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WASTE MANAGEMENT IN COFFEE INDUSTRY: A STUDY ON ROLE OF COFFEE CERTIFICATION PROGRAMS

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ABSTRACT

Coffee is one of the important agricultural crops grown all over the world Arabica and Robusta are the two principal varieties are mainly cultivated. India is the seventh largest producer of coffee. Coffee is a brewed beverage with a distinct aroma and flavor, prepared from the roasted seeds of the Coffee plant. It is one of the preferred beverage by most of us. 1000 kg of fresh berry gives about 400 kg of wet waste pulp. Coffee pulp contains caffeine, tannins and organic solid residues. If the water wastes are discharged directly to the nearby streams it creates the water pollution and not properly managed causes environmental pollution also. Coffee waste treatment and management is very essential. Coffee certification programs includes many certifying criteria to avoid environmental pollution and waste management. Coffee certification programs adds value to coffee production process by promotion of conservation of natural resources, biodiversity and environmental protection and waste treatment and management. Waste management is the big challenge all over the world. Industrial waste treatment and management is very essential to avoid environmental pollution and health hazards to human beings and animals. Coffee pulp, one of the principal by products of wet processed coffee. Its disposal in nature, without any treatment, causes severe environmental pollution. Coffee certification programs are the good initiative towards coffee waste treatment and management. In this paper an effort will be made to understand how coffee industry generates waste and why treatment and management of these waste is essential and how coffee certification programs helps to manage the waste generated in the coffee industry.

***KEYWORDS**: Coffee Industry, Waste Management*

Article History

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INTRODUCTION

Coffee is one of the important agricultural crops grown all over the world Arabica and Robusta are the two principal varieties are mainly cultivated. India is the seventh largest producer of coffee. Coffee is a brewed beverage with a distinct aroma and flavor, prepared from the roasted seeds of the Coffee plant. It is one of the preferred beverage by most of us. 1000 kg of fresh berry gives about 400 kg of wet waste pulp. Coffee pulp contains caffeine, tannins and organic solid residues. If the water wastes are discharged directly to the nearby streams it creates the water pollution and not properly managed causes environmental pollution also. Coffee waste treatment and management is very essential. Coffee certification programs includes many certifying criteria to avoid environmental pollution and waste management.

Certification ensure that products meet the relevant criteria for quality. Certification guidelines are satisfied during production, the way a coffee is produced is being certified. Before a coffee is certified it must be verified by an inspector from an independent certification agency. There are many coffee certification programs in international level to ensure the quality of coffee production. In India coffee certification programs are recent development. These certification programs adds value to coffee production process by promotion of conservation of natural resources, biodiversity and environmental protection and waste treatment and management. The environmental concern is an important issue nowadays. Maintaining the healthy state of surroundings is only way to lead the healthy life. The basic requirements for existence of human beings are air, water, food are fulfilled by our immediate environment. Growing population leads to increase in consumption, trade and communication worldwide

Certified Coffee Meaning

Certified coffees take one or more aspects of sustainability into account. This means the coffee was grown in a healthy environment, is economically viable for farmers, promotes fairness among farmers and workers, or all three aspects. Additionally, certified coffee meets all guidelines set by coffee growers and is verified by a certification organization.

OBJECTIVES OF THE STUDY

- To know about the coffee cultivation and its processing.
- To study about how waste is generated in the coffee industry.
- To analyze why waste treatment and management required in the coffee industry.
- To identify the role of coffee certification programs in avoiding environment pollution
- To know how coffee certification programs are supportive to waste management in the coffee industry.

RESEARCH METHODOLOGY

The study is mainly based on secondary data and some information are collected by visiting the certified farms and by discussing with coffee growers. Data is collected from various published articles, unpublished articles, Journals, Reports of Coffee Board of India and International Coffee Organization, websites of certifiers. And some of the information are collected from the persons of buying companies.

Need for the Study

Waste management is the big challenge all over the world. Industrial waste treatment and management is very essential to avoid environmental pollution and health hazards to human beings and animals. Many government and non government organizations taking initiatives in this regard. Agro based industries like coffee industries are also generates both water and solid waste. Proper treatment and management of these waste is required to protect human beings and animals from health problems. Coffee certification programs are also includes the criteria for environment protection and waste management.

Coffee Processing

Coffee pulp, one of the principal byproducts of wet processed coffee which constitutes almost 40% of the wet weight of the coffee berry. Coffee pulp is the main byproduct on coffee exploitation industry, it poses many problems in the coffee producing tropical countries. Its disposal in nature, without any treatment, causes severe environmental pollution Hence, it

is essential to treat and manage preferably by organic means. The three main characteristic features of coffee are acidity, aroma and taste. There are two ways by which coffee can be processed. They are dry (natural) processing and wet (fermented and washed) processing. In most cases, wet processing is regarded as producing a higher quality product. However, some areas prefer dry processed coffee for its fuller flavor

Wet Method

Approximately half of the world coffee harvest is processed by the wet method in which the coffee berry is subjected to mechanical and biological operation in order to separate the bean or seed from the skin. Berry skin and most of the pulp is separated in the Pulpers. This coffee pulp represents about 40% of the weight of the fresh fruit and presently is underutilized, causing serious pollution problems. In wet method, the pulping involves the removal of the outer red skin and the white fleshy pulp and the separation of the pulp and beans. Immature cherries are hard and green and very difficult to pulp. If the coffee is to be wet processed, correct harvesting is essential.

Dry Method

In dry method, the coffee cherries are dried immediately after harvest. This is usually sun drying on a clean dry floor or on mats. However, there are problems associated with this method. The most serious problem is dust and dirt blown onto the coffee which is drying in the open yard. Another problem is rainstorms often appear (even in the dry season) with very little warning. This can soak the drying coffee very quickly. Finally, labour has to be employed to prevent damage or theft. Sun drying is therefore not recommended.

Hulling

The dried cherry is then hulled to remove the pericarp. This can be done by hand using a pestle and mortar or in a mechanical huller. The mechanical hullers usually consist of a steel screw, the pitch of which increases as it approaches the outlet so removing the pericarp.

Cleaning

The hulled coffee is cleaned by winnowing.

PROBLEMS OF COFFEE WASTE

Agro-industrial wastes are generated in large quantities throughout the world. Their non-utilization results in loss of valuable nutrients and environmental pollution The better utilization by biotechnological means assumes social, economic and industrial importance. There are many initiatives regarding agro industrial waste management especially the coffee pulp. The wastewater from such type of industries has high concentration of organic pollutants. So it’s very harmful for surrounding water bodies, human health and aquatic life if discharged directly into the surface waters. the people residing in the vicinity utilizing this stream water for domestic purposes suffer from severe health problems.

Coffee pulp/husk contains some amount of caffeine and tannins, which makes it toxic resulting disposal problem. Several solutions and alternative uses of the coffee pulp and husk have been attempted. These include fertilizers, livestock feed, compost, etc. However, for these applications only a fraction of available quantity is utilized and is not technically very efficient. Attempts have been made to detoxify it.

MANAGEMENT OF COFFEE PULP

Recycling of wastewater back into production plants. Coffee pulp solid waste was converted into compost, which was used by the suppliers in fertilizing their coffee farms. Waste water management techniques used by the coffee pulping operators in India are based on the use of lagoons. With the Indian Standards for the effluent discharge, different combination of treatments like biomethanation, aeration and constructed wetland technology were adopted as an integrated system for the treatment of coffee processing waste water. Adsorption-based technique developed with low-cost carbonaceous materials showed good potential. Such adsorption approach can offer an easy and economic solution to these environmental challenges. The current anaerobic-aerobic lagoon system was evolved around 1978. The National Environmental Engineering and Research Institute (NEERI), Nagpur, produced a waste water processing solution based on the existing water usage pattern of 16,000-23,000 liter water per ton of fruit processed. The treatment process is based on the use of anaerobic (21 days) and aerobic (7 days) lagoons after an initial chemical pre-treatment (neutralization). The Indian Coffee Board has suggested this process with a total 29 days hydraulic retention time (HRT). A number of research efforts are in progress.

BY PRODUCTS

It is understood from the literature that many byproducts have been prepared from coffee waste. Some of them are as follows:

Organic Manure

Coffee pulp is a source of nutrients Therefore, pulp was treated and used as organic fertilizer. The pulp left in piles, for 3 to 12 months, turns into rich, black humus that can be used for composting. Another way of composting is to mix coffee husk with cattle manure, leaving the mixture in pits or heaps. The use of organic fertilizer helps to improve soil properties thus increasing yield as shown through investigations in Columbia. Using organic fertilizers also helps to reduce the need to buy inorganic fertilizers, hence saving the farmers money.

Role in Mushroom Production

Coffee pulp is used as planting soil for mushroom production. After having fermented for two days, the pulp is pasteurized with hot water, drained, dried, and mixed with mushroom spores. Then, they are put in plastic bags. After 3 - 4 weeks, the mushrooms grow out of the holes in the bags and are collected. One bag allows 2-3 mushroom harvests. The mushroom can be eaten or dried and sold in the market. Considering the large amount of coffee pulp generated every harvesting season, the income from mushroom growing is significant for farmers.

Animal Feed

As the coffee pulp is rich in nutrients. It can be dried and used in animal feeds. Further application, the pulp needs to be treated as soon as possible to prevent the development of fungi. Alternatively, the pulp can be mixed with sugar cane molasses, or urea and other inorganic substances and put in silos. However, using coffee pulp as animal feeds is of limited value, since the cost for drying the pulp sometimes exceeds the gain. Besides, the effects of caffeine, tannin and the high level of potassium may affect animal’s health.

International Coffee Certification Programs

Organic – Organic certification prohibits the use of synthetic chemicals used in agriculture. Organic standards are verified during production, as well as processing and handling.

Fair-Trade – Fair trade is an approach that aims to improve the market access and strengthen the organization of small producers. This approach also seeks to improve the livelihood of these producers by paying them fair prices and providing stability in trade relationships. Fair trade certification is only given to farmers' associations and cooperatives rather than individual farmers.

Rainforest Alliance – Rainforest Alliance-certified coffee is grown on farms located where forests, soils, rivers, and wildlife are conserved. Furthermore, workers are respected and paid decent wages, have safe working conditions, and have access to education and medical care. This coffee must be grown under tree's shade.

Bird-Friendly– This certification promotes shade-grown organic coffee, which plays a role in conserving trees for the environment and birds that migrate.

UTZ – Meaning "good" in a Mayan language, UTZ requires farmers to grow coffee with care to benefit their local communities and environment. This involves training employees on health and safety procedures, as well as using pesticides correctly. UTZ's environmental goal is to reduce the use of water, energy, and pesticides.

Starbucks C.A.F.E. Practices– Coffee and Farmer Equity (C.A.F.E.) ensures that Starbuck's coffee is sustainably grown by evaluating the economic, social, and environmental aspects of its production.

4C– The Common Code for the Coffee Community, or 4C, addresses social, economic, and environmental standards for everyone involved in coffee production—from farmers to exporters.

Though there are many coffee certification programs in international level in India few are operating. waste management related criteria of main certifications are analyzed here to know how coffee certification programs helps to environmental protection and waste treatment and management.

UTZ – Efficient use of water and energy Examples of such activities include: - use of an eco pulper to reduce water consumption -having procedures in place to reduce water consumption during washing of machinery. The target water consumption is below 10 lt/kg of green coffee (approximately 2 liters per kg of coffee fruit/cherries).

Waste management: A water treatment system is in place to eliminate or reduce pollution caused by coffee wastewater resulting from the wet process. Measures to treat wastewater include e.g.: - Surface runoff control - Plastic tubular digester - Anaerobic reactors - Lagoons - Aerobic filters are used

In central wet mills (of groups) and wet mills of estates (farms certified against the Code of Conduct for Individual and multi-site certification), a water quality analysis and monitoring program is implemented.

An analysis is conducted at least once per coffee season and includes an analysis of water samples before and after treatment. The analysis takes into account the watersheds of where the group is located and the risk/area of contamination, and serves to further improve, where possible, the water treatment system in place. The analysis indicates at least: - chemical oxygen demand (COD), - pH, - sediment able solids, and - flow rate.

Monitoring includes: - comparison of results from before and after treatment, - comparison with results from previous year(s), and - comparison with applicable national or local regulations. Corrective actions are taken based on the results. The records and monitoring program are available. Records include the: - date(s) of the analyses, - results and corrective actions, and - responsible person for the monitoring system.

Water

Clean water and contaminated water are separated. When possible, water is recycled during wet processing. In addition to recycling water, activities are implemented to reduce water consumption during wet processing. A water treatment system is in place to eliminate or reduce pollution caused by coffee wastewater resulting from the wet process. Measures are taken to efficiently (re)use water.

The 4C Association

In order to achieve this code of conduct comprises of 27 principles across economic, social and environmental dimensions and 10 unacceptable practices which are to be excluded before applying for 4C verification. Among 27 principles, 10 are principles relating to environment.

- Water resources are conserved and used efficiently.
- Waste water management in place.
- Training will be provided to small farmers for waste management
- Safe management of hazardous waste in place.
- Waste generation minimized and reuse and recycling are maximized

Rainforest Alliance coffee certification is operating through the sustainable agricultural network(SAN) with the objective to encourage the farms to analyse and consequently mitigate environmental and social risks caused by agricultural activities through a process that motivates continual improvement. The main principles of SAN relating to the environments are:

- Social and environmental management system.
- Ecosystem conservation.
- Wild life protection.
- Water conservation.

FINDINGS

- Coffee processing is done in two ways like wet processing and dry processing; wherein wet processing generates more waste
- Treatment of waste water is very essential to avoid environmental pollution and health hazards to human beings and animals
- In the present scenario protection of environment should be the first preference, coffee certification programs are initiative in this regard.

- Water is the basic requirement of every living beings in certified coffee farms proper water management, recycling of water, conservation of water resources are implemented
- Use of harmful pesticides and insecticides are prohibited in certified farms which will upset many natural processes
- The initiatives of coffee certification programs regarding the proper waste water and solid waste treatment and management reduces the environmental pollution.

SUGGESTIONS

- Waste generated in the wet coffee processing creates environmental pollution and health problems so it is advisable to all coffee pulpers to treat the waste water.
- Solid waste which is generated in the coffee industry are also be used as fertilizers for the coffee plants.
- Coffee certification programs includes the criteria of waste treatment and management so to avoid environmental pollution growers must go for coffee certification

CONCLUSIONS

In coffee producing countries, coffee waste constitutes a source of severe contamination and serious environmental problems. For this reason, since the middle of the present century, efforts have been made to develop methods for coffee waste treatment and management. There is a need to curb these problems through innovative and eco-friendly techniques. Coffee certification programs are good initiative in this regard. Proper awareness about the waste treatment and management is very essential or getting the forms certified also will serve the purpose.

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