3. APY data has been fixed to DES, GOI indices using appropriate algorithm.

3.2 Jharkhand

3.2.1 A Brief Profile of the State

Jharkhand state was carved out from Bihar in 2000. It has a geographical area of 79.71 lakh hectare with a population of 329.66 lakh (Census-2011 (P), contributing 2.72 per cent of total population of the country. Out of the total population 51.36 per cent are males and 48.64 per cent females. The population density is 414 persons per square km. The sex ratio is 947 female per 1000 male. Jharkhand is mostly rural with 78 per cent of the state's population residing in villages. According to NSSO 61st round (2004-05) and Planning Commission, the incidence of poverty is estimated at 40.3 per cent in the state, as compared to national average of 27.5 per cent. Population of the state consists of about 28 per cent scheduled tribes, 12 per cent scheduled castes and 60 per cent others. The state has 5 administrative divisions, 24 districts, 260 blocks, 4462 gram panchayats and 32615 revenue villages. Out of the total geographical area 28.08 per cent are net sown area, 29.20 per cent forests, and 8.60 per cent is in non-agricultural uses. The percentage of irrigated area is about 9 per cent and the cropping intensity is 116 per cent. The state comes under agro-climatic zone – VII and in zones XII & XIII as per agro-ecological characteristics of the country. The state receives rainfall of about 1200-1500 mm/annum.

3.2.2 Rainfall

The district wise monthly rainfall and per cent departure from normal in BGREI and NFSM districts of Jharkhand state during 2010-11 & 2011-2012 have been presented in table No. 3.8. The rainfall data in BGREI districts in respect of newly created districts namely; Chatra, Deoghar, Dumka, Latehar, Garwha, Saraikela and Jamtara have not been compiled distinctively by IMD. There is enormous variability in rainfall pattern over time and space impacting agriculture production adversely in Jharkhand state. It might be mentioned here that total irrigated area in the state is 13 per cent, which is the lowest in the country.

The rainfall data in NFSM districts in respect of newly created districts namely; Khunti, Simdega and Ramgarh have not been compiled distinctively by IMD. Rainfall pattern in NFSM districts also show outsized variability over time and space in both the years in Jharkhand besides being deficient.

Table No. 3.8: District wise monthly rainfall data during the 2010 & 2011 in Jharkhand .

Unit: Actual Rainfall (R/F) in mm; Rainfall Departure (Dep): in %

Sl.	District	Year	Factor	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly
(1) BGREI Districts																
1	**DHANBAD**	**2010**	R/F	7	0	0	4.6	28.1	152.8	171.2	171.5	253.4	49.1	3.7	38.5	879.9
			Dep	**-39**	**-100**	**-100**	**-74**	**-39**	**-21**	**-49**	**-43**	3	**-51**	**-49**	775	
		2011	R/F	0.9	0	13.4	3	29.9	313	180.9	470.6	285.7	18.6	0	0	1316
			Dep	**-93**	**-100**	**-31**	**-84**	**-40**	56	**-47**	52	5	**-81**	**-100**	**-100**	
2	**GODDA**	**2010**	R/F	0	0	0	0	0	33.1	212.9	176.9	130.5	13.5	0	0	566.9
			Dep	**-100**	-	-	-	-	**-81**	**-24**	**-26**	**-33**	**-83**	-	-	
		2011	R/F	0	0	0	0	0	255.6	206.4	399	165.2	0	0	0	1026.2
			Dep	-	-	-	-	-	50	**-30**	58	**-27**	**-100**	-	-	
3	**KODERMA**	**2010**	R/F	0	0	0	0	0	0	93	136.8	96.4	7.4	0	0	333.6
			Dep	-	-	-	-	-	-	**-67**	**-53**	**-51**	**-90**	-	-	
		2011	R/F	0	0	0	0	0	202.8	161.4	305.8	351.2	10	0	0	1031.2
			Dep	-	-	-	-	-	17	**-40**	14	61	**-88**	-	-	
4	**PAKUR**	**2010**	R/F	0	0	0	0	0	0	331	291	246	80	0	0	948
			Dep	-	-	-	-	-	-	-8	-15	-16	**-41**	**-100**	-	
		2011	R/F	0	0	0	0	0	524	176	372.7	161	27	0	0	1260.7
			Dep	-	-	-	-	-	129	**-53**	10	**-53**	**-81**	-	-	
5	**PALAMAU**	**2010**	R/F	0	2.6	0	0	19.2	50.5	158.3	141.5	148.7	22.9	5.4	25.9	575
			Dep	**-100**	**-88**	**-100**	**-100**	12	**-64**	**-52**	**-56**	**-33**	**-58**	**-28**	354	
		2011	R/F	0	3.4	0	18.1	10.6	296.1	122	376.4	338.4	19.2	0	0	1184.2
			Dep	**-100**	**-73**	**-100**	155	**-30**	111	**-60**	26	48	**-59**	**-100**	**-100**	
6	**EAST SINGHUM**	**2010**	R/F	0.5	6.2	5.8	10.4	74.1	51.7	99.6	133.1	137.2	48.3	10.6	38.6	616.1
			Dep	**-97**	**-74**	**-77**	**-71**	7	**-77**	**-70**	**-60**	**-44**	**-39**	**-26**	704	
		2011	R/F	14.3	5.7	12.2	29	113.7	466	194.1	478.1	422.6	75	0	0	1810.7

			Dep	-3	**-69**	**-41**	-9	80	107	**-34**	53	87	10	**-100**	**-100**	
7	**LOHARDAGA**	**2010**	R/F	0	0	0	0	0	104.7	147.9	258.5	116.6	52.4	0	54.4	734.5
			Dep	-	-	-	-	-	**-42**	**-52**	-19	**-46**	-17	-	677	
		2011	R/F	0	0	0	0	0	484.5	155.5	450.6	368.5	15	0	0	1474.1
			Dep	-	-	-	-	-	160	**-48**	55	60	**-74**	**-100**	-	
8	**GIRIDIH**	**2010**	R/F	1.1	0	8.6	10	85.6	102.7	212.2	260.2	220.8	55.8	4.4	32	993.4
			Dep	**-93**	-	**-35**	**-50**	134	**-45**	**-38**	-10	7	**-34**	**-37**	870	
		2011	R/F	0.1	0	5.6	12.7	37.8	319.6	144.7	437.6	242.7	36.7	0	0	1237.5
			Dep	**-99**	**-100**	**-59**	**-29**	-7	55	**-58**	59	1	**-54**	**-100**	**-100**	
9	**BOKARO**	**2010**	R/F	0.6	24.8	0	18.2	73	58.2	304.5	245.2	263.4	77.8	3.4	27	1096.1
			Dep	**-96**	75	**-100**	-1	82	**-67**	-4	-14	3	**-21**	**-66**	514	
		2011	R/F	7.8	2.4	29.2	32.4	26.4	402.2	185.9	488.8	202.1	73.1	0	0	1450.3
			Dep	**-34**	**-82**	60	71	-31	113	**-40**	63	-19	-6	**-100**	**-100**	
10	**SAHEBGANJ**	**2010**	R/F	0	11.1	0	0	0	0	172.7	116.8	393.8	78	0	0	772.4
			Dep	-	2	-	-	-	-	**-52**	**-59**	46	**-27**	-	-	
		2011	R/F	0	0	0	0	0	0	557.6	108.6	375.6	43.2	0	0	1085
			Dep	-	-	-	-	-	**-100**	116	**-73**	22	**-87**	-	-	
BGREI districts		**2010**	R/F	**0.9**	**4.5**	**1.4**	**4.3**	**28.0**	**55.4**	**190.3**	**193.2**	**200.7**	**48.5**	**2.8**	**21.6**	**751.6**
		2011	R/F	**2.3**	**1.2**	**6.0**	**9.5**	**21.8**	**326.4**	**208.5**	**388.8**	**291.3**	**31.8**	**0.0**	**0.0**	**1287.6**

Sl.	District	Year	Factor	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly
NFSM Districts																
1	**RANCHI**	**2010**	R/F	0	0	0	8.5	28.7	55.9	152.2	152	221.7	69.8	8.7	37.1	734.6
			Dep	**-100**	**-100**	**-100**	**-65**	**-37**	**-71**	**-53**	**-55**	-6	-18	**-23**	743	
		2011	R/F	5.6	0.5	1.8	7.6	46.9	485.7	166.9	507.8	329.6	31.5	0	0	1583.9
			Dep	**-74**	**-98**	**-92**	**-68**	-3	123	**-53**	48	36	**-50**	**-100**	**-100**	
2	**GUMLA**	**2010**	R/F	0	0	0	0	0	92.1	234.2	211.2	245.4	147.6	0	0	930.5
			Dep	-	-	-	-	-	**-56**	**-37**	**-43**	-6	73	**-100**	-	-
		2011	R/F	0	0	0	0	0	302.5	201.1	466.1	0	0	0	0	969.7
			Dep	-	-	-	-	-	32	**-46**	36	-	-	-	-	
3	**WEST SINGBHUM**	**2010**	R/F	0	2.2	3	36.4	0	56.3	100	180	172.6	55.6	0	42	648.1
			Dep	**-100**	**-91**	**-89**	28	**-100**	**-72**	**-69**	**-46**	**-25**	**-33**	**-100**	757	
		2011	R/F	3.1	0	29.9	65.5	71.9	268	229.6	313.8	363.7	0	0	0	1345.5
			Dep	**-76**	**-100**	29	174	27	29	**-27**	-8	63	**-100**	**-100**	**-100**	
4	**HAZARIBAGH**	**2010**	R/F	2.3	0	3	0	54	140.2	105.4	232.2	98.3	43.4	7.8	48.4	735
			Dep	**-88**	**-100**	**-82**	**-100**	41	**-22**	**-68**	**-22**	**-58**	**-51**	7	888	
		2011	R/F	11.8	0.6	0.2	5.9	24.6	148.8	75.4	297.5	229.7	55.2	0	0	849.7
			Dep	-16	**-96**	**-99**	**-50**	**-31**	-16	**-76**	3	4	**-33**	**-100**	**-100**	
5	**SANTHAL PARGANAS**	**2010**	R/F	0.2	0	0	0	0	134.1	303.6	201.3	186.2	84.4	0	4	913.8
			Dep	**-99**	-	-	-	-	**-35**	-13	**-38**	**-24**	**-35**	-	0	
		2011	R/F	0	0	0	0	0	308.5	117.2	295.1	0	0	0	0	720.8
			Dep	-	-	-	-	-	52	**-64**	-3	-	-	-	-	
NFSM districts		**2010**	**R/F**	**0.5**	**0.44**	**1.2**	**8.98**	**16.54**	**95.72**	**179.08**	**195.34**	**184.84**	**80.16**	**3.3**	**26.3**	**792.4**
		2011	**R/F**	**4.1**	**0.2**	**6.4**	**15.8**	**28.7**	**302.7**	**158.0**	**376.1**	**184.6**	**17.3**	**0.0**	**0.0**	**1093.9**
Jharkhand State		**2010**	R/F	**0.7**	**2.5**	**1.3**	**6.7**	**22.3**	**75.5**	**184.7**	**194.2**	**192.8**	**64.3**	**3.0**	**24.0**	**806.1**
		2011	**R/F**	**3.2**	**0.7**	**6.2**	**12.7**	**25.3**	**314.5**	**183.2**	**382.4**	**238.0**	**24.6**	**0.0**	0.0	**1190.8**

Source: *http://www.imd.gov.in/section/hydro/distrainfall/webrain*
Normal rainfall in Jharkhand for 2010-11: 1307.4 mm.

3.2.3: Area, Production and Yield (APY) of Rice Crop in BGREI Districts

The APY of rice crop in BGREI and NFSM districts for the period from 2010-11 to 2011-12 have been presented in table Nos. 3.9, 3.10 & 3.11. The Compound Growth Rate (CGR) of rice area in BGREI districts showed a decline of (-) 15.0 per cent during 2010-11 which further slowed down to (-) 6.8 per cent in 2011-12 due to deficient and erratic distribution of rainfall in the state.

The state witnessed drastic reduction in rice area in all the BGREI districts in both the years i.e., 2010-11 & 2011-12 in varying proportions.

The CGR of rice production in BGREI districts showed reduction of (-) 13 per cent during 2010-11, which came down to (-) 3.6 per cent in 2011-12 due to deficient and erratic distribution of rainfall in the state. The state witnessed drastic reduction in rice production in all the BGREI districts in both the years i.e., 2010-11 & 2011-12 in varying proportions except 2 (two) districts during 2010-11 and 9 (nine) districts during 2011-12, which recorded positive growth.

The CGR of rice yield in BGREI districts, however, showed growth of 2.4 per cent during 2010-11 which rose to 3.5 per cent in 2011-12 despite deficient and erratic distribution of rainfall in the state. In 2010-11, 12 (twelve) districts recorded positive growth in rice yield in the range of 0.1 per cent to 34.6 per cent. Remaining 5 (five) districts witnessed reduction in rice yield in the range of (-) 2.1 per cent to (-) 6.0 per cent during 2010-11. In 2011-12, 13 (thirteen) districts recorded positive growth in rice yield in the range that varied from 0.3 per cent to 19.9 per cent. Remaining 4 (four) districts witnessed reduction in rice yield in the range of (-) 1.3 per cent to (-) 6.1 per cent in 2011-12.

The CGR of rice area in NFSM districts showed decline of (-) 9.1 per cent during 2010-11, which came down to (-) 3 per cent in 2011-12 due to deficient and erratic distribution of rainfall in the state. The state witnessed drastic decline in the rice area in all the NFSM districts in both the years i.e., 2010-11 and 2011-12 in varying proportions except Ramgarh district, which witnessed growth of 39.7 per cent in rice area in 2011-12.

The CGR of rice production in NFSM districts showed reduction of (-) 5.9 per cent during 2010-11, which further rose and recovered to 1.5 per cent in 2011-12 despite deficient and erratic distribution of rainfall in the state. The state witnessed drastic reduction in rice production in 5 (five) NFSM districts in 2010-11 in the range of (-) 1.0 per cent to (-) 24.3 per cent. The remaining 2 (two) NFSM districts have recorded positive growth in rice production estimated at 4 per cent and 2.6 per cent in Simdega and Ramgarh districts respectively in 2010-11. In 2011-12, 5 (five) NFSM districts recorded positive growth in the range of 1.1 per cent to 133.9 per cent. The remaining 2 (two) districts witnessed reduction in rice production by (-) 12 per cent and (-) 8.8 per cent in 2011-12.

The CGR of rice yield in NFSM districts, however, showed growth of 3.4 per cent during 2010-11, which rose to 4.6 per cent in 2011-12 despite deficient and erratic distribution of rainfall in the state. In 2010-11, 5 (five) NFSM districts recorded positive growth in rice yield in the range from 0.2 per cent to 81.5 per cent. Remaining 2 (two) districts witnessed reduction in rice yield in the range of (-) 1.5 per cent to (-) 4.7 per cent during 2010-11. In the year 2011-12, all the 7 (seven) districts recorded positive growth in rice yield in the range of 3 per cent to 67.7 per cent except Ranchi district, which witnessed stagnant yield of rice.

Table No. 3.9: District wise per cent CGR of rice area during 2010-11 & 2011-12 in Jharkhand (Base year: QE: 2009-10=100).

Sl	District	Rice area('000' ha)								
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11*	2011-12$	CGR: 2010-11	CGR: 2011-12
BGREI Districts										
1	Chatra	16.3	28.5	33.7	33.0	14.9	6.1	33.1	-17.8	-6.1
2	Deoghar	49.8	49.3	49.5	49.4	32.8	24.6	49.1	-12.7	-6.4
3	Dhanbad	44.2	45.7	51.1	51.1	21.5	18.7	53.5	-17.1	-7.2
4	Dumka	119.8	130.0	103.1	104.8	62.2	44.2	102.7	-18.5	-10.6
5	Godda	69.8	68.0	46.5	47.1	32.2	20.5	42.0	-21.2	-14.2
6	Koderma	8.6	14.1	14.3	15.2	7.3	5.5	14.0	-11.3	-3.9
7	Latehar	20.2	21.4	20.4	47.6	1.0	6.9	22.8	-32.4	-16.1
8	Pakur	46.9	48.1	48.3	47.7	38.2	32.2	46.8	-7.1	-3.6
9	Palamau	28.5	40.6	34.7	44.8	7.1	4.0	42.2	-34.4	-16.4
10	Singhbhoom-E	90.5	107.8	121.4	113.3	84.1	38.5	127.3	-13.5	-4.9
11	Garhwa	37.9	49.1	26.3	20.8	15.0	13.3	52.3	-22.8	-7.6
12	Saraikela	78.5	84.0	92.5	92.0	76.5	56.9	91.0	-5.3	-1.9
13	Lohardagga	27.8	39.2	43.5	43.4	11.3	11.0	46.8	-21.3	-8.0
14	Giridih	62.1	69.2	78.4	76.1	28.2	21.0	77.1	-20.7	-9.4
15	Bokaro	17.5	26.4	29.8	30.5	15.1	6.8	31.2	-16.6	-5.7
16	Jamtara	44.3	39.2	42.7	44.5	34.8	16.0	44.0	-14.3	-6.9
17	Sahebganj	42.2	44.1	45.4	46.7	33.0	33.7	45.9	-5.5	-2.1
Total BGREI		804.9	904.6	881.6	908.0	515.3	359.9	921.8	-15.0	-6.8
NFSM districts:										
1	Ranchi	118.5	198.0	223.6	230.5	83.8	34.1	159.9	-22.2	-12.1
2	Khunti	0.0	0.0	0.0	0	38.2623	18.2	70.0	-52.4	35.3
3	Gumala	127.7	178.1	183.1	178.7	99.743	93.8	176.0	-9.0	-3.3
4	Simdega	95.6	86.0	87.4	89.8	75.9	56.1	88.2	-8.3	-4.3
5	Singhbhoom-W	151.7	162.7	175.3	168.3	151.642	122.1	170.8	-3.8	-1.3
6	Hajaribagh	56.3	94.2	102.7	108.3	15.5083	26.1	78.1	-23.1	-11.7
7	Ramgarh	0.0	0.0	0.0	0	14.894	10.0	29.1	-32.5	39.7
Total NFSM		549.8	719.0	772.1	775.6	479.7	360.4	772.0	-9.1	-3.0
Jharkhand State		1354.7	1623.6	1653.7	1683.6	995.0	720.3	1693.8	-12.3	-5.1
All India		43659.8	43813.6	43914.4	45537.4	41918.3	42862.4	43974.4	-0.5	-0.2

Source: DES, State/GOI.NB: 1. 2010-11: Final estimate.*

2. 2011-12$: 4th Advance estimate.

3. APY data has been fixed to DES, GOI indices using appropriate algorithm.

Table No. 3.10: District wise per cent CGR of rice production during 2010-11 & 2011-12 in Jharkhand (Base year: QE: 2009-10=100).

Sl	District	Rice production ('000' tons)								
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11*	2011-12$	CGR: 2010-11	CGR: 2011-12
BGREI Districts										
1	Chatra	17.1	68.4	70.6	42.7	23.3	11.2	88.3	-15.4	0.7
2	Deoghar	13.2	94.8	92.0	131.2	66.6	46.9	69.2	17.5	12.3
3	Dhanbad	43.2	121.1	117.3	109.5	32.7	20.0	113.2	-20.1	-6.8
4	Dumka	178.1	300.5	241.6	224.9	101.8	62.4	197.9	-21.7	-12.4
5	Godda	194.9	171.3	112.2	125.8	74.2	38.4	80.8	-25.9	-19.4
6	Koderma	8.8	31.8	29.7	31.8	5.2	7.6	24.8	-15.9	-5.1
7	Latehar	14.2	42.6	48.4	65.3	1.9	8.3	52.8	-28.6	-8.8
8	Pakur	79.2	96.8	94.2	126.2	52.9	76.0	69.5	-4.8	-5.1
9	Palamau	23.2	109.3	66.6	60.9	14.0	5.2	97.4	-32.4	-11.3
10	Singhbhoom-E	80.7	150.8	327.6	266.1	116.5	49.2	297.6	-9.4	2.3
11	Garhwa	16.6	55.7	46.2	29.6	22.7	16.9	100.5	-8.3	8.6
12	Saraikela	64.3	121.6	164.3	179.8	84.4	54.3	176.2	-5.2	2.7
13	Lohardagga	45.0	67.4	77.4	62.6	19.5	15.9	110.8	-23.0	-5.4
14	Giridih	30.1	172.7	107.2	201.0	47.9	38.1	169.5	-5.6	5.0
15	Bokaro	10.1	40.5	42.1	40.9	22.8	6.5	47.5	-10.6	1.4
16	Jamtara	39.8	58.7	62.8	103.5	82.3	30.0	83.7	0.3	4.2
17	Sahebganj	75.4	63.1	67.0	81.0	62.6	61.6	85.5	-2.4	0.9
Total BGREI		933.9	1767.0	1767.2	1882.9	831.4	548.7	1865.5	-13.0	-3.6
NFSM districts:										
1	Ranchi	177.8	396.3	455.2	566.6	143.7	54.9	294.7	-22.0	-12.0
2	Khunti	0.0	0.0	0.0	0.0	38	32.8	195.4	-13.6	126.8
3	Gumala	121.5	192.7	350.3	360.0	93.2	174.1	323.1	-1.0	5.2
4	Simdega	157.8	157.2	218.1	220.1	274.5	148.6	167.6	4.0	1.1
5	Singhbhoom-W	110.8	242.0	311.5	179.0	126.7	100.0	314.5	-8.2	1.7
6	Hajaribagh	56.2	212.6	234.1	211.5	17.2	36.9	182.4	-24.3	-8.8
7	Ramgarh	0.0	0.0	0.0	0.0	13.7	14.0	74.9	2.6	133.9
Total NFSM		624.1	1200.8	1569.2	1537.3	707.0	561.3	1552.6	-5.9	1.5
Jharkhand State		1558.0	2967.8	3336.4	3420.2	1538.4	1110.0	3418.1	-9.9	-1.4
All India		91793.4	93355.3	96692.9	99182.4	89093.0	95979.8	104322	0.3	1.3

Source: DES, State/GOI.NB:

1. 2010-11: Final estimate.*

2. 2011-12$: 4th Advance estimate.

3. APY data has been fixed to DES, GOI indices using appropriate algorithm.

Table No. 3.11: District wise per cent CGR of rice yield during 2010-11 & 2011-12 in Jharkhand (Base year: QE: 2009-10=100)

Sl	District	Rice yield (Kg/ha)								
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11*	2011-12$	CGR: 2010-11	CGR: 2011-12
BGREI Districts										
1	Chatra	1049	2396	2095	1294	1558	1828	2671	2.9	7.3
2	Deoghar	265	1924	1860	2656	2030	1910	1412	34.6	19.9
3	Dhanbad	977	2650	2297	2144	1523	1073	2115	-3.5	0.3
4	Dumka	1487	2312	2343	2145	1638	1410	1927	-3.9	-2.0
5	Godda	2792	2519	2412	2673	2302	1874	1924	-6.0	-6.1
6	Koderma	1023	2247	2077	2093	712	1400	1775	-5.2	-1.3
7	Latehar	703	1996	2368	1372	1845	1204	2313	5.6	8.6
8	Pakur	1689	2014	1951	2644	1383	2359	1484	2.5	-1.5
9	Palamau	814	2692	1920	1360	1973	1287	2309	2.9	6.2
10	Singhbhoom-E	892	1398	2698	2350	1385	1276	2339	4.8	7.6
11	Garhwa	438	1134	1754	1424	1507	1275	1922	18.7	17.5
12	Saraikela	819	1448	1776	1954	1103	954	1936	0.1	4.6
13	Lohardagga	1619	1722	1781	1442	1731	1447	2365	-2.1	2.8
14	Giridih	485	2496	1366	2643	1702	1812	2199	19.1	15.8
15	Bokaro	577	1533	1410	1340	1511	958	1523	7.2	7.6
16	Jamtara	898	1498	1471	2324	2363	1875	1902	17.0	12.0
17	Sahebganj	1787	1431	1478	1735	1896	1830	1864	3.3	3.1
Total BGREI		1160	1953	2004	2074	1613	1524	2024	2.4	3.5
NFSM districts:										
1	Ranchi	1500	2002	2036	2458	1716	1610	1844	0.2	0.0
2	Khunti	0	0	0	0	993	1802	2791	81.5	67.7
3	Gumala	951	1082	1913	2015	934	1856	1836	8.8	8.7
4	Simdega	1651	1828	2495	2449	3618	2650	1901	13.4	5.6
5	Singhbhoom-W	730	1487	1777	1064	835	819	1841	-4.7	3.0
6	Hajaribagh	998	2258	2280	1953	1111	1414	2335	-1.5	3.2
7	Ramgarh	0	0	0	0	919	1397	2577	52.0	67.5
Total NFSM		1135	1670	2032	1982	1474	1558	2011	3.4	4.6
Jharkhand State		1150	1828	2018	2031	1546	1541	2018	2.8	3.9
All India		2102	2131	2202	2178	2125	2239	2372	0.9	1.5

Source: DES, State/GOI.

NB: 1. 2010-11: Final estimate.*

2. 2011-12$: 4th Advance estimate.

3. APY data has been fixed to DES, GOI indices using appropriate algorithm.

3.3 Variability in APY of Rice and Wheat in BGREI and NFSM Districts in Bihar & Jharkhand

To analyze the comparative scenario of Area, Production and Yield in BGREI and NFSM districts prevailing in Bihar & Jharkhand states, the relevant data has been presented in table No. 3.12. It could be seen from the referred table that BGREI districts are more vulnerable in terms of area, production and yield deceleration as compared to NFSM districts. This clearly reveals that NFSM programme has greater sustainability in all three aspects viz., area, production and yield as compared to BGREI districts. The reasons for area production and yield deceleration in rice may be due to deficient and erratic distribution of rainfall, floods and drought besides increasing land use for non-agricultural purposes. In table No. 3.13, the relevant data on APY of wheat crop for Bihar state have been presented. It reveals that sustainability aspect in wheat cultivation in BGREI districts of Bihar is stronger especially in wheat production in NFSM districts, which may be the impact of greater national level concerns.

Table No. 3.12: CGR of Area, Production & Yield of Rice Crop in BGREI & NFSM Districts during 2010-11 & 2011-12 in Bihar & Jharkhand States (Base year QE: 2009-10)

State	2010-11*			2011-12*		
	BGREI Districts	NFSM Districts	Whole State	BGREI Districts	NFSM Districts	Whole State
AREA						
Bihar	(-) 3.0	(-) 1.2	(-) 2.4	- (2.0	(-) 0.1	(-) 1.3
Jharkhand	(-) 15.0	(-) 9.1	(-) 12.3	(-) 6.8	(-) 3.0	(-) 5.1
PRODUCTION						
Bihar	(-) 5.1	(-) 0.3	(-) 3.8	1.6	8.8	3.7
Jharkhand	(-) 13.0	(-) 5.9	(-) 9.9	(-) 3.6	1.5	(-) 1.4
YIELD						
Bihar	(-) 2.1	0.9	(-) 1.4	3.6	9.0	5.1
Jharkhand	2.4	3.4	2.8	3.5	4.6	3.9

*Source: Extrapolated from *Final estimates **4th Advance estimates, DES, MoA, GoI.*

Table No. 3.13: CGR of Area, Production & Yield of Wheat Crop in BGREUI & NFSM Districts during 2010-11 & 2011-12 in Bihar (Base Year QE : 2009-10)

State	2010-11*			2011-12*		
APY	BGREI Districts	NFSM Districts	Whole State	BGREI Districts	NFSM Districts	Whole State
Area	3.1	0.4	1.3	2.5	0.4	1.1
Production	4.1	5.2	4.8	4.0	5.1	4.7
Yield	7.6	4.7	3.5	6.5	4.7	3.6

*Source: Extrapolated from *Final estimates ** 4th Advance estimates, DES, MoA, GoI.*

CHAPTER – IV

RESULTS AND DISCUSSION

4.1 Setting

This chapter is based on analysis of the primary and secondary data. It covers the structure and performance of BGREI Programme during 2010-11 and 2011-12 along with conclusions.

4.2 Adequacy of the BGREI Program

The need based interventions made under BGREI programme by the concerned states were commenced with a view to enhance the productivity of rice and wheat crops. Its program formulated in 2010-11 was made by the concerned states in the first year of its implementation on the pattern of RKVY main Scheme. The component specific structure of BGREI program in Bihar & Jharkhand states based on per cent share of total expenditure during 2010-11 is presented in table No. 4.1.

Table No. 4.1: Component Specific Structure of BGREI Programme during the year 2010-11 based on percentage share in total expenditure in Bihar & Jharkhand.

Sl.	Components	Bihar		Jhakhand
1	Crop demonstrations	30.5%		1.2%
2	Induced Agricultural Inputs supply	27.0%		1.3%
3	Farmers & Staff trainings, Farmers fair, farmers study visits.	4.6%		0.5%
4	Water asset building	17.9%		89.3%
5	Improved farm equipments & machinery.	0.0%		7.5%
6	Seed multiplication	0.0%		0.2%
7	Soil amelioration	11.8%		0.0%
8	e-pest surveillance	0.0%		0.0%
9	Soil & water resources conservation	0.0%		0.0%
10	Sugarcane Industry Department	6.8%		0.0%
11	Contingencies	1.4%		0.0%
12	Monitoring	0.0%		0.0%
Total		100%		100%

4.2.1 Bihar

There were ten (10) major activities in BGREI program for the year 2010-11 which were implemented in all the districts of the State. Each activity comprises of Integrated Crop Development program of *Kharif* rice, summer rice, *Boro* rice, wheat & pulses, Maize Development program in non-ISOPOM districts, intercropping of pulses with maize, Soil amelioration, sugarcane department and contingencies. These crop specific activities consist of three (3) to ten (10) interventions namely; crop demonstrations, induced seed distribution, farmers & staff training, micro-nutrients, bio-pesticides, study tours & contingencies. The nursery of *Boro* rice is sown in the month of November which remains dormant till planting in January whereas the nursery of summer rice is sown in the month of January and 11-15 days old seedlings are transplanted also in the month of January.

4.2.2 Jharkhand

There were three (3) major activities in BGREI program during the year 2010-11. The activity of maize & wheat development program consisted of seventeen (17) interventions namely; seed multiplication, seed distribution, Technology demonstrations, conventional tillage method in wheat, zero tillage in wheat, induced supply of zero till seed drills, Rotavators & Power Tillers, Induced supply of micro-nutrients, Integrated Pest Management, induced supply of plant protection chemicals & weedicides and Farm Field Schools' patterned farmers' trainings. Similarly, the pulses development program consisted of fourteen (14) interventions namely; Seed distribution, Block demonstrations of 2 ha each, induced supply of soil amendments (lime, gypsum & phosphorous), induced supply of micro-nutrients, induced supply of *Rhizobium* & PSB culture, Integrated Pest Management, induced supply of plant protection chemicals, induced supply of Knapsack sprayers, Zero Till seed drill, Rotavator, Sprinkler sets, Pump sets, pipe for water conveyance and Farm Field Schools' patterned farmers' trainings. Another activities related to site specific needs were namely; **Birsa Pucca Check Dam (BPCD), Loose Boulder Check Dam (LBCD) & Guard Wall (GW).**

4.3 Structure of BGREI program in 2011-12

The structure of BGREI program was altogether changed during 2011-12 by way of major focus on technology transfer with assured technical backstopping, water asset building and site specific needs. Accordingly, the program was sub-divided in the following three projects backed with the provision of their monitoring:

- ➨Block Demonstrations of rice & wheat;
- ➨Water asset building;
- ➨Site specific needs; and
- ➨ Monitoring & evaluation

The provision of three tier monitoring system was also made in the program during 2011-12 besides creating a BGREI cell in the Crops Division of Department of Agriculture & Cooperation, Union Ministry of Agriculture for assisting the senior officials in successful implementation of the program. The component specific structure of BGREI program in Bihar & Jharkhand states based on per cent share of total expenditure during 2010-11 is presented in table No. 4.2

Table No. 4.2: Intervention specific composition of BGREI program during the Year: 2011-12 in Bihar & Jharkhand *(In %).*

Sl.	State	Block Demonstrations	Water Asset building	Site specific activities	Total
1.	Bihar	61.80	38.20	0.00	100.00
2.	Jharkhand	30.90	0.00	69.10	100.00

The component/intervention specific comparison of the structure of BGREI program in both the years reveals that:

- States attempted to reach out those districts which were hitherto not covered by ongoing crop development programs through BGREI program in 2010-11. Consequently crop focus became secondary consideration. This aspect has been duly addressed by delineating the districts between NFSM & non-NFSM and identification of mandate crops in the BGREI program implemented in 2011-12;
- The extent of integration of input package for demonstrations on crop production technology differed. A sum of Rs. 10,000/- per improved package of practices meant for demonstration for SRI (area not defined) in Bihar State in

2010-11. The composition of BGREI program in 2010-11 laid greater emphasis on incentivized supply of agriculture inputs with lesser emphasis on demonstration of crop production technology. In the amended BGREI program in 2011-12, greater emphasis was laid on the demonstrations of crop production technology with defined rice ecology specific recommended input package in the range of Rs. 6,852/- per ha (Traditional varieties under irrigated conditions) to Rs. 7,912/- per ha for rainfed upland rice crop and Rs. 4,000/- per ha for wheat crop. The input package for Block demonstrations of rice in 2011-12 under BGREI program included all the essential inputs required for improved agronomy as recommended by CRRI-Cuttack;

- The composition of the program in 2011-12 also included a separate provision for water asset building at farmers' level for on-farm water harvesting (Dug wells) in rainfed areas with hard rock besides shallow tube wells and bore wells in the areas with high water table for assured irrigation;
- Both the states have not included the provision of incentive towards custom based hiring of services from the service providers as an option for the beneficiaries of the program for certain agricultural operations like deep ploughing and sowing in lines using seed drill in 2010-11. The provisions of custom hiring of certain agricultural operations that contribute to higher crop yield are included in the BGREI program formulated for 2011-12. These provisions would help those farmers who are unable to afford the purchase of improved farm implements due to any reason (small holding size or lack of entrepreneurship);
- The implementation of the program was carried out in "dispersed" mode in 2010-11, which was modified to "cluster approach" during 2011-12 for the convenience of implementation, monitoring, technical backstopping and greater visibility of impact;
- The allocation of funds between components and each intervention (s) within the component was duly defined for convenience in implementation of the program, and;

- The allocation of funds was based on the area coverage of rice in the year 2011-12.

It might be mentioned here that agriculture in most of the parts of India is not vocational unlike developed countries instead it is a way life. Thus, its needs our multi-dimensional approach and operate at varied level of efficiencies commensurate to land holding size, education level, investment capacity and other tenancy related laws. Therefore, though the BGREI program formulated for 2011-12 may not address each micro-level need, it certainly offers macro-level technology commensurate to the ecological needs of the states. It is, however, suggested that both the States may institute the study on *"Technological and allocative efficiency of resources"* through State Agricultural Universities for formulation of Crop development programs for their States for deemed resource endowment. These studies could be conducted by the Department of Agricultural Economics in the State Agricultural Universities in collaboration with ICAR Crop Improvement Projects.

4.4 Performance Index of Technical Backstopping

The District wise Performance Index for Bihar & Jharkhand states as well as agricultural operations is given in table Nos. 4.3, 4.4 & 4.5. A perusal of the same indicates as below:

Table No. 4.3: **Performance Index (%) of the access of the participating farmers to technical backstopping in Bihar State under BGREI program during 2011-12.**

Technical back stopping	Farmers Reporting					Performance Index				
	Participation in training programme conducted under BGREI	Participation in demonstrations as progressive farmers	Progressive Farmers	Identified extension worker	KVK	Participation in training programme conducted under BGREI	Participation in demonstration as progressive farmers	Progressive Farmer	Identified extension worker	KVK
Rainfed Upland: District: Lakhisarai										
Improved Seed Variety	4	1	---	10	---	40	10	---	100	---
Fertilizer application	5	1	---	8	---	50	10	---	80	---
Plant protection	4	1	---	6	---	40	10	---	60	---
Farm machinery	--	---	---	---	---	---	---	---	---	---
Rainfed Shallow Low Land: District: Patna										
Improved Seed Variety	6	2	1	10	1	60	20	10	100	10
Fertilizer application	6	2	1	8	1	60	20	10	80	10
Plant protection	5	2	1	6	1	50	20	10	6	10
Farm machinery	--	---	---	---	---	---	---	---	---	---
Rainfed Medium: District: Gopalganj										
Improved Seed Variety	3	---	---	---	9	30	---	---	---	90.00
Fertilizer application	4	1	---	---	9	40	10	---	---	90.0
Plant protection	4	1	---	9	---	40	10	---	90	---
Farm machinery	---	---	---	---	---	---	---	---	---	---
Rainfed Deep Water: District: Begusarai										
Improved Seed Variety	5	1	3	7	---	50	10	30	70	---
Fertilizer application	5	1	2	6	---	50	10	20	60	---
Plant protection	5	1	4	6	2	50	10	40	60	20
Farm machinery	---	---	---	---	---	---	---	---	---	---
Irrigated: District: Jehanabad										
Improved Seed Variety	8	1	---	8	---	80	10	---	80	---
Fertilizer application	8	1	2	3	---	80	10	20	30	---
Plant protection	8	1	---	7	---	80	10	---	70	---
Farm machinery	---	---	---	---	---	---	---	---	---	---
State: Bihar										
Improved Seed Variety	26	5	4	35	10	52	10	8	70	20
Fertilizer application	28	6	5	17	10	56	12	10	34	20
Plant protection	26	6	5	34	3	52	12	10	68	6
Farm machinery	---	---	---	---	---	---	---	---	---	---

Source: Field Survey --- 2012.

4.4.1 Bihar:

11 per cent beneficiaries accessed technical support from the progressive farmers (*Krishi Salahkars* appointed on contractual basis under RKVY) followed by 70 per cent from the local extension worker and 19 per cent from the *Krishi Vigyan Kendras;* (table 4.5).

4.4.2 Jharkhand:

62 percent beneficiaries accessed technical support from the progressive farmers followed by 28 per cent from the local Extension worker and 10 per cent from the *Krishi Vigyan Kendras; (table 4.5).*

Table No 4.4: Performance Index (%) of the access of the participating farmers to technical backstopping in Jharkhand State under BGREI program during 2011-12.

Technical backstopping	Farmers reporting					Performance Index				
	Participation in training program conducted under BGREI	Participation in Demonstration as Progressive Farmers	Progressive Farmer	Identified extension worker	KVK	Participation in training program conducted under BGREI	Participation in Demonstration as Progressive Farmers	Progressive Farmer	Identified extension worker	KVK
Rainfed Upland: District: Pakur										
Improved seed variety	4	1	1	4	-	40	10	40	40	-
Fertilizer application	3	1	1	3	-	30	10	10	30	-
Plant Protection	3	1	-	3	-	30	10	-	30	-
Farm Machinery	-	-	-	-	-	-	-	-	-	-
Rainfed Shallow Low Land: District: Bokaro										
Improved seed variety	6	1	9	4	-	60	10	90	40	-
Fertilizer application	5	1	5	2	-	50	10	50	20	-
Plant Protection	3	1	5	3	-	30	10	50	30	-
Farm Machinery	-	-	-	-	-	-	-	-	-	-
Rainfed Medium: District: Godda										
Improved seed variety	10	3	4	2	-	100	30	40	20	-
Fertilizer application	8	2	4	2	-	80	20	40	20	-
Plant Protection	5	2	3	2	-	50	20	30	20	-
Farm Machinery	-	-	-	-	-	-	-	-	-	-
Rainfed Deep Water: District: Jamtara										
Improved seed variety	3	-	3	8	4	30	-	30	80	40
Fertilizer application	3	-	4	5	4	30	-	40	50	40
Plant Protection	1	-	3	1	3	10	-	30	10	30
Farm Machinery	-	-	-	-	-	-	-	-	-	-
Irrigated: District: Sahibganj										
Improved seed variety	-	-	3	-	-	-	-	30	-	-
Fertilizer application	-	-	9	-	-	-	-	90	-	-
Plant Protection	-	-	8	-	-	-	-	80	-	-
Farm Machinery	-	-	4	-	-	-	-	40	-	-
State: Jharkhand										
Improved seed variety	23	5	20	18	4	46	25	40	36	8
Fertilizer application	19	4	23	12	4	38	20	46	24	8
Plant Protection	12	4	19	9	3	24	20	38	18	6
Farm Machinery	-	-	4	-	-	-	-	8	-	-

Source: *Field Survey-2012.*

Table No. 4.5: Consolidated Performance Index (%) of agency specific access to Technical backstopping under BGREI in 2011-12 in Bihar & Jharkhand.

Parameter	Bihar	Jharkhand
Extension Worker	70	28
Progressive Farmers	11	62
Krishi Vigyan Kendra	19	10
State Agricultural University	0	0

Source: *Field Survey-2012*

While comparing the extent of accessing technical knowhow from all the sources with the earlier findings in the recent past, 55 per cent of BGREI beneficiaries have availed the technical knowhow of agriculture from different sources in 2011-12 as against 40 per cent households reported by Situational Agricultural Survey-2003 (NSS Report No 499-Year-2003). The findings of this study are also in agreement with regards to the observation that there was regional difference in accessing information to the observation made in the Situational Agricultural Survey-2003.

4.5 Extent of Change in Cropping Intensity

Cropping Intensity (CI) is largely influenced by assured irrigation potential besides other considerations. The results of CI across rice ecologies indicate differentiated pattern between BGREI beneficiaries and non-beneficiaries. The State wise change witnessed in CI of BGREI beneficiaries and non-beneficiaries during 2011-12 is found as under:

4.5.1 Bihar:

There has been significant increase in CI in respect of **BGREI beneficiaries** under rainfed shallow low land in Patna district, rainfed deep water in Begusarai district and irrigated land in Jehanabad district of Bihar State. There has been marginal change (up to 3%) in the CI of BGREI beneficiaries (2.09%) and non-beneficiaries (1.13%) across pooled ecologies (table 4.6).

Table No. 4.6: Change in Cropping Intensity in BGREI districts in Bihar in 2011-12 over 2010-11.

Type of farmers	Cropping intensity (%)		Extent of change	Remarks
	2010-11	2011-12		
Rainfed Upland: District: Lakhisarai				
Beneficiary	153.72	157.25	3.53 (2.3%)	Marginal increase
Non-beneficiary	203.53	203.66	0.13 (0.06%)	Marginal increase
Rainfed Shallow Low Land: District: Patna				
Beneficiary	153.70	158.38	4.68 (3.04%)	Significant increase
Non-beneficiary	149.16	150.59	1.63 (0.96%)	Marginal increase
Rainfed Medium deep water: District: Gopalganj				
Beneficiary	150.89	152.47	1.58 (1.04%)	Marginal increase
Non-beneficiary	147.27	142.95	-4.32 (-2.93%)	Marginal decrease
Rainfed Deep Water: District: Begusarai				
Beneficiary	170.67	176.14	5.42 (3.21%)	Significant increase
Non-beneficiary	166.16	167.68	1.89 (0.91%)	Marginal increase
Irrigated: District: Jehanabad				
Beneficiary	164.07	156.96	1.89 (-4.33%)	Significant decrease
Non-beneficiary	160.09	161.83	1.74 (1.09%)	Marginal increase
State: Bihar				
Beneficiary	159.16	162.48	3.32 (2.09%)	Marginal increase
Non-beneficiary	158.64	160.44	1.80 (1.13%)	Marginal increase

Source: *Field Survey-2012.* ***Marginal increase:*** *Below 3%,* ***Significant increase:*** *Above 3%*

4.5.2 Jharkhand:

There has been significant increase in CI in respect of BGREI beneficiaries (3.3%) under rainfed shallow low land in Bokaro district whereas significant increase in CI was witnessed on the farm of non-beneficiaries under rainfed Uplands in Pakur district. There has been marginal change (up to 3%) in the CI of BGREI beneficiaries (2.6%) whereas CI has shown declining trend in case of non-beneficiaries (-1.2%) for pooled ecologies (table 4.7).

Table No. 4.7: Change in Cropping Intensity in BGREI districts in Jharkhand in 2011-12 over 2010-11.

Type of farmers	Cropping intensity (%)		Extent of change	Remarks
	2010-11	2011-12		
Rainfed Upland: District: Pakur				
Beneficiary	127.71	131.43	3.72 (2.91%)	Marginal increase
Non-beneficiary	142.09	147.29	5.20 (3.66%)	Significant increase
Rainfed Shallow Low Land: District: Bokaro				
Beneficiary	151.18	156.17	4.99 (3.3%)	Significant increase
Non-beneficiary	159.18	160.49	1.31 (0.82%)	Marginal increase
Rainfed Medium: District: Godda				
Beneficiary	142.44	146.08	3.64 (2.56%)	Marginal increase
Non-beneficiary	159.13	161.97	2.84 (1.78%)	Marginal increase
Rainfed Deep Water: District: Jamtara				
Beneficiary	142.53	143.77	1.24 (0.87%)	Marginal increase
Non-beneficiary	132.58	132.67	0.09 (0.07%)	Marginal increase
Irrigated: District: Sahibganj				
Beneficiary	139.45	139.63	0.18 (0.13%)	Marginal increase
Non-beneficiary	135.04	134.52	-0.52 (-0.39%)	Marginal decrease
State: Jharkhand				
Beneficiary	140.52	144.18	3.66 (2.6%)	Marginal increase
Non-beneficiary	149.21	147.42	-1.79 (-1.2%)	Marginal decrease

Source: *Field Survey-2012,* ***Marginal increase:*** *Below 3%,* ***Significant increase:*** *Above 3% to 25%; and* ***Marginal decrease:*** *up to below -3%.*

4.6 Yield Gap in Rice

Yield gap analysis is often used as a practical tool for crop planning and development strategies. It also suggests the scope of yield enhancement across ecologies. The ecology specific yield gap analysis in rice crop among beneficiaries and non-beneficiaries in Bihar & Jharkhand states reveals that wide gap exists across ecologies and districts within a state. The calculation of yield gap is normally done on the basis of the yield obtained on the farmers' field or farmers yield and the potential yield of a particular variety. The yield gap status so emerged across ecologies vis-à-vis potential yields of popular varieties in both the states has been presented below**:**

4.6.1 Bihar:

In Bihar yield gap of paddy is compared with potential yield of paddy in kharif season amongst the selected BGREI beneficiary and non-beneficiary farmers. The same is presented in table 4.8. Accordingly the yield gap in Bihar state was in the range from 41.00 per cent to 46.00 per cent in respect of beneficiary and 48.00 per cent to 53.00 per cent in respect of non-beneficiary (table 4.8).

Table No. 4.8: Yield gap in paddy compared with farmers' yield and Potential yield in Bihar.

Crop	Potential yield (kg/ha)	Beneficiaries		Non-beneficiaries	
		Actual yield (KG/ha) (2011-12)	Yield gap	Actual yield (KG/ha) (2011-12)	Yield gap
Rainfed Upland: District: Lakhisarai					
Kharif Paddy	7000	3724	-3276 (-46.80%)	3609	-3391 (-48.44%)
Rainfed Shallow Low Land: District: Patna					
Kharif Paddy	7000	3914	-3086 (-44.09%)	3235	-3765 (-53.79%)
Rainfed Medium: District: Gopalganj					
Kharif Paddy	7000	3875	-3125 (-44.64%)	3475	-3525 (-50.36%)
Rainfed Deep Water: District: Begusarai					
Kharif Paddy	7000	4074	-2926 (-41.80%)	3315	-3685 (-52.64%)
Irrigated: District: Jehanabad					
Kharif Paddy	7000	3765	-3235 (-46.21%)	3613	-3387 (-48.38%)
State: Bihar					
Kharif Paddy	7000	3870	-31.30 (-44.71%)	3449	-3551 (-50.73%)

Source: *SDA, Bihar & Field Survey-2012.*

NB: *i. Potential Yield has been considered of rice varieties --- DRH – 775 & MTU- 1010.*
ii. Yield gap is given in absolute terms (i. e. Kg/ha) as well as per cent gap.

4.6.2 Jharkhand:

In Jharkhand state the yield gap of paddy in kharif season amongst the selected BGREI beneficiaries and non-beneficiaries has been presented in table 4.9. Accordingly, the yield gap in Jharkhand state was in the range from 42.00 per cent to 50.00 per cent in respect of beneficiary and 57.00 per cent to 59.00 per cent in respect of non-beneficiary (table 4.9).

Table No. 4.9: Yield gap in paddy compared with farmers' yield and Potential yield in Jharkhand.

Crop	Potential yield (Kg/ha)	Beneficiaries		Non-beneficiaries	
		Actual yield (KG/ha) (2011-12)	Yield gap	Actual yield (KG/ha) (2011-12)	Yield gap
Rainfed Upland: District: Pakur					
Kharif Paddy	5200	3009	-2191 (-42.71%)	2207	-2993 (-57.56%)
Rainfed Shallow Low Land: District: Bokaro					
Kharif Paddy	5200	2940	-2550 (-49.40%)	2138	-3062 (-58.88%)
Rainfed Medium deep water: District: Godda					
Kharif Paddy	5200	3034	-2491 (-47.90%)	2232	-2968 (-57.08%)
Rainfed deep water: District: Jamtara					
Kharif Paddy	5200	3004	-2609 (-50.17%)	2202	-2998 (-57.65%)
Irrigated: District-Sahibganj					
Kharif Paddy	5200	2909	-2588 (-49.77%)	2107	-3093 (-59.48%)
State: Jharkhand					
Kharif Paddy	5200	2979	-2221 (-42.71%)	2177	-3023 (-58.13%)

Source: *Field Survey-2012.*

NB: *i. Potential Yield has been considered of rice varieties – Birsa Dhan- 108 & BPT-5204.*
ii. Yield gap is given in absolute terms (i. e. Kg/ha) as well as per cent gap.

4.7 Educational Qualification Possessed by Progressive Farmers

A provision of engaging progressive farmers on contractual basis has been made under BGREI for the year 2011-12 to assist the field functionaries in land preparation and sowing/planting of crops under Block demonstration of rice and wheat. Subsequently, documentation of the agricultural operations carried out for conducting Block demonstrations of rice and wheat was also prescribed in "Information Card". In order to appraise the ability of these progressive farmers, their qualifications were also recorded during evaluation study. The same is presented below in Table-4.10.

Table 4.10: Educational qualification of the progressive farmers (%) engaged during 2011-12 in Bihar & Jharkhand.

Qualification	Bihar	Jharkhand
Illiterate	0.00	0.00
Primary	0.00	0.00
Middle	30.00	0.00
Hr. Secondary	60.00	67.00
Graduate	10.00	34.00
Post-graduate	0.00	0.00
Total	100.00	100.00

Source: Field survey-2012

The above table reveals that about 60 per cent of the progressive farmers possessed higher secondary qualification in Bihar and 67% in Jharkhand state. Besides, about 10% of progressive farmers were Graduate in Bihar and 34% in Jharkhand. Abut 30 % of the progressive farmers obtained the educational qualifications up to middle level in Bihar. Therefore, most of the progressive farmers are literate enough to maintain the prescribed "Information Card" for Block demonstrations. But in either of the states, no information card was found to be maintained by them. Actually all of them reported that they were not asked or trained to maintain such information cards.

The number of linked beneficiary farmers with the progressive farmers, area operated by the progressive farmers, documentation done by them, status and mode of payment of honorarium to them and status of supply of drum seeders to them were also assessed during the evaluation study. The same have been presented below in table No. 4.11.

Table 4.11: Activities carried out by Progressive Farmers & Status of Payment in Kharif during 2011-12.

Activities	Bihar	Jharkhand
No. of Linked Beneficiary Farmers per Progressive Farmers	203	218
Area Operated by the Progressive Farmers	100 ha	107 ha
Documentation of Information Card	None	None
Mode of Payment of Honorarium	Cheque	Cheque
Supply of Drum Seeders	Not Supplied	Supplied — Not used

Source: Field Survey-2012

The structure of handholding support through progressive farmers varied. There were 203 beneficiaries linked with one progressive farmer in Bihar state who

operated 100 ha as per prescribed norms of 100 ha. In Jharkhand, there were 218 beneficiaries linked with one progressive farmer who operated 218 ha of area only. Surprisingly, none of the progressive farmer was involved in documentation of Information Card devised for Block demonstrations. In Jharkhand, the supply of drum seeders was also not made in time to the progressive farmers due to first year of introduction of this intervention. As a result, it could not be put to use during *Kharif*-2011.

4.8 Concentration Ratio of Block Demonstration Clusters of Rice

The concentration ratio of demonstration clusters of rice at different levels has been computed on the basis of 1,000 ha size of clusters to assess the outreach of the crop production technology. The size of each demonstration was uniformly 0.40 ha throughout the State. Bihar State had followed "Dispersed" approach instead of cluster approach. All the demonstrations organized in Bihar State were SRI demonstration devoid of ecological consideration. The concentration ratios of the demonstration clusters in Jharkhand state in respect of blocks (0.39), Gram Panchayats (0.069) and villages (0.0212), which may be seen in table No. 4.11 (A).

Table No. 4.11 (A): Concentration of Block Demonstration (D/C) in relation to Blocks, Gram Panchayats and Villages at a Glance in Jharkhand under BGREI in Kharif, 2011-12

SN.	Name of District	No. of Demon stration	Concentration of D/C in relation to No. of Block		Concentration of D/C in relation to Gram Panchayat		Concentration of D/C in relation to Village	
			No.	Ratio	No.	Ratio	No.	Ratio
1.	Lohardagga	1	1	1.00	5	0.200	8	0.1250
2.	East Singhbhum	1	4	0.25	79	0.012	306	0.0032
3.	Giridih	1	1	1.00	4	0.250	30	0.0333
4.	Kodarma	1	6	0.17	4	0.250	13	0.0769
5.	Sahibganj	1	2	0.50	8	0.125	35	0.0286
6.	Palamu	1	2	0.50	8	0.125	25	0.2500
7.	Bokaro	1	2	0.50	10	0.100	16	0.0625
8.	Godda	1	3	0.33	15	0.067	40	0.0250
9.	Latehar	1	1	1.00	5	0.200	17	0.0588
10.	Dumka	1	7	0.14	39	0.026	134	0.0074
11.	Garwha	1	2	0.50	15	0.067	29	0.0344
12.	Deoghar	1	4	0.25	18	0.056	40	0.0250
13.	Pakur	1	1	1.00	14	0.071	35	0.0286
14.	Jamtara	1	1	1.00	4	0.250	21	0.0476
15.	Saraikela	1	1	1.00	3	0.333	20	0.0500
16.	Dhanbad	1	2	0.50	12	0.083	20	0.0500
17.	Chatra	1	1	1.00	2	0.500	10	0.1000
	Total	**17**	**44**	**0.39**	**245**	**0.069**	**799**	**0.0212**

Source: Calculated by the authors on the basis the data obtained from the Directorate of Agriculture, Government of Jharkhand.

A perusal of the concentration ratio (CR) i.e., the outreach of the crop production technology of rice crop during the year: 2011-12 (all seasons) in terms of Gross Cropped Area indicates that the gross outreach of the crop production technology in terms of rice Block demonstrations to Gross Cropped Area of rice was 0.0160 in Bihar & 0.0184 in Jharkhand, which may be seen in table No. 4.11 (B).

Table No. 4.11 (B): Concentration Ratio of Rice Block Demonstration Clusters to Gross Cropped Area under BGREI in 2011-12 in Bihar & Jharkhand

SN	State(s)	Total No. of Block Demonstration Clusters	Gross Cropped Area ('000 ha)	Concentration Ratio to Gross Cropped Area
1.	Bihar	33.476	2088.371	0.016029719
2.	Jharkhand	17.00	921.818	0.018441818

Source: Calculated on the basis of data obtained from BGREI Cell, Directorate of Agriculture & Co-operartion, Ministry of Agriculture, Government of India.

4.9 Adoption level of "Deep ploughing and Land preparation" by beneficiaries of Block demonstrations of rice and non-beneficiaries in BGREI districts during *Kharif*-2011

Deep ploughing & land preparation have been included as an intervention for the Block demonstrations of rice & wheat (land preparation only) under BGREI in 2011-12. Both of these are integral part of innovative crop production technology. The adoption level of "Deep ploughing & land preparation" by BGREI beneficiaries and non-beneficiaries indicates that "Deep ploughing & land preparation" was adopted by all the beneficiaries of rice under Block demonstrations whereas none of non-beneficiaries could adopt the "Deep ploughing". Moreover, land preparation was done by all the non-beneficiaries also (table 4.12).

Table No. 4.12: Adoption level of Deep ploughing and Land preparation by beneficiaries of Block demonstrations of rice in BGREI districts and non-beneficiaries during *Kharif*-2011 in Bihar & Jharkhand.

State	Deep Ploughing (%)		Land preparation (%)	
	Beneficiaries	Non-beneficiaries	Beneficiaries	Non-beneficiaries
Bihar	100	0	100	100
Jharkhand	100	0	100	100

Source: *Field Survey-2012.*

4.10 Perception of beneficiaries

The farmers' views were obtained on the BGREI program in terms of its adequacy in meeting their needs for rice & wheat cultivation covering the aspects namely; adequacy of supply of agriculture inputs for Block demonstrations of rice and wheat, program rating as a whole, delivery of technical backstopping and which agency guided the best, preference for sourcing of agricultural inputs and problems faced in marketing of agriculture produce. The responses so gathered are presented in table No. 4.13. The opinion expressed by the BGREI beneficiaries on the above indicators is elaborated as under:

4.10.1 Adequacy of input packs for Block demonstrations

Farmers' opinion was solicited with regard to the adequacy of input packs included under Block demonstrations of rice & wheat by way of explaining the provision of the interventions made for Block demonstrations under BGREI program during 2011-12. This question did not relate to actual supply of the approved inputs to the beneficiaries.

There was mixed response of beneficiaries of Block demonstrations of rice & wheat regarding adequacy of Input packs for Block demonstrations. The satisfaction level in this regard was 62 per cent in Jharkhand & 60 per cent in Bihar.

4.10.2 BGREI beneficiary farmers' perception towards rating of BGREI program

The farmers' opinion was solicited with regard to the overall rating of the BGREI program. There was mixed response of beneficiaries of Block demonstrations of rice & wheat in this regard. In Bihar, 58% beneficiary farmers rated BGREI program as "Good" and 42% rated it as "Average". In Jharkhand too, 58% beneficiary farmers rated BGREI program as "Good" and 42% rated it as "Average".

4.10.3 BGREI beneficiary farmers' perception towards adequacy of Technical Backstopping

Farmers' opinion was solicited with regard to status of availability of technical backstopping to the beneficiary farmers under BGREI program. In this regard there was mixed response of beneficiaries of Block demonstrations of rice & wheat. The beneficiary farmers reported that technical backstopping under BGREI program was "adequate" as responded by 72% in Bihar and 80 per cent in Jharkhand.

Table No. 4.13: Perception profile of BGREI beneficiaries about the program (%) in Bihar & Jharkhand.

State	Supply of inputs		Program rating			Technical backstopping	Who guided the best					Preference for source of inputs			Problems in Marketing	
	Adequate	Inadequate	Poor	Average	Good		KVK	SAU	CRRI	SDA	PF	Licensed dealers	Coop. Society	SDA outlets	Transportation etc.	Lower price than MSP
Bihar	60	40	0	42	58	72	8	0	0	70	22	100	0	0	44.00	72.00
Jharkhand	62	38	0	42	58	80	12	0	0	50	38	100	0	0	14.92	28.36

Source: Field Survey - 2012

4.10.4 BGREI beneficiary farmers' perception towards the agency "which guided the best"

It might be mentioned that the scientists of SAUs, KVKs & ICAR (ICAR-SAU system) were identified for providing technical support to the BGREI beneficiaries during 2011-12. Accordingly, farmers' opinion was solicited with regard to the agency which guided the best amongst *Krishi Vigyan Kendras* (KVKs), State Agricultural University scientists, CRRI scientists, Extension staff of State department of Agriculture, Non-Governmental Organizations (NGOs) or Progressive farmers under BGREI program. There was mixed response of beneficiaries of Block demonstrations of rice & wheat in this regard. In regard to best guidance opinion for SDAs, Bihar was observed at 70 % and Jharkhand 50 %.

4.10.5 BGREI beneficiary farmers' perception towards preference for source of inputs

Often concern about the efficiency of delivery mechanism is expressed in regard to implementation of social programs. Accordingly, the farmers' opinion was solicited with regard to preference for the source of accessing the agricultural inputs. There was mixed response of beneficiaries of Block demonstrations for rice & wheat on this front. The states of Bihar & Jharkhand preferred cent percent supply of agriculture Inputs under Crop Development programs through "Licensed Inputs Dealers" which have several advantages in terms of efficiency in delivery, enforcing regulatory mechanism more effectively and creating employment opportunities through Institution building. This arrangement of input delivery also reduces burden on the extension staff of the State Department of Agriculture in discharging their assigned official duties more effectively.

4.10.6 BGREI beneficiary farmers' perception towards problems faced in marketing of agriculture produce

The opinion of the beneficiary farmers of BGREI program was also captured relating to problems faced in marketing of agriculture produce. The arrangement of assured procurement of agriculture produce is as essential as promotion of technology. 72.00 per cent of respondents reported that farm gate prices are always lower than MSP due to non-existence of the provision of market intervention for cereals in Bihar. As a result of this, farmers feel detached from the crop development programs besides incurring loss. 44.00 per cent of respondents reported that there is problem of transportation of harvested produce to the markets due to poor rural roads, remotely located markets and lack of transport facility. In Jharkhand, 28.36 per cent reported about lower price than MSP and 14.92 per cent reported about transportation problem.

4.11 Input package for block demonstrations of rice adopted by BGREI beneficiaries *versus* non-beneficiaries during 2011-12

The Inputs used by the BGREI beneficiaries of Block demonstrations and non-beneficiaries during *Kharif*-2011 are presented in table No. 4.14 & 4.15. This study reveals that neither the beneficiaries nor the non-beneficiaries have used all the recommended inputs. Most of the beneficiary and non-beneficiary farmers have not undertaken seed treatment; weed control through weedicides, application of micro-nutrients and plant protection measures also. Even deep ploughing and line sowing have not been adopted in several cases.

Table 4.14: Productivity and net return/ha in rice during Kharif (2011) in Bihar (Cost in Rs.)

Activity	Rainfed upland **(Lakhisarai)**		Rainfed lowland (shallow) (**Patna)**		Medium deep water **(Gopalganj)**		Deep water **(Begusarai)**		Irrigated **(Jehanabad)**		All Ecological Regions (Bihar)	
	Beneficiary	Non-beneficiary	Beneficiary	Non-beneficiary	Beneficiary	Non-beneficiary	Beneficiary	Non-beneficiary	Beneficiary	Non-beneficiary	Beneficiary	Non-beneficiary
I. Inputs delivered under BGREI												
Deep ploughing and land preparation	---	---	---	---	---	---	---	---	---	---	---	---
Seeds	---	---	---	---	---	---	---	---	---	---	---	---
Seeds (benefit amount)	123.50	---	123.50	---	123.50	---	123.50	---	123.50	---	123.50	---
Seed treatment	10.00	---	10.00	---	10.00	---	10.00	---	10.00	---	10.00	---
Weed management	---	---	---	---	---	---	---	---	---	---	---	---
Micro-nutrients	---	---	---	---	---	---	---	---	---	---	---	---
Micro-nutrient(benefit amount)	57.58	---	68.96	---	52.08	---	49.59	---	50.39	---	55.79	---
Direct seeding /transplanting	---	---	---	---	---	---	---	---	---	---	---	---
Line sowing by drum seeders	---	---	---	---	---	---	---	---	---	---	---	---
Transplanting	---	---	---	---	---	---	---	---	---	---	---	---
Plant protection	---	---	68.96	---	52.08	---	---	---	50.39	---	34.28	---
Cash Benefit	479.84	---	574.71	---	434.02	---	416.32	---	419.99	---	464.97	---
II. Inputs used at own cost												
Land preparation	6238.00	6229.16	3448.27	3481.48	4838.32	4816.91	4646.13	4675.52	3614.02	4209.54	4556.94	4682.52

Seeds	461.91	692.70	592.59	916.67	473.28	832.61	617.13	867.71	664.40	989.24	581.86	859.78
Seed treatment	14.95	23.95	38.85	27.77	46.42	52.31	17.89	20.89	38.29	21.05	31.28	29.19
Transplanting	2245.68	2250.00	1874.42	1876.54	1873.91	1872.45	1575.35	1573.54	1963.25	1873.71	1906.52	1889.24
Manures	---	---	---	---	---	---	---	---	---	---	---	---
Soil amendments	---	---	---	---	---	---	---	---	---	---	---	---
Micro-nutrients	473.61	109.37	300.58	295.06	226.56	274.63	300.38	188.85	288.96	203.93	318.01	214.28
Fertilizers	1397.79	1776.04	1700.57	1453.70	1253.68	901.92	3205.45	2464.40	975.01	353.60	1706.50	1389.93
Bio-fertilizers	225.52	---	270.11	---	203.99	---	195.67	---	197.40	---	218.53	---
Irrigation	254.32	604.17	692.52	469.13	162.76	217.96	547.46	330.72	506.09	355.47	432.63	395.49
Weeding	876.92	734.37	1183.90	712.96	1030.81	686.57	1092.42	800.70	1063.62	78.57	1049.53	602.63
Plant protection	---	---	---	---	---	---	---	---	---	---	---	---
Harvesting	2541.99	2567.71	2500.00	2503.08	2500.00	2500.00	2500.00	2500.00	2500.00	5846.58	2508.39	3183.47
Threshing	1370.20	1569.79	1500.00	1501.85	1348.30	1349.35	1600.00	1599.91	1500.00	1500.00	1463.70	1504.18
III. Land revenue paid	75.96	76.87	84.99	85.10	79.95	79.95	89.96	89.95	65.61	68.29	79.29	80.02
IV. Interest on capital paid	967.18	1011.67	942.98	837.16	984.50	885.50	1290.26	1173.18	1035.02	965.67	1043.98	974.63
V. Grand total of cost per farm	37126.40	16940.00	27798.19	15975.97	36159.49	33194.54	43903.50	37359.46	35872.12	35203.60	36171.94	27734.71
VI. Cost per hectare	17144.03	17645.83	15204.74	14160.53	15694.16	14470.16	18277.87	16285.37	15065.94	16465.65	16277.34	15805.50
Cost per hectare (including benefit)	17814.95	17645.83	15975.97	14160.53	16365.84	14470.16	18877.64	16285.37	15720.21	16465.94	16950.92	15805.56
VII. YIELD												
Grain yield rate (kg./ha)	3724.00	3609.00	3914.00	3235.00	3895.00	3475.00	4074.00	3315.00	3765.00	3613.00	3874.40	3449.40

Straw yield (qt./ha)	8.25	8.13	8.50	8.06	8.33	8.23	8.50	8.06	8.29	7.85	8.37	8.07
VIII. VALUE OF THE PRODUCE												
Value of Grain per farm	68883.33	30566.96	50213.15	20939.65	78779.77	70635.48	85499.83	67277.05	59114.88	51800.40	68498.19	48243.82
Value of Straw per farm	3543.85	1592.18	3695.35	1638.35	1708.15	1694.90	2122.25	1934.50	3594.28	3167.15	2932.77	1996.41
IX. RETURNS												
Net Return/farm excluding benefit	35297.78	15219.14	26110.31	6602.03	44328.43	39135.84	43718.58	31852.09	26837.04	19763.95	35258.42	22514.61
Net Return (including benefit)/farm	34626.86	15219.14	25264.18	6602.03	43656.75	39135.84	43118.81	31852.09	26182.77	19763.95	34569.67	22514.61
Net return/ha (excluding benefit)	16937.75	15853.27	15005.92	4075.33	19239.76	17060.08	18200.90	13860.78	11271.33	9244.13	16131.13	12018.71
Net Return/ha (including benefit)	16615.57	15853.27	14559.27	4075.33	18948.24	17060.08	17951.21	13860.78	10996.54	9244.13	15814.16	12018.71

Source: Field Survey--- 2012.

Table 4.15: Productivity and net return/ha in rice during Kharif (2011) in Jharkhand (Cost in Rs.)

Activity	Rainfed upland **(Pakur)**		Rainfed lowland (shallow) (**Bokaro)**		Medium deep water **(Godda)**		Deep water **(Jamtara)**		Irrigated **(Sahibganj)**		All Ecological Regions	
	Beneficiary	Non-beneficiary	beneficiary	Non-beneficiary	beneficiary	Non-beneficiary	beneficiary	Non-beneficiary	beneficiary	Non-beneficiary	beneficiary	Non-beneficiary
I. Inputs delivered under BGREI												
Deep ploughing and land preparation	-	-	-	-	-	-	-	-	-	-	-	-
Seeds	-	-	-	-	-	-	-	-	-	-	-	-
Seeds (benefit amount)	113.83	-	229.26	-	92.81	-	212.82	-	126.76	-	154.99	-
Seed treatment	-	-	-	-	-	-	155.92	-	42.25	-	39.63	-
Weed management	364.25	-	431.56	-	371.23	-	639.79	-	450.70	-	451.50	-
Micro-nutrients	-	-	-	-	-	-	-	-	-	-	-	-
Micro-nutrient(benefit amount)	654.53	-	775.46	-	667.05	-	1140.12	-	207.75	-	688.92	-
Direct seeding /transplanting	-	-	-	-	-	-	-	-	-	-	-	-
Line sowing by drum seeders	256.12	-	303.44	-	261.02	-	594.84	-	316.90	-	346.46	-
Transplanting	-	-	-	-	-	-	-	-	-	-	-	-
Plant protection	170.74	-	202.29	-	174.01	-	297.42	-	264.08	-	221.70	-
Cash Benefit	682.98	-	-	-	696.06	-	-	-	-	-	275.80	-
II. Inputs used at own cost												
Land preparation	4678.43	4333.33	4308.84	4206.19	4312.64	4349.92	4560.48	4251.10	4222.75	4531.25	4416.62	4340.35
Seeds	89.13	131.94	238.71	470.11	381.97	480.73	-	273.13	158.45	203.12	173.65	311.80

Seed treatment	-	-	-	-	-	-	-	-	-	-	-	-
Transplanting	1937.96	1958.33	2240.39	2195.88	2231.73	2154.90	2260.41	2114.54	2017.61	1992.18	2137.62	2083.16
Manures	-	-	-	-	-	-	-	-	-	-	-	-
Soil amendments	-	-	-	-	-	-	-	-	-	-	-	-
Micro-nutrients	-	-	-	-	-	-	-	-	-	187.50	-	-
Fertilizers	2299.38	1751.39	2543.16	2222.68	2336.14	2383.63	2577.99	2397.58	1938.31	1992.19	2338.79	2149.49
Bio-fertilizers	-	-	-	-	-	-	-	-	-	-	-	-
Irrigation	39.28	180.56	104.52	128.87	95.71	102.73	16.52	-	69.72	-	65.15	82.43
Weeding	561.19	1061.11	629.13	715.47	593.39	979.13	400.20	800.66	761.97	809.38	589.17	873.15
Plant protection	213.43	-	212.41	61.86	346.58	337.08	-	264.32	330.29	500.00	220.54	232.65
Harvesting	2491.46	2027.78	2972.69	2723.72	2384.28	2259.23	2569.40	2581.06	2670.77	2681.25	2617.72	2454.60
Threshing	1259.25	1027.78	1477.75	1443.30	1480.86	1270.47	2757.44	2736.78	1367.96	1381.25	1668.65	1571.91
III. Land revenue paid	88.34	87.50	94.47	89.90	82.99	82.65	64.90	65.86	82.20	83.28	82.58	81.83
IV. Interest on capital paid	805.52	810.00	698.93	745.98	868.58	735.96	884.00	737.00	680.42	629.06	787.49	731.60
V. Grand total of cost per farm	29352.10	9626.20	25897.64	14553.80	29958.03	18860.00	29008.99	14729.60	24306.61	9593.90	27704.67	13472.70
VI. Cost per hectare	14463.37	13369.72	15521.00	15003.96	15114.87	15136.42	16132.25	16222.03	15708.89	14990.47	15388.07	14944.52
Cost per hectare (including benefit)	16705.82	13369.72	17463.01	15003.96	17377.05	15136.42	19173.16	16222.03	17117.33	14990.47	17567.27	14944.52
VII. YIELD												
Grain yield rate (kg./ha)	3009.00	2884.00	2940.00	2650.00	3034.50	1354.50	3005.00	2591.00	2909.00	2612.0	2979.50	2418.30
Straw yield (qt./ha)	8.32	8.19	8.07	7.86	8.26	8.19	8.00	7.84	8.08	7.92	8.14	8.00

VIII. VALUE OF THE PRODUCE												
Value of Grain per farm	46285.30	17156.60	37104.80	21178.80	45498.83	30026.24	40352.30	20690.60	37266.90	14632.00	41301.62	20736.84
Value of Straw per farm	2795.80	1038.60	2152.00	1237.00	8908.35	5767.01	7236.40	3326.00	3850.00	1873.00	4988.51	2648.32
IX. RETURNS												
Net Return/farm excluding benefit	19729.00	8569.00	13359.16	7862.00	24449.15	16933.25	18579.71	9287.00	16810.29	6911.10	18585.46	9912.45
Net Return (including benefit)/farm	17486.55	8569.00	11417.15	7862.00	22186.97	16933.25	15537.80	9287.00	15401.85	6911.10	16406.06	9912.45
Net return/ha (excluding benefit)	11228.79	11901.38	9008.20	8105.15	14181.64	13590.08	12280.05	10227.97	11838.23	10798.59	11707.38	10924.63
Net Return/ha (including benefit)	9952.50	11901.38	7698.69	8105.15	12869.47	13590.08	10269.53	10227.97	10846.37	10798.59	10327.31	10924.63

Source: Field Survey --- 2012.

4.12 Impact of BGREI program in terms of grain yield and farmers income

The Mean difference Test of yield of paddy, pulses and wheat between BGREI beneficiaries and non-beneficiaries are presented below in Table-4.16.

Table 4.16: Mean difference test of grain yield of paddy in Bihar & Jharkhand.

State	Test/Checks	Yield in Kg/ha					
		N	Mean	SD	SE of Mean	t-statistics (0.01 level)	DF
***Kharif*-2011: Paddy**							
Bihar	**Beneficiary**	50	3874.30	188.38	26.64	8.468	73
	Non-beneficiary	25	3448.60	235.90	47.18	7.857	40
Jharkhand	**Beneficiary**	50	2977.30	124.167	17.560	6.751	73
	Non-beneficiary	25	2691.20	244.051	48.810	5.515	31

Source: *Field Survey-2012*

The test results clearly indicate that yield rates of *Kharif* paddy in Bihar between beneficiary and non-beneficiary farmers are statistically significant at 0.01 per cent probability level. It also indicates that the yield rate for beneficiary farmers were higher than that of the non-beneficiary farmers.

4.13 Determination of the impact of inputs on total yield

In order to determine the impact of various inputs on total yield, an analysis has also been made to find out the factors determining yield of paddy. For this purpose, multiple regression exercise was carried out. Yield per hectare has been taken as "dependent variable" and the "predictor (independent) variables" including both continuous and dummy variables. The continuous variables are value of seeds used per hectare, value of micro-nutrients used per hectare and other costs (inclusive of fertilizers, plant protection chemicals etc.) per hectare. The dummy variables include ecological dummies for rainfed upland, rain-fed medium, rainfed deep water and irrigated ecology. The state wise impact of inputs in to the total yield of paddy is given below in table 4.17.

The estimated results indicate that the overall specification of the model is validated as approximated by the value of R^2. [R^2 = {Total Sum of Squares (TSS)}-{Error of Sum of Squares (SSE)}/TSS].

The result of the regression has been presented in table - 4.17.

Table 4.17: Determination of the impact of inputs in the total yield of paddy in *Kharif* - 2011 in Bihar & Jharkhand

Factors/Interventions	Summary of multiple regression	
	Bihar	**Jharkhand**
R^2	**0.203**	**0.303**
Adjusted R^2	**0.120**	**0.231**
SE of Estimate	**269.282**	**192.094**
Dependent Variable: Yield (Kg/ha.)		
Coefficients of independent variable:		
Constant	3239.284	2385.034
Costs of Seed per hectare(Rs.)	-0.173	-0.323
Costs of Micro-nutrients per hectare (Rs.)	0.377	0.090
Other Costs per hectare (Rs.)	0.034	0.032
Dummy for rainfed Upland ecology	-214.19	104.137
Dummy for rainfed shallow low land ecology	-52.426	12.616
Dummy for rainfed medium deep water ecology	-5.828	92.809
Dummy for rainfed Deep Water ecology	57.269	-77.886
Dummy for HYV Irrigated ecology	-	-
Dummy for Irrigated –hybrid ecology	-	-
Dummy for Irrigated-Traditional ecology	-	-

Source: *Estimated from Field data*

4.13.1 Bihar

The predictor variables for variation in yield rate (table- 4.17) found statistically significant are meant for micro-nutrients and other costs, both showing a direct relationship with productivity (both significant at 0.05 levels). Micro-nutrients per hectare have a positive coefficient suggesting that higher the value of micro-nutrients used per hectare, higher the productivity. This implies that provision of micro-nutrients under the program has significantly contributed to increased yield of paddy. At the same time the significant positive coefficient of costs other than seeds and micro-nutrients (tagged here as 'other costs') in turn indicates that there is much scope for further application of other inputs in cultivation. It should be noted that no other predictor variable has shown significant impact on productivity, including the dummy variables introduced for specific ecological regions. This indicates that variation in ecology does not have significant impact on the productivity. The implication has been that the program should focus more on proper distribution and application of micro-nutrients for the improvement of productivity of the crops.

4.13.2 Jharkhand

The predictor variables of 'other costs' are found statistically significant; suggesting that higher use of other inputs other than seed and micro-nutrient result in higher levels of productivity. This however does not establish the affectivity of the BGREI program through its intervention in seed and micro-nutrient provisions. At the same time, all the ecological dummies turned out to be statistically insignificant accompanying with varying degrees of the coefficients. This confirms that ecological variation in Jharkhand does not have any significant impact on the productivity of the crop; and hence does not requires ecology specific technologies under the BGREI program for the improvement of productivity of the crops, at least for Jharkhand state (table No. 4.17).

4.14 Progress of allocation & utilization under BGREI during 2010-11 and 2011-12

The State wise intervention specific physical & financial achievements of BGREI program during 2010-11 and 2011-12 have been presented in table No. 4.18. These interventions included agriculture inputs distribution (seeds, micro-nutrients, weedicides and soil amendments, seed minikits, intercropping, line sowing); Farmers & Staff trainings, Farmers' fair, Farmers study visits; Seed multiplication; Soil amelioration; Sugarcane Industry department; e-pest surveillance & Soil & water resources conservation. About 0.7% was assigned for program management and monitoring. The overall utilization of funds in 2011-12 was 73% in Bihar (table No. 4.19) and 97% in Jharkhand (table No. 4.20).

Table No. 4.18: Physical and Financial Utilization under BGREI Programme during 2010-11 in Bihar & Jharkhand (*Financial in Lakh Rupees)*

SN	Components	Factor	Bihar		Jharkhand	
			Physical	Financial	Physical	Financial
1.	Total Demonstrations	A	18707 ha	1713.04	4500 Nos	90.00
		U	18707 ha	1713.04	874 Nos	17.758
2.	Total Agricultural Inputs	A	---	1509.76	---	149.26
		U	---	1509.76	---	19.15
3.	Total Extension Activities	A	---	255.66	131 Nos.	36.03
		U	---	255.66	10 Nos.	8.03
4.	Water Asset Building	A	---	1006.7	---	2470.18
		U	---	1006.7	---	1321.02
5.	Total Improve Farm Implements	A	00	00	1409 Nos.	272.85
		U	00	00	1144 Nos.	111.30
6.	Total Seed Multiplications	A	00	00	5500 qtls	55.00
		U	00	00	299 qtls	2.99
7.	Grand Total	A	---	5613.83	---	3073.32
		U	---	5613.83	---	1480.25

Table No. 4.19: Physical & Financial achievement under BGREI in Bihar during 2011-12

(Unit: Financial: Rs. In Lakhs)

Sl. No.	Indicative intervention specific program proposed by DAC			Program approved by SLSC		Achievement till February, 2012	
	Interventions	Physical Target	Financial Target	Physical Target	Financial Target	Physical	Financial
1	Block demonstrations-Autumn rice (1000 ha clusters-In Numbers) @ Rs. 7,500/-ha	37	2809.00	32. 0	2400.00	32.000	2400.00
2	Block demonstrations-Boro rice (1000 ha clusters-In Numbers) @ Rs.7,800/-	-	-	3.866	115.98	3.866	115.98
3	Block demonstrations-wheat (Numbers)	22	880.00	22. 0	880.00	22.0	880.00
4	Zero Till seed drill	360	54.00	0	0	0	0
5	Shallow Tube wells (Numbers)	6000	720.00	6000	720.00	6000	720.0
6	Pump-set (Numbers)	600	60.00	600	60.00	600	60.00
7	Site specific needs: Identified by State						
7.1	Shallow Tube wells		1010.00	6000	720.00	6000	720.0
7.2	Pump sets			6000	600.00	6000	600.0
	Total	**-**	**5533.00**	**-**	**5495.98**	-	**5495.98**
				% Financial utilization		**73%**	

Table No. 4.20: Physical & Financial achievement under BGREI in Jharkhand during 2011-12

(Unit: Financial: Rs. In Lakhs)

Sl. No.	Indicative intervention specific program proposed by DAC			Program approved by SLSC		Achievement till 31.03.2012	
	Interventions	Physical Target	Financial Target	Physical Target	Financial Target	Physical	Financial
1	Block demonstrations-Autumn rice (1000 ha clusters in Numbers)	17	1271	17	1298.84	17	948.13
2	Shallow tube wells	4000	480	0	0	0	0
3	Pump-set (Numbers)	600	60	0	0	0	0
4	Bore well/Dug well (Number)/	3000	900	0	0	0	0
5	**Site specific needs Schemes of 2010-11 to be completed in 2011-12 as under**:						
(1)	BPCD			232	1220.447	-	1002.0457
(2)	LBCD			232			
(3)	Lift Irrigation			232			
6	**Schemes for 2011-12:**	-	457				
(1)	BPCD			175	787.50	-	1121.917
(2)	LBCD			167	375.75	-	
(3)	Lift Irrigation			160	504.00	-	
	Total		**3168**	**-**	**4186.537**	**-**	**3072.093**
	% Financial utilization					**97%**	

4.15 Monitoring status of the program by CRRI, Cuttack

Monitoring of BGREI program for extending technical backstopping was decided to be carried out by the nominated scientists of ICAR-SAU formations under overall supervision of CRRI-Cuttack. The outcome of the field visits based on the reports received from ICAR-SAU formations is presented below in table No. 4.21.

Table 4.21: Field visits undertaken by the Scientists of ICAR-SAU during 2011-12 in Bihar & Jharkhand

Sl.	State	Total districts	Number of districts visited by ICSR-SAU		
			CRRI	SAUs	Total
1.	Bihar	29	1	Not Reported	1
2.	Jharkhand	17	3	Not Reported	3

Source: BGREI cell, DAC, GoI;

4.16 Monitoring by Central Steering Committee (CSC)

The staff members of BGREI Cell have visited the 19 BGREI districts in Bihar out of 20 districts during *Kharif* -2011 and 09 districts in Jharkhand out of 17 districts (table 4.22).

Table 4.22: Field visits by BGREI Cell for monitoring of BGREI program during Kharif – 2011 in Bihar & Jharkhand.

Sl. No.	State	*Kharif*-2011		
		Total districts	Visited districts	% visited districts
2.	Bihar	20	19	95%
4.	Jharkhand	17	9	53%

**Some BGREI components across all the districts in Chhattisgarh State.*
Source: BGREI Cell, DAC, GoI.

4.17 Conclusion

- Significant increase in grain yield of rice has been witnessed in the Block Demonstrations under BGREI;
- BGREI program has narrowed down the yield gap across rice ecologies;
- Water asset building component under BGREI Program has resulted in increased Cropping Intensity;
- Progressive farmers proved the most viable link between Extension machinery and linked beneficiary farmers;
- Technical backstopping was largely extended by State Extension Workers;
- Farmers perception gathered during the study revealed that BGREI program was one of the best programs in terms of adequacy of Input package/technology dissemination, and;
- Problem of marketing of harvested produce and low market prices still persists.

CHAPTER – V

SUMMARY & CONCLUSION

5.1 Background

A strategic initiative **'Bringing Green Revolution in Eastern India' (BGREI)** to develop high potential Eastern Region of the country for food grain production has been initiated since 2010-11. The programme is being implemented as a sub-scheme of Rashtriya Krishi Vikas Yojana (RKVY) in seven eastern states namely Assam, Bihar, Chhattisgarh, Jharkhand, Odisha, Uttar Pradesh (Eastern) and West Bengal. The objective of the programme is to increase the productivity of rice based cropping system in the resource rich eastern region by intensive cultivation through promotion of recommended agriculture technology and package of practices by addressing the underlying constraints of different agro-climatic sub-regions. Most of the activities taken up under BGREI programme during 2010-11 are short term strategies that are crop specific and development oriented. The programme for 2011-12 include a bouquet of three broad categories of interventions, viz., Block demonstrations of rice and wheat, asset building activities for water conservation and utilization such as construction of shallow tube wells, dug well/bore wells and distribution of pump sets, drum seeders, zero till seed drills and site specific activities for facilitating the petty works such as construction/renovation of field/irrigation channels/electric power supply for agriculture purposes, institutional building for inputs supply etc. In order to sustain the productivity gain, a total of 269 block demonstration of rice, each of 1000 hectares was proposed to be implemented in five agro-ecological sub-regions namely rainfed uplands, rainfed low lands (shallow low land, medium, deep water) and irrigated rice (traditional, hybrid). The objective of the demonstration was to improve seed replacement rate (SRR), promote line sowing/planting coupled with promotion of plant nutrient and plant protection technologies. It was proposed to promote hybrid rice technologies

in 40 units of 1000 hectares each. Every farmer in these units was to be encouraged to take up at least 0.40 hectare under hybrid rice. In case of wheat, emphasis on use of zero till seed drills was proposed to be conducted. Package of practices proposed under the demonstrations includes provision of seed, sowing operation, seed treatment and weedicide.

5.2 Rationale of the Study

Being enthused by the overwhelming response to BGREI program at all the levels in the BGREI states and the prospects of crop production reported to have surpassed all the previous records of rice production in the Crop Division of the Department of Agriculture & Co-operation decided to conduct the "End-term Evaluation of BGREI Programme."

In above backdrop the Crop Division of the Ministry of Agriculture, Government of India has assigned this study to be undertaken in all the seven BGREI states through Agro-Economic Research Centres located in these states. Accordingly Agro-Economic Research Centre for Bihar & Jharkhand, T M Bhagalpur University, Bhagalpur has undertaken this study in Bihar and Jharkhand states. Now the programme has completed its two years of implementation by the terminal year of 11th Five Year Plan (2011-12), so it is high time to conduct the study with a view to assess the actual performance of the programme during the implementation both at the macro and micro levels. This would help the concerned states to devise the strategic action plan in conformity with the identified constraints at the grass root levels.

5.3 Objectives of the Study

i. *To observe crop response to promoted technologies.*
ii. *To evaluate impact of various interventions of Block demonstrations to drive growth in the yield of rice and wheat.*
iii. *To identify gaps, if any, between recommended, promoted and implemented technologies.*
iv. *To explore effectiveness of technical backstopping, and;*
v. *To examine the effectiveness of the provision of progressive farmers and SDA staff entrusted with BGREI Programme.*

5.4 Methodology

Considering the diversity in rice production across the districts, five districts representing each of the five agro-ecological regions in both the states were selected for obtaining farmers' response about the programme. Farm household survey was conducted with the help of structured schedule.

The study is exclusively focused on evaluation of Block Demonstrations of rice to the extent possible besides understanding the planning and implementation strategies adopted by the states. The sample units of demonstrations have been selected from 5 rice ecologies namely; rainfed uploads, rainfed shallow low land, rainfed medium deep water rainfed deepwater and irrigated. At the first stage of sampling, one district is selected from each of the five rice ecologies considering the concentration of demonstrations in the district. In the second stage, one representative block of one block demonstration is selected following the same procedure. At the third stage, total number of 10 beneficiaries and 5 non-beneficiaries are selected at random from each selected block. In sum a total of 50 beneficiaries and 25 non-beneficiaries spread over 5 selected BGREI districts from each of the two states are covered in the study.

5.5 Limitations

i. The sample size is not adequate besides being unequal representation between beneficiary and non-beneficiary respondents.
ii. Initial timeline of the study during which the field work completed was too short for such an exhaustive study.
iii. Sourcing of secondary data from all the concerned was not equal.
iv. The study was launched very late in Bihar & Jharkhand states due to late deployment of field personnel that too for very short period (35 days).
v. The Centre also needs capacity of research faculties and infrastructure building in adoption of modern techniques of evaluation.
vi. Farmers' presumptions prevail in collection of data due to lack of recording of information and data related to agricultural operations, etc.

5.6 Rainfall and Growth in Area, Production and Yield of Rice and Wheat in Bihar & Jharkhand

5.6.1 Bihar

5.6.1.1 A Brief Profile of the State

Bihar is the third most populous state in India with a population of 10,38,04,637 persons {(Census – 2011 (P)}, contributing 8.58 per cent to total population of the

country. Out of the total population 52.20 per cent are male and 47.80 per cent female. The state is a densely populated region, with no less than 11.02 persons living per sq. km of its area, which is much above the national average (3.82 persons/sq km). About 41.40 per cent of the population lived below poverty line (Planning Commission in 2004-05).

Traditionally, Bihar's economy is dominated by the agricultural sector. The state has a geographical area of 93.60 lakh hectares. Bihar falls in the riverine plane of the Ganga basin area. Because of the topographical nature, the proportion of total land put to agricultural use here is high as compared to other states of India. In 2008-09 the area under forest was at 6.60 per cent and the area under non-agricultural use at 17.80 per cent. The area under net sown area is 59.60 per cent. Cropping intensity is 1.38 per cent. The total irrigated area is 49.20 hectares that accounts for about 88.00 per cent of the net sown area. But the irrigation efficiency of MMI schemes was 42.50 per cent in 2010-11.

5.6.1.2 Rainfall

The quantum of rainfall and its distribution are positively correlated with agricultural production. The yearly actual rainfall during 2010-11 & 2011-12 was 943.4 mm and 1226.0 mm respectively in Bihar. However, it is 861.1 mm in 2010-11 and 1128.2 mm in 2011-12 in BGREI districts whereas in NFSM districts these were 968.3 mm and 1323.7 mm respectively. It reveals that in BGREI districts, it is lower than the states actual rainfall whereas that of higher in NFSM districts during 2010-11 & 2011-12.

5.6.1.3 Area Production and Yield of Rice Crop in BGREI Districts

The Compound Growth Rate (CGR) of rice area in BGREI districts showed decline of (-) 3.00 per cent in 2010-11 and (-) 2.00 per cent in 2011-12 and that of in NFSM districts were (-) 1.20 per cent in 2010-11 and (-) 0.10 per cent in 2011-12. These were (-) 0.50 per cent in 2010-11 and (-) 0.20 per cent in 2011-12 in all-India and (-) 2.40 per cent and (-) 1.30 per cent respectively in Bihar. As regards the CGR of rice production in BGREI districts, it indicates a decline of (-) 5.10 per cent in 2010-11 and increase of 1.60 per cent in 2011-12. The CGR of rice production in NFSM districts

were (-) 0.30 per cent and an increase of 8.80 per cent in 2010-11 & 2011-12 respectively These were at all-India level 0.30 per cent and 1.30 per cent and in Bihar (-) 3.80 per cent and 3.70 per cent in 2010-11 and 2011-12 respectively. The CGR of rice yield in BGREI districts was (-) 2.10 per cent in 2010-11 and 3.60 per cent in 2011-12 whereas that of 0.90 per cent and 9.00 per cent respectively in NFSM districts. However, these figures were 0.90 per cent and 1.50 per cent in 2010-11 and 2011-12 at all-India level and (-) 1.40 per cent and 5.10 per cent in Bihar. It reveals that decline in CGR of rice area is higher in BGREI districts compared to Bihar & all-India figures. In case of CGR of rice production during 2010-12, it has increased in BGREI districts, Bihar state and all-India level too. But it higher in the state followed by BGREI districts and all-India level.

5.6.1.4 Area, Production and Yield of Wheat Crop in BGREI Districts

The CGR of wheat area in BGREI districts reveals exponential growth of 3.10 per cent during Rabi 2010-11, which came down to 2.50 per cent in Rabi 2011-12 but that of in NFSM districts, Bihar state and all-India level is much lower in both the years The CGR of wheat production in BGREI districts indicates exponential growth of 4.10 per cent during Rabi 2010-11 which came down to 4.00 per cent in Rabi 2011-12 but that of in NFSM districts and Bihar state is higher in both the years. The CGR of wheat yield in BGREI districts indicates exponential growth of 7.60 per cent during Rabi- 2010-11, which came down to 6.50 per cent in Rabi 2011-12 but that of in NFSM districts, Bihar state and all-India is much lower.

5.6.2 Jharkhand

5.6.2.1 A Brief Profile of the State

Jharkhand state was carved out from Bihar in 2000. It has a geographical area of 79.71 lakh hectare with a population of 329.66 lakh (Census-2011 (P), contributing 2.72 per cent of total population of the country. Out of the total population 51.36 per cent are males and 48.64 per cent females. The population density is 414 persons per square km. Jharkhand are mostly rural with 78.00 per cent of the state's population residing in villages. According to NSSO 61st round (2004-05) and Planning Commission, the incidence of poverty is estimated at 40.3 per cent in the state, as compared to national average of 27.5 per cent. Population of the state consists of

about 28 per cent scheduled tribes, 12 per cent scheduled castes and 60.00 per cent others. Out of the total geographical area 28.08 per cent are net sown area, 29.20 per cent forests, and 8.60 per cent is in non-agricultural uses. The percentage of irrigated area is about 9 per cent and the cropping intensity is 116 per cent. The state comes under agro-climatic zone – VII and in zones XII & XIII as per agro-ecological characteristics of the country.

5.6.2.2 Rainfall

There is enormous variability in rainfall pattern over time and space impacting agriculture production adversely in Jharkhand state. The state receives rainfall of about 1200-1500 mm/annum. The yearly actual rainfall in Jharkhand is 806.1 mm and 1190.8 mm respectively. However, it is 751.6 mm in 2010-11 and 1287.6 mm in 2011-12 in BGREI districts whereas that of 792.4 mm and 1093.9 mm in NFSM districts respectively.

5.6.2.3 Area, Production and Yield of Rice Crop in BGREI Districts

The CGR of rice area in BGREI districts showed a decline of (-) 15.00 per cent during 2010-11, which further slowed down to (-) 6.80 per cent in 2011-12 due to deficient and erratic distribution of rainfall in the state. The CGR of rice area in NFSM districts, Jharkhand state and all-India level showed decline in both the years These figures are (-) 9.10 per cent and (-) 3.00 per cent in NFSM districts, (-) 12.30 per cent and (-) 5.10 per cent in Jharkhand state and (-) 0.50 per cent and (-) 0.2 per cent at all-India level during the years 2010-11 & 2011-12. The CGR of rice production in BGREI districts showed reduction of (-) 13.00 per cent during 2010-11, which came down to (-) 3.60 per cent in 2011-12. In NFSM districts, these figures were (-) 5.90 per cent and 1.50 per cent whereas that of in Jharkhand state was (-) 9.90 per cent and (-) 1.40 per cent respectively. But the CGR of rice yield in BGREI districts indicated an increase of 2.40 per cent and 3.50 per cent in 2010-11 and 2011-12 respectively. In case of NFSM districts, Jharkhand state and at all-India level, these have also increased in both the years but the increase is higher in NFSM districts and Jharkhand state compared to BGREI districts.

5.7 Variability in APY of Rice and Wheat in BGREI and NFSM Districts in Bihar & Jharkhand

To analyze the comparative scenario of Area, Production and Yield in BGREI and NFSM districts prevailing in Bihar & Jharkhand states, the relevant data has been presented in table No. 5.1. It could be seen from the referred table that BGREI districts are more vulnerable in terms of area, production and yield deceleration as compared to NFSM districts. This clearly reveals that NFSM programme has greater sustainability in all three aspects viz., area, production and yield as compared to BGREI districts. The reasons for area production and yield deceleration in rice may be due to deficient and erratic distribution of rainfall, floods and drought besides increasing land use for non-agricultural purposes. In table No. 5.2, the relevant data on APY of wheat crop for Bihar state have been presented. It reveals that sustainability aspect in wheat cultivation in BGREI districts of Bihar is stronger especially in wheat production in NFSM districts, which may be the impact of greater national level concerns.

Table No. 5.1: CGR of Area, Production & Yield of Rice Crop in BGREI & NFSM Districts during 2010-11 & 2011-12 in Bihar & Jharkhand States (Base year QE: 2009-10)

State	2010-11*			2011-12*		
	BGREI Districts	NFSM Districts	Whole State	BGREI Districts	NFSM Districts	Whole State
AREA						
Bihar	(-) 3.0	(-) 1.2	(-) 2.4	- (2.0	(-) 0.1	(-) 1.3
Jharkhand	(-) 15.0	(-) 9.1	(-) 12.3	(-) 6.8	(-) 3.0	(-) 5.1
PRODUCTION						
Bihar	(-) 5.1	(-) 0.3	(-) 3.8	1.6	8.8	3.7
Jharkhand	(-) 13.0	(-) 5.9	(-) 9.9	(-) 3.6	1.5	(-) 1.4
YIELD						
Bihar	(-) 2.1	0.9	(-) 1.4	3.6	9.0	5.1
Jharkhand	2.4	3.4	2.8	3.5	4.6	3.9

*Source: Extrapolated from *Final estimates **4th Advance estimates, DES, MoA, GoI.*

Table No. 5.2: CGR of Area, Production & Yield of Wheat Crop in BGREI & NFSM Districts during 2010-11 & 2011-12 in Bihar (Base Year QE : 2009-10)

State	2010-11*			2011-12*		
APY	BGREI Districts	NFSM Districts	Whole State	BGREI Districts	NFSM Districts	Whole State
Area	3.1	0.4	1.3	2.5	0.4	1.1
Production	4.1	5.2	4.8	4.0	5.1	4.7
Yield	7.6	4.7	3.5	6.5	4.7	3.6

*Source: Extrapolated from *Final estimates ** 4th Advance estimates, DES, MoA, GoI.*

5.8 Results & Discussion

5.8.1 Structure of the BGREI Programme in 2010-11 & 2011-12

The component and intervention specific structure of BGREI Programme in both the states are as below:

Table No. 5.3: Component Specific Structure of BGREI Programme during the year 2010-11 based on percentage share in total expenditure in Bihar & Jharkhand.

Sl.	Components	Bihar	Jhakhand
1	Crop demonstrations	30.5%	1.2%
2	Induced Agricultural Inputs supply	27.0%	1.3%
3	Farmers & Staff trainings, Farmers fair, farmers study visits.	4.6%	0.5%
4	Water asset building	17.9%	89.3%
5	Improved farm equipments & machinery.	0.0%	7.5%
6	Seed multiplication	0.0%	0.2%
7	Soil amelioration	11.8%	0.0%
8	e-pest surveillance	0.0%	0.0%
9	Soil & water resources conservation	0.0%	0.0%
10	Sugarcane Industry Department	6.8%	0.0%
11	Contingencies	1.4%	0.0%
12	Monitoring	0.0%	0.0%
Total		100%	100%

Table No. 5.4: Intervention specific composition of BGREI program during the Year: 2011-12 in Bihar & Jharkhand *(In %).*

Sl.	State	Block Demonstrations	Water Asset building	Site specific activities	Total
1.	Bihar	61.80	38.20	0.00	100.00
2.	Jharkhand	30.90	0.00	69.10	100.00

5.8.2 Performance Index of Technical Backstopping

As per the Situational Agricultural Survey – 2003 (NSS Report No 499/2003), the extent of accessing technical knowhow from all the sources was 40.00 per cent, whereas in 2011-12, 55.00 per cent of BGREI beneficiaries as revealed from the study, have availed the technical knowhow of agriculture from different sources. The agency specific access to technical backstopping under BGREI in 2011-12 in both the states may be seen in table below:

Table No. 5.5: Consolidated Performance Index (%) of Agency Specific access to Technical Backstopping under BGREI in 2011-12 in Bihar & Jharkhand.

SN	Parameter	Bihar	Jharkhand
1.	Extension Worker	70	28
2.	Progressive Farmers	11	62
3.	Krishi Vigyan Kendra	19	10
4.	State Agricultural University	00	00

Source: Field Survey - 2012

The findings of this study are also in agreement with regards to the observation that there was regional difference in accessing information to the observation made in earlier NSSO study.

5.8.3 Change in Cropping Intensity

There has been increase in cropping intensity in respect of BGREI beneficiaries in both the states, which may be seen in table below:

Table No. 5.6: Change in Cropping Intensity in BGREI districts in Bihar & Jharkhand in 2011-12 over 2010-11.

Type of farmers	Cropping intensity (%)		Extent of change	Remarks
	2010-11	2011-12		
State: Bihar				
Beneficiary	159.16	162.48	3.32 (2.09%)	Marginal increase
Non-beneficiary	158.64	160.44	1.80 (1.13%)	Marginal increase
State: Jharkhand				
Beneficiary	140.52	144.18	3.66 (2.6%)	Marginal increase
Non-beneficiary	149.21	147.42	-1.79 (-1.2%)	Marginal decrease

Source: *Field Survey-2012,* ***Marginal increase:*** *Below 3%,*
Significant increase: *Above 3% to 25%; and* ***Marginal decrease:*** *up to below -3%.*

5.8.4. Yield Gap in Rice

The yield gap analysis in rice crop among beneficiaries and non-beneficiaries reveals that wide gap exists in both the states. The calculation of yield gap is normally done on the basis of yield obtained on the farmers' field or farmers yield and the potential yield of some particular varieties. Table below presents the yield gap in both the states:

Table No. 5.7: Yield gap in paddy compared with farmers' yield and Potential yield in Bihar.

Crop	Potential yield (kg/ha)	Beneficiaries		Non-beneficiaries	
		Actual yield (KG/ha) (2011-12)	Yield gap	Actual yield (KG/ha) (2011-12)	Yield gap
State: Bihar					
Kharif Paddy	7000	3870	-31.30 (-44.71%)	3449	-3551 (-50.73%)
State: Jharkhand					
Kharif Paddy	5200	2979	-2221 (-42.71%)	2177	-3023 (-58.13%)

Source: *Field Survey-2012.*

NB: *i. Potential Yield has been considered of rice varieties in Bihar --- DRH – 775 & MTU-1010.*

ii. Potential Yield has been considered of rice varieties in Jharkhand – Birsa Dhan- 108 & BPT- 5204.

iii. Yield gap is given in absolute terms (i. e. Kg/ha) as well as per cent gap.

5.8.5 Concentration Ratio of Block Demonstration Clusters of Rice

The concentration ratio of demonstration clusters of rice at different levels has been computed on the basis of 1,000 ha size of clusters to assess the outreach of the crop production technology. The size of each demonstration was uniformly 0.40 ha throughout the State. Bihar State had followed *"Dispersed"* approach instead of cluster approach. All the demonstrations organized in Bihar State were SRI demonstration devoid of ecological consideration. The concentration ratios of the demonstration clusters in Jharkhand state in respect of blocks (0.39), Gram Panchayats (0.069) and villages (0.0212).

5.8.6 Perception of beneficiaries

The farmers' views were obtained on the BGREI program in terms of its adequacy in meeting their needs for rice & wheat cultivation covering the aspects namely; adequacy of supply of agriculture inputs for Block demonstrations of rice and wheat, program rating as a whole, delivery of technical backstopping and which agency guided the best, preference for sourcing of agricultural inputs and problems faced in marketing of agriculture produce. The responses so gathered are presented in table No. 5.8.

Table No. 5.8: Perception Profile of BGREI beneficiaries about the programme (%) in Bihar & ` Jharkhand

State	Supply of Inputs		Programme rating			Technical backstopping	Who guided the best					Preference for Source of Inputs			Problems in Marketing	
	Adequate	Inadequate	Poor	Average	Good		KVK	SAU	CRRI	SDA	PF	Licensed dealers	Coop Society	SDA Outlets	Transportation, etc.	Lower Price than MSP
Bihar	60	40	00	42	58	72	8	00	00	70	22	100	00	00	44.00	72.00
Jharkhand	62	38	00	42	58	80	12	00	00	50	38	100	00	00	14.94	28.36

Source: Field Survey - 2012

5.8.7 Determination of the impact of inputs on total yield

In order to determine the impact of various inputs on total yield, an analysis has also been made to find out the factors determining yield of paddy. For this purpose, multiple regression exercise was carried out. Yield per hectare has been taken as *"dependent variable"* and the *"predictor (independent) variables"* including both continuous and dummy variables. The continuous variables are value of seeds used per hectare, value of micro-nutrients used per hectare and other costs (inclusive of fertilizers, plant protection chemicals etc.) per hectare. The dummy variables include ecological dummies for rainfed upland, rain-fed medium, rainfed deep water and irrigated ecology. The state wise impact of inputs in to the total yield of paddy is given below in table 5.9.

Table 5.9: Determination of the impact of inputs in the total yield of paddy in *Kharif* - 2011 in Bihar & Jharkhand

Factors/Interventions	Summary of multiple regression	
	Bihar	**Jharkhand**
R^2	**0.203**	**0.303**
Adjusted R^2	**0.120**	**0.231**
SE of Estimate	**269.282**	**192.094**
Dependent Variable: Yield (Kg/ha.)		
Coefficients of independent variable:		
Constant	3239.284	2385.034
Costs of Seed per hectare(Rs.)	-0.173	-0.323
Costs of Micro-nutrients per hectare (Rs.)	0.377	0.090
Other Costs per hectare (Rs.)	0.034	0.032
Dummy for rainfed Upland ecology	-214.19	104.137
Dummy for rainfed shallow low land ecology	-52.426	12.616
Dummy for rainfed medium deep water ecology	-5.828	92.809
Dummy for rainfed Deep Water ecology	57.269	-77.886
Dummy for HYV Irrigated ecology	-	-
Dummy for Irrigated –hybrid ecology	-	-
Dummy for Irrigated-Traditional ecology	-	-

Source: *Estimated from Field data*

5.8.7.1 Bihar

The predictor variables for variation in yield rate (table- 5.9) found statistically significant are meant for micro-nutrients and other costs, both showing a direct relationship with productivity (both significant at 0.05 levels). Micro-nutrients per hectare have a positive coefficient suggesting that higher the value of micro-nutrients used per hectare, higher the productivity. This implies that provision of micro-nutrients under the program has significantly contributed to increased yield of paddy. At the same time the significant positive coefficient of costs other than seeds and micro-nutrients (tagged here as 'other costs') in turn indicates that there is much scope for further application of other inputs in cultivation. It should be noted that no other predictor variable has shown significant impact on productivity, including the dummy variables introduced for specific ecological regions. This indicates that variation in ecology does not have significant impact on the productivity. The implication has been that the program should focus more on proper distribution and application of micro-nutrients for the improvement of productivity of the crops.

5.8.7.2 Jharkhand

The predictor variables of 'other costs' are found statistically significant; suggesting that higher use of other inputs other than seed and micro-nutrient result in higher levels of productivity. This however does not establish the affectivity of the BGREI program through its intervention in seed and micro-nutrient provisions. At the same time, all the ecological dummies turned out to be statistically insignificant accompanying with varying degrees of the coefficients. This confirms that ecological variation in Jharkhand does not have any significant impact on the productivity of the crop (table 5.9).

5.8.8 Progress of Financial Utilization under BGREI during 2011-12

The overall utilization of funds in 2011-12 was 73% in Bihar and 97% in Jharkhand.

5.8.9 Monitoring Status

Monitoring of BGREI program for extending technical backstopping was decided to be carried out by the nominated scientists of ICAR-SAU formations under overall supervision of CRRI-Cuttack. The outcome of the field visits based on the reports received from ICAR-SAU formations is presented below in table 5.10.

Table 5.10: Field visits undertaken by the Scientists of ICAR-SAU during 2011-12 in Bihar & Jharkhand

Sl.	State	Total districts	Number of districts visited by ICSR-SAU		
			CRRI	SAUs	Total
1.	Bihar	29	1	Not Reported	1
2.	Jharkhand	17	3	Not Reported	3

Source: BGREI cell, DAC, GoI;

5.8.10 Monitoring by Central Steering Committee (CSC)

The staff members of BGREI Cell have visited the 19 BGREI districts in Bihar out of 20 districts during *Kharif* -2011 and 09 districts in Jharkhand out of 17 districts (table 5.11).

Table 5.11: Field visits by BGREI Cell for monitoring of BGREI program during Kharif – 2011 in Bihar & Jharkhand.

Sl. No.	State	*Kharif*-2011		
		Total districts	Visited districts	% visited districts
2.	Bihar	20	19	95%
4.	Jharkhand	17	9	53%

**Some BGREI components across all the districts in Chhattisgarh State.*
Source: BGREI Cell, DAC, GoI.

5.8.11 Conclusion

- Significant increase in grain yield of rice has been witnessed in the Block Demonstrations under BGREI;
- BGREI program has narrowed down the yield gap across rice ecologies;
- Water asset building component under BGREI Program has resulted in increased Cropping Intensity;
- Progressive farmers proved the most viable link between Extension machinery and linked beneficiary farmers;
- Technical backstopping was largely extended by State Extension Workers;
- Farmers perception gathered during the study revealed that BGREI program was one of the best programs in terms of adequacy of Input package/technology dissemination, and;
- Problem of marketing of harvested produce and low market prices still persists.

CHAPTER – VI

RECOMMENDATIONS AND POLICY SUGGESTIONS

On the basis of the findings of this study, following recommendations and suggestions emerged:

6.1 Bihar

i. The state has high potential for yield enhancement of rice, so seeds and technology should be made available as per the suitability of agro-ecologies of the region/sub-regions. ***(Attn.: Directorate of Agriculture, Government of Bihar).***

ii. Irrigational infrastructure in the state requires transformation. Irrigational facilities should be given in a way to ensure access of water to all farms. ***(Attn.: Dept. of Water Resources & Department of Agriculture, Government of Bihar).***

iii. Agriculture marketing is a big challenge in the state. It should be looked here on priority basis. There is urgent need to develop the rural agriculture markets to urban agri-marketing centres. ***(Attn.: Dept. of Agriculture, Govt. of Bihar).***

iv. Delivery of recommended agri-inputs should be made available in time. ***(Attn.: Directorate of Agriculture, Govt. of Bihar).***

v. Package of practices as prescribed under BGREI programme must be attended. ***(Attn.: Directorate of Agriculture, Govt. of Bihar &KVKs of the respective districts).***

vi. There is need of co-ordination for technical back stopping between KVK, ATMA & District/Block Extension machineries. ***(Attn.: Directorate of Agriculture, Government of Bihar).***

vii. Coverage in terms of area and number of beneficiaries under the BGREI programme should be expanded and increased. ***(Attn.: Directorate of Agriculture, Government of Bihar).***

viii. Greater emphasis on site specific interventions should be given. ***(Attn: Directorate of Agriculture, Government of Bihar).***

ix. Use of conoweeder, drum seeder and other implements should be promoted. ***(Attn.: Directorate of Agriculture & Directorate of Extension, Government of Bihar).***

x. There is need for capacity building of progressive and beneficiary farmers. ***(Attn.: Directorate of Agriculture, Government of Bihar).***

xi. There is need of improvement in monitoring, evaluation and documentation. ***(Attn. BGREI Cell, Dept. of Agriculture, Government of Bihar)***

6.2 Jharkhand

i. The state has large potential of yield enhancement of rice. In view of its potentiality inputs like seeds and technology should be made available as per the suitability of agro-ecologies of the region/sub-regions. ***(Attn.: Directorate of Agriculture, Government of Jharkhand).***

ii. Timely delivery of recommended agri-inputs under BGREI programme should be ensured in one go. ***(Attn: Directorate of Agricuture, Govt. of Jharkhand).***

iii. There is need to establish co-ordination between the BGREI programme implementing agencies to ensure the quality of deliverables. ***(Attn.: BGREI Cell, Dept. of Agriculture, Government of Jharkhand).***

iv. Use of implements made under the BGREI programme should be promoted. ***(Attn.: Directorate of Agriculture, Government of Jharkhand).***

v. Coverage in terms of area and number of beneficiaries under the BGREI programme should be expanded and increased respectively. ***(Attn.: Directorate of Agriculture, Government of Jharkhand).***

vi. Infrastructure created under water asset building should be functional. Some disputes were found in course of field survey, which should be settled with for smooth functioning of the scheme. ***(Attn.: Directorate of Soil Conservation, Dept. of Agriculture, Govt. of Jharkhand).***

vii. Strengthening of co-ordination for technical backstopping between KVK, ATMA and State extension functionaries is required. ***(Attn.: Directorate of Agriculture, Government of Jharkhand).***

viii. Improvement in monitoring, evaluation and documentation is urgently needed. ***(Attn.: Directorate of Agriculture, Government of Jharkhand).***

ix. Problem of marketing of agriculture produces still persists in the state, which should be suitably addressed. ***(Attn.: Department of Agriculture, Government of Jharkhand).***

x. Irrigational water available at the field/micro level should be utilized by way of connecting their sources with to crop fields. ***(Attn.: Dept. of Water Resources & Directorate of Soil Conservation, Govt. of Jharkhand).***

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Annexure - I

Co-ordinator's Comments on the Draft Report

"End-term Evaluation of BGREI Programme in Bihar & Jharkhand"
Agro-Economic Research Centre for Bihar & Jharkhand
T M Bhagalpur University, Bhagalpur

Thank you very much for sending the draft report. We have gone through the report with interest and the overall report reads well. However, we have some specific comments/suggestions to offer which are to be incorporated before finalization of the study report.

Date of receipt of the draft report	:	*05/03/2013*
Date of sending the comments on the draft report	:	*26/03/2013*

Chapter – 2
The analysis presented in this chapter is quite good. The author however should present the desired concentration table in the prescribed table format supplied to the participating centres. Needless to mention, it is needed for maintaining the uniformity in the study.

Chapter – 4
For the determination of impact of inputs in the total yield of paddy, the author has run regression equation. However, the model used has failed to identify the determinants. Under the circumstance, some more variables could be incorporated so that we can get some meaningful results. The state average yield has been used to calculate the yield gap (table 4.8). It could have been better if potential yield is used rather than state average yield for calculation of yield gap.

Chapter – 5
In policy implications, please mention the name of the agency/department that is to take the policy action.

Hony. Director
Agro-Econmic Research Centre
Visva-Bharati
Santiniketan

Annexure - II

Action Taken Report (ATR)

Title of the Study : **End-term Evaluation of the Implementation of BGREI Programme in Bihar & Jharkhand**

Date of receipt of the Comments : 04/04/2013

Chapter – 2

Tables relating to Concentration Ratios have been incorporated as 4.11 (A) & 4.11 (B) and placed at page No. 56 & 57 respectively.

Chapter – 4

In order to determine the impact of various inputs on total yield of paddy, multiple regression analysis has been made. The variables used for this analysis are seeds and micro-nutrients. It was done for maintaining the uniformity in the study. So at this stage any change/addition in such variables will affect uniformity aspect.

To calculate the yield gap (tables 4.8 & 4.9), potential yield has been used, as suggested, in place of state's average.

Chapter – 5

Name of the agency/department has been incorporated in the policy implications.

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