REDUCING DEFORESTATION THROUGH GREEN PAPER MAKING

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Abstract:

- Paper is an essential material used worldwide in education, packaging, and industries.
- Traditional paper production heavily relies on wood pulp, which leads to deforestation and ecological imbalance.
- This project proposes an eco-friendly method of making paper from agricultural wastes such as sugarcane bagasse, corn husks, banana stem fibers, and wheat straw.
- The research plan focuses on developing a cost-effective, sustainable, and biodegradable alternative to commercial paper.

Introduction:

- The increasing demand for paper has resulted in excessive cutting of trees, contributing to deforestation and environmental pollution.
- Agricultural wastes are abundantly available and often remain unused or are burnt, causing air pollution.
- By recycling these wastes into paper, we can reduce deforestation, minimize pollution, and promote eco-friendly practices.

Selection of Problems & Background Information

- **Problem Identified:** Deforestation due to large-scale tree cutting for paper pulp.

- **Background:**
    - 40% of industrial wood harvest goes into paper production.
    - Agricultural residues such as bagasse, rice husk, and banana fibers are mostly discarded or burnt.
    - Converting these wastes into paper reduces both environmental impact and waste management issues.

Research Questions:

- Can agricultural wastes be used as a raw material for paper production?
- Which agricultural waste material produces the best quality paper?

Hypothesis:

"If agricultural wastes such as sugarcane bagasse, banana stems, and wheat straw are treated and processed properly, then they can be converted into durable, eco-friendly paper that can serve as a sustainable alternative to conventional paper."

Objectives:

- To utilize agricultural wastes for eco-friendly paper production.
- To reduce deforestation and promote sustainability.
- To compare the quality of eco-friendly paper with conventional paper.
- To design a low-cost, small-scale method of paper production.

Materials Required:

- Agricultural waste (banana stems, corn husk, bagasse, wheat straw, etc.)

- Large container for boiling
- Sodium hydroxide (NaOH) solution (for pulping)
- Water
- Blender / grinder
- Wooden frame with fine mesh (paper mold)
- Cloth or blotting sheets
- Rolling pin or press
- Drying board

Procedure:

1. Collect and clean agricultural waste materials.
2. Cut into small pieces and boil in NaOH solution to break fibers.
3. Wash thoroughly to remove chemicals.
4. Grind into fine pulp using a blender.
5. Dilute pulp with water and spread evenly on the mesh frame.
6. Remove excess water, press with a rolling pin.
7. Dry under sunlight or press dry between sheets.
8. Peel off the eco-friendly paper sheet and test its texture and strength

Step-by-step: Make the paper

1. **Prepare the plant fibers**
    - Chop or tear the agricultural waste into small pieces (adult help). If it's fresh and watery (banana stems), dry a little in sun for a few hours so it's easier to cut.

2. **Soak**
    - Put the chopped fibers in a bucket, add hot (not boiling) water and a tiny drop of dish soap. Let soak for **12–24 hours** (longer softens fibers).
3. **Make pulp**
    - Put small handfuls of soaked material plus water into the blender (fill with ~half water). Blend to a smooth mush — that's your pulp. Do this in batches. If pulp is too thick, add water. Add some shredded scrap paper into some batches to compare.
4. **Add binder**
    - If your paper falls apart when dry, mix in a little white glue (1–2 tbsp per blender batch) or 1–2 tbsp cornstarch paste (mix cornstarch with warm water until smooth). This is a variable you can test.
5. **Form the sheet**
    - Put a cup or two of pulp in a tub of water (pulp spreads better in water). Dip the mould & deckle into the tub horizontally, lift it so a thin layer of pulp sits on the screen. Shake gently to even it out.
6. **Drain & couching**

Lift the mould so water drains off. Place the mould face down on a clean cloth. Use a sponge to press and soak up extra water through the screen.

- Then carefully peel the wet sheet from the screen onto another cloth or piece of wax paper (this is called "couching").

7. **Press**
    - Stack a few sheets between towels or cloths. Press with a rolling pin or place under heavy books for 20–60 minutes to remove more water.
8. **Dry**
    - Carefully separate the sheets and let them dry flat in the sun or in a warm place for 24–48 hours. Once dry, gently peel the paper off the cloth.
9. **Finish**
    - Trim edges with scissors. If needed, iron (adult) on a low setting between cloths to flatten.

Observation Table:

Sample ID	Fiber type	Scrap paper %	Binder (yes/no/type)	Thickness (mm)	Drying time (hrs)	Strength (clips)	Fold count	Absorbency (secs)	Notes
A	Banana	0%	None						
B	Banana	50%	None						
C	Bagasse	0%	Glue						

Pie Chart – Possible Raw Material Contribution

- Sugarcane Bagasse – 35%
- Banana Stem Fibers – 25%
- Wheat Straw – 20%
- Corn Husk – 20%

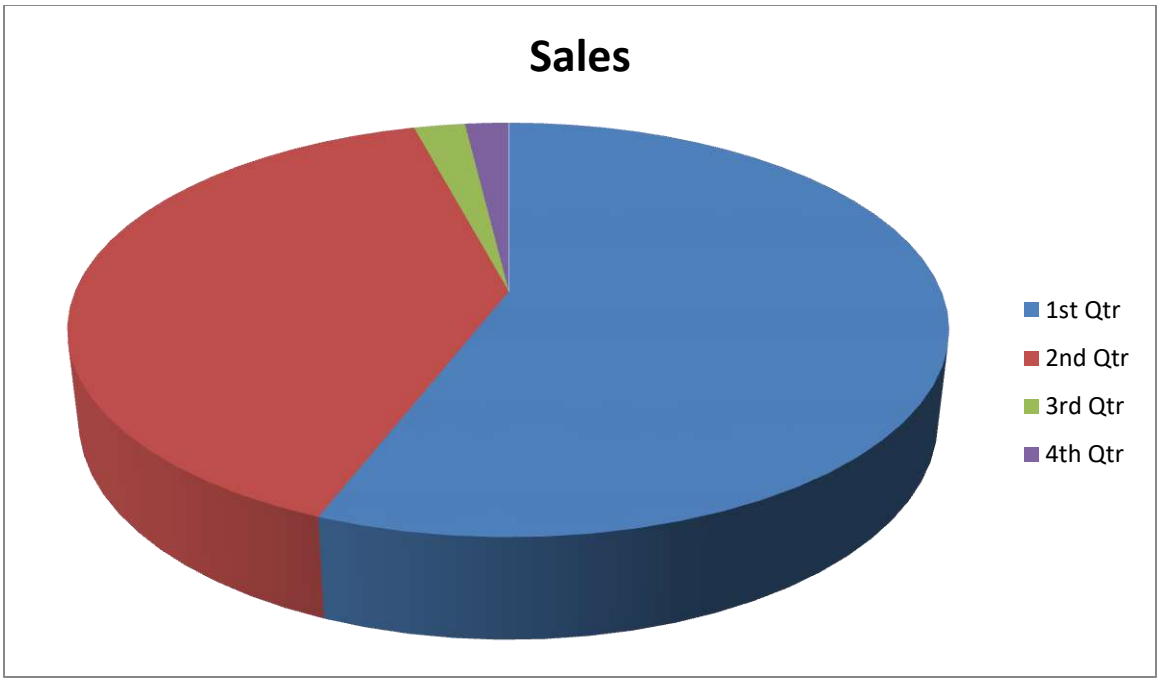

Table – Comparison of Eco-Friendly Paper vs. Conventional Paper

Property	Eco-Friendly Paper	Conventional Paper
Raw Material	Agricultural waste	Wood pulp
Cost	Low	Higher
Environmental Impact	Eco-friendly	Deforestation
Strength	Moderate–High	High
Biodegradability	100%	80–90%

Risk and Safety:

- Use gloves while handling NaOH solution to avoid skin burns.
- Ensure proper ventilation during boiling process.
- Dispose of chemical waste safely.
- Use protective goggles while grinding and pressing pulp.

Primary Function:

To recycle agricultural wastes into eco-friendly paper that reduces deforestation, minimizes waste burning, and supports sustainable living.

Expecting Results:

- Production of durable, biodegradable paper from agricultural waste.
- Reduction in cost compared to conventional paper.
- Better utilization of agricultural residues.
- Promotion of eco-friendly alternatives in schools, offices, and industries.