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Socio-Economics Importance and Its Determinant Factors of Wetlands in Eastern Ethiopia

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ABSTRACT

Wetland in Ethiopia provides various socio-economic benefits for the local community and for the people who live around the ecosystem. Despite this, the wetland in Ethiopia provides various benefits to the local community, it is under severe pressure and degradation from natural causes and human activity. The present study aims to assess the socio-economic importance of the wetland that existed in the East Harerghe zone. Both primary and secondary data were employed to answer the study objective. Accordingly, a total of 220 respondents were selected to administer the questionnaire. SPSS version 20 was used for data analysis and a multiple regression model was used to see the relationship between dependent and independent variables. The income generated varies in two lakes, Lake Langie is 56,196.8 birr, whereas the mean annual income in Lake Adele is 54,662.6 birr. The determining factor for the income generated from the wetland is the respondent land size and the distance between the wetland and farmland. Among respondents, 53.2% of the respondents perceived that the lakes are highly degraded followed by less degraded 33.9% and 12.6% in good condition. Agricultural expansions are indicated as the major triggering factor for the degradation of wetlands followed by population pressure, sedimentation, deforestation, overgrazing, and poor law enforcement and regulation respectively. Most respondents are interested in participating in conservation activity and the recommended activity to tackle this degradation is soil and water conservation and tree planting activity.

INTRODUCTION

A wetland is an area of land that is covered with water or saturated by water. It includes areas of marsh, fen, peat land, or water, it could be artificial or natural, and also temporary or permanent, with water that is static or flowing, fresh, brackish, or salt, including areas of marine water with the depth of which at low tide, does not exceed six meters (Davis et al., 1997). In Ethiopia, all the listed type of wetland exists, except coastal and marine-related wetlands (Arayaselassie and Tesfaye, 2019; Leykun, 2003). The estimated number of wetland coverage in the country varies among different scholars, according to Karlsson, (2015)in Ethiopia wetland covers 1.14% of the land mass of the country and 77 wetlands were identified including lakes. This ecosystem contains the highest amount of biodiversity and the most productive ecosystem (Cooper et al., 2006; Dubeau et al., 2017; Hagos et al., 2014; Schuyt, 2005) are critical for supporting human livelihoods in Africa (Rebelo et al., 2010; Seelig and De Keyser, 2006). Additionally, it provides various social, economic, and environmental benefits to the local community that lives around the wetland. Moreover, it has an important role in climate change mitigation (Reid et al., 2005), and it is considered the largest carbon sink (Crooks et al., 2011). They are also part of the rural people's economy as they traditionally play an important role in rural communities through the provision of water, and other materials, for both humans and livestock (Assefa et al., 2015).

Despite the fact, that the wetland in Ethiopia provides various benefits to the local community; it is under severe pressure and degradation human activity. This degradation of wetlands is rooted in

the misconception that wetlands are considered a wasteland. Reports from the different study indicate that wetlands area had declined from 20% to 60% within 25 years (Gebremedhin et al., 2018; Hussien et al., 2018; Tolessa et al., 2018). The highest share of the disturbance in the wetland ecosystem originated from human disturbance, it accounted for 65% of the disturbance in this ecosystem, while 35 % from the natural origin (Dugan, 1990).

There are only very few published studies on the socioeconomic importance of wetlands in Ethiopia are available (Abebe et al., 2014; Assefa et al., 2015; Bekele, 2011; Gebremedhin and Belliethathan, 2020; Kassa and Teshome, 2015; Mequanent and Sisay, 2015; Mulatu et al., 2015)Some study results on the causes of wetland degradation in Ethiopia, based on a socio-economic study are available (Gebresllassie et al., 2014; Kassa and Teshome, 2015; Mequanent and Sisay, 2015; Mulatu et al., 2015). So, the present study aims: (a) to assess the socio-economic importance of the wetland in Lake Lange and Adele. (b) to identify the determinate factor for the socio-economic importance of this wetland. (c) to assess the main challenge this wetland faced.

MATERIALS AND METHODS

Study Area

The study was undertaken in the East Harerghe zone in Oromia regional state in two lakes namely Lake Adelie and Lake Langie. Geographically Lake Adelie is located at Latitude 9^{o} $25^{'}$ $27^{"}$ N and Longitude 41^{o} $55^{'}$ $36^{"}$ E. On the other hand, Lake Lange is in Latitude 9^{o} $26^{'}$ $37^{"}$ N and Longitude 41^{o} $47^{'}$ $47^{"}$ E. The total area of the zone is 22,622.6 km^2 (Zeleke et al., 2021). It contains the three traditional Agro-climatic zones highlands (>2300 m.a.s.l), Midland (1500-2300 m.a.s.l), and Lowland (<1500 m.a.s.l). The midland holds 24.5% of area coverage of the total area of the zone and is home to different lakes like Haromaya, Adele, and Langie. The study area experienced bimodal rainfall with a mean annual participation of 751mm. The highest amount of rainfall occurs between April to August (Alemayehu et al., 2007). The mean temperature of the study area was 16^{0}c, where the maximum temperature was 19^{0}c, and the lowest was 13^{0}c.

East Harerghe zone contains 20 districts with a total population size of 3.4 million including 415,575 Male households and 33,903 Female households. The study area is known for the small-scale irrigation cash like *Catha edulis* (khat) and *Coffea arabica* (Coffee) (Tessema et al., 2013; Wordofa et al., 2023). Khat cultivation undertaking is one of the livelihood strategies that provides socio-economic importance for the local community. The surrounding lake provides a significant amount of benefit for the local community by providing water in terms of irrigation, especially in the cultivation of Khat and coffee. Regarding the fishery resources, Lake Adele is rich in fish resources like; Nile Tilapia (*Oreochromisniloticus*) and Catfish (*Clariasgariepinus*) the types of fish fishermen harvested from the Lake (Alemayehu et al., 2018).

Sampling Techniques and Sample Size

Based on a reconnaissance survey and secondary information from the Woreda offices Agricultural eight kebele were selected from each wetland that is from Adele (Adele Tabiye, Efia Oromia, Damota, and Dengego) and Langie (Wichita, Langie, Yabata Selama, and Galiemergie). In these selected kebeles, individual respondent was selected in random sampling to determine the number of respondents in each study area. To determine the total sample population taken from each kebele the formula was adopted (Kothari, 2004).

$$n = \frac{Z^2 * p * q * N}{e^2(N-1) + Z^2 * p * q}$$

Where **N**…is the total number of households in each kebele, **n** ... is the number of sample population taken from each kebele, **Z**…confidence level 95% (1.96), **p**…sample proportion, 0.5, **q**…1-**p**, 0.5, and **e**… the desired level of precision (0.05). Accordingly, a total of 220 respondents were selected to administer the questionnaire.

Data Collection

Both primary and secondary data sources were used for this study. The primary data was obtained from household surveys, focus group discussions and key informant surveys. While secondary data collected from the relevant sources of published and unpublished documents were used.

Method of analysis

The filled questionnaires were coded and entered into SPSS (version 20) and Microsoft Excel, and both descriptive and inferential statistics

were used to analyze the data for parametric and non-parametric tests. A multiple linear regression model (MLM) was used to the relationship between dependent and explanatory variables. MLM is important to see this type of relationship between dependent and independent variables especially since the dependent variable is continuous data.

RESULTS AND DISCUSSION

Socio-Economic Characteristics of the Respondent

Among the total respondents, 79% of the respondents are male household respondents whereas 21% of the respondents are from female households. Regarding the religious composition of the respondent, 98% of the respondent is Muslim and the rest of the respondent is Christian. Concerning the marital status of the respondent, 204 respondents are married followed by 7 both single and windowed, and 2 respondents were divorced. In terms of the educational status of the respondents, 53.6% of the respondents cannot read and write followed by primary school (30.5%), secondary school (10%), and College or university degree (5.9%).

The respondents have a mean family size of 6. In terms of the land size, the mean is 0.54ha with a maximum of 2.7ha and a minimum of 0.07. Regarding respondent age, the highest is 69, and the lowest is 22 with a mean of 42 (Table 1).

Table 1. Socio-Economic Characters of Respondent

socio-economic character	N	Min.	Max.	Mean	Std. dev
Age	220	22	69	42.45	10.05
Family size	220	1	12	6	2.51
Land size (ha)	220	0.07	2.7	0.54	0.40

Source: authors' survey

Ecosystem Service and Perception

The respondents ranked the first irrigation as a service provided by the wetland followed by livestock drinking (100), domestic use (9), drinking water (9), and the least taken by raising seedlings (1). Regarding cultural service, the first rank is recreation, cultural service followed by religion, education, and ecotourism respectively celebration and holiday time. In the regulator purpose, erosion control service the one ranked first followed by water purification, sediment retention, and temperature regulation.

In a country like Ethiopia, people's livelihoods are dependent on the utilization of natural resources. Among the different types of natural resources that exist in the country, wetland is one of them. Wetland provides various benefits (De Groot et al., 2002; Verhoeven et al., 2006; Zedler and Kercher, 2005)such as flood protection, water quality enhancement, freshwater, fisheries, food chain support; and various socio-economic (Siew et al., 2015). Recognizing and identifying this wetland function and services is important in reclaiming the wetland ecosystem (Verhoeven and Setter, 2010).

Economic Importance of Lakes

Income generated by the local people comes from farming activities, especially *Catha edulis* (khat) farming irrigation is the main source of income additionally, selling grass (locally called Chefie) is the main source of income. Khat farming especially with small-hold farms intercropped with Maize and Sorghum is the main livelihood source. The respondent's mean annual income varies between lakes and Lake Langie is 53358.66 birr, whereas the mean annual income in Lake Adele is 50505.21 birr (Table 2). The mean annual income of Lake Adele is less than Lake Langie. This annual income difference is not statistically significant. The major identified benefit provided for the local people is irrigation and income generated from this is the main source of income in the study area. A similar finding indicates that framing with irrigation is the main source of livelihood in the wetland area (Moges et al., 2018). Khat intercropped with major crops like sorghum and maize, and it indicates that the wetland existing in the area supports agricultural activity (McCartney and Houghton-Carr, 2009). It also serves as the main source of income for the local community.

Table 2. Income generated from wetland.

Wetland name	N	Mean	Std. Deviation	Minimum	Maximum
Adele	115	50505.21	49604.68	5000	300000
Langie	105	53358.66	49107.62	4500	255000
Total	220	51867.09	49276.05	4500	300000

Source: authors' survey

As shown in Table (3), the determining factor for the income generated from the wetland is the respondent land size and the distance between the wetland and farmland. Other factors like gender, age, marital status, number of years the respondent stayed in the area, level of education, and family size don't have significant factors in income generation from the wetland. The income generated from this wetland is dependent on the distance between the farmland and the respondent farmland size. When the farmer's farmland is far away from the wetland it is difficult to cultivate in the irrigation system due to the income generated from this wetland decreasing. Another important factor in determining the income generated from the wetland is household farm size, when the respondent farmland size increased the income generated from this land also increased. Although the income generated from this wetland increases, the income gain comes from the wetland in the expanse of the wetland, and most of the farmers in the study area exploit the boundary of the wetland. This activity compromises the sustainability and existence of the lake. This is the most common phenomenon in the lake of Harerghe, where the farmer's land holding is small and has high population growth (Alemayehu et al., 2006). The study in the Zeway and Hawassa lakes indicates small and mechanized farming activity affects the respective wetlands (Getnet et al., 2014).

Table 3. Determining Factor Income Generated from Wetland

Model variable	Standardized Coefficients Beta	t	Sig.
Gender of respondent	-0.036	-0.568	0.571
Age of respondent	0.029	0.299	0.765
Marital status	0.004	0.06	0.952
Number of years the respondent stayed in the area	0.118	1.179	0.24
Level of Education	-0.033	-0.493	0.623
Family Size	-0.052	-0.743	0.458
Distance between Farm plot and Wetland	-0.178	-2.962	0.003
Land size	0.413	6.277	0

Source: authors' survey

Status of the Lakes in the Past 20 Years

The respondent was asked to compare the status of the lakes in the past 20 years, 53.2% of the respondents mentioned that the lakes are highly degraded followed by less degraded 33.9% and 12.9% in good condition (Table 4).

Table 4. Status of the Lake in the Past 20 Years

Status of the lake in the past 20 years	Frequency	Percentage
Highly degraded	117	53.2
Less degraded	75	33.9
In good condition	28	12.9

Source: authors' survey

Most of the respondent perceived that agricultural expansion (56%) is the major triggering factor for the land use change in the wetland the next triggering factor is population pressure (21%), sedimentation (8%), deforestation (7%), overgrazing (4%), and poor law enforcement and regulation (4%) (Table 5).

Table 5. Triggering Factor for Land Use Change

Triggering factor for land use change	Frequency	Percentage
Agricultural expansion	123	56
Sedimentation	18	8
Overgrazing	9	4
Deforestation	15	7
Population increase	46	21
Poor enforcement of law and regulation	9	4

Source: authors' survey

The study area is the most populated in the Oromia region Alemayehu et al. (2006) this population growth coupled with the shortage of land aggravated the degradation of the wetland in the area. This agricultural activity uses an excessive amount of water through irrigation systems which use lake water pumped out during the dry season. The local community recognized the wetland degradation and in the past 20 years, the wetland has been highly degraded. A study by Geheb and Abebe (2003) also indicates that improper extraction of wetland resources threatens the existence and health of the ecosystem. The main cause of the degradation of this ecosystem is agricultural expansion. Due to a shortage of farmland in eastern Harerghe, the wetland existed in the area exposed to this farming land expansion. This wetland is subjected to intensive irrigation as well and due to this the water level of the lake drops drastically during the dry season (Jiang et al., 2020; King et al., 2015; Niu and Dudgeon, 2011; Zou et al., 2018). A similar study indicates that agricultural expansion and khat framing contributed to the decline of water resources in the wetland (Eneyew and Assefa, 2021; Niu and Dudgeon, 2011). Additional it leads to reduction of wetland biodiversity (Ketema et al., 2020; Seki et al., 2018).

Conservation and Local People's Perception

Of the total respondents, 92.3% of the respondents are willing to participate in the conservation of the lake whereas the rest 7.7% of the respondents weren't willing. The respondents suggested soil and water conservation (70%), followed by planting a tree (19.1%) and protecting the boundary of the lake (10.9). Regarding the involvement of the stakeholders in the conservation activity of the lake, the respondents perceived the local people (48%) as the most effective in the conservation and rehabilitation of the lake of the total respondents. On the other hand, 35% of the respondents noticed that the involvement of all stakeholders is essential in the conservation of the lake, whereas 18% of the respondents indicated the sole responsibility of the conservation is the government.

CONCLUSION

The wetland that existed in the country provided an enormous amount of socio-economic benefit for the people living around this area. Even though the ecosystem provides these benefits, they face risks from overexploitation of human activity and degradation from natural causes. The wetland in the study area supports household income most of the income generated in the study area is from irrigation activity. The most determining factor for the income generated from this wetland is the respondent farm size and distance between the wetland and farm area. Most of the respondents perceived that the wetland that existed in the study area is highly degraded and the majority cause for this is the agricultural expansion and population pressure. Many respondents are interested in participating in conservation activity and the recommended activity to tackle this degradation is soil and water conservation and tree planting activity.

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