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**GROWING NEED OF WATERSHED DEVELOPMENT IN RURAL AREA – A STUDY FROM AUSGRAM BLOCK – II, BARDDHAMAN DISTRICT, WEST BENGAL, INDIA**

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**ABSTRACT**

Watershed is a geo-hydrological unit that draining to a common point by a network of streams. Micro watershed lies at the lowest level of the river hierarchy. Watershed management is an integrated and interdisciplinary approach. It requires land use adjustment measures for the reduction of soil erosion to increase agricultural operation, rural employment, ecological restoration and for economic growth. Micro watershed management will fulfill the aim of micro level planning through greater association of local resources, local problems and local peoples. The present paper is linked with Aduria micro watershed in Ausgram - II block of Barddhaman district. This paper is an attempt to show the physical and socio-economic characteristics of the study area, stakeholder's attitude regarding the project, problem analysis and major management measures regarding watershed development in the area. This paper is based on both primary and secondary data. Various simple statistical and cartographic techniques have been applied to prepare it.

*Key words – Micro watershed, Watershed development, Land Use, SHG, Migration.*

**INTRODUCTION**

Watershed is a geo-hydrological unit which drains to a common point within the drainage system. Watzel (1957) defined watershed as the land and water areas, that contribute run off to a common point. It is surrounded by a ridge line which starts from and ends at the same common draining point duly encircling the watershed area (Mani, N.D. 2005). A watershed is the land and water area which contributes runoff to a common point. It is a land area which conveys the overland flow of rainfall in the form of runoff to an outlet in to the main flow channel. (Rajora, Rajesh. 1998). Micro watersheds are best fitted for watershed management. Micro watersheds lie at the lowest level of the hierarchical river system. Its average size is 1000 hector (Soil and Land Use Survey of India). Watershed management involves the use of land and water resources to increase the vegetative cover of watershed area with active participation of organization. It considers all the watershed activities which are necessary for the protection and conservation of resources (Seethapathi, P.V. & et.al 2008). Watershed

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development is an integrated effort for increasing production through better use of primary resources without any negative effect on the natural balance. The method of watershed development aims on solving local problems by taking advantage of traditional know how and co-operation of local people. (Garjar&Jat, 2008). Integrated microwatershed development and management is considered as the important tool for rural development. Micro watersheds lie at the lowest level of planning hierarchy. There is greater potentialities for development as there is greater participation of local people. There are optimum utilization of local resources, fulfillment of basic needs, local employment generation and up gradation of local skills etc. So micro watershed based development are considered as the best way of micro level rural planning. There are some indicators of rural development (Singh, Katar, 2009) which could be achieved in a developed manner by watershed

development activities, like – 1. Agricultural production, efficiency, 2. Improved agricultural work force, 3. Rural healthcare infrastructure, 4. Rural educational infrastructure, 5. Rural amenities, 6. Transport facilities, 7. Rural financial infrastructure, 8. Standard of living of rural people. Ausgram block - II is an underdeveloped area due to its physical barriers. Here micro watershed based rural development strategies are essential for its development. Here watershed development could be implemented for its proper development. This paper is an attempt to propose some watershed based management and development strategies in the region on the basis of physical characteristics, socio-economic conditions, stakeholder's attitude and major problem analysis.

### LOCATION OF THE STUDY AREA

Aduria micro watershed is located in Ausgram block – II of Bardhaman district. Amarpur, Aduria, Fanri Jungle, Hedogorya, Salko, Tilong, JaliKandar, Gohalara and Garai are the major mouzas. It is under Amarpur Gram Panchayet. It has 1502 ha area. It is located between  $87^{\circ}31'00''$  E to  $87^{\circ}35'00''$  E longitude and between  $23^{\circ}31'30''$  N to  $23^{\circ}34'30''$  N latitude approximately. The code of this watershed is 2A3 B2 – L7 after modified SLUSI (Soil and Land Use Survey of India) method.

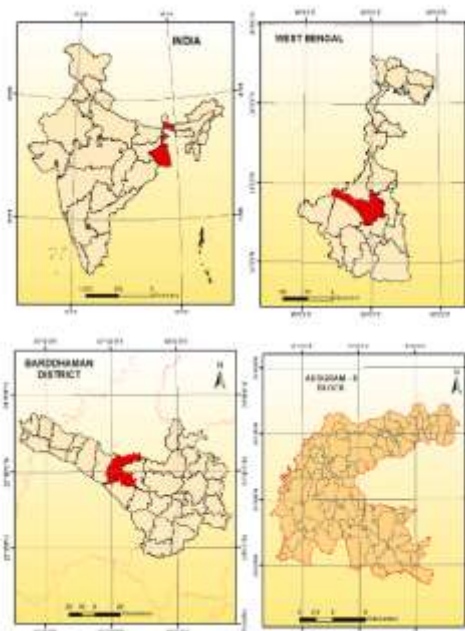


Fig – 1 Location of the study area

### OBJECTIVES

1. To find out the physical and socio-economic characteristics of the watershed area.
2. To investigate mouza wise major problems as per respondents view.
3. To know about the stakeholders attitude regarding this area.
4. To formulate management measures from watershed development point of view in the study area on the basis of respondent's perception survey.

### DATA BASE & METHODOLOGY

Present paper is based on extensive field survey in Aduria micro watershed area. Survey of India Toposheet – 73M/10, NBSS&LUP maps (National Bureau of Soil Survey and Land Use Planning), maps from SLUSI (Soil and Land Use Survey of India), LISS - III image etc. have been used for mapping. Socio-economic mapping is based

on household survey, census – 2011 data and various cartographic techniques. Arc GIS 10.3 software has been used for other mappings.

## RESULTS AND DISCUSSION

### A. PHYSICAL CHARACTERISTICS

#### 1. Relief and Physiography:

Contour ranges between 45-65 mts from south to north. Depending on contour spacing the region is divided into three relief zones viz. (i) 40-50mts (ii) 50-60 mts (iii) 60-70 mts. The maximum land is under 50-60 mts. height category.

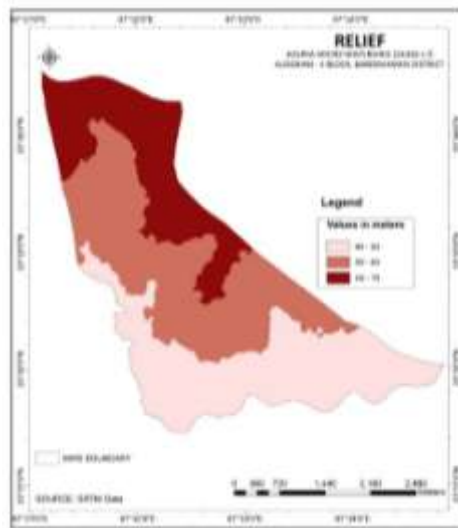


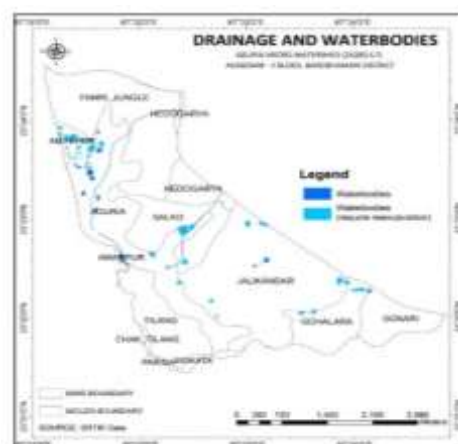
Fig – 2

#### 2. Drainage & Water bodies:

In the southern part Kopai river is the main drainage line, passing from west to east. One major Kandarnala which originates from Hedogorya forest and moves from north towards south. And another nala starts from Hedogorya jungle and meets with the previous Kandarnala. From Jalikandarmouza one drainage line starts and passing towards Gohalara. In Amarapur and Aduria there is maximum concentration of ponds and tanks.

#### 3. Slope Direction:

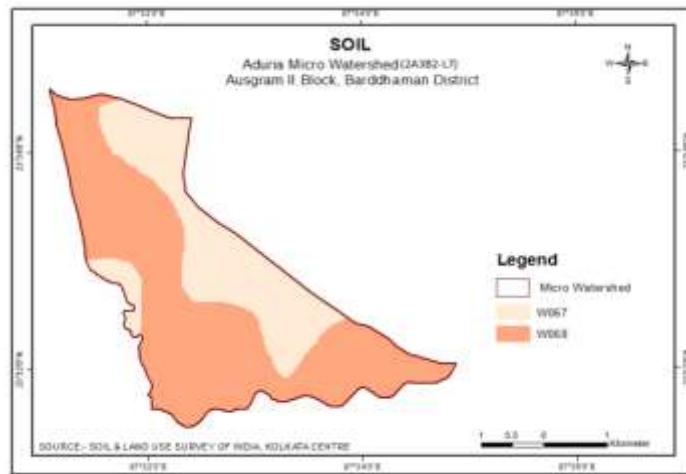
General slope of this region is from north to south. The slope ranges between  $0^{\circ}$  - above  $1^{\circ}$ . High slope zone is concentrated mainly in the forested and lateritic parts with about 18% areal coverage in the north eastern corner.



**Fig – 3**

**4. Soil:**

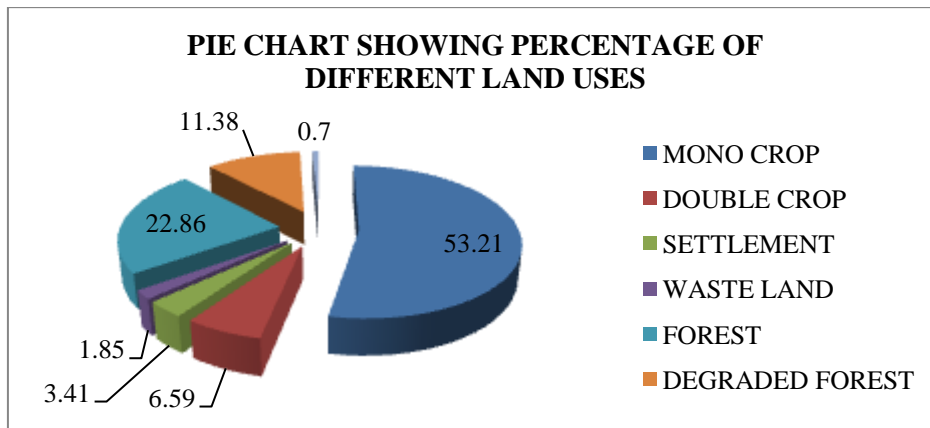
The area has mainly two types of soils – alluvial and laterite. Alluvial is 65% of the total area. The laterite is 35% of the total area. The rate of soil erosion is moderate to severe in lateritic and red soil zones.



**Fig – 4**

**5. Land Use Land Cover:**

Present land use land cover situation shows maximum concentration of mono crop i.e. 53.21%. The forest land is 22.86%, degraded forest is 11.38%, and the waste land of 1.85% of the total area.



**Fig – 5**

**6. Water resource:**

Water resource situation of this watershed is not so developed. In Tilongmouza pre-monsoon and post-monsoon water table are 18 and 7 ft. BGL. The worst condition is found in Jalikandarmouza, which is 50 ftBGL in pre-monsoon 25 ftBGL in post monsoon months. In Jalikandar(75%),Amarpur(71.43%) and in Aduria(66.67%) ponds become dry in summer. Number of failure tube wells in summer season are more in Aduria, Jalikandar, Chalk Tilong and Tilongmouzas. This is not a perfect condition for living.

**B. SOCIO-ECONOMIC CHARACTERISTICS**

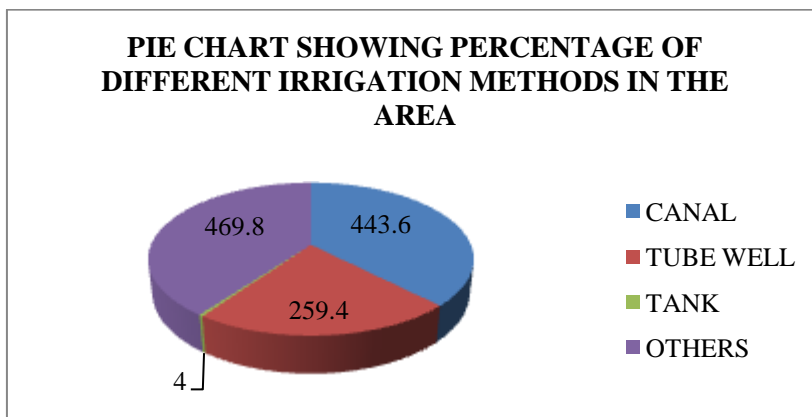
**1. Agricultural Situation:**

In upland agricultural field average water level is 5.5” and in lowland fields it is 10.25”. Low land field, have the tendency to keep more rain water. Upland fields have the tendency of crop failure in less rainfall months.

Maximum farmers are willing to do rabi cultivation whose numbers are more in case of Garai(80), Amarpur(45) and Aduria(40)mouzas. Crop failure due to water crisis are found in September-October in Garai, Amarpur, Aduria and Jalikandarmouza.

**2. Irrigation system:**

Total un-irrigated land is more in Amarpur (347.0 ha) and in Jalikandarmouza (271 ha). In Gohalara and Salko the total irrigated land is nil. There is no irrigation sources. In Garai, Chalk Tilong and Jalikandar the amount of irrigated land is very little. This land could be converted into irrigated land due to watershed development. Tilongmouza has tank irrigation facilities.



**Fig – 6**

**3. Population:**

Garai (2161), Amarpur (1721) and Aduriamouza(1476) have maximum population concentration as per census – 2011. In Tilong and Chalk Tilong, there is no tribal population. In Garai there is no SC population. Concentration of poor SC / ST is found almost in every mouzas.

**4. SHG (Self Help Group):**

Situation of SHG is not so satisfactory in the study area. The numbers are very little in Tilong, Chalk Tiong, Jalikandar mouza. Garai(20), Gohalara(10) and Aduria(10) mouzas have more SHGs. For self-sufficiency there need to form more SHGs.

**5. Migration:**

Here people migrate to search for better income and employment. Daily migration is highest in Amarpurmouza (55%). In Aduria seasonal and daily migration rates are equal i.e. 40%. Rate of permanent migration is highest in Garaimouza because many people from here have settled in other states for various jobs. Here seasonal migration is also found at the time of agricultural operation.

**C. Stakeholder’s analysis**

**Table: 1 Stakeholder’s view point regarding the watershed project (n=120)**

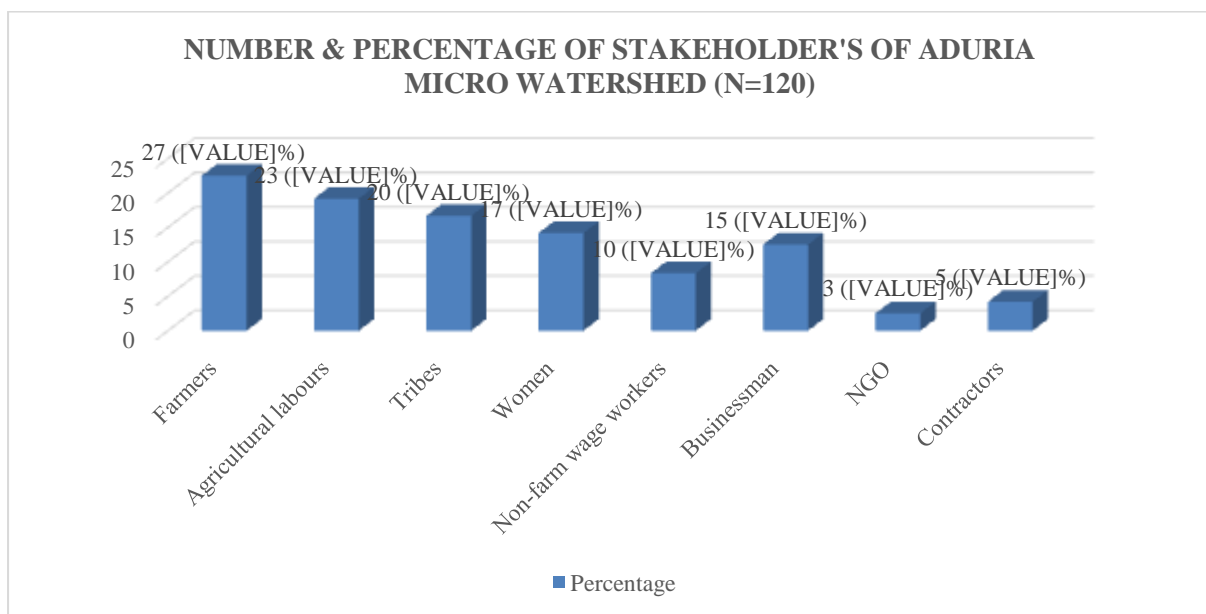
Stakeholders	Their demands	Number & percentage of stakeholders
Farmers	i) They expect the watershed development activities would make agriculture more reliable by increasing water availability. ii) Expect more check dam and other	27 (22.5)

	<p>water harvesting structure and plantation.</p> <p>iii) Construction of open well.</p> <p>iv) Fodder availability for livestock.</p> <p>v) Horticulture crops.</p> <p>vi) Employment generation.</p> <p>vii) Participate in watershed activities.</p> <p>viii) Want soil testing, drought resistant and HYV crops.</p> <p>ix) Irrigation during dry season.</p> <p>x) Training for new technologies of agriculture.</p>	
Agricultural labours	<p>i) Wage employment through watershed activities.</p> <p>ii) Fodder availability for livestock.</p> <p>iii) Financial assistance through livestock based activities.</p> <p>iv) Want more SHG for self-sufficiency.</p> <p>v) Income from share cropping.</p>	<p>23 (19.17)</p>
Tribes	<p>i) Expect income generating activities like- dairying, goat rearing etc.</p> <p>ii) Like to be involved as wage labours.</p> <p>iii) Want representative in watershed committee.</p> <p>iv) Want land development activities on their lands like contour bund, leveling etc.</p> <p>v) Plantation in their own land.</p> <p>vi) Want irrigation in their own farms during dry season.</p> <p>vii) Wants to be the member of SHGs.</p> <p>viii) Youth expect skill development for self-employment from the project.</p>	<p>20 (16.67)</p>
Women	<p>i) Willing to make labour contribution in watershed activities.</p> <p>ii) Want to participate in planning, implementation &amp; maintenance activities.</p> <p>iii) Want to take part in SHG activities</p>	<p>17 (14.17)</p>

	<p>on watershed basis.</p> <p>iv) Would like to participate in monitoring of watershed development activities with PRI.</p> <p>v) Want their empowerment through education and training activities.</p>	
Non-farm wage workers	<p>i) Increase in fodder availability, drought resistant forage crops.</p> <p>ii) Increase water availability for livestock rearing.</p> <p>iii) Financial assistant to improve livestock based activities.</p> <p>iv) The constructional workers expect wage work from it.</p> <p>v) Fisherman expects improved surface water level.</p> <p>vi) Masons expect work in building watershed development structures.</p> <p>vii) Carpenters and black smith expect more work related to making and repairing of farm implements.</p>	<p>10 (8.33)</p>
Businessman	<p>i) Want increased selling of products like- agricultural seeds, pesticides, fertilizers, farm implements.</p> <p>ii) Want increased trading from vegetable, rice and fish etc.</p>	<p>15 (12.5)</p>
NGO	<p>i) Would like to be involved in the project planning, implementation etc.</p> <p>ii) Expect responsibilities in project implementation or, facilitation.</p>	<p>3 (2.5)</p>
Contractors	<p>i) More machinery based works to build structures such as check dams.</p>	<p>5 (4.17)</p>

(Brackets indicate percentage)

(Field survey)



**Fig – 7**

To understand socio institutional aspect of a project there need to analyze the attitude of stakeholders. There will be a lot of beneficiary groups if watershed development is done in Aduria area. These are like – farmers (22.5%), agricultural labours (19.17%), tribal people (16.67%), women (14.17%), businessman (12.5%) etc. They all have their own interest to develop watershed project here.

**D. Analysis of major problems in various mouzas**

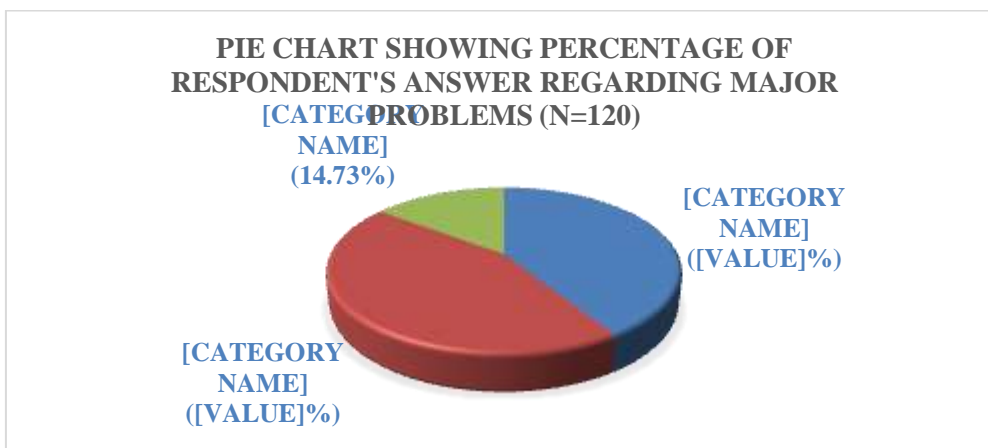
**Table: 2 Respondents view about various problems in the study area (n=120)**

Name of problems	Responses		
	High	Moderate	Low
1) Crop failure due to water crisis	50 (41.67)	60 (50)	10 (8.33)
2) Loss of rain water	42 (35)	56 (46.67)	22 (18.33)
3) Siltation in field channel	66 (55)	42 (35)	12 (10)
4) Lack of rain water harvesting structures	53 (44.17)	40 (33.33)	27 (22.50)
5) Water crisis in summer	72 (60)	43 (35.83)	5 (4.17)
6) Gully formation	30 (25)	60 (50)	30 (25)
7) Lack of integration	55 (45.83)	55 (45.83)	10 (8.34)
8) Soil erosion & degradation	62 (51.67)	50 (41.67)	08 (6.66)
9) Decreasing soil fertility	44 (36.67)	63 (52.5)	13 (10.83)

10) Agricultural production loss	50 (41.67)	50 (41.67)	20 (16.66)
11) Unemployment & poverty	30 (25)	62 (51.67)	28 (23.33)
12) Forest land degradation	37 (30.83)	56 (46.67)	27 (22.5)
Average	49.25 (41.04)	53.08 (44.23)	17.67 (14.73)

(Brackets indicate percentage)

(Field survey)



**Fig - 8**

The area has faced many natural as well as socio-economic problems. On an average 44.23% respondents answered as moderate regarding the problems of the area. 41.04% respondents answered as high and 14.73% respondents answered as low regarding the overall problems of the area. Respondent's answers regarding the problems were high in case of siltation in field channel (55%), lack of rain water harvesting structures (44.17%), water crisis in summer (60%) and soil erosion (51.67%). Maximum respondents answered in moderate regarding the problems of this area like – crop failure due to water crisis (50%), loss of rain water (46.67%), gully formation (50%), decreasing soil fertility (52.5%), unemployment and poverty (51.67%) and forest land degradation (46.67%).



**Plate - 1 Cracks of soil in summer**



**Plate - 2 Dry pond bed in summer**



**Plate - 3 Extensive gully erosion**

Considering the physical, socio-economic conditions of the region and the above problems it is clear that the region is facing some trouble. To overcome water crisis and soil loss, farmers want check dam, re-excavation and excavation of ponds, ground water recharge structure, plantation works, contour trench etc. over the region. These structures are the measures, which are applied at the time of watershed management and development. So all such above problems could be solved by micro-watershed management by govt. or semi govt. or non govt. agencies.

**E. Management measures**

**Table: 3 Perception survey regarding various management strategies in Aduria Micro watershed**

(n= 120)

Watershed structural measures	People's level of demand		
	Highly agreed	Moderately agreed	Lowly agreed
1) New ponds & water harvesting structures	83 (69.17)	30 (25)	07 (5.83)
2) Contour bund & trenches	45 (37.5)	57 (47.5)	18 (15)
3) Check dam cum reservoir	36 (30)	67 (55.83)	17 (14.17)
4) New plantation works	83 (69.17)	27 (22.5)	10 (8.33)
5) Pasture land development	55 (45.83)	40 (33.33)	25 (20.84)
6) Re-excavation of water harvesting structures & field channels	92 (76.67)	20 (16.67)	08 (6.66)
7) Ground water recharge well	66 (55)	44 (36.67)	10 (8.33)
8) Gully plugging	37 (30.83)	51 (42.5)	32 (26.67)

(Brackets indicate percentage)

(Field survey)

In watershed management, structural measures are very effective. From the perception survey it is clear that

people of this region highly want new ponds and water harvesting structures (69.17%), new plantation works (69.17%), pasture land development (45.83%), re-excavation of water harvesting structures (76.67%) and ground water recharge well (55%). Respondents moderately agreed to want contour bunds, check dam cum reservoir and gully plugging as structural measures in watershed area. In watershed management structural measures are not the only measures but non-structural measures are equally important. From non-structural measures point of view followings are important – 1) creation of mass awareness, 2) arrangement of frequent soil testing, 3) training for SHG members and farmers, 4) consciousness about drought farming, 5) checking of forest cutting, 6) stopping of submersible etc.

## **CONCLUSION**

Integrated Watershed Management and Development is very essential in Aduria Micro watershed area as this area is facing so many physical and socio – economic problems. Micro watershed management is considered as an important tool for rural development phenomena. It will fulfill almost every demand of stakeholders. By developing Aduria micro watershed project, rural livelihood could be improved. So there need maximum people's participation and co-operation. Government need to be also active. In this way that rural area will achieve development.

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