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Impact of Water Availability and Conservation Trends on Livestock and Community Mobilization: In Case of Yabello, Southern, Ethiopia

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ABSTRACT

The Yabello range land in southern Ethiopia is the main rangeland site in Ethiopia and this rangeland highly characterized by a lack of rivers or other open surface water. Those resulted to frequent mobilization of livestock and the local community. This paper focus on assessing the impact of Water availability and conservation trends on livestock and community mobilization. The data were collected from three kebele of Yabello district (Dida Tuyura, Danbal-Waccu and Arero) selected purposefully. PRA, Field survey method, semi-structured questionnaires were applied to 40 community representative in each of the selected kebele in total of 120 community representatives were interviewed that supported by direct observation and informal discussion to understand the availability and conservation trends of water and its impact on the life style of the community. And the type of water source, trends of use, watering methods of livestock, management practice in the community, the introduction other methods for water harvesting techniques its benefit and limitation as compared to the past decade practices were assessed. This research data also reveals that the integration of scientific technologies, policies and community indigenous knowledge in order to sustain the solution to scarcity of water and its impact on the local community is vital issue for Yabello area.

***Keywords:** Water resource, Community, Livestock, mobilization, Indigenous knowledge*

INTRODUCTION

From the total of earths land surface more than 65% is fall under the category of dry land (arid and semi- arid areas) and more than 12.5 % of this dry land host the land which is a base for livestock production called rangeland [7] and mostly the southern part of Ethiopia (Borana) serves for pastoral and agro-pastoral activates to support people's daily activity and livelihood [5]. In Southern Ethiopia most of the total land area covered by grassland or savanna ecosystem [8]. Rangeland is a type of land found predominantly in arid and semi-arid regions that is managed as a natural ecosystem supporting indigenous vegetation, grasses, and grass like plants, forbs or shrubs. Those area highly characterized by low human population density and highly variable or uncertain rainfall as compared to other part of the country. And in the pastoral area grazing biomass is entirely determined by the amount, pattern and timing of rainfall (water availability). Most areas of the Yabello rangelands are characterized by a lack of rivers or other open surface water. Hoping to improve the living conditions of the Pastoralists, the Ethiopian government constructed many ponds in the Yabello lowlands since the 1960s.This concern is due to the fact that these areas experience sever recurrent drought and thus having a dreadful negative effect on environment, people and livestock [9]. These constructed bonds serves as for livestock and people drinking, and also forage production purpose, but it leads to overgrazing .Yabello pastoral area has been changed over last three decades and recently drawing concern about its sustainability due to its recurrent drought, loss of key grazing lands and water resource, inadequate infrastructure development as well as massive death of cattle followed by restocking and destocking are the major issue [9]. The frequent occurrence of drought in Yabello rangeland area resulted in diminished both

quality and quantity of local water and forage resource. This followed negative impact and severity problem on livestock production as well as livelihood of pastoral community of the area. In addition to its positive efforts, rangeland degradation is widespread around watering point, computation and conflict over water by a growing population with computing demands is a common problem [3]. [6] discussed that interactions between animals and water points lead to the development of distinct ecological units, called piosphere. These piospheres are at immediate vicinities of livestock watering points and, therefore, are areas of high use. Yabello rangeland area characterized by a general scarcity of surface water and more than 46 ponds were constructed by southern rangeland development unit (SRDU) and CARE Ethiopia. However, some of the ponds are in sufficient because water is lost due to high infiltration or siltation. In general, there are data that told as the general water characteristics of Yabello range land but there is no any documented data that shows how water availability impact on both livestock and pastoralist mobilization as well as its impact on rangeland degradation. Therefore, the objective of this study was to evaluate the impact of water availability and management practice on 1). Livestock stability and productivity, 2). Community mobilization and 3). As well as to assess the current status of both traditional and modern water source pondsexisting situation.

Materials and Methods

Description of the Study Area

The study was done at Dida Tuyura, Danbal-Waccu and Arero kebele of Yabello district Borana zone, southern Ethiopia in 2018. It is situated at 566 km south of Addis Ababa along Addis – Moyale road. The area of Yabello town is 5426 km^2, and located between 4°30′55.81″and 5°24′36.39″ north latitude and between 7°44′14.70″and 38°36′05.35″ east longitude, the altitude is about 1000-1500 m, maximum altitude of 2000 m.

The rainfall of the area is characterized as bi-modal. Which is the 73% of rainfall occur in March to May, the 27% of rainfall occur in September to November [4]. The potential evapotranspiration is 700-3 000 mm [2]. The study area also dominated by savannah vegetation containing mixtures of perennial herbaceous vegetation. It is also confronted with the problem of bush expansion in the native savannah grass lands. Besides the area characterized by savanna grass land.

Methods Data Collection

Three kebeles has been chosen to carry out this research through purposive selection techniques based on the information gathered from different aspect with regards to very serious impact of water resource both on the livestock and the community. Customary institution also included to gather the required information.

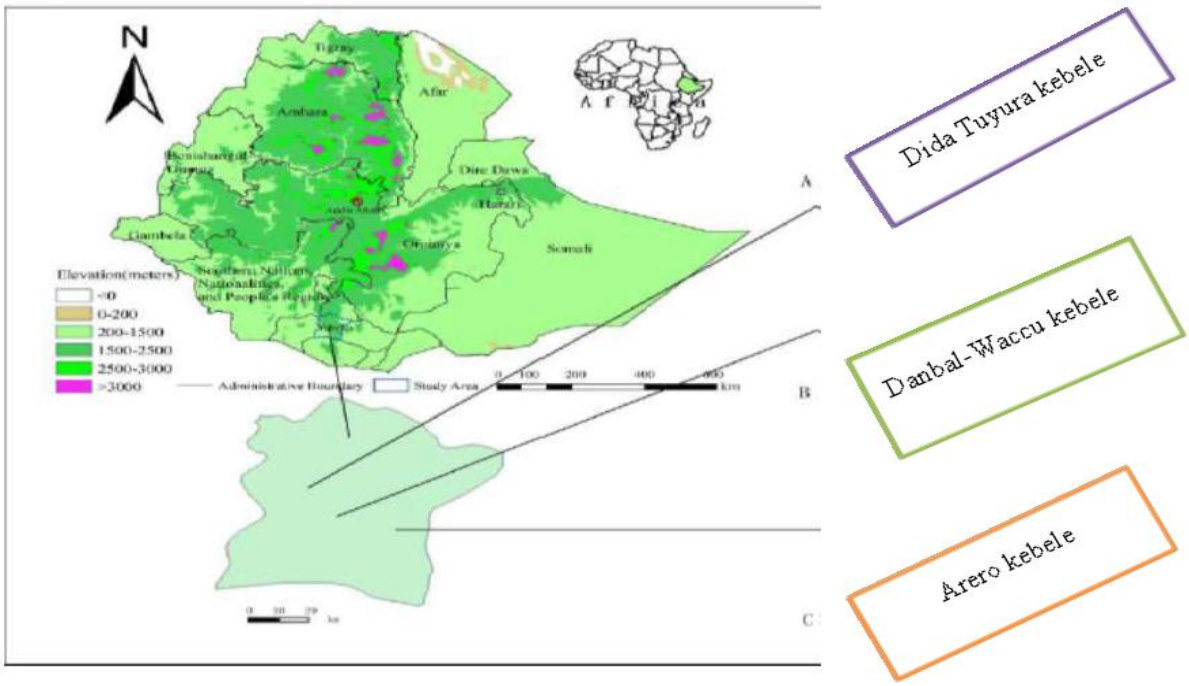


Figure1. *Geographical location of study areas.*

Data Collection, Sampling Procedure and Data Management

PRA and semi- structured interview has been conducted to gather information. And also focal group discussion was held with key informants and different water management bodies at each kebele level. The basic issues addressed in the questionnaires include community knowledge about water use, watering frequency, duration of water availability for use, critical period of water shortage, its proximity and side impact of watering point. Data of functional both natural and manmade water source were collected to make comparison. Amount of water loss due to watering efficiency also considered. Labor availability at different season was assessed. Pastoralist views about water resource depletion were also captured. Information that obtained from GIS (geographical information system) and GPS (geographical position system) software used to collect and mapping watering point. Totally 120 respondents, 40 people from three (3) kebeles have been interviewed for the assessment. The ages of respondents were older than 25 years in order to ascertain the efficiency of their experience with impact of water resource on the study area

Figure2. *Interview and group discussion with the local community of Yabello pastoralists together with stake holders*

Data Analysis

The data were managed using computer Excel software program while computer based data coding, storage and retrieval mechanism was implemented. Both quantitative and qualitative statistical analysis was done using SPSS (statistical package for social science) software.

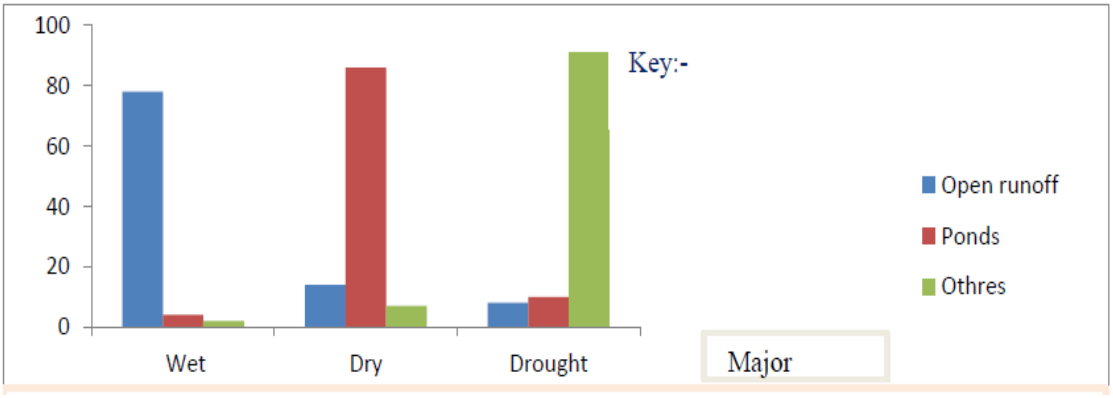
Result and Discussion

List and Trends of Water Source

The drainage system of the area is located within the Genale - Dawa river basin and its ground water level is deep and there is no perennial river in the area. Based on the respondents data source and filed observation data open surface water which includes runoff/flood water, ponds and micro dams and ground water like boreholes, shallow wells, motor pumps and also Tula wells are the major water sources in the study area that serves as both for domestic use and livestock consumption depending up on the season. According to the data obtained from the respondents greater than 78% runoff/floodwater sources are utilized during wet season, while more than 86% ponds are utilized during dry season and also more than 91% of other water sources are utilized during drought occurrence on the area that described below in graph (1). This assessment data almost in line with [11]. Runoff/ flood water and small family ponds are temporary water sources collected around the village during rainy season and local called ‘ Hara’ by the Yabello community. And also ‘Haro’ is the term that represents small ponds that used during the normal dry period.

On the other hand majority of the respondents indicated that ground water source such as boreholes and shallow wells are highly preferable for livestock watering as a result of its high salinity content and this used for to improve the livestock body condition. In the

area majority of water source are communal except some of small ponds that developed by privately. During water source development all the activity and material contribution was covered by their labor, as the data obtained from the respondents indicate.



Major Determinant Factors for Watering Livestock and its Mobilization

Accessibility of water, pasture and season are the major determinant factors for livestock mobilization distance from home. The availability of water is highly depends on season type. That means during wet, normal dry and drought season accessibility of water is almost less than 1km, 8-10km and almost beyond 27km respectively based on the data obtained from the local respondents that shows in table (1).

Table1. *Respondents view on water availability at different season*

No.	Estimated distance that water source will be available(KM)	Data obtained from respondents for each season (%)		
		Wet	Normal dry	Drought
1.	<1	97	9	-
2.	6-10	3	88	6
3.	≥20	-	3	94

The long distance mobility of both livestock as well as the pastoralist in order to feed the livestock both water and pasture during drought season locally termed as "Furaa" where movement was done based on information of weather, availability of water and pasture, livestock disease and also the security issue .This data is in agreement with [10]. Traveling hours both the livestock and the community also depends on the season. According to table (2) traveling time in wet season is less than 1hr (72% of the respondents), at normal dry season it ranges from 2-3hr (84% of respondents) and during drought season it takes from 7-11hr (69% of respondents). But the community also indicated that watering of weak animals, calves and lactating cows during both normal dry and drought season is performed at home by fetching water using human back and animals like donkey and camel from far distance.

Table2. *Estimated traveling hour for watering livestock at different season*

No.	Estimated traveling time(hr.)	Data obtained from respondents for each season (%)		
		Wet	Normal dry	Drought
1.	<1	72	28	-
2.	2-3	10	84	6
3.	7-11	2	29	69

When we compared the watering frequency of livestock in the last three decades (30 years) ago it also depend on the season. That means, in wet season watering of livestock was done daily as a result of less amount of livestock number and also availability of water is high with in short distance form settlement area as indicated by 81% of the respondents. In normal dry season livestock watering is performed with one- two day interval according to 79% of respondents. While at drought season watering frequency it ranges to three and more days listed by 69% of respondents. But when we see the current situation for wet season watering of livestock takes place from one-two day's interval. This is because of increasing of livestock number and due to less availability of water sources (87% of respondents), in normal dry season three- five

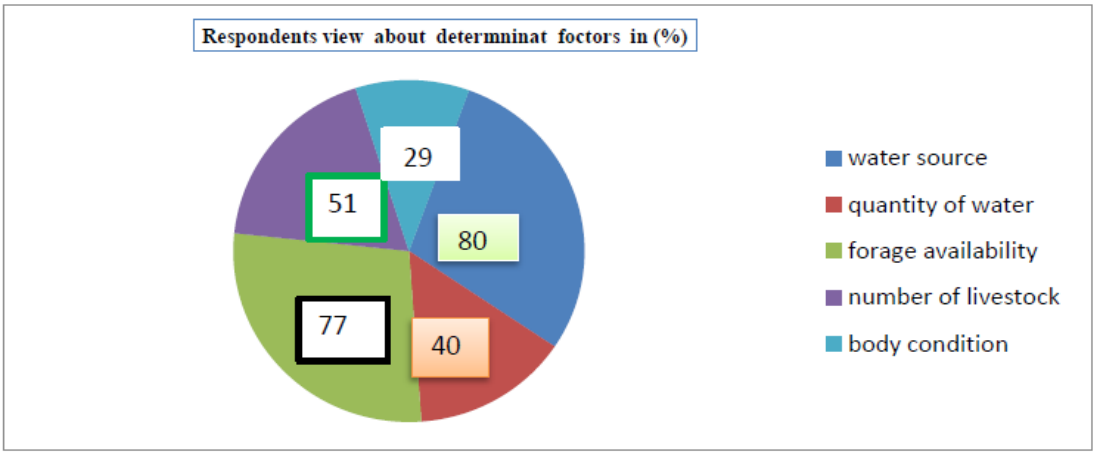
days interval and in drought season almost it ranges six days interval livestock watering performed that indicated in table(3) below. This is due to the case that far distance between watering point and pastoralist settlement. This data is in agreement with the data done by [11]. In general as we can understand from the respondents the watering frequency of each animal type also varies.

Table3. *Comparison of watering frequency of livestock for the last three decades and currently.*

Type of livestock	Watering frequency in the past 30 years(days)						Current watering frequency(days)					
	WS	R (%)	NDS	R (%)	DS	R (%)	WS	R (%)	NDS	R (%)	DS	R (%)
Cattle	daily	81	1-2	79	≥3	69	1-2	87	3-5	66	~6	88
Sheep and Goat	1-2	52	3-4	72	4-5	67	2	64	4-5	57	7-8	60
Donkey	2	77	4-5	76	≥10	59	2-3	81	7-9	63	12-15	78
Camel	-	56	1	51	12-14	69	-	75	≥15	65	27-20	81

Note: ***WS****= wet season,* ***R (%)*** *= respondents in %,* ***NDS****= Normal dry season,* ***DS****= Drought season*

And also livestock watering frequency also highly related with pasture availability in the rangeland area. That means, the more pasture available means the more will be resistant for watering of livestock. For instance, resistance variation in watering duration between the past and the current livestock is that in the past livestock has the more chance to access enough pasture which makes them more resistance for water requirement than the current livestock. According to the data that we obtained from the local community, the Yabello livestock breeds are highly resistance for long watering frequency as compared to other area livestock. In general the distance of water source, quantity of water from the source, forage availability, number of livestock as well as body condition of the livestock is the major determinant factor for watering frequency and also mobilization of both livestock and pastoralists in the Yabello rangeland.



Graph2. *Respondents view about the major determinant factor for watering frequency of livestock*

Water Resource Conservation Trends in Yabello Area

In the Yabello area conservation of water resource managing using its costmary institute. This customary practice is manly governed by '*Abba Gada'* that governs and enforced the access and use of communal water and pasture. Even the newly elected body revised the existing tenure, management system based on the social and political affair of the area. The local households abided by this customary law how to keep it and watering animals as ordered by the traditional water resource administrator, locally called '*abba herregaa'* that was assigned by the *Gada* council as routine practice. The water sources that are found in the area are subject to set of restrictions, rules and regulations that are applicable and enforced by the local agent that is called '*abba herregaa'* under surveillance of the elders. Failure to application of this law will lead to exclusion from the social life of the community and his is the major method of the community that used for controlling the water source in Yabello area. Some of the community members initiated and are in the process of constructing underground cisterns to further improve the water availability for the area.

Figure3. *Underground construction of the water cistern by some of the community at Yabello*

Challenges of Conservation in the Study Area

Even though, lack of proper land use planning practices by planners and lack of resource to effectively maintain and manage water resource by the local government are some of the negative impact on traditional managing system. Even if majority of the respondents agreed that management of water source developed by the external bodies had to be by the whole community, those problems resulted in discrimination water resource management by the community. Lack of proper land using that resulted overgrazing around the water source, aggravation of soil and incidence of human and livestock disease are also major challenge. And also in case of absence of rules and regulation, free access of both water and forage created a room for in agreement between the communities. The huge ponds that constructed during dry season in the grazing area, leads to shift the dry season grazing land to wet season which resulted in shortage of feed at dry season. This current information is in lined with [4]. The accessibility of the water resource is gained and maintained by through the participation of the local council. As a result upkeep, control, utilization and maintenance of those areas of water source are the daily concern for all Yabello communities. Although, the decision on tenure arrangements and also rangeland management primary involves male-dominated governing council lead by elder's women also participating on erasure it [1].

The trends of surface water point quality in Yabello area become decline and more siltation from time to time due to loss of vegetation cover, degradation of land and expansion of agriculture according to the data obtained from the respondents. Constriction of micro-dams and small ponds are the common practice used to increase the volume of water harvest and quality of water during the dry season. However, lack of materials/ tools and high labor consumption nature of the activities was the major problem of desilting surface water.

Livestock and Community Mobilization for Water Resource and Following Impact

In general the Yabello rangeland is characterized with no Perennial River, recurrent drought, irregular rainfall pattern and infested by invasive plant species. Informants of this assessment pointed out that currently most the pastoralist did not have enough water both for livestock and domestic watering purpose. So in order to solve this critical shortage of water, mobility is the only immediate solution taken especially for livestock watering during dry and drought season in the area. Since cattle is the most sensitive animal for watering frequency, mobility for water accounts takes at first degree, but if the situation is become more harsh all of the livestock migrates to the place where water and pasture are relatively available. This makes the local community doesn't have permanent settlement area and stable way of life as well as following high economic impact while the move from place to place. The increasing loss of suitable pasture and water has significantly decreased the milk and meat production in each pastoralist household in the pastoral areas of Yabello zone. However, most pastoralists do not credit the feeding practices as part of their production application, which results in deterioration of milk and meat production for household benefit. The shortage of milk and meat is valued socially and economically as

milk is an essential food source in pastoralist communities. Yabello pastoralists use milk for respected cultural ceremonies and as a staple food, particularly for children and mothers. And also both the livestock and community health issue also faced to a great concern. During their mobility the access of resource with the local people is almost equal since it depends up on equal participation of its conservation.

Figure4. *Bake pond water source in Yabello*

Figure5. *Impact of watering point for rangeland degradation*

CONCLUSION

Generally, much effort has been made to develop water accessibility, Yabello rangeland is an area with chronic water shortage. In the study area runoff/ flood water, micro dams, ground water, ponds, Tula wells and others are major water source even if not supported the need of the pastoralists. Season is the major determinant factor in the study area for traveling distance and time taken in order to search the water source both in local people and the livestock which is high and very high during dry and drought season. When we see the watering frequency of livestock in the past three decades and currently the demands is highly become increasing without the supply of the resource. That means, the frequency of watering livestock has been increased due to recurrent drought that results in diminishing the grazing and water source in the region. Local institute of Yabello pastoralists has very sophisticated means of crucial resource management such as pasture and water foe more than a century. That customary institute builds by the local community interest that has its own laws, rules and regulations that are overseen and revised by governing council headed by elders, but currently it is less applicable due to different factors. Among the factors that cause mobilization of the current livestock and community are population growths, massive immigration, political marginalization, land privatization, dynamic land conversion to cultivated land, ignorance of indigenous knowledge by planners during developmental activates and lack of sufficient resource to effectively maintain and mange water resource are some of the listed evidence. So any management intervention measurement should be consider local knowledge with the scientific ones and policy makers should be interacted for its implementation for sustainable management of the rangelands and in order to reduce mobilization of the community and livestock as well as following economic impact.

RECOMMENDATIONS

Base on the data obtained from this result, the following basic recommendation were forwarded.

- Supporting local customary institution, appropriate planning of management activates by incorporating local knowledge, technical, scientific and customary practice for both water and pastures conservation and minimizes mobilization.
- Appropriate water harvesting technologies, which is easily adaptable by the community by accommodate the local knowledge and create ownership by the pastoralist of the region.
- Introduction of participatory natural resource management practices for water development is crucial.

AUTHOR CONTRIBUTIONS

Available data collection, writing up and gap assessment was done by Yeneayehu Fentehun while grammar edition as well as some necessary thing that had been included were performed by Professor XU-Xinwen and Dr.Wang Yong-dong.

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CONFLICTS OF INTEREST

The authors declare that there is no competing of interest.

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