Effectiveness of Integrated Watershed Management Intervention for Sustainable Development in Meskan District, Southern Ethiopia

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Abstract

The core drive of this study was to measure the effectiveness of integrated watershed management implementation in Meskan district. Systematic sampling technique and random sampling method were used to select sample micro-watersheds and specific households from the two selected intervention and less/ non-intervention areas, respectively.

Data were collected through household questionnaire review, focused group discussion, key informant interview, and field observation .Moreover,, physical soil and water conservation structures' arrangement measurement was piloted. To analyze the data, SPSS version -20 software descriptive statistics, chi-square test, independent t-test, and participation index were used. The study discovered that the intervention has effective progresses in enhancing the attitude of society towards integrated watershed management practices, protecting soil erosion, improving ground and sub- surface water availability, increasing vegetation cover and expanding household income source. However, low public involvement, nonexistence of the structures design arrangement with criteria, and lack of differentiated soil water conservation procedures, lack of regular maintenance time, and unable to use suitable structures for each micro- watersheds were some of the main drawbacks of the implementation. Therefore, this study commends that the stakeholders should make appropriate adjustment measures for practical failures and additional interdisciplinary revision should be heading for discover the difficulties.

Keywords: Meskan district, Integrated, Effectiveness, Intervention, Watershed Management

1. Introduction

The concept of integrated watershed management has established to ensure effective use of social,environmental, and economic capitals. It has been critical in a country like Ethiopia where morethan 80% of the population depends on agriculture. A large part of the high land in Ethiopia is categorized by low level of technological change , low productivity, high risk of uncertainty and vulnerability to natural resources degradation [1]. Deforestation, soil erosion, and nutrient depletion are the major social, ecological, and economical problem in Ethiopia [2] . Sustainable development and increased food production in agricultural based developing countries requires availability of sufficient water and fertile land. Water especially affects greatly the prosperity of people and their development potential and health [3] .

The recent methodology which should be done critically for effectiveness is integrated watershed management through 'community based participatory approach', which requires participation of local people. The government of Ethiopian recognizes the spirit of this methodology as evidences from effectively implemented model schemes appear encouraging . Substantial effort is occurring to replicate 'community based participatory integrated watershed management' activities in districts of most regions. As an element of this effort, in the last ten years, a nationwide 30 -40 days watershed management through public work campaign has occurred [4]. But many problems were also recoginized that threaten the effectivness of watershed management. Lack of information and technical advice to support the identification of interventions appropriate for the local context;the uneven distribution of the water management costs and benefits, and uncoordinated interventions of actors and institutions within a watershed weer the main challenges . To solve these challenges and support, best practices scaling up was very important[5]. Moreover, for the last many years, different social activities, such as improvements in monitoring and diverting superficial waters, overgrazing, discovering ground water, and in excess

use of natural resources for a diversity of drives have been accepted without attention. Unable to keeping the natural resource, mishandling of the watershed, and absence of maintaining the quality of environment have greatly affect the sustainable development of the country.

In order to improve the aforementioned problems, the role of participatory integrated effective watershed management is essential. It can prevent the community from flooding and erosion, poor water quality, and water shortage. Subsequently, the rivers, streams, and wetlands of a certain watershed area can provide ecological facilities that maintain the health safety, social, and economy prosperity by developing and distributing cleaned drinking water; maintaining ecological diversity ,providing opportunities of recreation that attract tourists; providing opportunities of spawning for commercially valuable fish; raising property values; supporting agriculture, and protecting people and property from risk of flooding [6] .

The Government of the country (Ethiopia) is undertaking community based watershed management practices all over the country mainly during the last 10 years [7]. According to Meskan district office of Agriculture, there are exhaustive watershed management activities in the local areas following the program launched by the government and almost all kebeles of the district practicing in different SWC activities, contaning biological and physical measures. However, until now, Effectiveness of those conservation activities for the local condition was not continually evaluated throughout the country. The monitoring system of those interventions is fragmentary, and there is week maintenance of physical structures [8]. As it is also the Governmental approach to solve natural resources degradation and enhance productivity for future sustainable development, the issue should have to get more attention. This being a general scenario, no much research is yet done to evaluate the sucussfullness of IWSM interventions in relations to its biological and physical impact in the study area. This study is, therefore, intended to evaluate the effectiveness of IWSM interventions in Meskan district through identifying the main watershed management interventions implemented, evaluating the outlook of the local society towards the intervention, identification of supporting institutions, evaluating selected intervention measures in terms of their scientific standard and investigating the environmental contribution of watershed management activities.

2. Materials and Methods

2.1. Study Area Description

The research was conducted in Southern Nation Nationalities and Peoples Regional State, Gurage Zone, Meskan District, Ethiopia, .which lies between 7˚50’0’’ N and 38˚20’0’’ E respectively and 130 km far away from the capital city of Addis Ababa, 155 km from regional capital city of Hawasa, and 100 km from zonal capital city of Wolkite. The district has 42 kebeles totally, among these, 40 of them are rural kebeles while the rest 2 are urban kebeles.

According to (Meskan district finance and economic development office, 2018) and (CSA), the estimated total population of the Woreda is 222,602 (109,549 men and 113,060 women). The total household number is 46,570 of this 29,398 are men headed households and 17,172 are women headed households. The district is located at an altitude range of 1501-3500 masl. The mean annual rainfall of the area is 1001-1200 mm. The topography of the district is 55% leveledland, 35% sloppy and 10% high land. From 50,177 ha, total area coverage of the district the land which used for cultivation is 13,579. Total land covered with perennial and annual crop is 9.9,31.3 ha,respectively, 25.22 ha shrubs land,grazing, and forest, and 26.73 ha is covered with others. The lower watershed part of Zebidar mountain (the highest mountain in the region) with high risk area to soil erosion by runoff; land slide and changing the river direction causing social &economic crisis in the woreda and the administration center of the study area (Butajira city) with a population of around 100000 the impact watershed has direct impact also on the city administration as well.

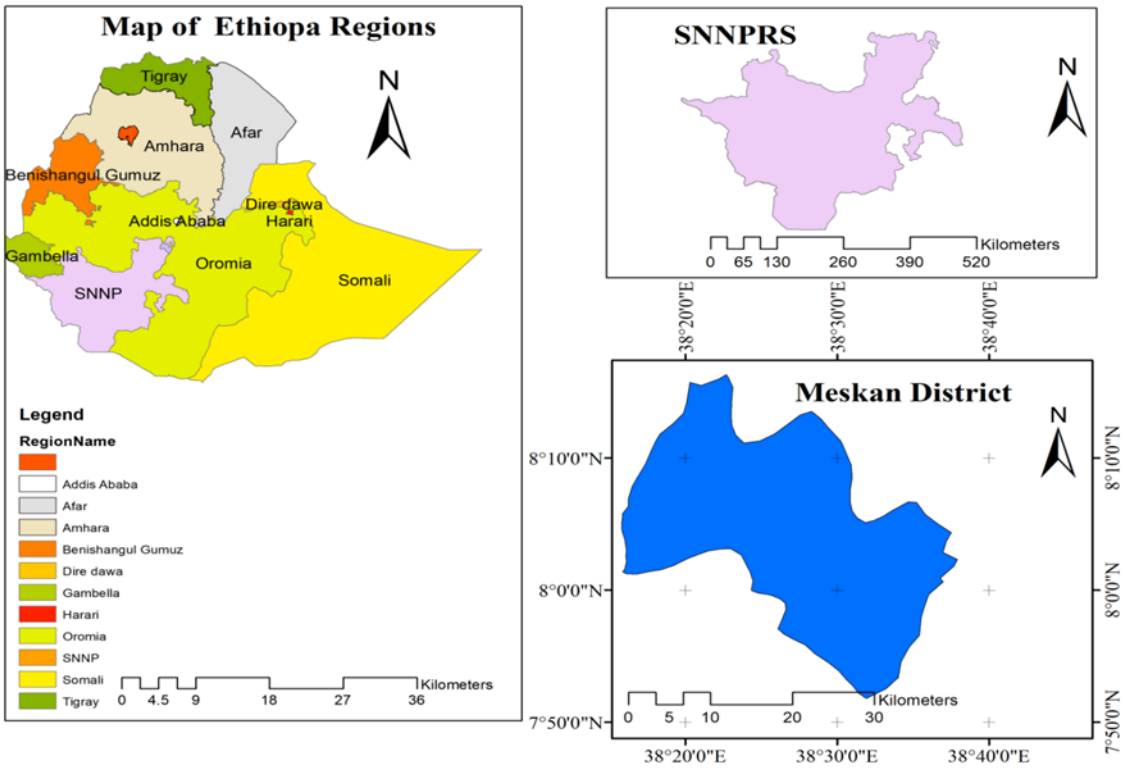

Figure-1 Local Map source www.google.gov.et

2.2. Primary and Secondary Data Collection and Analysis

The study was conducted on four-sub watersheds, which are selected systematically: this systematic selection has been done in order to use best matched watersheds for comparison; two have watershed management intervention, while the others have less/no intervention. The historical similarity before watershed management intervention, to collect the data, 200 households were survived; 12 key informant's interview was conducted (key informants were carried out with 3 elders, 3 local administrators, 3 youth leaders, and 3 experts), and 8 focus group discussions were conducted (the focused group discussion includes 12 to 15 people in each group and community elders, youth and females was included in the focused group discussion).

For secondary data, I have collected reports from district to regional level; the police documents of the country have been reviewed; tried to collect image documented in different years, and physical observations were done to found the actual condition of the study area in different aspect of the study.

The survey was conducted by using both open and closed ended structured questions. In addition focused group discussions were conducted based on checklists and semi-structured questionnaires, and in-depth. During this session, respondents permitted to express their opinions, views, feelings, and perspectives about the research process and outcomes. Soil and water conservation structures layout measurement was conducted on sample households' cachments and numerical symbols (coding) was done, and then the collected data entered into Statistical Package for Social Science. Finally, descriptive statistics, t-test, chi-square test, participation index and logistic regression model were used for analysis

3. Results and Discussion

3.1 Level of knowledge, participation, and perceptions of the society about IWSM

The concept integrated watershed development program with participatory approach was emphasized since the last 25 years. This approach has been focused on soil and water conservation measures to improve crop productivity and livelihood in watersheds [9]. To achieve this goals the first priority should be changing the attitude and knowledge of the society instead of thinking for day today problems, such as fuel wood, food consumption, and extracting construction materials; it is better to keep integrated and sustainability of natural resources by soil and water conservation. As shown in Table-1, 90% from intervention category and 85% from nonintervention category respondents rated first that water and soil conservation is as means to get integrated economic, social

an environmental benefits; and it is the same to result with key informants and group discussions, Indicating that the attitude of the society in the study area is positively changed and they accept the integrated approach of the program

Table -1. The reason to participate on watershed management

		Intervention category With intervention Count	Column Valid N %	Less intervention Count	Column Valid N %	Total Count	Column Valid N %
Source of fuel	1	4	4.0%	1	1.0%	5	2.5%
	2	2	2.0%	6	6.0%	8	4.0%
	3	73	73.0%	53	53.0%	126	63.0%
	4	18	18.0%	38	38.0%	56	28.0%
	5	3	3.0%	2	2.0%	5	2.5%
Construction	1	3	3.0%	0	0.0%	3	1.5%
	2	4	4.0%	2	2.0%	6	3.0%
	3	19	19.0%	41	41.0%	60	30.0%
	4	72	72.0%	51	51.0%	123	61.5%
	5	2	2.0%	6	6.0%	8	4.0%
Food consumption	1	4	4.0%	14	14.0%	18	9.0%
	2	88	88.0%	80	80.0%	168	84.0%
	3	8	8.0%	1	1.0%	9	4.5%
	4	0	0.0%	3	3.0%	3	1.5%
	5	0	0.0%	2	2.0%	2	1.0%
Soil and water conservation	1	90	90.0%	85	85.0%	175	87.5%
	2	5	5.0%	14	14.0%	19	9.5%
	3	0	0.0%	0	0.0%	0	0.0%
	4	5	5.0%	1	1.0%	6	3.0%
	5	0	0.0%	0	0.0%	0	0.0%
other	1	0	0.0%	0	0.0%	0	0.0%
	2	0	0.0%	1	1.0%	1	0.5%
	3	0	0.0%	1	1.0%	1	0.5%
	4	6	6.0%	10	10.0%	16	8.0%
	5	94	94.0%	88	88.0%	182	91.0%

Source SPSS Analysis

As shown from the Table-2a, the level of knowledge as assessed from the respondents rated 0.5% very low, 7 % low, 17.5 % medium, 47 % high, 28 % very high, suggesting that 75% of the respondent the level of knowledge is high and fromTable-2b, the chi-square test the p value <0.05 shows that have significant difference between intervention and non-intervention area, this result is consistent to the previously published literature .[9]

Table-2a. Level of knowledge about IWSM

		Intervention category With intervention	Less intervention	Total	Level in %
Level of knowledge about IWSM	very low	1	0	1	0.5
	low	3	11	14	7
	medium	15	41	56	17.5
	high	53	41	94	47
	very high	28	7	35	28
Total		100	100	200	100

Table2b Chi-Square Tests
The reason to participate at IWSM * Intervention category

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	31.775[a]	4	.000
Likelihood Ratio	33.822	4	.000
Linear-by-Linear Association	25.140	1	.000
N of Valid Cases	200		

a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is .50.

Source SPSS Analyses

One of the means to check the attitude (perception) of the society towards integrated watershed management practices is on the participation during the practical implimentation of the program and the the driving force or resion to participate on the program. As shown in the Figure 2, eventhough men have the highest rate, the participation of the society with intervention area and non intervention area is almost the same that means (men, women, and youth,) all participate with out gender and age defference. From this, we can conclude that the participation of the society is good and shared as best practicies between the intervention areas .

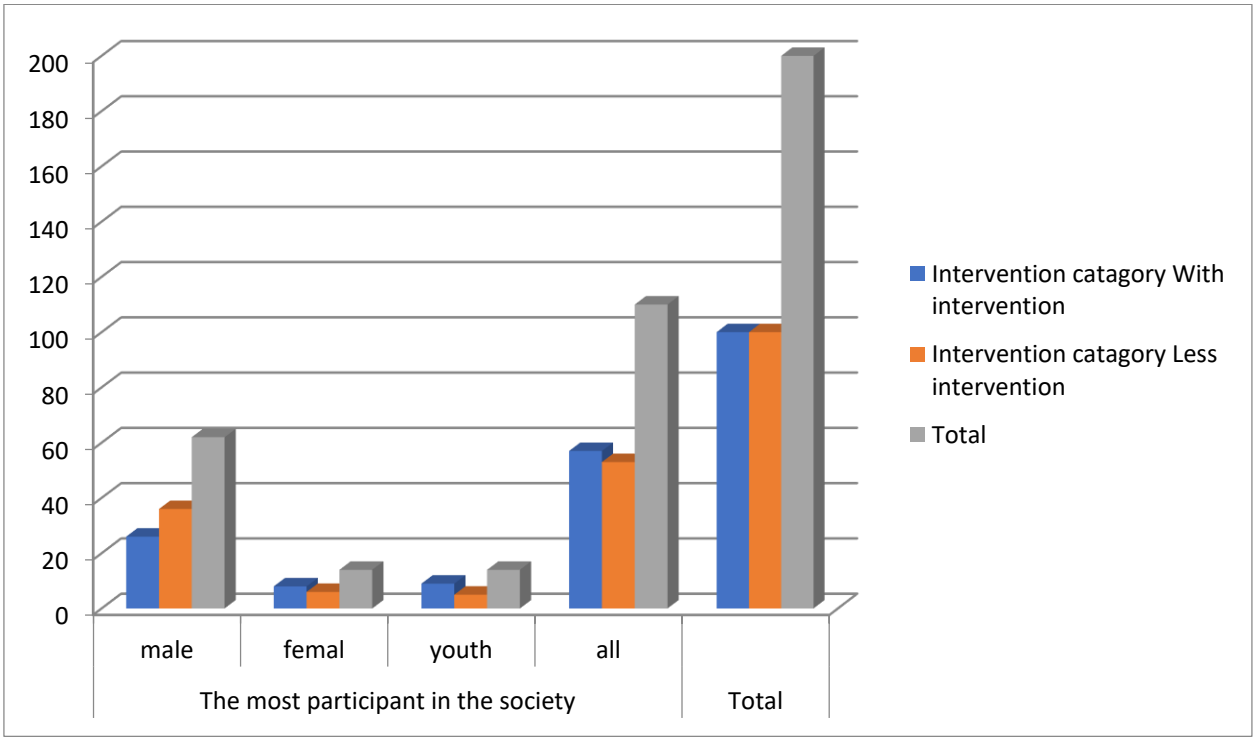

Figure- 2. The most participant in the society

As observed from the Figure 3, the respondents replied that the reason to participate at IWSM 96% and 81% understanding the value, 2%and 12% fearing of isolation, 2% and 2%fearing of punishment,0% and 5% political enforcement, with intervention and non intervention respectively, this shows that the perception of the society is very good and the society participate in the program by understanding the vale of the program from (Table-3a) the chi-square test p value (0.004) is less than 0.05 which means is has significant deference between the cataegories. In addition to this, the perception of the society more than 80% is high and very high 17.5 % is medium and 2.5%is low as shown in the table below (Table- 3 b)

Figure- 3 The reason to participate at IWSM

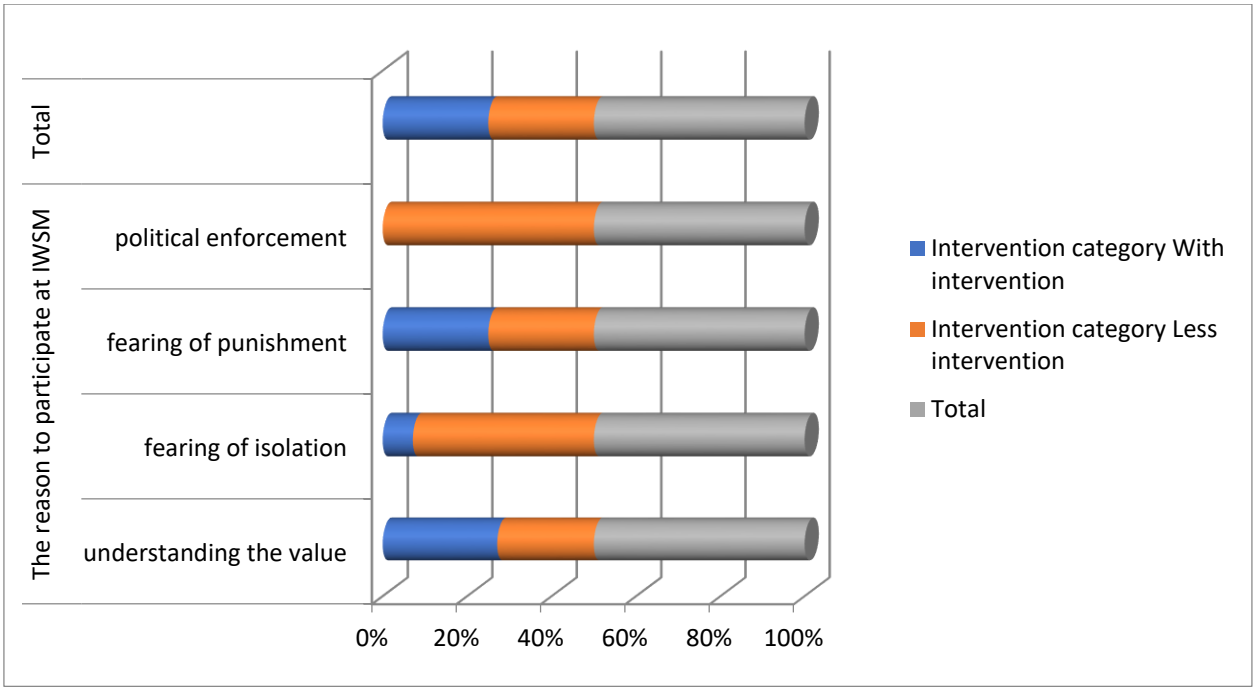

Table- 3a Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.414[a]	3	.004
Likelihood Ratio	16.129	3	.001
Linear-by-Linear Association	9.124	1	.003
N of Valid Cases	200		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is 2.00.

Table-3 b Perceptions of the society about IWSM

		Intervention category		Total
		With intervention	Less intervention	
Perceptions of the society about IWSM	very low	1	0	1
	low	4	0	4
	medium	10	25	35
	high	45	62	107
	very high	40	13	53
Total		100	100	200

3.2 Effectivness of the training

Building the capacity of local communities and extension workersare an important component in watershed management. Different people have different roles and responsibilities in watershed projects implementation and there is a need to train people involved in the watershed development program. The purpose of training is to achieve sustainable village/community-based development with

integrated watershed management serving as a tool. Training can enhance knowledge, attitude, skills, and relationship [7]. Thus, to empower the attitude of the society to wards the program increasing the knowladge of IWSM its social ecconomic , environmenatal value and sustainable development in the study area different trainigs were given by stake holders like the govrnment officials, development agents, NGOs, and community leaders its impact have siginificat change in the community in conserving natural resources by preventing siol erosion increasing soil fertility and moisture conservation but the effectiveness is different from place to place and between the two intervention category as show in the Figure 4 below the training effectivness is very high in the intervention area while it is low in the non intervention area [10] from this resuit we can coclude that means and aproch of the training should be taken as best practice from intervention area. Moreover, this result is also similar with the China Watershed Management Project (CWMP), is contributing to the improved management of the Yellow River, and other basins, by developing best practice models for watershed management[11].

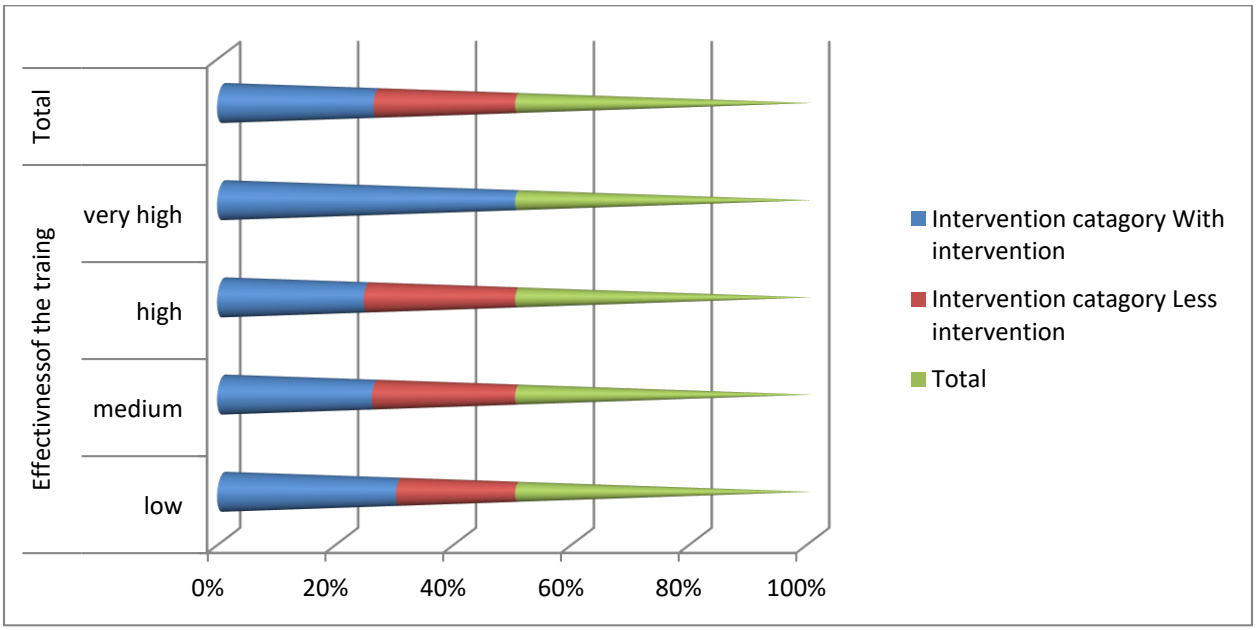

Figure -4 Effectiveness of the training

3.3 Types and reliability of SWC structure

Each soil and water conservation structure has specific standards according to the slope, soil type, amount of rain fall. Research findings suggest that structures constructed under these standards are less effective in controlling erosion. . Improper construction of structures leads to a series soil erosion by collecting the surface runoff and increasing collective high volume flow. Thus, keeping the construction minimum standards is not optional it is mandatory. . As shown in the Table 4, 68% of the respondents agreed that all type of soil and water conservation, 16% stone bunds, 4.5% stone bunds, 3.5% fanyaju, and 8% planting tree seedling, indicating that most of the society agreed that all types of soil and water conservation structures are implemented on their locality; and the reliability of the structures are also 1% low, 36.5% medium, 62% high, 0.5% very high. And also from key informant and focus group discussion have the same conclusion. From field observation and some of key informant realized that fanyaju is not appropriate some parts of the study area this similar to the founding of [10]. From this, we can conclude that all structures implementation is not appropriate to all the study area.

Table -4 a Type of conservation practice

	Intervention category		
Type of conservation practice	With intervention	Less intervention	Total
Stone bund	17	15	32
Soil bund	1	8	9

water Fanyajuu	3	4	7
conservation planting tree seedling	6	10	16
all	73	63	136
total	100	100	200

Table- 4 b Reliability the structure * Intervention category

		Intervention category		Total
		With intervention	Less intervention	
Reliability the structure	low	0	2	2
	medium	36	37	73
	high	63	61	124
	very high	1	0	1
Total		100	100	200

3.4 Maintenance responsibility, timing, and management of the structure

As shown in the figure 5 and Table 5a, the sustainability of SWC depends on who takes the responsibility to maintain the structures at a regular time. From the household survey, 83.6% household leaders, 8% development agents, 8% NGOs, and 0.4% others agreed that the responsibility is taken by households. However, when we analyze the maintenance time 80.4% of the respondents replied that the maintaining time is occasional 10.6% regular and 9% replied as unknown, this shows that the society accept the responsibility to maintain and manage the soil and water conservation by themselves but there is series problem on maintain the structures regularly, this is the same conclusion with focus group discussions and key informant interviews. This is towing to the problem that the district agricultural office mainly focus on the expansion of the SWC rather than maintaining the structures at regular time, which is the same to [12] found poor structure maintenance in Campaign works watershed Management

Table- 5 a Who takes maintenance responsibility * Intervention category

		Intervention category		Total
		With intervention	Less intervention	
Who takes maintenance responsibility	household leaders	99	59	158
	development agent	1	14	15
	NGOs	0	15	15
	others	0	1	1
Total		100	89	189

Figure -5 Who take maintenance responsibility

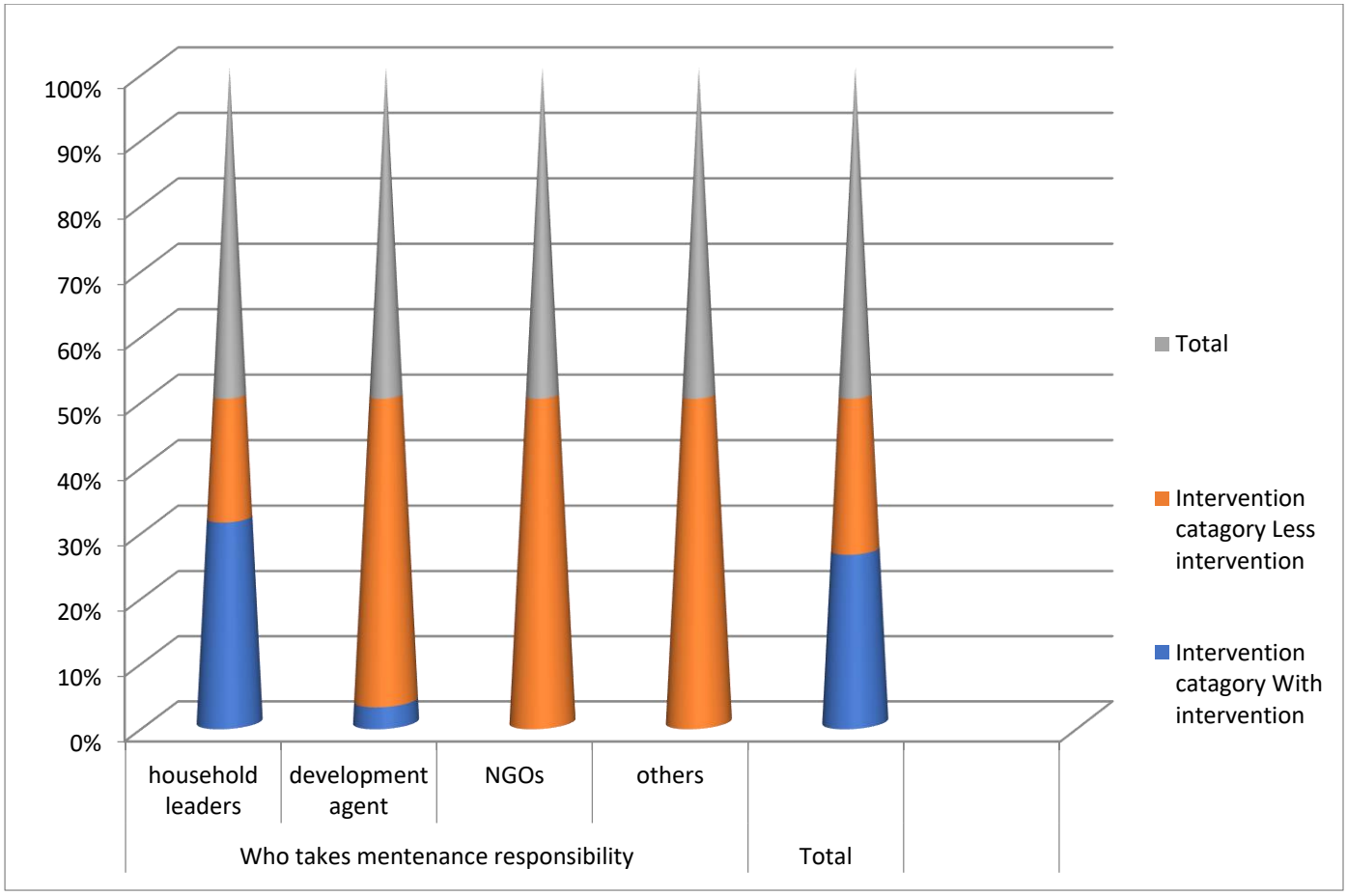

Table -5 b Maintenance time * Intervention category

		Intervention category		Total	% of response
		With intervention	Less intervention		
Maintenance time	regular	8	12	20	11
	Occasional	88	64	152	80
	unknown	4	13	17	9
Total		100	89	189	100

Table 5 c Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.744[a]	2	.013
Likelihood Ratio	8.987	2	.011
Linear-by-Linear Association	.629	1	.428
N of Valid Cases	189		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.01.

3.5 The effect on improving income source of the society

The socioeconomic impacts of integrated watershed management for sustainable development were assessed based on income, assets owned by farm households, income diversification, employment opportunities, food security, health and education. Most of the key informants interviewed suggested that their socioeconomic conditions improved since integrated watershed management activities began in their communities. The study clearly reveals that the problem of watershed management problems could not be solved without addressing the socio-economic problems of the area. Development organizations need to take income generation and farmer market participation more into account as powerful mechanisms positively or negatively influencing watershed management. More farmers need cash income for their households [13]. To solve the problem, the program should be linked with incomes generating mechanisms‟ to the society in general and youth, poor and landless in particular (i.e. improving the livelihood of inhabitants) in addition to the improvement of crop and livestock production to keep the sustainability of the program; it should be related with daily life of the community as shown in the table below the program is one source of income like selling fodder crops, Bee farming, seedling preparation, environmental protection, and Daily labor listed in priority as source of income in the watershed area, this result shows that from independent sample T-test 95% confidence interval of the difference (table -6) selling of fodder crops is the main source of income in the study area .[3]

Table- 6 Independent Samples Test

Value on		Levine's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Selling fodder crops	Equal variances assumed	0.039	0.845	0.399	198	0.69	0.03	0.075	-0.118	0.178
	Equal variances not assumed			0.399	185.667	0.69	0.03	0.075	-0.118	0.178
Bee farming	Equal variances assumed	9.043	0.003	-1.642	198	0.102	-0.12	0.073	-0.264	0.024
	Equal variances not assumed			-1.642	197.203	0.102	-0.12	0.073	-0.264	0.024
Seedling preparation	Equal variances assumed	1.41	0.236	1.6	198	0.111	0.16	0.1	-0.037	0.357
	Equal variances not assumed			1.6	194.667	0.111	0.16	0.1	-0.037	0.357
Environmental protection	Equal variances assumed	26.248	0	-1.977	198	0.049	-0.18	0.091	-0.36	0
	Equal variances not assumed			-1.977	181.722	0.05	-0.18	0.091	-0.36	0
Daily labor	Equal variances assumed	8.826	0.003	-1.251	198	0.212	-0.11	0.088	-0.283	0.063
	Equal variances not assumed			-1.251	165.264	0.213	-0.11	0.088	-0.284	0.064

3.6 Its effect on surface water availability and expansion of irrigation

The implementation of IWSM in the study area has great impact on the availability of surface and ground water and it leads to the expansion of irrigation The local communities categorized the availability of water into four classes: namely, very low , low, medium, and high .

The presence of water sources, the volume of water sources, its nearness to the settlement and constant flow rate of the water sources were the main criteria locally used to categorize the availability of water resources in the study area. According to respondents, the area which has several water sources with continuous flow rate and nearest to the settlement is characterized as high. On the other hand, if the area has no several water sources, fluctuated flow rate and far away from the settlement, the water availability is considered as low. Moreover, if the case is in between the above two category the water availability is termed as medium if it is series problem they termed as very low.

Most of respondent in the intervention area rated water availability as high, while non-intervention site as medium. The result observed indicates statistically significant variation between the two intervention categories of areas in water availability. The availability of water in the less/non intervention area is less than the intervention one. Moreover, from group discussion and all key informants from the intervention micro watershed also expressed that the soil and water conservation structures constructed on farmland have contributed to the water from rainfall to be enter in the soil rather than being runoff, and it increased the soil moisture content. These indicate that the intervention has positive contribution for the improvement of water availability in the area. This result is similar with findings of [14] in India. The impact of watershed management on subsurface water availability developed springs, shallow and hand-dug wells, hand-dug wells and water harvesting pond although the level of changes varies from watershed to watershed. From the respondents,focus group discussion, key informant , and field observation founded that groundwater can be found at depths of less than 8-12 m, as compared to depths of more than 25- 50 m prior to watershed management interventions. This leads the farmers to expand the irrigation system in the study area and have significant change in food security. The impact is more visible on groundwater recharge than surface runoff this result is similar to [15]

3.7 The effect on improving soil fertility and crop production

Agriculture is the main income source of the community in the study area. Mixed farming which involves crop production and animal husbandry is adopted by all farmers. Crop production in the area includes the production of staple food crops, cash crops and cereal crops. The survey result depicted that majority of the respondents in both sites categorized their land soil fertility is improved time to time due to the fact that replied as great change in crop production in general [16] . Empowering farmers to have how to alleviate degradation and how to maintain sustainability of natural resources through training has a great contribution in conserving watershed resources. The survey result indicated that most of the respondents agreed the advantage of soil and water conservation structure on their watershed catchments. Out of the selected respondents more than 99% of them address that soil and water conservation structures have positive impact by improving their land through preventing erosion, increase soil depth, enhancing land productivity, and, moisture conservation. The study conducted in Amhara Region by [17] also indicated that the participants had evaluated the soil and water conservation works as good. Similarly, 95% have believed there were differences between conserved and none conserved areas in terms of soil erosion problems and productivity. Farmers emphasized that their conserved farm cachments are more fertile than the non-conserved ones since the latter are more disposed to soil erosion than the former. In similar study conducted Gunano watershed of Wolaita southern Ethiopia farmers perceive that soil bunds improve the fertility of the soil and then increase yield [18].

3.8 Impact on Sustainable development

Sustainable development is a development that meets the desires of the present without compromising the capability of next-generation to meet their own need .It is not so easy to realize and answering the key components of IWSM interventions for the future generation , therefore, it is the time to create the actual research basis and do act depending on it for the future generation of IWSM for sustainable development issues[19]. Improving the lives of a few hundreds or even thousands of farmers does not necessarily amount to generating sustainable development. Likewise, conserving the soil in thousands of plots does not automatically amount to managing and rehabilitating the whole watershed. The only hope of achieving a lasting impact with relatively modest funds is to foster development which starts something that will continue to grow and spread on its own. This contrasts with many current projects that continue to provide inputs but do not aim for self-perpetuating growth. Projects need to limit themselves to practices that are of such benefit to the farmer that s/he will continue them on his/her own and his/her neighbors will emulate, and will continue to change the landscape, even long after the project itself or other assistance promoting the practice has ended [13] to achieve this goal the attitude of the society for future generation has great impact on the other hand, as shown in the table -7 below the sustainability issues of the watershed plans and technologies implementation in both intervention and non-intervention is almost the same 46.% very high ,44% high ,9% medium ,0.5% low, and 0.5% very low .This result show that 90% of the respondents replied that participating

in integrated watershed management program highly increased the attitude of the society to work for future generation in sustainable way this is the same conclusion with key informants and focus group discussions .From this we can concluded that the implementation of IWSM has significant contributes for the sustainable development of the study area .this is the same result found [20]

Table -7 The value of thinking for sustainability

		Intervention category		Total	% share
		With intervention	Less intervention		
The value of thinking for sustainability	very low	1	0	1	0.5
	low	0	1	1	0.5
	medium	11	8	19	9
	high	49	39	88	44
	very high	39	52	91	46
Total		100	100	200	100

4. Conclusions

The watershed management intervention in Meskan district was effective in several aspects; mean while it has also the components in which the implementation has unsatisfactory achievements. The findings indicated that the watershed management intervention brought decreasing soil erosion, enhance soil fertility, increasing of crop and livestock production, improvement of surface and ground water availability, and development of vegetation cover and improve income source of the society specially for youth and landless and create positive attitudinal change on the society about sustainable development in its intervention area.

The participation status of communities in watershed management was good. The structural arrangement of the institution was participatory; most of community leaders at lower level is committed to take their responsibility .But, some administrative bodies of the local area instead of dedicating their effort for the community development through sustainable IWSM they have their own motives and concerns like securing authority for long period of time.

Most of introduced physical soil and water conservation structures are appropriate for the area .that means in most micro-watersheds, structure selection, design, construction, and spacing were appropriate. However, in some micro-watersheds errors need correcting, such as; too long bunds without space for land users to move across farmland, bunds with narrow berms, poor stone bund foundations,and shallow channel depth . Moreover, the effort that exerted to repair the broken/sediment filled/ structures is poor in some area and needs attention, which affect the long term fate of these structures However, the implemented structures layouts were not related with the standards. Besides to the limitation on layouts of the structures, the diversity of implemented structure was also having some problems. And also, the management of implemented SWC structures with regular maintenance was not practiced in the area. In spite of having the limitations due to many reasons, the overall evaluation showed that IWSM intervention for sustainable development has effective achievements in the area.

5. Recommendations

- The local communities are expected to devote themselves for the success of IWSM interventions for sustainabie development.
- The government of the district is expected to develop the knowledge, skill, and capacity of,the society , community leaders, community facilitators,in relation to IWSMfor sustainable development through capacity building.
- The soil and water conservation structures should be maintained with a regular time and the implementation should be related with the standard.
- The current watershed management approaches mostly focuses on physical part of the implementation /soil and water conservation/, rather than integrating the biological part, but effective watershed management requires multidisciplinary and innovative approaches based on the local situation.
- Comprehensive baseline survey of the IWSM is needed before onset of the watershed activities at watershed level to expand best practices of the impact of the intervention.
- Furthermore, interdisciplinary study for related to sustainable development is recommended to be done in the same study area or elsewhere in the region to provide empirical evidences for the country situation.

- In addition to increasing the vegetation cover by expanding the plantation approach shouid be one source income focusing on edible fruit, and select tree seedling

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Abbreviations

IWSM Integrated watershed management

CSA - central statistics agency

KEBELE- Lower administrative structure of the country

SNNPR-Southern Nation Nationalities Peoples Region

SWC-Soil and Water Conservation

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