Journal of Economics and Sustainable Development
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.8, No.19, 2017

Economical and Environmental Impact of Selected Wet Coffee Processing Industry in Gedeo Zone, South Ethiopia

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Abstract
The role of wet coffee process industry is important to sustainable development of socio-economic natural systems in area. thus socio-economic characteristics of households and access are interrelated to income from common property resources. This paper tries to address environmental, social and economic conditions in reference to wet coffee processing industry in Gedeo zone. Wet coffee processing industry is important to surrounding community in socio economic characteristics and produces higher quality and receives higher prices on national and international market relative to coffee prepared via dry method. This processing industry can use a lot of water and impact the chemistry of that water which produces large amounts of processing effluents and that have the potential to damage the environment. It is especially important to understand this coffee related pollution with climate change and natural resource degradation thus the market allocation in socio-economic variables of the resource-using common property resource and that rival and non excludable. Miss use management of common property, which limits on the extent to certain groups are able to again access and benefit from goods through environmental pollution. I argue that common property rights on common-pool resources are a necessary but implement in integration of environmental and economic policies are beneficial and which serve sustainable and equitable resource use.
Keywords: Environmental, Social and Economics

1. Introduction

Agriculture is essential to human survival and social development. Coffee is one of export agricultural production In Ethiopia that earn 25% export income of country. Coffee produce in different area in the country especially southern region is major producer of coffee next to Oromiya. Gedio zone is one of coffee producer in southern regain and high exporters next to Sidama in the regain.

The farming system of Gedeo is characterized multi-cropping or agro-Forestry system through unique combination of two natural perennial crop; Coffee and Enset. Enset (Enset ventricosum)is herbaceous multipurpose crop and a staple food of the community. Coffee (Coffea arabica L.) is one of economical agricultural production and its plantation cover about 60000 hectare and coat more than 21% of region coffee export. in addition to more than 85% family live hood depend on production and processing and that survive on coffee as leading as cash crop in deed for decade coffee cultivation has been evolved as one of the most sustainable cash crop farming practice in the area for local farmers coffee production is a traditional way of life that one inherits from the parents. However irrespective of how coffee is grown closer to nature and its economical values discharges from wet coffee processing plants represent a major source of river pollution in the area. In fact worldwide human population growth and economic development, increasing demand for agricultural products has placed substantial pressures on agriculture and natural resources; this in turn has caused environmental pollution and ecological degradation. The environmental impact of wet and semi-wet coffee processing is considerable. Problems occur through large amounts of effluents disposed into watercourses heavily loaded with organic matter rather its than inherent toxicity (Adams et al 1987).

Presently there are numerous coffee washing industries in the Gedeo zone which owned by cooperative, privet and plc. and that Companies if they work at full capacity each of these plants can process at least 2.8 tones parchment could generate 680tones pulp and pollute 70m3 of water every day from this the cumulative impact of the pollution hazard by those processing industries.

In light of above idea contributes of coffee in the environmental, social and economic conditions most important in the country, hence to fill main goal industry should produce quantities and qualitative coffee processed production is important. Those processes play great role in social economy and environmental of Gedeo community. On other hand the description of coffee industry in particular and the unintended impacts due to it is important. Therefore this paper discussed on the major problems that associated with wet coffee processing and summarized the socio-economical and environmental issues on selected (Andinet Plc.) wet coffee process industry in Gedeo zone, south Ethiopia.

2. Coffee processing

Processing of coffee consists of mainly removal of the skin, pulp, parchment and silver skin from coffee seed. The quality of final product depends up on the method, the method of the processing there are two method of coffee processing natural (sun) dry process and washed (wet) process

2.1 Dry processing

Sun Dry processing which are known as un washed or natural method of processing coffee. Thus largest portion of coffee produced in the area. The common practice is that Dry coffee processing is crushing the sundried coffee using a huller to release the green bean. Thus prepared properly, it has high quality. In fact Sun-dried coffee is prepared from fully matured, red cherry picked and dried over a raised bed or cement floor or local materials like dried bamboo, wooden stick, bamboo mats, any other material that may not affect quality of the coffee, and that stir frequently to ensure even drying and The store at well ventilated, clean and dry area. Finally properly dried coffee hulled to remove the outer skin.

2.2 Wet coffee processing

Wet coffee processing is the mechanical removal of the outer cover (pulp) of the fully red cherry. It's done by power driven machine or hand operated pulper. In both operations, water used to facilitate the pulping process. Pre- grading is the system in which the heavy, the medium and the light coffee separated based on weight and size. The work performed by the Aagard pre-grader with an oscillating sieve and water at constant flow. Pre-grader separates pulped, un-pulped and skins

The role of coffee process industry is important to sustainable development of socio-economic natural systems in area. There are two type of coffee processing to supply export market those are washed and unwashed coffee. Those processes managed by cooperatives, privates and investors. While Gedeo zone produces more than 21,000 ton (more than 13000ton wet and about 8000ton dry) of processed coffee every year (data from Gedeo agricultural office) and pulping alone can consume a lot of water per ton of coffee cherries to remove coffee pulp, this has not been quantified extensively. However this water ends up contaminated with a lot of organic material or nutrient that leached out from coffee fruit. Consequently the poor management of coffee processing industry affects natural resources (water, plant and soil), and those lead to unintended impacts on environmental, social and economic conditions, through influent and pollution.

3. Environmental impact of coffee processing industry

Coffee is one of economical agricultural product that has high foreign currency in the country consequently role of coffee has economical, social and environmental influence. While it is important to sustain environmental condition through coffee plantation effectiveness thus protect soil from exposing to the sun, aid to soil conserve, protect soil erosion and run off, provide carbon sequestration especially in agro forestry practice.

Wet coffee processing is the mechanical removal of the outer cover (pulp) of the fully red cherry. It's done by power driven machine or hand operated pulper. In both operations is used water to facilitate the pulping process. Pre- grading is the system in which the heavy, the medium and the light coffee separated based on weight and size. The work performed by the Aagard pre-grader with an oscillating sieve and water at constant flow. Pre-grader separates pulped, un-pulped and skins

Figure 1. Discharging coffee washed water to river

Intermediate washing takes place while the parchment coffee is in the fermentation tank. And In some other machines, mucilage is removed by de-mucilage machine by scratching method. In addition the Grading takes place by flotation process while washing in a washing channel using water. Likewise the heavy density

sinks down while the medium and lights flows down to the end of the washing channel lastly Washing finalized to purify and finaly washing water discharge to river (figure 1).

Unlike wise to sustain those condition Ethiopia government forwarded interrelated the political option to protect environment and socio-economic success of country through industry license. In fact in Gedeo zone various techniques decide to reduce amount of water uses and pollution from waste water through recycle waste water, use coffee waste as compost and filtrate sieves to improve water waste through infiltration and remove coffee debris from water before reenter natural river. However implementations of these practices are optional. Likewise poor management of coffee processing industry affect surrounding ecosystem through degradation of natural resource. According to GTZ (2015), the organic and acetic acids from the fermentation of the sugars in the mucilage make the wastewater very acid (pH down to 3.8). Under these acid conditions, higher plants and animals will hardly survive. While Pollution arises when raw water used in coffee processing operation is discharging to streams and small rivers. Similar problems are caused from drainage seepage of row effluent from decomposing coffee pulp.

4. Externalities of wet coffee processing

Wet Coffee processing industry externality is a cost or benefit that affects community. The chemical composition of composted and non composted pulp to alleviate the pollution problem caused due to mis management of coffee by product. On other hand natural resources, production and use of Coffee processing can have a positive or negative effect on the allocation of the resources.

4.1. External Benefits

Positive externalities of wet coffee processing, also referred to as external benefits, impose a positive effect on a third party. While pulped coffee husk important to make organic fertilizer and that surrounding farmers decomposed and used it to coffee farm or as organic fertilizer. Similarly organic fertilizer important for producing coffee productivity sustainably and also play greet role on worldwide especial coffee commodity exchange center. It is natural resources are used and also sustained, the external benefits of coffee produced husk by natural resources impacts the majority of the public in a positive way.

Organic coffee production practices are reducing erosion, and conserve water, while it may benefit the wider community, not just the industry owner. Similarly, the owner of coffee processing distribute coffee husk in a village may generate positive externalities for other farmers.

4.2. Negative externality

Water pollution from wet coffee processed is a significantly a negative externality. In fact the byproducts of wet coffee processing plant coffee pulps solid from the mucilage and residual water are predominately organic biological in nature they rapidly ferment to produce organic acid lowered pH eutrophication of receiving water and bodies malodors and that affects other than those who coffee producer and those who live surrounding community.

Therefore making Stream Rivers quiet unsuitable for domestic use the problem is so hazard and that has a negative impact of plants and animals. According to some surrounding farmers complained that pregnant cows aborted after having water such from polluted rivers. In addition to river surrounding spring water also contaminated with coffee husk chemicals through leaching. On other hand the use of natural resources is inefficient because the social benefit is less than the social cost.

Those industry influent influence crop, live stock, human health, fishery and other adjacent industry that use the same resource and that found after primary industry influent sources.

Human health: the poor management affects human health around ecosystem through water and air pollution. In fact water is important to living things and people used it to drink, to food preparation and etc. however wet coffee processing industry release west water to river that affected human health through influent. Likewise dry coffee processing industry pollute air through release concentration of dust in the atmosphere via these affect inhale of human

Livestock production: water also important to live stock production but through wet coffee west water influent it and cause live stock health and decline live stock production.

Plant or crop production: community after industry influent used water or irrigation technology to produce crop. While those influents affect soil physiochemical characteristic through acidity and soil microbial activity and also if the industry was dry processing high concentration of air pollution those affect evapotranspiration of plant.

Fishery or aquatic animals: Wet coffee processing industry influents contain mucilage and mucus with acidic property. Therefore it affects respiration and ecosystem of aquatic animals and also it cause unfavorable environment to fishery after industry influent around ecosystem or water shade

Industry that used the same river or around the ecosystem : in fact there are different industries around river

water shade those used the same river to produce or to process comparable or different production however the wet coffee industry influent pollute the river and influence socioeconomic of industries after influent.

Consequently the poor management of coffee processing industry affects natural resources (water, plant and soil), and those lead to unintended impacts on environmental, social and economic conditions, through influent and pollution. On other hand adjacent industry leave form market or there is no competition between industries and that become monopoly industry which threat to market allocation.

5. Economical impact of coffee processing industry

Coffee is one of economical crop and foreign currency in come production in the country. In addition to it play great role in economical, social and environmental condition of community in zone.

According to Ethiopia Council of Ministers, (2008) set Regulations on Coffee Quality Control and Transaction Council of Ministers Regulations No 159/2008". Thus run agriculture and rural development bureau of a coffee producing region and this proclamation may establish special arrangement for transaction of better quality and higher price supply coffee and also aid coffee market linkage between producer and consumer. While the commodity exchange center divided in to two primary commodity center and Ethiopia commodity exchange center those primary commodity center important to community of coffee producers to avoid coffee cost linkage and local commodity exchange center inputs or additional income to surrounding community via support their live hood. On other hand it is not only supports the entire economic growth of the nation but it is also the source of income for millions of coffee growers, thousands of coffee traders.

First market center that collected coffee to industry to process based on Ethiopia commodity exchange standard and that aid coffee to processing in the standard of Ethiopia commodity exchange center. While coffee process industry needs high man power to process coffee those include coffee collector and high labor of coffee processer and that communities directly contribute to income and that achieve a life. According to industry owner the man power is very important and it incorporates more than 550 communal workers (Andinet Plc, 2016). However Environmental degradation cause climate factor and that affect coffee productivity and decline coffee yield those threatens all aspects of human wellbeing.

Wet coffee processing used more water to facilitate the pulping process via water source from river said. On other hand almost all wet coffee processing industry settled around water shade and that is Common Property Resources. Thus goods are non-excludable and rival in consumption. River water might make the basis for rightful public criticism and those sources of market failure that stem from the inability to exclude individuals from consuming a good or service. According to Wonago woreda agriculture office report presently there are different coffee washing plant such as owned by cooperative, privet and plc. These Companies if they work at full capacity each of these plants can process at least 2.8 tones parchment could generate 680tones pulp and pollute 70m3 of water every day from this the cumulative impact of the pollution hazard by those processing plants is obvious. In fact according to "Andinet Plc" manager suggest that to wash sufficient volume of water at proportion of 10Kg of coffee in about 100littre of water needed.

In light of above idea community those depend on river said and other wet coffee processing industry that setting under river said or water shade are used same river. On other hand the consumer used influent water and that caused negative externality via this good is conmen property.

6. Resource Allocation

the coffee processing industry of production, creates more benefits but that costs for water pollution does not concerned on other hand the upper water shade said industry influent river and that industries impact on goods of producers, consumers, and society as a whole. Although In the long run, externalities directly impact resource allocation.

In fact Ethiopia following free market yet negative externality cause market allocation or situation turned to fixing price. On other hand water influent geographic areas lead adjacent industry out of market and upper water shade industry have created monopolies. Likewise, it is an illegal situation of water pollution that dominant geographical area.

Environmental and health externalities from waste water are likely to disproportionately affect the community, who are most dependent on that natural resource and tend to live in fragile ecosystems since these dependent on water for income and consumption. On other hand people live in river basins where water extraction rates exceed replenishment, yet because the costs of resource depletion accumulate downstream, private individuals lack incentives to reduce or reject their water use. In fact water extraction technologies sometimes directly conflict between resource users however wet coffee processing industries are very selective and well controlled.

7. Regulating Common Property Resources

Common Property Resource is one that is non-excludable, but is rival in consumption. The fundamental problem

is an individual's use of these resources is often faced with a use or lose-it through release influent to river. Moreover, when individuals use the resource, they often impose costs on the resource not born exclusively by the current user. Likewise pollution of the surrounding environment and contamination of water and other natural resources as an effect of miss use of coffee husk and waste water which released from coffee industry.

Managing Common Property Resources have taken through institution such as informal institution and formal institutions management of the commons. Informal institution: natural resource management requires cooperation among users of the resource therefore the local community have few incentives thus the wet coffee processing industry pollute the river and spring water on surrounding which consumed by local community hence clear water option is needed to incentive the community and that create positive externalities or that minimize negative externalities. On the other hand if they could charge others who benefit (and would be willing to pay for that benefit), then they would potentially use more of the positive externality.

The government of Ethiopia set up coffee regulatory body in policy governing the sector and that was Ministry of Agriculture, currently called Coffee & Tea Development Board. However institutional framework, lack of implementing coordinate policy and Macroeconomic policy are Weak in country. Therefore Create an Enabling policy environment, Support agricultural research and development Coffee Organization, Promote a strong institutional framework to better coordinate policy and Macroeconomic policy

Likewise in the area a rising awareness - high relevance for coffee processors In order to avoid environmental damage and health risks, characteristics and processes in waste water need to be understood. Thus good understanding, site specific treatment measures are to be taken. In order to keep treatment facilities small and keep treatment costs low and also water quantities must be reduced through water recycling of use water. In addition a major constraint in wastes management is the low priority that agricultural sector fragile to waste management services. Worn out and damaged water waste disposal systems in the industry, and the same is true for pulpier wastes, which are treated or changed to organic fertilizer (compost).

8. Conclusion

Wet coffee processing industry is significance reduction in water quality at downstream through influent that released to river, which indicating long term impact on the ecosystem. pollution of the surrounding environment and contamination of water and other natural resources as an effect of miss use of coffee husk and coffee washed waste water. In fact Sustainable economic development, environmental sustainability and poverty eradication are the major objective of development plans in Ethiopia. Therefore integration of environmental and economic policies in country is transition economies. Thus little benefit is gained from water focusing on sustainable management that supporting communities under ecosystem.

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