Department for International Development

Final Report: Measuring Socio-economic and Bio-physical Outcomes of MGNREGS Works

February 2020

Infrastructure for Climate Resilient Growth in India (ICRG) Programme

Submitted By:

IPE GLOBAL
Expanding Horizons. Enriching Lives.

IPE GLOBAL LIMITED
IPE Global House,
B - 84, Defence Colony,
New Delhi - 110 024, India
www.ipeglobal.com

In association with

Ricardo Energy & Environment

pwc

MANCHESTER 1824
The University of Manchester

Table of Contents

1. About ICRG

Infrastructure for Climate Resilient Growth (ICRG) programme aims at demonstrating adaptation and strengthening the resilience and livelihood security of the rural poor in India, by supporting construction of better quality and more productive infrastructure under the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) - the world's largest government funded social protection programme. MGNREGS guarantees 100 days of unskilled wage labor on demand from the poor during lean agriculture time. The programme targets some of the poorest and most vulnerable people in the states of Bihar, Odisha and Chhattisgarh especially poor women, improving their resilience to climate induced adverse agriculture seasons and making their livelihoods more secure.

The Technical Assistance being provided at national and state levels focusses on generating evidence to:

- **Strengthen the capacity of the administrative and technical staff** in the state governments (Bihar, Odisha and Chhattisgarh) and local implementation agencies to better plan, build and monitor the construction of physical assets under MGNREGS
- **Building a stronger policy focus** on the design and implementation of infrastructure under MGNREGS
- **Strengthening MGNREGS systems and processes** to ensure better delivery, including the development of innovative, especially IT based, tools
- **Improving the evidence base** on how better physical assets can support livelihoods that are more resilient to flood, drought and high temperature

2. Report Objectives and Scope

Several studies point out that MGNREGA works address the underlying causes of vulnerability, such as lack of irrigation, decrease in forest cover, poverty and marginalization, and contribute to enhancing the resilience of communities that depend on such works. Despite this, the MGNREGA monitoring and information system currently does not capture these benefits accruing from the works. It merely measures inputs and outputs such as person days generated, number of assets created, expenditure etc.

The ICRG programme developed an M&E framework and implemented it on-ground to derive outcome level evidence base and demonstrate how the MGNREGA programme improves socio-economic well-being of people, and simultaneously improves bio-physical parameters of their local area.

The M&E Framework developed under the ICRG programme in mid-2017 was executed in 2018 for climate resilient works (CRWs) till 2017-18 and again to collect baseline data and benchmark the outcomes – socio-economic and bio-physical. The framework was subsequently re-administered in 2019 to establish a comparison with the previous data and draw some inferences on whether the proposed framework could be a tool to measure resilience outcomes.

The comparisons indicate that there is merit in the framework and methodology and focus now needs to move to deciding on how such an impact assessment design could be scaled up for successful adoption by Ministry of Rural Development, across the country.

The following table summarises the expected outcomes from the different types of works included as a CRW:

CRW - MGNREGA Works	Economy	Durability	Outcome/Productivity
Water conservation and water harvesting works	Cost of construction per unit of storage of water/unit area benefitted	Pucca work: 15-25 years Kaccha work: 5-10 years	• Number of wells recharged • Area brought under irrigation • Cropping intensity • Increase in production • Increase in groundwater level/table • Change in land use
Afforestation and tree plantation	Cost per unit area/plant till the tree grows (3-4 years)	Afforestation trees, 15-25 years	• Economic (fodder, fruits etc.) • Plant survival rate • Carbon content
Irrigation canal including micro and minor irrigation	Cost per unit area brought under irrigation	15-25 years	• Increase in productivity in a year by taking number of crops in a year
a) Irrigation facility/horticulture/plantation b) Farm bunding/land development	Cost per unit area brought under irrigation/plant till its productive/unit area developed	a) 15 -25 years b) 10-15 years	• Area covered under irrigation/plantation/land development • Increase in productivity in a year by taking number of crops in a year
Renovation/repair of traditional water bodies including de-silting of tanks	Cost per unit increase in storage capacity of water/silt removed	10-15 years	• Increase in storage capacity of water • Increase in groundwater table
Flood control and flood protection works	Cost per unit area developed	10-15 years	• Area developed • Increase in productivity per annum
Land development	Cost per unit area developed	15-25 years	• Area developed • Increase in productivity /annum

3. Survey Framework

The bio-physical and socio-economic survey formats were administered twice:

1. In July 2018 to capture production and productivity patters in the previous cropping seasons – Kharif (July to October 2017); Rabi (October 2017 to March 2018) and Zaid (March to June 2018) at CRW sites of 2016-17 and 2017-18.
2. In October – November 2019 where production and productivity in the previous cropping seasons from Kharif, Rabi and Zaid in 2018-19 were captured.

The survey was carried out with the farmers at the 432 CRW sites that were identified in 2017-18.

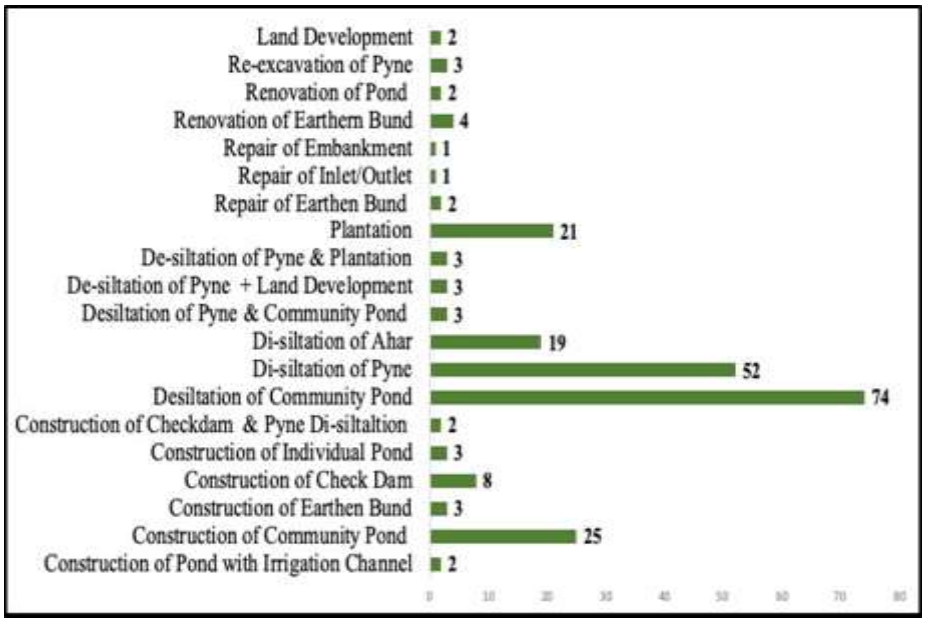
a. Sample size: 14757 households were expected to directly benefit from the 432 sites that were identified since 2016 in all three states. With 99% confidence interval and 2.5% margin of error required sample size is 2399.
b. Sample: 9 farmers in Bihar, 5 in Odisha and 2 farmers in Chhattisgarh were interviewed at each of 432 work sites.
c. Sample frame: sample frame consisted of list of beneficiaries and their land holdings in the command area of the proposed CRW. Farmers selected were those with small and marginal land holdings via random number generation.
d. Surveyor and survey execution: the survey was conducted by the Block Community Mobilizers.

This report presents the findings of the surveys. The analysis of the survey on plantations is limited only to October-November 2019 because this information was not collected at the baseline survey. At that time the number of plantation works was limited, and this was not a statistically significant sample for benchmarking.

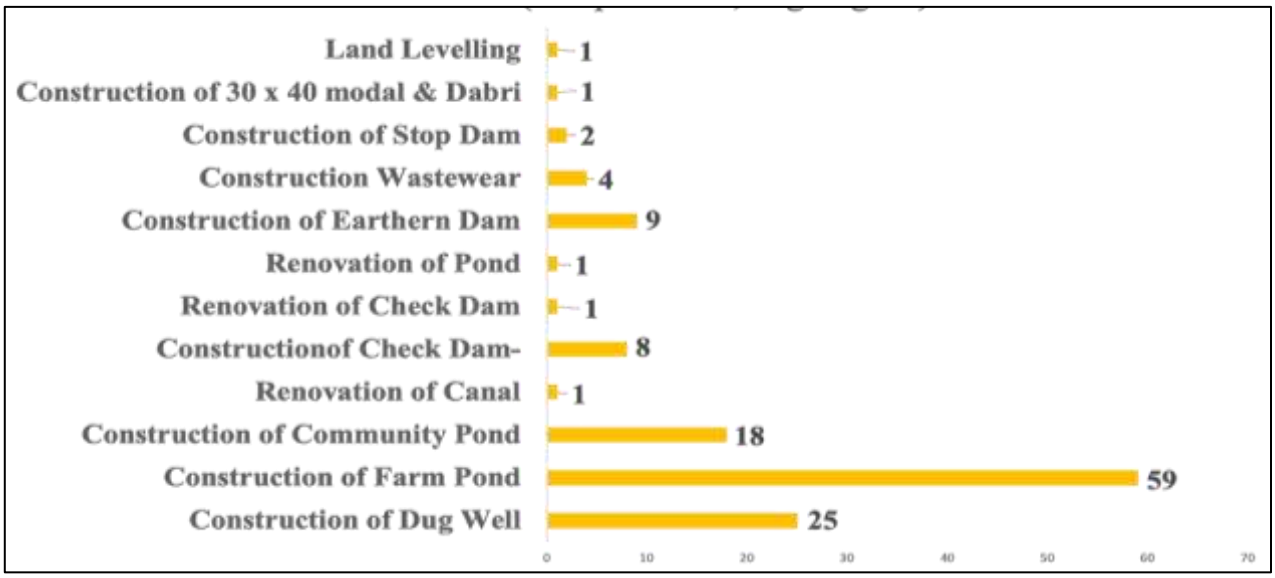
4. Climate Resistant Works (CRWs)

Climate Resistant Works (CRWs) as defined under ICRG are a composite of works with a main structure and a host of ancillary works. The ICRG programme's premise is that construction of these works in the proposed phases and as per the design will contribute to improving resilience. The details of the CRWs in each of the states is as follows.

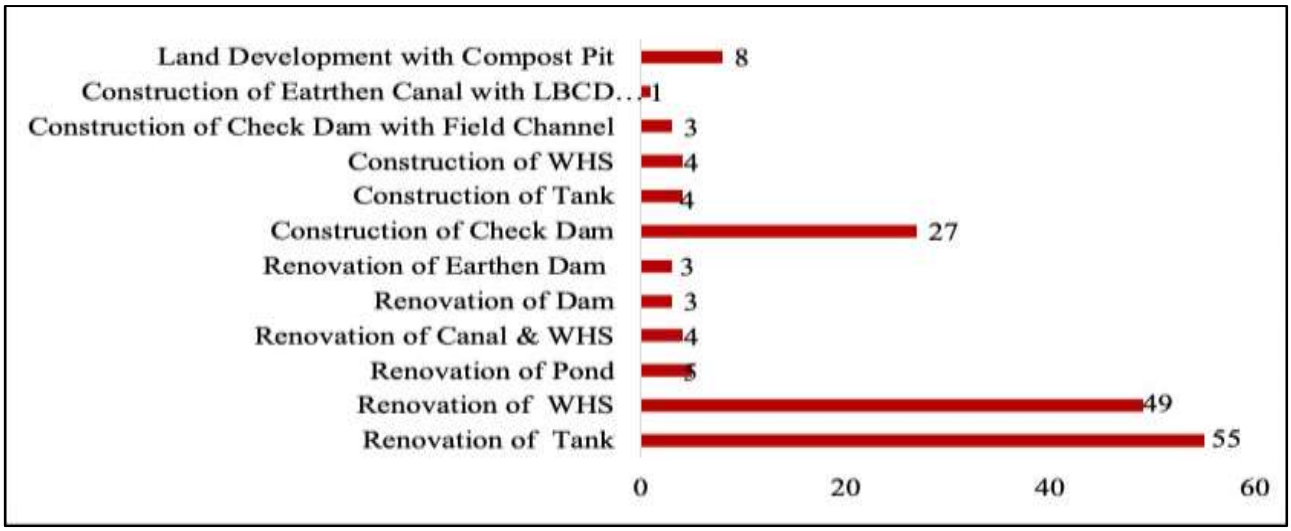
There were 233 CRWs constructed in **Bihar** where the preference was for de-siltation of the traditional water conservation and distribution systems – the ahar-pyne.



In **Chhattisgarh**, 130 CRWs were constructed with a preference for farm ponds.



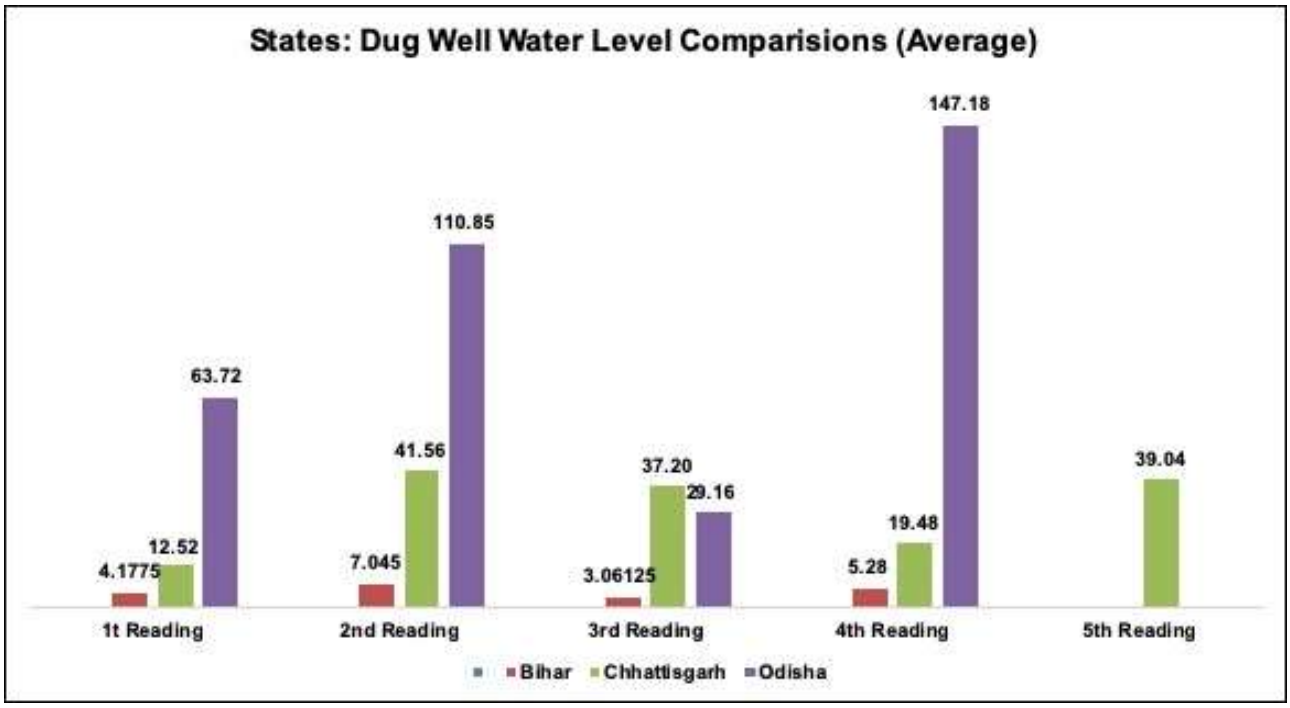
In Odisha, 166 CRWs were constructed with a preference for renovation of water harvesting structures and tanks.



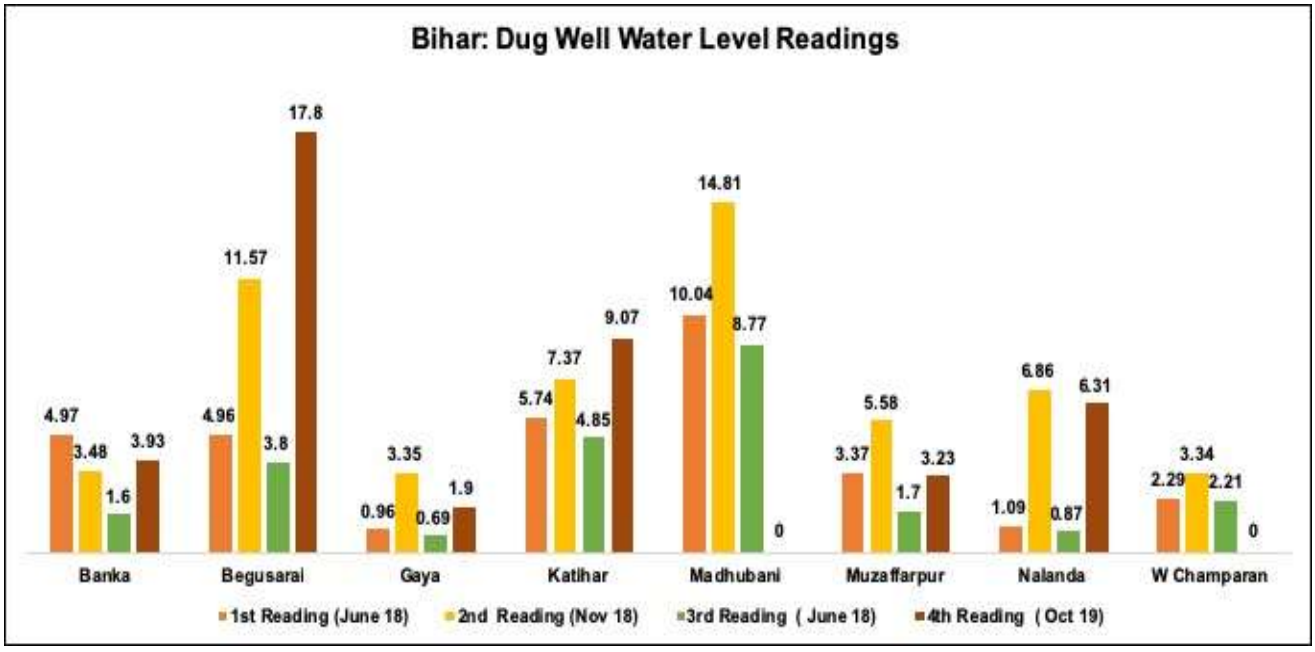
5. Bio-Physical Indicators

A. Dug well data analysis

The Dug Well readings were collected during the pre-monsoon and post-monsoon phases to understand the impact of CRWs on water levels in wells. States have taken 4 -5 readings.
The chart below compares the status of dug well water levels across the states.



In 2019, following the construction of CRWs, water level readings were collected for 89 Blocks in 22 Districts of the 3 States. **In Bihar**, data was collected from 230 dug wells in the vicinity of the CRW in 32 Blocks. Readings were taken from wells at an average distance of 226 m from a CRW.

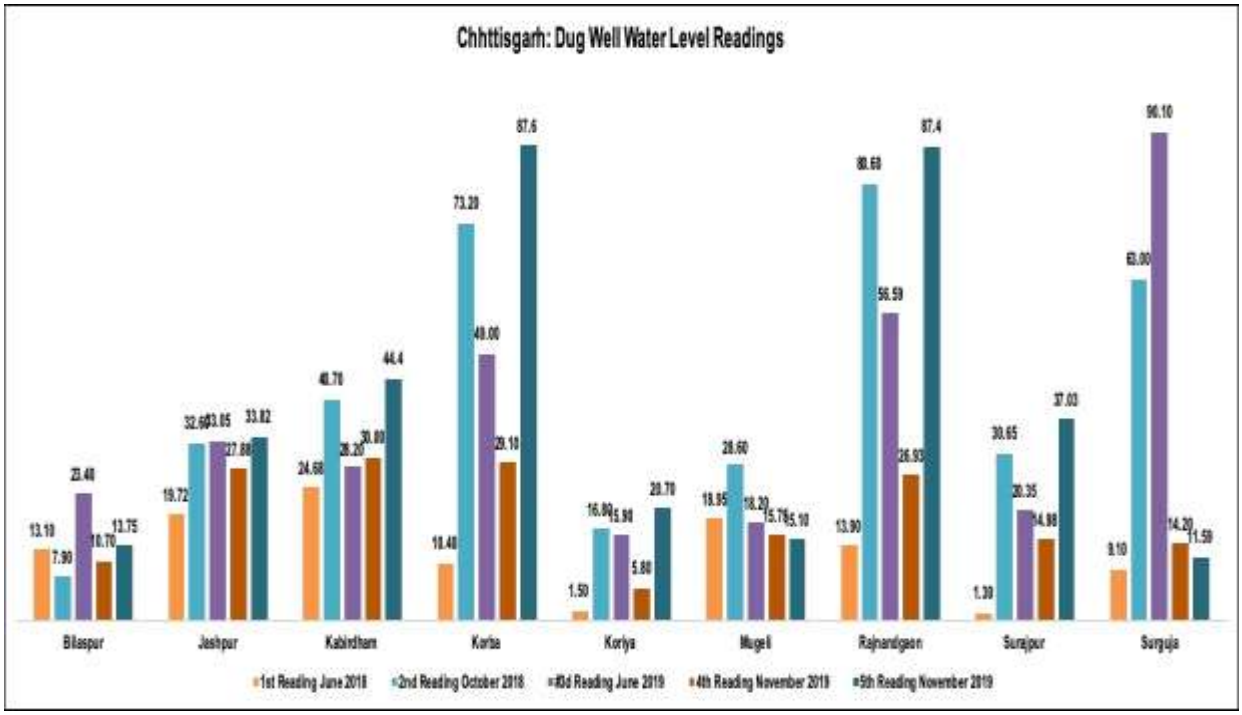


The inferences from the analysis of the data for the state shows the following:

- Compared to the average water level recorded in the Baseline (2018) at 7.06m, survey done in 2019 records levels at 7.93m – an increase of 0.87m. Although there has been an increase in the water level (on an average) there are inter-district variations.

- Droughts we witnessed in Banka, Gaya and parts of Nalanda. While the state government declared measures to combat the situation, the timing of the survey was such that the impacts of these measures were yet to be perceived. However, the survey had to be done at the specified time in order to maintain consistency therefore, there are abrupt trends in water levels recorded in these districts.
- In Madhubani and W. Champaran districts, no new works were started as per the order of the District Magistrate therefore, the 4th reading is recorded as '0'.
- Districts in S. Bihar – Gaya and Nalanda are witnessing a shift in rainfall patterns with very long dry spells in September-October and heavy rainfall in November-December. In the last two years, about 30% of the volume of rainfall in these districts was in November-December. The readings for this survey were taken in October to maintain consistency and this is another factor for the lower water levels.

In Chhattisgarh, data was collected from 93 dug wells in 30 Blocks. Readings were taken at an average distance of 250m from the CRW.



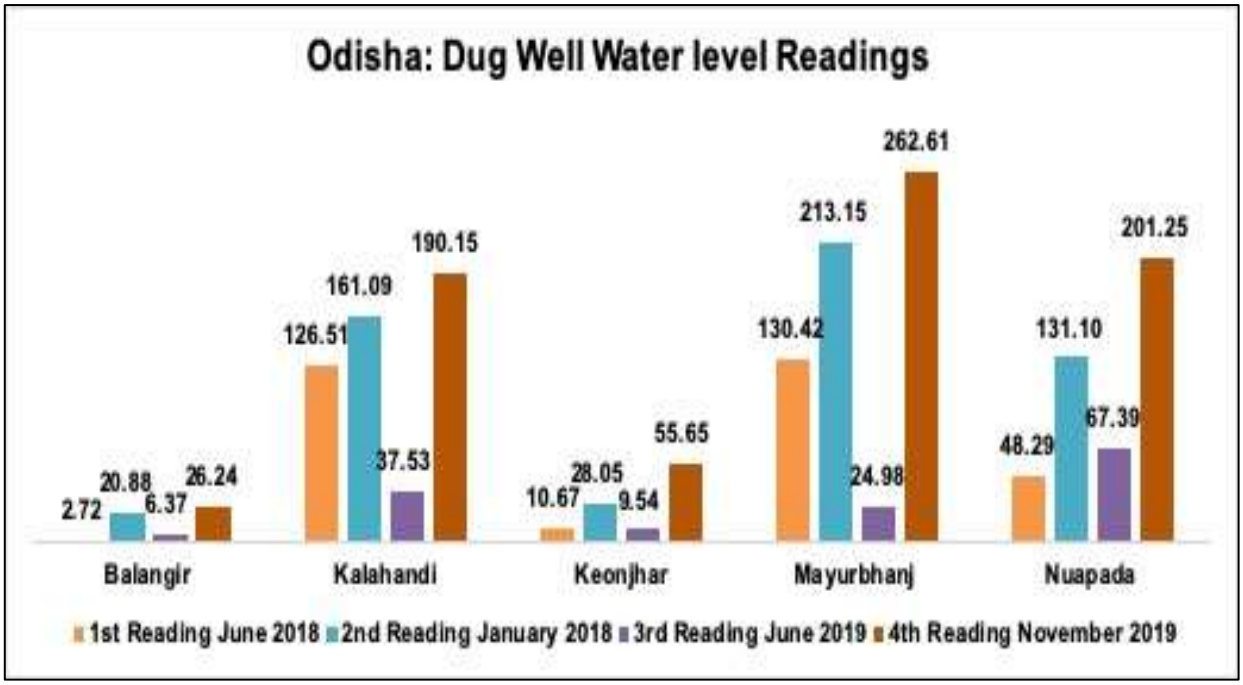
The inferences from the analysis of the data for the state shows the following:

- Increase in water levels were noted in 58 wells of the 93 surveyed. Recharge of dug wells depends on several factors – soil type, geology and land use pattern. Thus, the scope of recharge varies. About 53% dug wells in the vicinity of CRWs recorded a positive change in water levels compared to the pre-monsoon readings; water levels remained unchanged in 21% wells. The CRWs contributed to checking the decline in water levels in wells at two-thirds of the sites in the 30 Blocks.
- Water levels increased in 62% dug wells in the post monsoon – this indicates that CRWs supported farmer's capacity for protective irrigation during kharif and scope for cultivation of rabi crop.
- About one third of dug well recorded declined or no change in water availability in the post monsoon season. On cross checking with farmers, it was found that in most cases, farmers used water for protective irrigation and increasing the intensity of crop during kharif. For

example, in Masturi block of Bilaspur, there was a localised drought situation and farmers used the dug well extensively for protective irrigation to save the paddy crop.

- In Surguja, the lower water levels recorded in the 4th and 5th readings could indicate that there was heavy use of water from the wells for protective irrigation for kharif and preparation for rabi crop.

In Odisha, data was collected from 168 wells in the vicinity of CRWs in 28 Blocks. Wells located at an average distance of 344m from a CRW were considered.



The inferences from the analysis of the data for the state shows the following:

Depth of water level	Before CRW		After CRW	
Season	Pre- monsoon	Post- monsoon	Pre- monsoon	Post- monsoon
	1st Reading	2nd Reading	3rd Reading	4th Reading
Water Level in Metres	1.41	3.42	1.62	4.84

As is seen from the table, there has been a substantial increase in water levels since the construction of CRWs.

- 60% of the dug wells surveyed recorded an increase in water level by 1-2m; 4% showed an increase above 2 m but about 32% of the dug wells surveyed showed fluctuating water levels that were an outcome of the wider climate conditions prevailing at the time of the survey.
- Inter-district comparisons show a remarkable increase in water levels in the districts of Mayurbhanj, Keonjhar and Nuapada.

B. Plantation

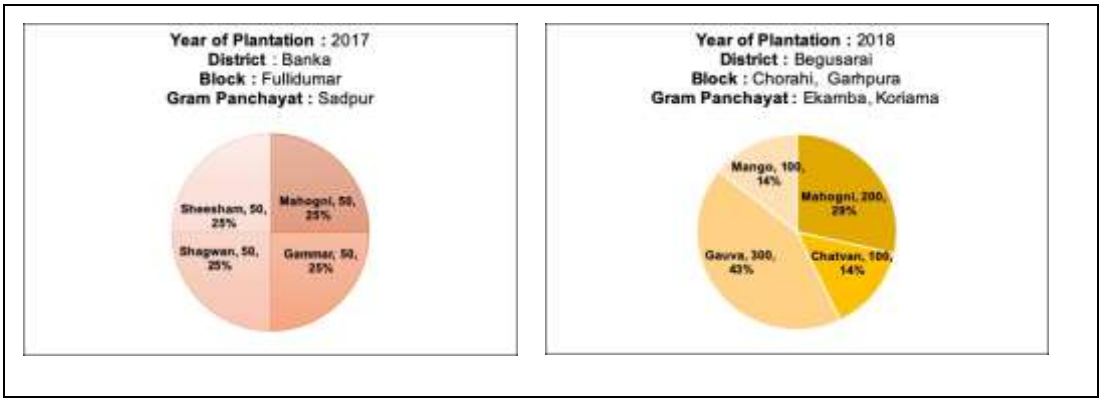
The analysis of the plantation data will help in understanding the improvement in carbon sequestration to mitigate climate change and its adverse impact on several other parameters such as, water retention in the soil, prevention of soil erosion, rainfall and improvements in the livelihoods of communities. This report considers consolidated plantation to calculate carbon sequestration using

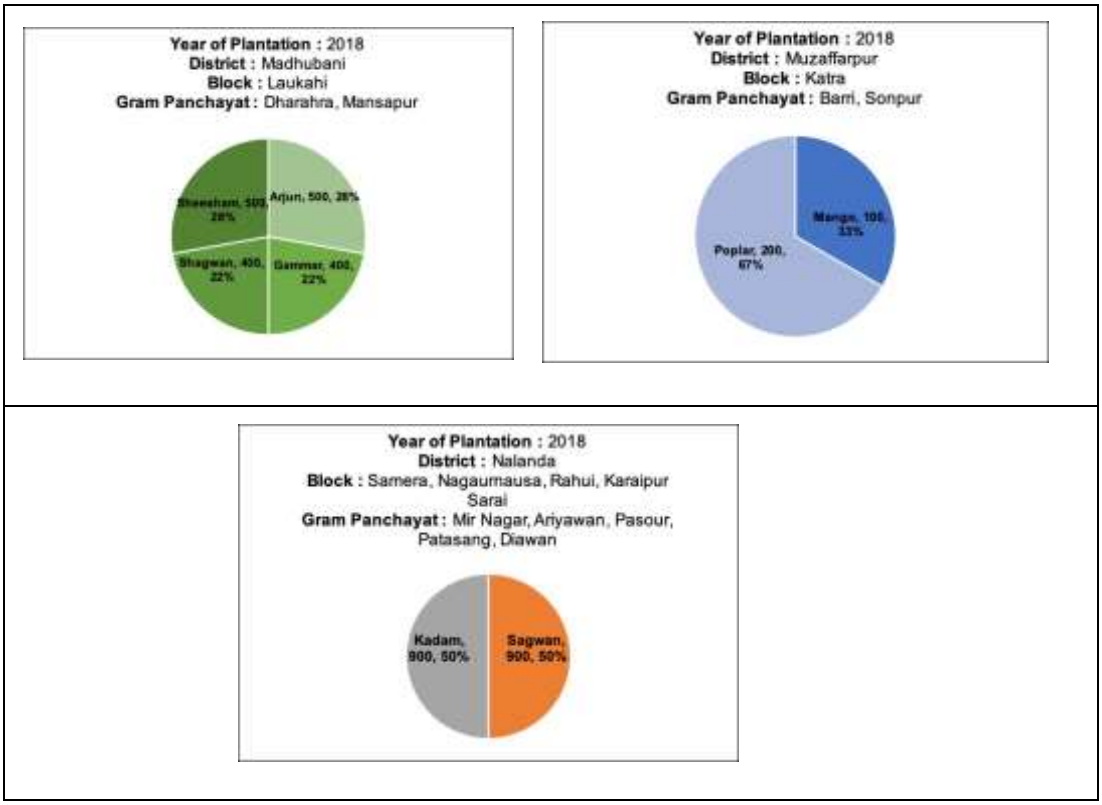
the formula developed by Dhandet et.al; 2003 i.e. total saplings X 39.21 = carbon sequestered (in pounds).

In Bihar, plantations were undertaken in 2017 and 2018 in 5 districts and 11 blocks. The varieties included teak and fruits. The details are as seen in the table.

No.	Variety	Total Saplings Planted
Year 2017		
1.	Mahogany	50
2.	Gammar	50
3.	Shagwan	50
4.	Sheesham	50
Total	**5**	**1000**
Year 2018		
5.	Mahogany	200
6.	Gammar	400
7.	Shagwan	1300
8.	Sheesham	500
9.	Chatvan	100
10.	Gauva	300
11.	Mango	200
12.	Arjun	500
13.	Poplar	200
14.	Kadam	900
Total	**10**	**4600**
Grand Total		**5600**

The district-wise details are shown in the pie graphs.





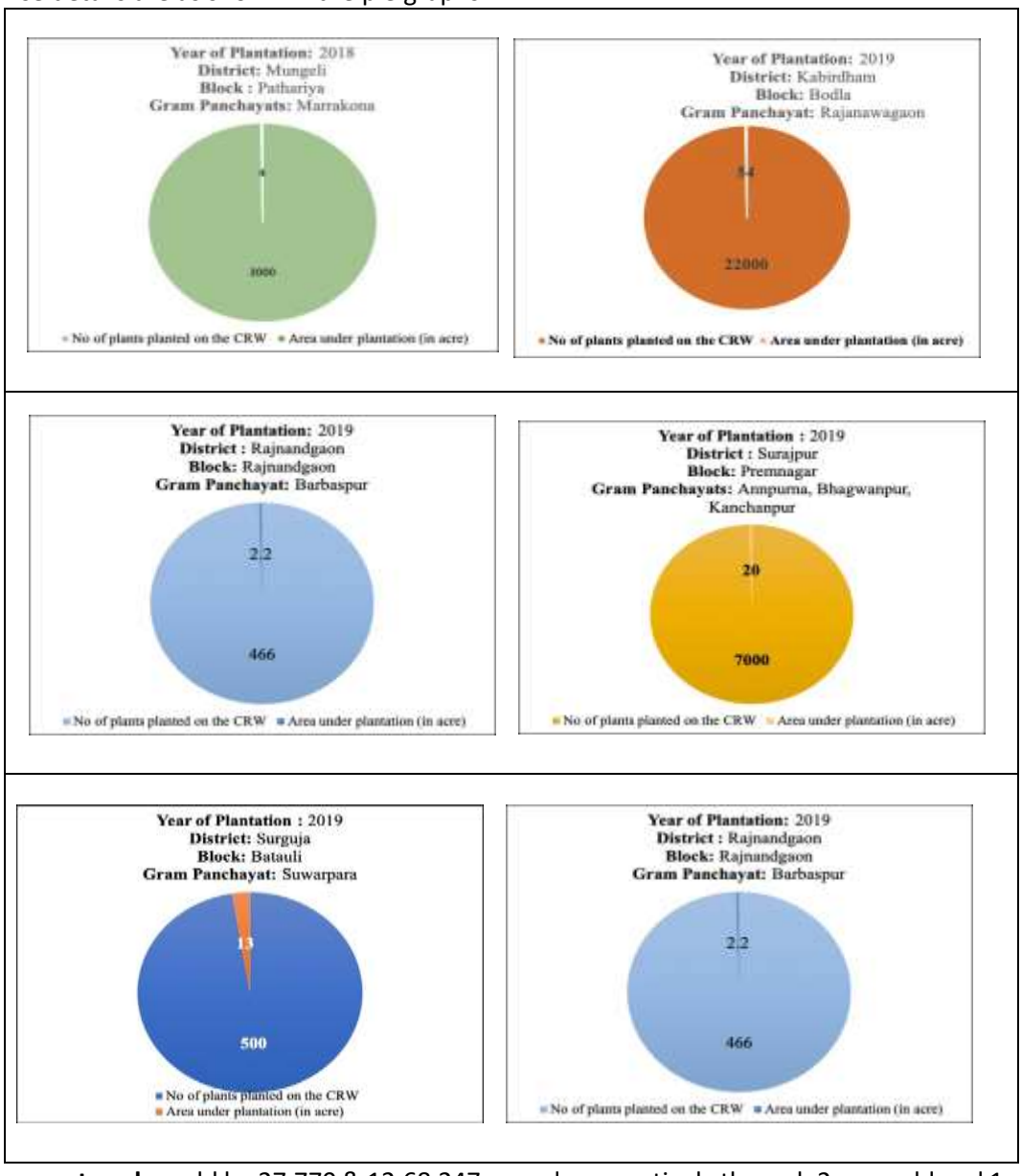
The **Carbon sequestered** would be 27.770 & 1,64,682 pounds respectively through 2-year-old and 1-year old saplings when they arrive at full maturity of the canopy.

In Chhattisgarh, plantation was undertaken on barren lands in 2018 and 2019 in 6 districts and 6 blocks mainly as block plantation. In 2018, 4.0 acres was covered while in 2019, 103.7 acres were covered bringing the total area under plantation to 107.7 acres over two consecutive years. A total of 33345 plants of 17 species were planted.

No.	Variety	Total Saplings Planted
Year 2018		
District: Mungeli		
1.	Gauva	1500
2.	Jamun	100
3.	Lemon	200
4.	Mango	200
Total	**4**	**1000**
Year 2019		
Districts: Bilaspur, Kabirdham, Rajnandgaon, Sarguja, Surajpur		
1.	Guava	932
2.	Jamun	457
3.	Amla	4853
4.	Jackfruit	1520
5.	Gulmohar	319
6.	Black Albizzia lebbek	6000
7.	White Albizzia lebbek	6000
8.	Sisum	3000
9.	Gmelina arborea	3000
10.	Mango	2200
11.	Java Plum	100

12.	Drumstick	150
13.	Custard apple	100
14.	Lemon	1264
15.	Sisam	350
16.	Neem	700
17.	Bamboo	1400
Total	**17**	**32345**
Grand Total	17	**33345**

The district wise details are as shown in the pie graphs.

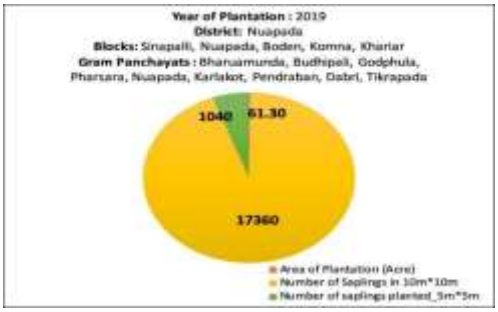


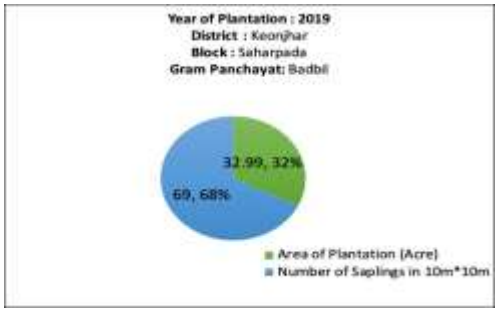
The **Carbon sequestered** would be 27.770 & 12,68,247 pounds respectively through 2-year-old and 1-year old saplings when they arrive at full maturity of the canopy.

In Odisha, plantation has been undertaken in 2019 in 2 districts – Nuapada and Keonjhar. The preferred varieties were mango, banana, teak, sal and chakunda. A total of 1040 saplings (planted in 5m*5m) and 17360 saplings (planted in 10m*10m) brought the total number to 18400 saplings on 61.3 acres of land.

Year of Plantation: October 2019			
District: Nuapada			
No.	**Variety**	**Number of Saplings planted_5m*5m**	**Number of Saplings in 10m*10m**
1.	Teak		6000
2.	Chakunda, Teak, Sal		6000
3.	Mango	960	
4.	Banana	40	
5.	Mango		200
6.	Mango		720
7.	Teak		3600
8.	Mango		80
9.	Mango		600
10.	Mango		40
11.	Mango		120
12.	Banana	40	
Total	**12**	**1040**	**17360**
District: Keonjhar (plantations are continuing at the time of drafting this report)			
	Mango		
	Cashew		
	Papaya		
	Drumstick		

The district wise details are shown in the pie graphs.

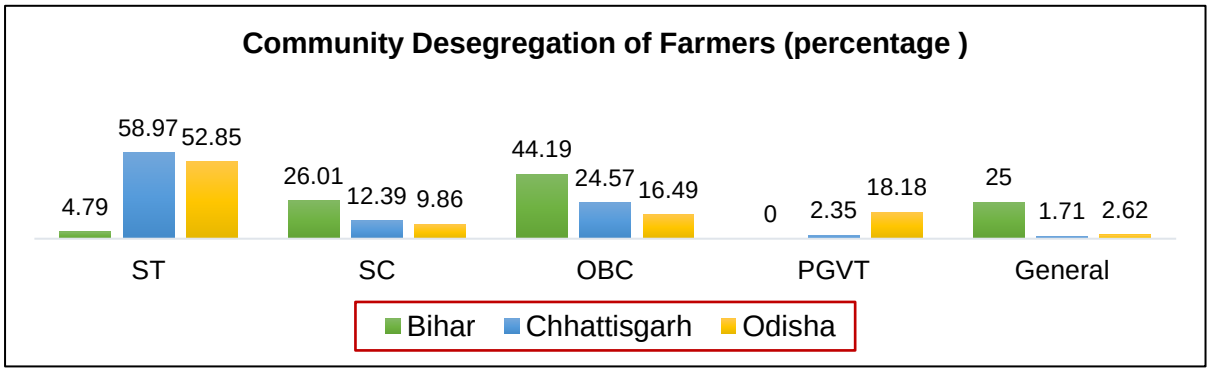


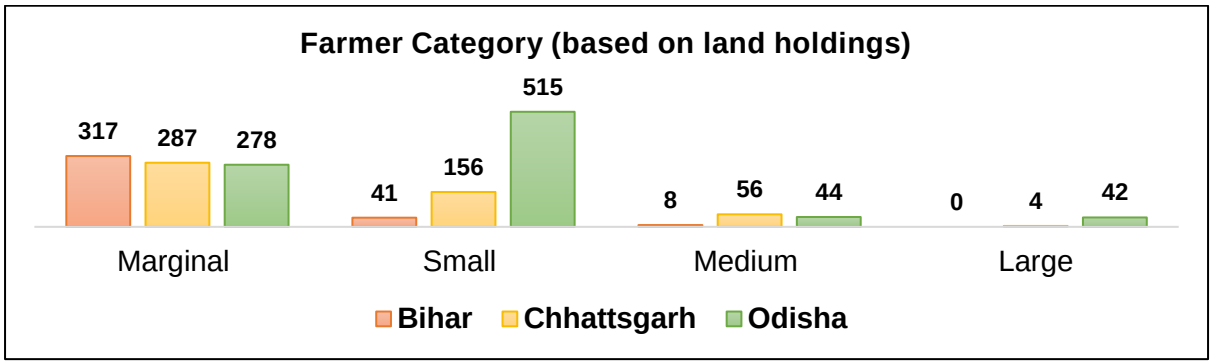


The **Carbon sequestered** would be 27.770 & 12,68,247 pounds respectively through 2-year-old and 1-year old saplings when they arrive at full maturity of the canopy.

6. Socio-economic Indicators

Socio-economic indicators using a Farmer's survey captured data on economic wellbeing of beneficiary households by using agriculture production and productivity of the crops grown in the catchment area as proxies. The data was based on recall of respondents of occurrences in the previous year. The survey covered 1748 farmers. The de-segregation of the farmers surveyed by community and land holdings is as shown below.





From the graphs above it is seen that

- In Bihar, 74.99% farmers surveyed were from the OBC, SC and ST groups while 25% of those surveyed were from the General category. In terms of land holdings, 317 of those surveyed are in the marginal farmer category.
- In Chhattisgarh, 95.93% of farmers surveyed were from the ST, OBC and SC categories while only 1.71% of those surveyed were from the General category. In terms of land holdings, 287 of those surveyed are in the marginal farmer category.
- In Odisha, 97.38% of farmers surveyed were from the ST, PVTG, OBC and SC categories while only 2.62% of those surveyed were from the General category. In terms of land holdings, 515 of those surveyed are in the small farmer category.

The respondents of the survey (gender desegregated) were as shown in the table below.

State	Male	Female
Bihar	363	37
Chhattisgarh	468	42
Odisha	831	79
Total	**1662**	**158**

A. Cropping Intensity and Cropping Productivity

The survey has shown that there has been an increase in cropping intensity and diversity across all the states on account of the increase in water availability following the construction of CRWs. The state wise details are as follows:

- **In Bihar** the overall status of cropping intensity in the Baseline and End Line are as shown in the table below.

District	Block	Baseline %			Post CRW %		
		Net Sown Area	Gross Cropped Area	Cropping Intensity	Net Sown Area	Gross Cropped Area	Cropping Intensity
Banka	Fullidumar	63.18	88.4	139.91	36.79	57.40	156.04
	Chanan	29.84	45.8	153.48	35.20	41.40	117.61
	Bousi	13.88	9.5	68.44	4.00	5.00	125.00
	Dhorayia	54.83	105	191.5	28.00	31.00	110.71
Begusarai	Chaurahi	3.11	6.35	204.18	6.11	6.46	105.73
	Dandari	17.89	34.28	191.61	94.74	158.62	167.43
	Garhpura	4.14	8.43	203.62	21.75	21.75	100.00
Gaya	Mohanpur	26.68	14.68	55.02	18.43	19.752	107.20
	Tankuppa	29.37	51.04	173.78	50.48	52.18	103.37
	Phatehpur	25.74	34.5	134.03	39.92	44.2	110.72
Katihar	Azamnagar	37.05	86.2	232.65	68.40	68.4	100.00
	Balrampur	67.18	92.63	137.88	119.80	119.8	100.00
	Barsoi	33.76	45.5	134.77	75.40	75.4	100.00
	Falka	58.79	58.6	99.67	135.50	135.5	100.00
Muzaffarpir	Aurai	14.72	59.52	404.34	47.03	41.63	88.50
	Katra	52.64	108.69	206.47	90.99	25.88	28.44
Nalanda	Karaipur Sarai	32.85	77.5	235.92	28.08	26.204	93.32
	Rahui	34.56	69.97	202.45	40.21	39.634	98.58
	Sarmera	20.96	42.44	202.48	19.44	19.44	100.00

The inferences from the above are as follows:

- Cropping intensity has increased from the Baseline of 154 to 174 at the End line. The contributory factors are as follows:
    - ICRG supported the restoration of the traditional ahar-pyne structures. Pynes are meant for water distribution therefore, the restoration of these structures has led to an increase in the irrigation potential of a wider area and therefore an increase in crops grown.
    - In districts where ICRG promoted the construction of individual ponds, there has been an increase in the diversity of crops. For instance, in Gaya, farmers are now cultivating maize and vegetables; in Banka oilseeds like mustard are being grown and in Katihar, bananas are being grown. In all these districts, there was only one crop grown earlier and the land remained fallow for one season because of non-availability of water.

- The crop productivity has increased from 5.88 quintals per acre of kharif in the Baseline to 7.49 quintals per acre at the End line. The contributory factors are as follows:
  - The increase in the availability of water following the ICRG interventions has ensured the timely availability of water for irrigation.
  - Additionally, ICRG has promoted improvement in farming practices like seed and farm bed preparation – these have also helped in increasing productivity.

- **In Chhattisgarh** the overall status of cropping intensity are as shown in the table below.

District	Block	Baseline %			Post CRW %			
		Net Sown Area	Gross Cropped Area	Cropping Intensity	Net Sown Area	Gross Cropped Area	Cropping Intensity	Change in Cropping Intensity
Bilaspur	Masturi	28	28.2	100.71	56	112	200	99.29
Jashpur	Jashpur	21.25	33.75	158.82	12.5	21	168.00	9.18
	Kansabell	38.53	38.53	100.00	38.8	72	185.57	85.57
	Farsabahar	45.02	45.02	100.00	122.52	241.84	197.39	97.39
Kabirdham	Bodla	80	104	130.00	80.73	160	198.19	68.19
	Pandriya	80	81	101.25	83	166	200.00	98.75
	S.Lohara	72.99	82.54	113.08	44.22	85.08	192.40	79.32
	Kavrdha	49.54	70.68	142.67	73.7	144.64	196.26	53.58
Korba	Kartala	21.81	23.8	109.12	23.8	46.6	195.80	86.67
	Pali	25.19	26.93	106.91	30.43	49.86	163.85	56.94
	Podi Uproda	60.5	62.99	104.12	58.62	115.54	197.10	92.98
	Sonhat	31.5	31.5	100.00	47	47	100.00	0.00
Mungeli	Mungeli	24.4	51.1	209.43	50.1	53.8	107.39	-102.04
	Pathariya	28.6	37.1	129.72	37.37	57.74	154.51	24.79
	Lormi	30.5	47.8	156.72	51.2	60.3	117.77	-38.95
Rajnandgaon	Mohla	28	33.64	120.14	29.78	56.57	189.96	69.82
	Chuikhadan	30.91	36.71	118.76	43.21	55.82	129.18	10.42
	Rajnandgaon	86.9	90.26	103.87	92.76	224.78	242.32	138.46
Surguja	Lundra	22.4	25.5	113.84	36.79	52	141.34	27.50
	Sitapur	40.82	40.82	100.00	43.33	81.76	188.69	88.69
	Batoli	51.5	65.27	126.74	79.59	121.46	152.61	25.87
State Total CG		**898.36**	**1057.14**	117.67	**1135.45**	**2025.79**	178.41	

The inferences from the above are as follows:

- Cropping intensity has increased from the Baseline of 106.37 to 178.41 at the End line. The contributory factors are as follows:
  - The number of farmers who can take a kharif crop increased by 64% - this indicates that CRWs have contributed to enhance the capacity of farmers to cultivate crops.
  - The CRWs related to farm ponds and dug wells have proved effective in increasing crop intensity. In 8 Blocks there has been an increase of about 80% in crop intensity and in 4 Blocks the impact on crop intensity is between 50-80%. This indicates that

CRWs have contributed to enhancing net sown area and most importantly helped in taking multiple crops from the same arable land in different seasons.

- The crop productivity has also increased because of the increase in water availability for irrigation. Farmers have shown a preference for cultivation of paddy over more hardy crops like millet (Kabeerdham district). Paddy cultivation has increased because of availability of water for irrigation; the area under vegetables has increased although the area fluctuates (farmers are exploring commercially viable crops to enhance incomes). Although there has been an increase in the area under double crop, there has been limited impact on productivity of rabi crops.

- **In Odisha** the overall status of cropping intensity is as shown in the table below.

District	Block	Baseline %			Post CRW %		
		Net Sown Area	Gross Cropped Area	Cropping Intensity	Net Sown Area	Gross Cropped Area	Cropping Intensity
Balangir	Gudvela	51.87	47.77	108.58%	47.17	94.34	200.00
	Deogaon	74.03	42.26	175.17%	30.00	60	200.00
	Saintala	196.49	103.75	189.39%	77.55	155.1	200.00
	Titilagarh	106.21	327	32.48%	48.00	96	200.00
Keonjhar	Jhumpura	98.13	77.5	126.61%	64.43	128.6	199.61
	Telkoi	19.7	63.54	31.00%	66.00	132	200.00
	Ghatgaon	52.48	30.76	170.59%	48.71	94.5	194.01
	Saharpada	33.59	25.61	131.18%	27.56	188.68	684.61
	Banspal	14.08	40.7	34.59%	33.70	67.4	200.00
	Sadar	30.88	100.85	30.61%	12.60	25.2	200.00
Kalahandi	Karlamunda	145.5	47.5	306.32%	4.28	4.55	106.43
	Narla	106.7	33.5	318.52%	1.68	3.35	200.00
	Kesinga	119.8	26.65	449.51%	1.10	2	181.82
	Golamunda	92.63	37	250.34%	1.75	3.5	200.00
	Bhawanipatana	97.32	39.4	247.00%	1.97	3.94	200.00
	Lanjigarh	100.04	39	256.50%	1.44	2.88	200.00
Mayurbhanj	Jamda	61.75	35.2	175.43%	89.00	70	78.65
	Kusumi	86.45	53.79	160.72%	107.58	107.58	100.00
	Kaptipada	13.38	36.11	37.05%	36.11	72.22	200.00
	Khunta	22.95	66	34.77%	40.85	81.7	200.00
	Shamakhunta	27.05	65	41.62%	74.00	148	200.00
	Bangiriposi	7.2	54	13.33%	72.50	145	200.00
	Bisoi	17.85	48.5	36.80%	64.66	129.32	200.00
	Udala	18.8	47.5	39.58%	49.00	98	200.00
Nuapada	Khariar	124.07	50.23	247.00%	49.23	98.46	200.00
	Komna	129.13	53.53	241.23%	49.28	98.56	200.00
	Sinapali	115.35	47.2	244.38%	45.2	90.4	200.00
	Boden	103.74	43.3	239.58%	40.8	81.6	200.00
	Nuapada	132.96	41.5	320.39%	47.5	95	200.00

The inferences from the above are as follows:

- Cropping intensity has increased on an average because of multi cropping in one year. This has been made possible because of the increase in irrigation potential created through the CRWs.
- Farmers have introduced short term varieties or drought resilient varieties – these are an outcome of inputs provided under ICRG for improving the livelihoods of farmers.
- The crop productivity has increased from 4.46 quintals per acre of kharif to 6.98 quintals per acre of kharif. This is because more and more area is now assured of irrigation because of the CRWs. There has been convergence from other schemes at the CRW sites; more indirect beneficiaries are getting into diverse farming practices. The Odisha Livelihood Mission has made funds available for adoption of climate smart livelihood practices.

B. **Production and Productivity**

The overall position of production and productivity of key crops in the project states is shown in the table below.

Kharif Season	Area(In Acres)		Produce(In quintals)		Productivity	
Bihar	Baseline	Post CRW	Baseline	Post CRW	Baseline	Post CRW
Rice	484.71	6370.92	5874.09	4830.7	12.12	0.76
Arhar	4.32	2.96	19.12	22.9	4.43	7.74
Vegetables	0.5	3	2.8	69	5.6	23
Chattisgarh						
Rice	685.15	468.05	5328.2	5425.2	7.78	11.59
Arhar	56.18	27.78	114.16	37.18	2.03	1.34
Vegetables	5.2	7.26	38.86	40.85	7.47	5.63
Odisha						
Rice	1475.83	1294.34	7571.68	10248.04	5.13	7.92
Arhar	12.25	8.13	17.46	31.39	2.15	3.86
Vegetables	10.91	14.69	48.63	102.6	4.46	6.98
Total (3 States)	2735.05	8197.13	19015	20807.86	51.17	68.82
Average	911.68	2732.37	6338.33	6935.95	17.05	22.94

There has been an increase in the area and productivity in all 3 states following assured irrigation linked to the various CRW interventions, livelihood improvement support through making available additional funds, farm inputs and linkages with other government programmes. Some noteworthy outcomes are as follows:

- The table above shows that in Bihar, there has been a decrease in the under arhar (from 4.32 acres to 2.96 acres) while the productivity has increased from 4.43 quintals per acre to 7.74 quintals per acre. The farmers grow a 9 month cycle crop. ICRG has provided inputs on improving farming practices especially in seed treatment and maintaining distance between rows and lines of crops – these have contributed to increase in productivity.
- In Bihar in W. Champaran, Madhubani and Muzaffarpur districts, vegetable cultivation is now seen following the construction of CRWs. The borewells around the CRWs have increased

water levels thus, these districts now have assured water for 11 months (up from 7 months). Prior to the ICRG intervention, farmers grew rabi crops and there was minor kharif cultivation because the lands remained waterlogged. Following the ICRG interventions and the CRWs, farmers are cultivating rice, vegetables and wheat and the area now sees rabi and zaid crops and a marginal increase in kharif crops.

- One of the other areas of support provided by ICRG in Bihar was the analysis of total factor productivity. The availability of resources, area, market demand etc. were analysed and farmers advised on the areas for improvement – this has also contributed to the increase in productivity.

7. Conclusion

The administration of the M&E Framework as developed under ICRG has conclusively proven that interventions implemented under the programme have had a positive impact. There is now increased water available for irrigation especially to tide over the dry spells in the monsoons as well as prepare the land for the rabi crop. Assured water has led to diversification of crops. The 'soft' inputs under the programme especially linking with specialized agriculture improvement agencies like the Krishi Vigyan Kendras and other government programmes will continue to assist farmers in improving their livelihoods.