

CHAPTER: 02

LATENT POWER OF DUG WELLS IN SEMI-ARID REGIONS OF JHARKHAND

HIMADRI SINHA
himadri@ihmr.edu.in

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ABSTRACT

Dug-well has been the lifeline for farming in semi-arid region of Jharkhand for time immemorial. Most marginal farmers found it useful because it is low cost and could be renovated easily and water can be used both for agriculture and domestic purpose. Under MGNREGA, assistances were given to marginal and small farmers to construct more durable dug-well with concrete structures. This chapter assessed the impact such dug-well on 159 dug-well owners through individual case study and comprehensive socio-economic assessment. It was found that besides extending the cropping seasons from monsoon to summer, dug-well also helped in enhancing crop yield, household income and reduced indebtedness.

Keywords: *Dug-well, Irrigation, MGNREGA, Semi-arid agriculture, Jharkhand*

INTRODUCTION

Unlike most part of Jharkhand, the western part of Jharkhand particularly Palamu, Garhwa and Parts of Latehar districts have semi-arid climate. These districts face frequent drought due to untimely as well as uneven distribution of rainfall and prolonged dry spells during the rainy season. Drought causes poor agriculture, food insecurity, vicious cycle of poverty. Aftermath resulted in left wing extremism and social unrest. Drought proofing activities are carried out to improve semi-arid agriculture and to combat poverty and food insecurity. Drought proofing activities includes afforestation, tree plantation and construction of earthen dam, water harvesting and promotion of judicious use of water for agriculture. Hence, the kharif crop needs to be drought-proofed through 'protective' irrigation, applied to overcome accumulated soil moisture deficits within the rainy season. Low cost dug well has been one of the major

sources of drought coping mechanism for local people for long time. Dug well provides lifesaving irrigation for crops during the drought as well as can be used for multiple cropping in normal year of rainfall and to meet domestic water use. Therefore, under MGNREGA, dug wells were promoted with farmer's participation in individual farming plots. In this chapter the impact of dug well in individual farmer's life and its impact on district agriculture in reducing poverty and inequality have been documented and analysed from the perspectives on inclusive development.

THE DUG-WELL

Dug-well is one of ancient source of water for multiple use wherever viable surface water source was not available. Dug wells are originally shallow wells that are dug by hand or with simple tools. Traditionally, a dug well was excavated below the groundwater table until incoming water exceeded the digger's bailing rate. In Jharkhand, normally these wells were not cased or lined. After every monsoon season, it used to be repaired and renovated for the use. Most of the traditional dug wells are found to have diameters in the range of 1.2 to 1.5 metres (4 to 5 feet). The larger size allows as many as four large well buckets to be used simultaneously if raising pulleys are properly located.

Under MGNREGA, dug-well designs are modified to enhance its durability. This modification includes enhanced width, depth for higher water flow and casing with stones/brick with cemented plastering. Government assistances are provided to marginal and small farmers to stabilise their household income. Under MGNREGA The well was then lined (cased) with stones, brick, tile, or other material to prevent collapse.



Figure 2.1: Traditional and modern dug-wells in farmer's field

REVIEW OF LITERATURE

Five-year plan was initiated in India in 1951 to empower the poor, marginalised and traditionally deprived sections of the society. India implemented twelve five years plan through its apex body known as Planning Commission of India (PCI). Later on, this was restructured and renamed as NITI AAYOG. One of the major programmes of PCI was MGNREGA. MGNREGA not only assures wage employment to all job card holders but also create durable assets for the promotion of economic development both for the community and the individuals (Ranaware et al., 2015, Singh and Sinha, 2020). Public or community assistance programmes of the governments across the world yielded positive benefits for the economic and social empowerment of people (Del et al., 2009). During twelve five years plans, India has vigorously pursued public work programs under the wage and self-employment generation programmes mitigate negative shocks like drought that can otherwise have significant negative consequences (Gilligan & Hoddinott, 2006). Considering the above facts, government of India envisaged the scheme for generating mass level employment opportunity for low/medium income level people. After long discussions and continuous feedback from the national and state level stakeholders, finally, 'The National Rural Employment Guarantee Act' (NREGA) was framed. This Act was later implemented through the MGNREG scheme which was consciously attempted to counter weaknesses of earlier programs through several notable features in its design. It introduced a right-based framework with legislative backing. It also incorporated time bound action to fulfil guarantee of work within 15 days of demand for work and a disincentive for non-performance (Mehrotra, 2008, Ambasta et al., 2008, Sing & Sinha, 2020). Hence, the National Rural Employment Guarantee Act, (NREGA) was notified on September 7, 2005. At present this Act is also known as "Mahatma Gandhi National Rural Employment Guarantee Act" (MGNREGA). The objective of this Act is to enhance livelihood security in rural areas by providing at least 100 days of guaranteed wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work (Ministry of Rural Development, 2008). Agriculture sector in India suffers from low productivity in most parts of the country; it is highly unstable as it is subjected to fluctuations in rainfall (majority of cropped area in India is rain-fed, without security of water supply); and majority of poor (working poor and un/underemployed) are located in this sector (Bhalla, 2007). An employment guarantee program can be planned in a way that it reduces water insecurity and promotes agricultural growth. The works under MGNREGA mostly relate to water, soil and land (Institute of Rural Management Anand, 2010; Tiwari, 2011; MGNREGA, 2005, Sing & Sinha, 2020). It gives priority to activities related to water conservation, water harvesting and groundwater recharge, drought-proofing, flood protection, land development, afforestation and activities related to infrastructure like road connectivity. The goal of NREGA activities has to be conserving natural resources and enhancing environmental services to sustain food and livestock production, increasing the supply of fresh water for drinking, and increasing grass and forest product production. MGNREGA activities can facilitate and promote sustainability through functioning environmental services (Tiwari, 2011). The list of works, permitted to be carried out under MGNREGS, reflects recognition of the need to ensure that MGNREGS contributes to growth of agricultural production through enhancement of land productivity. Ghose (2011) argued that if the works actually

carried out have followed the specified norms, food production should increase in the longer run. MGNREGA provides a supplementary source of income, and raises the monthly per capita consumption expenditure of rural households, besides being a self-targeting, assets creation, and being in nature, employment and environment sustainable program. It is seen that the participation rate of the SCs and STs is higher the reasons for which may be their poverty and being landless or having small land holdings. One important feature of the program is that there is no discrimination in wages according to the gender. It reduces traditional gender wage discrimination, vulnerability of production system to climate variability and decreases distress migration. It has a positive impact on the socio-economic status of women also (Ministry of Rural Development, 2012-13).

STUDY METHODS

The present study was both qualitative and quantitative in nature. Qualitative data included information about dug well construction and its uses were collected through a semi structured interview schedule to development individual cases. Quantitative data was collected through a structured interview schedule. List of villages where dug wells were constructed under MGNREGA was provided by the district authorities. Study was conducted in 98 villages. From each village one or two beneficiaries were selected through purposive sampling method Dug well owners from the study area were interviewed with the help of structured interview schedule. The interview schedule includes respondent's general profile, social and economic profile, cost benefit analysis of cultivated crops, analysis of accessibility and availability of drinking and domestic water, employment etc. The secondary data was obtained from the block offices.

THE STUDY AREA

The present study was conducted as the part of the author's own study related to the impact assessment of dug-wells in three districts of Palamu region of Jharkhand namely Garhwa, Latehar and Palamu consists of 20 blocks. All selected districts were tribal majority districts and the study was carried out in sampled areas that are pre-dominantly inhabited by Scheduled Tribes (ST). The dug wells were provided to ST community under Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS).

The Palamu district lies between 23°05' and 24°08' North latitude and between 83°55' and 84°30' East longitude. The Garhwa district lies between 23°60' and 24°39' North latitude and 83°22' and 84°00' East longitude. The Latehar district lies between 23°45' and 23°75' North latitude and 84°30' and 84°50' East longitude. Study was conducted in 27 villages of Palamu, 37 villages of Garhwa and 34 villages of Latehar districts.

Details about study area with respect to district, block, gram panchayat and village are given in Table 1. The google map of study area was given in Fig. 2.2.

Table 2.1: Details of study area

District	Block	Gram Panchayat	No. of Village
Palamu	Lesliganj	Choura, Darudih, Rajhara, Dabra	05 (18.51)
	Panki	Loharsi, Ambabar, Suddi, Dandarkala, Naodiha,	10 (37.03)

		PankiPaschim, Kelhawa, Nuru, Pakariya, Karar	
	Manatu	Majhauri-1, Chak, Padma, Punshikhurd, Dumri, Rangeya	07 (25.92)
	Bishrampur	Katatkala, Ghasidag	05 (18.51)
	Sub Total		27 (100)
Garhwa	Bhawnathpur	Arsali (North), Arsali (South), Bansani, Bhawnathpur, Chapri, Jhumarsota, Jhumarsota, Hariharpur, Kailan, Manjhigama, Makri, Pandaria, Sinduria	15 (40.54)
	Kharaundhi	Chandani, Kupa, Sundi, Maghigawa, Arangi, Sisri, Raji, Kharaundhi, Kabiradih	10 (27.02)
	Ramna	Tandwa, Silidag, Hardag Kala, Karnapura, Marwania, Bahiyar Kala, BahiyarKhurd, Gamharia, Bulka	12 (32.43)
	Sub Total		37 (100)
Latehar	Latehar	Demu, Parsahi, Hetpochra	07 (20.58)
	Balumath	Rajwar, Murpa	05 (14.70)
	Manika	Namudag, Banduwa, Manika	04 (11.76)
	Garu	DhangarTola, Kotam	07 (20.58)
	Mahuadanr	Chainpur, Durup, Aksi, Sohar	07 (20.58)
	Barwadih	Ukamad, Morwaikala, Ganeshpur, Haratu	04 (11.76)
	Sub Total		34 (100)
	Total Villages		98

Figures within parenthesis are in percentage of the district (sub) total



Figure 2.2: Google map showing positions of selected districts and blocks of study area

Profile of Dug-well Owners (DWO)

Study was done by taking 40, 70 and 49 dug-well owners(DWO) in Palamu, Garhwa and Latehar districts respectively. The total number of dug-well owners selected through convenience sampling at the village level was 159. Out of them eight were female and 151 were male. Average age of DWO was 45.5 years. Nearly 28% DWO were illiterate, 30% studied till primary school and 15% studied up to middle school had . Therefore, nearly 73% DWO low level of education and only 27% Dow pursued their study beyond middle school. Average family size of DWO was 7.6 persons/family with a standard deviation 0f 3.38 persons (Table 2.2). Furthermore nearly 95% DWO had agriculture as their primary occupation. The average earning members per household was 2.5 with standard deviation of 1.28 (Table 2.3)

Table 2.2: Profile of the dug-well owners covered under the study

Parameters	District wise dug-well owners				
	Palamu	Garhwa	Latehar	Total	
Dug-well owners (N)	40 (100)	70 (100)	49 (100)	159 (100)	
Sex	Male	38(95.0)	65(92.8)	48 (97.9)	151 (95.0)
	Female	2(5.0)	5(7.1)	1 (2.1)	8 (5.0)
Age	Average	48.30	45.74	42.53	45.52
Education	Illiterate	14(35.0)	22(31.4)	9(18.4)	45 (28.3)
	Primary	8(20.0)	25(35.7)	14(28.6)	47 (29.6)
	Middle	14(35.0)	0	10(20.4)	24 (15.1)
	Secondary	3(7.5)	16(22.9)	10(20.4)	29 (18.2)
	Higher	1(2.5)	2(2.9)	2(4.1)	5 (3.1)
	Secondary				
	Graduation	0	4(4.7)	3 (6.1)	7 (4.4)
Post Graduate	0	1(1.4)	1 (2.0)	2 (1.3)	
Family size	Mean	6.80	8.59	7.45	7.61
	SD	2.64	4.70	2.78	3.38

Figures within parenthesis are in percentage of dug well owners (N)

Table 2.3: Occupational profile and number of earning members per household of the DWO

Occupation	District			Total	
	Palamu	Garhwa	Latehar		
Agriculture	36(90.0)	67 (95.7)	49 (100)	152 (95.6)	
Private Service	0	0	0	0	
Government Service	0	1 (1.4)	0	1 (0.6)	
Shopkeeper	0	1 (1.4)	0	1 (0.6)	
Wage labour	3 (7.5)	1 (1.4)	0	4 (2.5)	
Contract Job	1 (2.5)	0	0	1 (0.6)	
Earning members	Mean	2.80	2.04	2.71	2.51
	SD	1.26	1.20	1.38	1.28
Total No. of DWO (N)	40 (100)	70 (100)	49 (100)	159 (100)	

Figures within parenthesis are in percentage of total DWO (N)

Stories of Some of Dug-well Owners

Box 1: Story of Kuleshwar Manjhi

Kuleshwar Manjhi's household was immensely benefitted by the dug-well assistance under MGNREGA. He belonged to Pathauliya village of Choura panchayat in Lesliganj block of Palamu district. He was given the assistance of Rs. 2,05,849 in the form wage assistances for labour worked for digging the well and material assistance for lining the well with stone, cement mortars, and concrete. With the help of dug well he could now provide lifesaving irrigation to monsoon crops when rain is delayed for prolonged period. He has started growing vegetables, pulses and oilseeds during winter and summer. The dug-well also provides water domestic and drinking water to his household. Through multiple cropping he could

increase around 52-55 employment days per year. His income has nearly doubled and thereby reduced his mental stress during the lean season and reduced his indebtedness.

Box 2: Story of Jitendra Oraon

Jainendra Oraon lives in Tetardih village in Padma Panchayat in Manatu Block. He used to have hand dugout shallow well by which he used to grow potato and peas in a small patch of land. During monsoon season, the well used to be broken down from the edges due to water flow. Under MGNREGA, he could make the well wider up to twelve feet and deepen it to have more steady flow of water. He was given the assistance of Rs. 2,05,849 in the form wage assistances for labour worked for digging the well and material assistance for lining the well with stone, cement mortars, and concrete. He now grows potato, pea, mustard, moong, maize and other vegetables during winter and summer seasons. His income has increased by nearly 225% and helped him to pay back all his loans.

Physio geographical status of Dug-well

Dug-well has added significant benefit to individual DWO who were completely dependent on rainfed cropping earlier. Under MGNREGA, DWOs constructed 13-14 feet diameter well having depth varying from 27-40 feet depending on the water level. Water level during winter was sufficient for more than 77% DWO across the districts. However, during summer only 25%-40% DWOs had sufficient water for growing crops. On average, irrigation could be provided to 1.65 acres of land in Palamu, 0.66 acres in Garhwa and 0.74 acres in Latehar during winter. During summer irrigation could be provided to 0.52 acres of land in Palamu, 0.62 acres in Garhwa and 0.39 acres in Latehar (Table 2.4).

Table 2.4: Physical status of dug-well

Different Parameter		Districts		
		Palamu	Garhwa	Latehar
DWO (N)		40 (100)	70 (100)	49 (100)
Diameter (feet)	M	14.72	12.77	14.15
	SD	0.71	0.956	1.91
Depth (feet)	M	27.67	36.03	28.83
	SD	5.18	6.44	5.00
Water level during winter season	Sufficient	31 (77.5)	61 (87.1)	45(91.8)
	Moderate	0	7 (10.0)	1(2.1)
	Insufficient	9 (22.5)	2 (2.9)	3(6.1)
Water level in summer season	Sufficient	17 (42.5)	18 (25.7)	28(57.1)
	Moderate	0	11 (15.7)	0
	Insufficient	23 (57.5)	41 (58.6)	21(42.9)
Water level in rainy season	Sufficient	35 (87.5)	67 (95.7)	48(97.9)
	Moderate	0	3 (4.3)	0
	Insufficient	5 (12.5)	0	1(2.1)
Irrigated area in winter (acres)	M	1.65	0.66	0.74
	SD	1.31	0.40	0.55
Irrigated area in summer	M	0.52	0.62	0.39

(acres)	SD	0.41	0.21	0.16
Irrigated area in	M	2.09	3.47	0.91
monsoon (acres)	SD	1.60	1.48	0.51

Figures within the parenthesis are in the percentage of N

N= Total DWO; M=Mean; SD= Standard Deviation

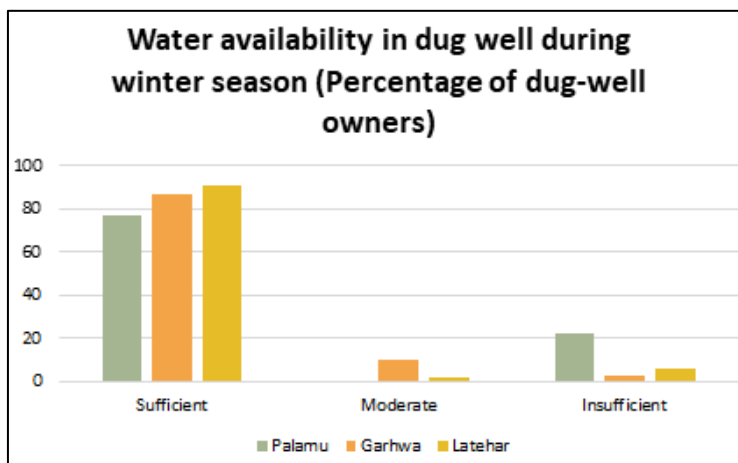


Figure 2.3: Water level in dug-well during winter season (percentage of DWO)

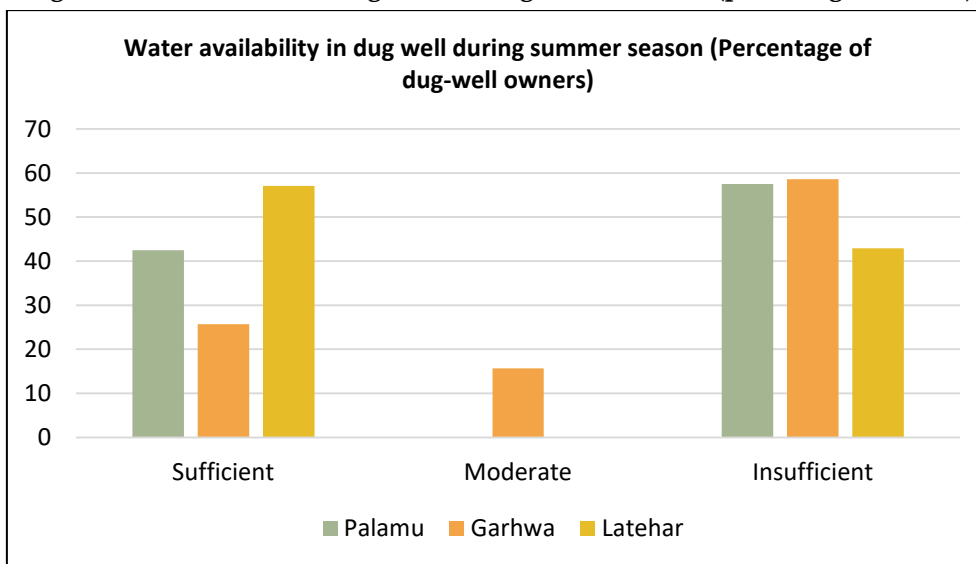


Figure 2.4: Water level in dug-well during summer season (percentage of DWO)

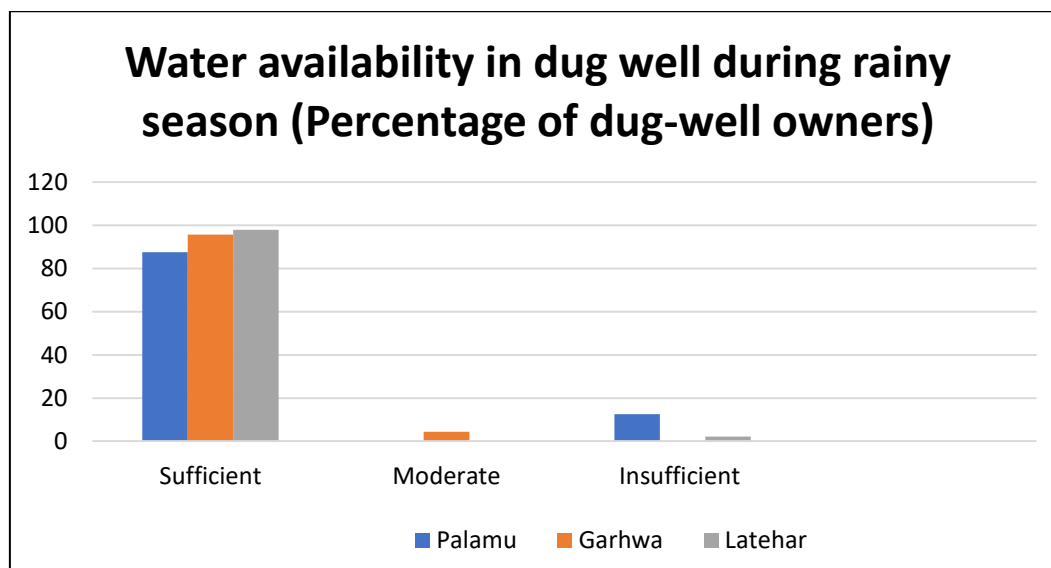


Figure 2.5: Water level in dug-well during rainy season (percentage of DWO)

Economic Impact of Dug-well

Economic indicators included enhancement of annual income from agriculture, enhancement in total number of employment days due to increased in cropping, and enhancement in gross cropped area per year at the household level of DWO.

There was an average enhancement of Rs. 16373.74 in annual agriculture income per household when computed at the price level of April 2023. Similarly on average, total number of employment days due to increased cropping per household was enhanced by 54.34 days and gross cropped area per household was increased by 2.42 acres per year (Table 5).

Table 2.5: Enhancement in economic indicators of DWO household due to dug-well

Indicator		Average enhancement at household			
		Palamu	Garhwa	Latehar	Total
DWO	<i>N</i>	40	70	49	159
Agri income/year# (Rs.)	<i>M</i>	18101.53	18550.24	12468.88	16373.55
	<i>SD</i>	9382.94	6376.06	979.46	5579.487
Total employment days/year	<i>M</i>	68.38	51.11	43.61	54.34
	<i>SD</i>	61.83	20.73	47.3	43.24
Gross cropped area/year (acre)	<i>M</i>	1.46	3.52	2.29	2.42
	<i>SD</i>	0.19	0.64	0.08	0.30

Price is computed at price level of April 2023

N= Total DWO; M=Mean; SD= Standard Deviation

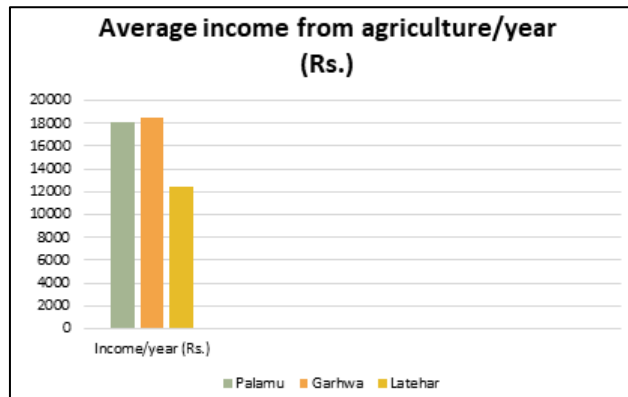


Figure 2.6: Average income enhancement from agriculture/year (Rs.) for DWO

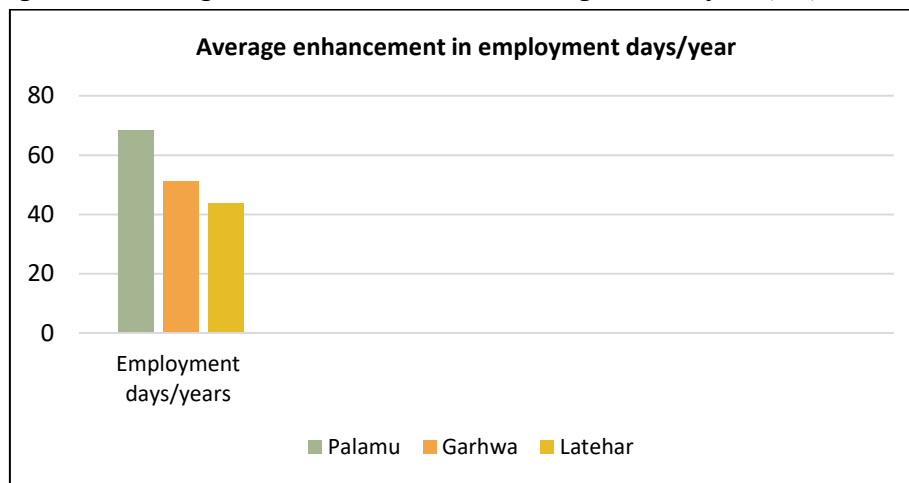


Figure 2.7: Average enhancement in employment days per year for DWO

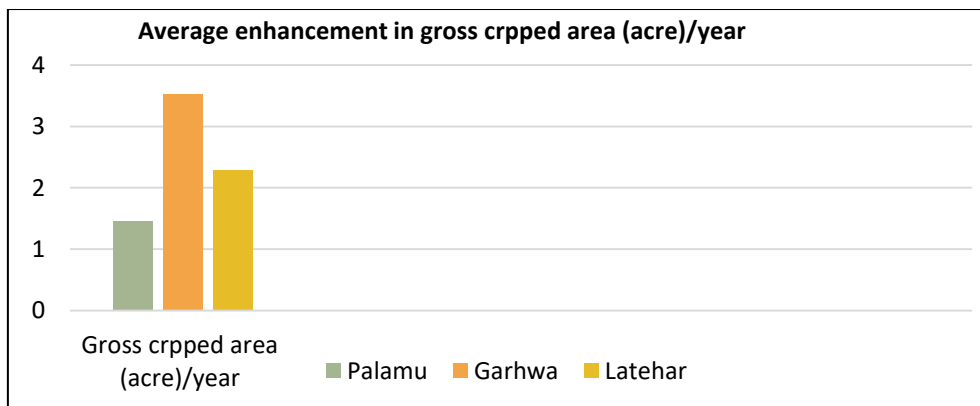


Figure 2.8: Average enhancement in gross cropped area in acres per year for DWO

Social Impact of Dug-well

Social indicators for assessing dug-well included ownership of well, enhancement of availability of drinking water, domestic water and water for livestock.

It was found that 97.5% dug wells were owned by the individual farmer. Only few wells were constructed in the community land. There was an average enhancement of availability drinking water for 22% DWOs, 25.8% DWOs had reported the increase of availability of water for domestic use and 32% DOWs reported the enhancement in the availability of water for the livestock (Table 5). However, only 17.6% DWOs felt that there was overall improvement in their household wellbeing.

Table 2.6: Improvement in social conditions of household due to dug-well

Indicator	Number of DWOs			
	Palamu	Garhwa	Latehar	Total
DOW	40	70	49	159
Ownership of well	37 (92.5)	70 (100)	48 (97.9)	155 (97.5)
Increased availability of				
a. Drinking water	12 (30.0)	7 (10.0)	16 (32.7)	35 (22.0)
b. Domestic water	13 (32.5)	8 (11.4)	20 (40.8)	41 (25.8)
c. Water for livestock	12 (30.0)	14 (20.0)	25 (51.1)	51 (32.1)
Overall wellbeing	1 (2.5)	16 (22.9)	11 (22.4)	28 (17.6)

Figures within the parenthesis are in the percentage of N

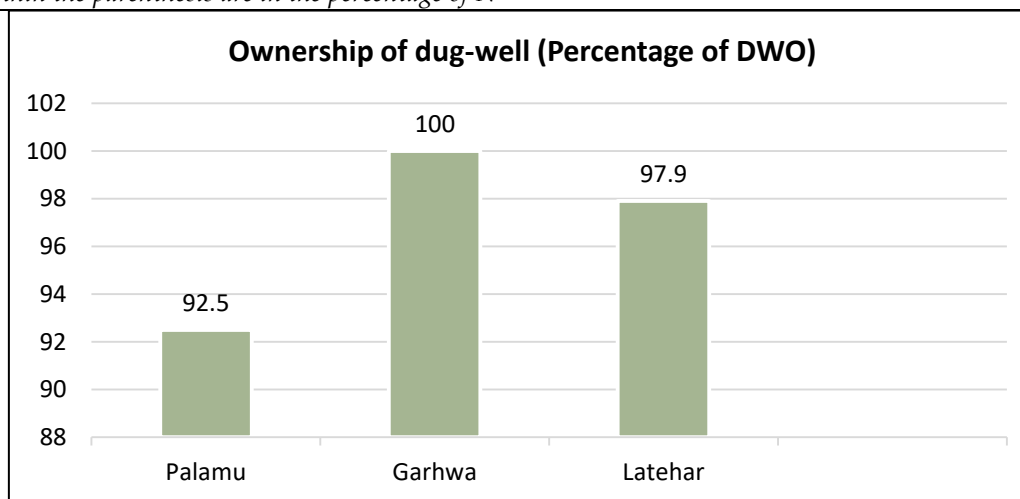


Figure 2.9: Ownership of dug-well by DWO (in percentage)

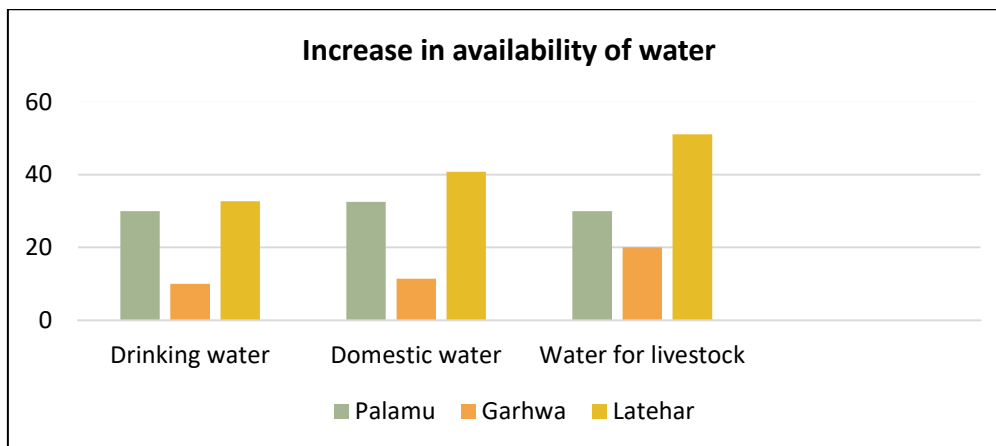


Figure 2.10: Increase in water availability for drinking and domestic purposes in percentage of DWO

DISCUSSION AND CONCLUSIONS

The present study investigated the impact of dug-wells in three districts of Palamu region of Jharkhand namely Palamu, Garhwa, and Latehar. All selected districts are tribal and Dalit majority districts and the study was carried out in sampled areas that are pre-dominantly inhabited by Scheduled tribes (ST), Scheduled castes (SC) or Dalits. Dug wells were provided to ST, SC and OBC (Other backward castes) communities under Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS). In the study total number of dug wells selected from three districts of Palamu region namely Palamu, Garhwa, and Latehar were 159. Out of total 159 dug wells, 40 dug wells from Palamu, 70 dug wells were selected from Garhwa, and 49 dug wells from Latehar district respectively. In all three districts, 53 (33.3%) dug wells were owned by ST community and same number of dug wells were owned by OBC community, 45 (28.3%) dug well were owned by SC community and 08 (5%) dug wells were owned by general category.

Season-wise area irrigated by dug wells beneficiaries in all three districts is different. During rainy season, average irrigated area for dug well beneficiaries in Latehar district had 3.47 acres which is highest in comparison of average irrigated area of dug well beneficiaries of Garhwa and Palamu district. During winter season, average irrigated area for dug well beneficiaries in Garhwa district had 1.65 acres which is highest in comparison of average irrigated area of dug well beneficiaries of Palamu and Latehar district. During summer season, average irrigated area for dug well beneficiaries in Latehar district had 0.62 acres which is highest in comparison of average irrigated area of dug well beneficiaries of Garhwa and Palamu district.

Season-wise utilisation of water by dug well beneficiaries for agricultural activities in all three districts is different. Out of total 159 dug well beneficiaries, 156 (98.1%) beneficiaries used well water during *khari* season, 148 (93.1%) beneficiaries used well water during *rabi* season and 80 (50.3%) beneficiaries used well water during *zaid* season. Apart from utilisation of dug well water for agricultural activities, it is also used for livestock, drinking water demand and domestic use. In all three districts, out of

total 159 beneficiaries, 51 (32.1%) beneficiaries used dug well water for livestock, 35 (22%) beneficiaries used for drinking purposes and 41 (25.8%) beneficiaries used for domestic uses.

In the present study, impact of dug wells was assessed in terms of percentage of cultivated area of dug well beneficiaries increased / decreased, percentage of employment days of dug well beneficiaries increased / decreased and percentage of annual income of dug well beneficiaries increased / decreased while comparing pre and post dug well period in all three districts.

Study findings revealed that the average cultivated area of DWOs was increased by 155.4%, 179.72%, and 209.68% during *kharif* season in Palamu, Garhwa, and Latehar districts respectively compared to pre dug well period. Additionally, during *rabi* season, this was increased by 179.69%, 213.95%, and 159.46% and during *zaid* (summer), it was increased by 137.5%, 255.55%, and 137.45% in Palamu, Garhwa, and Latehar districts respectively.

With respect to comparing pre and post dug well period, it was observed that the recipients of dug well increased their employment days by 140.07%, and 141.12% and 148.96% during *kharif* season in Palamu, Garhwa, and Latehar districts respectively. Similarly, income of DWOs was increased by 142.78%, 180%, and 166.67% during *kharif* season in Palamu, Garhwa, and Latehar districts respectively. During *rabi* season, recipients of dug well have increased their income by 175.5 %, 166.67%, and 129.88% in Palamu, Garhwa, and Latehar districts respectively. During *zaid* season, income of DWOs was increased by 159.04%, 166.67%, and 121.57% in Palamu, Garhwa, and Latehar districts respectively.

Overall findings of the present study concluded that construction of dug well under MGNREGA in tribal majority districts of Palamu region of Jharkhand created greater opportunity among the DWOs to increase their average cultivated crop land area in greater extent due to availability and sufficiency of dug well water throughout the year. Due to increased availability of well water in all three cropping seasons, DWOs cultivated various crops in all three seasons which resulted in increase in crop productivity and net annual income. Involvement of DWOs in crop cultivation in all three seasons was directly linked with increase in employment days of the DWOs. Apart from increase in average cultivated crop land area, net annual income and increase in employment days for DWOs, construction of dug well under MGNREGA also secured availability of water for livestock, drinking water for human consumption, and domestic use.

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