

**IDEA TO PRODUCT: EXPERENTIAL LEARNING TO BUILD
SUSTAINABLE BUSINESSES**

**Fabricating Biodegradable Packaging & Sanitary Towel
through Utilization of Seaweed and Banana Waste:
A Value Addition Strategy**



Building a green business



COMMERCIALISING BIODEGRADABLE PACKAGING & SANITARY TOWELS

VISION: BUILDING SUSTAINABLE BUSINESSES IN SUBSAHARA AFRICA

GENESIS OF THE INTEREST:

Training Trainers in Entrepreneurship promotion across African countries revealed:

- Majority of the youth started “trade” survival business—
- Innovators were having challenges commercializing their innovations
- **Youth unemployment –increasing**
- Many challenges that could potentially become new avenues for building enterprise.
- Micro and Small enterprises were not surviving their 5th year birthday



In Djibouti & Madagascar TVETs in technical skills & Entrepreneurship



Entrepreneurial Training in TVETs-Djibouti



Business 1. AIRFRESHNER TEAM – CONTRACTED BY EDUCATION MINISTRY & CURRENTLY MAKING MONEY



PATESSERIE: SNACKS & CONFECTIONARIES

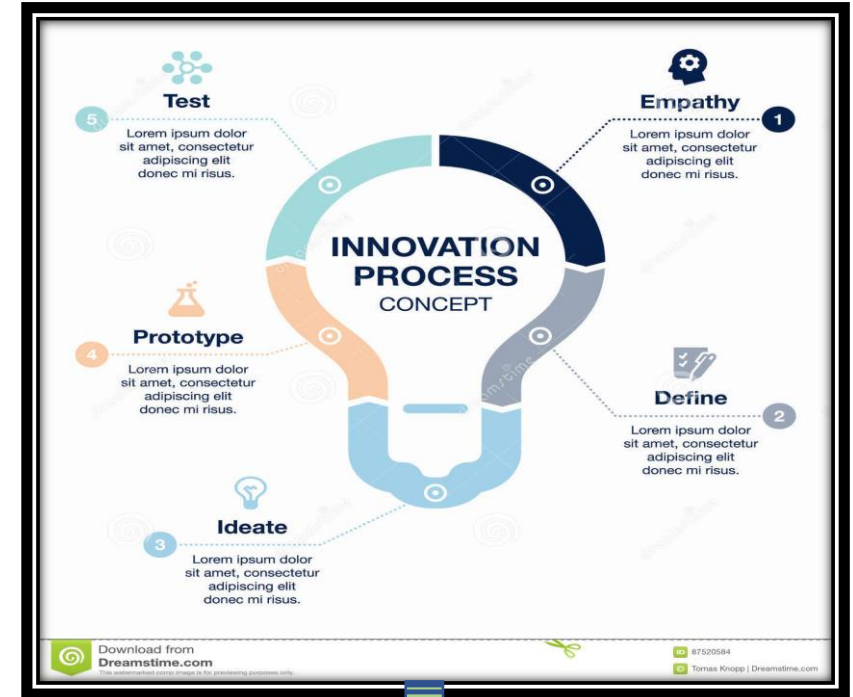
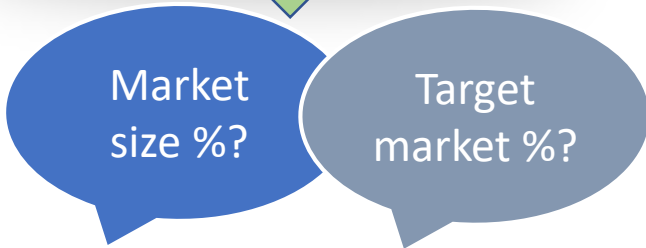
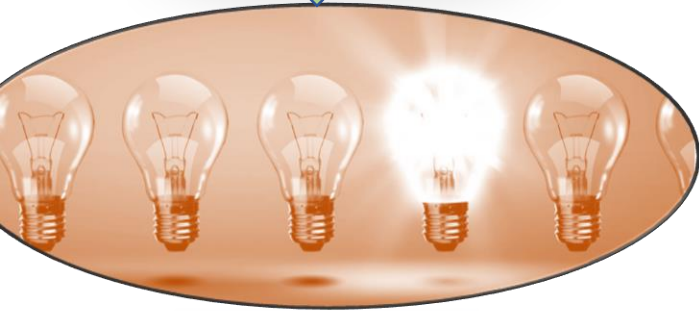


Technical skills used into start a business

From Innovation to Entrepreneurship



How can we partner with TVETs in technical skills & Entrepreneurship?



The Challenge :Packaging in the low income Traders



Caroline has to buy her vegetables daily & the vendor needs versatile packaging

Defining the problem to be solved(SDG 8,9,13,14 &15)

What is the problem?

- Environmental micro-plastic pollution-low density plastic
- Micro plastics in marine food such as fish,lobsters yet biomass can be used (Eriksen et al., 2014; Thompson, 2015; Wilcox, Van Sebille, Hardesty, & Estes, 2015; Worm, Lotze, Jubinville, Wilcox, & Jambeck, 2017).
- Sanitary disposal - an environmental challenge due to the non-biodegradability of the products (Kangwana, Muthengi, & Austrian, 2020; Okunola A, Kehinde I, Oluwaseun, & Olufiropo E, 2019; Sampa et al., 2021)

How can we partner with TVETs (technical skills & Entrepreneurship)?

Key objectives

1. Carry out a pre- market -determine consumer needs and preferences in packaging & sanitary towels.
2. Use banana waste to fabricate packaging material
3. Use sea weed (carrageenan) to develop hydrogel
4. Prepare a 100 kg hydrogel through crosslink modified carrageenan with hydroxyethyl cellulose for use in sanitary towels.
5. Develop cellulose based impermeable film from banana pseudo stem(bio-plastic).
6. Enhance anti-microbial properties of the sanitary towel using locally available plants.

These components will be added to enhance a biodegradable sanitary towel material.

THE TEAM & PARTNERS



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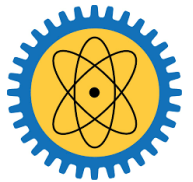
Dr. E.Wanzala
Kenyatta univ.



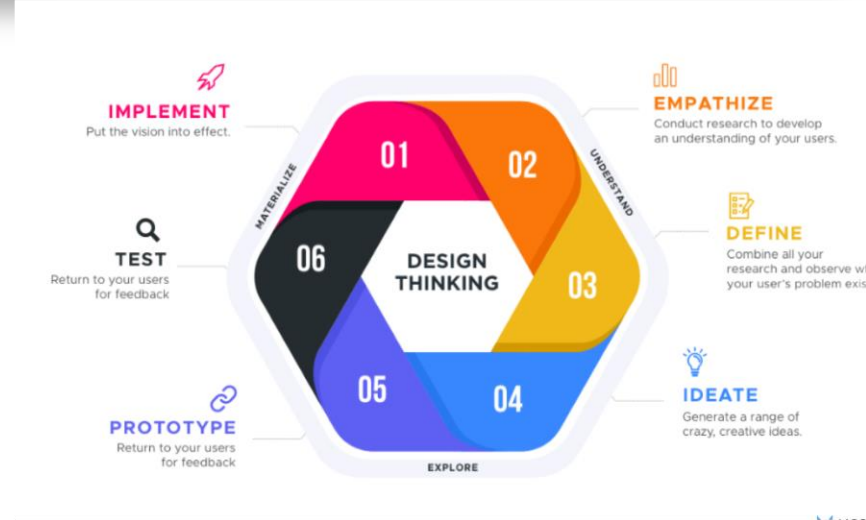
Biodegradable Sanitary towels & packaging (Moi, KIRDI, KU)



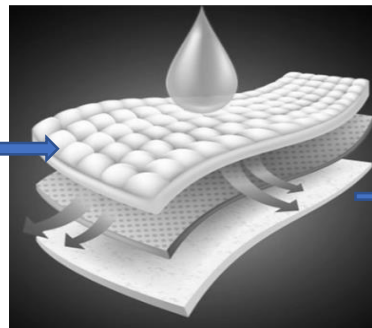
Hydrogel project



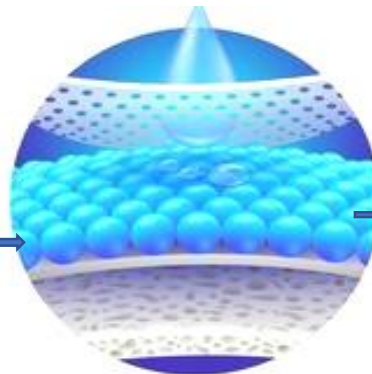
Roadmap-Design Thinking Approach



Step 1-Pre-market survey to establish needs



Step 2-Prepare 3-layer sanitary towel fabric from banana pseudo stem pulp



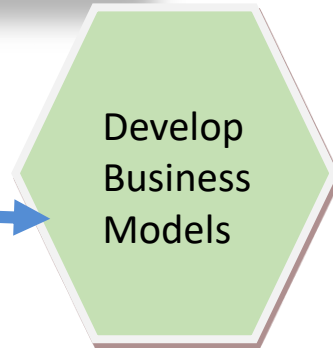
Step 3-Impregnate the middle layer with cellulose based hydrogel beads and aloe vera/ neem droplets. Incorporate bioplastic impermeable sheath at the base.



Step 4 - heat seal the three layers to create final biodegradable sanitary towel.



Step 5- iterate product to make final sanitary towel samples



Step 6- make business models to commercialize

What is the Market Need?-Pre-market Survey

Pre-market Survey

- 400 students from schools in low income areas: Kibera, Nakuru & Gatundu
- Key highlights- Cost, irritation, stigma & lack of hygiene education awareness
- **Not aware of micro plastic pollution**
- Require more absorbency especially for night.
- **Cost-Unfordable when out of school**
- **Micro businesses-cheaper packaging**



Packaging Design-Light, normal & heavy flow

What steps have we undertaken? Machinery Fabrication- Kenya industrial Research & Development Institute(KIRDI)

Partner with TVETs (technical skills in Engineering)-work with my team on the ground



What steps have we undertaken? Fibre extraction

(Masters-Fashion)



Decorticating process with machine fabricated at KIRDI



Extracted fiber, washed and cleaned to remove lignin remnants



Decorticated banana fibre, ready for pulping

Step 2-Fabricating the Absorbent core (NRF)



(PhD-Chemistry)



TVET students assisting in decorticating

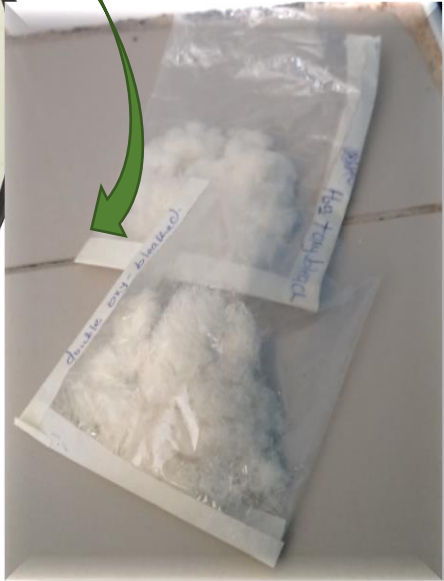
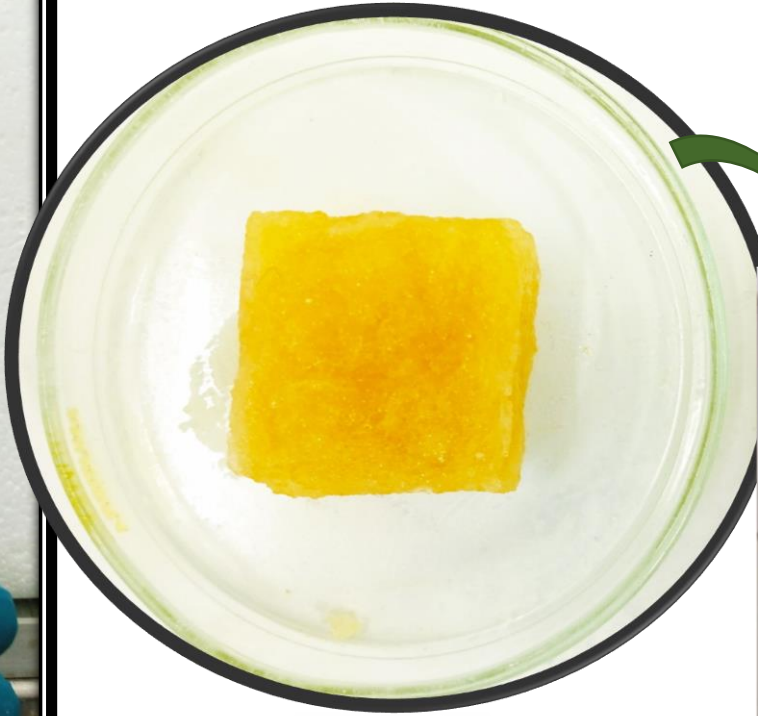
Hydrogel to increase absorbency



(PhD-Chemistry)



Hydrogel-swelling measurement of the hydrogel



Impregnated into the absorbent core material

Development of Antimicrobial properties



(Ph.D-Chemistry)



- Crude extracts of neem leaf powder, stem bark powder.
- Stoppered containers and stored in the fridge.

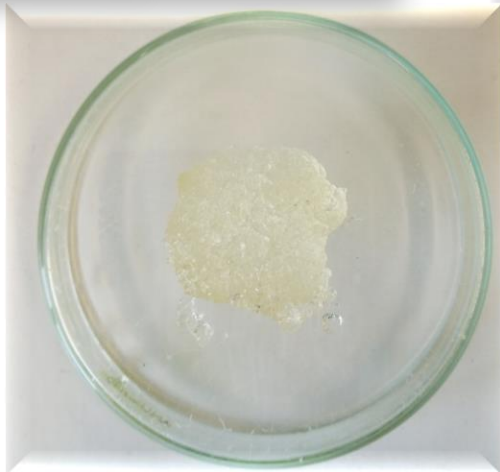


Key Results-Bio-plastic Prototype

Composite films prepared from different polymer matrices



(PhD-Bio-Chemistry)



What is our Social Media Strategy?

PROTOTYPE



YouTube

BLOGS

[Her \(@knowallabout her\) • Instagram photos and videos](#)



Feeds, stories, messages-pay for ads- automatic & placement
Short videos
Reels
Blogs
Data analytics-done

Lessons Learnt

- **Collaboration across different disciplines- working in a multidisciplinary team** -(Engineering, chemistry, material science, pharmacology, Fashion marketing & entrepreneurship)
 - Lesson- Leadership & communication skills. Resilience
- **PhD & Masters Students- Working with a team of students**
 - Lesson- Experiential learning(learning by doing) –knowledge transfer

Partner with TVETs for technical skills and mentor TVET students in innovation & entrepreneurship.

- **Planning & development- Iterative process requires –Design thinking**
 - Lesson- be flexible and embrace newer innovative approaches.
 - Building a business- (partnership with manufacturers, TVET, licensing, building a business from scratch)

Conclusion-Next Steps

PROTOTYPE

Continue with the prototypes- use different fibre, hydrogel, bio-plastic & metabolites compositions to get MVP

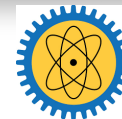
TEST

Carry out Tests- Absorbency, Biocompatibility etc.
KEBS standards & get market feedback & iterate to get beta products.



APPRECIATION

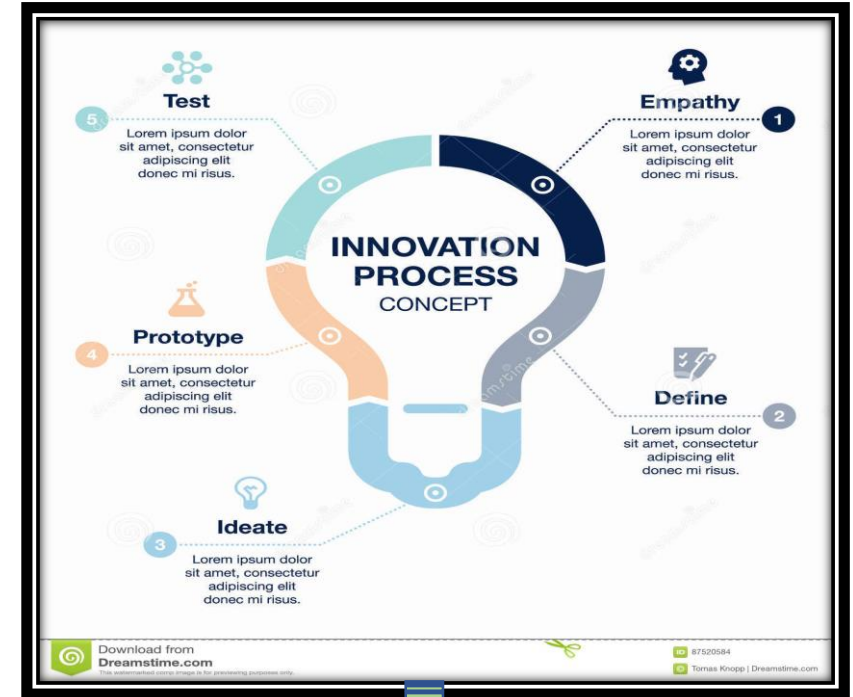
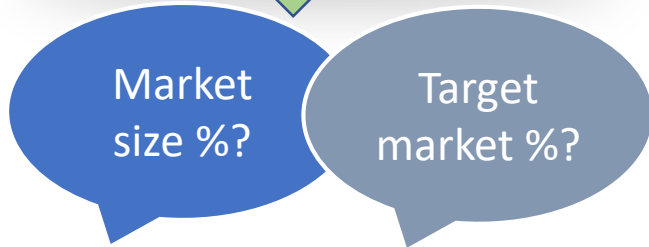
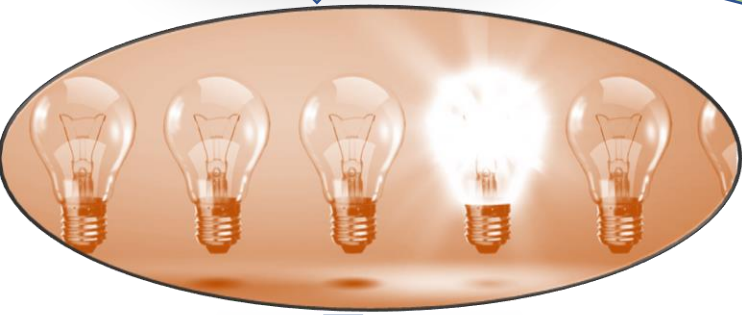
- Team- for the collaborative work R2C
- PhD Scholars & Undergraduate Marketing team
- Kenyatta university Research Innovation & Outreach Office
- RSIF team & ICIPE Team, NRF, Kenia



From Innovation to Entrepreneurship



Partnering with TVETs (technical skills & Entrepreneurship)



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Thank You

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