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STRENTHENING WATERSHED MANAGEMENT: ISSUES FOR SUSTAINABLE TRIBAL DEVELOPMENT IN ODISHA

Abstract

Tribal economy basically depends on agriculture. The agricultural occupation offers livelihood to the majority of tribal communities of our country. Thus, the fate of the tribal development closely linked to the fate of its agriculture. In recent days there is a greater need to empower the tribal communities with focus on improving agricultural skill, techniques, entrepreneurship and productivity. This will certainly help in creating conditions for sustainable development, in determining pattern of development based on the local resources of tribal region according to the requirements of the tribal people. This paper attempts to find out the feasibility of the progressive changes in livelihood through watershed management which is certainly instrumental to deliver apposite benefit and increase the capacity building of tribal farmers for their sustainable growth.

Keywords: *Watershed Management, Sustainable livelihood, Tribal Development.*

Recived: *10th Jan 2020* ***Revised:*** *3th June 2020* ***Accepted:*** *10th June 2020*

Introduction

Indian economy is an agrarian economy and livelihood of rural and tribal people is intricately linked with the access to natural resources. Watershed is viewed as a panacea to improve the livelihood security of rural poor in a diversified manner. Watershed development provides sustainable livelihood to the rural poor through creating diverse livelihood. Therefore, in the policy framework, it is necessary to examine how this goal is achieved by watershed development project.

Watershed development has become a core strategy for poverty alleviation and tribal development in India with its acceptance as a unit of planning for synergizing development by different ministries in ninth plan

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document. The main argument behind this approach is that the higher incidence of poverty in drought prone, hilly or rain fed areas can be reduced with watershed development programmes. Soil and water conservation tool with landscape focus and technology approach has become a holistic development tool to address livelihood issues of rural poor (Carney 1998).

Watershed development approach is viewed as a panacea to dissipate spatial developmental inequality across the regions by augmenting and diversifying employment and income. It involves re-generation of the environment and management of the needs of tribal communities in such a way that their demands match with the resources available likes land, water and vegetation within that particular watershed. The watershed project aims at treatment of degraded lands with the help of locally available technology and low economic cost to provide better crops and livelihood for the user communities. Watershed development focuses on both the human resource development besides improvement of environment in the identified area. This reduces drought and increases agricultural production, boosts fodder, fuel and timber.

Understanding Relevance of the problem

The agricultural production in most of the tribal villages of Odisha is very low. It often leads to threat for the food security of tribal communities. Hilly, sloppy and infertile lands with poor agricultural techniques, lack of irrigation facilities and low investment in agriculture are major causes of food insecurity in tribal areas.

Koraput is one of the most underdeveloped areas in Odisha, which comes under Tribal Sub Plan (TSP) area with high density of schedule tribe's population. The study district i.e. Koraput of Odisha is tribal dominated and coming under the 5th schedule of our constitution. The major tribal communities are the *Kondhs*, the *Parajas*, the *Bhotadas*, the *Sauras*, the *Gadabas* and the *Durua*, etc. Other important social groups are that of Scheduled Caste which includes various castes like the *Dambo*, *Ganda*, *Ghasi*, *Pana* etc. Scheduled Tribes constitute 50.56 per cent and Scheduled Castes constitute 14.25 per cent of the total population of the district (Census of India 2011). The literacy rate of the district is 49.87 per cent while female literacy is only 38.9 2per cent (Census of India 2011).

84 per cent of the population of the area lives below poverty (BPL Census: 1997). Unlike rest of Odisha and India, the poverty incidence in this area shows an increase in last two decades. The rural people of the district heavily depend on agriculture but the agriculture productivity of the small scale and marginal tribal farmers is very low. The uneconomic land holding, lack of technical knowledge and inefficient use of water resources further creates obstacles for sustainable livelihood opportunities of these people.

Most of the areas of the district depend on the vagaries of monsoon for agricultural activities. It is important to give emphasis on watershed management in order to boost the agricultural productivity of the tribal peasants. About 70 per cent of land in agriculture is rain-fed and the locals depend on irrigation primarily through the *Jhola* (small spring) systems. There is only one medium irrigation project i.e. the Upper Kolab Irrigation Project providing irrigation to 45000 hectares of land of the relatively plain area. Thus, the agricultural production is highly dependent on the rain and management of runoff water. Apart from the *jhola* cultivation, shifting cultivation (*podu chasa*) is carried out on sloping land, which has made soil highly susceptible to erosion. It also leads to formation of small channel or gully. In a circumstance of heavy dependence on subsistence agriculture, hilly and uneven topography and ongoing degradation of natural resources watershed development has emerged as a substantial strategy to bring overall development. The implementation of watershed management project is one of the many useful strategies of development which can bring positive changes for the disadvantaged groups in rural areas. All-out efforts in the course of watershed development programmes are required for increasing economic activities and raising the productivity of land with environment conservation techniques in the district.

Theoretical framework and Overview of literature

Watershed management is related to tribal life's engagement with natural resource management. Traditional ecological knowledge of tribes is very instrumental in managing watershed management in their society. Synergy of traditional ecological knowledge and modern technology can do wonder to provide diversified livelihood and sustainable development in tribal areas. However, an integrative approach by combining the valuable traits of both traditional and modern knowledge will be beneficial for their enduring development. Drawing Schumacher's 'small is beautiful' model, micro watershed project can be a panacea to eradicate the bottlenecks of development and bring sustainability for tribal livelihood opportunities. It will be more people centered and make a way for environmental and human sustainability.

For agrarian societies like India, which depend on availability of irrigated water or rainfall for the purpose of agriculture, watershed management is an important prerequisite for the overall development. The importance of irrigation in the development process of agriculture has been clearly brought out by both micro and macro studies in India (Dhawan 1988; Rath 1996). Watershed development not only increases the use of yield increasing inputs (high-yielding variety seeds, fertilizers, etc), but also facilitates for high productivity, cropping intensity, along with additional employment opportunities (Reddy 2000). In a comprehensive study of water resources in India, Prasad (2003) points out that 'the development of water resources helps in the alleviation of poverty from

both rural and urban areas, by creating lot of opportunities for livelihood'. It enhances the agricultural production, which is the main source of livelihood in rural areas where the bulk of the poor in the developing world reside.

Highlighting the impact of watershed management on tribal livelihood, Padhi and Padhy (2010), argued that 'the introduction of integrated watershed programme in Koraput district of Odisha has enhanced the livelihood of the tribals in this region'. Improved irrigation water control in central India has redressed the livelihood problems of tribals (Phansalkar and Verma 2004). While recommending policies for alleviating poverty Rath (1996) has indicated that 'the primary and vital task would be to extend an irrigation facility which has visible impact on productive employment'. The irrigation opportunity not only increases the production and productivity of agricultural commodities but also helps to reduce the level of poverty (Moorthy 2001). Describing the impact of irrigation reforms on the tribal life of Gujarat, Mukharji (2004) mentioned that 'the development in irrigation sectors has changed their cropping pattern, increased production'. It not only increased the wage rate and days of work availability but also reduced the migration during lean seasons.

The new approach is a shift from 'the resources perspective' to 'people's perspective' which highlights the poverty as a consequence or impact of environmental degradation and demonstrates how livelihood realities change when environmental resources are degraded. Emphasizing on the significance of community involvement in irrigation management for sustaining agriculture, Kodakadi (2004) said that 'in many drought prone areas of lower income countries, return to agriculture could be increased by community based water harvesting and the people's knowledge of land and water resources in their locality will help in enhancing productivity'. Watershed development includes harnessing rainfall for improvement of barren hill slopes, commonly owned lands and water resources in rain-fed areas with participation of its primary stakeholders. Both water and land are the prime resources in watershed management system. Though watershed development is not very new in our country, still management of micro watersheds for ecological and livelihood reasons has been of recent origin (Farrington et al 1999).

Watershed development has come out as a major strategy of rural development especially to address the challenges of rain-fed hinterlands and food security. The importance of rain-fed agriculture is gradually being recognized by policy makers. Though the concept of watershed development is very old, still of late its role is being realized to enhance sustainable development in most underdeveloped areas. With its growing usefulness, the policy decisions of the programme itself has undergone several changes initiated by C.H.Hanumantha Rao committee in the early nineties and established in the recent common guidelines (Samuel et al 2008).

However, there is a dearth of reliable comprehensive information and studies on the long term potential and impacts of watershed across the regions.

In spite of the mounting importance of watershed management as an approach to rural development there has not been much research on the impact assessment of these projects in western Odisha, particularly in KBK region. Research is required to focus on the watershed management in order to understand its positive impact on environment and livelihood process.

In the above backdrops, the objective of the study is to examine the impact of the watershed development programmes undertaken by various Government departments and Non-Government Organizations (NGOs) for sustainable development. The broad objectives are to evaluate the impact of the watershed programmes on the beneficiaries before and after the completion of the project.

Objectives

The major objectives of the study are as follows:

1) To find out the factors contributing in livelihood generation through the intervention of participatory watershed programme.
2) To critically evaluate the role of integrated watershed programmes for sustainable development in tribal areas.
3) To analyze the importance of watershed for protecting environment and natural resources of tribal area.
4) To find out the growth in the agricultural productivity and crop diversification in the region.
5) To explore various constraints in successful watershed management programme and to put forth the appropriate suggestive measures to eradicate those constraints.

Methodology

The study is carried out in three tribal dominated blocks viz. Semiliguda, Koraput and Nandapur blocks of Koraput district in Odisha. The multi-stage purposive sampling method is used for the selection of sample watersheds in these three blocks. Four randomly selected watershed projects are taken from each block for evaluation. 25 households have been selected on random basis from each watershed and are surveyed for collection of information regarding various aspects of watershed and its impact. Thus the total number of households selected from each watershed is twenty five, from each block is hundred and the total households selected as sample (from the universe) is 300. The name of blocks, watershed, villages and the number of households selected are presented in the table -1.

The proposed study is based on intensive fieldwork. The study aims to collect both primary and secondary data by using qualitative and quantitative sociological tools. The qualitative methods include observation, focused group discussion and key informant interview method. The quantitative methods include

formal interviews from the households, concerned government officials and NGO workers with the help of structured interview schedule. The secondary data are collected from published reports of similar projects, policy documents, records of various government department of the Koraput, district statistical handbook, from various journals, unpublished thesis and other published materials. The collected data is analyzed through appropriate statistical procedures and finally the research report is prepared.

Table - 1 Distribution of Sample

Sl.No	Name of Block	Name of Watershed	Name of the village	Name of the GP	No. of Household
1	KORAPUT	01.Kalchur	1.Kalchur 2. Bhoiguda	Bada Suku	25
		02.Pitei	1.Pitei	do	25
		03.Sirisi	1.Sirisi	do	25
		04.Suku	1.Suku Station 2.Maliguda 3. Suku	do	25
2	NANDAPUR	05. BhairabigudiNala	1.Charampi 2.Podapadar 3.Nandigaon 4. Khotalaput 5. Gunthalguda	Bilaput	25
		06. Balighat	1.Badel 2. Koreiput 3. Sisaput	Badel	25
		07.Bada Nala	1.Masuri 2.Pangiput 3.Silpandi	Badel	25
		08.NageswariNala	1. Taintar 2. Khadaput 3. Gailput	Bheja & Balda	25
3	SEMILIGUDA	09. Baba Gupteswar	1. Jangamput 2. Daleiguda 3.Thatapadarguda	Pitaguda	25
		10. Bira Khamba	1.Patraput 2.Pujariput 3.Roselput 4.Kuturput	Rajput	25
		11. Leenga Deomali	1.Kandha Sirimunda 2.Paraja Sirimunda	Kunduli	25
		12. Puja Dora	1.Padiguda 2. Kediguda 3. Gulel	Subai	25
Total	**3 Blocks**	**12 Watersheds**			**300 Households**

The survey is conducted during 2015-17. In order to gain confidence on the sample size and to assess the possible difficulties in the field work of the main survey, it was thought necessary to conduct a 'pilot survey' of watersheds of three sample blocks (four watersheds from one block). For this purpose, an interview schedule was designed and pilot study was taken between August, 2015 and September, 2015. This helped the researcher to prepare a list of the final sample and to explore other relevant information for the main survey.

The actual data collection from the field carried on in the sample blocks viz. Nandapur, Koraput and Semiliguda of Koraput district over a period of ten

months i.e. from October 2015 to August, 2016. However, for verification some data and to collect some additional information, final stage of field survey is conducted in the months between September, 2016 and December, 2016.

Data are collected through interview schedule by holding face to face oral interview with the respondent (mainly with Head of the Household) and their responses have been carefully recorded in that pre-designed schedule. The interview schedule is carefully designed and improved after a pilot survey of three watersheds so as not to leave any scope of omission of any relevant data required for the purpose. The interview schedule is used for the attainment of the general information regarding the socio-economic profile of respondents and also to know their view, particularly in reference to the benefits of watershed project for the uplift of tribal and rural communities. This schedule comprises of the definite, concrete and pre-ordained questions to elicit more structured and detailed answers. Both open-ended and close-ended questions have been designed and included within the schedule. Through the open-ended questions, the researcher has tried to obtain the respondent's free responses. On the other hand the close-ended questions are given with dichotomous and/or multiple alternatives to provide opportunity for respondents to choose the most appropriate answer from the set of alternative answers. The mode of data collection involves (i) direct questioning of household head (ii) extracting data from the participant observations (iii) interviewing of selected informants.

Apart from primary source, information is also collected from secondary sources regarding the implementation and utilization of various watershed programmes in the block and selected villages. Data from secondary sources comprise both published and unpublished. The published sources comprise survey documents, census materials, related text book and journals, statistics from district institutions like district statistical office, office of department of forest, soil conservation, Krisi Vikas Kendra (KVK) etc. Unpublished data are also collected from various M.Phil and PhD dissertations, the records of various offices of the panchayats and blocks etc.

The study has also been supplemented by other research instruments like informal group discussion, periodic visits, participation in village level meeting, discussion with government officials, Gram panchayat officers, watershed committee members and social workers who have expertise and firsthand knowledge in the tribal areas.

Analysis and Interpretation

Odisha is one of the poorest states of India in which nearly 22 per cent of the population of the state are tribes, who have a precarious economic condition and considered as the most vulnerable group of the state. Inconsistent rainfall and degradation of natural resources have resulted in decrease of

agricultural production. It has its impact on food insecurity, rising out-migration and periodic deaths from starvation. This environmental situation has negative impact on the livelihood pattern of tribal areas. The life of the tribals is gradually more vulnerable due to a persistent lack of assured livelihood.

Odisha Tribal Empowerment and Livelihood (OTELP) resume its intervention during 2007-08. This is well supported by IFAD, WFP, DFID and Govt. of Odisha covered 30 backward blocks of Koraput, Kalahandi, Gajapati, Kandhamal, Malkanagiri, Nawarangpur and Rayagada district in a phased manner. The selection of micro watersheds is made by assessing critical parameters like impenetrable tribal population, pervasiveness of poverty and far-reaching degradation of natural resources like land and forest. The prime objective of OTELP is to include the marginalized section of society in the watershed programme. Therefore, it generally includes the villages which have 60per cent of STs and SCs population or more than this and who are below the poverty line (otelp.org).

Agriculture and wage employment in agriculture are the main source of income. Crop diversification, increase in production, increase of man-days, introduction of cash crops etc. have provided more opportunities for income generation. In all the watersheds it has been observed that watershed has increased the number of sources of income per households.

Multiple sources of income

Table - 2 depicts that 187 households (62.33 per cent) are now rely on four or more sources of income which was significantly high compared to 12.33 per cent before the implementation of watershed activities. At that period, though there were some households who have either four or more than four sources of income, it was less in number and only restricted to wage labour. But after the intervention of watershed households the availability of four or more sources of income has increased significantly. It is now related to agricultural and its allied activities. It has not forced them to migrate outside as well. If we include households having three or more sources of income then it comes to 93.67per cent. Rest households who have less than three sources of income are basically small households with fewer members. So it is observed that in general the number of sources of income has improved in all those watershed areas. Those who have less land or landless have got opportunity to work in the developmental work created through government supported projects as wage earners and also involved in several non-farm watershed activities. Availability of multiple sources of income reduces the risk of loss of earnings.

Table - 2 Households depending on multiple Sources of income

Sl.No	Total HH of different blocks	One source of income	Two source of income	Three source of income	four or more source of income
1	Koraput (100)	01	09	34	56
2	Nandapur(100)	00	02	29	69
3	Semiliguda(100)	04	03	31	62
Total	3 Blocks (300)	05	14	94	187

Source: Field Study

There is also a positive trend of increase in numbers of sources of income from various sources over four years reflecting the impact of project interventions which can be observed (out of 300 sample households) from the figure - 1.

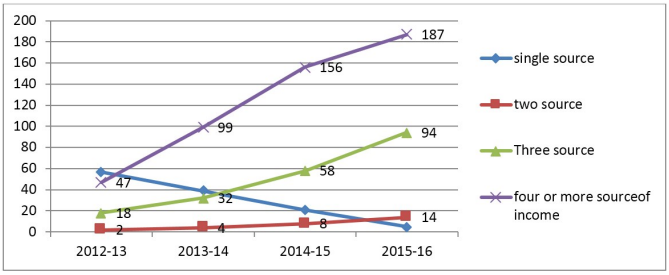


Figure - 1 Households depending on multiple Sources of income over the years

Livestock promotion

Live stock promotion through the watershed project is very important and appreciably contributing to the livelihoods of tribals after agriculture and wage employment. The number of households out of 300 sample households depending on livestock as a source of income is depicted in table-3.

Table - 3 Number of households depending on Livestock

Sl.No	Total HH of different blocks	Main Source	Second Source	Third Source	Fourth source
1	Koraput (100)	01	09	23	11
2	Nandapur(100)	01	12	34	09
3	Semiliguda(100)	03	22	30	06
Total	3 Blocks (300)	05	43	87	26

Source: Field Study

Livestock linked with fishery, has been implemented extensively by the programme particularly for the landless poor households. The cumulative results of these high level participation indicators have enhanced notably than the earlier period which points toward positive results for rural livelihood. Information on the livestock population shows that it has significantly increased in all the watershed areas due to the initiation of govt. as well as civil society. Earlier plough animals are poor in quality with health condition due to the

insufficient feed and fodder. The people are not conscious about milk production so the milk producing cattle are not taken much care. Sometimes population suffers due to attack of render pest, black and foot and mouth disease. Now the conscious level regarding livestock has significantly increased. Various economic activities regarding livestock like goat farming, piggery and diary etc. has made people to realize the importance of livestock for their agriculture as well as livelihood support.

Strengthening land right

Agriculture is the main source of livelihood option of all the watershed area. Earlier these people have not received their land *patta* (legal document). But now after the implementation of watershed about 70.67 per cent of the people are having legal right over their land through government land *pattas*. Few households are landless and they are indirectly earning their livelihood through agricultural labour and share cropping.

Table - 4 Number of households having Land right/*Patta*

Sl.No	Total HH of different blocks	Land right before Watershed	Land right after Watershed
1	Koraput (100)	32	68
2	Nandapur(100)	19	53
3	Semiliguda(100)	45	91
Total	3 Blocks (300)	96	212(70.67per cent)

Source: Field Study

Surplus cash income

87 percent of the households from the watershed villages have remarked positively by mentioning that the surplus cash income has been generated which is much better than the year before the introduction of the watershed. This is due to the huge wage earning from the project construction activities and the sale of surplus agriculture production like vegetables, pulses and other cash crops. The trend of increasing in cash income between the year before the introduction of watershed and after the completion of watershed has been presented in the figure-2. It is clearly evident that before the introduction of watershed only 21 percent of respondents say that they had surplus cash income, but after the completion of watershed programme now in 2015-16, 87per cent of respondents say they have surplus cash income. This shows the positive impact of watershed on increased income of the area.

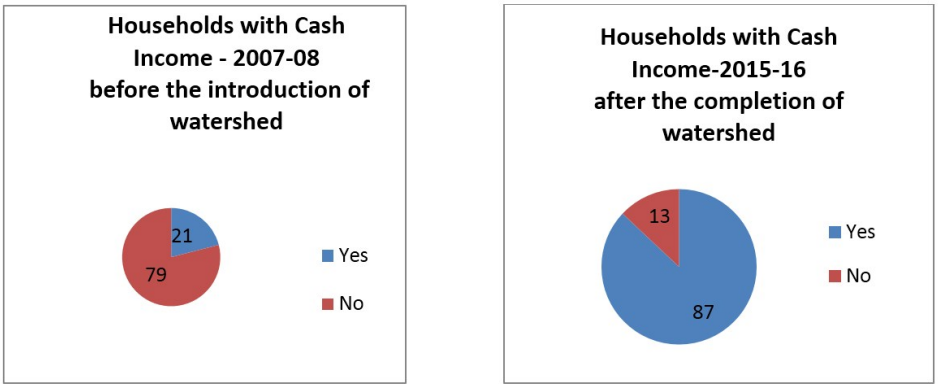


Figure - 2 Households with cash income - before and after the watershed

Land cultivation pattern before and after the watershed

Before the introduction of the watershed 8 per cent of households were not able to cultivate their land. And a majority of households (77per cent) were cultivating the land only for the purpose of consumption. It was only to manage their day to day food purpose. As the irrigation facility was not adequate before the implementation of watershed, most of the households were cultivating just for their survival. A few households (15per cent) because of their good financial condition and irrigation facility were able to cultivate for both consumption and sale of agricultural products in the market before the introduction of watershed (see figure-3). However, after the implementation of watershed majority of households have got opportunity to avail irrigation facility. Their production of crops has also significantly increased and now the majority of households sale their surplus agricultural products in the nearby market for income. It is observed that 83 per cent of households are now cultivating for both consumption and sale in the market. This is a positive trend observed in all the watersheds. The impact of agriculture interventions through adopting scientific technology has also helped for better cultivation and to increase the production in these villages.

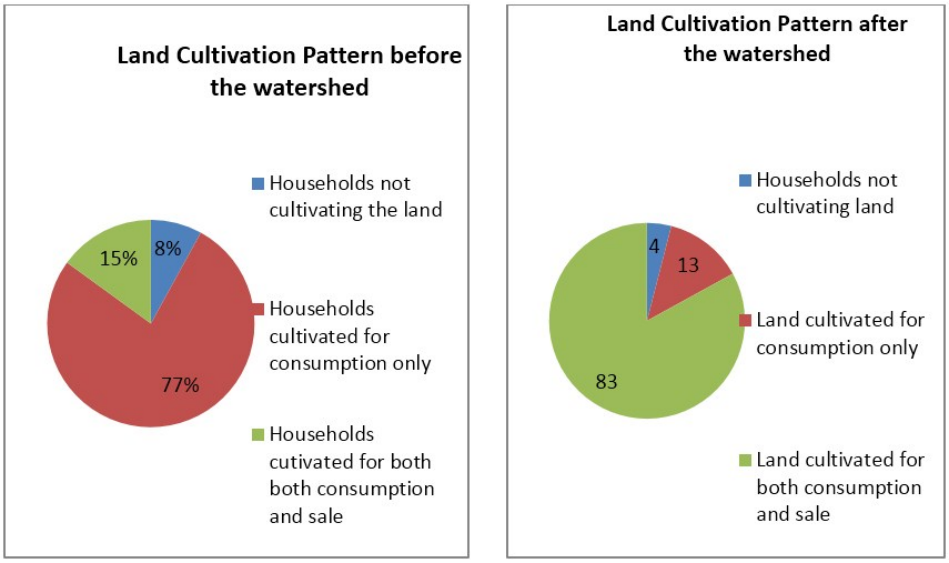


Figure-3-Land cultivation pattern – before and after the watershed

Increase in irrigation facility

Among sample households, 14 percent of households informed that they had more or less some irrigation facility available even before the implementation of watershed. But that was not adequate and dependable source. However, the implementation of watershed has enormously increased the irrigation facility through increase in ground water level. It has been enhanced through well, pond and drip irrigation as well. From the figure, it can be observed that 89 per cent of the respondent mentioned that they have irrigation facility available after the intervention of watershed and they are satisfied with this facility. The respondents who mentioned about the lack of irrigation facility are not due to the physical or environmental conditions. But it is due to their lack of financial conditions. For irrigation one need to spend something either individually or collectively for pump set, pipe and fuel. 11 percent of respondents have mentioned that they do not have adequate finance to go for this. They also mentioned that they have less agricultural lands and these are mainly in hilly slope that has not been covered by field channel of watershed initiative. But the overall situation of irrigation facility is satisfactory. Even through watershed treatment of land and hills the area for cultivation has been increased. Besides, the farmers are now taking *rabi* (winter) crops with the available water from these sources and take second and third crop in one year of time.

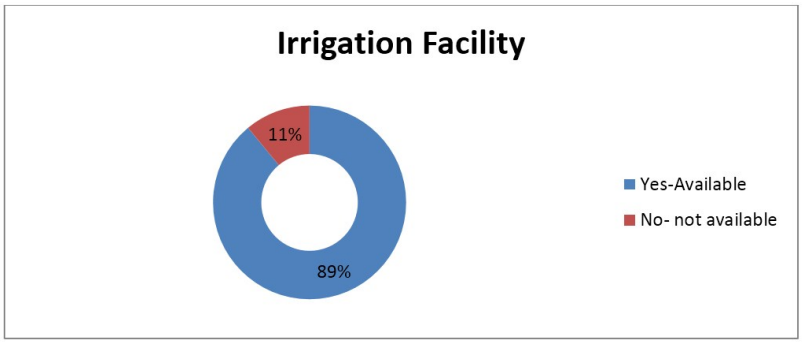


Figure-4-Irrigation facility available after the intervention of watershed

Increase in agricultural production

In an agrarian economy, income has direct relation with the production of the agricultural crops. Watershed intervention has resulted in increase in productivity and crop production area in the programme villages.

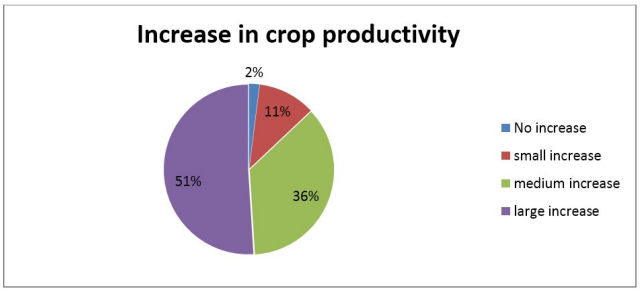


Figure-5-Increase in crop production after the intervention of watershed

The data from primary survey indicates that about 87 percent of the respondent's families have clearly mentioned that there are increases in productivity of various agricultural crops in recent years especially during the implementation of watershed programme. The increase in various major crops has been given in the table - 5.

Table-5-Increase in Production of various crops

Season	Crop	Before Watershed Yield (q/ac)	After Watershed Yield(q/ac)
Kharif	Paddy	5-6	8-9
	Ragi, Alsi	2-3	4-5
Rabi	Vegetables	1-2	2-3
Summer	Cash crop	1-2	2-3
	Paddy	4-5	5-6
	Vegetable	1-2	2-3

Source: Field Study

It is clearly visible from the table that production of various agricultural crops per acre has significantly increases due to the programmes implemented through watershed project.

Cultivation of high value crops/cash crops

The villagers were unaware about the practice of growing cash crop before the introduction of watershed. But after the intervention of watershed the practice of cultivating cash crops by the villagers have been encouraging in the watershed area. In the survey it is observed that only 18 percent respondents were cultivating cash crops. Yet again, it was restricted to vegetable only. But after the introduction of watershed programme, 82 percent of the respondents are cultivating cash crops and it does not restricted to vegetables only. Along with vegetable now it includes ground nut, sun flower, ginger, garlic, turmeric etc.

Access to market

After the introduction of watershed programmes, not only the production of farmers has increased but the sale of the surplus agricultural or horticultural products have been facilitated by the programme to ensure increased income to the poor tribal families. Watershed project has promoted collective marketing as a strategy to accelerate income of tribal people. It has also increased the bargain power of tribal farmers to sale their products. The easy access to market has motivated the farmers to grow particularly more vegetables and other high value crops which in turn increase the income at household level. From the study it is observed that 94 percent of the farmers have access to market for the sale of their agricultural product.

Physical access to market for sale of agricultural and other produces by the farmers is a key concern in the watershed project. Generally the urban traders or petty businessmen come to the remote tribal villages and buy agricultural produces with cheaper price from the farmers. This practice not only restricts the farmers to know the market price of their produces but also exposed them to be exploited by the middlemen. After the intervention of watershed project, the exploitations of tribal farmers are reduced and the exposures to market as well as information access to the market have been considerably improved.

Access to common property resources

Common property resources like forest, pasture land and village ponds are the key livelihood assets for the poor tribal families. This provides an opportunity for landless farmers to generate income in village. The study indicated that 92 percent of the households have access to forest for food, fodder and other income. It is observed that the forest has been regulated,

protected and developed sustainably by promoting *Vana Sangrakhana Samiti* (Forest Management Committees). Majority of respondents have informed that over these seven years, the access has been improved. Nevertheless, various actions like demarcating the forest, silvi-cultural process, plantation activities and protection of plants has promoted the conservation of forest and providing forest products to the poor tribal families on sustainable basis.

78 percent of sample households said now the access to forest is regulated but it is for a better cause and voluntarily decided by the villagers through village forest management committee. 92 percent respondents say that the access to forest has improved over the years. All the respondents say that productivity of forest has increased and majority (89 percent) of them say that it is because of watershed measures particularly for the treatment of hills and increase of ground water level.

Pasture land is a major resource for rural poor or tribal people as it is required for grazing of livestock. Watershed project aims for improvement of the pasture land in order to provide sufficient fodder for the livestock. Development of pasture land with diversified fodder is clearly visible in all these watershed area. 89 percent of the respondents have agreed that they are accessing forest land for the collection of fodder for their animals. They reported that the better management practices through watershed committees are instrumental to enhance the access and management of pasture land. However, allowing for the free grazing of domestic animals after the *kharif* (rain) agriculture season in tribal society is a matter of concern and therefore needs attention. The change of practice from free grazing to the control grazing is required that would further improve the situation in the management of pasture land and its productivity. The following figure presents the status of the access and productivity of the pasture land.

89 percent of sample households said now the access to forest is regulated but it is for a better cause and voluntarily decided by the villagers through village forest management committee. 81per cent respondents say that the access to forest has improved over the years. 99per cent of the respondents say that productivity of forest has increased and majority (78per cent) of them say that it is because of watershed measures particularly for the treatment of hills and increase of ground water level.

Increasing importance of agriculture

Before the implementation of the watershed only 52 percent of sample households were considering agriculture as their primary source of livelihood. The data from the field reveals that it was due to the low productivity of crops and lack of availability of water facility in this area. They were mainly depending on wage labour in the nearby places in order to maintain their economic life. But now, 87 percent of households have taken agriculture as their primary

occupation, it is followed by 7 percent households who have taken forest produce as their primary occupation. 4 percent households depend on animal husbandry and only 2 percent households take wage earning as their primary occupation. One of the significant impacts of watershed is that after its intervention villagers have stopped completely shifting cultivation in their villages. Those who are depending on non-agricultural occupation that is primarily because of lesser land or no land holdings. However they have also received some benefit from watershed in terms of few non-farm economic activities. After the watershed intervention, the ground water level has significantly increased and the fertility of the soil has also improved. Because of that, it is observed that more people now concentrate on agriculture for their main livelihood process. This is found as a very positive impact of watershed in this area.

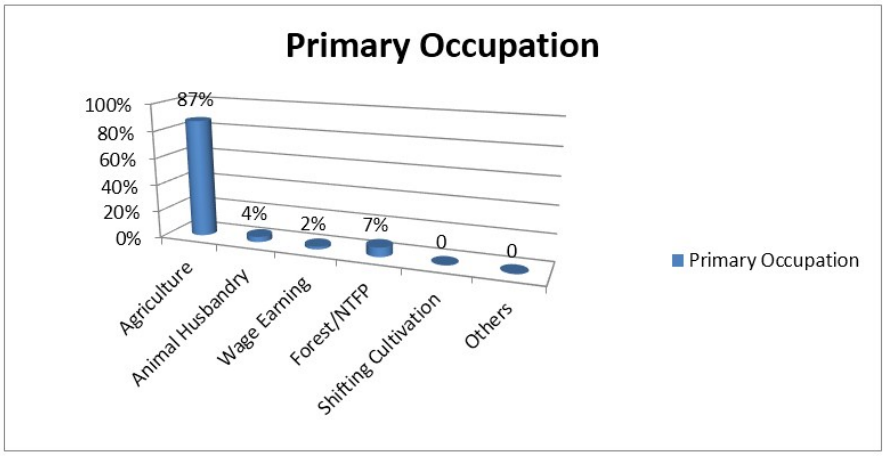


Figure-6-Primary Occupation

Crop diversification is an important positive impact of watershed programmes. Before watershed the farmers were cultivating limited number of crops and it was primarily restricted to paddy or pulses. Some of the chief crops were rice, ragi, niger and few vegetables like tomato, chilly and beans. But after the intervention of watershed and its concomitant congeniality of climate, now they are cultivating many new crops like maize, oil seeds like ground nuts, sunflower, vegetables like capsicum, french beans, ridge gourd, lady's finger; many types of fruits like mango, guava, jack fruits and water melon; new pulses like *arhar*, runner bean, soybean, black gram and moong; varieties of spices like ginger, turmeric and garlic. Majority of sample households (96 percent) said that now they are cultivating diversified crops according to their convenience. They have also adopted mixed farming. While doing mixed cropping they normally prefer the following combinations either in full or by taking few at a time.

Mixed cropping types

- Ragi + Sorghum + Bajra + Arhar+Vegetable
- Ragi + Sorghum + Bajra + Arhar + Blackgram +Vegetable
- Rice + Sorghum + Arhar + Vegetable
- Rice + Sorghum + *Suan* + Vegetable
- Rice + *Alasi* + Vegetable

Plantations and Agro-forestry

The conservation of forest on one hand and plantation on other has significantly improved the livelihood as well as environment of the watershed area. Watershed has taken initiative for the plantation of fast growing species like *Eucalyptus*, *Cassia seamea*, *Simaruba glauca* and *Anacardium occidentale* in hill slopes. These watersheds had plantation of sisal (*Agave sisalana*) in degraded hills made by Department of Soil Conservation. Villagers got remunerative income from this plantation through collection and selling of sisal sucker as well as from collection of leaves and fibre extraction. Many fibre extraction groups in these villages have been formed to take up these activities.

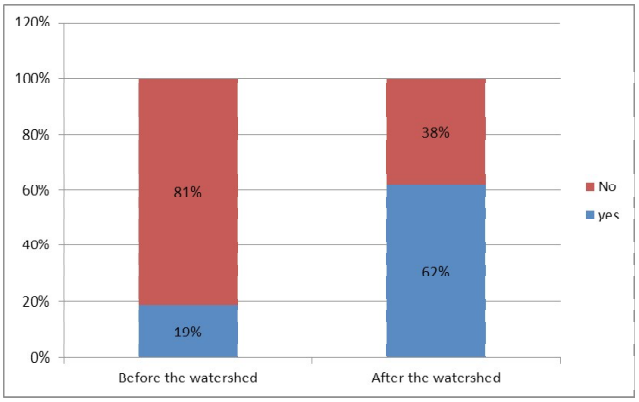
The shifting cultivation has long been stopped in these villages. Traditional agro-forestry systems in the village include backyard/homestead agro-forestry and occasional tree on the field bunds. Some hedgerow systems are observed in pediment slopes where along stone bunds, species like *Murraya koengii*, *Cipadessia*, *Baccifena*, *Lantana camara*, *Carissa spinarum* are promoted to grown in bush form to effect soil and moisture conservation.

In the backyard agro-forestry, miscellaneous trees like Eucalyptus, Artocarpus *heterophyllus*, *Dendrocalamus strictus*, *Mangifera indica*, *Tamarindus indica*, *Bixa orellena*, *Pongamia pinnaata*, *Caryota urens*, *Syzigium cuminil*, *Gmelina arborea*, *Bombax ceiba* etc. are found to be grown in scattered form, mainly concentrated on bunds. In backyard agro-forestry, though these trees miscellaneous are found to be grown in scattered form, but mostly with Eucalyptus concentrated on bunds.

Horticulture

The ecological condition of the area is very suitable for horticulture, particularly the lower hill slopes which have been used through these options. Farmers with the help of watershed bodies and the support of district horticulture department officials have taken growing mango, guava, *sapota*, banana, pineapple, jack fruits etc., either separately or through intercrops. This has been wonderfully supported by development of *wadi* and drip irrigation. Before the introduction of the watershed only 19 percent of the sample households were involved with horticulture activities, but it has now increased to 62 percent which is a good sign from the point of view of livelihood in this area.

Figure-7-Horticulture before and after the watershed



Non –farm activities

The below diagram depicts that watershed has enhanced many kind of non-farm enterprise in the villages. OTLEP has supported for non-farm livelihood opportunities especially to the households who are either landless or have less lands. Now after the implementation of watershed, employment diversity has been observed in watershed area. Majority (97 percent) of sample households have now taken various non-farm activities as their secondary occupation in this area.

Suggestive Remarks

Keeping in view the socio-economic, educational and environmental background of these tribal areas, the following recommendations can be considered for better and effective implementation of the programmes in this region besides helping the planners and scholars to explore more on watershed development programme.

- Socio-cultural preferences and taboos of tribals need to be fully probed and understood and respected for success of the project.
- Various related developmental activities like health camps, animal health camps, distribution of winter cloths, availing of mosquito nets, construction of community place, community bathroom, drinking facility, pond, biogas units etc, greatly helped in building faith of the villagers.
- More concerted follow-ups are required for translating activities from conception to field application.
- Through understanding of villager's socio-religious features, customs, festivals, and timing of development interventions project can

accumulate more success.

- Exposure of farmers frequently to Krisi Vigyan Kendra and model cultivation unit will amplify the adoption of improved agricultural technology.
- Poor farmers are required to be given incentives in the form of inputs and technical support for a longer period than relatively progressive ones for adoption of a particular technology.
- Collaborative linkage between line departments is a key factor in holistic development of watershed areas.
- Interventions for land less need more focus.
- The traditional indigenous knowledge for natural resource management of tribal society should be explored, understood in their setting and if needed fine-tuned or blended with modern technologies for adoptability, sustainability and increased productivity.
- Watershed community's choice of species, preference of bio-diversity, trait of quick acceptance of new species should be respected and exploited to bring in durable ecological and economical changes to their settings.
- The traditional /existing tribal institutions should be respected and its revival should be given top priority than completely creating new situations.
- Marginal lands on hill slopes may be put under fast growing and well copping trees like Acacias, *Melia, Simaruba* etc. to meet fuel needs.
- Eucalyptus, teak, *Gmelina*, poplar may be planted at field bund.
- Pasture improvement for livestock improvement/replacement should also be given emphasis for overall development of tribals. Cultivated fodders like and *ropogon*, *guinea*, *napier* and other grasses like *sambuta*, hill broom, *heteropogon*, para grass with trenches in the form of linear plantations across slopes are the good options for generating fodder for live stocks in this region.
- Vegetable crops like broccoli, capsicum, green peas, French beans, watermelon, and ridge gourd should be introduced in large scale at tribal areas to provide them higher profit.
- Small gully beds may be protected by planting agave, *sambuta* and bamboo.
- Agriculture interventions in the form of promoting locally relevant, drought resistant, crop mix are necessary to increase the land productivity.

- Introduction of sustainable crop production techniques, viz. mixed farming, mixed cropping, alley cropping for assured income.
- Large plantation of hardy trees like mango, guava, cashew, tamarind, jackfruit, custard apple, medicinal plants etc. in hilly land (*danger*) and highlands not suitable for raising crops.
- Pasture and silvi-pasture development to address the needs of livestock holders besides conserving soil and moisture is to be taken up.
- Alley cropping with nitrogen fixing trees and promotion of high value cash crops like potato, onion, yam, *colocasia* etc. are to be taken up to replace paddy, finger millet, niger, mustard crops by improved variety of *arhar* and high value beans in the degraded sloppy lands.
- Pisciculture program should be encouraged for the benefit of the marginal farmers and landless.
- Though there is a strong institutional arrangement prevalent in the implementation mechanism, for greater transparency and ensuring more democracy in the process, the local Panchayati Raj Institutions (PRIs) should be involved in the entire process of implementation of the programme.
- Community mobilization activities, celebration of National events/ dates, inter block/ Watershed competitions, Rallies, Awareness programme, observance of local festivals etc. should be continuous events and at no point there should be break in it. Awareness generation at watershed committee and Project Implementing Agency (PIA) level on different topics should be given priority on a continuous basis.
- Regular training at watershed committee, PIA/block and district level should continue all along the year. Training on innovative activities, local skills, improved technology etc. should be given priority. In fact, a training and community organization activities calendar should be prepared and accordingly the programmes be organized.
- Nursery is a vital need in all the watersheds. Provision of saplings of fuel and fodder plantation, fruit bearing trees, vegetable cultivation should be ensured either through individual nursery or from a central nursery at every watershed area.
- Establishment of a medicinal/ herbal plantation garden is felt essential in the watershed.
- Community based grain banks and seed banks should be established in the watershed and government support should be ensured at the beginning for food and seed security.
- Since the climate is conducive for the cultivation of flower in this locality

and it has a high market value in the neighboring state of Andhra Pradesh., floriculture should be promoted for the economic upliftment of the rural poor.

- More emphasis should be given to sanitation, safe drinking water, health and education, awareness and confidence building.
- Steps should be taken for off-farm income generating avenues having linkages with local availability of input & scope of marketing.
- Skill transfer for repairing & maintenance of assets should be ensured (Tube well/Biogas & Other constructed structures).
- Suitable forestry species for degraded hills in Koraput like Acacia *auriculiformis*, *Melia azaderach*, and *Gmelina arborea* should be adopted.
- Attempt should be made to overcome the shyness of the villagers by which they can recognize their capabilities, understand their own needs, and develop a strong will to achieve their goals.
- If Watershed Management has to become peoples' movement, technologies would have to be simple, low cost and should be based on vegetative measures, which are self-regenerative.
- In order to make the participatory approach of development more meaningful the role of Non-Government Organizations (NGOs) is felt very important. The social organization part may be entrusted to the NGOs so that villagers can participate at different stages of project implementation.
- As far as possible various works may be entrusted to the SHGs rather than to other external agencies.

Conclusion

Although sustainable livelihood is still a major concern of watershed project in the tribal areas of Odisha, its efforts have also led to substantial increase in the production of food grains, multiple sources of income, livestock promotion**,** surplus cash income**,** cultivation of high value crops/cash crops**.** By this the economic status of tribes in a watershed area has been enhanced. Watershed activities have inspired for the formulation of several village cooperatives and through tribal farmers have got access to market. It has also helped them to have access to common property resources and receiving the legal documents of their land. Introduction of various non –farm activities through watershed project has brought diversification of livelihood activities in tribal area. Increase in irrigation facility has helped for expansion of plantation areas and increase of forest coverage which is very instrumental to sustainably manage the natural resources of the area.

Watershed Development is one of the most significant approaches for overall rural development. It is eco-friendly and a hydrologically correct approach for efficient use of soil and water for more agriculture production. This is a useful programme for the treatment of an area to get many direct and indirect livelihood benefits. Watershed, a natural entity in itself, combines forest management, land use management and water management. It has offered a very good unit for planning and implementing soil conservation, water harvesting, afforestation and environmental protection programmes. It is also considered as a rational basis for optimum management of available resources. Watershed programmes have been effectively implemented in the Koraput district of Odisha with the active involvement and co-operation of the beneficiaries. However, there is a need to convert the weaknesses of this programme into strengths and threats into opportunities by involving people in all management aspects related to conservation measures and repair of structures in post watershed development period, diversified agricultural activities and the benefit accrued should be shared and utilized.

The author declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

References

Carney, Diana (ed.)

1998 Sustainable Livelihoods: what contribution we can make? *Conference proceedings* on *the DFID Natural resource Advisors Conference*. London: Department for International Development.

Dhawan, B.D.

1988 "Impact of Irrigation on Farm Economy in High Rainfall Areas: The Kal Project", *Economic and Political Weekly*, Vol-XXIII, No.52-53: 173-180.

Farrington J, C Turton and A.J. James (eds.)

1999 *Participatory Watershed Development: Challenges for 21st Century*. New Delhi: OUP

Kodakadi, G.K.

2004 *Common Property Resource Management: Reflection on Theory and Indian Experiment*. New Delhi: OUP.

Moorthy, N.

2001 "Irrigation and Rural Poverty Nexus: A Structure Analysis", *Indian Journal of Agricultural Economics*, Vol-56, No.1.

Mukharji, A.

2004 "Agrarian Transformation among Tribals: From Migrants to Farmer Irrigators", *Water Policy Research Highlight, No.8*, IWMI-TATA Water Policy Program.

Padhi, S.R. and B. Padhy (eds.)

2010 *Tribal Development: Contemporary Issues and Perspectives*. New-Delhi: Mangalam Publication.

Phansalkar, S and S. Verma

2004 "Improved Water Control as Strategy for Enhancing Tribal Livelihoods", *Economic and Political Weekly*, Vol-XXXIX, No.31: 3469-3476.

Prasad, K.

2003 "Water and Poverty Alleviation", *The Indian Journal of public Administration,* Vol. XLIX (3), July September.

Rath, N.

1996 "Poverty in India Revisited", *Indian Journal of Agricultural Economics*, Vol-20, No.6.

Reddy, V.R.

2000 "Sustainable Watershed Management: Institutional Approach", *Economic and Political Weekly*, Vol-XXXV, No.38:3435-3444.

Samuel, Abrahm, K. Joy, Suhas Paranjape, Eshwer Kale, Raju Adgale and Ravi Pomane

2005 *Watershed development in Maharashtra: A large scale rapid assessment*, SOPPECOM, Forum for Watershed Research and Policy Dialogue.

Website:

https://vdocuments:site (for census 2011)

https://censusindia.gov.in/2011

www.otelp.org

www.indiaenvironmentportal.org.in (for BPL Censusu- 1997)