The Development of Agriculture Bio-Mass Banana Trunk Waste (Straw) as Alternative Agriculture Fertilizer and Bio-absorboost (bricks) for Urban and Rural Crop Production

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Submitted By

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Certification

This is to certify that **Muhammad Haris** , bearing CMS Id **54586** has successfully completed the final project **The Development of Agriculture Bio-Mass Banana Trunk Waste (Straw) as Alternative Agriculture Fertilizer and Bio-absorboost (bricks) for Urban and Rural Crop Production,** at the **Balochistan University of Information Technology and Management Sciences**, to fulfill the partial requirement of the degree **Textile Engineering.**

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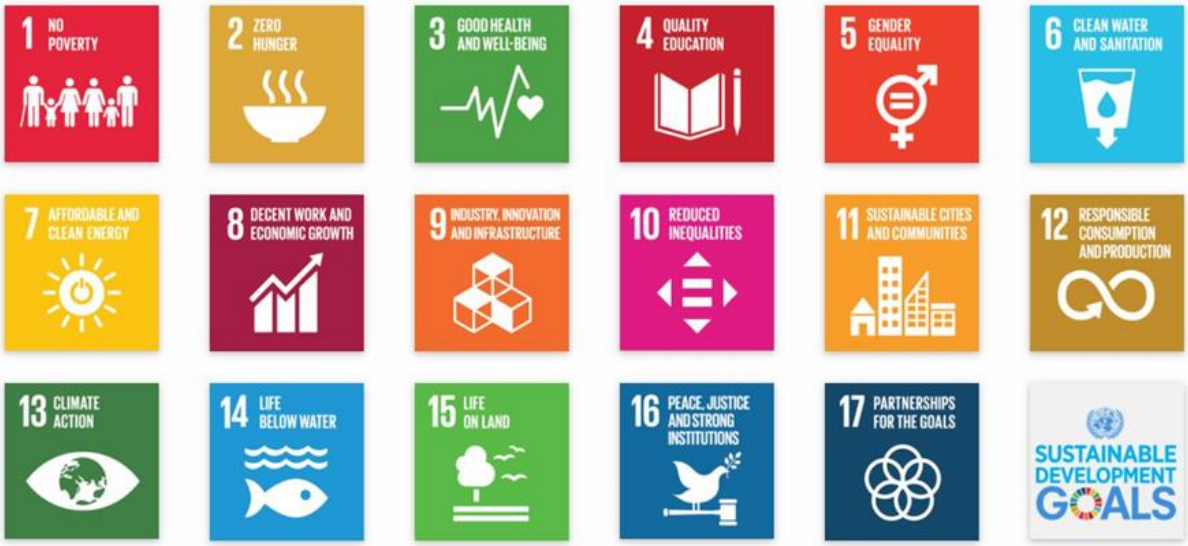
Project Title (mention project title here)

Sustainable Development Goals

(Please tick the relevant SDG(s) linked with FYDP)

SDG No	Description of SDG	SDG No	Description of SDG
SDG 1	No Poverty	SDG 9	Industry, Innovation, and Infrastructure
SDG 2	Zero Hunger	SDG 10	Reduced Inequalities
SDG 3	Good Health and Well Being	SDG 11	Sustainable Cities and Communities
SDG 4	Quality Education	SDG 12	Responsible Consumption and Production
SDG 5	Gender Equality	SDG 13	Climate Change
SDG 6	Clean Water and Sanitation	SDG 14	Life Below Water
SDG 7	Affordable and Clean Energy	SDG 15	Life on Land
SDG 8	Decent Work and Economic Growth	SDG 16	Peace, Justice and Strong Institutions
		SDG 17	Partnerships for the Goals



Range of Complex Problem Solving			
	Attribute	**Complex Problem**	
1	Range of conflicting requirements	Involve wide-ranging or conflicting technical, engineering and other issues.	
2	Depth of analysis required	Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models.	
3	Depth of knowledge required	Requires research-based knowledge much of which is at, or informed by, the forefront of the professional discipline and which allows a fundamentals-based, first principles analytical approach.	
4	Familiarity of issues	Involve infrequently encountered issues	
5	Extent of applicable codes	Are outside problems encompassed by standards and codes of practice for professional engineering.	
6	Extent of stakeholder involvement and level of conflicting requirements	Involve diverse groups of stakeholders with widely varying needs.	
7	Consequences	Have significant consequences in a range of contexts.	
8	Interdependence	Are high level problems including many component parts or sub-problems	
Range of Complex Problem Activities			
	Attribute	**Complex Activities**	

1	Range of resources	Involve the use of diverse resources (and for this purpose, resources include people, money, equipment, materials, information and technologies).	
2	Level of interaction	Require resolution of significant problems arising from interactions between wide ranging and conflicting technical, engineering or other issues.	
3	Innovation	Involve creative use of engineering principles and research-based knowledge in novel ways.	
4	Consequences to society and the environment	Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation.	
5	Familiarity	Can extend beyond previous experiences by applying principles-based approaches.	

Abstract

This research project focuses on harnessing the potential of agricultural biomass, specifically banana trunk waste, as a sustainable alternative for both fertilizer and bio-absorboost bricks in agricultural practices. In the context of escalating environmental concerns and the need for eco-friendly solutions, the utilization of banana trunk waste addresses the dual challenge of agricultural waste management and the development of innovative agricultural inputs.

The study delves into the extraction and formulation processes to transform banana trunk waste into an effective bio-fertilizer. By harnessing the rich nutrient content of the waste material, this alternative fertilizer not only serves as a cost-effective substitute but also contributes to the reduction of chemical fertilizer usage, mitigating environmental impacts. Simultaneously, the research explores the incorporation of banana trunk waste in the creation of bio-absorboost bricks, which function as soil conditioners, water retainers, and structural support for crops in both urban and rural settings.

This interdisciplinary approach offers a holistic solution to agricultural sustainability, merging waste management with enhanced agricultural productivity. The proposed bio-fertilizer and bio-absorboost bricks not only provide economic benefits but also align with the global shift towards eco-friendly and sustainable agricultural practices, making significant strides in promoting a circular economy within the agricultural sector. The outcomes of this research have the potential to revolutionize farming practices, fostering a more resilient and sustainable future for both urban and rural crop production.

Keywords: method; thesis; computer

Undertaking

I certify that the project **The Development of Agriculture Bio-Mass Banana Trunk Waste (Straw) as Alternative Agriculture Fertilizer and Bio-absorboost (bricks) for Urban and Rural Crop Production** is our own work. The work has not, in whole or in part, been presented elsewhere for assessment. Where material has been used from other sources it has been properly acknowledged/ referred.

Muhammad Haris

54586

Acknowledgement

We truly acknowledge the cooperation and help make by **Dr. Nazakat Khoso Assistant Professor** of **BUITEMS**. He has been a constant source of guidance throughout the course of this project. We would also like to thank **Dr. Qasim Siddiqui Assistant Professor** from **BUITEMS** for his help and guidance throughout this project.

We are also thankful to our friends and families whose silent support led us to complete our project.We are also thankful to our friends and families whose silent support led us to complete our project.

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List of Acronyms

1. SAP - Superabsorbent Polymer

2. C-SAP - Cellulosic Superabsorbent Polymer

3. Agro-Tech - Agricultural Technology

4. CBA - Cost-Benefit Analysis

5. CSA - Controlled Water Release

6. ABS - Absorboost (Cellulosic Superabsorbent Bio-Polymer)

7. CTW - Cellulosic Textile Waste

8. EW - Eco-Friendly Water

9. ETW - Eco-Friendly Textile Waste

10. CW - Controlled Water

11. URF - Urea Replacement Fertilizer

12. R&D - Research and Development

13. CE - Circular Economy

14. SSA - South Asia

15. EFP - Eco-Friendly Practices

16. EM - Economic Benefits

17. JCA - Job Creation Analysis

List of Equations

Chapter 1

1.1 Introduction

The global agricultural landscape is witnessing a paradigm shift towards sustainability, necessitated by the pressing need to address environmental concerns, optimize resource utilization, and enhance food security. In this context, the utilization of agricultural biomass as a resource for developing alternative fertilizers and soil conditioners has emerged as a promising avenue for sustainable agricultural practices. This research endeavors to explore the untapped potential of banana trunk waste, specifically the straw, as a dual-purpose solution for both fertilizer and bio-absorboost bricks, catering to the needs of urban and rural crop production.

Banana cultivation generates a substantial amount of agricultural waste in the form of trunk straw, which is often considered a byproduct with limited utility. However, this research posits that banana trunk waste can be transformed into a valuable resource through an innovative and eco-friendly extraction and formulation process. The resulting bio-fertilizer, derived from the nutrient-rich composition of banana trunk waste, presents an eco-friendly alternative to conventional chemical fertilizers. By harnessing the inherent nutrients within the waste material, this alternative fertilizer not only reduces the environmental impact associated with chemical fertilizers but also offers a sustainable and cost-effective option for farmers.

Furthermore, the research extends its focus to the development of bio-absorboost bricks utilizing banana trunk waste. These bricks function as multifaceted agricultural inputs, acting as soil conditioners, water retainers, and structural support for crops. The incorporation of banana trunk waste in the creation of these bio-absorboost bricks provides an integrated solution for enhancing soil fertility, water retention, and crop stability. This dual-purpose approach, encompassing both fertilizer and soil conditioner, aligns with the principles of a circular economy by transforming agricultural waste into valuable inputs for sustainable crop production.

As the world grapples with the challenges of climate change, resource depletion, and increasing agricultural demands, this research represents a timely and innovative contribution to the quest for sustainable farming practices. By harnessing the potential of banana trunk waste, this study seeks to redefine the conventional notions of agricultural waste and foster a more resilient and eco-conscious approach to urban and rural crop production.

1.2 Statement of the problem

Despite the growing awareness of environmental sustainability in agriculture, significant challenges persist, necessitating innovative solutions to address critical issues such as water scarcity, soil moisture control, and the effective management of agricultural waste. One of the prominent challenges is the underutilization of banana trunk waste, a byproduct of banana cultivation, which remains largely unexplored for its potential contributions to sustainable agricultural practices. This study identifies a pressing need to repurpose banana trunk waste and integrate it into the agricultural framework to mitigate water scarcity, enhance soil moisture control, and address the burgeoning issue of textile waste in a sustainable manner.

Water scarcity poses a substantial threat to global agriculture, necessitating the development of water-efficient solutions for crop production. Additionally, traditional soil moisture control methods often rely on non-renewable resources and synthetic materials, contributing to environmental degradation. The inadequate utilization of agricultural waste, especially banana trunk waste, exacerbates the issue, as this resource has the potential to serve as a valuable input for sustainable agricultural solutions.

Therefore, the overarching problem addressed by this research is the underutilization of banana trunk waste in mitigating water scarcity, optimizing soil moisture control, and providing eco-friendly alternatives to address the challenges posed by textile waste in agriculture. The study aims to fill this research gap by developing natural cellulosic bricks, optimizing banana trunk waste as a fertilizer, and conducting a thorough cost-benefit analysis to assess the societal and environmental impacts of these sustainable agricultural solutions.

1.3 Goals/Aims & Objectives

Goal:

The overarching goal of this research project is to enhance sustainable agriculture practices by repurposing banana trunk waste into innovative and eco-friendly solutions. The primary focus is on addressing challenges related to water scarcity, soil moisture control, and textile waste, ultimately contributing to a more resilient and environmentally conscious agricultural sector.

Objectives:

1. Develop bio-absorbent natural cellulosic bricks using banana trunk waste for efficient moisture management in agriculture.

2 Optimize banana trunk waste as a fertilizer to enhance crop yields, benefiting diverse crops including food-grain crops, tomatoes, onions, sunflower, cotton, maize, and rice.

3 Create Absorboost, a cellulosic superabsorbent bio-polymer (C-SAP), from banana textile waste to retain soil moisture under varying weather conditions, particularly benefiting drip-irrigation and cotton farming.

4 Conduct a comprehensive cost-benefit analysis to assess potential job creation, reduction in agricultural costs, and economic benefits of the project on a larger scale.

5 Demonstrate how the project's outcomes contribute to sustainable agriculture practices by addressing challenges such as water scarcity, soil moisture control, and textile waste.

6 Evaluate the project's impact on reducing environmental damage caused by conventional agricultural practices through the recycling of textile waste and the use of eco-friendly fertilizers.

7 Explore and quantify the potential for job creation in the sustainable agricultural product sector, encompassing production, distribution, and application of Absorboost and bio-absorbent bricks.

8 Demonstrate the contribution to a circular economy by repurposing banana trunk waste into valuable agricultural products, promoting a more sustainable and closed-loop approach in the agricultural industry.

1.4 Motivation

The motivation behind this research stems from a dual commitment to address pressing environmental challenges in agriculture and unlock the untapped potential of banana trunk waste. With a global imperative to adopt sustainable farming practices, the project endeavors to repurpose banana trunk waste into innovative solutions, including bio-absorbent natural cellulosic bricks and Absorboost, a superabsorbent bio-polymer derived from banana textile waste. The urgent need to mitigate water scarcity, optimize soil moisture control, and address the escalating issue of textile waste in agriculture serves as the driving force. By developing eco-friendly alternatives and conducting a comprehensive cost-benefit analysis, the research aspires to contribute significantly to sustainable agriculture, reduce environmental damage associated with conventional practices, create job opportunities, and promote a circular economy by transforming agricultural waste into valuable resources. This motivation underscores the project's commitment to pioneering transformative solutions for a more resilient and environmentally conscious agricultural

1.5 Assumption and Dependencies

Assumptions:

1. **Availability of Banana Trunk Waste:** The successful execution of this research assumes a consistent and sufficient supply of banana trunk waste for experimentation and development processes.

2. **Technical Feasibility:** The assumption is made that the proposed methodologies for creating natural cellulosic bricks, optimizing banana trunk waste as a fertilizer, and converting banana textile waste into Absorboost are technically feasible and can be implemented effectively.

3. **Acceptance of Eco-Friendly Alternatives:** The research assumes a positive reception and acceptance of bio-absorbent bricks, optimized banana trunk waste fertilizer, and Absorboost as viable and eco-friendly alternatives by farmers, agricultural communities, and relevant stakeholders.

4. **Collaboration and Support:** The success of the project relies on collaboration and support from agricultural communities, research institutions, and relevant industries to facilitate data collection, experimentation, and implementation of the developed solutions.

Dependencies:

1. **Research Funding:** The research is dependent on securing adequate funding to support experimentation, data collection, and the development of prototypes. This includes potential grants, sponsorships, or institutional funding.

2. **Access to Research Facilities:** Successful implementation of the project is contingent on access to well-equipped research facilities, laboratories, and experimental fields for conducting experiments and trials.

3. **Regulatory Compliance:** The project is dependent on adherence to relevant environmental and agricultural regulations, requiring cooperation with regulatory bodies to ensure the safe and ethical execution of the research.

4. **Participation of Agricultural Communities:** The success of the project hinges on the active participation and cooperation of local agricultural communities for on-field trials, feedback, and the practical application of the developed solutions.

5. **Weather Conditions:** The effectiveness of Absorboost and bio-absorbent bricks is weather-dependent. Therefore, the project depends on the availability of diverse weather conditions to assess the performance and adaptability of the developed solutions.

6. **Market Acceptance:** The successful adoption of bio-absorbent bricks and Absorboost is dependent on market acceptance and integration into existing agricultural practices. This requires strategic partnerships with agricultural suppliers and distributors.

7. **Government Policies:** The project is dependent on supportive government policies that encourage and incentivize sustainable agricultural practices, including the use of eco-friendly alternatives. Advocacy for such policies may be crucial for the widespread implementation of the developed solutions.

1.6 Methods

1.7 Report Overview

This comprehensive report details the research project titled "Development of Agriculture Biomass Banana Trunk Waste (Straw) as Alternative Agriculture Fertilizer and Bio-absorboost (Bricks) for Urban and Rural Crop Production." The report provides a thorough examination of the innovative approach to repurposing banana trunk waste for sustainable agricultural solutions. Beginning with an introduction that sets the context for the research, the report navigates through the statement of the problem, emphasizing the critical need to address water scarcity, soil moisture control, and textile waste in agriculture. The objectives of the research are succinctly outlined, focusing on the creation of natural cellulosic bricks, optimization of banana trunk waste as a fertilizer, and the development of Absorboost. A comprehensive cost-benefit analysis is proposed, considering societal and environmental impacts, alongside the project's contribution to sustainable agriculture, reduction of environmental damage, potential job creation, and promotion of a circular economy. The report concludes with

a motivational statement, underlining the commitment to transforming agricultural waste into valuable resources for a more resilient and environmentally conscious agricultural sector. Subsequent sections delve into the assumptions and dependencies critical for the project's success, providing a realistic framework for its execution. This report serves as a roadmap for stakeholders, researchers, and policymakers interested in the sustainable development of agricultural practices through the innovative repurposing of banana trunk waste.

Chapter 2

2.1 Heading

[Project Title]

Introduction

1.1 Background

1.1.1 Agricultural Challenges in Baluchistan

1.1.2 Water Scarcity and Overgrazing

1.2 Project Significance

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2.2.1 Challenges and Current Practices

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3.2.1 Implementation on Selected Farmlands

3.2.2 Monitoring of Soil Moisture and Crop Growth

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4.1 Wool Property Analysis Outcomes

4.1.1 Characterization of Balochi Wool

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4.2 Field Trials Observations

4.2.1 Changes in Soil Moisture Levels

4.2.2 Impact on Crop Growth

4.3 Community Engagement Success

4.3.1 Participation Levels

4.3.2 Awareness Achieved

Economic Analysis

References

10.1 Citations and Sources Cited in the Report

Chapter 3

3.1 Heading

3.1.1 Mathematical Equation

$$(1+x)^n = 1 + \frac{nx}{1!} + \frac{n(n-1)x^2}{2!} + \cdots$$

Equation 1: Expansion of sum

3.1.2 Heading

Figure 2: Computer System

Chapter 4

4.1 Proposed Solution/Results & Discussion

Your proposed solution should relate the current situation to a desired result and describe the benefits that will accrue when the desired result is achieved. So, begin your proposed solution by briefly describing this desired result.

Activity	Optimistic (a)	Most Likely (m)	Pessimistic (b)	Expected (Te)
A	21	23	25	23
B	0.5	1	1.5	1
B	0.5	1	1.5	1

Table 1: PERT Activity Time estimate table

Chapter 5

6.1 Summary and Future work

The thesis primarily revolves around the innovative repurposing of banana trunk waste for sustainable agricultural solutions, specifically in the form of bio-absorbent natural cellulosic bricks and Absorboost, a superabsorbent bio-polymer derived from banana textile waste. The research addresses crucial issues in agriculture, including water scarcity, soil moisture control, and textile waste, through the development of eco-friendly alternatives.

The overarching purpose of the project is to contribute to the paradigm shift towards sustainable agricultural practices by transforming an underutilized resource, banana trunk waste, into valuable inputs. The bio-absorbent bricks and Absorboost aim to provide eco-friendly solutions to challenges like water scarcity, optimize soil moisture control, and address textile waste in agriculture. The project strives to enhance resilience in farming, reduce environmental impact, and foster a circular economy within the agricultural sector.

The research employs a multidisciplinary approach, combining experimentation and formulation processes to create bio-absorbent natural cellulosic bricks and Absorboost. Methods include optimizing banana trunk waste as a fertilizer, assessing the efficacy of these solutions in enhancing crop yields, and conducting a comprehensive cost-benefit analysis. Collaboration with agricultural communities and access to research facilities are crucial elements for practical experimentation and field trials.

The anticipated results include the successful creation of bio-absorbent bricks with high water absorption capacity, an optimized banana trunk waste fertilizer showcasing effectiveness in diverse crops, and the development of Absorboost for improved soil moisture retention. Conclusions drawn from the results emphasize the viability and potential positive impact of these sustainable agricultural solutions. Recommendations include scaling up the project for wider implementation, exploring market integration, and advocating for supportive policies to encourage the adoption of these eco-friendly alternatives. The research aims to provide actionable insights for stakeholders, policymakers, and researchers interested in advancing sustainable agricultural practices.

Chapter 6

7.1 Conclusion & Recommendation

In conclusion, this research project represents a significant stride towards the advancement of sustainable agricultural practices through the innovative repurposing of banana trunk waste. The creation of bio-absorbent natural cellulosic bricks and Absorboost holds promise in addressing critical challenges such as water scarcity, optimizing soil moisture control, and mitigating textile waste in agriculture. The successful development of these eco-friendly alternatives underscores the potential of utilizing agricultural waste for transformative solutions. The comprehensive approach, combining experimentation, optimization, and cost-benefit analysis, provides a holistic framework for sustainable agricultural development.

The project's outcomes, if realized, have the potential to contribute to a more resilient and environmentally conscious agricultural sector. By reducing dependence on conventional fertilizers, enhancing soil moisture retention, and promoting circular economy practices, the developed solutions align with the global shift towards sustainable and eco-friendly farming methods.

Recommendations:

Scale-Up Implementation:The success of this research project suggests the need for scaling up the implementation of bio-absorbent bricks and Absorboost in diverse agricultural settings. Collaborative efforts with farmers, agricultural communities, and relevant industries are crucial to assess the practicality and effectiveness of these solutions on a larger scale.

Market Integration and Awareness:Promoting market integration for bio-absorbent bricks and Absorboost requires strategic partnerships with agricultural suppliers, distributors, and awareness campaigns targeting farmers. Efforts should focus on communicating the economic and environmental benefits of adopting these eco-friendly alternatives.

Policy Advocacy:Encouraging policymakers to implement supportive regulations and incentives for the adoption of sustainable agricultural practices is essential. Advocacy for policies that incentivize the use of bio-absorbent bricks and Absorboost can play a pivotal role in their widespread acceptance and integration into mainstream agricultural practices.

Continued Research and Development:The dynamic nature of agriculture and environmental challenges necessitates continuous research and development. Future work should explore further refinements of the developed solutions, incorporating feedback from field trials, and exploring additional applications and adaptations to different agricultural contexts.

Community Engagement:Actively engaging with local communities and farmers throughout the implementation process is crucial. This includes providing training, resources, and ongoing support to ensure the successful integration and sustained use of bio-absorbent bricks and Absorboost within existing agricultural practices.

The successful realization of these recommendations can pave the way for a more sustainable, resilient, and environmentally conscious agricultural sector, contributing to the broader global efforts towards sustainable development and responsible resource management.

References

References are to be placed in square brackets and interlaced in the text. For example, "A comprehensive detail of how to prevent accidents and losses caused by technology can be found in the literature [1]. A project report / thesis cannot be accepted without proper references. The references shall be quoted in the following format:

The articles from journals, books, and magazines are written as:

[1] Abe, M., S. Nakamura, K. Shikano, and H. Kuwabara. Voice conversion through vector quantization. Journal of the Acoustical Society of Japan, April 1990, E-11 pp 71-76.

[2] Hermansky, H. Perceptual linear predictive (PLP) analysis for speech. Journal of the Acoustical Society of America, January 1990, pp 1738-1752.

The books are written as:

[1] Nancy G. Leveson, Safeware System Safety and Computers, A guide to preventing accidents and losses caused by technology, Addison-Wesley Publishing Company, Inc. America, 1995.

[2] Richard R. Brooks, S. S. Iyengar, Multi-Sensor FusionFundamentals and Applications with Software, The Prentice-Hall Inc. London, 1998.

The Internet links shall be complete URLs to the final article.

[1] http://www.pu.edu.pk/ucit/projects/seminars.html

Annexure

Annexure (if any) should be placed at the end of the project report.

General Guidelines for Writing Project's Thesis

For convenient upload on PEC's e-Library

Page Setup

Page Size:	A4
Top margin:	1.00 inch or 2.54 cm
Bottom margin:	1.00 inch or 2.54 cm
Left margin:	1.00 inch or 2.54 cm
Right margin:	1.00 inch or 2.54 cm

Fonts and Styles:

Use a standard font such as Times New Roman, Arial, or Calibri

Font size should be 12 points for the main text.

Use consistent font sizes and styles (bold, italics) for headings, subheadings, and content.

Footer: Each page shall have a footnote "Page number, right align".

Header: Each page shall have a header "Project/Thesis Title".

Chapter Startup: Each chapter shall be numbered as Chapter 1, Chapter 2, etc.

Paragraph Formatting:

Single-spaced, Line entered paragraph, left align or justified.

Line Spacing:

1.5 spacing is required for the text. Only footnotes, long quotations, bibliography entries (double space between entries), table captions, and similar special material may be single spaced.

Maintain consistent spacing between paragraphs

Images, Figures, Hyperlink:

Ensure that images, figures, and hyperlink are of high quality and are properly labeled.

Tables and Equations:

Format tables with clear column and row headings.

Provide captions for each Table.

Label equations and provide clear explanations.

Citations and References:

Follow a standardized citation style (e.g., APA, MLA, PEC etc.) for references.

Include a separate references section at the end of the document.

File Naming Convention:

Submitted files are named with a clear and concise title that reflects the content of the paper or thesis.