

The Role of Indigenous Knowledge Systems in soil and water conservation at Busogo and Mukamira Sectors respectively in Musanze and Nyabihu Districts

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## INTRODUCTION

The rate of erosion and runoff processes is increasingly taking over the fertile soil layer in Rwandan land mainly in hilly areas of Nyabihu and Musanze districts resulting in:

- Loss of soil nutrients,
- Loss of properties (Infrastructure)
- Loss of lives
- Flooding







# Motivation for this study

- Despite the role modern soil and water conservation techniques, local farmers have develop indigenous strategies to cope with soil erosion and runoff challenges.
- However, the role of those indigenous strategies are not recognized by the researchers, policy makers and engineers.



# **Research Goal**

#### General objectve

#### Specific objectives

To evaluate the role of indigenous knowledge systems on soil and water conservation. Identify the type and role of indigenous soil and water conservation systems used by the farmers in the study area

Describe the challenges met by the farmers in using indigenous knowledge systems for soil and water conservation

#### Study questions

What are the type and role of indigenous soil and water conservation systems used by the farmers in the study areas?

What are the challenges met by farmers on the use of indigenous knowledge systems for soil and water conservation ?

### **Sample Size and Sampling Methods**

$$n = \frac{z^2 x \ p \ x \ q \ x \ N}{d^2 (N-1) + z^2 \ x \ p \ x \ q}$$

Where: n= sample size,

N = size of population (number of household head),

Z = coefficient normal distribution,

q = probability of failure,

d = margin error,

p = probability of success.

Then, in Busogo Sector  $n = \frac{(1.96)^2 \times 0.5 \times 0.5 \times 14471}{(0.09)^2 (14471-1)+(1.96)^2 \times 0.5 \times 0.5} = 117.9 = 118$ Mukamira Sector  $n = \frac{(1.96)^2 \times 0.5 \times 0.5 \times 28675}{(0.09)^2 (28675-1)+(1.96)^2 \times 0.5 \times 0.5} = 118.08 = 118$ The total number of samples in the two sectors was therefore set to 236 whi

The total number of samples in the two sectors was therefore set to 236, which were evenly distributed in the villages of selected sectors.

### RESULTS

# Information source for Soil and water

### conservation measures

S	MUK	AMIRA	BUS	0G0	Total	
Source of information	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1. Soil conservation						
(1) Local Leaders (e.g. farmer promoters, village leaders,)	118	100	118	100	236	100
(2) Local Government/ Agronomist	118	100	117	99.2	235	99.6
(3) Media/ <u>Umuganda</u>	113	95.8	106	89.8	219	92.8
(4) Neighboring farmers	67	56.8	57	48.3	124	52.5
(5) NGOs	37	31.4	41	38	78	33.1
(6) Other government institutions (e.g. UR, RAB,)	28	23.7	34	28.8	62	26.3
2. Agroforestry Practices						
(1) Local Government/Agronomi	98	83.1	78	66.1	176	77
(2) Media/ <u>Umuganda</u>	87	73.1	88	77	175	73
(3) Local Leaders (e.g. farmer promoters, village leaders,)	61	51.7	59	50	120	50.8
(4) Other government institutions	40	33.9	58	49.2	98	41.5
(5) NGOs	41	38	45	38.1	86	36.4



# Modern Soil and water Conservation Practices of the Study Areas

Techniques	MUKA	MIRA	BUS	OGO	TOTAL	
rechniques	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
<ol> <li>Chemical fertilizer</li> </ol>	68	57.6	63	53.4	131	55.5
2. Modem Agroforestry	52	44.1	47	39.8	99	41.9
<ol> <li>Radical Terracing</li> </ol>	20	16.9	18	15.3	38	16.1
<ol> <li>Artificial water way</li> </ol>	14	11.9	20	16.9	34	15.0
5. Modern Cut- off drain	11	9.3	11	9.3	22	9.3



# Indigenous Soil and water conservation Practices Applied by the farmers

Indigenous Soil	MUKAMIRA		BUSOGO		TOTAL			
conservation Practices	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage		
Biological Soil conservation measures								
Crop rotation	100	88.0	98	83.1	198	83.9		
Intercropping	71	60.2	65	55.1	136	57.6		
Mixed cropping	41	38.0	49	41.5	90	38.1		
Indigenous agroforestry	26	22.0	34	28.8	60	25.4		
Fallow	22	18.6	25	21.1	47	19.9		
Alley cropping	26	22.0	21	17.8	47	19.9		
Minimum Tillage	15	12.7	18	15.3	33	14.0		
Mulching	8	6.8	23	19.5	31	13.1		
Mechanical Soil conservation	on measures							
Cultivation on ridges/rows	93	78.8	88	77.0	181	76.7		
Stone bund/barrier	76	64.4	83	70.3	159	67.4		
Traditional dams/water Retention ditches	76	64.4	81	68.6	157	66.5		
Traditional cut-off drain/Drainage systems	58	49.2	44	37.3	102	43.2		
Terraces	30	25.4	22	18.6	52	22.0		
Soil fertilizer systems								
Fresh farm yard manure	73	61.9	87	73.7	160	67.8		
Compost	82	69.5	75	63.6	157	66.5		
Crop residue	48	40.7	37	31.4	85	36.0		
Green Manure	8	6.8	12	10.2	20	8.5		
Weed burning	4	3.4	6	5.0	10	3.0		





# Benefit of some indigenous practices

#### Stone Bund :

- Remove stones from field, easier to plough
- Slows runoff & traps moisture
- Stops erosion & traps nutrients



### **Ridge cultivation**

- Reduce runoff and erosion
- leaving the soil covered with residue until next planting
- Allows better water penetration into the soil



# **Factors hindering adoption of Indigenous** and Modern soil conservation measures

	MUKAMIRA		BUSOGO		TOTAL			
FACTORS	Frequency	Percen tage	Frequenc y	Percenta ge	Frequency	Percentage		
Indigenous soil conservation measures								
1. Require high labor	80	67.8	51	43.2	131	55.5		
2. Government Policy on soil conservation	38	32.2	40	33.9	78	33.1		
Modern soil conservation measures								
1. High cost	57	48.3	53	44.9	110	46.6		
2. Require high knowledge	33	28	36	30.5	69	29.2		
3. Lack of required materials	16	13.6	18	15.3	34	15		
4. High Maintenance	12	10.2	11	9.3	23	9.7		

# Effectiveness of Indigenous and Modern Measures Soil conservation measures

<b>M</b>		MUKA	AMIRA	BUSOGO		TOTAL	
Measures		Frequency	Percentages	Frequency	Percentages	Frequency	Percentages
Modern Soil							
Conservation		32	27.1	34	28.8	66	28
Indigenous Soil Conservation		36	30.5	38	32.2	74	31.4
Combination both	of	<mark>4</mark> 9	41.5	47	39.8	96	40.7
Total						236	100

## **Conclusion and Recommendation**

- Indigenous methods of SWC are long established and work well in Rwanda.
- However, their success is largely affected by political factors and intervention by developed countries, NGO's etc.
- There is an ever increasing need for cooperation and understanding between researchers, engineers, Policy makers and local farmers etc.
- Including indigenous knowledge into research based projects can contribute to local empowerment and development and increasing self-sufficiency and ownership of the local peoples.
- There is a need of combining indigenous with modern soil conservation measures

