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Indigenous Knowledge Assessment on Irrigation Water Management Practices

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Abstract: Indigenous knowledge is the local or traditional knowledge system used by farmers. Therefore indigenous knowledge on irrigation water management means using of local or traditional knowledge system to manage irrigation water. This study was aimed to investigate farmers' current irrigation water management practice and their technical performance. In this study I used reconnaissance survey and observation were carried out with each implementing center and Woreda Bureau of Agriculture to obtain overview of different irrigation schemes and irrigation practice conditions. The collected qualitative and quantitative data both from primary and secondary sources were analyzed using appropriated statistical methods like SPSS. The study result showed that farmers have developed several indigenous knowledge of irrigation water management practices. Among these knowledge, most of farmers in both weredas use furrow irrigation method, farmers use soil moisture method and crop leaf wilt techniques to irrigate cropped land, Most farmers apply irrigation water at morning and night time, The respondents uses watering top ridge to determine irrigation water sufficient and watering bottom ridge and slow stream flow for irrigation water insufficient.

Keywords: Indigenous, Assessment, Irrigation Water Management

1. Introduction

Ethiopia is a country, with land coverage of 1.13 Million km^2, found in Eastern part of Africa [3]. The country is geographically located in between the latitudes 5°N and 15°N, and longitudes 35°E and 45°E [15]. Ethiopian economy is mainly depend on Agriculture [14; 11].

Irrigation is defined as the application of suitable water to crops in appropriate amount at the right time [8]. Irrigation scheduling is required for developing best irrigation water management practices for irrigated areas [2].

In Ethiopia modern irrigation scheme construction was started in the Middle Awash Valley by private investors at the beginning of 1960s. There are several types of irrigation schemes found in Ethiopia based on size of scheme can be classified as large (>300ha), and medium (200-300ha) irrigation schemes constructed in the country mainly found in Oromia, Afar, SNNPR, Amhara, and Somali regions [13]. The purposes of the construction were to maintain food security, sustainable supply of agricultural raw materials for the domestic industries and factories, and create increased foreign incomes through optimal use of water resources [12].

Agricultural production using irrigation is a major consumer of fresh water; therefore, efficient irrigation water utilization based on sound methodology is becoming more important [4]. Water management is defined as any actions that reduce the amount of water used or enable water to be used more efficiently [7]. The process by which irrigation water is controlled and used in the agricultural production is called Irrigation Water Management, IWM [6] Therefore, Irrigation water management requires determining when to irrigate and how much water to apply in each application [10].

Indigenous knowledge is can be described as knowledge and beliefs handed down through generations by cultural transmission about the relationship of living beings and their environment [5]. The farmers have been practice traditionally different agricultural activities to maximize or optimize benefits from the use of their natural, human and financial resources. Such practices may include areas of soil and water conservation, abstraction of water for irrigation, conveyance

of water, methods of application and scheduling of irrigation water to crops, choice of crops, other agronomic practices for irrigated crops, and management of the water users in making decisions to share water, maintenance of irrigation scheme, conflict resolution, etc [9].

In Ethiopia small scale and traditional irrigation accounts for more than 55% of the total irrigated land [1]. In such conditions, farmers practice irrigation water management mostly from indigenous knowledge. Moreover, farmers easily understood and accept indigenous knowledge than other technical recommendations from extension point of view. However, the potential of such knowledge is not much understood in terms of irrigation water management in different part of the country. Therefore this study will be carried out based on the objective to identify the indigenous knowledge on irrigation water management of the country and recommend the best indigenous knowledge which could be recommended for other areas and different farmers.

Objective

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

2. Methodology

The study was conducted at different part of the country in the areas where smallholder farmers practice traditional irrigation activities. A reconnaissance survey and observation was carried out with each implementing center and Woreda Bureau of Agriculture to obtain overview of different irrigation schemes and irrigation practice conditions. Secondary data was collected from documents and literatures, Bureau of Agriculture and other relevant offices like design if any.

Based on the reconnaissance survey and observation survey area was selected and appropriate semi-structured survey questioner was prepared for different schemes and community. Experts of Woreda Bureau of Agriculture could be included for the survey work especially on the fields of irrigation and extension. The assessment was include survey questioner interview for different users including all level of community and with gender inclusion using stratified random sampling technique. Moreover, it also include focus group discussion, key informant interview and transect walk for observation of indigenous knowledge on the current irrigation water management practices.

Total number of household to be interview and number of areas (schemes) were based on the local condition. However, it must be large enough to meet the minimum for survey study. Key informant including Woreda irrigation experts, development agents, water use association committee and other organization like designer if any were interviewed with semi-structured interview on information regarding institutional functioning of the scheme, water management condition, irrigation scheduling, input use, conflict resolution mechanisms and market linkage. Based on these questioner and discussions primary data was collected for this study. The collected qualitative and quantitative data both from primary and secondary sources were analyzed using appropriated statistical methods like SPSS.

3. Result and Discussion

3.1. Socio-demographic Characteristics

Table 1. *Socio-demographic characteristics by respondents per Woreda.*

Variable	Categories	Wereda	
		Sebeta	Welmera
Gender (%)	Male	94.7	65.5
	Female	5.3	34.5
Relation to house hold (%)	Head	94.7	44.8
	Spouse	5.3	55.2

Table 2. *Experience of practicing Irrigation.*

Experience of practicing Irrigation	Sebeta	Welmera
Less than 5 years (%)	52.6	34.5
5 – 10 Years (%)	26.3	20.7
10 – 20 Years (%)	15.8	27.6
20 – 50 Years	5.3	17.2

Around 100 HHs were randomly selected from two weredas of west shewa and south west shewa zones (Table 1). From sebeta wereda the respondents were around 94.7% were male and 5.3% were female and in Welmera wereda 65.5% were male and 34.5%were female. In relation to the house hold held 94.7% were male and 5.3% were female in sebeta wereda and 44.8% were male and 55.2% were female in welmera wereda.

The result in (table 2) indicate that 52.6% of farmers have less than 5 year experience of irrigation practice in sebeta wereda and around 47.4% farmers have more than 5 year experience of irrigation practice. In welmera wereda 34% of farmers have less than 5 year experience of irrigation practice and 66% farmers have more than 5 year experience of irrigation practice.

3.2. Irrigation Methods

The assessment result shown as in sebeta wereda farmers use Furrow irrigation method they don't use other methods like Basin, Flooding, Sprinkler and Drip but in Welmera Wereda Furrow irrigation and somehow Basin and Drip irrigation are used.

Table 3. *Irrigation method used.*

Irrigation Method	Sebeta	Welmera
Furrow	100	75.9
Basin	0	10.3
Flooding	0	0
Sprinkler	0	0
Drip	0	13.8

3.3. Source of Irrigation Water

According to the result (table 4) in both weredas (Welmera and Sebeta) different irrigation water sources like River, spring, Ground water and Harvested rain have been used. The canal in sebeta wereda unlined but in welmera wereda both lined and unlined canals were used (table 5).

Table 4. *Sources of irrigation water.*

Sources of Irrigation water	Sebeta	Welmera
River	57.9	72.4
Spring	5.3	10.3
Ground water	36.8	13.8
Rain water	0	3.4

Table 5. *How do you construct the canal?*

Type of construction	Sebeta	Welmera
Lined	0	31.8
Unlined	100	68.2

3.4. Techniques Used to Irrigate Cropped Land

Table 6. *What techniques use to irrigate cropped land?*

When to irrigate	Sebeta	Welmera
Soil moisture content	13.3	33.3
Crop leaf wilt	46.7	29.6
Soil crack /dryness	13.3	3.7
scheduling	26.7	18.5

Table 7. *When do you apply the water in a day.*

	Sebeta	Welmera
Morning	52.6	24.1
Mid day	5.3	31.0
Afternoon	5.3	34.5
Night	36.8	10.3

Farmers in both weredas use different indigenous knowledge to irrigate cropped land. In Sebeta wereda most farmers use crop leaf wilt technique and in Welmera wereda most farmers use soil moisture content technique. Farmers use different times in a day like morning, midday, afternoon and night.

3.5. Measuring Method

According to the respondents in both weredas they didn't measure the irrigation water amount (table 8) and most Farmers in sebeta wereda use one week irrigation interval and in welmera wereda use two week irrigation interval (table 9).

Table 8. *How do you quantify the amount of irrigation water?*

Measuring Method	Sebeta	Welmera
Area - Volume	11.1	10.7
Not measured	89.9	82.1
siphon	0	7.1

Table 9. *Irrigation Interval used for different crops.*

Irrigation Interval	Sebeta	Welmera
One week	71.4	10.7
Two week	28.6	64.3
Three week	0	3.6
Every day	0	21.4

3.6. Determination of Irrigation Water Sufficiency

The respondents in Sebeta wereda uses watering top ridge to determine irrigation water sufficient and watering bottom ridge and slow stream flow for irrigation water insufficient. Most of welmera wereda responded that watering top ridge use to determine irrigation water sufficient but similar to sebeta wereda farmers they use watering bottom ridge and slow stream flow to determine irrigation insufficient.

Table 10. *Indigenous knowledge of farmers on how to determine irrigation water sufficient.*

	Sebeta	Welmera
Watering to Top ridge	100	75
Watering to middle side of the ridge	0	25

Table 11. *Indigenous knowledge of farmers on how to determine irrigation water unsufficient.*

	Sebeta	Welmera
Watering to bottom ridge	40	30.8
Slow stream flow	60	69.2

4. Conclusion and Recommendation

The results of the assessment indicate that Farmers have their own indigenous knowledge on irrigation water management. Among these knowledge, most of farmers in both weredas (Welmera and Sebeta) use furrow irrigation method, farmers also use soil moisture method and crop leaf wilt techniques to irrigate their cropped land, Most farmers apply irrigation water at morning and night time, the respondents uses watering top ridge to determine irrigation water sufficient and watering bottom ridge and slow stream flow to determine for irrigation water insufficient. The irrigation schemes are administered and monitored by the traditional but democratically elected "water use Committee" from the irrigation water users who has implementing the traditional bylaws but served without any incentive.

To make this indigenous knowledge more effective:

1) Farmers should be assisted by government and non-governmental organizations giving training, participate in field days and demonstration, providing improved agricultural technologies and providing better access to credit.
2) Assisting the farmers to establish cooperatives for better market options, input supply and to get other benefits.
3) Assisting the farmers to establish water use association by government non-governmental organizations.
4) Water allocation and distribution systems among users should be managed by Water use association.

References

[1] Agricultural Water Management. 2010. Ethiopian situation analysis. Found at http://awm-solutions.iwmi.org/Data/Sites/3/Documents/PDF/Country_Docs/Ethiopia/Situation%20Analysis%20Brief%20Ethiopia.

[2] Ali M. H., Paul H. and M. R. Haque, 2011. Estimation of evapotranspiration using a simulation model. J. Bangladesh Agril. Univ. 9 (2): 257–266.

[3] Awulachew, S. B., Yilma, A. D., Loulseged, M., Loiskandl, W., Ayana, M., Alamirew, T., (2007), WaterResources and Irrigation Development in Ethiopia. Colombo, Sri Lanka: International Water Management Institute. 78p. (Working Paper 123).

[4] bakhshal khan lashari, khalifa qasim laghari, and atta muhammad phul, 2010. development of an irrigation scheduling model. mehran university research journal of engineering & technology, volume 29, no. 4.

[5] Berkes, F. (1993). Traditional Ecological knowledge in perspective in: Traditional Ecological Knowledge. Unesco, Canada, MAB Ottawa.

[6] Brouwer, C. and M. Heibloem (1986). "Irrigation water management: irrigation water needs." Training manual 3.

[7] Brooks, D. B. (2006). An operational definition of water demand management. Water Resource Development, 22, (4) 521–528.

[8] Food and Agriculture Organization. 2015. Yield gap analysis of field crops: Methods and case studies Rome. Italy.

[9] Hanibal Lemma, Habtamu Yesigat and Tsedalu Jember, Analytical documentation of traditional practices and farmer innovation in agricultural water management in two traditional irrigation schemes in North-west Ethiopia, Gondar Agricultural Research Center, Gondar, Ethiopia.

[10] Majumdar, D. K. (2001). Irrigation water management: principles and practice, PHI Learning Pvt. Ltd.

[11] Makombe, G.; Namara, R.; Hagos, F.; Awulachew, S. B.; Ayana, M.; Bossio, D., (2011), A comparative analysis of the technical efficiency of rain-fed and smallholder irrigation in Ethiopia. Colombo, Sri Lanka: International Water Management Institute. 37p. (IWMI Working Paper 143).

[12] MoA (Ministry of Agriculture), 2011. Natural Resources Management Directorates: Small-Scale Irrigation Situation Analysis and Capacity Needs Assessment. MoA. Addis Ababa.

[13] Tilahun, H. and Paulos, D., 2004. Results to date and future plan of research on irrigation and its impact. Workshop on Impact of Irrigation on Poverty and Environment, Workshop Proceedings, Ethiopia.

[14] World Bank, (2006), Ethiopia: Managing water resources to maximize sustainable growth. A World Bank water resources assistance strategy for Ethiopia. The World Bank Agriculture and Rural Development Department. Report No. 36000-ET. Washington, DC, USA.

[15] Yazew E. (2005), Development and management of irrigated lands in Tigray, Ethiopia. PhD thesis, UNESCOIHE Institute for Water Education, Delft, the Netherlands, 265pp.