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**DIVERSION BASED IRRIGATION AND LIVELIHOOD
RECONSTRUCTION: A CASE OF SETTLED LAND
OUSTEES IN WESTERN ODISHA**

Abstract

The diversion based irrigation (DBI) is a sustainable model of irrigation for the agricultural development in uplands. The DBI supplies water to the agricultural fields through gravity flow without using electric and diesel pumps. It has turned into a life sustaining mechanism to small land holders in topography where canal irrigation is extremely difficult due to high altitude of land. The present study is based on the diversion based irrigation and livelihood reconstruction of Rengali Dam induced land oustees in Hatidahala village of western Odisha. For Rengali dam project, the people were forced to leave their villages and resettled at Hatidahala village (56 households with 289 populations) where they certainly were dumped without further livelihood assistance. In fact, the large scale irrigation systems initiated by the government over the decades though brought in the desired outcomes however, not sufficient. Further, in case of big Dam based irrigation the farmers from its upstream are not much benefitted as compared to the farmers from downstream. In fact, the land oustees due to such large scale irrigation system more frequently fall into a cycle of impoverishment risks. However, rescuing the land oustees from ensuing risks at resettlement sites is not even close to the reality. Nevertheless to accelerate agro-production in rural settings other small scale irrigation systems such as for example lift irrigation, check-dams, roof water harvesting, diversion based irrigation, etc cannot be suppressed. In that situation, the diversion based irrigation program a unique form of irrigation initiative performed in Hatidahala community where in actuality the livelihoods of land oustees has been secured thereby improving their financial problems at present.

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Introduction

Agriculture is the first and foremost source of livelihood for many in the rural area. Agricultural development has been the prime indicator of any prosperous country of the world. But without adequate irrigation infrastructure no agriculture has ever developed and will be developing. This is also an historical fact. Historically agricultural revolution took place around 10,000 BC by which human being started farming beside food gathering and hunting. And consequently they led second agricultural revolution by using technologies in agricultural production during the Industrial revolution. It was the river and its irrigation extension that transformed simple unsettled societies to settled human societies. Thus, the agriculture passed through traditional stage (when human power, animal power, and simple tools were used), subsistence stage (food grains produced for needs but not for profit) and Industrialized stage (large scale production through application of fertilizer, pesticides, irrigation, fossil fuels, etc). However, it was the Green Revolution (planned use of irrigation, pesticides, fertilizers and high-yield crops took place) that changed the scenario of agriculture worldwide. It lifted the face value of the agricultural production and substantially led a transition from subsistence agro-economy to market based agro-economy. Unfortunately, so far the benefit of green revolution was not extended to all agricultural fields. As a result, many of the rural hinterland and villages left out in their traditional and subsistence stage of agricultural production. Accordingly agro-based livelihood has not been transformed in many rural pockets worldwide.

India and Odisha are not exception to these facts. Scarcity of water or insufficient irrigation results in lower agricultural production. Water scarcity in agriculture is another problem for the cultivators affecting their work and income. In the name of development, dams were constructed but, its irrigation features have become dysfunctional in the context of heavy consumption of water by industries in the region. Pro-industrialization economic system in the State has neglected and affected the agricultural sector to the extent that it needs to rethink on restoration of agro-activities to achieve sustainable development of villages.

One of such steps has been the restoration of traditional small irrigation to the agricultural fields. However, the lost traditional irrigation methods such as lift irrigation, irrigation by diverting perennial streams, are not given much importance in these days but if they are restored well, it can support the rural livelihood to a greater extent. In fact, the large irrigation projects like Dams which consume more lands, cause large scale displacement and escalate impoverishment risks among land oustee. Dam projects are expensive and difficult to be managed, compared to it, small irrigations e.g., Diversion Based Irrigation (DBI) system are easy to manage, do not require much land and supportive to rural livelihood without causing any impoverishment risk to the people.

Diversion Based Irrigation (DBI) System

What is DBI, why it is important, how it help and how it will be implemented are some of the research questions have been dealt in the paper. In fact, the diversion based irrigation (DBI) system is one of the old irrigation systems that are designed to divert rivers /streams to irrigate farms. It is also known as gravity flow system of irrigation as it applies gravitational force to the flow of water from streams and rivers to agricultural fields (Livolink 2018).

The DBI system in general consists of three main components namely inlet/storage structure, conduit for conveying water to the farm from the inlet and an outlet for discharging water into field (CInI 2014). This scheme can be broadly classified in three categories namely the diversion scheme, Storage schemes and Surface flow scheme. The diversion scheme provides gravity flow irrigation by diversion of stream water supply without arranging any storage. Essentially this scheme includes two parts: an obstruction (weir) or bund constructed across the stream for raising and diverting water and a channel/pipe to convey the water into the field. The Storage scheme which includes tanks and reservoirs impound water of streams and rivers. The essential features of this scheme include a bund/dam or a water harvesting structure to store water and conveyance and distribution system. The surface flow scheme with a lifting device installed on it provides irrigation partly by lifting water and conveying the water through gravitational flow to the field.

Diversion based irrigation (DBI) are two types. One refers to the revival of traditional systems (Dong, Ahar-Pyne, Phad, Gonchi) and another is pipe laid irrigation systems. The diversion based irrigation system actually diverts a portion of water from natural flow of water like spring/mountainous stream or any water harvesting structure for irrigating the crops with or without its intermediate storage. The DBI works through perennial and semi-perennial source of water in a higher elevation and diverting the water through PVC pipe lines along with the contours through intermittent outlets (Jagat 2018). It has become simple and cost-effective method as it functions without electricity consumption. It greatly helps in irrigating the agricultural fields belonging to undulating, hilly and mountainous (UHM) regions.

The Sir Dorabji Tata Trust (SDTT) has been implementing the diversion-based irrigation (DBI) programme since early 2009. The Sir Dorabji Tata Trust and the Allied Trusts have revived this ancient and cost-effective irrigation system in Odisha under the Diversion Based Irrigation programme (Tata Trust 2016). This irrigation system becomes a life sustaining mechanism to small land holders in topography where canal irrigation is almost impossible due to high altitude of land. Without using any electric pump or diesel pump, the diversion based irrigation project supply water to the fields through gravity flow is a sustainable model for providing the irrigation facilities to the uplands.

Diversion Based Irrigation and Livelihood Reconstruction of land oustees in Odisha

In case of Odisha comparison to the coastal belt which is blessed with perennial water bodies and irrigation prospects linked from upland Dams and canal constructions, the non-coastal belt could not benefit much from the water projects. So far the water projects like dam or reservoirs have immensely benefitted to their downstream regions by extending irrigation potential and controlling floods but not so to their upstream regions. Specific to western and southern parts of Odisha, degrading agriculture, inadequate agro-based livelihoods options, unsuitable and unstable market system, lack of traditional irrigation system, poor communication and transportation and illiteracy have worsened the situation. The sources of traditional agro-based livelihoods have been disrupted and now rural people are facing livelihood challenges. Further, the widespread negative impact of displacement, distress migration, urban migration, have affected agricultural sector. Poor farmers are becoming further marginalized in the absence of government or community support, starvation death, farmers' suicide are nothing but the serious outcome of such disruption.

In this regard the irrigation plays an important role in agricultural productivity and stable human habitation in the villages. Further, despite rich natural resources in Odisha people live in dire poverty in many of its rural pockets. Specific to western and southern parts of the State, degrading agriculture, unsuitable and unstable rural market, inadequate livelihoods options, poor communication, illiteracy, etc have worsened the situation. The widespread negative impact of development induced displacement like mineral industries caused imbalanced ecology has made the people economically vulnerable. These are so complicated and nerve breaking for the displaced people that, "it is not simply a question of their physical displacement, but also the displacement of their agricultural lands, common property resources, village atmosphere, settled community life, social capital, civil societies, indigenous knowledge, ideas, values, etc." (Garada 2013a; 23, Garada 2013b). Consequently, they are vulnerable to post-displacement impoverishment risks like landlessness, joblessness, homelessness, marginalization, increased morbidity and mortality, food insecurity, etc. (Garada 2012a & 2012b; Cernea 2006; Pandey 1998). "Unfortunately, the large scale coal mining projects in Odisha are alarmingly found to have simultaneous contradictory effects such as material progress versus environmental pollution, economic growth versus ecological catastrophe, capitalists prosperity versus adversity on local people, public development versus local people's impoverishment, accessibility to the fruits of development versus vulnerability to risks of development, development at industrial centre versus under-development at periphery, pro-modern life style versus anti-traditional life style, pro-global changed society versus anti-local society, so on, and so forth" (Garada 2013a; 22). The Dam project namely

Hirakud Dam multi-purpose project affected 22,144 families in the Sambalpur district of Odisha in 1946 could not provide adequate rehabilitation and resettlement for its land oustees (Garada 2015; Baboo 1992). “The legal title holders and common property resources (CPRs) dependents like food gatherers, hunters, forest produce collectors and tribal artisans could not be rehabilitated” (Garada 2015; 93). According to Baboo the project authority could not realize the displaced people’s extent of agrarian loss (Baboo 1992).

In this context gradually the traditional rural livelihoods have lost its space in villages and people are facing livelihood challenges. Poor farmers are becoming further marginalized in the absence of community support or external support to them. Starvation death, farmers’ suicide are nothing but the serious outcome of such a system. In the name of development, dams were constructed but, its irrigation features have become dysfunctional in the context of heavy consumption of water by industries in the region. Pro-industrialization economic system in the state has neglected and affected the agricultural sector to the extent that it needs to rethink on restoration of agro-activities in villages to achieve sustainable development of villages. Large irrigation projects are expensive, difficult to manage, consume more land causing large scale displacement and increased impoverishment risks for the project affected people. Irrigation plays an important role in agricultural productivity. Scarcity of water or insufficient irrigation results in lower agricultural production and affecting cultivators’ work and income. The lost traditional irrigation procedures such as lift irrigation, irrigation by diverting perennial streams, these days are not given much importance but if restored well, it can support the rural livelihood to a greater extent.

One of such steps can be restoration of traditional small irrigation to the agricultural fields. Compared to it, small irrigations e.g., Diversion Based Irrigation (DBI) system are easy to manage, do not require much land and supportive to rural livelihood without causing any impoverishment risk. Diversion Based Irrigation system is significant enough for hilly and mountainous terrains for meeting domestic as well as cultivation needs at almost zero electricity cost. It requires remarkably lesser investment for irrigation with minimal maintenance cost. It functions as a supporting tool for ensuring sustainable livelihood & food security by ensuring irrigation and promoting second crop and income of the community people.

In this regard with the financial and technical support of Sir Dorabji Tata Trust, the Diversion Based Irrigation programme has been implemented by the welfare agencies namely Livolink, ADARSA, AJSA in Koraput, Sambalpur, and Kalahandi districts respectively. The projects have been proved to be beneficial in enhancing and restoring farmers’ livelihoods in these localities (Livolink 2018, ADARSA 2014 & AJSA 2013).

Methodology

Hatidahala village is the study area where the diversion based irrigation system has been operationalised by an organization known as ADARSA supported by Sir Dorabji Tata Trust. The study village is an inaccessible hilly village of Jujomura block in the Sambalpur district of Odisha. It is situated 45 km away from Jujomura and 45 km away from the Sambalpur city. The total geographical area of the village is 144 hectares. The major objectives in the study include understanding the basic features of the low cost diversion based irrigation system, assessing the impact of the DBI initiative on economic life of the beneficiaries and exploring improvement in other aspects of their social life due to DBI initiative. The case study is based on a descriptive research design and primary and secondary sources of data. The primary data collected from the people of village as a case, focused group discussions and observation whereas the secondary data mostly the studies and reports made by ADARSA, other published articles and Census data etc. have been used in the study.

Profile of Study village

Hatidahala village is situated in Meghpal GP of Jujomura block in Sambalpur district of Odisha.



Map-01: Hatidahala village in Meghpal GP, Sambalpur District, Odisha

As per the Table-1 the study village Hatidahala comprising 56 households has a total population of 289. Out of this total population there are 49.13 percent males and 50.87 percent females. The average sex ratio of the village is 1035 which is higher than State average of 979 whereas child sex ratio is 846 which are lower than state average of 941 in 2011. There are 73.44 percent literates in the village along with 78.44 percent males and 60.8 females.

The schedule tribe (ST) constitutes 98.27 of the village population while the schedule caste constitutes only 1.73 percent of total population in the village (Census, 2011). Thus the tribal population who entirely depend on the agriculture and its allied sector needs to be taken care of.

Out of total 166 workers in the village there are 52.40 percent males and 47.59 percent females. And about 53.01 percent i.e., 88 are engaged in main work (employment or earning more than six months) while 46.98% (78) are doing marginal activities which only provide them livelihood for less than six months.

Pre- Diversion Based Irrigation (DBI) Situation of study village

The Hatidahala village in the Sambalpur district of Odisha has been witnessing frequent droughts over the decades. This region is a dry land where water scarcity is one of its major problems, whether it is in the shape of drinking water or of agricultural water supply. Earlier the villagers did not have any access to irrigation or other modes of water supply for their lands. All the families in the village are the displaced people of Rengali Dam which is being constructed on River Brahmani. For Rengali dam project, the people were forced to leave their own villages and resettled in the present Hatidahala village of Meghapal gram panchayat where they were dumped without the further livelihood assistance. As of many resettlement areas, there have been least opportunities for restoring the villagers' previous livelihood sources. As most of the people were cultivators, they did not have necessary skills and exposure to opt for other sources of livelihood at present. Because of scarcity of water they were facing many difficulties and had to rely on the traditional ways of doing agricultural production i.e., half a yearly cultivation and half a yearly rest. Certainly they were not getting the actual benefits of the dam project. As the study village situated with a dry land, village wells and ponds get dry in summer and even the groundwater level goes much down the usual level. For their domestic use the women in the village had to walk four to five kilometers everyday to fetch water from a tiny perennial stream in nearby forest. For agriculture, the villagers were completely dependent upon the rain fall which was again could not be stored due to lack of proper infrastructure in the village. Hence, safe drinking water and water for irrigation were some among the major problems of the people in study village round the year. Further, low agricultural production made these oustees to live in dire poverty, hunger and marginalization. In absence of irrigation facilities in such difficult terrains, they used to remain jobless for more than six months in a year. The principal occupation of the villagers is agriculture and as village's rain-fed terrains allowed the farmers only to own one seasonal cropping and if there were low rainfall in per year, there had been low crop production and people had only to walk out the village searching for wage labour. This led to a situation of causing cheap labour and labour migration from the village.

Our FGD reveals that the beneficiaries of the project in the study area are mainly the land oustees of the Rengali Dam Project resettled in the current location after displacement. By displacement, they lost their cultivable land as a major source of livelihood and became poor gradually when they could not adjust with the relocation processes. During the study while discussing about previous living conditions of the villagers, it was found that the incomes generated from NTFP product marketing were just hand to mouth for some families. There was no alternative, either they had to migrate to towns with their family and children or they have to face poverty and hunger in the place. Basically most people were dependable on agriculture; “this is the need and way” from which they can able to fulfill basic needs of their families. But without proper irrigation it was not possible to have a minimum standard of life for many. Even if certain facilities provided by Government, they were beyond their reach. Furthermore, prior to construction of the DBI project, women of the families were going around four to five kilometers for the purpose of fetching drinking water, bathing and washing clothes to the nearby small perennial streams. People of the area used to experience drought once in every three years and thus, they had very low agricultural production. Now the conditions have been changed with the progressive livelihood options provided by DBI Project and supported by ADARSA.

Post-Diversion Based Irrigation (DBI) Situation of the study village

A non-profit making organization known as ADARSA (Association for development and research in socio-economic activities) is found to have commendable job in rescuing the land oustees from nagging water scarcity in agricultural lands in Sambalpur district of Odisha. It has been enabling poor families residing in difficult terrains to double their incomes by taking second crop, using diverted water flows in addition to ensuring assured irrigation for the Rabi and Kharif crops. In this regard, the efforts created by the ADARSA in Hatidahala village in securing villagers’ lost livelihoods are remarkable. Our studies reveal that poor water control strategy has been one of the major hindrances in the livelihood enhancement of farmers in the area. The diversion based irrigation not only enhances the people’s livelihood mechanism but also strengthens community engagement in management of water sources round the year.

The DBI initiatives in the village

The salient features of the efforts made by the ADARSA include conservation and judicious use of water resources, enabling arrangements that provide access to the communities to such resources, and improving livelihood options that are in consonance with the ecosystem functioning. For installing the DBI system, at the initial stage, village survey, potential site survey, promotion of farmers’ club and Micro Level Planning etc. were conducted by ADARSA with

the help of professional engineers and water resource management experts and monitored installation and technical expertise till the end of the project. The community people were mobilized to implement and maintain the DBI structures. ADARSA played a crucial role in motivation, community mobilization and securing labour contribution from the beneficiaries. The villagers took their own initiative for digging drain (of 3feet and 5 inch deep) and fitting pipes by their own effort to provide water for agriculture and household consumption. The Farmers' Club members of the villages were involved in the total management of the project. They tracked the process from the beginning to end by ensuring participation, maintenance and sustainability of the total system. The entire irrigation system is managed by the "Farmer's Club" formed by the target beneficiaries of the villages. The Farmer's Club had prepared the frame work for effective and timely sharing of water among the beneficiaries. The capacity building of the target families for improved agricultural practices had also carried out by the organization in collaboration with agriculture and horticulture departments. The entire task was coordinated by the local dynamic leaders, and community level representatives. Everything was done with labour contribution by the villagers ensuring hundred percent community people's participation.

The role of the Farmer's Club includes monitoring the progress, ensuring participation, sustainability & maintenance and organizing community meetings. It records connection details of the system, functioning of check points and total supply of water in the community.

Every month the village people are now contributing some money i.e., Rupees fifty per household to meet the maintenance cost of the total system in future. The amount raised from contribution, is kept in shape of deposits in village fund operated by the Club. They have proved themselves skilled enough to lead the community around them and on common issues in the community, they plan and work collectively.

In addition to these, to improve the techniques of cultivation, better utilization of water resources as well as for improved agriculture, ADARSA has undertaken further assistance in the form of workshops and capacity building trainings, crop demonstration in the project areas in collaboration with Agriculture and Horticulture Departments, Govt. of Odisha. Trainings are provided on improved agricultural practices like Systematic Rice Intensification (SRI), improved variety vegetable cultivation and kitchen gardening (ADARSA, 2013). Community level stake holders are strengthened for DBI structure management and maintenance. The Birbajarangabali Farmers' Club members of the village are trained on operation and maintenance of irrigation systems along with crop planning and water sharing techniques.

Table 2 depicting the beneficiary detail of the DBI project in the study village, where all the 56 households in the study area are receiving the benefits of the DBI project. The total land holdings of the villagers are 336 acres i.e., each family received 6 acres of land during their resettlement in the village

and out of it, 156 acres of land has been irrigated by the DBI project. Of the total land holdings, 134 acres of land gets irrigated during Rabi season and 156 acres of land gets irrigated during Kharif season. The acute scarcity of water both for domestic use and agricultural use has been removed by the installation of the DBI system in the study area.

The DBI Impact in the village

Before initiation of DBI irrigation almost all the villagers of Hatidahala village were experiencing dual marginalization. First, they were the victims of development induced displacement and second, they were not able to cultivate their land due to severe water scarcity and as a result most of the youth in the village were seasonally migrating to neighbouring cities as labourers for earning their bread and butter. Acute water scarcity was one among the principal issues of the villagers. For domestic use, they were depending on the only tube-well situated in the primary school campus of the village. Their living standard was too low. Their cultivable lands were lying fallow most of the seasons. On an average, they were getting around 30 kg (roughly) of paddy per season and Rs. 250.00 – Rs. 350.00 per month as their wage. The daily wage labourers were earning Rs. 40.00 – Rs. 50.00 per day leading a very poor living standard. After installment of DBI irrigation system, the villagers have been able to address and meet their minimum needs along with other needs of health and clothing to a large extent.

In the study, it was found that not only the farmers in agricultural land but the women in the households have also been benefited under the DBI project. It has been observed that entire families (N= 56) in the study village are making use of the water for both domestic and irrigation purpose and producing two seasonal crops which was not at all possible for them prior to the installment of the DBI system.

The study found that there were multiple impacts on the lives of the rural poor which involved impact on both their economic and social life. As presented in Table 3, all the beneficiaries experienced growth in their annual income with increase in their crop production as a result of the irrigation facility extended by DBI. Only 12.5 percent beneficiaries found to have raised in their seasonal income by Rs. 6000 to Rs. 8000 whereas, 87.5 percent beneficiaries (households) were found to have increase in seasonal income by more than Rs. 8000. This difference of growth found among the beneficiaries was based on their preference to the type of crop to be grown in their field and the marketing efforts.

Discussion

With the support of Sir Dorabji Tata Trust, ADARSA organization initiated DBI projects during Kharif and Rabi seasons in Hatidahala village (ADARSA 2014). In this irrigation system, the farmers do not have any regular operational costs except their contribution for the maintenance of the scheme. As per our observation

and focus group discussion the diversion based irrigation system is providing irrigation to the un-irrigated areas in the village. About 91.07 percent of the households in the village find DBI as main mechanism for livelihood generation. They acknowledge that the self-sustaining management system of water resources can be appropriate and much effective than other governmental canal irrigation. As cultivators prefer irrigated water from supply pipes than diesel motor and pumps that are expensive and often not available, the DBI has been a boon for them as responded by all the beneficiaries during the study. All the households in the village feel inclusive of the diversion based irrigation system because it provides benefits to all families in same ways and builds community stake for its operation and maintenance. By taking experience from community engagement in the DBI project, community people have become more confident and organized in planning and working for their better livelihoods. It is noted that in the process of project activity, unity and solidarity have been achieved and maintained among the villagers at present. Our observation and focus group discussion reveal that the diversion based irrigation system has improved the crop production potential considerably. Now all 56 households in the study area have assured irrigation for their agricultural fields round the year. This has lead to two crop cycles, i.e. Kharif and Rabi in a given year. Our study reveals that the DBI system has facilitated for around 168 acres of land under irrigation covering 56 households in the village. About 89.3 percent of the households agree that the unused lands have become productive with the water provision round the year.

Our observation and focus group discussion also reveal that it has been helpful in stabilizing kharif paddy and with support of the organization; around 55.4 percent families have been encouraged to take short-duration cash crops in the Rabi season, resulting in 20-50% increase in their incomes. About 64.3 percent farmers have started cultivating hybrid mustard, hybrid maize along with additional kitchen garden and thereby supplementing their family incomes. As an outcome, the range of initiating a number of agro-based income generation activities is creating a demand in the neighboring villages too.

The DBI initiative is also providing wage employment to the marginal workers. It is estimated that each farmer taking irrigated agriculture has at least an additional seasonal income of Rs. 6000 from the project. About 46.4 beneficiaries were found to get wage employment opportunities in the village along with kitchen gardening and short duration cash crops like flower cultivation. Distressed migration had been an issue in the study village but, as an outcome of the DBI project, the unemployed youths in the village are now involved in agricultural activities and thus there is a straight 75 percent reduction in distressed migration in the village. The study observed reduced dependency on forest produce of the villagers due to creation of employment opportunities during each succeeding year with support of ADARSA. Moreover, there is improvement in the standard of living of the villagers. It has enhanced the capacity of people to help them achieve food sufficiency round the year and have surplus cash income to meet their other family expenses. Presently, villagers are able to develop kitchen gardens, with the help of the project near their homestead lands and it is also helping women to use water for their daily household works.

The women are no more required to walk kilometers to fetch water for domestic use. They are getting it at their doorsteps. The food security has been regained completely in the community and the surplus production of vegetables is now supplied to district market through vegetable cooperatives.

Conclusion

The diversion based irrigation is incredibly sustainable, inexpensive and environmental friendly water-supply system. Gravity transports the water using zero energy, helping to make the project extremely financially viable. This tiny irrigation project along with community engagements could make a great difference in both economic and social facets of community living. There is need of encouragement to put in such unique traditional initiatives specifically in rain-fed terrains to improve the livelihood of individuals rather opting for establishing large irrigation projects which regularly results in large scale land acquisition accompanied by massive human displacement and their marginalization. Additionally it involves community participation creating space for community solidarity and collective endeavour. There remain many other villages facing the problem of water scarcity and related irrigation problems creating their vicious cycle of poverty. Promoting and facilitating such small but sustainable irrigation projects must be done in communities facing water issues for promotion of livelihoods of the poor thereby raising their social conditions.

Table.1: Demographic Profile of Village

Sl	Particulars	Total	Male	Female	Sex ratio
1	Population	289	142(49.13)	147(50.87)	1035
2	Child (0-6 yrs.) Population	48	26(54.16)	22(45.84)	846
3	Scheduled Caste	5(1.73)	2(40.0)	3(60.0)	—
4	Scheduled Tribe	284(98.27)	140(49.26)	144(50.74)	—
5	Literacy rate	177(73.44)	91(78.44)	76(60.8)	—
6	Total workers	166	87 (52.40)	79(47.59)	—
7	Main workers	88(53.01)	49(56.32)	39(49.36)	—
8	Marginal workers	78(46.98)	38(43.68)	40(50.63)	—

Source: Census of India, 2011.

Table.2: Beneficiary Details

Sl. No.	DBI initiatives	Beneficiary Details
1.	Population of Hatidahala covered	289
2.	Total land (Acres)	336
3.	Land covered by DBI (Acres)	156
4.	No. of beneficiaries (households)	56
5.	Irrigation to Rabi Crops (Acres)	134
6.	Irrigation to Kharif Crops (Acres)	156

Source: Field study, 2018

Table.3: Distribution of beneficiaries and raise in their income

Sl. No.	Beneficiaries (No. of Households)	Raise in income (Seasonally)	Percentage
1	49	By more than Rs. 8000/-	87.5
2	07	In between 6,000/- to 8000/-	12.5
Total	56	NA	100

Source: Field study, 2018

Table.4: Major impacts of the DBI project

Sl. No.	Major impacts	Households	%
1.	Irrigation to Un-Irrigated Areas	51	91.07
2.	Management of water resource	56	100
3.	Community engagement	56	100
4.	Production Potential of agricultural lands	56	100
5.	Productive of Unused lands	50	89.3
6.	Short-duration cash crops	31	55.4
1.	Agro-based income generation activities	36	64.3
2.	Food sufficiency	56	100
3.	Food security	56	100
4.	Wage employment	26	46.4
5.	Reduction in distressed migration	42	75
6.	Reduction of dependency on forest produces	47	83.9

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