Social and Economic Management of Pine Leaves

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Abstract: Recycling pine leaves is an environmentally friendly alternative to generating organic waste that contributes to environmental degradation and takes up space within landfills. If pine leaves were to end up decomposing in landfills, they would generate greenhouse gases and contaminate the environment, and that is prevented by them being recycled instead. Pine leaves contain valuable nutrients that can be used to produce an order for organic fertilizers, making them a good substitute for artificial fertilizers, recycling the leaves also improves soil quality, making it conducive to healthier plant life. By recycling pine leaves, a resource cycle is established nut begins to run. In turn, the establishment and operation of pine recycling facilities create employment opportunities within local communities. The collection, transport, and processing of pine leaves in recycling facilities create jobs during the recycling chain, which ranges from collection to transportation, processing, and distribution, and that means the recycling of pine leaves can contribute to the growth of local economies and the development of local communities. Recycling pine leaves can also be a cost-effective replacement for traditional waste disposal methods and is a strategy that saves municipalities and businesses money on waste disposal costs and the cost of building and running expensive waste disposal facilities. The contribution of pine leaves to recycling processes represents a redirection of waste streams that is central to the establishment and operation of a circular economy, and which is more efficient and resilient than the current linear economy. Pine recycling initiatives require community participation, which creates a sense of environmental responsibility that can lead to local pride. These values, in turn, promote social cohesion and security. Educational programs on recycling and sustainable lifestyles that may be integrated into pine recycling initiatives can also enhance environmental awareness and social cohesion. In conclusion, the benefits of recycling pine leaves are multi-faceted; the practice maintains the environment, conserves resources, creates employment, returns nutrients to the environment, improves soil quality, saves money and space, encourages community participation, and reduces carbon footprints, and is thus consistent with nearly all socioeconomic development objectives. The implementation and support of pine recycling initiatives will enhance the overall well-being and sustainability of local and global communities.

1 INTRODUCTION

Recycling pine leaves, also known as pine needles or pine straw, has the potential to generate many socioeconomic benefits that enhance both environmental sustainability and economic well-being. Pine leaves are a common consequence of forestry and landscaping activities, and recycling offers a comprehensive waste management solution. A presentation of the connected financial benefits takes after- 1. Ferreira-Santos P, et al. (2005).

Natural Preservation: Keeping pine cleared out of landfills decreases the natural effect of trash transfer. This incorporates brought-down volumes (lessening of landfill burden) and outflows of poisonous gasses, such as methane, bringing down the general natural impression.

Soil Wellbeing Advancement: When reused as mulch or natural matter, pine takes off and gives natural fabric that can advantage soil wellbeing. They upgrade soil structure, dampness maintenance, and supplement substance, empowering more beneficial and more beneficial plant advancement while moreover developing economical horticulture strategies- 2. Mármol I. et al., (2019).

Disintegration control and water preservation: Utilizing reused pine takes off as mulch makes a difference to dodge soil disintegration. The covering of pine straw settles the soil, limiting water runoff and boosting water invasion, both of which are basic to water preservation endeavors, particularly in drought-

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prone zones or those encountering water shortage challenges.

Financial changes: The reusing of pine clears out making chances for nearby endeavors to accumulate, handle, and showcase reused pine straw items. The industry has the potential to supply work, with occupations in collecting, handling, and conveying reused pine taking off profiting territorial and nearby communities- El Omari N, et al., (2020).

Bolster for the Scene and Cultivation Industry: Landscapers and horticulturists utilize reused pine takes off as cost-effective, long-lasting mulch. The accessibility of these reused pine straw items decreases the request for manufactured options whereas too advancing the development of plants and trees, contributing to the common magnificence of urban and country settings- Chiu H.F. et al., (2019).

In expansion to this, communities can be included through instruction. Reusing pine clears can be advanced as a technique to empower communities to receive environmentally advantageous propensities. Instructive programs can be made to educate the benefits of reusing, raising mindfulness of its positive effects and creating intrigued in eco-friendly hones; cultivating a sense of natural awareness that leads to a community-driven decrease in squandering and advancement of preservation.

As already expressed, the financial benefits of reusing pine take off expand past squander administration to incorporate natural preservation, moved forward soil wellbeing, financial action, and prospects for financial advancement. It can also include communities and empower community-led preservation- Yang H., et al. (2021).

Finally, the socioeconomic benefits of recycling pine leaves go beyond trash management; as an enterprise, it may assist environmental conservation and better soil health, as well as engage communities in increasing awareness and generating community-driven conservation efforts. Recognizing and properly appreciating these benefits is likely to pave the way for more sustainable and economically feasible strategies that improve the environment while also aiding local community economic growth- Kim K.Y., et al., (2000).

2 LITERATURE REVIEW

This has been a big idea in Uttarakhand state for the past few years because of losses caused by forest fires and because of the promotion of organic farming, which the state's current chief minister has made a priority. This is because pine spp predominates at high altitudes (>1000m), which is one of the main causes of the state's frequent forest fires because pine needles are most likely the burning raw material. As they start to burn, pine needles are more likely to break and catch fire; this is comparable to how something shines more when it is more polished. Pine needles are combustible once they catch fire because they contain waxes and resins- Postu P.A., et al., (2019).

It fills it in when submerged in water, and it covers the whole forest floor during a forest fire. Thus, pine needles, lantana shrubs, and other tree waste litter (rubbish) can be used to produce biomass energy (white coal + vermin compost) for productive uses, thereby reducing the risk of forest fires. After that, all of this biomass (pine needles, waste leaves from other trees, waste dry wood, and lantana shrubs as raw material) can be gathered by a community project and collected from the forests- Kurti F., et al. (2019). This biomass can then be processed into vermin compost and white coal briquettes (high-density biomass), which will help to commercialize the biomass.

Forest fires are a common occurrence during the summer in the northwestern Himalayas, keeping residents and foresters on edge. Aside from causing enormous damage to flora and fauna, they are a major contributor to climate change, since several hectares of green cover gradually become a major cause of forest fires. Pine needles, which are the leaves of pine trees, are extremely flammable due to the presence of turpentine oil- 10. Venkatesan T., et al., (2019).

A single spark and high temperature are sufficient to ignite them. Pine is widely dispersed over the world. A total of 120 pine species have been recognized, with the top 40 identified in each country. Pinus roxburghii is the botanical name for the pine found in Asia's Himalayan area, including India (I), Bhutan (B), China (Ch), and Afghanistan (A).

It is frequently referred to as Chir Pine. Keeping in mind its elemental nature, all countries have adopted some common management practices for pine bio residue in the form of pine needles, such as raking, lifting from the forest floors, and use for various local purposes such as manure, animal bedding, fire control, electricity generation, and so on- Postu P.A., et al., (2019). Pine bio residue is renewable and has the potential to alleviate global energy crises due to its environmental compatibility. The authors have also proposed using pine needles as a green energy source- Mármol I., et al. (2019).

Approximately 2 million tonnes of trash (pine needles) in the form of dry biomass are produced by Uttarakhand's pine forests. A dense layer of fallen pine needles inhibits the establishment of green grass.

The locals set fire to the pine debris because they want lush grass to feed their cattle. Forest fires caused by dry pine needles are the leading source of greenhouse gas emissions in the atmosphere- Venkatesan T., et al., (2019).

In this form, it emits about 500 million kilograms of CO2 into the atmosphere each year. The Indian government implemented several policies and measures to combat forest fires. Some of these policies and actions include the Indian Forest Act of 1927, the Forest Conservation Act of 1980, the Forest (Conservation) Rules of 1981, and the National Forest Policy of 1988.

Every year, 600 million trees, mostly pines, are cut down in the EU and distributed around the world. 45% of the stock grows in industrialized, man-made forests. Pine is mostly used for lumber since it grows quickly and is inexpensive, making it widely employed in the construction sector, furniture manufacturing, and paper production. But trees contain more than simply timber. If the entire tree could be eaten and consumed, demand for wood and other raw materials would be significantly decreased. The authors investigate the use of pine needles as an alternative material for a variety of applications. Pine needles account for 20-30% of total tree mass: while the branches are used for biomass to generate energy, pine needles are left over because their high raisin content prevents them from being burned, and billions of needles are thus left behind each year, drying or rotting in forests after pine trees are cut down.

Wildfires engulf millions of hectares of forest in the Indian Himalayan area each summer. The highly inflammable pine needles that litter the forest floor are a primary cause of fires. A social venture in Uttarakhand is attempting to reverse this by collecting needles and converting them into big semi-fermented masses, which are then used to make methane. This is designed to prevent forest fires, create local jobs, and offer a more reliable power source to the region.

This master's dissertation attempts to answer the questions of what the model contributes to sustainable development and whether it is suitable for scaling out. The study creates a local sustainability assessment framework to evaluate the operation's current performance, impact on people and the forest, and future hazards. Interviews with a wide range of stakeholders in the field, observations, a household survey, and a literature analysis reveal the significant hurdles of using pine needles for energy, as well as the project's early visible triumphs. This study aims to bring the complexity of sustainable development 'in practice' to life by grounding them in the reality of a social company.

Pine needles are a major cause of forest fires in India's western Himalayas. One of the forest bio residual choices is to carefully find ways to use these pine needles. Pine needles can be used to make briquettes, which are a valuable type of renewable energy source. There is a need to employ this type of renewable energy since it has low carbon emissions, has very few technological interventions, is easy to access, and provides direct benefits to the community. The goal of this study is to list, categorize, and rank the enablers that promote energy generation with dried pine needle briquettes.

This research uses the fuzzy Analytic Hierarchy Process, a multi-criteria decision-making approach, to rank such enablers. It discovers that among the technology enablers, those interventions will operate when mediated by a set of technological enablers, and therefore technological enablers are critical to unlocking the potential of dried and fallen pine needles for energy generation. The third category of enablers is those that affect the environment on multiple levels.

The third significant set of enablers is market-related, which comprises the industry's strong demand for pine needle-based bio briquettes, a viable fuel linkage, and a sense of business strategy among the principal actors. The economic enablers include the ability of such initiatives to produce employment, offer supplemental income, and promote a sense of self-sufficiency, making them enticing enough for individuals to accept.

Finally, government and social and community-based facilitators are critical, and their existence is often overlooked in such efforts. This is the first study of its type. No research has identified, classed, or ranked these enablers for the generation of energy from pine needles in Uttarakhand. The document has the potential to help accomplish the United Nations' Sustainable Development Goals for 2030, which include climate action and affordable and sustainable energy.

3 MATERIALS AND METHOD

The pine leaves are dropped from the pine trees after a particular time. These leaves remain lying idle in the forest of Kumauni in Uttarakhand. The lying leaves became dry after some leaves. The oil contents are present in the leaves. In summer, this dry leave become the main reason for fire in the forest. When the fire is expanded in the forest, these leaves work as

fuel to the fire. If these leaves are done collect from the forest and buy from the labour collector. It may be the employment for the labour.

This device is a portable recycling machine of waste pine leaves. The purpose of this machine is to make the board (just like a wooden board) by recycling waste pine leaves. The size of the machine is adjusted in such a way that it may be used domestically.

The machine has six main components. These are as follows:

The first component is the weighing scale. This component works with a weighing sensor. As the waste pine leaves are kept in the area, the machine will start to work after a particular weighing limit. This component will be adjusted on the top of the machine. The second component of the machine is the cutting machine. The cutting blades will cut the waste leaves into small pieces. The purpose of this section is to convert the waste leaves into small pieces of the same size. The third component of the machine is the shredder machine. The uniform pieces of the waste leaves will be shifted in this section. The blades of the shredder machine will convert the waste leaves into very small pieces.

The fourth component of the machine will be a pulp-making section. In this section, the machine will make the pulp of the leaves. The pulp of the leaves is converted into a layer. The screw press machine help to make the surface of the layer of pulp smooth and hard. The screw press device helps to remove the moisture. The final product of this machine will be in the form of a board of pine leaves just like a wooden board. The power is generated by the solar panel, which is situated on the top of the device. To charge the battery through a solar cell, the given device should be put on the roof of the home or in an open place.

4 RESULTS AND DISCUSSION

Please find below an example of how waste-to-wealth can be a robust tool in socio-economic conversation. This example is by recycling waste pine leaves, and the socio-economic outcome and conversations can be:

Environmental Conservation Reduced Landfill Pressure: Recycling waste pine leaves reduces the pressure on landfills from organic material and addresses the pollution of the environment.

Soil Health Improvement: Waste pine leaves when composted or made into an organic fertilizer nourish the soil with nutrients and improve its structure.

Economic Opportunities Work Creation: The process of waste collection to processing uses a lot of human labor meaning work for those collecting the waste, driving vehicles, sorting, processing, etc.

Small Business Development: The entry of waste pine leaf recycling introduces small businesses like waste processing, composting, and products created for recycles. There is also potential for the recycling of pine leaves to be used as a raw material in industries to reduce resource requirements for production and further the conservation of resources. The recycling process would require far less energy than manufacturing the same from raw mined products saving significant amounts of energy and the resultant greenhouse gas emissions. Through such measures, the community learns and becomes more environmentally responsible and sustainable by understanding the issues from seeing them, and so discrimination between news and fake news is almost automatic.

Community Participation: Engaging local communities in the recycling of their wastes builds community pride and place attachment leading to a happier, more sustainable, and environmentally caring community. Recycling of remnant pine leaves can be an annual saving in landfill space and direct operational costs for a town.

Business Cost Reduction: When businesses use recycled pine leaves, they may find it costs them less than when they use other raw materials.

Product Invention: The recycling of pine leaves may assist in the invention of new products that can be commercialized and are sustainable.

Market Expansion: With recycled pine leaf products, some new markets may be opened particularly for environment-concerned people leading to growth in the green economy. Government policy and incentives

Policy Support: Governments can support waste recycling through a variety of policy initiatives including supporting particularly good examples, tax breaks, and subsidies to green businesses.

Regulatory Compliance: Mandatory recycling from businesses can rapidly make waste management more sustainable.

5 CONCLUSION

The proper management of waste pine leaves delivers socio-economic benefits well beyond the environmental conservation of the final (recycling) product. It is a sustainable environmental practice that reduces landfill pressure and improves soil health. It

generates jobs and is a spin-off for small industries. It could well be that what is recycled is used as a raw material reducing resource needs and finally the need for energy. It identifies the community, which in countless ways, leads to environmental awareness and consciousness, and a commitment to take stewardship of the natural environment around us, and so produce the yield of the general practice of such a waste management initiative. Municipal cost savings and the benefits to be realized by a corporate entity an actual direct monetary advantage. Reduced landfill cost by a municipality and economic advantages by a corporate entity vis-à-vis other raw material.

In summary, socio-economic benefits will reign from handling the pine leaves as waste pine leaves will become part of a full socio-economic cycle – waste to consumer product. Within the benefits include environmental sustainability, job creation, community health, and economic expansion. The only manner in which so wide an array of benefits may be had is through a process of direct guidance of the pine leaf under the aegis of the Directorate for the Bionic Pine Tree, a creature of the Ohio Department of Natural Resources.

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