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Research Article

Terracing, A Better Erosion Control Measure Than Contour Farming

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Abstract

Erosion is a limitation to agricultural practices in the rainforest zones of Africa. Research shows that almost 30% of farm produce in the affected areas is lost to erosion. Common methods of erosion control methods had been discovered and practiced by modern farmers and rural farmers through the efforts of the Agricultural extension workers. Some of the erosion control methods include plating cover crops, terracing, ridging, crop rotation, contour farming and lots more.

This research work investigated the best erosion control method out of contour farming and terracing. Improved maize varieties was planted on prepared contour and terraced farmland of the same dimension of (6m x 6m) at the teaching and research farm of the department of Agricultural science, Adeyemi College of Education, Ondo, Ondo State, Nigeria. The primary growth rate of the maize plants was measured and recorded weekly from the time of germination to the time of fruiting. The number of maize seed per farmland was also taken at the end of the harvest.

The result of the experiment that took ten weeks to reach completion clearly shows that terracing is a better method of erosion control than contour farming with or without the construction of ridges.

Keywords: Maize; Harvesting Seed; Terraced Farmland

Introduction

Maize (Zea mays) is one of the cereal crops grown in most parts of Nigeria and her neigbouring Africa nations. Maize is a major source of carbohydrate in the diet of Nigerians. It is the staple food of approximately half of the human race. The current expansion of maize production in Nigeria and other countries of the world has been as a result of a steady increase in human population. Maize is consumed in many ways. It may be eaten as corn flakes, corn bread and corn cake. At times, it is eaten as roasted or cooked corn. In some Yoruba races of Nigeria, it is cooked alongside with beans and eaten as porridge. It can be dried and ground to make pap.

Maize is also an important raw material for a number of agro-allied industries. For instance, maize husk is used in making paper and cigarette wrapper and maize grain is brewed into alcoholic beverages called bears [1]. The importance of maize in livestock management cannot be overemphasized. It serves as a very essential source of about 60% carbohydrate 4% oil and 10% proteins to livestock [2].

Soil is the mixture of minerals, organic matter, gases, liquids and myriad organisms that together support plant life. Two general soil classes are top soil and subsoil. Soil is a natural body that exist as part of the biosphere that performs for important functions. It is a medium for plant growth; it is a means of water storage, supply and purification; it is a modifier of the atmosphere of Earth; and it is a habitat for organisms that take part in decomposition of organic matter and the creation of a habitat for new organisms.

Soil is considered to be the skin of the earth with interfaces between the lithosphere, hydrosphere, atmosphere of the earth and biosphere [3]. Soil consists of a solid phase minerals and organic matter as well as a porous phase that holds gases and water [4-6]. Accordingly, soils are often treated as a three state system [7].

Soil is the end product of influence of the climate, relief (elevation, orientation and slope of terrain), biotic activities (Organisms) and parent minerals (Organic minerals) interacting over time [8]. Soil continually undergoes development by way of numerous physical, chemical and biological processes which include weathering with associated erosion. One problem of the soil is erosion.

Erosion is the action of exogenic process such as waterflow or wind which remove soil and rock from one location on the earth's crust, then transport it to another location where it is deposited.

Eroded sediment may be transported just few millimeters or for thousands of kilometers [9,10].

While erosion is a natural process, human activities have increased by 10 – 40 times the rate at which erosion occurs globally. Excessive or accelerated erosion causes both 'on-site' and 'off-site' effects include sedimentation of water ways and eutrophication of water bodies as well as sediment – related damage to roads and house. Water and wind erosion are two primary causes of land degradation, combined, they are responsible for about 84% of global extent of degraded land, making excessive erosion one of the most significant environmental problems world – wild [9,10].

Intensive agriculture, deforestation, roads, anthropogenic climate change and urban sprawl are amongst the most significant human activities in regard to their effect on stimulating erosion [11]. However, there are many preventive and remediation practices that curtail or limit erosion of vulnerable soils.

Rainfall and the surface runoff which may result from rainfall, produces four main types of soil erosion: Splash erosion, sheet erosion, rill erosion and gully erosion. Splash erosion is generally seen as the first and least severe stage of soil erosion process which is followed by sheet erosion, then rill erosion and gully erosion, the most severe of the four [12,13].

In Splash erosion, the impact of falling raindrop creates a small crater in the soil [14] ejecting soil particles. The distance these soil particles travel can be as much as 0.6m (2ft) vertically and 1.5m (5ft) horizontally on level ground.

If the soil is saturated or if the rainfall rate is greater than the rate at which water can infiltrate into the soil, surface runoff occurs. If the runoff has sufficient flow of energy, it will transport loosened soil particles (sediments) down the slope [15].

Rill erosion refers to the development of small, ephemeral concentrated flow paths which function as both sediment source and sediment delivery system for erosion on hill slopes. Generally, where water erosion rates on disturbed upland areas are greatest, rills are active, flow depths in rills are typically of the order of a few centimeters (about 1inch) or less and along – channel slopes may be quite steep. This means that rills exhibit hydraulic physics very different from water flowing through the deeper, wider channels of streams and rivers [16].

Gully erosion occurs when runoff water accumulates and rapidly flows in narrow channel (stream) during or immediately after a heavy rainfall or melting snow, removing soil to considerable depth [17,18].

Wind erosion is a major geomorphological force, especially in arid and semi-arid regions. It is also a major source of land degradation, evaporation, desertification, harmful air born dust and crop damage especially after being increased far above natural rates by human activities such as deforestation, urbanization and agriculture [19,20]. Wind erosion is of two primary varieties: deflation, where the wind picks up and carries away loose particles; and abrasion where surfaces are worn down as they are struck by air born particles carried by wind. Deflation is divided into three categories: Surface creep, where larger, heavier particles slide or roll along the ground; Saltation, where particles are lifted a short height into the air; Suspension where very small and light particles are lifted into the air by wind and are often carried for long distance. Saltation is responsible for the majority (50% - 70%) of wind erosion, followed by suspension (30% – 40%) and then surface creep (5% - 25%) [9,10,21].

Wind erosion is much more severe in arid areas and during times of drought. For example, in the Great plains, it is estimated that soil loss due to wind erosion can be as much as 6,100 times greater in the drought years than in wet years [22].

Common methods of erosion control are: Cover cropping, Mulching, Chemical weeding, Contour farming and Terracing.

Contour farming is the farming practice that involves the ridge making across the slope of the land but Terracing is an engineering aspect of erosion control that involves the construction of short steps along the contours of the land with a view to preventing the rapid flow of water down the slope. Graduated terrace steps are commonly used to farm on hilly or mountainous terrain.

Terraced field both decrease erosion and surface runoff and may be used to support growing crops that require irrigation such as rice. The rice terraces of the Philippines cordilleras have been designated as a UNESCO world Heritage site because of the significance of this technique.

The objective of this study is to compare the productivity of crops grown on a contour farmland and terraced farmland of the

same area and come out with a better method of erosion control out of terracing and Contour farming system [23-31].

Materials and Methods

A piece of land was cleared and divided into two sections and labeled as Section A and B. Each of the two sections has a dimension 6m x 6m which makes up an area of 36 square meters. Forty (40) ridges were manually constructed across the slope of the land in section A, making it a contour farmland while 40 ridges were manually constructed on the short steps of the land in section B to make it a terraced farmland. Hybrid maize seeds were planted in each of the two sections at a regular spacing of 30cm x 75cm. Thinning and supplying were done in each of the sections at early stage of germination which was about 3 to 5 days after planting. Weeding was carried out regularly during the period of germination and it stopped during harvesting period. The height of the maze stands in each of the two sections was taken with the aid of measuring tape and recorded once in a week for ten weeks. At maturity, the number of maize cobs as well as the number of maize seeds produced from the two sections was determined by manual counting and recorded after harvesting and proper drying process. The yield of the two sections was thereafter compared.

Results and Discussion

The weekly average height in centimeter (cm) of maize stands is shown in table 1 and figure 1 above. The average height of maize stands planted in section A for the 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th and 10th week was determined in centimeters (cm) to be 2.39, 12.82, 23.69, 38.39, 49.86, 59.98, 68.21, 82.38, 101.28 and 117.09 respectively while the average height of maize stands planted in section B for the1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th and 10th week was determined in centimeters (cm) to be 2.71, 12.48, 23.55, 44.09, 53.35, 62.52, 71.02, 84.03, 103.59 and 118.49 respectively. The table also reveals the average height of maize stands in section A and B from the first week to the tenth week as 55.61 cm and 57.58 cm respectively. From this result, it clearly shows that section B has the maize stands with the highest height than the section A.

Week Number	Average Height of maize in Section A	Average Height of maize in Section B
Week1	2.39	2.71
Week2	12.82	12.48
Week3	23.69	23.55
Week4	38.39	44.09
Week5	49.86	53.35
Week6	59.98	62.52
Week7	68.21	71.02
Week8	82.38	84.03
Week9	101.28	103.59
Week10	117.09	118.49
Total	556.09	575.83
Average	55.61	57.58

Table 1: *Average height of maize stands in Section A and B.*

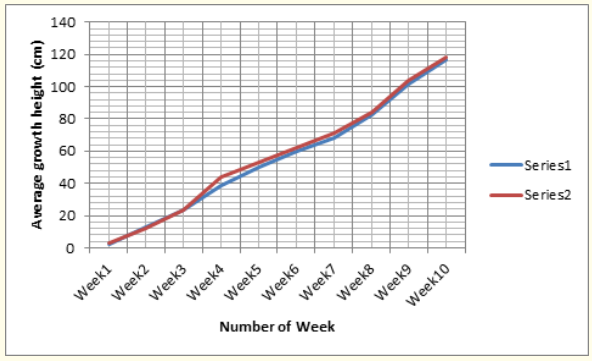

Figure 1: *A graph illustrating the average progressive height of maize stands in the two sections.*

Key

Section B

Section B

Table 2 above shows that the number of maize seeds counted after the first, second and the third harvest in section A is 6, 110; 6,192 and 6,200 maize seeds respectively while the number of maize seeds counted after the first, second and the third harvest in section B is 9,696; 6,176 and 7,412 maize seeds respectively. The total number of maize seeds according to the table 2 above counted from section A and B is 18,502 and 23,284 respectively.

	Section A	Section B
First Harvest seed count	6,110	9,696
Second Harvest seed count	6,192	6,176
Third Harvest seed count	6,200	7,412
Total	18,502	23,284

Table 2: *Number of maize seeds from the two sections.*

Conclusion and Recommendation

Conclusion

From the results of this research work, it is concluded as stated thus:

1. Terracing as a method of erosion control produces the highest average height of maize with 57.58cm over contour farming system of erosion control which produced the average height of maize as 55.62 cm;

2. Terracing as a method of erosion control produces the highest total number of maize seeds of 23,284 over contour farming system of erosion control which yielded the total number of 18,502 maize seeds.

Recommendation

With the result and conclusion of this research, it is therefore recommended as stated below:

1. Erosion prone pieces of land should be controlled before planting is done;
2. Terracing is preferably recommended as a better method of erosion control instead of contour farming system as a method of erosion control.

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