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Indigenous Knowledge Assessment on Irrigation Water Management Practices in Metekel Zone, North West Ethiopian

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Abstract: Farmers in indigenous knowledge practices are not much considered in terms of irrigation water management in Metekel zone. The study was conducted in different districts of Metekel zone, North Western Ethiopia in order to identify local irrigation water management related knowledge and practices of the farmers, to identify the best indigenous irrigation water management of the area, to assess the farmers perception and subjective assessment towards irrigation water management practice in their area, to identify the current irrigation water management practice under small scale farmers condition. The survey was made on 115HHs. Using the proper statistical techniques, the acquired qualitative and quantitative data from primary and secondary sources was evaluated. (statistical package for social science). Farmers in the study area explained their own indigenous irrigation water management knowledge when they irrigate their irrigation farm and when water is scarce. Among this knowledge of farmers avoid over irrigation (19.13%) making pond on the land (6.09%), irrigated during night (5.22%), making furrow (2.61%), apply mulch (1.17%), and only removing weed when irrigation water is scarce (0.87%). 99.1% of farmers used river water source and the remaining 0.9% used spring and well. 6.96% of farmers select maize to grow when water is scarce, 27.83% did not specify crops but for 51.3% of farmers shortage of water was not the problem. From the result conclusion can make that most of farmers have indigenous knowledge on irrigation water management even if shortage of water is not a series problem in the area.

Keywords: Indigenous, Indigenous, Water Management, Farmers, Metekel Zone

1. Introduction

More than 55% of Ethiopia's irrigated land is covered by small-scale and traditional irrigation methods [2].

Indigenous knowledge is the unique knowledge confined to a particular culture or society. This knowledge is generated and transmitted by communities, over time, in an effort to cope with their own agro-ecological and socio-economic environments [6]. Indigenous knowledge is the basis for local level decision-making in food security, human and animal health, education, natural resource management and other vital economic and social activities.

Traditional knowledge is a cumulative body of knowledge, know-how, practices and representations maintained and developed by peoples with extended histories of interaction with the natural environment [7].

Indigenous knowledge is defined as the understanding of the interaction between living things and their environment that has been passed down culturally through the generations [4].

Assessing about indigenous knowledge help for researchers and other farmers in different regions who encounter water scarcity [15].

When we plan a project or a program for a particular community, the starting point should be the indigenous practices and thoughts on life. The primary driver of traditional water management is water shortage and need for survival [5].

Appropriate institutional support should be provided to smallholder irrigators to improve the overall performance of traditional irrigation schemes [9].

The Oromia, Afar, SNNPR, Amhara, and Somali regions are home to the majority of the country's large (>300 ha) and medium (200–300 ha) irrigation systems [14].

By making the best use of water resources, they were designed to preserve food security, sustain agricultural raw material supplies for home businesses and factories, and enhance foreign incomes [10].

Water Resources Management is the process of planning, developing, and managing water resources, in terms of both water quantity and quality, across all water uses. It consists of the organizations, facilities, financial aid programs, and information systems that support and direct water management.

Farmers in Metekel zone manage irrigation water using traditional knowledge. Furthermore, from the perspective of extension, farmers more readily grasped and accepted indigenous knowledge than other technical recommendations.

However, the potential of such knowledge should also be advanced with technical recommendations. And should understand in terms of irrigation water management in Metekel zone.

Therefore, this study was carried out based on the goal of identifying the indigenous expertise of irrigation water management and recommends the best indigenous knowledge which could be recommended for the farmers in the area.

The objectives are:

1. To assess the farmers perception and subjective assessment towards irrigation water management practice in their area.
2. To identify the best indigenous irrigation water management.
3. To identify the current irrigation water management practice under small scale farmers' condition.
4. To assess the technical performance.

2. Materials and Methods

2.1. Description of the Study Area

The study was conducted at different districts of Metekel zone where smallholder farmers practice traditional irrigation activities. Metekel zone is the largest zone of Benishangul Gumuz Regional State, North-West of Ethiopia. It covers an area of 3,387,817 hectares consisting of seven districts: Pawe, Manbuk, Bullen, Wembera, Dibate, Mandura, and Guba, Woredas.

The annual rainfall of the area is 900-1580mm and the topography of the zone have varying altitudes from 600- 2800 m.a.s.l. and. About 80% of the study area is characterized by a sub-humid and humid tropical climate [13]. The surrounding of Metekel Zone has a wide climatic range within hot to warm moist lowlands and hot to warm -sub-humid lowlands agro ecological zones. Farmers practice a mixed crop-livestock production system. Cereals (sorghum, maize and finger millet) and oilseeds (sesame, soybean, and groundnut) are the most important food grains mainly cultivated in the zone [1].

The soil type of the study area is characterized by heavy clay soil with total available soil moisture level range 222-259 (mm/meter depth) and initial available soil moisture depletion level range 111-129 (mm/meter depth) varying with soil depth. The mean infiltration rate of the soil is 70 mm/day and the bulk density is varying from 1.12-1.31gm/cm^3 across the depth of 1.2 meter. The annual maximum and minimum temperature of the study area is 35°C and 20°C respectively [3].

Agricultural activities in the zone dominated by mixed crop-livestock production, which accounts 96.2% of the farmers and the rest 3.8%, were involved only in livestock production [13].

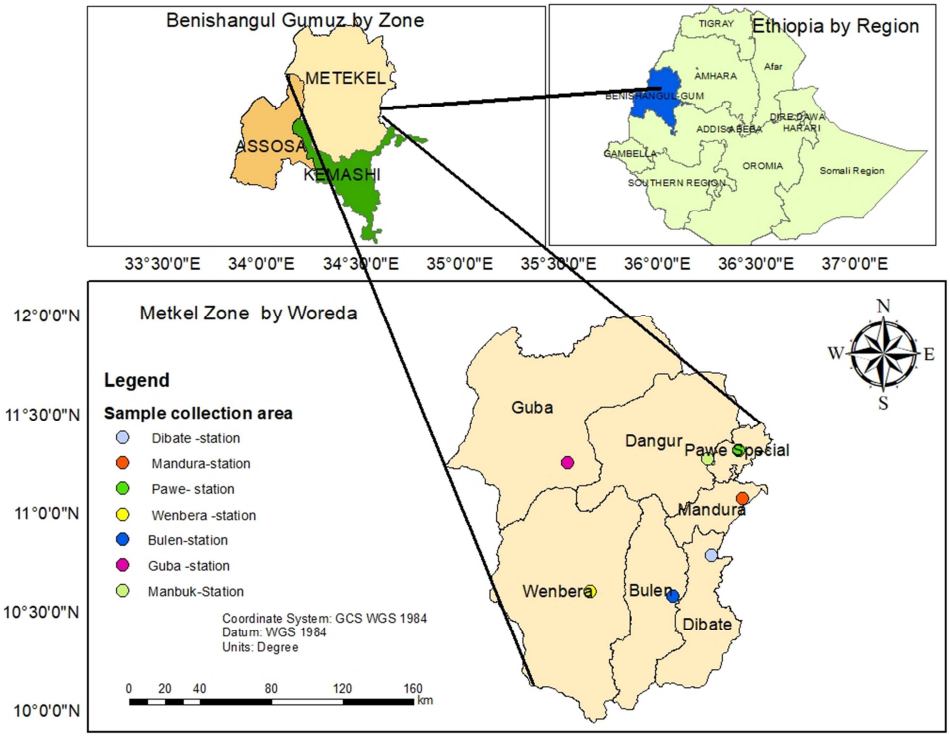

Figure 1. *Location map of the study area.*

2.2. Data Collection

Appropriate semi-structured survey questioner was prepared. The assessment has included survey questioner interview for different users including all level of community and with gender inclusion using stratified random sampling technique.

Total number of households to be interview and number of areas were based on the local condition. However, it was large enough to meet the minimum for survey study. Key informant including Woreda irrigation experts, development agents.

2.3. Data Analysis

The collected qualitative and quantitative data both from primary and secondary sources have been analyzed using appropriated statistical methods (SPSS).

3. Results and Discussion

To identify the current and the best indigenous irrigation water management practices under small scale farmer's condition of Metekel zone both primary and secondary data were used for the analysis.

Table 1. *Marital status of Household head.*

		Percent
Valid	Married	92.2
	Divorced	5.2
	Single	0.9
	Widowed	1.7
	Total	100

**Most of the interviewed farmers were married (92.2%) and only 0.9% of interviewed farmers were single.

Table 2. *Educational level of Household head.*

		Percent
Valid	Illiterate	39.1
	Read and write	60.9
	Total	100

**Most of the interviewed farmers (60.9%) can Read and write. only 39.1% of interviewed farmers were illiterate.

Table 3. *Main Occupation of household head.*

	Occupation	Percent
Valid	Farmer	90.4
	Labour	9.6
	Total	100

**90.4% of farmers live using farming system and 9.6% of farmers live by daily labor work.

Table 4. *The source of water for irrigation.*

		Percent
Valid	River	99.1
	Spring	0.9
	Total	100

**As shown in table 4, most of (99.1%) of source of water for irrigation derived from river. The survey result in West Showa Woreda showed that almost all sources of irrigation water are rivers [12].

Table 5. *The farmer's indigenous knowledge for when irrigation water is scarce.*

water storage mechanism	Observation	Percent
Avoid over irrigation and blocked the river	22	19.13
Making pond on the land	7	6.09
Making furrow	3	2.61
Removing weed	1	0.87
Irrigated during night and well watering	6	5.22
Mulching	2	1.74
No water storage	74	64.35
Total	115	

As in table 5, 19.13% of the farmers used avoiding over irrigation technique to save and manage their irrigation water. But for most of the farmers (64.35%) water shortage was not there problems. Farmers in Metekel zone have developed several indigenous knowledge of irrigation water management practices depending on the situation.

Different traditional water technologies and management practices have been used in various parts of the world, and the practices vary depending on the local circumstances [5].

Table 6. *Equipment you used for irrigation water delivery and management.*

	Observation	Percent
Machineries	5	4.3
Pump	35	30.4
Not Equipment Used	75	65.2
Total	115	100

Only 30% of farmers used pump and 65.2% of farmers used gravitational water diversion system to irrigate their crops.

Table 7. *Crops used when water is scarce.*

Types of crops	Observation	percent
Maize	8	6.96
Onion	2	1.74
Paper	7	6.09
Mango	3	2.61
tomato	3	2.61
Sugarcane	1	0.87
Did not specify crops	32	27.83
No shortage of water	59	51.3
Total	115	100

From table 7, maize was prioritized crops when irrigation water was scarced. Farmers use drought tolerance crops for adaptation to climate change [8].

Table 8. *Perception on amount of water that has greater contribution for maximizing yield.*

	Observation	Percent
Applying large volume of water	4	3.5
Applying small amount of water	1	0.9
Applying medium amount of water	106	92.2
Applying large volume of water and medium amount of water	4	3.5
Total	115	100

**Most of the farmers (92.2%) have a concept that to produced maximum crop yield a medium (optimum) amount of water needed. Farmers in in Sebeta wereda didn't measure the irrigation water amount and have their own indigenous knowledge on irrigation water management [11].

4. Conclusion

The survey result showed that farmers have developed several indigenous knowledge of irrigation water management practices, which are:

1. The irrigation water source for 99.1% of the respondent farmers used river water source.
2. 92.2% of the respondent farmers decided that applying medium amount of water for maximum crop production.
3. Most of the farmers (19.13%) avoid over irrigation and blocked the river when water is scared.
4. Even if for 27.83% of respondent did not decide their crop in water scarce area and for 51.3% shortage of water was no problem.
5. Maize was prioritized crops for 6.96% of resonance when irrigation water was scared.
6. Most of the despondence farmers 65.2% used gravitational water diversion system to irrigate their crops.
7. From the discussion, we can conclude that Strengthen farmer's indigenous irrigation water management knowledge for smallholder irrigation water user is more efficient and cost effective.
8. The study revealed that other farmers as well as researcher could learn from the wisdom and techniques.
9. The study may help the improvement of livelihood of the rural farmers of this zone.
10. These traditional knowledge based practices of this area are low cost and more profitable for farmer under water scarcity.

Conflicts of Interest

The authors declare no conflict of interest.

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