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Base Line Study of Mitkie Learning Watershed of Pawe District, North Western Ethiopia

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Abstract
Conducting Baseline study before implementing of watershed project is crucial to evaluate and monitor the impacts of watershed project intervention on beneficiaries' socioeconomic. The purpose of this study was to characterize the socio economic condition of Mitkie learning watershed in Pawe district with objective of identify and document the current status, potentials and constraints of Mitkie learning watershed and to provide base line data and information for further project monitor and evaluation of the intervention. It was used systematic and simple random sampling method to select 80 sample households (72 were males and 8 were females) and descriptive statistics method of data analyze was employed. The socio economic of the study area was good which is 70% were able to read, write and above, more than half of them was used improved seeds, fertilizer and herbicide to enhance their crop production, 68.8 % access to irrigated land and suitable for low land bamboo productions whereas some are poor socio economic characters were 100% used flooded method of irrigation, saving(18.75%) and borrowing(6.25%) habit, local animal breed(3.8%) and forage technology usage(6.25%). This study suggest that stakeholders as well as project managers should be used and cooperate the base line study in their Annual plan and implement accordingly for further improvement of socio economic of the sample households.
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1. Background and Justification

The history of watershed management planning in Ethiopia has been started, dating back to the 1970s with large watersheds(Gebregziabher *et al.*, 2016). Watershed approach soil and water management were strives to address the problems of severe land degradation and natural resources depletion; inappropriate use of land management practices; low agricultural productivity; shortage of livestock feed; lack of integration of ecological and economic interventions; lack of access to and conflict on communal land resources; and inadequate and passive participation and coordination of actors in watershed management. However, large efforts remained mostly unsatisfactory due to lack of effective community participation, limited sense of responsibility on assets creation, unmanageable planning units and non-addressing the problems of local people (Desta *et al.*, 2005).

Watershed is not simply the hydrological unit but also socio- political-ecological entity which plays crucial role in determining food, social, and economical security and provides life support services to rural people (Wani *et al.*, 2008).The watershed development technologies aimed not only to conserve the natural resources but also improving the socio-economic conditions of the rural people who depend upon watershed for their livelihood. The impacts of various watershed treatments are however varying. The changes in various bio-physical, environmental aspects will have significant impacts on the socio-economic conditions of the people. Watershed development programs are designed to influence the bio-physical aspects, the environmental aspects and thereby bringing changes in socio-economic conditions (Deshpande and Rajasekaran, 1997). The watershed intervention helped the rural household of on-farm and non-farm income level to be improved through maintaining soil moisture for crop production and source of feed for animal and used as catalyst for off farm generating within the watershed. Evidences show that the rural labor households in the treated villages derived Rs. 28732 when compared to Rs. 22320 in control village, which is 28.73 per cent higher in Kattampatti watershed. Similarly, the per capita income was also relatively higher among households of watershed treated villages. The percentage difference among households across villages worked out to 13.17 per cent in Kattampatti and 70.44 per cent in Kodangipalayam watershed(Palanisami and Kumar, 2004)

Although, participatory watershed approach of soil and water conservation has impact on diversifying and increasing income of watershed beneficiaries through soil and water conservation practices', SWC practice in Pawe district is limited and unsustainable. The vegetation covers, forest, grazing land and soil fertility of the cultivated land in the district are become decreasing from year to year. Moreover, the district population is increasing from year to year that needs additional cultivated land, grazing land, fire woods and trees for house construction and daily economic activities that accelerated the deforestation and degradation of the cultivated land

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in the study area. As result of these consequences the crop and animal productivity of the district has been decreased.

To heal the degradation of natural resources of the district as well as to increase the productivity and production of animal and crop sectors, Mitkie learning integrated watershed project was proposed to implement in the district t. As result of the project, crop and animal productivity, income sources is expected to increase and will increase food security status of watershed beneficiaries. Mitkie learning watershed covers 582 ha of land which 260 ha cultivated land, 50 ha degraded land, 40 ha grazing land, 50 ha irrigated land and 180ha of land invaded by invasive alien weed which has been planned to change the current biophysical and socio-economy of the watershed. At the end of the project, the land use patterns, crop and animal productivity and diversified income source of watershed beneficiaries will be changed as well as the livelihood of watershed beneficiaries are expected to improve. Therefore, this baseline study was conducted to document necessary baseline information which used to measure the impact of Mitkie learning watershed project intervention.

2. Research Methodology

2.1 Description of the study area

This study was conducted at Mitkie community based participatory learning watershed in Pawe district, Metekel zone, Benishagul Gumuz National Regional state ,North western of Ethiopia as shown in figure 1. The learning watershed is located 567 km far away from Addis Ababa to the North-Western direction with geographically, is located $11^0$20’04.93’’-$11^0$17’50.43’’ latitude and $36^0$27’21.88’’- $36^0$28’22.95’’ longitude. The altitude of watershed ranges between 1087 –1167 m.a.s.l and is bounded in the south by village 10, in the west by village 9, in the north by village 23/45, and in the east by pawe district Administrative. It is characterized as worm humid lowland area with very high rainfall. The area has a unimodal rainfall pattern, with an extended rainy season, from March to September. However, the peak rainy season is from July to August. According to records from 1987 – 2001, the mean annual rainfall is 1659 mm. The mean annual maximum temperature is 32 ^{0}C, and monthly values range is 27 - 37 ^{0}C. The mean annual minimum temperature is 16 0C, and monthly values range between 12 –19 0C. The soils of Mitke learning watershed are broadly categorized as Vertisols (black clay soils), and Nitisols (red or reddish-brown laterite soils) (Yimam and Gebrekidan, 2013).

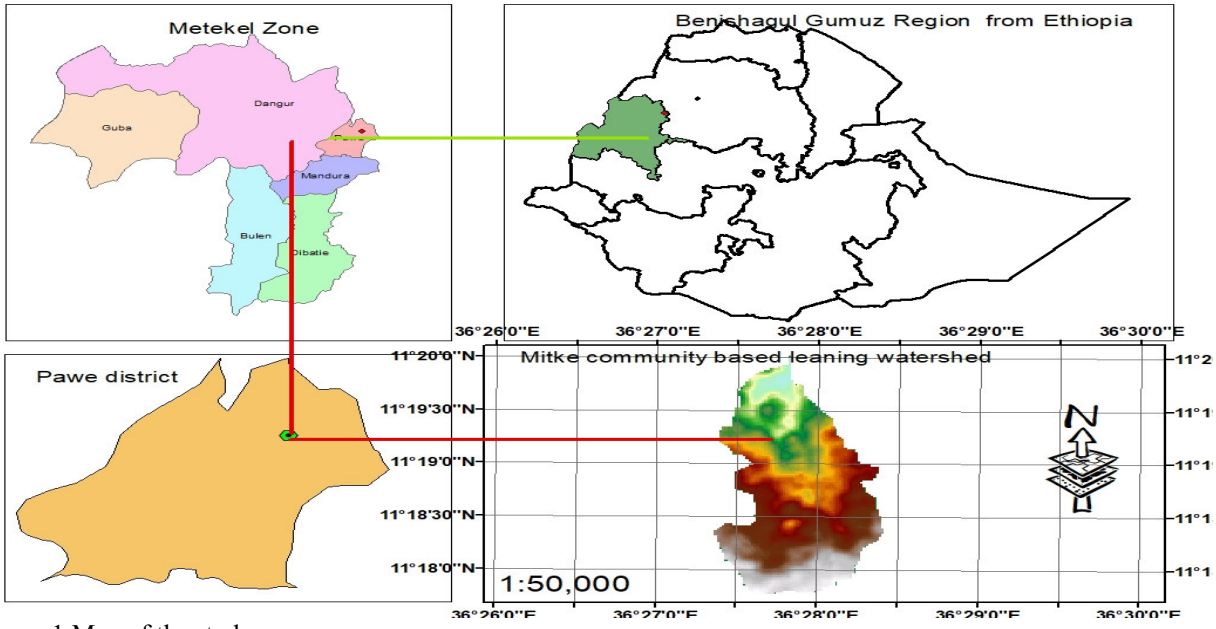


Figure 1 Map of the study area

2.2 Method of sampling

Two stage sampling method was used to select the study population. Systematic and simple random sampling methods were employed. For the purpose of sampling the watershed clustered in to three parts. Village 10, 9 and 2345 is the bottom, middle and upper part of the watershed respectively. The residences of three villages that interact with the watershed environment to accomplish the daily economic activities were considered as the study population.

2.3 Sample size determination

The beneficiary of the Mitkie learning watershed was listed by order of numbers and registered as downstream, upper stream and middle. There were a total of 926 household beneficiaries in the watershed, out of which 260

upper stream, 331 middle stream and 335 downstream beneficiaries. The total sample size was taken based on the following formula(Cochran, 2007).

$n = Z^2 (PQ)/e^2$ ---------- 1

Where

n - Is number of sample size when population is less than 10,000, Z - Is 95% confidence limit i.e. 1.96, p - Is 0.2 (proportion of the population to be included in the sample i.e 20%), q – Is 0.8 proportion of the population not to be included in the sample i.e 80%) and e - Is margin of error or degree of accuracy desired (0.05)

According this formula 80 sample households were taken from three different streams. The sample distribution is illustrated as follow

Table 1. Selected sample size by streams

Streams	Total population	Sex		Total
		Male	Female	
Middle	331	28	3	31
Down	335	33	4	37
Upper	260	11	1	12
Total	926	72	8	80

Source Survey data (2018)

2.4 Method of data collection and analysis

The study used both primary and secondary data which collected through structured questionnaire and checklists respectively. Primary data were collected by trained enumerators from sample households of watershed beneficiaries through face to face interview whereas secondary data were collected from published and district administrative offices. The primary data collected includes the demographic characteristics of sample household, ownership of assets, land use patterns, major crops grown, consumption, and marketing, input use, access to agricultural extension, irrigation, financial institution, potential, constraints and income sources. In addition to this, personal observation, focus group discussion and key informant interviews were conducted to support the interpretation of the result obtained from field survey. It used descriptive statistics and gross marginal analysis method to analyze the data. Statistical software for social science (SPSS) of soft version 20 was used to examine this paper.

3. Results and Discussion

3.1 Demographic characteristics of sampled household heads

Most of the sample households are Cristian believes (78.75% Cristian and 21.25% Muslim) and male headed (90% were male and 10 % were women) with marital status of 92.4% married and 7.6% divorced respectively (Table 2). Regarding the educational level of the household head 30% were illiterate whereas 70 of them were literate which means able to read and write and above. This is studies is in line with Assessment of rice production and marketing in pawe district showed that 63.45 sampled households were able to read and write (Berhanu *et al.*, 2015).

Table 2. Gender, marital status, education and religion of sampled households

Gender of HH head	Frequency	Percent
Male	72	90
Female	8	10
Total	80	100
Marital status		
Married	74	92.4
Divorced	6	7.6
Total	80	100
Education		
Illiterate	24	30
Literate	56	70
Total	80	100
Religion		
Cristian	63	78.75
Muslim	17	21.25
Total	80	100

Source: survey data (2018)

3.2 Socio-economic characteristics of sampled household heads

The sampled household heads' family size ranges from one up to twelves with a mean 5.51 and standard deviation

of 2.12.The sampled household head has been living in the kebele for 3 up to 34 years with a mean 28.49 years and standard deviation of 7.50 years (table 3). The residence of the study area has been resettled during the Derge regime in 1985 from Oromia Special zone of Amhara regional state and Kembat Tembaro zone of South People Nation and Nationalities. Besides there are self-settled residences from the neighbor of Awi zone Amhara regional states for the sake of daily laborer, large range land and cultivated land.

The sampled household heads have been experienced on average 24.11 years and standard deviation of 10.81 years in producing crops and rearing of animal with the traditional farming system. Their farming experience ranges from 0 up to 60 years. The age of sample household head ranges from 25 to 80 years with a mean 43.28 and standard deviation of 11.54 years.

Family age composition was indicated the availability of labor force in the family as well as watershed for different farming and watershed activities. 439 total family members were identified under different age groups. The sample household age was used to identify active labor force available for different activities of the watershed. Accordingly, 58.31% of the watershed population was shared by active labor force in the watershed (table 3).

Table 3. Family size, age and farming experience of sampled households

Continuous variables	Mean	Std. Deviation
Family size	5.51	2.12
Male	2.86	1.50
Female	2.65	1.44
years lived in the kebele	28.49	7.50
Experience of farming	24.11	10.81
Age of HH head	43.28	11.54
Male Age b/n 0-14 yrs	1.89	.85
Male Age b/n 15-64 yrs	1.59	.82
Male Age above 64 yrs	1.00	0.00
Female Age b/n 0-14 yrs	1.74	.78
Female Age b/n 15-64 yr	1.80	1.08
Female Age above 64 yrs	1.00	0.00

Source: survey data (2018)

3.3 Ownership and land use pattern in Mitkie learning watershed

All most all of sampled households (98%) have their own land while only 2% was landless. These landless were young household heads in the kebele. On average the sampled households own land 2.6 ha of which is higher than the district of 1.16 ha (Wegary *et al.*, 2013)(Bekele et. al, 2013). However, the assessment of upland rice production and marketing in pawe district found than average land holding was 3.38 ha (Birhanu et.al, 2015) which is higher than 2.6 ha in Mitkie watershed. The main occupation of the sampled household were agriculture which accounts 97.5% while only 2.5% of sampled household heads were off farming during the study period (table 4).

The main asset of the sample households' in Mitkie learning watershed are cultivated land (rain fed and irrigated), animal in TLU, number of oxen used for draft purpose, purchase of animal inter of money and amount of money saved. The sample households' were owned on average 2.6 ha and 0.22 ha of rain fed and irrigated cultivated land with standard deviation of 1.47 and 0.17 ha respectively. They were also owned on average 1.93 animals in TLU, 2.08 numbers of oxen with standard deviation of 1.64 and 1.11. The sample households accumulated their assets by purchasing animals and saving money in financial institution. They were purchase animals on average of 7373 and save money 2786 with standard deviation of 5069 and 2671 respectively (Table 4).

Table 4. Ownership of Asset in Mitkie learning Watershed

Did have own land	N	Frequency
Yes	78	97.5
No	2	2.5
Main Occupation		
Agriculture	78	97.5
Off farming	2	2.5
Asset owned	Mean	Std. deviation
Owned land in ha	2.6	1.47
Irrigated land in ha	0.22	0.17
Animal Holding in TLU	1.93	1.64
Oxen ownership in No.	2.08.	1.11
Animal purchase in ETB	7,373	5,069
Money saved in ETB	2,786	2,671

Source: survey data (2018)

3.4 Sample household heads land use patterns in Mitkie learning watershed

Almost all land owners allocated their land for cropping and homestead purpose. They planted different staple and cash crops to meet the annual households' food and non-food consumption. The owner of land was allocated their cultivated lands as cropping land, homestead, degraded, grazing, woodlot, fallow lands respectively. Cropping and homestead land use patterns accounts 161.07 ha out of 203.76ha of total cultivated lands.it shares 79.05% of the total land owned by the sampled households. Next to these land use patterns degraded land use was accounted 5.52 %(11.25 ha) out of total 203.76 ha of cultivated ha (table 5). This is cause due to less practice of water and soil conservation practices, high rain, long rainy season, high run off and erosion. As result its soil fertility becomes decreased and gradually degraded.

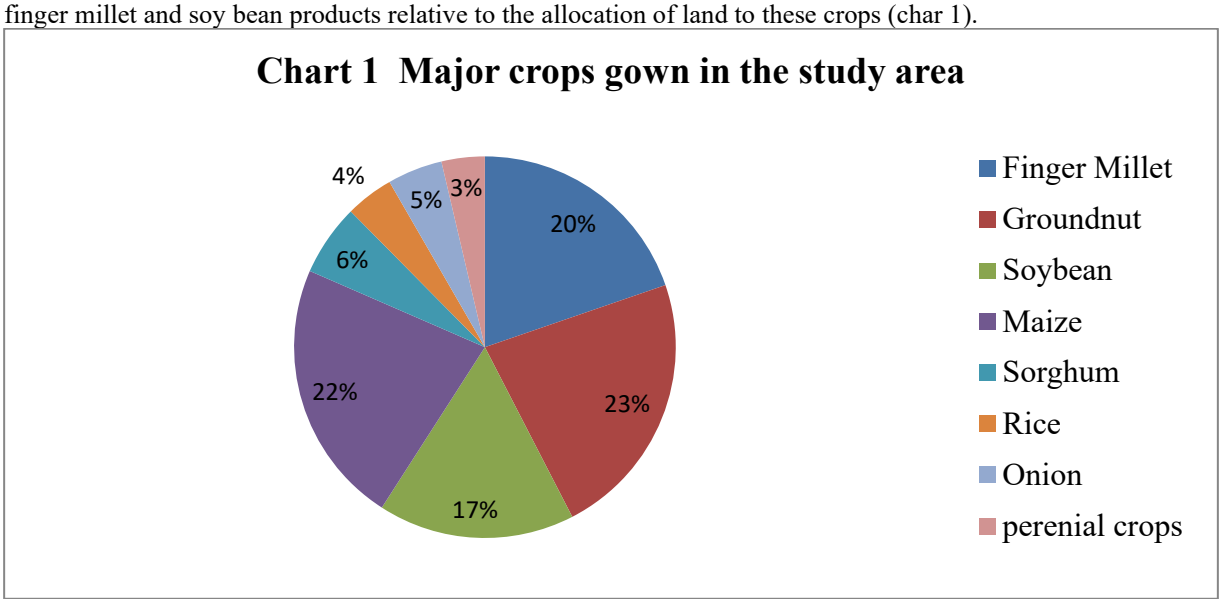
Table 5. Sample Household heads Land Use patterns

Sampled HH head land use in hectare	N	Mean	Std. Deviation
Homestead land	76	0.34	0.25
Crop land	78	1.73	1.10
Wood lot land	21	0.37	0.42
Grazing land	14	0.57	0.47
Degraded land	17	0.66	0.67
Share out land	11	0.71	0.35
Rent out land	8	0.84	0.69
Fallow land	2	0.56	0.09
Rent/Share in land	3	1.67	2.04

Source: survey data (2018)

3.5 Major crop Production in Mitkie earning watershed

Smallholder farmers were produced both cash and staple crops. They produce these crops for household food consumption and cash earn purposes. Finger millet, Maize, sorghum and rice were among the staple crops produced for consumption purpose whereas Groundnut, Soy bean and Onions were produced for cash earn purpose. Sample households were prioritized and allocated their farm land for Finger millet, Groundnut, Maize and soy bean crops respectively by their importance. However they were produced large amount of Groundnut, maize, finger millet and soy bean products relative to the allocation of land to these crops (char 1).



Source: survey data (2018)

3.6 Sample Household input use in Mitkie learning watershed

Mitkie learning watershed communities have been used improved seed, Herbicides and fertilizers to boost their crop production. Improved maize and soybean seeds are commonly used in the watershed. Use of these inputs in the study area was moderate relative to other watershed studies of improved input usages particularly improved seed and Herbicides. Input of Herbicide was used for all crops whereas fertilizer was mainly used for maize.

The improved seed and herbicide adoption rate of Mitkie learning watershed were 55% and 46% respectively which is higher than the others studies conducted in Amhara region (Addisu *et al.*, 2013). (Addisu *et al.*, 2013) reveals that herbicide input usage of watershed communities in Amhara region was low. According his study the adoption rate of improved seed and Herbicides were 45% and 35% respectively. It is lower than Mitikie learning

watershed.

Table 6. Sample households' input use in Mitkie learning watershed

Input use	Obs	Mean	Std.deviation
Fertilizer (Q)	47	0.56	0.53
Fertilizer cost(birr)	47	612	531
Own seed(Q)	73	0.93	0.76
Improved seed(Q)	44	0.43	0.39
Improved cost(birr)	44	521	520
Herbicide (litter)	37	2.60	1.90
Herbicide cost(birr)	37	333	275

Source: survey data (2018)

3.7 Consumption and marketing share of major crops in Mitkie learning watershed

Sampled household produced both cash and stapled crops. Maize, sorghum and finger millet produced primary for consumption purpose. They were allocated 35 up to 67 % these products for consumption. The rest is shared by other crops and groundnut. Around 9 % of groundnut was consumed from the total production (table 7). This is similar with (Getahun and Tefera) reported groundnut was consumed only 7% out of total production. However, soy bean was not consumed at household level at all. About seventy percent of the produced groundnut and soy bean were sold mainly for agro-industrial raw material at district and village market to meet the financial demands of sample households during the study period.

Table 7. Consumption and marketing of sampled households

Types of Crops	Produced in Qt	Consumed in Qt	% of Consumed	Sold output in Qt	% of sold
Maize	405.80	243.15	59.92	57.9	14.27
Sorghum	109.10	73.40	67.28	22.7	20.81
Finger millet	356.90	122.55	34.34	13.7	3.84
Groundnut	409.40	37.85	9.25	291.55	71.21
Soybean	300.50	0.00	0.00	209.95	69.87
Other Crops	158.00	79.67	50.42	40	25.32

Source: Survey data (2018)

3.8 Livestock ownership and Access to improve livestock breed of sample households in Mitkie learning watershed

Smallholder farmers are rearing live stocks for plow power, meat, and additional income sources. They were reared local live stocks like Cattle, shoats and chickens. Above ninety five percent of the sample household's rears local breed. Among the sampled Household only 3.8% was used improved livestock tehnologies. These were chicken and sheep only (table 9).

Table 8. Access to Improved Livestock Technology

Access to Improved LS Technology	Percent
Yes	3.75
No	96.25
Types of technology	
Chicken	2.5
Sheep	1.3

Source: survey data (2018)

3.9 Cattle feeding system, access to improved forage and demand of improved animal breeds of Sample household in Mitkie learning watershed

Smallholder farmers were rearing cattle to diversify their income as well as to reduce risk of crop failure by natural hazards. Besides usage of improved cattle breeds and feed high nutrient value of improved forges will be increased the income generated from this sector. However Cultivation and feeding of improved forage practices in the study area were very poor. More than fifty six percent of sampled household Livestock owners were practiced free grazing cattle feeding system. The production and productivity of cattle were low. Due to these reason they were less adopter of improved forage varieties. Only 6.25% of the sampled household heads were adopted improved livestock forages like rodus grass, elephant grass, andro pogen, and biracaria grasses (table 10).

Table 10. Cattle feeding trend and improved forage production

Cattle feeding system	Percent
free grazing	56.25
controlled grazing	5
Combination	26.25
I did not Ls	11.25
Forage produced	
Yes	6.25
No	93.75

Source: survey data (2018)

3.10 Demand of Improved Livestock types in Mitkie learning watershed

Smallholder farmers were reared livestock as alternative source of income. To enhance the income source from this sector requires productive and disease tolerance livestock technology. To meet these aim smallholder farmers were showed demand of Cattle, sheep, goat and chickens of improved livestock technology types accordingly their importance. Among these demand of improved cattle and sheep were share large percentage relative to goat and chicken (chart 2).

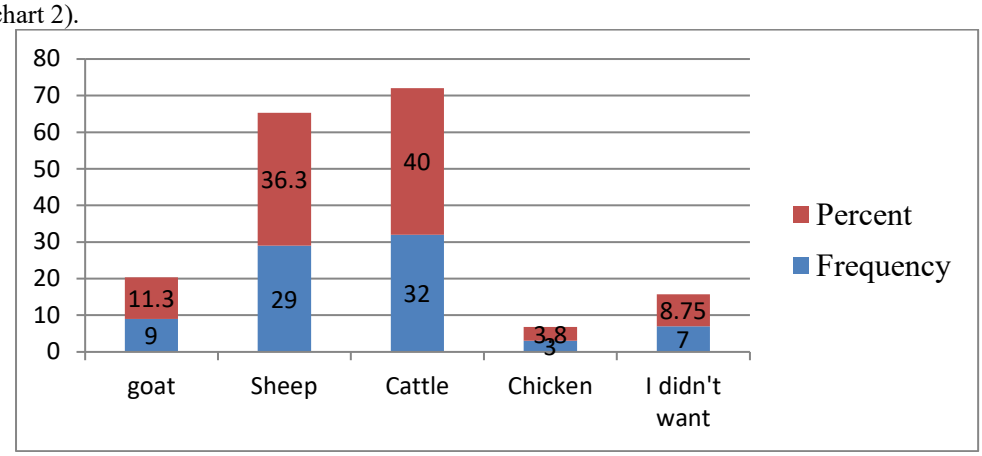


Chart 2. Types of Livestock demanded

3.11 Income source and expenditures of sample households in Mitkie Learning watershed

Sample households were practice mixed farming system with few participation in the off farm activities. The source of income generated was from selling of crop, livestock and tree like bamboo and off farm activities petty trade, daily labor and carpenters. Soy bean and Groundnuts were the main cash crops and have relative higher output price in the study area. They were generated income on average 11,194 birr from crop sale, 8,518 birr from livestock sale, 1041 birr from sale of trees and 1278 birr from off farm activities annually. Income source of crops and livestock were dominant of income sources share 94% of the sample household total income annual (table 11).

Table 11. Sample Households' Income source in Mitkie watershed

Income sources	Obs	Mean	Std. deviation
Crop	59	11,194	10,166
Livestock	54	8,518	6583
Trees	12	1041	620
Off farm	32	1278	998
Total	75	15815	12149

Source: survey data(2018)

3.12 Sample households' expense per year in Mitkie learning watershed

Sample households have been allocated their income for durable, non-durable goods, productive and non-productive assets. They were invested their incomes on productive assets like Agricultural inputs and educational services for the sustainability of their income generation. However, they were also allocated in non-durable and non-productive assets for the sake of social and cultural building and acceptance by the community. Based on this, they were allocated their annual income on purchase of family clothes, utensils and health services. Most of the annual income was allocated clothes, Agricultural inputs and health services with a mean value of 1713.28, 1200.20 and 1035.08 with standard deviations 1088.26, 1194.59 and 1014.33 of respectively. They were also expending their incomes on health service, purchase, repair utensils and education (table 12).

Table 12. Sample Household Expenditure per year on goods and services

Types of Expenditure	Obs	Mean	Std. Deviation
Total Expenditure	78	5712.82	5021.83
Cloth Purchase	73	1713.28	1088.26
Agri Input purchase	49	1200.20	1194.59
Health service	65	1035.08	1014.33
Utensils Purchase	27	924.07	915.90
Repair Utensils	21	773.80	737.85
Education Service	57	748.07	712.15

Source: survey data (2018)

3.13 Agricultural Extension contact, Access to Financial service, access to irrigation of sample households in Mitkie learning watershed

Agricultural service is the key pillar to change the current perception, knowledge and skills of smallholder farming system and technologies adoption in Mitkie learning watershed. It play vital role on changing of agronomic practices, use of improved inputs like seed, fertilizer and pesticides. Sampled household head was gained agricultural extension service moderately. Almost sixty percent were gained Agricultural extension service per month. Among these 37.5 % were gained more than twice per month. However the extension service was given to male headed households that shares 41.3 percent. Female headed households were accessed only five percent (table 13).

The saving and borrowing habit of sampled households were low. There are two micro finance institution credit and saving service providers at district level. But it does not have any branch at kebele level to provide these services. 18.75% of sample households were practiced saving in rural micro finance and banks. Only 6.25% of the sample households were accessed to credit from formal, semi formal and informal financial institutions. Out of these 2.6% were gained credit from formal and semi formal financial institution. The borrowed money was allocated for input purchase, oxen and consumption purposes (table 13).

Sampled households have been well accessed to irrigation service from the river in the Mitikie learning watershed. About seventy percent of the participants were practiced irrigation. However, almost ninety five of them were used traditional irrigation systems that are flooded irrigation systems. They have 0.22 ha of land irrigated land on average with a range of 0.01 ha to 0.5ha during study period (table 13). Access to irrigation in Mitikie learning watershed was better due to the distribution of irrigated land to community members has been taken recently. The accessibility of irrigation in Mitikie learning watershed was better than the studies conducted in Mnara and karita watershed of Kindo Didaye district, southern Ethiopia (Merkineh *et al.*, 2018).

Table 13. Access to agricultural extension, Financial and Irrigation services

Did get Agri-Ext service	Percent
Yes	57.5
Access to saving	
Yes	18.75
No	81.25
Institution saved	
Rural MFI	1.3
Bank	17.5
Are you Access to credit	
Yes	6.25
No	73.75
Source of credit	
Regional MFI	1.3
Cooperative	1.3
Relatives	3.75
Access to irrigation	
Yes	68.8
Irrigation Method	
Flooded/furrow	94.36/3.64

Source: survey data (2018)

3.14 Perception of Natural resource degradation and Soil water conservation practices of sample household in Mitkie learning watershed

Sample household respondents well understood the Natural resource degradation of their environment. Before the resettlement of sample households, Mitikie learning watershed has been covered with plenty of natural resources.

According their observation and understanding the forest land has been changed in to crop land with poor soil and water conservation practices due to population pressure. 77.5% of the sampled household heads believed that there is degradation of natural resources in the Mitikie learning watershed. The major causes of natural resource degradation were deforestation (59.7%) followed by continuous cultivation (16.1%), overgrazing and weather fluctuation (11.3%) respectively (table14). The cause of natural resources degradation in Mitikie watershed is similar with the studies conducted in Kindo Didaye district, southern Ethiopia (Merkineh *et al.*, 2018). The study point out that deforestation and overgrazing causes of Natural resource degradation was 60% and 35% respectively in the study area. In case of over grazing it has low cause on Natural resource degradation. This is due to large free grazing land near the study area and Livestock owners use the grazing land as alternatives.

Table 14.Sampled Households perception on Natural resources degradation and causes

Natural Resources Degradation	Percent
Yes	77.5
No	22.5
Major Causes of natural resource degradation	
Deforestation	59.7
Weather fluctuation	11.3
Overgrazing	11.3
Continuous cultivation	16.1
Improper cultivation	1.6

Source: survey data (2018)

3.15Types of Soil and water conservation practice In Mitikie learning watershed

Majority of the Sample households have experienced on constructing soil and water conservation practices. 62.5% of them were constructed different Soil and water conservation (SWC). About 37.5 percent has not practiced SWC. Among the SWC practices; soil bund was more dominantly practiced in the study area. It shares 74% and only 26% was covered by tree planting, fanaju and mulching of SWC practices (table 15).

Table 15. Types of Soil and water conservation practice In Mitikie watershed

Did construct SWC	Percent
Yes	62.5
No	37.5
Types of SWC	
Soil bund	74
Tree planting	14
Fanaju	6
Mulching	6

Source: survey data (2018)

4 Conclusion

The base line study was characterized and examined the socio economic condition Mitkie learning watershed in Pawe district using descriptive statistics, focus group and key informant interviews

Based on the sample taken to study the base line of Mitkie learning socio economics characteristics, 90% of the sample were male and the rest 10% was female headed households. The religions of sample households were contained orthodox, Muslim, protestant and advents. Majority of samples households were active labor force with able to read and write and above which helps to easily understand new natural resources, crop and animal science technologies and disseminated in the watershed. More than half of sampled households have used improved technologies like improved seed, fertilizer and herbicides to enhance the crop sector production and productivity. Besides they were cultivated both cash and staple crops. The accessibility to irrigable land was also better in the watershed. However the irrigation method was traditionally diverted and irrigated with flooded system which caused soil salinity and acidity at long term. In addition to this underutilized the irrigation water sources as well as could be a means of conflicts due to shortage irrigation water source. Modern irrigation weir and canal should be constructed in the watershed to decrease the percolation of water and modern irrigation methods should follow to use the available water efficiently.

Service of saving and credit was very poor in the watershed. Even it has not any branch of micro finance institutions at kebele level. Access to financial services has an impact on use of agricultural inputs, creation of employment and engagement on new agro business activities. Government and non-government organization should expand micro finance institution in proximity of rural communities. Access of improved forage and animal breeds were very poor in the watershed. Improved forage and animal breed has vital role enhancement of smallholder farmers' income as well as their wellbeing. Research center in the agro ecology should give priority on animal breeding based on the demands identified by the end users. In addition to this awareness creation and

training on improved forage production should be arranged to watershed community.

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