

Banana Pseudo-Stem Face Masks as Post-Pandemic Future Business Venture

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Abstract- The world's constant combat towards global issues such as climate change, pollution, violence, security, terrorism, etc., all rooted from danger inflicted activities or interests has taken its toll accelerating our extinction. The list goes on and in just a snap, we were all consumed by the infamous COVID-19. This pneumonia-like disease has launched a global economic tsunami and disruption to our lives that was later on declared as a pandemic. With no available cure yet, there were few safety measures practiced globally namely social distancing, quarantine, and mass testing. In order to contain and avoid further spread of the virus, we were forced to adapt to the new normal. Personal Protective Equipment (PPE) has become an inseparable part of our daily lives ergo, the increase in PPE production, which is considered inevitable, leads to a surge in global plastic waste. COVID-19 waste has become a new form of pollution caused by mass production of single-use PPE with no structured waste management that floods our ocean beds. Manufacturers are now looking for alternatives to decrease plastic waste and to shift to a more sustainable and circular PPE ecosystem. Philippines, as the second top exporter of bananas in the world, would a banana pseudo-stem fiber be the most promising business venture opportunity at post-COVID stage?

Indexed Terms- Face mask, pollution, PPE, banana, fiber, COVID-19, business venture

I. INTRODUCTION

The world has been battling climate change caused by plastic pollution for years now. Into the bargain, the pandemic has further contributed to the current predicament. The use of Personal Protective Equipment (PPE) such as disposable face masks, gloves, etc. serves as a new hygiene habit and protection against the virus resulting in 300% increase

in demand at the pinnacle of this pandemic. Massive waste from discarded PPE from the health-care facilities and the general public is continually growing as we approach the post COVID stage.

The Philippines is known as the second largest banana exporter in the world producing approximately 3.5 million metric tons of bananas annually. Bananas are considered the most useful and significant plant in the world. All parts of it like its fruit, flower bud, trunk, leaves and pseudo-stem can be used for various purposes. The banana pseudo-stem has natural cellulose fiber that is elastic that makes it suitable in producing textiles, diapers, and even bank notes. Its eco-friendly attributes make it the best alternative for an artificial polymer matrix which is a thermoplastic or a thermoset material generally known as glass reinforced plastic (GRP).

The worldwide production of plastic was recorded at 367 million metric tons in 2020. The statistic shows enormous opportunity for the utilization of cellulose fiber as an alternative. With a soaring demand for face masks as basic PPE, face masks made from pseudostem fiber are environmentally friendly as it can potentially decrease growing COVID-19 PPE waste, and economical as it supports job growth of farmers.

II. STATEMENT OF THE PROBLEM

Our reliance on personal protective equipment (PPE) as primary health-care supply to control the spread of the virus consequently aggravate the global waste. About 1200 percent increase in demand on medical mask manufacturing was observed in December 2020 that leads to shortage to the general public. Most PPE is considered cheap, single-use, and contains ranges of different plastics. They are not compostable and can last forever. The immortality of the plastics along with the sudden increase in PPE production has pushed

manufacturers and researchers to innovate material science that can make disposable PPE such as masks, gowns, and gloves reusable and eco-friendly. The approach involves exploring organic, renewable, bio-based, recyclable materials such as banana plants.

Over the past decades, the face mask has been the best protection against diseases. This is mandatory to all frontliners like health workers, police and people related to health care even the general public to protect the face and nose from contamination. Its main objective is to block viruses through droplet transmission. One of the most important attributes of a face mask is its filtration ability.

Banana pseudostem fiber as sustainable PPE promises the future of reduced global waste but with the recent advances in mask engineering, emerging discovery of new materials, etc., how marketable and sustainable banana pseudostem is as a business venture at post pandemic? Moreover, what are its advantages and disadvantages to consider?

III. COURSES OF ACTION

Banana plants belong to the family of Musaceae that typically grow in tropical and subtropical countries of South-east Asia. It is considered the most useful plant as almost all of its parts can be exploited from its fruit, leaves, peel, leaves, stalk, flower to pseudo-stem for different applications such as flavoring, coloring, thickener, livestock feeds, organic fertilizer, nutrient source and fibers.

Banana fiber, a lignocellulosic fiber, is a natural bast fiber used in artisanship products such as baskets, bags, rope, twines, mat, etc. Only 10%-12% of its pseudo stem is being utilized in making other products; anything in excess is discarded or used as a fertilizer. Its properties such as impermeability, hygroscopicity, UV protection and filtration efficiency makes masks made from pseudostem fibers environmentally friendly, economical, and recyclable.

The nanofiber from the banana peel is synthesized through various methods such as preparatory treatment by hand stripping then grinding it through a mixer, then subject to chemical treatment under 1% Sodium Hydroxide then to be washed with 1% Acetic

Acid and water afterwards. The soaked pile will be placed under sunlight for 1-2 days or for faster production in 100°C to 120°C for 4-5 hours. It will be added to a starch solution and shaken multiple times. Banana fibers are chemically composed of 60% cellulose, 19% hemicellulose, 5% lignin, and others making smaller solid biomass. Banana peels underwent pretreatment through thermal and medical characterization, chemical and mechanical analysis, then dissolution methods like infrasound and cryogenic grinding to extract nano fibers to be used in making masks. Nanocellulose from banana pseudostem has immense potential as bioplastic which is recyclable and compostable.

Face masks are usually made with 3 layers - an inner, outer, and filter layer. Masks made from banana pseudostems or biomasks went to filtration efficiency tests that focused on air permeability, water absorbency, and water repellency. Moreover, its antibacterial properties, bacterial penetration and breathability. Mann-Whitney U Test was used to measure the mentioned characteristics. It confirms 3-layer or 4-layer biomask is favorable at a rate of 95 out of 100 in terms of water repellency with a baseline of 70 out of 100, and air permeability of 0.001 compared to baseline of 0.05. Given its high air permeability, the banana fiber filters can provide extra comfort in terms of breathability. However, it lacks efficacy on water absorbency. It shows that the water is being absorbed for 60+ seconds compared to the baseline of less than 55 seconds and this may result in discomfort to the wearer.

Results show that banana pseudostem made masks met and somehow exceeded the baseline standards for facial masks. Water repellency measures the effectiveness of biomask against droplet-based transmission vectors which are common in respiratory illnesses like COVID-19. Air permeability is crucial to ensure the wearer can breathe easily. Although water absorbency is almost at par with the baseline, bioface masks are still a safe and acceptable alternative.

CONCLUSION

The heightened demand on Personal Protective Equipment such as face masks has produced enormous global waste in addition to the existing.

Approximately 5 billion people have added to the waste volume since pandemic hits. This challenge has led to the manufacturers and researchers to innovate mask engineering and exploit organic and raw materials to produce cheap, recyclable but quality masks. Natural composite fiber from banana pseudostems can be an alternative for polymer compounds commonly found in plastics. Banana pseudostem masks have the potential to be an alternative face mask. It is cheaper than usual surgical masks, more environmentally friendly as the materials are compostable, and with its strong fiber, it can substantially protect us from the virus.

COVID-19 virus is expected to stay and continue to mutate as time goes by. This is a great business venture opportunity worth investing in. No country can sustain the increase of ongoing demand for medical supplies like face masks, hence trading is essential. Advantages of biomasks are not only limited to the agricultural sector but also transportation infrastructure, logistics, manufacturing, and as well as stocks.

With all the challenges continuously piling up with the pandemic, nothing can stop innovative entrepreneurs and businesses to quickly pivot to meet the increasing demands for masks. Not just limited to humanitarian reasons but also a new source of revenue amid the economic tsunami. Business owners take advantage of the masks and use it as a powerful tool to attract new customers to their stores, products, services and websites. Few companies have found themselves growing as a result of mask ventures. It results in hiring more full-time and temporary workers and increases new partnership opportunities, vendors, and suppliers.

To all COVID-19 inspired entrepreneurs and business owners who see opportunities and breed innovation amid crisis, the two questions you must ask yourself are: “Are we providing an innovation that everybody is passionate about?” and “will there be enough customers to grow a business with at post-covid future?”. Both answers are affirmative towards the maximization of banana pseudo-stem made masks as it is environmentally friendly and economical.

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