SOIL EROSION CONTROL THRU CORNCOB INCORPORATION USING SIMULATED PLOTS OF MONTEVIDEO CARMEN, BOHOL

College of Agriculture and Natural Resources
BOHOL ISLAND STATE UNIVERSITY
Zamora, Bilar, Bohol

RONALD S. CLAVITE JR.

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Presented to the Faculty of the
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Zamora, Bilar, Bohol

In Partial Fulfillment
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Ronald S. Clavite Jr.

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APPROVAL SHEET

This thesis entitled **"SOIL EROSION CONTROL THRU CORNCOB INCORPORATION USING SIMULATED PLOTS OF MONTEVIDEO CARMEN, BOHOL"** prepared and submitted by **Ronald S. Clavite** Jr., in partial fulfillment of the requirements for the degree in Bachelor of Science in Agricultural and Biosystems Engineering has been examined and recommended for acceptance for oral defense.

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ABSTRACT

Soil erosion is a very common agricultural and environmental problem in the Philippines that is primarily caused by rainfall, for this, a study was conducted. The study has been proposed to evaluate the amount of soil loss in every slope model plot and its significant different considering also the time interval from the time of water sample collection upon the simulation of runoff surface water, plots were categorized into treated and untreated with corncob and without corncob, respectively. Water discharge collection was done every 15, 30, 45, 60, 90, and 120 minutes. The data were analyzed using Two independent T-test in finding the significance in between treated and untreated group, while the Analysis of Variance (ANOVA), Tukey's Honest Significant Difference test were used. Specifically, it sought to answer the following questions; 1) Which of the treatments has better resistance of soil erosion? 2) Which period has the highest amount of soil loss occurred among treatment? 3) Is there a significant difference on the amount of soil loss in terms of the time interval in water sample collection and among treatments. Based on the results of the study, soil medium added with corncob tended to resist soil erosion and the highest amount of soil loss was at 120 minutes with the mean value of 365.80 g/m^2. In conclusion, Soil medium added with corncob tended to mitigate soil erosion as for the amount of soil loss but not enough to have a significant different. Also, the highest amount of soil loss was in 120 minutes with the mean value of 365.80 g/m^2.

Chapter 1

THE PROBLEM AND ITS SCOPE

Rationale

Agricultural land degradation is a widespread problem in the Philippine uplands that has persisted despite decades of conservation farming projects (Cramb et al. 2000). The approach centers on the formation of community Land care groups, supported to varying degrees through partnerships with government and non-government agencies. Such groups identify problems at the local level and mobilize information, community effort, and finances to help improve the management of their soil, water, vegetation, and other natural resources.

Land degradation in the Philippines is likewise seen as a serious environmental problem. Agricultural practices and economic pressures have severely degraded the agricultural resource base, causing accelerated soil erosion, siltation of irrigation systems, flooding, and water pollution (Briones 2005). Upland fields with protruding stones and rocks on ground surfaces as well as abandoned farmlands are now dominant particularly in the southwestern part of the island. Thus, the strategies for rehabilitating and conserving these land resources are necessary where soil erosion is the prime problem to be mitigated (Torillo and Mihara, 2011).

LITERATURE BACKGROUND

Legal Basis

In response to the growing problems on soil and water conservation in the country, the Republic Act No. 3082, or also known as the "Five –year Soil Survey and Conservation Act" was enacted on June 17, 1962. The act state to survey, protect and conserve soil and promote the wise utilization of soil and water at the earliest possible time in order to safeguard the usefulness of those two vital resources and thereby insure stable farm production which is basic to our economy and the general well-being or our people.

Philippine's Republic Act 9003 also known as the Ecological Solid Waste Management Act of 2000, was enacted on January 26, 2021. The chapter hopes to provide the brief background of the country particularly on the issue related to waste management such as population, economic situations, urbanization and modernization among others. It will also discuss the definition, classification and generation of waste both in urban and rural areas.

Related Studies

According to Briones (2010), the most important cause of land degradation in the Philippines is soil erosion. Despite wide variations in the figures, and considerable uncertainty about the degradation parameters, even the most conservative methods lead to large estimates of the cost of soil erosion, comparable at least to the annual investment in research and development of the public sector. Direct interventions such as promotion of soil-conserving farm technologies are worthwhile investments based on social benefit-cost analysis. Owing to liquidity and other constraints, however, farmers may forego these investments. Indirect interventions such as tenure reform have an ambiguous effect on soil erosion; however, removal of domestic protection of corn has a positive effect on soil conservation. Upland farmers, including the large population of subsistence corn growers, are among the poorest segments of the rural population.

The study of Torillo and Mihara (2011) stated that the coconut husk buffer was effective to trap transported soils, however the nutrient losses from the plots with the coconut husk buffer were slightly higher than that from control plot without any treatments in the initial stage of rainfall events after the installation of coconut husk buffer strip.

Lapar and Pandey (1999) reveals that the high cost of establishment, maintenance and the loss of land to hedgerows are considered to be the major constraints to adoption by non-adopters. The economics of the contour hedgerow system is found to improve substantially if crop intensification or cash cropping is possible. In addition to the need to develop a range of cost-effective technologies, the study indicates that in the more marginal environments, on-site benefits alone may not be sufficient to justify investment in soil conservation.

In the study of Eatedal (2012), results indicated that the sod was the most effective erosion control treatment, followed by the riprap, and then by the sweetgum balls. Statistical analysis showed a significant difference in the means among the erosion control treatments for some measurements. There was significantly ($P<0.05$) less erosion (as measured by rills' depth and width) in the sweetgum ball treatment than in the control; therefore sweetgum balls were an acceptable treatment for rill erosion.

Sepúlveda and Narváez (2018) revealed that the soil surface was severely eroded, with mean values of area affected of 88.4% and 73.5% at 3 and 6 months, respectively. In the 3 month plots, the erosion bore scant relation to the factors analyzed. Conversely, the area affected by soil erosion in the 6-month plots was significantly related to the degree of ground cover by weeds and litter, and the erosion threshold was located at 80% of vegetal cover. However, plots with this level of cover did not achieve effective erosion control, due to the low level of plant litter cover (15.7%) compared to that of weeds (75.5%). We conclude that this low content of vegetal residue in the soil, together with the tillage practices employed, explains the large surface area affected by erosion and the impossibility of establishing an erosion threshold.

THE PROBLEM

Statement of the Problem

This study was conducted to control soil erosion thru adding corncob as an additional medium in the soil.

Specifically, it sought to provide answer on the following questions:

1. Which treatment has better resistance of soil erosion?
2. Which period of time interval has the highest amount of soil loss occurred for both treatment?
3. Is there a significant difference on the amount of soil loss in terms of:
    a. Time interval of water sample collection; and
    b. Treated and Untreated plots.

Null Hypothesis

There is no significant difference on the amount of soil losses between time interval and treatments.

Significance of the study

This study was comprehensively designed and experimented for the benefits of the following:

Administrators. The result of this study will help the Agriculture and Engineering Department to provide support on pursuing this kind experiment to conduct other research in solving the problem of soil erosion.

Engineers. This study would be helpful by providing the knowledge that will be useful in the future and the innovative uses of corncob as an alternative way in minimizing the soil erosion in the area.

Farm owner. The result of this study will help the farm owner to make use of their agricultural waste in the farm like corncob to be added in the soil medium in minimizing the soil erosion in upland areas.

Students. Through the finding of this study, the students will have an idea on what are the good benefits of using corncob in mixing to the soil medium to prevent from erosion.

Future researcher. Upon the findings of this study, future researcher will be encouraged to conduct future research about the possible uses of corncob in preventing the upland areas from soil degradation or erosion.

Scope and Limitation of the Study

The main focus of this study is to determine the amount of soil losses in every slope model plot with and without corncob added in it. This study was done at Bohol Island State University, Zamora, Bilar, Bohol.

RESEARCH METHODOLOGY

Environment

This study was conducted at Bohol Island State University where the soil sample were taken from the upland areas of Montevideo, Carmen, Bohol where most of the area were sloppy and prone to soil erosion.

Design

This study was employed in two factorial experimental research in which subject for oven drying method to determine the soil losses of the soil upon the surface runoff water simulation in the provided slope model plot with corncob as an additional medium to the soil. The factors include the treated and untreated soil medium in every plot and the amount of soil loss in every different time of water discharge collection, 15, 30, 45, 60, 90 and 120 minutes. Three (3) replication in every time of collection were involved in this study.

Materials

The study needs a number of materials for the success of this study such as, corncob and soil which was collected in the selected farms of Montevideo, Carmen, Bohol. Other materials like G.I sheet, wood lumber, steel tube and carpentry tools and equipment were also needed for the making of the slope model plot and it's stand. Record book and camera were also important for the success in this study by recording and documenting the flow of the study.

Procedure

In order to evaluate the effects of adding corncob in the soil medium on mitigating soil erosion, constructing the slope model plot with a dimension of (15cm x 20cm x 120cm) made of G.I sheet and shall be constructed at Bohol Island State University Bilar, Bohol.

The corncobs were collected at the nearest farm of corn production the selected barangay of Carmen, Bohol. The collected corncobs were cut into half and divided in 4 strips. Soil medium was collected at the upland areas of Montevideo Carmen, Bohol.

The soil medium were a sandy loam, dark colored type of soil with the properties of; Water content (W) = 43.81 %, Wet density (ρ_t) = 1.39g/cm^3 Dry density (ρ_d) = 0.97g/cm^3 Porosity (n) = 63.46%, Void ratio (e) = 1.74, Degree of saturation (S_r) = 66.94%, Solid phase (SP) = 36.54%, Liquid phase (LP) = 42.42%, Gas phase (GP) = 21.04%, and collected from upland areas of Carmen, Bohol with 20% of stripped corncob to the area of the plot with soil to be filled with 18 kg of soil in the slope model plot that will be set up at 8^0 slope. The latter is the maximum slope of upland ground surface recommended for the safety of agricultural machineries. When the slope model plot were already filled, the simulation of runoff water amounting 18 liters of suspended water per plot assuming that the rain intensity at 60mm/hr, the rainfall intensity is classified as a violent precipitation.

Set up the slope model plot by making the stand which is made of steel tube and clamp to construct 8° slope stand.

Figure 1. Slope model plots mounted at 8°

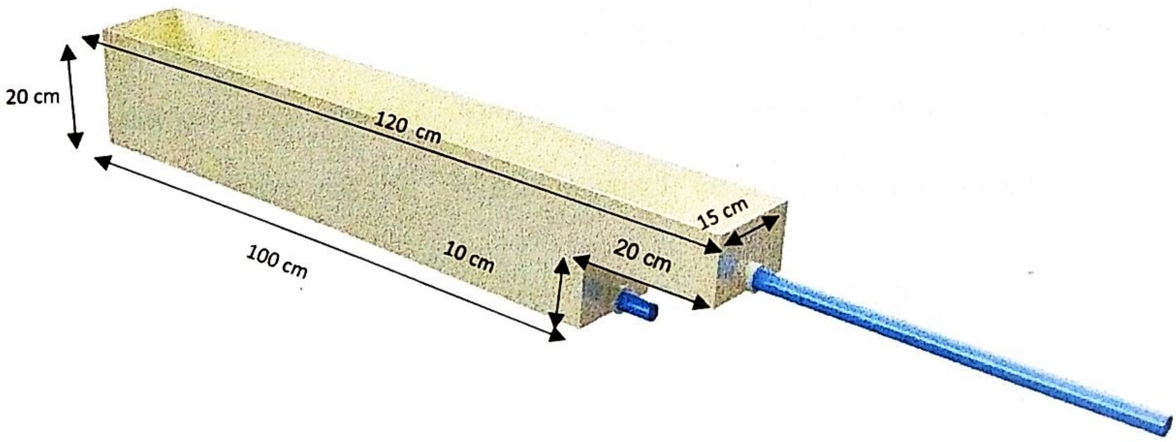


Figure 2. Slope model plot

Collecting the amount of the water discharge from the surface runoff at 15, 30, 45, 60, 90, 120 minutes upon the runoff simulation. Collect water samples of 200ml only in every water discharge of surface runoff in every collecting period.

The collected water samples of 200ml was used to find the amount of soil losses through oven drying method which 20ml were selected from the 200ml water sample and placed in aluminum can that undergone oven drying.

Data Processing and Analysis

Data gathered includes:

1. The soil medium undergo surface runoff water simulation to collect the water samples in every 15, 30, 45, 60, 90, and 120 minutes, and
2. Amount of soil loss was determined thru oven drying method.

Statistical Analysis and Test of Significance

The amount of soil loss between treatments was analyzed using the T test. To test the significant different between time intervals, Analysis of variance (ANOVA) was used. Further analysis using Tukey's Honest Significance Difference (HSD) was used to determine which time interval shows significant results.

DEFINITION OF TERMS

Corncob- refers to the byproduct of the corn plant which is considered as an agricultural waste.

Soil Medium- refers to the medium that will be used for planting and or farming.

Slope Model Plot- refers to the constructed structure that will be filled with the soil mixture.

Oven Drying- refers to the drying oven method is a thermogravimetric method (loss on drying) in which the sample is dried for a defined period of time at constant temperature. The moisture content is determined by weighing the sample before and after drying and determining the difference.

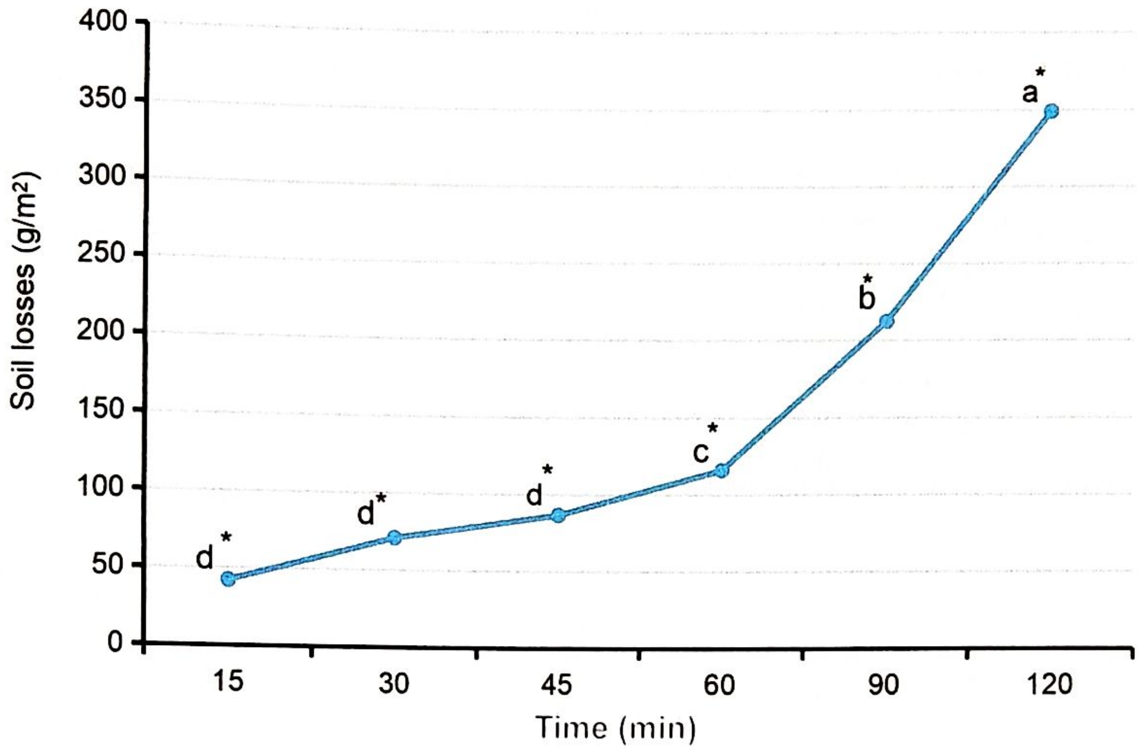
Chapter 2

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

The soil medium incorporated with and without corncob were placed at a slope model plot with an 8^0 slope and undergone by a surface water runoff simulation to determine the amount of soil loss in each plot. In determining the soil loss, collecting the water discharge in every 15, 30, 45, 60, 90 and 120 minutes were done and subjected for oven drying. The data gathered on the amount of soil loss in each plot in every time interval were tabulated and analyzed.

Figure 3 presents the graphical presentation of the soil loss on plot 1, treated plot. Results showed that at 15 minutes, soil loss is the lowest accounting 42 g/m^2 while 120 minutes obtained the highest soil loss at 348.80 g/m^2. Statistically, it was observed that at 120 minutes were highly significantly different at 5% level of confidence compare to 15 minutes and among other time intervals.

On the other hand, no significant difference was obtained between 15, 30, and 45 minutes. It was also observed that at 60, 90, and 120 minutes was significantly different to each other. Thus, time period tended to affect in the soil losses with the use of corncob.



* significant difference at p≤0.05
Means with the same letters are not significant different

Figure 3. Graphical presentation of the soil loss concentration on the treated plot

Table 1 and 2 presents and supports the findings of figure 3 in which shows that there is significant different between 120 and 15 minutes at 0.05 level of confidence and so for other time intervals.

Table 1

Analysis of variance for Plot 1

Source	**DF**	**Sum of Square**	**Mean Square**	**F value**	**Pr (> F)**
Treatment	1	84.4561	84.4561	0.16	0.6949
Time	5	449676.5858	89935.3174	167.86	0.0000
Treatment: Time	5	3067.7275	613.5455	1.15	0.3642
Error	24	12858.4727	535.7697		
Total	35	465687.2431			

Response Variable: Specific load

Table 2

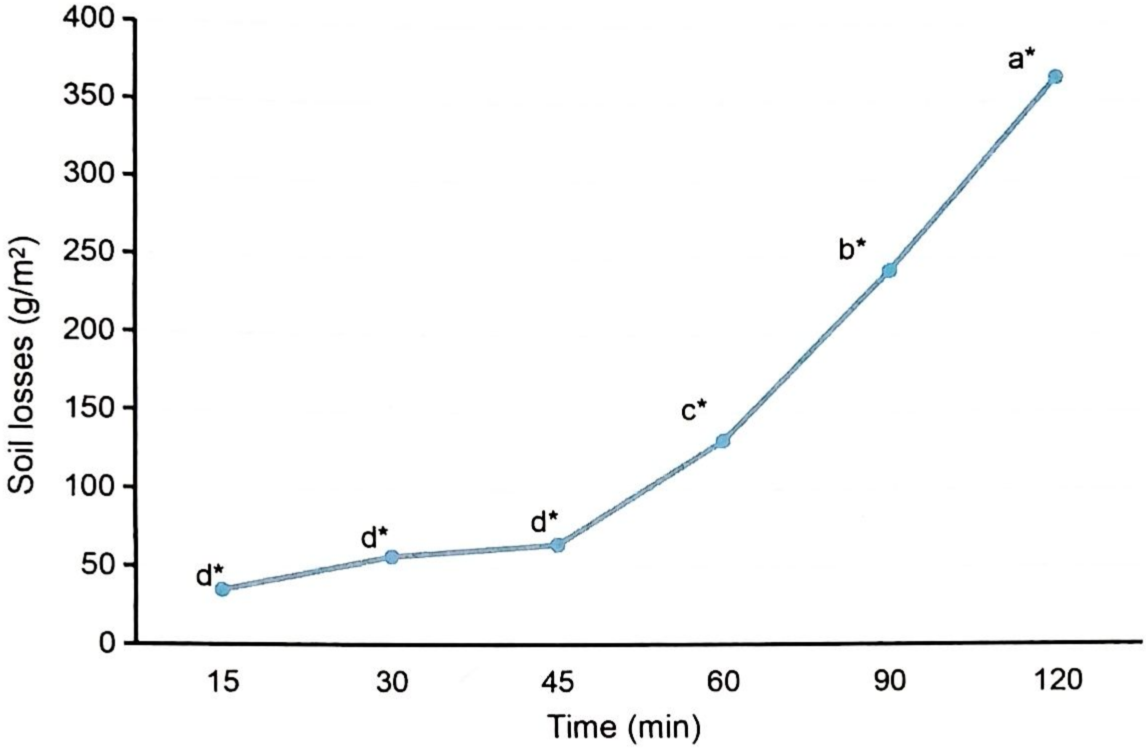
Tukey's Honest Significant Difference (HSD) test on the comparison of time at each level of each treatment in Plot 1

Time	N	Treated = 1 group
15	3	42.04333 (d)
30	3	70.83333 (d)
45	3	86.55667(d)
60	3	115.90000 (c)
90	3	212.33333 (b)
120	3	348.83333 (a)

Means with the same letters are not significantly different

Alpha	0.05
Error Degrees of Freedom	24
Error mean Square	535.7697
Critical value	4.3727
Test Statistic	41.3198

Figure 4 presents the graphical presentation of the soil loss on plot 2 of untreated plot. The results showed that at 15 minutes, soil loss is the lowest with the amount of 34.80 g/m^2 and at 120 minutes obtained the highest soil loss accounting 365.80 g/m^2. Statistically, it was observed that at 120 minutes, there were highly significant different at 5% level of confidence compare to the 15-minute time interval. On the other hand, no significant difference was obtained between 15, 30, and 45 minutes. Meanwhile, at 60, 90, and 120 minutes, significant difference was observed.



* significant difference at p≤0.05
Means with the same letters are not significant different

Figure 4. Graphical presentation of the soil loss concentration on the untreated plot

The Significant difference at time interval appeared probably because of the time flow of water discharge in every time of collection. The amount of soil loss in every time of collection makes differ to each other because in the first 15 minutes, most topsoil was probably eroded and in the following 15 minutes will erode more than the first 15 minutes because of the continuous flow of runoff water that will smoothen the soil and will cause for more amount of soil that will be eroded as time pass. It implicate that as the time increases the soil loss also increases.

Finding out the significant effect on the time intervals in every treatments were important in order to find out if the time flow will affect on the increase or decrease in the amount of soil losses. It can be determined from the data if those time intervals can really affect the soil loss upon the runoff surface water simulation.

Table 3 and 4 presents and supports the findings of figure 4 in which shows that there is significant different between time in 120 minutes and in 15 minutes at 0.05 level of confidence and so for other time intervals

Table 3

Analysis of variance for Plot 2

Source	**DF**	**Sum of Square**	**Mean Square**	**F value**	**Pr (> F)**
Treatment	1	84.4561	84.4561	0.16	0.6949
Time	5	449676.5858	89935.3174	167.86	0.0000
Treatment: Time	5	3067.7275	613.5455	1.15	0.3642
Error	24	12858.4727	535.7697		
Total	35	465687.2431			

Response Variable: Specific load

Table 4

Tukey's Honest Significant Difference (HSD) test on the comparison of time at each level of each treatment in Plot 2

Time	N	Untreated =2 group
15	3	34.80000 (d)
30	3	56.70000 (d)
45	3	64.69000 (d)
60	3	131.6667 (c)
90	3	241.22333 (b)
120	3	365.80000 (a)

Means with the same letters are not significantly different

Alpha	0.05
Error Degrees of Freedom	24
Error mean Square	535.7697
Critical value	4.3727
Test Statistic	41.3198

Figure 5 represents the cumulative amount of soil losses in treated and untreated plots. Results showed that both of the treatments obtained the lowest and highest amount of soil losses at time in 15 minutes and in 120 minutes, respectively. It also reveals that the soil erosion in each time interval in both treatments obtained soil losses that are comparable to each other.

Statistically, the analysis reveals that there was no significant difference between treated and untreated plot, this means that from the result of the experiment, there is no changes of adding corncob to the soil medium in terms of preventing from soil erosion.

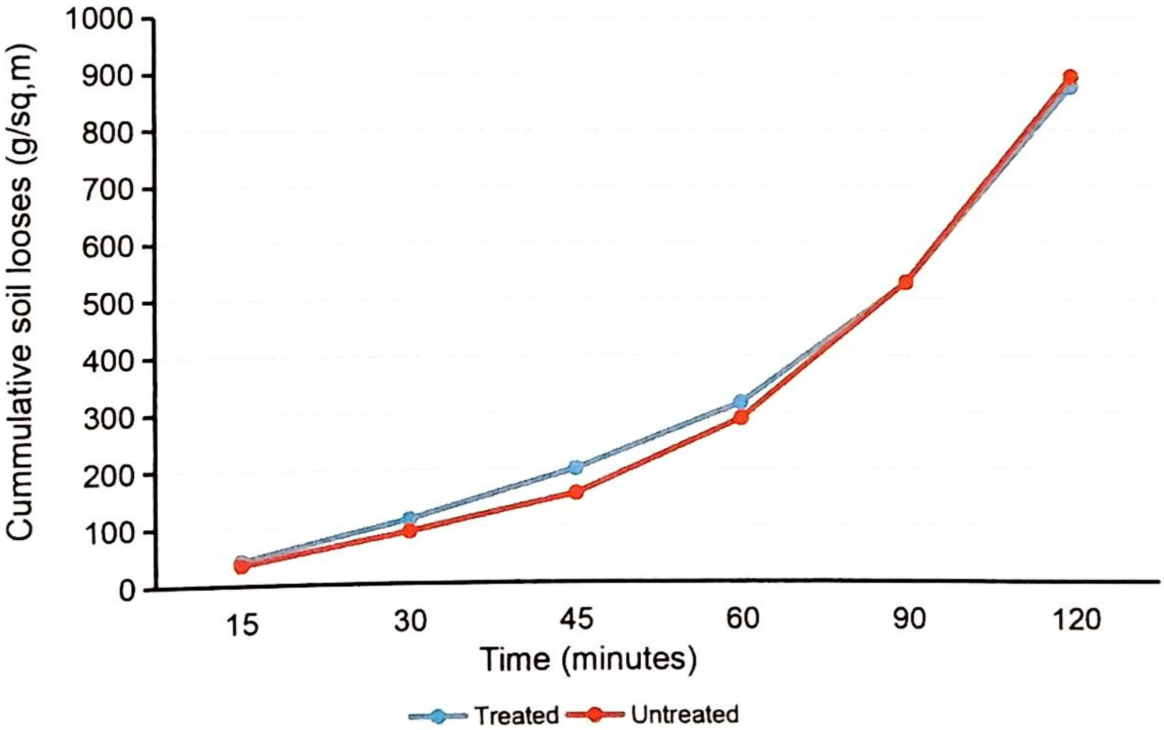


Figure 5. Cumulative amount of soil losses in treated and untreated plots

Chapter 3

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary of findings

The study aims to evaluate the amount of soil loss added with corncob to the soil medium. Specifically, this study wants to determine the amount of soil loss in every time interval in each treatment and to verify the significant differences between every time interval in each treatment, so as for the significant differences between each treatment.

This study covered from conducting an experiment by making the slope model plot which was made at Bohol Island State University, Zamora, Bilar, Bohol. The study will not be completed without the soil medium and the corncob in which were the vital parts of our experiments, we collected our soil medium and the corncob at Montevideo, Carmen, Bohol. The experiment was done by of the surface water runoff simulation in each plot or treatment, afterwards, the collection of the water samples from the simulation in every 15, 30, 45, 60, 90 and 120 minutes in each treatment. The collected samples were weighed before and after the oven drying. The duration of oven drying were at least 24 hours to surely determine the amount of soil loss.

There were only two treatments on this study, the treated soil medium which were added with corncob for about 20% of the surface area in the slope model plot and the untreated or control soil medium which were a pure soil.

The amount of specific load was observed that the treatment which has the highest amount was in time 120 minutes of the untreated plot with the mean value of 365.80 g/m^2.

The addition of corncob in the soil medium causes only a slight in increase in its resistance from soil erosion, thus, the statistical treatment implied that there is no significant difference in between the treated and untreated soil medium. However, statistical test showed a significant difference in terms of time interval of water collection in each treatment, such as time 120 minutes were highly significant compare to time 15 minutes and to other time intervals. No significant difference was obtained between time 15, 30, and 45 minutes. It was also observed that time 60, 90, and 120 minutes was significantly different to each other on the treated plot. On the other hand, at time 120 minutes was highly significant at 5% level of confidence compare to time 15 minutes and to other time intervals. No significant difference was obtained between time 15, 30, and 45 minutes. Meanwhile, at time 60, 90, and 120 was significantly different to each other on the untreated plot.

Conclusions

Based on the result of the study, the following conclusions were drawn;

1. Soil medium added with corncob tended to mitigate soil erosion as for the amount of soil loss but not enough to have a significant different.

2. The highest amount of soil loss was in time 120 minutes with the mean value of 365.80 g/m^2

3. a. There were highly significantly different at time 15, 60, 90, and 120 minutes. However, there was no significant difference for the time at 15, 30 and 45 minutes for the treated plot. Significant difference were also present at untreated plot the same as for the treated plots for its time intervals.

   b. There is no significant difference among the treated and untreated soil medium, thus the null hypothesis was accepted.

Recommendations

Attached on the conclusion drawn in the study, the following recommendations are forwarded;

1. Conduct the same experiment using the artificial rain simulator to evenly distribute the water drops.
2. Conduct the same study with higher percentage of corncob added in the soil medium.
3. Conduct same study with different time intervals of water sample collection.
4. Implement another study using other agricultural waste as an additive to the soil medium to determine the possible ways in mitigating soil erosion.
5. Conduct the same study in the actual field scenario.

REFERENCES

Briones, R. 2010. Addressing land degradation: benefits, costs, and police directions. Philippine Journal of Development. Vol. 37, Issue 1, No. 68.

Cramb, R., Catacutan, D., Arellano, Z. and Mariano, K. 2000. The 'Landcare' approach to soil conservation in the Philippines: an assessment of farm-level impacts. Retrieve on October 28, 2021, from; file:///C:/Users/x/Downloads/pp060451.pdf

Eatedal A. 2012. Comparison of three soil erosion control treatments, retrieve on; October 28, 2021, from; https://www.utm.edu/departments/msanr/_pdfs/1375909692-E_%20Alqusaireen_research_project_final.pdf

Lapar, M. and Pandey, S. 1999. Adoption of Soil Conservation: The case of the Philippine uplands. Agricultural Economics. Vol. 21, Pages 241-256.

Republic Act 3082. 1962. Five-year Soil Survey and Conservation Act. Official Gazette. Congress of the Philippines.

Republic Act 9003. 2001. Ecological Solid Waste Management Act of 2000. Official Gazette. Congress of the Philippines.

Sepúlveda, R. and Narváez F., 2018. Erosion control in the sustainable cultivation of maize (*zea mays l.*) and beans (*phaseolus vulgaris l.*) at two stages of the agricultural cycle in Southern Guatemala. Retrieved on October 28, 2021, from file:///C:/Users/x/Downloads/sustainability-10-04654-v2.pdf

Torillo, J.Jr. and Mihara, M. 2011. Erosion control by coconut husk buffer strip in Bohol Island of Philippines. International Journal of Environmental and Rural Development. Vol. 2, Issue 1, Pages 25-30.

APPENDICCES

Appendix A- Determination of Physical Properties of Soil Sample

The water content, wet density, dry bulk density, porosity, void ratio, degree of saturation, solid phase, liquid phase and gas phase of the soil were obtained through a calculation using the following formulas:

1. $\text{Water Content (W) (\%)} = \frac{\text{Initial Weight (g)} - \text{Oven Dry Weight (g)}}{\text{Oven Dry Weight (g)}} \times 100\%$
2. $\text{Wet Density } (\rho_t) = \frac{\text{Mass of Raw Soil (g)}}{\text{Total Volume of Soil (cm}^3)}$
3. $\text{Dry Bulk Density } (\rho_d) = \frac{\text{Mass of Dry Soil (g)}}{\text{Total Volume of Soil (cm}^3)}$
4. $\text{Porosity (n) \%} = \frac{1 - \text{Dry Bulk Density (g/cm}^3)}{\text{Specific Gravity} - \rho\text{water (g/cm}^3)} \times 100\%$
5. Constant specific gravity (Gs) = 2.65
6. $\text{Void Ratio (e)} = \frac{\text{water density } (\rho_w) \times \text{specific gravity (Gs)}}{\text{wet density } (\rho_t)}\left(1 + \frac{W}{100}\right) - 1$
7. $\text{Degree of Saturation (Ds) \%} = \frac{\text{water content (W)} \times \text{specific gravity (Gs)}}{\text{Void ratio (e)}}$
8. $\text{Solid Phase (SP)} = \frac{\text{dry bulk density } (\rho_d)}{\text{Specific gravity (Gs)} \times \text{wet density } (\rho_t)} \times 100$
9. $\text{Liquid Phase (LP)} = \frac{\text{wet density } (\rho_t) - \text{dry bulk density } (\rho_d)}{\text{water density } (\rho_w)} \times 100$
10. $\text{Gas Phase (GP)} = \frac{1 - \text{volume of soil (Vs)} + \text{volume of water (Vw)}}{\text{total volume (V)}} \times 100$

Appendix A- Raw Data

Table 1. Raw data gathered during the experiment.

CAN NO.	CAN MASS (g)	CAN + DRIED COLLOID MASS (g)	MASS DIFFIRENCE (g)	SOIL LOSS CONCENTRATION (mg/L)
TP1-15-1	16.91	17	0.09	4500
TP1-15-2	15.45	15.52	0.07	3500
TP1-15-3	16.56	16.62	0.06	3000
TP1-30-1	16.61	16.69	0.08	4000
TP1-30-2	16.98	17.12	0.14	7000
TP1-30-3	16.69	16.81	0.12	6000
TP1-45-1	16.61	16.73	0.12	6000
TP1-45-2	16.52	16.66	0.14	7000
TP1-45-3	17	17.15	0.15	7500
TP1-60-1	16.94	17.13	0.19	9500
TP1-60-2	16.54	16.72	0.18	9000
TP1-60-3	16.6	16.8	0.2	10000
TP1-90-1	16.58	16.74	0.16	8000
TP1-90-2	16.53	16.69	0.16	8000
TP1-90-3	16.49	16.66	0.17	8500
TP1-120-1	16.66	16.94	0.28	14000
TP1-120-2	16.55	16.85	0.3	15000
TP1-120-3	17.42	17.62	0.2	10000
P2-15-1	15.69	15.78	0.09	4500
P2-15-2	17.04	17.11	0.07	3500
P2-15-3	16.7	16.78	0.08	4000
P2-30-1	16.57	16.69	0.12	6000
P2-30-2	16.95	17.1	0.15	7500
P2-30-3	17.16	17.31	0.15	7500
P2-45-1	16.77	16.91	0.14	7000
P2-45-2	16.6	16.74	0.14	7000
P2-45-3	15.73	15.86	0.13	6500
P2-60-1	16.67	16.94	0.27	13500
P2-60-2	16.88	17.16	0.28	13000
P2-60-3	14.94	15.22	0.28	13000
P2-90-1	17.01	17.22	0.21	10500
P2-90-2	16.57	16.77	0.2	10000
P2-90-3	15.69	15.93	0.24	12000
P2-120-1	16.9	17.2	0.3	15000
P2-120-2	16.8	17.11	0.31	15500
P2-120-3	16.66	16.98	0.32	16000

CAN NO.	DISCHARGE AMOUNT (L)	SPECIFIC LOAD (g/sq.m)	AVE (g/q.m)	COMMULATIVE AMMOUNT
TP1-15-1	1.72	51.6		
TP1-15-2	1.72	40.13	42	42
TP1-15-3	1.72	34.4		
TP1-30-1	1.875	50		
TP1-30-2	1.875	87.5	70.8	112.8
TP1-30-3	1.875	75		
TP1-45-1	1.9	76		
TP1-45-2	1.9	88.67	86.6	199.4
TP1-45-3	1.9	95		
TP1-60-1	1.83	115.9		
TP1-60-2	1.83	109.8	115.9	315.3
TP1-60-3	1.83	122		
TP1-90-1	3.9	208		
TP1-90-2	3.9	208	212.3	527.6
TP1-90-3	3.9	221		
TP1-120-1	4.025	375.67		
TP1-120-2	4.025	402.5	348.8	876.4
TP1-120-3	4.025	268.33		
P2-15-1	1.305	39.15		
P2-15-2	1.305	30.45	34.8	34.8
P2-15-3	1.305	34.8		
P2-30-1	1.215	48.6		
P2-30-2	1.215	60.75	56.7	91.5
P2-30-3	1.215	60.75		
P2-45-1	1.42	66.27		
P2-45-2	1.42	66.27	64.7	156.2
P2-45-3	1.42	61.53		
P2-60-1	1.5	135		
P2-60-2	1.5	130	131.7	287.9
P2-60-3	1.5	130		
P2-90-1	3.34	233.8		
P2-90-2	3.34	222.67	241.2	529.1
P2-90-3	3.34	267.2		
P2-120-1	3.54	354		
P2-120-2	3.54	365.8	365.8	894.9
P2-120-3	3.54	377.6		

Appendix B

Statistical Tables

Comparison of Time at each level of each Treatment
Tukey's honest Significant Difference (HSD) Test

Alpha	0.05
Error Degrees of Freedom	24
Error mean Square	535.7697
Critical value	4.3727
Test Statistic	41.3198

Summary;

Time	N	Treated = 1 group	Untreated =2 group
15	3	42.04333 (d)	34.80000 (d)
30	3	70.83333 (d)	56.70000 (d)
45	3	86.55667(d)	64.69000 (d)
60	3	115.90000 (c)	131.6667 (c)
90	3	212.33333 (b)	241.22333 (b)
120	3	348.83333 (a)	365.80000 (a)

Means with the same letters are not significantly different

ANNOVA TABLE

Response Variable: Specific load

Source	**DF**	**Sum of Square**	**Mean Square**	**F value**	**Pr (> F)**
Treatment	1	84.4561	84.4561	0.16	0.6949
Time	5	449676.5858	89935.3174	167.86	0.0000
Treatment: Time	5	3067.7275	613.5455	1.15	0.3642
Error	24	12858.4727	535.7697		
Total	35	465687.2431			

Source of variation	DF	F-value	F-tabular	
			5%	1%
Treatment	1	0.16	4.26	7.82
Time	5	167.86	2.62	3.90
Treatment; Time	5	1.15	2.62	3.90
Error	24			

T-Test Statistics

Homogeneity of variance

Variable	method	Num DF	Den DF	F value	Pr (>F)
Cumulative amount of specific load (kg/L)	Folded F	2	2	25.54	0.0754

Two independent sample t-test, h0: mean diff=0

Variable	Method*	variances	DF	t-value	Pr (> t)
Cumulative amount of specific load (kg/L)	pooled	equal	4	-0.1906	0.8581

*at 0.05 level of significance.

Source of variation	DF	T-value	T-tabular	
			5%	1%
T1 (treated) T2 (untreated)	4	0.1906	2.776	4.604

Appendix C

Letter and Requests

Republic of the Philippines
Bohol Island State University
BILAR Campus, Zamora, Bilar, Bohol

Vision: A premiere Science and Technology University for the formation of a world class and virtuous human resource for the sustainable development of Bohol and the country.
Mission: BISU is committed to provide quality higher education in the arts and sciences as well as in the professional and technological fields, undertake research and development and extension services for the sustainable development in Bohol and the country

Dr. Marietta C. Macalolot
Campus Director
BISU Bilar Campus
Zamora, Bilar, Bohol

Ma'am:

Greetings!

As a requirement for graduation, I am currently conducting my thesis entitled "SOIL EROSION CONTROL THRU CORNCOB INCORPORATION IN UPLAND AREAS OF MONTEVIDEO, CARMEN, BOHOL". To date, I have my design ready for fabrication.

In this connection, I would like to request from your good office to allow me to **use the Autoshop** as a venue, plainer and other cutting tools for fabrication during weekdays. I am hoping for your approval with this request. Your usual support is of great help to realize my dream.

Thank you so much and GOD bless.

Respectfully yours,

RONALD S. CLAVITE JR.
BSABE Student

Noted by:

ENGR. ERWIN G. LUDEVESE
DABE Chairperson

SEVERINO B.SALERA, Ph.D
AUTOSHOP INCHARGE

JULIAN E. TORILLO JR., PhD.
Thesis Adviser

Approved by:

DR. MARIETTA C. MACALOLOT
Campus Director

Republic of the Philippines
Bohol Island State University
BILAR Campus, Zamora, Bilar, Bohol

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Dr. Noel T. Lomosbog
CANR DEAN
BISU Bilar Campus
Zamora, Bilar, Bohol

Sir:

Greetings!

As a requirement for graduation, we are currently conducting our individual thesis entitled:

"STUDY ON QUALITY OF COMPOST FROM VEGETABLE RESIDUES BY MILLIPEDES"

"SOIL PHYSICO-CHEMICAL CHARACTERISTICS OF RAIN FED AND IRRIGATED PADDIES IN KAGAWASAN, DAGOHOY, BOHOL"

"SOIL EROSION CONTROL THRU CORN COB INCORPORATION IN UPLAND AREAS OF MONTEVIDEO, CARMEN, BOHOL"

"MITIGATING SOIL EROSION USING PINEAPPLE LEAVES MULCH"

In this connection, we would like to request from your good office to allow us to use the Soil Laboratory as a venue for the analysis of soil physical parameters, during weekdays. We are hoping for your approval with this request. Your usual support is of great help to realize our dreams.

Thank you so much and GOD bless.

Respectfully yours,

RONALD CLAVITE — BSABE Student
JOSUA GAUDICOS — BSABE Student
HILBETH JEAN MELENCION — BSABE Student
CINDELYN PALMA — BSABE Student

Noted by:

ENGR. ERWIN G. LUDEVESE — DABE Chairperson
JORGE CABELIN — SOIL LAB INCHARGE
JULIAN E. TORILLO JR., Ph.D. — Thesis Adviser

Approved by:

NOEL T. LOMOSBOG, Ph.D.
CANR DEAN

Republic of the Philippines
Bohol Island State University
BILAR Campus, Zamora, Bilar, Bohol

Vision A premiere Science and Technology University for the formation of a world class and virtuous human resource for the sustainable development of Bohol and the country.
Mission BISU is committed to provide quality higher education in the arts and sciences as well as in the professional and technological fields, undertake research and development and extension services for the sustainable development in Bohol and the country.

DR. MARIETTA C. MACALOLOT
Campus Director
BISU Bilar Campus
Zamora, Bilar, Bohol

Ma'am:

Greetings!

As a requirement for graduation, we are currently conducting our individual thesis entitled:
"QUALITY OF COMPOST FROM VEGETABLE RESIDUES BY MILLIPEDES"
"SOIL EROSION CONTROL THRU CORN COB INCORPORATION IN UPLAND AREAS OF MONTEVIDEO, CARMEN, BOHOL"
"MITIGATING SOIL EROSION USING PINEAPPLE LEAVES MULCH"

In this connection, we would like to request from your good office to allow us to use the Civil Technology Building as a venue for the fabrication of our individual compost beds and soil beds, during weekdays. We are hoping for your approval with this request. Your usual support is of great help to realize our dreams.

Thank you so much and GOD bless.

Respectfully yours,

RONALD CLAVITE
BSABE Student

JOSUA GAUDICOS
BSABE Student

HILBETH JEAN MELENCION
BSABE Student

Noted by:

ERWIN G. LUDEVESE, MSAE
DABE Chairperson

MELVIN T. MAGDALES, CE
PPFD Officer

JULIAN E. TORILLO JR., Ph.D.
Thesis Adviser

Approved by:

DR. MARIETTA C. MACALOLOT
CAMPUS DIRECTOR

Appendix D

Photodocumentation

Figure 6. Making of the Slope model Plot and the Stand

Figure 7.Finished Stand and Slope Model Plot

Figure 8. Soil Medium Preparation

Figure 9. Soil medium Filling and Application of Corncob

Figure 10. Preparation for the Actual Conduct of the Experiment

Figure 11. Actual Conduct of the experiment and the collection of water Sample

Figure 12. Preparing and Weighing the can to be used for oven drying

Figure 13. Collection of 20ml in every time of water samples collected and subjected for oven drying

Figure 14. Weighing the can after at least 24 hours of oven drying.