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ENVIRONMENTAL IMPACTS OF FLORICULTURE INDUSTRY IN DEBREZEIT TOWN: A NEED FOR STRATEGIC ENVIRONMENTAL ASSESSMENT

M.Sc. Thesis In

Environmental Planning and Landscape Design

By: -Abayneh Tilahun

Advisor:- Ephrem G/mariam (Ph.D).

Graduate Study in Environmental planning and Landscape Design
Faculty of Technology – EiABC
Addis Ababa University.

July 2013, Addis Abeba

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Thesis submitted to the school of Graduate Studies of Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Masters of Science in environmental planning and landscape design

Environmental Impacts of Floriculture Industry In Debrezeit Town: A Need For Strategic Environmental Assessment

Abayneh Tilahun

June 2013

Approved by Board of Examiners	Signature	
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Chairperson	Signature	date

Declaration

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any other university, and that all sources of material used for the thesis have been duly acknowledged.

Name: Abayneh Tilahun

Signature: _____

June 2013

Confirmation

This thesis can be submitted for examination with my approval as a university advisor.

Name: _____

Signature: _____

Date: _____

Place and date of submission: Addis Ababa, June 2013.

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Acronyms

BOD	Biological Oxygen Demand
CEAA	Canadian Environment Assessment Act
CEC	Cation Exchange Capacity
COD	Chemical Oxygen Demand
EC	Electrical Conductivity
EHPEA	Ethiopian Horticultural Producers and Exporters Association
EIA	Environmental Impact Assessment
EPA	Federal Environmental Protection Authority
EPE	Environmental Policy of Ethiopia
EU	European Union
FAO	Food and Agricultural organization of the United Nations
IPM	Integrated Pest Management
m.a.s.l	meters above sea level
MPS	Millieu Program Sierteelt
Mg/l	milligram per liter
MoRAD	Ministry of Agriculture and Rural Development
PH	Power of Hydrogen
PPP	Policy Plan Programme
SEA	Strategic Environmental Assessment
µS/cm	micro Siemens per centimeter
UNEP	united nation’s environmental program
USEPA	United States Environmental Protection Authority
UWEA	Uganda Workers Education Association
WHO	World Health Organization

Abstract

Floriculture is one of the booming sectors in Ethiopia, and a good way to generating income for both the owners and the government. Beside this, different environmentalists complain on the industry because the industry uses too much pesticides and chemical fertilizers which damage the environment. The general objective of this research is to assess the ecological impacts of floriculture industries on surrounding environment with respect to the existing environmental regulations/EIA/ and implementation, and assessing a need for strategic environmental assessment/SEA/ which basically focuses on cumulative impacts. The study was conducted on floriculture industry and the surrounding environment where the industries are congested, in Debrezeit town. The necessary data are collected through interviewing the employee (Senior Experts) in floriculture industry, direct physical site observation and assessing existing situation of the study area and by taking sample from the soil and river water. Water samples are taken at five sample points along the Wedecha River which is found adjacent to the industries. Eight parameters (pH, electrical conductivity (EC), Nitrate (No3-N), reactive phosphate (PO4), Biological oxygen demand (BOD), chemical oxygen demand (COD), Sulfate (SO_4), Total ammonia (T-NH_3)) are used to analyze ecological impacts of the industries on water body. The soil sample also taken from two different green houses those are established in different time series. The following parameters, pH, CEC, EC, Phosphorus (P) and total Nitrogen (TN) are used to analyze the impact on the soil by the industries. The founding result indicating that some parameters BOD_5 (54 mg/l), PO_4 (3.4 mg/l), NO_3 (16.6 mg/l), T-NH_3 (0.1 mg/l) from water samples are beyond the standard which is stated by EPA. And the soil sample result of (CEC and EC) also has a great difference when compared to common agricultural soil and the concentration of phosphorus (P) and nitrogen (N) are high when compared to international standards. Beside this, 90% of the flower industry uses ground water resources. As planting media 40% uses soil bed, hydroponics 30% and the rest 30% also used both planting media. The waste is discharged directly to water body by 30% of the farm and 40% are drain to the land. The land use change is also visible, 30% of the farm is established on local farmer's area, and 40% are established on state farm area and the rest 30% are established by removing the swampy area. In the case of health issue only 20% of the farms have a clinic. And no one have (100%) EIA document. Therefore, to assure the environmental sustainability of the booming projects of floriculture industry, the introduction of SEA to the country will flourish the way. SEA can do in a better way which EIA is unable to do. Wastewater recycling, Wastewater treatment, Vegetation Buffer preparation, integrated pest management (IPM) practices, Health and safety training to workers, and application of Strategic Environmental Assessment SEA are a good practices to minimize the impact and For better, sustainable and conducive environment sake.

Keywords: Floriculture industry, effluent, EIA and SEA

1. Introduction

1.1. Background of the Study

Floriculture can be defined as “a discipline of horticulture concerned with the cultivation of flowering and ornamental plants for gardens and for floristry, comprising the floral industry.” It can also be defined as “The segment of horticulture concerned with commercial production, marketing, and sale of bedding plants, cut flowers, potted flowering plants, foliage plants, flower arrangements, and noncommercial home gardening.” Floriculture is one of the booming sectors in Ethiopia. The first private floriculture companies, Meskel flower and Ethio–flora, started activities around 1997 on a few hectares of land. According to Wikipedia (2011) the industry uses too much pesticides and chemical fertilizers which damage the environment. They believe that too much pesticide is getting into water bodies damaging the biodiversity and excessive chemicals are killing useful organisms in the soil. Environmentalists are also concerned, that waste materials will damage the environment – will get into the soil, into water bodies or be used by people and cause serious damage.

The problems stated above will be very severe if the controlling framework, within the sector or from government, is loose. Policy plays a vital role in the formulation and implementation of any regulatory framework. Based on the national policy, laws have been enacted. Environmental impact assessment in the industry, the presence or lack of laws and standards in the use of chemical fertilizers and pesticides and the practice of monitoring of the same, if any, the feasibility of tasks done by the floriculture farmers and agencies to minimize the adverse environmental impact of the sector’s water use and disposal of waste. Moreover, the extent to which the industry observes the compliance standards required in binding instruments and regulatory schemes will be assessed.

This paper is mainly focuses on to assess the environmental impact of the floriculture industry in Debrezeit town. Observed impacts of this industries in the area are, waste discharges in to water bodies, the chemicals also have great impact on human health, land use changes also another impact of the floriculture industries and intensive use of water. Along this the proper implementation of EIA is also another limitation in order to

maintain the desired environmental management. Beside this point this paper mainly emphasizes the importance of strategic environmental assessment /SEA/.

1.2. Statement of the Problem

Emissions from floriculture greenhouses are very location (greenhouse)-specific and it is hard to draw general conclusions (Hengsdijk and Jansen, 2006). Much information is lacking, which is required for performing a proper environmental impact assessment of the horticulture and floriculture sector. However, the little data available gives an indication of the potential impact of floriculture development on the regional water resources in relation to current open field vegetable production.

In general, input use (water, fertilizers and crop protection agents) per ha is higher in greenhouses than in open field vegetable production as a consequence of the crop characteristics, quality requirements for export to the EU and the year-round production. The use of fertilizers and crop protection agents per ha will be higher in floriculture but the related environmental impact depends on the scale of production (Wikipedia, 2011).

Pesticides of floriculture industries can cause cancer, birth defects, reproductive and nervous system damage, and floriculture workers are exposed at numerous stages of plant growth. Worker exposure is of particular concern in greenhouses, where up to 300 different chemicals are used in enclosed spaces--increasing risk of exposure through the skin and by inhalation (Sisay, 2007). Generally, the waste materials will damage the environment – will get into the soil, into water bodies or be used by people and cause serious damage. Beside this the emphasis for proper implementation of EIA is decline, due to given priority for encouraging development activities.

1.3. Research Objective

1.3.1. General Objective

- The general objective of this research is to assess the ecological impacts of floriculture industries on surrounding environment with respect to the existing environmental regulations/EIA/ and implementation analysis and assessing a need for strategic environmental assessment/SEA/ which basically focuses on cumulative impacts.

1.3.2. Specific Objective

- Assessing the impacts of fertilizer, pesticides, waste disposal, chemicals usage and intensive use of water resources in the surrounding environment.
- Assessing the impact on human health, soil fertility, ground water and land use structure.
- Assessing the regulation, follow up and proper implementation of Environmental Impact Assessment /EIA/.
- Recommending the way for better environmental management practices.

1.4. Significance of the Research

The major significance of this research is to identify the existing environmental impact on the area which observed recently, because of booming of the floriculture industries. And also to direct the remedies for the existing environmental impact due to the chemicals the floriculture industry utilized. In order to strength the policies and proper implementation of EIA on floriculture industries and to enhance the quality of life of the society such researches have a vital role. Advocating the strategic environmental assessment (SEA), for such kinds of intensive chemical and other natural resources utilized sector is also have its own importance. Analyzing the cumulative impacts of such sectors must be recognized, rather than focusing on specific effects of each flower farms.

1.5. Limitation of the Study

The research title is more specific and it is applicable to conduct the desire scope in the study area. To conduct this research the main constraints are lack of laboratory equipments for proper scientific experiment related with this research topic. Data availability, analysis, obtaining important inputs and the required materials from floriculture industry owners and financial issues are also the limitation of the study. These problems are obstacles to assess and analyze the existing situation and to propose planning and design solutions.

2. Literature Review

2.1. Introduction and Definition

Floriculture, or flower farming, is a discipline of horticulture concerned with the cultivation of flowering and ornamental plants for gardens and for floristry, comprising the floral industry. The development, via plant breeding, of new varieties is a major occupation of floriculturists (Wikipedia, 2011). According to encyclopedia environmental health (2011) Floriculture refers to the cultivation or farming of flowering and ornamental plants for gardening and floristry, including floral design. Floriculture crops are typically herbaceous differentiating them from nursery crops, which are typically woody. Floriculture crops include flowering plants, bedding and garden plants, foliage or house plants, fresh cut flowers, and cultivated greens.

Floriculture includes all commercially grown flowering and ornamental plants in greenhouse-based pots, trays, troughs, contained beds or in field settings (wqpn, 2006). Bedding and garden plants are typically grown in cell packs and marketed in flats or trays, pots, hanging baskets, or large mixed containers for the landscape Bedding and garden plants may be either annual or perennial and are often vegetable or herb transplants. Floriculture crops are typically grown in a controlled environment or greenhouse (i.e. glasshouse) however; many cut flowers may also be grown out-of-doors in many climates (SE Newman, 2011).

According to Wikipedia (2011) as distinguished from nursery crops, floriculture crops are generally herbaceous. Bedding and garden plants consist of young flowering plants (annuals and perennials) and vegetable plants. Cut flowers are usually sold in bunches or as bouquets with cut foliage. The production of cut flowers is specifically known as the cut flower industry. Farming flowers and foliage employs special aspects of floriculture, such as spacing, training and pruning plants for optimal flower harvest; and post-harvest treatment such as chemical treatments, storage, preservation and packaging. In Australia and the United States some species are harvested from the wild for the cut flower market (Wikipedia, 2011).

2.2. Global Scale of Floriculture

Globally, different countries participating in floriculture industry and enhancing the activities time to time. According to Brian (2009) The Cut Flower and Foliage Industry in Australia is part of the agricultural sector and engages in growing flowers and foliage for cutting and display.

In Australia Water use efficiency is an area of the highest priority for all primary production sectors including cut flower and foliage enterprises. There is significant opportunity to increase the efficient use of water through the application of sophisticated irrigation scheduling tools and techniques as those being developed and used in Israel and Europe (Brian, 2009).

Israel is also leading the world in its application of these water use efficiency measures to its production areas such as greenhouse design and automation, irrigation scheduling as well as the use of lesser quality, recycled and marginal water in cut flower growing. Effectively applying these technologies and techniques provides not only significant water savings potential but can also improve plant quality, crop yield and of course profitability (Brian, 2009).

The Netherlands has also a total area of 8,149 hectares of land for flower and pot plant production. 5,365 hectares is for protected cropping and 2784 hectares for open (in-ground) production. The value of this production is Euro 3890 million from 6,807 properties (International statistics flowers and plants, 2007).

According to Belwal and Chala (2008) in 2001, the UN International Trade Centre estimated the global area of 200,000 hectares dedicated to cut flowers commanding value of USD 27 billion. In terms of total area of production, Asia and the Pacific cover nearly 60 percent of the total world area. The key markets for flower are Western Europe, North America and Japan. The EU is the world's leading importer of flowers. The other largest importers are Germany, the USA, the UK, France, The Netherlands and Switzerland accounting for nearly 80 percent of global imports.

2.3. Industry Expansion in Ethiopia

In Ethiopia, floriculture as an industry counts only a decade but expands from two (2000) to 85 (2011) in number (Hortiflora Magazine, 2011). According to Ethiopian investment Agency (2008) Cut flowers introduction program was started in 1980/81 crop season in collaboration with GTZ by importing planting materials from Canary Islands and Holland. Production operation for commercial purpose was commenced in 1981/82 production season in the first time at Zwai state farm Next to Zwai farm, Debere Zeit and Tibila state farms were involved in producing fresh cut flowers. Even though different types of flowers are grown and exported to Europe and US market, the climate provide nearly ideal conditions for roses.

According to Afrogadda (2010) Ethiopia exports more than 80 million stems a month to 40 countries. Seventy percent go to the Netherlands, from where they are sent around the world. It also exports to Germany, Britain, and Russia and, in smaller amounts, to the United States and the Middle East. The level of production has made Ethiopia the second-largest producer of roses in Africa next to Kenya and sixth in the world after Holland, Colombia, Ecuador, Kenya and Israel.

The sector's contribution to employment and export revenue has been progressively increased over the last few years. According to the report from Ethiopian Flower Producer Association EFPA (2007) 35,000-50,000 workers are employed of which 60 percent are women.

The floriculture industry contributes major share of the national economy by setting its export enhancing to 100 million USD second biggest in 2007, increase of five-fold from 2005. In 2008, Ethiopia has earned 186 million USD from horticulture exports out of which 80 percent was generated by flower (Getu, 2009).

According to the report of Ethiopian Horticulture Producer and Exporters Association (EHPEA) in 2010 the revenue of the sector has grown by 25 percent from 2008, following the global economic and financial crisis (Hortiflora Magazine, 2011).

The expansion of floriculture industry in Ethiopia is highly encouraged by the availability of wide natural resources; among the resources which make Ethiopia favorable for floriculture development is water and irrigable land resources which the country has and the flower needs in abundant. Ethiopia has 122 billion cubic meter surface water, 2.6

billion cubic meter ground water, 12 river basins, 18 natural lakes including the rift valley lakes and a potential of 3.7 million hectares irrigable land (Ethiopian Horticultural Strategy, 2007).

However, there are a number of challenges that must be resolved to continue the development of the sector with present rapid speed. Among the challenges include environmental impacts of the sector which can create pressure on the sustainability and market acceptability of flower industries.

The industry is blamed for using too much chemicals which damage the environment through its discharge. The production uses more than 300 chemicals as pesticides and growth regulators, which kills useful organisms in the soil and disturbs the biodiversity (Sisay, 2007).

Getu (2009) confirmed that intensive chemical fertilizers and pesticides that are frequently applied to produce a quality rose resulted in the negative impact on the environment.

2.4. Water Utilization of the Floriculture Industry

Greenhouses require water for irrigation, cooling, pesticide application, root-zone media preparation, and cleanup. A one-hectare greenhouse has the potential to use between 120 000 and 160 000 liters per day. The majority of this water is used for irrigation and its rate of use is dependent on the level of solar radiation, greenhouse shading, air movement in the greenhouse, types of plants grown, irrigation system design, and the degree of leaching employed. Best management practices in a greenhouse usually include runoff minimization, efficient irrigation system design, reduction in overwatering, integrated pest management using less pesticide application, fertility optimization, reduction in storm runoff by diversion and storage for irrigation, and proper disposal of greenhouse runoff through treating and recycling runoff and reverse osmosis (SE Newman, 2011).Moreover, too much use of water leads to conflict with the local community, as was the case in the Naivasha district in Kenya. It may also lead to depletion of water from its natural reservoir.

In Ethiopia, there is not a special water management strategy being applied in the cut-flower industry. Similarly, neither water treatment nor recycling is well adopted. Only a few farms are currently applying reverse osmosis, UV treatment and recycling. Chemicals are

routinely used to control the growth of algae in reservoirs and water delivery pipes (Abiy, 2011).

Intensive utilization of water resources without considering the coming consequences will lead to reduces the ground water table, as USEPA (1990) after intensive water use by floriculture, the water table has dropped under the savanna surrounding Bogota.

2.5. Chemical Utilization and WHO Standard for Chemical Usage in Floriculture Industry

Due to the growth of the industry, environmental concerns are indeed growing. Environmentalists are raising many concerns in relation to the expansion of floriculture in Ethiopia, such as the use of pesticides and chemical fertilizers, disposal of waste materials, and the protection of bodies of water. According to environmentalists, there is an overuse of pesticides and chemical fertilizers in the industry, which damages the environment. They believe that too much pesticide is getting into bodies of water, damaging the biodiversity. Excessive amounts of chemicals are killing useful organisms in the soil. Environmentalists are also concerned that waste materials will damage the environment that they will seep into the soil, into bodies of water, or be used by people and cause serious damage (Wikipedia, 2011).

According to Abiy (2011) While development has been reported in application of chemicals largely due to awareness of workers, pressure from labor unions within the farms, and directives of the Ministry of Agriculture, there are still some hazardous chemicals that are still in use (see table 1) Class 1a extremely hazardous and class 1b highly hazardous categories of the WHO that are still in use in the Ethiopian flower industry.

Table 1: Hazardous Pesticides use in Ethiopia

Comercial Name	Use	Hazard	WHO
Aldicarb	Insecticides/nematicides	Extremely Hazardous	WHOIa
Ethoprophos	Insecticides/nematicides	Extremely Hazardous	WHOIa
Cadusafos	Insecticides/nematicides	Highly Hazardous	WHOIb
Carbofuran	Insecticides/nematicides	Highly Hazardous	WHOIb
Dichlovos	Insecticides/nematicides	Highly Hazardous	WHOIb
Fenamiphos	Insecticides/nematicides	Highly Hazardous	WHOIb
Methiocarb	Insecticides/nematicides	Highly Hazardous	WHOIb
Methomyl	Insecticides/nematicides	Highly Hazardous	WHOIb
Monocrotophos	Insecticides/nematicides	Highly Hazardous	WHOIb
Omethoate	Insecticides/nematicides	Highly Hazardous	WHOIb
Oxamyl	Insecticides/nematicides	Highly Hazardous	WHOIb

Source: (Sisay Misganaw, 2007) and WHO chemical hazard category.

2.5.1. Effects of Floriculture Industry Chemicals on Environment

Pesticides and fertilizers used in the normal course of growing plants are the most important potential threats to groundwater. Pesticides having high leaching potentials, high surface loss potentials, or which are persistent in soil are of greatest concern. Method of application, pesticide formulation, soil type, and microbial activity in the soil are some other factors which affect how much chemical may reach the groundwater (Hengsdijk and Jansen, 2006).

2.5.1.1. Fertilizers

Use of excessive amounts of improper application of fertilizers and pesticides may result in harmful chemical contamination of ground water (David, 2002). Fertilizers are significant pollution treats because of their high solubility and the frequent application of large volumes of irrigation water (Thrupp and Lori, 1998).

Nitrogen and phosphorus must be managed carefully to ensure that excessive amounts do not degrade water quality. Too much nitrogen and phosphorus along with carbon in surface water cause eutrophication (excessive algae growth) in rivers, lakes, and ponds (David, 2002). And also, application of “bad” fertilizers or too many fertilizers can cause severe problems to plants or soil microbes. With increased soluble salt content in the soil, the ability of the roots to absorb water and nutrients is reduced, and the plants will wilt and die due to dehydration (Afrogadaa, 2010).

2.5.1.2. Pesticides

According to Meer and Vander (1997) methyl bromide, an ozone depleter and a categoryl acute toxin, is a heavily used and is among the most dangerous toxic substances known. There exists a wide array of other pesticides with known health risks. Some fungicides used, such as Mancozeb and Captan are suspected carcinogens, and such herbicides as paraquat, are extremely toxic through any route of exposure, whether absorbed through the skin, inhaled, or somehow ingested.

Chemical pest controls, increase soil salinity and destroying its productivity. According to Afrogadaa (2010) in-house agronomist Ato Seyoum Fenya, talk about Ethiopian flower farm experiences on pest control, the containers which store twenty litres of pesticide used each day on Menagesha Flower farm, are reportedly buried in the grounds without being sealed. Even if the containers are sealed and then buried, thus following the advice of the Ethiopian Environmental Protection Authority, this probably only delays a huge future environmental catastrophe. Moreover, too much chemicals kill useful organisms in the soil. And if too much pesticide gets into water bodies it damages the biodiversity.

What is more according to some researchers the land once used by the flower industries will take 40 to 60 years to rehabilitate if intensive treatment was conducted to that extent. Given the type of chemical being used, unregulated waste removal system and irresponsible government; it is very improbable that the land will be ready for agricultural use even in the coming century. If the flower farm expansion keeps with the current pace, the whole nation’s crisis of food will be in unmanageable (Afrogadaa, 2010).

2.6. Environmental Impacts of Floriculture Industries

With the expansion of the floriculture industry, there is a growing concern as to its adverse effect on the national environment. Ato Tsegaye Abebe, Head of EHPEA, is aware of this concern and stated that, “When any new sector is introduced into a country there are inevitably concerns about the impact of the sector on the local environment….” (Mulugeta, 2009).

The only alternative to chemical/artificial fertilizers is the use of organic cultivation. Nitrogen in fertilizer can produce nitrates, which can be washed away from fields by rain or irrigation, eventually finding their way to water bodies and soil. Water pollution, soil and water quality degradation, human and cattle health effects, air pollution, risk on aquatic life, as well as water logging and salinization are only a few of the undesired impacts (Mulugeta, 2009).

Pesticides (which include herbicides, insecticides, fungicides and more) can contaminate organisms, soil, water, turf, and other vegetation. It is estimated that less than 0.1 percent of the applied pesticide reaches the target pest, leaving 99.9 percent as a pollutant in the environment, including the soil, air, and water, or on nearby vegetation. The adverse effect of pesticide use includes degrading water and soil quality, effect on non-targeted lives like soil organisms, aquatic life, human beings, insects, cattle etc, air pollution, and increase of pesticide resistance by targeted pests (Mulugeta, 2009).

2.6.1. Effects on Health

With regard to matters dealing with workers’ health and safety issues, different literature indicated that they face problems that affect their health conditions. For example, the absence of toilet facilities and their poor condition, absence of clean drinking water, showers, absence of maternity leave as well as absence of first aid and free medical care coupled with the presence of high temperature in the greenhouses create potentially hazardous effect on workers’ health. However, chemical were seen damaging the health of the workers. Skin chemical allergies, respiratory problems, and unconsciousness because of inhalation of chemicals are among the direct health problems associated with the chemicals as witnessed by the health centers. In addition to these health problems mentioned by health centers, the workers added early abortion in women, birth problems,

stomach aches, vomiting, and poor appetite (http://www.addisfortune.com/Vol7No359/.htm).

According to Mulugeta (2009) many diseases such as *Methemoglobinemia*, Japanese encephalitis (JE), cancer etc. have been noted due to use of chemical fertilizers. Research demonstrates that "on rare occasions, nitrates have caused infants to become ill or die of *Methemoglobinemia* (more commonly known as blue-baby syndrome)." *Methemoglobinemia* occurs when the excess nitrates that remain in the soil move into the ground water and when this water is used for drinking by human beings as a result of which the nitrite interferes with the oxygen carrying capacity of the blood.

According to Workneh (2007) However, the management does not seem to be concerned about worker's health, as they do not seem to be taking measures to improve some of the important facilities such as the provision of safe drinking water and toilets on the farm. Instead, the management is more interested in protecting the flowers from plant diseases rather keeping the workers healthy.

According to Fatuma's (2008) study the floriculture farms were seen very close and there was only five meters between the farm and road to densely populated residents of the area. The neighboring households were strongly complaining of a pungent and irritating smell coming from the nearby farms especially while chemical spraying was going on in the farm greenhouses. Most of the time the chemical spraying was done in the morning times and the surrounding communities explained they were unable to eat their breakfast because of the disturbing bad smell coming out of the farms greenhouses.

UWEA (2006) mentioned from its research in Ugandan floriculture industries in the neighboring communities of flower farms complain of a smell when spraying was going on at the farm. According to UWEA (2006), it was also reported that bees which are necessary for pollination have disappeared due to spraying, hence poor yields in the surroundings.

2.6.2. Impact on Water Bodies

There are many fertilizers, which leak through the soil to the ground water or ditches and streams, thus causing water pollution. In a process known as *eutrophication*, fertilizer washed from fields into surface waters stimulates algae growth, which blocks sunlight needed by aquatic vegetation putting their survival at stake. This loss in vegetation

disrupts the food chain, leading to the death of economically important aquatic life. Moreover, this causes depletion of oxygen found in the water thus degrading the quality and usability of the water (Mulugeta, 2009).

Pesticides can move from the site of application via drift, volatilization, leaking, and runoff. Pesticides, including herbicides, can and do leak to contaminate ground water. Once ground water is polluted with toxic chemicals, it may take many years, a huge expense and a complex process for the contamination to be cleaned up. As a result, the contamination (by pesticides) of ground and surface water, which supplies the greatest part of drinking water, is a serious problem worldwide. When pesticides contaminate water, they can be harmful to the fish and other marine or freshwater animals that live there (Mulugeta, 2009). Additionally, Solid wastes and toxic chemicals that contaminated water body can develop water born disease (Abiy, 2011).

Lake Naivasha in Kenya floriculture farms has been accused of polluting the lake water through extensive use of chemicals, which has had a heavy effect on the lake's biodiversity. Fishermen highly blame that fish stocks are declining and the lake is being polluted by chemicals. Because of this there is usually conflicts raised between the community and the flower farms and some of them are feeling insecurity to produce comfortably (Becht *et al.*, 2006).

Aquatic life is in danger with floriculture industries effluent of wastewater. As a result of the Second North Sea Conference in 1987, a number of countries agreed to reduce discharges of certain chemicals in to water systems (Megara and John, 1999).

Researchers took small samples of water from local rivers and flower farms, and samples of discarded flowers from the farms. Flower farmers deny channeling water into rivers and natural water courses after they have watered their flowers. But investigators found that very few would treat water after it had passed over the pesticide-covered flowers (Stevenson *et al.*, 1997).Most use of excessive amounts or improper application of fertilizers and pesticides that result in harmful chemical contamination of the total environment and high pollution effect on water bodies (Whiles *et al*., 2000).

2.6.3. Impact on Soil

A growing crop does not take up all the nutrient ions in the fertilizer applied to the soil. Generally, healthy soil contains enough nitrogen fixing bacteria, which fixes sufficient

atmospheric nitrogen to supply the needs of the growing plants. But continued use of chemical fertilizers may destroy these nitrogen-fixing bacteria and many other micro- and macro- organism of the soil. In addition, an acid in chemical fertilizers, such as sulfuric acid and hydrochloric acid, which tends to increase the acidity of the soil, reduces the soil's beneficial organism population and interferes with plant growth. (Mulugeta, 2009).

Another most visible impact is the depletion of the soil through the intensive usage of fertilizers and chemical as well as during the waste disposal of cut flowers. The different types and amount of chemicals exposes the soil to loss its natural fertility. They have different character and reacted differently when they apply to the soil and change its texture, acidic value and fertility. Researcher from Colombia stated the treats that "Flower farmers in Colombia don't realize that the intensive use of the soil, the water and the intensive and excessive use of chemicals is going to convert the Savannah of Bogota into a sterile land," (USEPA, 1996).

2.6.4. Impact on Air

Some fertilizers, like Urea, spread in the fields with the help of sprayers and the ammonia therein react with the water present in the air causing the formation of ammonia oxide, and hence air pollution. Foliage, moves away from the area of application, and contaminate the environment. As much as 80-90 percent of applied pesticides can be volatilized within a few days of application (Mulugeta, 2009). Due to its highly volatility nature , is estimated that only 0.1 percent of the total applied pesticide attain its intended goal but the rest 99.9 percent leaves as an air pollutant. And the pesticides applied in the greenhouses travels an average distance of 1,500 miles, adding significantly to global warming and air pollution (Anonymous, 2003).

According to Abiy (2011) there are still some hazardous chemicals that are still in use. The use of methyl bromide is not officially encouraged by any institution. However, it is not yet banned from application in flower production. Methyl bromide is a fumigant that is regarded to be a serious ozone depletion agent. Ethiopia ratified the Vienna Convention and Montreal Protocol in October 1994 to help support in the regulation of the use of ozone depleting chemicals.

2.6.5. Impact on Land Cover Change

According to Fatuma (2008) most of the local communities and previous land holders perceived and explained the issue of land use change in association with the shortages of agricultural products, fuel and construction woods and price increase as well as the rapid climatic change seen in the locality. They were stressing that, because of most of agricultural lands and eucalyptus plantations were changed from forest cover and farm lands to floriculture farms, therefore, there have seen a shortage of agricultural products and forest products. Most of the people in Holeta area explained, as a result of their poor livelihood and increased prices of produce they couldn't afford to purchase agricultural and forest products as per their needs.

This finding was confirmed by the ILO (2006) report document on Ethiopia which stated that one of the side effects of floriculture expansion is problem of conserving the forest resources.

2.6.6. Waste Disposal Feature and Impact on Surrounding Environment

Floriculture activities produce different types of waste ranging from liquid to solid, hazardous to non-hazardous, and in effect require safe waste disposal and differentiated treatment. Empty chemical containers (fertilizers, pesticides) and their washing waters and obsolete chemicals are the major spheres of concern in addition to which other agricultural waste such as cut off crop parts, unused soil, and waste water are generated in the sector. According to Abiy (2011) Chemical containers, diseased plants, residue of cut-flower Stems and plastics are some of major solid wastes. It is known that up to 500 tons of residues per hectare per year are generated from flower farms. Liquid waste that cannot be reused or recycled should be collected and kept in impermeable containers or solar evaporation ponds. The waste residue should be transported off-site for safe disposal at a local, council-approved waste disposal area. However, the flower farms in Ethiopia have been heavily criticized for not having adequate means of waste management systems.

2.7. Environmental Policy and Laws of Ethiopia

In the 1990s, Ethiopia made significant progress in laying a foundation for addressing environmental problems. One major initiative for introducing environment into the national policy arena was the Conservation Strategy of Ethiopia (CSE) process, which started in

1989 and completed its work in 2003, culminating in a five-volume report. The CSE was instrumental in:

- Developing and obtaining government approval for the Environmental Policy of Ethiopia;
- Prompting the establishment of the Environmental Protection Authority;
- Introducing new thinking about environmental issues and development and put into circulation new ideas about sustainable development;
- Initiating and undertaking capacity-building activities for environmental management at the federal and regional levels;
- Facilitating the development and publication of a considerable amount of guidance, providing the government and donors with a basis for environmentally sustainable planning at the federal and regional levels.

The CSE was one of the influences that led to the inclusion of several references to environment in the 1995 Constitution of the transitional government. Article 44 guarantees the right to live in a "clean and healthy environment". Article 92 refers to the state's responsibility to design and implement programs and projects that do not damage the environment and establishes the joint responsibility of the government and citizens to protect the environment (CIDA, 2004).

The Environmental Policy of Ethiopia (EPE) included various policy directions which address the need to protect and develop the environment and conserve national resources for sustainable use. As a key guideline principle, the policy takes the position that when a compromise between short-term economic growth and long-term environmental protection is necessary, because rehabilitating a degraded environment is very expensive (Environmental Policy of Ethiopia (EPE), 1997).

EPE underlines recycling waste water when it is found to be safe for health and environment or when the recycling cost is not high. With regard to fertilizer use, EPE promotes the use of organic matters. EPE also regulates waste management by stipulating that waste disposal guidelines and strategies, and regulations to enforce them will be formulated, and an effective monitoring system will be established.

In the last quarter of 2002, three new environmental proclamations were approved. This legislation to a large extent operationalizes the objectives and the broad framework for environmental management stated in the Environmental Policy of Ethiopia.

1. Establishment of *Environmental Protection Organs* (Proclamation 295/2002) clarifies the institutional mandate and responsibilities of the EPA and aims to integrate environmental considerations into the policies and decision making of sectoral agencies through such means as the establishment of environmental units in these agencies at the federal level and the creation of independent environmental agencies at the regional level.

The proclamation is notable for its emphasis on human welfare and development. This is reflected in the EPA's mission statement, which begins, "The mission of the EPA is human well-being and ensuring environmentally sustainable development". The environmental legislation requires that regions establish their own independent regional environmental agencies (REAs) or designate an existing agency for this work. The mandate of the REA is not clearly outlined in the proclamation, but there is a general understanding that it will involve functions similar to those of the federal EPA.

2. *Environmental Impact Assessment* (Proclamation 299/2002) specifies the projects and activities that will require environmental impact assessment. The EIA must be prepared by the proponent of the project, following the format specified in the legislation. The EPA will then review the EIA study, approve the project (with or without conditions), or reject it.
3. *Environmental Pollution Control* (Proclamation 300/2002) addresses the management of hazardous waste, the establishment of environmental standards for various environmental media (air, water, and soil), and the monitoring of pollution. The problem of improper handling of hazardous substances is increasingly important- for example, with respect to pest management and industrial development.

However, the attention given to the environmental impact of the floriculture wastes is very poor and is evident in the weak link between the farms and EPA.

2.8. Environmental Impact Assessment and Strategic Environmental Assessment

2.8.1. Overview on EIA

According to UNEP (1999) definition, Environmental Impact Assessment as a tool used to identify the environmental, social and economic impacts of a project prior to decision-making. It aims to predict environmental impacts at an early stage in project planning and design, find ways and means to reduce adverse impacts, shape projects to suit the local environment and present the predictions and options to decision-makers.

As per Jay *et al.* (2006) EIA as it is practiced today, is being used as a decision aiding tool rather than decision making tool. There is growing dissent on the use of EIA as its influence on development decisions is limited and there is a view it is falling short of its full potential. Hence, EIAs have often been criticized for having too narrow spatial and temporal scope. At present no procedure has been specified for determining a system boundary for the assessment. The system boundary refers to 'the spatial and temporal boundary of the proposal's effects'. This boundary is determined by the applicant and the lead assessor, but in practice, almost all EIAs address the direct, on-site effects alone. There is a need for stronger foundation of EIA practice through training for practitioners, guidance on EIA practice and continuing research.

2.8.1.1. EIA in Ethiopia

Prior to becoming a legal requirement in 2002, the application of EIA in Ethiopia was introduced by a few sectors. The former Ethiopian Valleys Development Authority was the first national institution to incorporate EIA into its activities. The authority developed its own specific guideline for the application of EIA in pre-feasibility and feasibility studies of potential medium-scale irrigation projects (Solomon, 2006).

In Ethiopia development planning, especially, has in the past been rather rudimentary, and that which existed paid little or no attention to environmental impacts. As a result the country has, over the last few decades, experienced a serious degradation of natural resources and damage to the environment and human health. If appropriate environmental monitoring and protection is not carried out, the development efforts of these projects could damage the environment and make development unsustainable (Yonas, undated).

According to Proclamation number (295/2002) Environmental Protection Agency has been given particular responsibility by the Government. In this regard, the EPA has taken the necessary steps and embarked on the establishment of an Environmental Impact Assessment System for Ethiopia including the preparation of Procedural and Sectoral Guidelines as a prerequisite for the approval of new development activities and projects. Moreover, Articles 11 and 12 of the Proclamation require EPA to follow up and monitor the implementation of the project already done according to the EIA and to see whether circumstances have occurred which might require a new EIA to be done.

According to EPA procedure, the project proponent (developer) is responsible for undertaking an 'Initial Environmental Examination' (IEE) in order to determine whether or not a given project requires full EIA. The IEE report would have importance in setting out relevant details of the project (location, size of the project, likely impacts and proposed mitigation measures etc). On the basis of the IEE report, the Competent Agency (e.g. EPA) will approve the project (with conditions if considered necessary), request a full EIA study, or reject the project outright.

Setting the time frame for various stages of EIA process, and the incorporation of workable appeal and grievance procedure have not yet been settled (Yonas, undated). As Mellese and Mesfine (2008) the very nature of EIA requires many specific rules for its implementation. Lack of these specific rules obstructs the implementation of EIA. Article 7(2) of the EIA Proclamation illustrates the need for more specific regulations.

By using EIA both environmental and economic benefits can be achieved, such as reduced cost and time of project implementation and design, avoided treatment/clean-up costs and impacts of laws and regulations. Although legislation and practice vary around the world, but the Ethiopian EIA legislation is similar in content and application to the Canadian Environmental Assessment Act (CEAA). A comparative analysis of the two environmental legislations undertaken by the Environmental Assessment and Compliance Branch of CIDA (2004) concluded that the environmental assessment process in Ethiopia as prescribed in the legislation met with the minimal standards of the CEAA.

Furthermore, it was found that the Ethiopian EIA goes one step beyond the CEAA - it includes what is the equivalent to a Strategic Environmental Assessment.

2.8.2. Strategic Environmental Assessment

Sadler and Verheem (1996) define Strategic Environmental Assessment (SEA) as the formalized, systematic and comprehensive process of identifying and evaluating the environmental consequences of proposed Policies, Plans or Programmes (PPPs) to ensure that they are fully included and appropriately addressed at the earliest possible stage of decision-making on a par with economic and social considerations.

Another definition about SEA is says that, SEA is a process directed at providing the authority responsible for policy development (the “proponent’’) (during policy formulation) and the decision maker (at the point of policy approval) with a holistic understanding of the environmental and social implications of the policy proposal, expanding the focus well beyond the issues that were the original driving force for new policy (Brown and Therivel, 2000).

Since this early definition the field of SEA has rapidly developed and expanded, and the number of definitions of SEA has multiplied accordingly. SEA, by its nature, covers a wider range of activities or a wider area and often over a longer time span than the environmental impact assessment of projects. SEA might be applied to an entire sector (such as a national policy on energy for example) or to a geographical area (for example, in the context of a regional development scheme). SEA does not replace or reduce the need for project-level EIA (although in some cases it can), but it can help to streamline and focus the incorporation of environmental concerns (including biodiversity) into the decision-making process, often making project-level EIA a more effective process. SEA is commonly described as being proactive and ‘sustainability driven’, whilst EIA is often described as being largely reactive (Camco, 2011).

There are several reasons behind the growing use and interest in SEA internationally. First and foremost, public demands have intensified, particularly in many industrial countries, for more systematic consideration of environmental and social impacts of policymaking and strategic planning (Olav and Henrik, 2002).

Thérivel and Partidário (1996) assure that SEA can play an important role in enhancing the integration of environmental and social objectives in policy and planning processes,

thereby facilitating the implementation of sustainable development. A more integrated system of planning means that sustainability criteria are incorporated throughout the planning process, for instance, in the identification of suitable (or unsuitable) locations for development and in the assessment of alternative PPPs.

2.8.2.1. SEA in Different Parts of the World

In industrial Countries SEA is mainly exercised, according to the Olav and Henrik (2002) the Canadian SEA Directive essentially elevates EIA to the level of policies, plans, and programs. And also recently, the EU passed a Directive mandating SEA for certain plans and programs. According to the Thérivel and Partidário (1996) the rationale for undertaking SEA in the United Kingdom, at both policy and development plan levels, is founded on concepts of sustainability (UK Cabinet 1994) and on a long tradition of economic appraisal.

Developing countries have limited SEA experience to date, However, there are clear signs that SEA is being studied with growing interest in many countries and some, such as South Africa, Indonesia,Chile, Colombia, and Brazil (São Paulo State), are already developing policies or guidelines on SEA. On the other hand, some of the poorest countries may still see SEA as yet another potentially constraining and resource-demanding burden on their economic growth and on industrialization (Olav and Henrik, 2002).

Issues related to openness, democracy, and governance may also influence the rate at which SEA systems are being or will be implemented (Thérivel and Partidário, 1996).

In Ethiopia SEA is not prepare at legal level and not given an emphasis but, the World Bank has supported SEA of a national roads program in Ethiopia. Other donors, such as the Netherlands, have been involved in a number of SEA or SEA-like processes. In Tanzania, strategic assessments are part of the planning process for national parks (Olav and Henrik, 2002).

2.9.2.2. The Differences between SEA and EIA

When we compare both EIA and SEA, SEA can assess impacts which EIA may not be able to assess, and the classic example, of course, is large-scale impacts or very long-term impacts--long term in the sense of several decades and not just a few years ahead--

and also the notion of cumulative impacts that SEA can sometimes be more able to deal with than EIA. We have the feeling that SEA involves a greater variety of skills and institutions than EIA, and that SEA utilizes a much broader set of techniques and approaches and also EA or EIA being more at the project level and SEA covering the whole range, program, policy, and the whole life cycle of a plan, program, or policy, sometimes referred to as PPP (Camco, 2011).

SEA and EIA can be vertically integrated, and there are several examples where SEA of policies, plans, and programs, for instance, in the transport sector, could be extremely useful and relevant for project-level EIA. And if well done and, again, if organized and well planned, SEA has the potential to reduce the resources which are required for EIA both in terms of time and cost resources.

According to Jean (2003) SEA has to influence decisions; otherwise, SEA doesn't really fulfill its purpose. More often than not, a good SEA is an SEA that reached the decision makers at exactly the right moment when the policy was going to be approved or during the process of preparing a plan or a program. If SEA, like EIA, does not influence a decision, then clearly SEA should not be undertaken.

Table 2: Differences between SEA and EIA

SEA	EIA
Is pro-active and informs development proposals	Is usually reactive to a development proposal
Assesses the effect of a policy, plan or programme on the environment, or the effect of the environment on development needs and opportunities	Assesses the effect of a proposed development on the environment
Addresses areas, regions or sectors of development	Addresses a specific project
Is a continuing process aimed at providing information at the right time	Has a well-defined beginning and end
Assesses cumulative impacts and identifies implications and issues for sustainable development	Assesses direct, indirect, cumulative, and residual impacts and benefits
Focuses on maintaining a chosen level of environmental quality.	Focuses on the mitigation of impacts
Has a wide perspective and a low level of detail to provide a vision and overall framework	Has a narrow perspective and a high level of detail
Creates a framework against which impacts and benefits can be measured	Focuses on project-specific

Source: Dalal-Clayton and Sadler, 1998, adapted from CSIR (1996), and partly modified by Camco

3. Materials and Methods

3.1. Description of the Study Area

The study was conducted on floriculture industry and the surrounding environment where the industries are congested, in Debrezeit town. Debrezeit town is found at about 47kms to the southeast of Addis Ababa and situated between Dukem and Mojo towns along Addis Ababa Djibouti road, in Oromia Region, North Shewa zone of Ada'a Wereda.

The geographical/astronomical/ location of Debrezeit town is at $8^0$44'40''N latitude and $38^0$59'9''E longitude at an Altitude of 1925ms and It is characterized with a humid tropical climate and intense precipitations from June to August. The air temperature varies around the year from a minimum of 06°C to a maximum of 36 °C. The town covers about 14,000 hectares of area. There are more than 15 floriculture industries established around the Wedecha River which is found 10 km away from the town. The effluents of floriculture industries are directly discharged to the river and impose impacts on the surrounding environment.

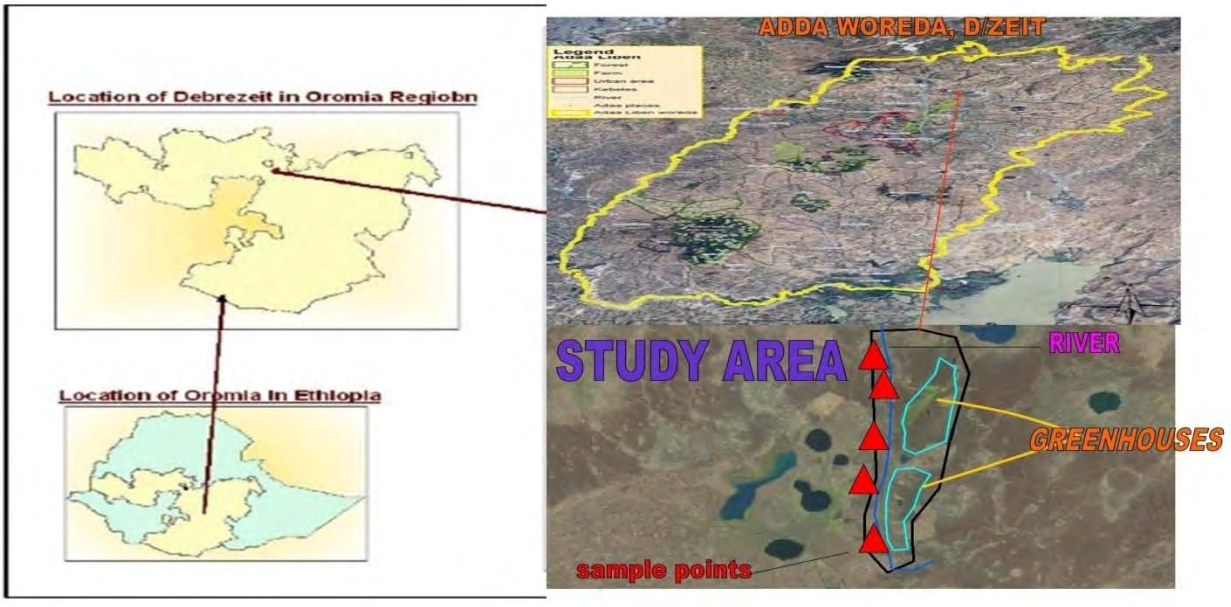

Figure: 1 Location Map of the Study Area (Source: own survey, 2013).

3.2. Data Collection Method

The necessary primary and secondary data are collected based on questioner, reviewing related literatures such as sources from various governmental and nongovernmental organizations and interviewing the employee in floriculture industry, direct physical site observation and assessing existing situation of the study area and by taking sample from the soil and river water.

3.2.1. Water and Soil Sampling

Samples are taken from water and soil. Water sample is taken from the river which is found nearby, and also soil sample taken from two different greenhouses. This green houses are established in different time series, the first one is in 2008 and the second one is in 2011, this will enable to analyze the chemical impact of floriculture industry on the soil.

3.2.2. Analytical Method

Water samples were collected from different five points along the river and finally changed to homogenous mixture by combining them all, which may enable to analyze the overall cumulative effects of those 15 floriculture industries impact on the river. The samples are taken from the upper parts of the catchment, the middle one where many point sources are found, and from lower stream parts. From this water samples the study try to analyze pH, electrical conductivity (EC), Nitrate (No3-N), reactive phosphate (PO4), Biological oxygen demand (BOD), chemical oxygen demand (COD), Sulfate (SO_4), and Total ammonia (T-NH_3) parameters.

The soil sample is taken by using auger, which enabling to pick out the soil from different depths. Therefore, the sample were taken from three depths from top layer (10m depth), middle layer (10-15m depth) and inner part of the soil (15-20m depth) and finally the homogenous mixture of this three layer soil measured to evaluate the impacts of floriculture industries chemical on soil at two different greenhouses depending on their time series. These three layers of soil are taken from two different greenhouses, to analyze the trend. The soil sample is taken to analyze the following parameters pH, CEC, EC, Phosphorus (P) and total Nitrogen (TN).

The methods of analysis for water pH is potensio metric, the COD is analyzed by open replax method, the EC is also analyzed by potensio metric method, SO_4 and PO_4 is analyzed by coloro metric method which is used the instrument called spectro photometer to read the color strength and total nitrogen is analyzed by per sulphate method.

The methods of analysis for soil sample total nitrogen is Kejelhad method, the CEC is analyzed by Ammonium acetate method, Phosphorus is analyzed by Alitad Olisen method, and the pH is measured by pH meter and the EC is measured by electron conductivity meter.

3.3. Materials

pH was measured using JENWAY model 3510 pH meter; EC were measured using JENWAY model470 conductivity meter. Chemical oxygen demand was determined by using a HACH DR/2016 photometer (HACH, USA) and BOD_5 was measured following APHA (1998) instruction.

3.4. Data Analysis Method

The data collected for this study were analyzed using SPSS for variation in pH, CEC, EC, Phosphorus (P) and total Nitrogen (TN) Nitrate (No3-N), reactive phosphate (PO4), Biological oxygen demand (BOD), chemical oxygen demand (COD), Sulfate (SO_4), Total ammonia ($T\text{-}NH_3$) concentrations in the soil and water. The SPSS is also used for analysis of the data which is obtained from questioner.

The results of physicochemical parameters were also compared with Ethiopian EPA provisional standards to check whether the effluent and impacts of floriculture chemicals is within the stated standard or not.

4. Result and Discussion

4.1. Result Obtained From Questioner

4.1.1. Ground Water

90% of the floriculture farms use the ground water and only ten percents use both river water and ground water. But the depth for bore hole is varying from farm to farm depending on their need of water consumption and the level of water table. 60% of the farm digs their borehole with range of 80-100m, 30% of the farm is 100-150m, and 10% of the farm uses 50-80m depth of the bore hole for water consumption. The majority about 90% of the farm use the drip irrigation mechanism which is known as good for water saving, and 10% uses both drip and sprinkler for irrigation. According to David (2002) after intensive water use by floriculture, the water table has dropped under the savanna surrounding Bogota.

Figure 2: Sources of Water for Greenhouse Consumption (Source: own survey, 2013).

4.1.2. Planting media usage

The majority of floriculture farms preferred soil bed as planting media because of its cost effectiveness, obviously the impact on environment is not their own concern. According to different farm managers, they plan to change their all planting media to soil bed in the

future, because using hydroponics as a media is expensive and more sensitive even if its environmental benefit is uncompromised. Therefore, only 30% of the farm used hydroponics as media and soil bed takes 40%, the rest 30% uses both media, some farms transfer the used water by hydroponics to soil media after treating the water.

Table3. Percentage of planting media

Planting media	Percentage	Hectare	Proportion /hectare/
Hydroponics	30%	37.2ha	29.6%
Soil bed	40%	39.2ha	31.25%
Both	30%	49ha	39.07%
Total	100%	125.4ha	100%

(Source: own survey, 2013).

Out of 49ha for using of both media, 29.5 ha is hydroponics and the rest 19.5 ha is soil media.

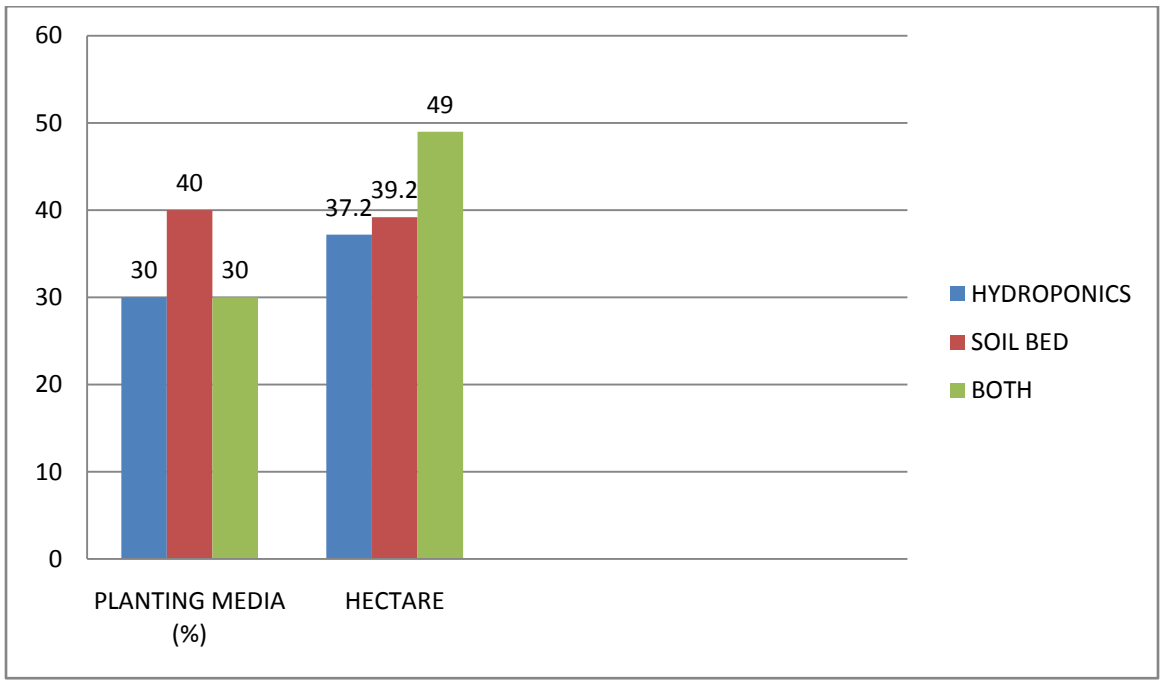

Figure 3: Planting media percentage of flower farm industry (Source: own survey, 2013).

4.1.3. Waste disposal and Water recycling

The main advantage of using hydroponics media is enabling the farm to reuse the water. The farm who use only the hydroponics as media is recycling the waste water and reuse it those takes about 30%, and other 30% whose use hydroponics and soil bed as media they all drain to the water body (wedecha river), 40% of the farm, drain to the nearby land.

Drain the waste water directly to the water body lead to the process of eutrophication, according to Art (1993) Eutrophication is the process by which a body of water acquires a high concentration of nutrients, especially phosphates and nitrates. These typically promote excessive growth of algae. As the algae die and decompose, high levels of organic matter and the decomposing organisms deplete the water of available oxygen, causing the death of other organisms, such as fish. Eutrophication is a natural, slow-aging process for a water body, but human activity greatly speeds up the process.

Most of the time the drained waste water to land is comes from the pipe remains, which is provide the fertilizer to the plants and the other waste water sources in the farm is comes from after harvesting the flower. The fresh flower must be stored in the solution of chemicals (Aluminum sulphate and calcium hypo chloride) and water in order to minimize the ability of flower maturity and perish ability. Finally, this chemical solution is not kept properly rather drain to the land irresponsibly.

When we look only the percentage for the post harvesting solution removal 70% flower farms drain to the land and only 30% of flower farm removed this post harvesting solution to soak away pit, which is constructed by gravels and charcoals enable to filter the waste water and finally clear water will be drain to the ground.

In addition to this soak away pit 10% of the flower farm in D/zeit establish the vegetation buffer area which enables to filter the waste water and to sip the toxic elements from the waste water and change the toxic water to the intoxicated, to establish this vegetation buffer zone water loving plants (grasses, shrubs…) must be planted. The rest 90% of the flower farm have no any idea about vegetation buffer zone or wetland system.

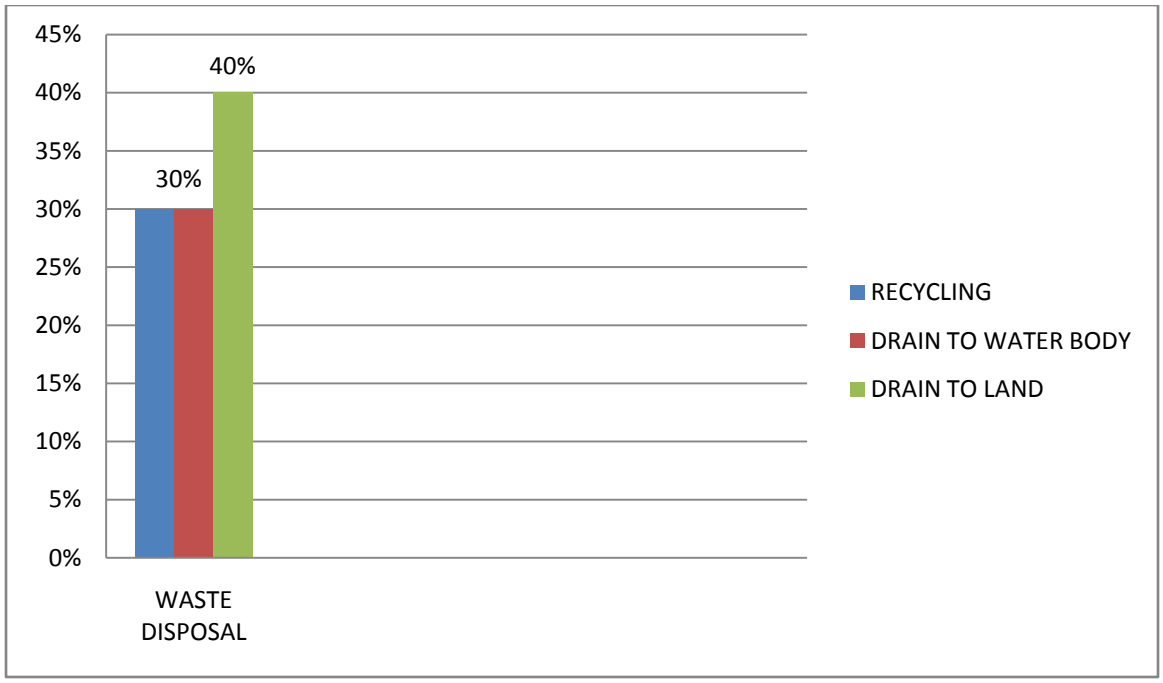

Figure 4: Liquid Waste Disposal Percentage (source: own survey, 2013).

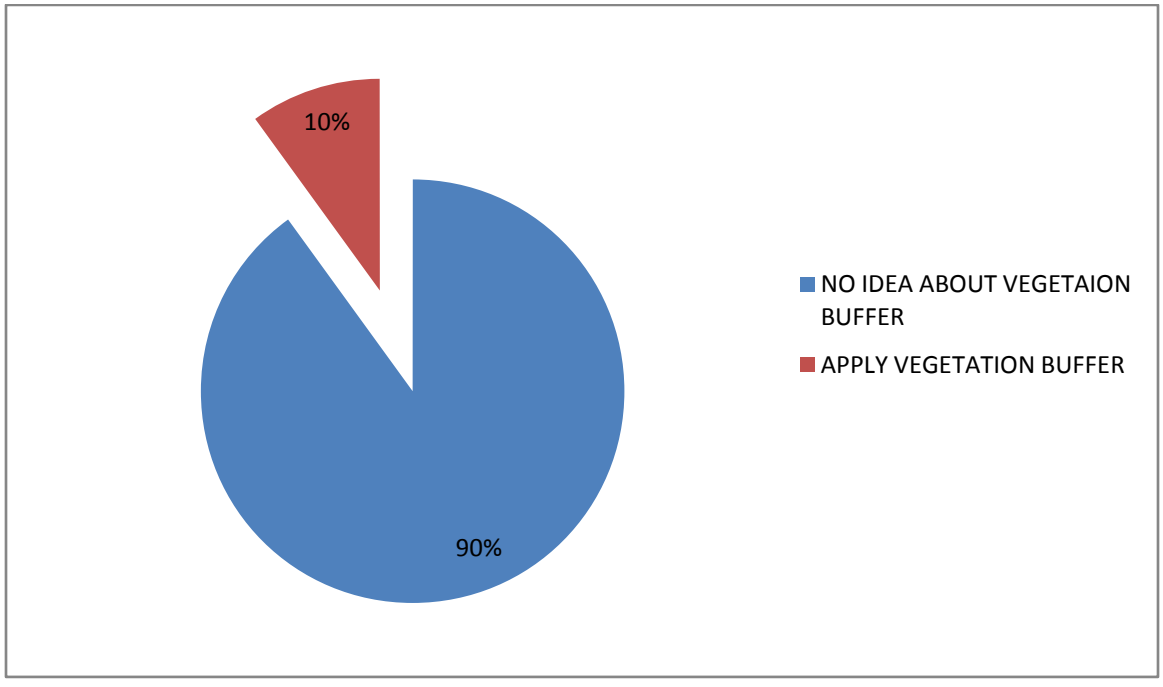

Figure 5: Percentage of Vegetation Buffer Usage (Source: own survey, 2013).

4.1.4. Land cover change

Obviously, Floriculture industry needs large farm areas this expanded area requirement will lead to land use change and conversion of useful ecological site.

30% of the flower farm established after removal of the local farmers, even if they replace in legal way there is a pain to lose the childhood place. And 40% of the floriculture company's take the land which is state farmland before. And the rest 30% of the land is swampy area, which the Wedecha River is up flow and inundates during the rainy season. According to Alan and Adrian (undated) Wetlands act as sponges during dry periods of the year; they regulate run-off and recharge ground water resources, and they purify water supplies. And even the government also not gave attention for wetland or swampy areas, Government policies that have failed to recognize the significance of local wetland management practices (Alan and Adrian, un-dated).

In near future five farms have plan for further expansions; three farms plan to expand by half of their own current area coverage, from 15-30ha, 5-12ha, and 7-15ha and two farms also plan to increase their area by 4hectare for more production and expansion.

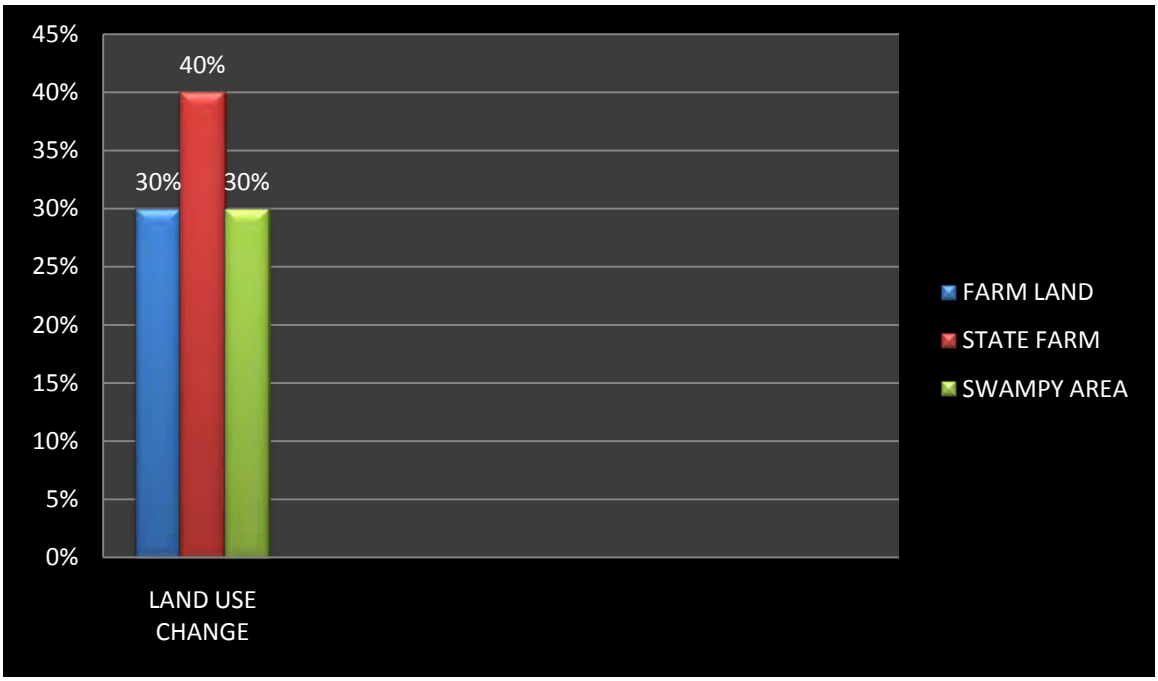

Figure 6: Percentage of land use change for floriculture industry usage (source: own, 2013).

4.1.5. Human health

Many employees in the flower farm have feelings of pain because of the exposures for chemicals, as they said till we adapt the smell we are frequently vomiting and headache is most of the time visible. The most flower farms have their own first aid services for every incidence, but 80% of the company's haven't a clinic that means only 20% have a clinic. All company's (100%) delivered the personal protection material such as gloves, goggles and other wearing materials. According to Mr. Solomon, who is production manager in one of the company's says "even if we provide the necessary material the workers are not more willing to use it properly, obviously the materials are not comfortable when wearing but nobody wants to tolerate this'' and he add also "we are give always short trainings and display some written cautions to be more worry about their health''.

The workers more exposed to chemicals are those who are participating in the chemical spraying section, some company's provide additional care for this section like, milk and provision of a better food, and 70% of the company's try to check up their blood toxicities and chemical level if they are toxicated they shift to other chemical free section, but the rest 30% of flower companies are not checking their workers blood toxicities level. About 200 workers from the total hectare of 125.4ha are participating in chemical section, 60 workers (30%) are not checked.

4.1.6. Water consumption

Floriculture industry uses water intensively as compare to the common vegetable production. Depending on the farm area, the climate change and water using mechanism, flower Farm Company's daily water consumption is varying.

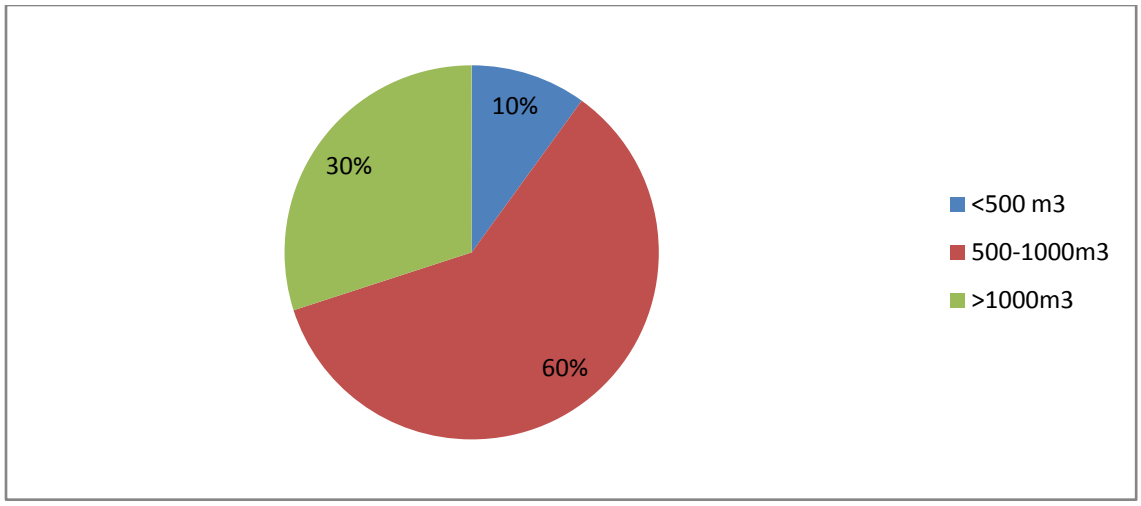

Figure 7: Daily water consumption of flower farms in meter cube (source: own survey, 2013).

4.1.7. Solid waste

Solid waste is include the plastics, cartons and chemical containers, almost 90% of Flower Company's burn the solid wastes with in incinerator at higher temperature (800℃-1000℃) and only 10% of the flower company's burn to the open air unsafely and recklessly. The other waste is green waste which is the remaining from plants; unwanted leaf and stem are removed and collected before the flower prepare for packing. Only 40% of company's utilized this green waste as a form of compost for their own organic fertilizer need, 30% are collect and ignore it, the rest 30% burn on open air irresponsibly.

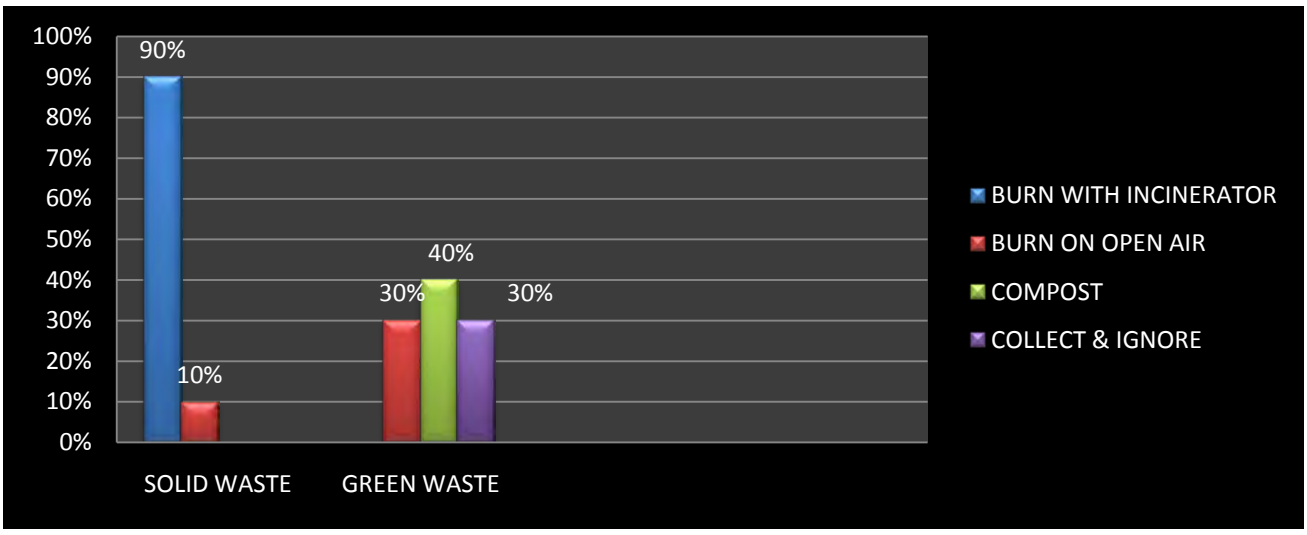

Figure 8: Percentage of solid waste and green waste disposal (source: own survey, 2013).

4.1.8. Air pollution

In the surrounding of the flower farm I am try to communicate with some residents informally about the smell from the company's, but most of the people did not recognized that the smells are harmful for health. I am also witnessed for this bad smell most of the time the chemicals are sprayed at early morning; they are very dangerous for asthmatic people and birds.

According to Getu (2009) pesticides has a capacity of contaminating organisms, soil & water. Due to its highly volatility nature , is estimated that only 0.1 percent of the total applied pesticide attain its intended goal but the rest 99.9 percent leaves as an air pollutant. The pesticides applied in the greenhouses travels an average distance of 1,500 miles, adding significantly to global warming and air pollution (Anon, 2003).

UWEA (2006) mention in its research in Ugandan floriculture industries the neighboring communities of flower farms complain of a smell when spraying is going on at the farm. It was reported that bees necessary for pollination have disappeared due to spraying hence poor yields in the surroundings.

4.2. Impact on water body by chemical analysis of (EC, pH, COD, BOD, PO4, NH3 and NO3)

To analyze the impact of floriculture industry in a water body some samples are taken from five different points and finally mixed up (homogenous mixture) those samples for cumulative result of the river. Eight parameters are measured (EC, pH, COD, BOD, PO4, NH3, SO4 and NO3).

Table4: The overall result of sample water, with comparing to Ethiopian EPA standards

Parameters	Cumulative Result	EPA Provisional Standard
Electrical conductivity, EC (µs/cm)	414	100-1000(µs/cm)
pH	6.59-8.88	6-9
Chemical oxygen demand, COD(mg/l)	84	<150(mg/l)
Biological oxygen demand, BOD_5(mg/l)	54	<5(mg/l)
Reactive phosphate, PO_4(mg/l)	3.4	<=0.005(mg/l)-0.1
Sulfate, SO_4(mg/l)	40	
Nitrate, NO_3(mg/l)	16.6	1-10(mg/l)
Total ammonia T-NH_3(mg/l)	0.1	0.025(mg/l)

(Source: own survey, 2013).

4.2.1. EC and pH

The electrical conductivity of the river may increased due to the ions from fertilizer and pesticides which are directly discharge to the water body therefore, the cumulative result is 414 (µs/cm) but the optimum EC for stream is100-1000(µs/cm) (EPA, 2003). The result is fall between the range of the standards maybe it is because of the sample, it was took at rainy time and maybe the waste water washed away to down streams. EC estimates the amount of total dissolved salts or the total amount of dissolved ions in the water. High electrical conductivity indicates high dissolved solids concentration; dissolved solids can affect the suitability of water for domestic, industrial and agricultural uses (Moore, 1989).

The pH value of the river wedecha sample water is ranges from 6.59-8.88. But, the optimum pH for river water is around 7.4 (Barbour *et al.*, 1999) and 6-9 (EPA, 2003).

Harriet *et al.* (2006) stated that extraction of water and release of products from the floriculture industry in Lake Naivasha increased the pH of the water from (7.28±0.03 to 8.8±0.0); the average pH value exceeds EU limits for drinking water (pH<8.5). According to FAO (2011) pH exceeds from 8.4 is not advisable for irrigation purpose. Therefore, from

this point we can analyze the Wedecha River, even if it falls between the ranges of EPA standards it is not good enough for domestic usage, irrigation and even drinking for cattle's.

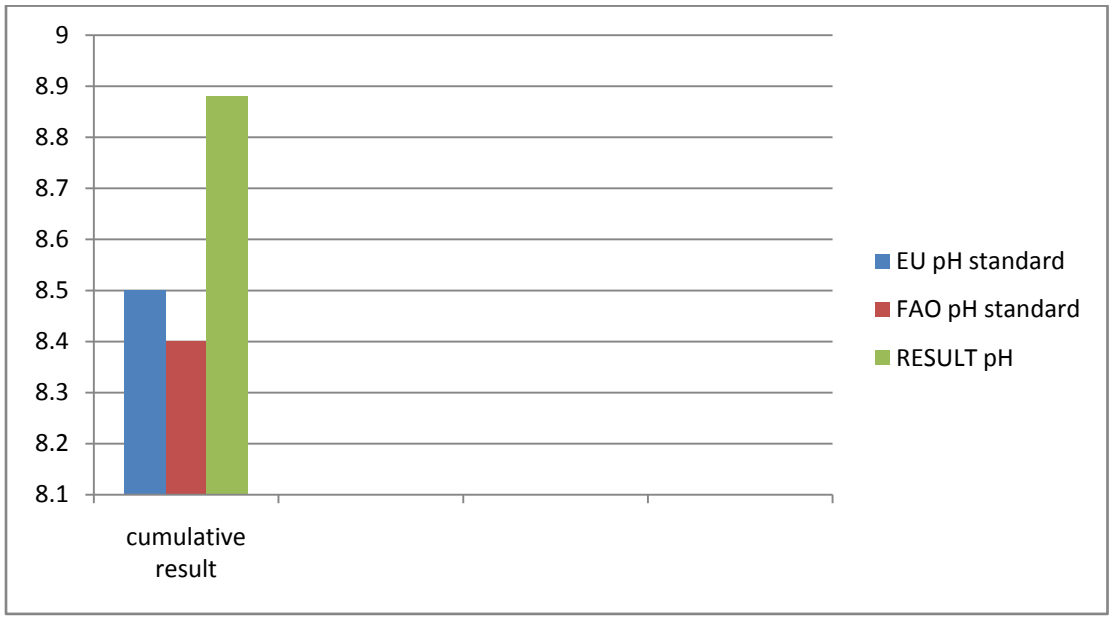

Figure 9: pH levels of Sample River and Different standards (source: own, 2013)

4.2.2. Biological oxygen demand

Biological oxygen demand refers that a measure of the amount of oxygen bacteria will consume while decomposing organic matter under aerobic conditions. Oxygen is important for life continuity in the water if the amount of oxygen is become less and less, the organism live in the water is exposed to severe condition and finally for extinction. Organic wastes from the farm effluent act as a food source for water born bacteria. Bacteria decompose these organic materials using dissolved oxygen, thus reducing the dissolved oxygen which is present for fish. The difference in the concentration of BOD could be due to excessive concentration of nutrients at the downstream area which increased the demand for dissolved oxygen by bacteria to decompose these organic materials (Malefia, 2009).

The overall BOD of river wedecha is about 54(mg/l). According to the research which was conducted on this river by Sisay (2007) the level of BOD was ranges from 19.9 to 46.7 mg/l, therefore it is now increased by 7.3(mg/l). According to the standards of the EPA (2003) the optimum BOD5 for stream water is< 5 mg/l. Mostly unpolluted streams

have a BOD5 that ranges from 1 to 8 mg/l (USEPA, 1976). The result shows that there is high amount of biological oxygen demand in the river.

4.2.3. Chemical oxygen demand

The averaged COD of the Wedecha River is about 84 mg/l, as compare as the research conducted before by Sisay (2007) the COD of the Wedecha River is ranges from 24.6 to 60.3mg/l. The amount is enhanced by20.1mg/l; it shows how the direct effluent from floriculture farms is increased. When we compare the result to the EPA standard it is inside the range, but we can simply recognized that the increment of COD of the river. The optimum COD for stream water is < 150 mg/l (EPA, 2003).

COD is a measure of the total quantity of oxygen required to oxidize all organic material in to carbon dioxide and water. High levels of COD and BOD values in the study area could be due to excessive organic and inorganic wastes in the farm effluent (Gordon et al., 1992).

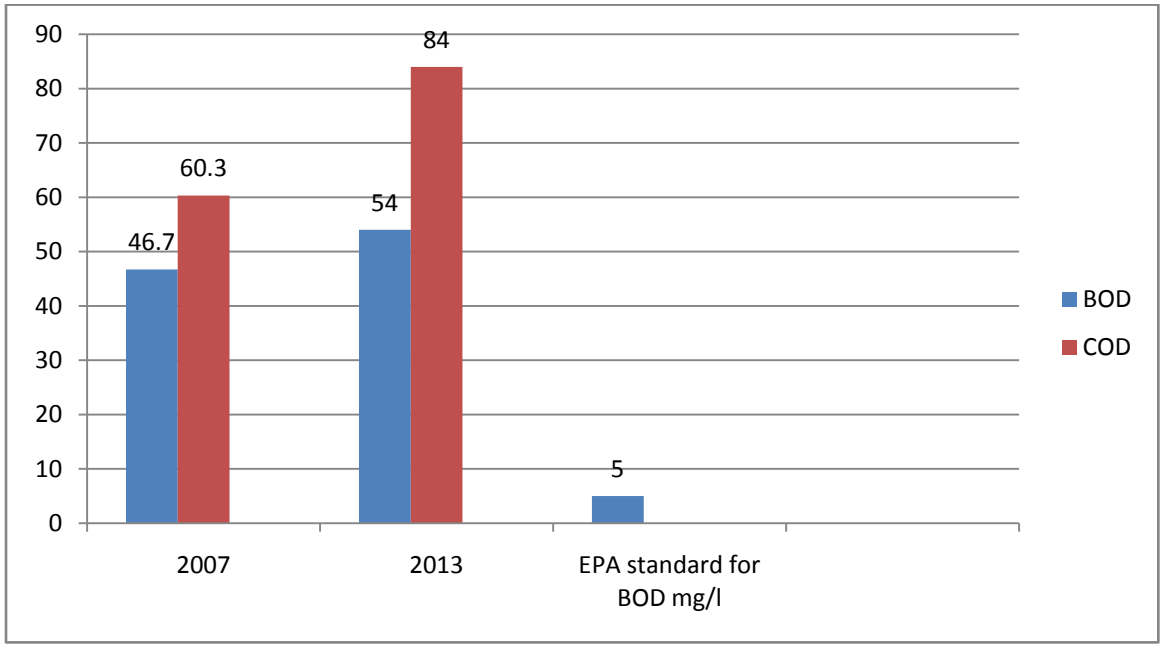

Figure 10: BOD and COD result (source: own, 2013)

4.2.4. Nitrate NO_3

The concentration of nitrate at Wedecha River is 16.6 mg/l; high concentration of nitrate in the water body is due to the fertilizer that the flower farms used and discharge. High

amounts of nitrate lead to the algal growth and enhancing the process of eutrophication, which finally brings shortage of oxygen level and damage for the water body.

Water with nitrate levels exceeding 1.0 mg/l should not be used for feeding babies (Dodds, 2002). Under certain conditions high levels of nitrates (>10 mg/l) in drinking water can be toxic to humans. High levels of nitrates in drinking water have been linked to serious illness and even death in infants. The ambient standard to protect aquatic ecosystems is 10 mg/l (EPA, 2003).

Therefore, the Wedecha River is not good enough for aquatic life.

4.2.5. Total Ammonia T-NH_3

The total ammonia of the river wedecha is 0.1 mg/l but the standard states by EPA (2003) the optimum NH3-N for stream water is < 0.025 mg/l. Therefore, the river is filled with ammonia beyond the standard level.

Figure 11: Image showing after the effluent discharged to the water body (source: own, 2013)

Figure 12: Eutrophication in Wedecha river (source: own, 2013)

4.2.6. Phosphate PO_4

The total phosphate of the river wedecha is 3.4 mg/l and the EPA (2003) provisional standard for PO_4^{3-} is 0.005mg/l and the standard for Phosphates should not to exceed 0.1mg/l in any stream (Hyland *et al.*, 1993). Floriculture industries are known for using excessive fertilizers and the effluents from the farm drained directly to the water body. Excessive amounts of phosphorous in a system can lead to an abundant supply of vegetation and excessive growth of algae, consequently low dissolved oxygen. This all shows that the river is highly concentrated by phosphate and exposed to emerging of phytoplankton that leads to eutrophication.

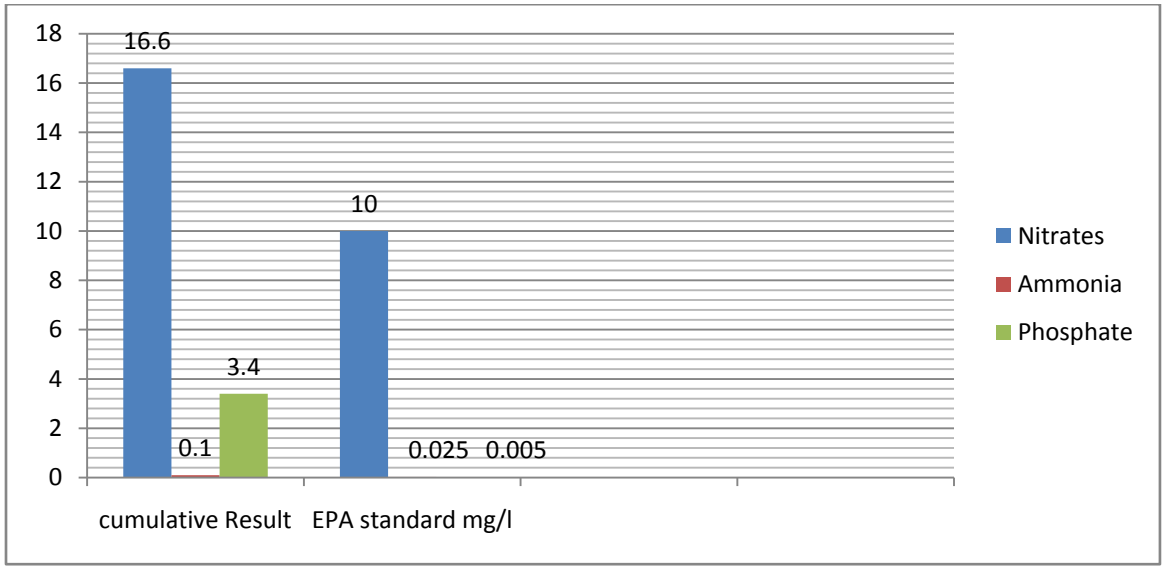

Figure 13: nitrates ammonia and phosphate level of the river (source: own, 2013)

4.3. Soil Result with Chemical Analysis Of (pH, Phosphorus (P), Electrical Conductivity (EC), Cation Exchange Capacity (CEC), And Total Nitrogen

The soil sample is taken from two different greenhouses, sample 1 from the green houses which is established in 2008 and sample 2 from 2011 G.C. this will enable to compare and analyze the chemical accumulation level of the soil before five years and recently.

Table: 5 Total soil results with different parameters.

	pH	CEC (c mol/kg)	EC (µscm-1)	P (mg/l)	TN (%)
Sample 1 (2008)	6.60	131.68	690	70	0.1764
Sample 2 (2011)	6.14	75.44	711	40	0.2464

Source: own survey, 2013

4.3.1. Phosphorus

Phosphorus is relatively immobile in soil. Most flower farms uses high amounts of fertilizers therefore, the accumulation of phosphorus is high in the soil. Due to the immobility of the phosphorus the 2008 sample contain 70 mg/l of phosphorus while the 2011 sample contain40mg/l. according to Scottish Agricultural College (SAC) laboratory interpretation, if the amount of phosphorus falls between 26-70 mg/l considered as high concentration. High soil phosphorus combined with surface runoff can cause excessive growth of plants and algae in surface waters, damaging aquatic ecosystems (E.S. Marx et al, 1999).

Table 6: Soil interpretation method

(Olsen extraction) Olsen P	
Defra Index	mg/l
0	0-9
1	10-15
2	16-2
3	26-45
4	46-70
5	71-100
6	101-140
7	141-200
8	201-280
9	Over 280

Source: The Potash Development Association, 2005.

4.3.1.1. Relationship between Defra and SAC scales

The Scottish Agricultural College (SAC) laboratory uses different extractants and used a descriptive rather than a numeric scale.

Table 7: Relationship between Defra and SAC scales

Defra Index	SAC description
0	Very low
1	low
2	Moderate
3-7	high
8-9	Excessively high

Source: The Potash Development Association, 2005.

4.3.2. Cation Exchange Capacity

CEC is a measure of a soil's capacity to retain and release cation such as K, Ca, Mg, and Na. and CEC is also shows the varying capacity of soils to hold and release these nutrients. Soils with high clay or organic matter content tend to have a high CEC. Sandy soils have a low CEC. In floriculture industry there is high chemical exposure of soil, this spraying chemicals may contain different amounts of cation this will lead to high concentration of ions.

The result shows that in sample 1(2008), the CEC of the soil is 131.68 c mol/kg, while sample 2(2011) 75.44 c mol/kg. The accumulation of ions for five years in sample one is higher than sample two, therefore the trend is when the time goes the cation accumulation and exchange capacity will increase.

In order to compare the CEC amounts of the floriculture industry soil with common agricultural soil, I will refer the sample which is taken from farm field around sebeta area. The sample is taken from ten sample plots and the result is ranges from16.12 c mol/kg to 27.7 c mol/kg, this shows how the soil CEC of floriculture farm is higher than common agriculture soil land. This means also the industry uses many chemicals those enhance the CEC of the soil and finally changes the neutral soils to saline soils.

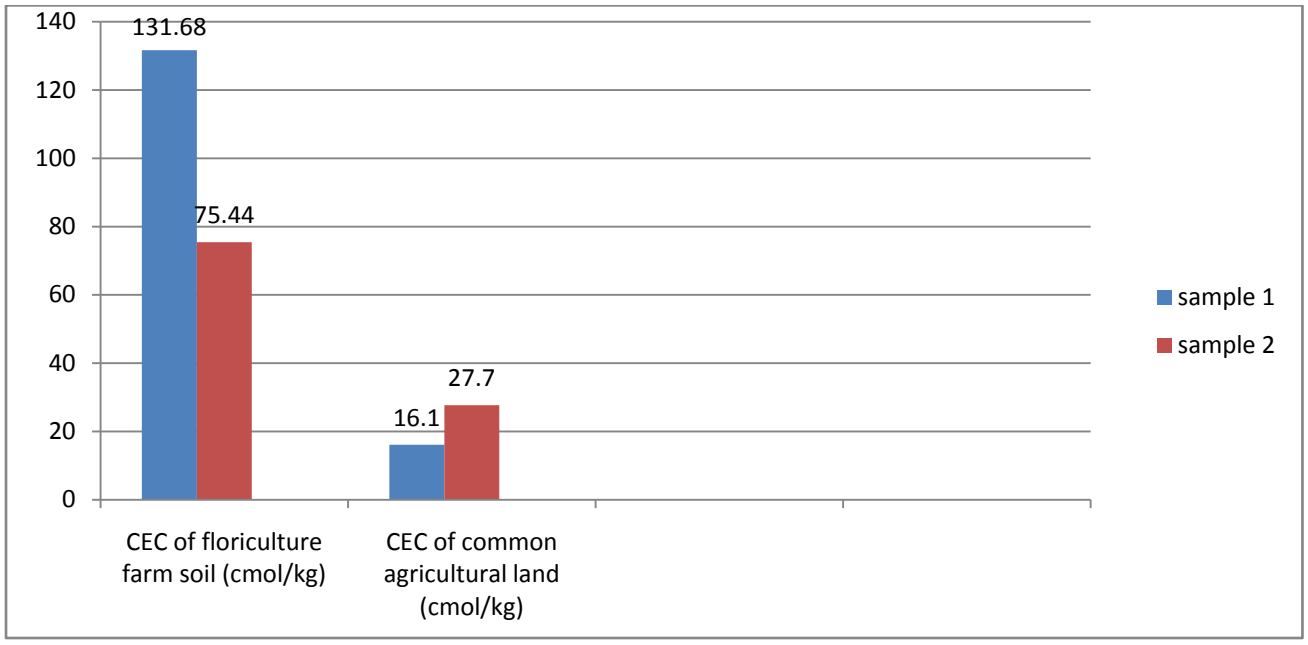

Figure 14: CEC comparison between floriculture soil and common agricultural land (source: own, 2013)

4.3.3. Total Nitrogen

Total nitrogen analysis measures N in all organic and inorganic forms. According to the result total nitrogen percentage for sample 1 (2008) is 0.18% and for sample 2 (2011) is 0.25%, therefore from this we conclude that the nitrogen concentration of recently established green house is higher than that of formerly (2008) established. This may be because of continuous adding up of nitrogen due to increase fertility rate of the recently established soil. According to E.S. Marx et al (1999) a typical agricultural soil contains about 0.10 to 0.15 percent of N. From this we can analyze the greenhouse soil contain more nitrogen than common agricultural soil.

4.3.4. pH

This is a symbol denoting the relative concentration of hydrogen ions (H) in the soil solution. A pH of 7 is considered neutral. pH values below 7 are called acid and those above 7 are called alkaline. Vegetables generally do well in soils 6.0 (Moderately acid) to 7.2 (slightly alkaline). The sample 1 pH result is 6.60 and sample 2 is about 6.14.Most of the time roses need acidic soil which enable them to take up the required nutrients from soil, that is why the newly established greenhouse soil is moderately acidic than the greenhouse which established in 2008.

4.3.5. Electrical Conductivity

The electrical conductivity provides an idea about the exchangeable elements present in the soil. Most of the time the source of EC are ions from fertilizers and pesticides, this fertilizers and pesticides contribute to the enhancing of conductivity.

EC of sample 1 (2008) is 690 (µscm-1) and sample 2 which is recently constructed green house (2011) is 711(µscm-1). When the amounts of EC become high the exchangeable elements of the soil is become high, therefore the salinity of soil also become high. EC of newly established greenhouse is higher than the former one; this might be the continuous usage of fertilizer and pesticide, in order to improve the fertility of soil shortly.

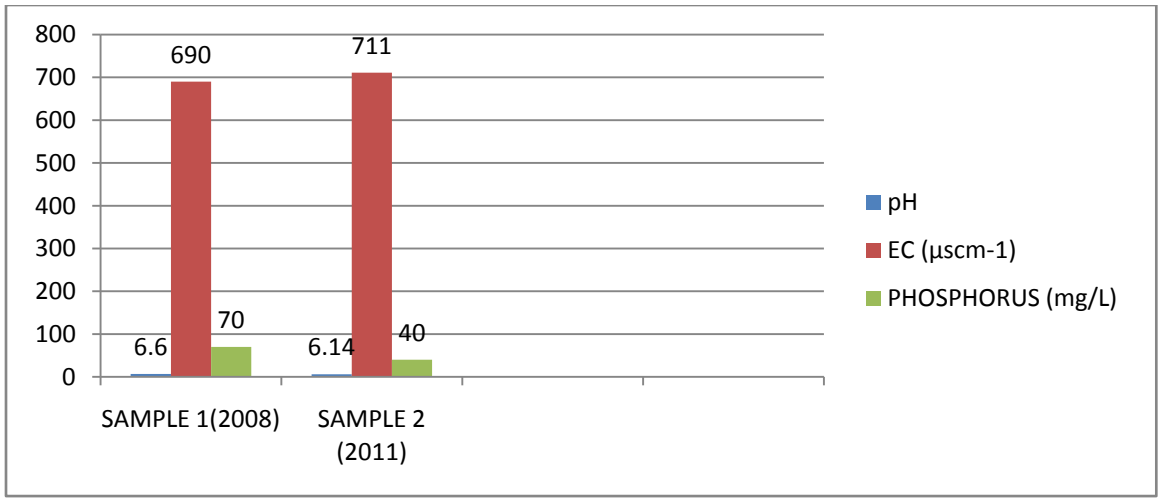

Figure 15: the value of pH, EC, and phosphorus in two sample plot (source: own, 2013)

4.4. Result on policy issues

4.4.1. EIA

According to proclamation No. 299/2002, "without authorization from the Authority or from the relevant regional environmental agency, no person shall commence implementation of any project that requires environmental impact assessment…"even if the Ethiopian law states about EIA, the follow up, monitoring and regulation is not well exercised.

In Debrezeit all flower farms (100%) haven't their own EIA document, the cause is when they are established before 7-8 years ago the government gives more attention for expansion of the flower industry, and encouraging this new emerging industry's to be strong, therefore the concern for environment is decline. According to Mr. Ahmed who is an expert in one of regional EPA office "at that time nobody's speak loudly about the impact of the industry's, because each and every thing was politicized and the government officials are not want to hear such information's''.

Proclamation no. 299/2002, gives the power to federal EPA for approval and rejection of the project after reviewing the EIA document, "the authority…approve the project without conditions and issue authorization if it is convinced that the project will not cause negative impacts…'' and about the responsibility the law also states that, "The Authority shall be responsible for the evaluation of an environmental impact study report and the monitoring of its implementation".

Even if the law says this, the EPA disseminated his power to sectoral offices to review the EIA and for further decisions to approve or reject the project. Therefore, some sectors are not able to implement properly according to Abiy (2011) with the aim of accelerating the issuance of the investment permits and to ensure a 'one window shopping' service, the Ethiopian Investment Agency started issuing the permit before an EIA was done. Issuance of an investment license before an EIA has clearly reduced the incentive of investors to go through the process of an impact assessment.

According to Mr. Ahmed " at regional level we are not distributed the power to regional sectoral bureaus as the federal EPA did, because they are not efficient to do by their own even we are as regional EPA not efficient to do what we have to do". He add also about the compilation of the EIA document "Even we know that most consultants are not compile properly the EIA document, they simply copy paste and they are not asses the expected impact of the project by visiting the area physically, because it is not cost effective, the project owner's most of the time are not want to pay more. But we are not still taken measure to stop such repeated and improper compilation of EIA document".

On this issue the law says that "Any person who, without obtaining authorization from the Authority or the relevant regional environmental agency, or makes false presentations in an environmental impact assessment study report commits an offence and shall be liable to a in of not less than fifty thousand birr and not more than one hundred thousand Birr (Proclamation no. 299/2002).

The power to monitoring of the project implementation is given by law to federal EPA and regional organs "The Authority or the relevant regional environmental agency shall monitor the implementation of an authorized project in order to evaluate compliance with all commitments made by, and obligations imposed on the proponent during authorization", Proclamation no. 299/2002.

But on the ground the monitoring activities are not carried out properly, according to Mr. Mohamed head of Oromia EPA says that "after 2003 E.C. we are seriously work on EIA, each and every projects must bring the EIA document and after we approved the Oromia investment bureau will give the permission for the project to go ahead, beside this the monitoring and follow up is not begin till".

All floriculture company's is a member of EHPEA Ethiopian Horticulture Producer Exporters Association and they all accept the code of practices which is prepared by the association. The code of practices describes about the workers health safety, environmental safety and quality production of the flower, for better export standards. Beside this Ethiopian association, some flower industry's are a member of MPS which is encourages the environmental friendly production and workers health safety.

60%of the flower industry is a member of this MPS and 40% are not involved till, the main advantage to be a member of MPS is will promote the quality of the flower and enhance the acceptance globally, even the selling price is increase for those members of the MPS than not a member. The MPS always follow the process and regulate each chemical, fertilizer and energy consumption digitally; if some error happens they cancelled immediately the member ship status. To be more effective and to reduces the environmental impact of the flower industry's and to enhances the rehabilitation activities, some industry's try to train one of their employee on environmental issues, but some those take about 20% have their own environmental specialists graduated from accredited universities, the majority about 80% of the company's haven't their own environmental professional.

4.5. A need for SEA

The Proclamation no. 299/2002, which states about EIA is not implemented in a well manner. Due to the complicated system of a globe, Project' Environmental Impact Assessment (EIA), as currently practiced, has been unable to respond to this increasing complexity and provide for global, sustainable and sound decision-making (Maria, un-dated).

Beside this, regulation at project level specifically are not effective as compare to the principles and practical achievements of SEA, therefore for acquiring sustainable result evaluation and monitoring must be carried out on cumulative effects of the floriculture farms. According to UK-DETR (1998) the main objectives of SEA is early warning of cumulative effects and large-scale changes. And also along with the concepts of sustainability, SEA has been evolving strongly associated to the achievements of sustainability practices and the consideration of cumulative effects (Maria, un-dated).

4.5.1. Justification for a need Strategic Environmental Assessment in the Floriculture Industry

SEA can ensure long-term economic sustainability of the industry in the wake of emerging environmental shocks such as climate change with its negative impacts like water stress. For an industry such as floriculture which consumes significant amounts of land, soil and water resources.

The need for SEA in the industry is further brought out by the industry's approach to "cluster farming" where a number of farms are co-located in a specific geographical area such as is the case around Lake Naivasha, Kenya and elsewhere. Individual project/farm-level EIAs may not be able to deduce cumulative, synergistic and long-term environmental effects of such co-location, while SEA will (CAMCO, 2011).This is the same as the study area in debrezeite, there is about ten huge floriculture industries are co-located and there cumulative environmental impacts have its own severe consequences.

The water demand for floriculture industry is high. The case study also states that, although water is abstracted from both the lake and underground sources, there is no metering. This finally, led to water depletion and scarcity. In the case of the flower farm in debrezeit, most of the farms are using ground water resources with the depth of 150m bore holes. Unless the necessary metering and regulation taken the consequences are obvious.

Even if all flower farms have their own EIA document, the degradation is still continue and unstoppable. Due to the incapability of project level EIA, environmental impact on the lake Naivasha and the surrounding ecology is become severe. According to Mireri (2005) the decision to set up large scale commercial flower farms and other commercial activities such as tourism, agriculture, dairy and beef farming, and fisheries around the lake is a classical regional example of the incapability of EIA to fully scope out the environmental impacts of such a large scale projects.

The law requires that EIAs be performed for all projects before their implementation; while for projects which were existing before the law came into force, environmental audits (EAs) should be undertaken. As such, all or most flower farms around Lake Naivasha have undertaken EIAs and periodically undertake EAs to comply with the law. Yet despite this compliance with the law, the lake's environment has continued to degrade in the recent past. The lake level has registered a major decline during the last 100 years (Mireri, 2005).

In the case of Debrezeit, all flower farms (100%) haven't their own EIA document. The cause is when they are established before 7-8 years ago the government gives more attention for expansion of the flower industry, and encouraging this new emerging industry's to be strong; therefore the concern for environment is decline. To minimize the sum up impact of flower farms on environment and to assure ecological sustainability the concern about SEA should be encouraged rather than focuses more on EIA.

Finally the case study conclude that, had a SEA been undertaken before the decision to put up such large scale investment was made, this potential catastrophe could have been avoided. Nevertheless, the case of Lake Naivasha provides a clear justification as to why a SEA is critical for such economically important projects as the floriculture industry around Lake Naivasha (Mireri, 2005).

SEA thus provides economic, social and environmental benefits to current and future generations (UNDP and REC, undated). In addition, by incorporating sustainable development considerations early in the decision-making process, there is a good chance that the subsequent design of individual projects will be more environmentally acceptable and that the project-specific EIA process will be more focused and efficient, further reducing the cost of EIA undertaking (Weaver, undated).

Therefore, Ethiopia did not still apply the SEA at policy level. In order to achieve sustainable environment for needs of present generation without compromising the ability of future generations to meet their own needs the application of SEA is must be begin.

5. Conclusion and Recommendation

5.1. Conclusion

Economically the floriculture industry is playing a vital role and contributes a lot to country's GDP, but in other side the industry has its own environmental and social health impact, due to the input the industries utilize. The fertilizer, chemicals, intensive use of surface and ground water, and the conversion of wetlands and farm lands for flower industries, the bad smell from chemicals, the waste disposal to water body and some health problems (which are visible in some workers) this all are negative impacts of the industry which is analyzed by this research paper.

The river around the flower farms are highly exposed to direct effluents of fertilizer wastes from flower farms, and the water quality of the river is changed and the eutrophication process is takes place which is finally brings severe consequence to ecology of the river wedecha. The BOD and COD of the river are increased from the 2007 measurement.

Ethiopia has environmental Policies and laws, among these laws EIA is highly incorporated with the flower industry. The mandate and responsibility to regulate and execute the EIA is given to EPA, but in this paper analysis the EIA is not properly manipulates and exercised. Almost all (100%) of flower farms haven't their own EIA document, which is ordered by the law to be reviewed before implementation of any projects.

To assure the environmental sustainability of the booming projects of floriculture industry, the introduction of SEA to the country will flourish the way. SEA can do in a better way which EIA is unable to do, Individual project/farm-level EIAs may not be able to deduce cumulative, synergistic and long-term environmental effects of such co-location, while SEA will (CAMCO, 2011).

This study revealed that the impact by flower farms is significant in debrezeit area and the project level EIA is unable to regulate and magnifies the cumulative or the sum of the industries impact on environment. The need for SEA is a way to achieve the required environmental and developmental sustainability, and make easier to analyze the cumulative impacts of the floriculture industries and to take measure.

5.2. Recommendation

The flower industry highly contribute for environmental impacts, the waste waters are drain to water body and the soil media which they plant the flowers are highly vulnerable for direct chemical contact, and the workers are highly contaminated by hazardous chemicals. For better, sustainable and conducive environment sake, the floriculture industries must be practices the following recommendations.

Vegetation Buffer preparation: Vegetation buffer has to be prepared in place before the wastewater is discharged to the river to improve the discharged water quality. The vegetation is must be water loving species; by nature these plants can change the toxic waters to intoxicated water.

Wastewater treatment: the wastewater has to be treated before it is discharged to the nearby rivers. The waste water is incorporated with varieties of chemicals that pollutes water and soil of the surrounding environment.

Wastewater recycling: Floriculture industries wastewater has to be recycled rather disposed directly to the environment.

Land fill or incinerator: using these mechanisms for solid wastes, such as cans of chemicals and cartoons rather than disposing to the environment. Landfill mechanism is applied by burring the solid wastes in to the land, and incinerator is burning the waste without or minimal smokes in container like building.

Integrated pest management (IPM) practices: promoting to use such kinds of mechanisms and use of environmental friendly agro-chemicals are highly encouraged.

Hydroponic: rather than using soil media for planting, using hydroponic is advisable.

Health and safety training to workers: continuous workshops and training about the chemicals and the importance of wearing safety materials.

Setting buffer zones: keeping a certain safe distances for floriculture farms from residential area, and agricultural practices. Implementation of buffer zone management can include practices like planting trees in their farm yard to minimize any environmental risks from floriculture.

Environmental impact assessment EIA: proper follow up and regulation by authorized body EPA must be take place.

Strategic Environmental Assessment SEA: the floriculture industry is huge industry, the waste due to the fertilizer usage may change the quality of water bodies and the soil media also become infertile due to the chemicals spray on it and high amounts of fertilizer solution with acid. Therefore, these all impacts must be studied and emphasized not only as one flower farm impact rather as a sector or floriculture industries impact on environment cumulatively.

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Appendix: 1 Questionnaire for the floriculture industry professionals (Expertise).

RELATED TO WATER RESOURCES

1. WHAT IS THE SOURCE OF WATER FOR YOUR FLOWER FARM USAGE?
   ☐ RIVER OR LAKE ☐ RESERVOIR ☐ GROUND WATER ☐ OTHER SOURCE
2. HOW MANY M^3 OF WATER USED PER 1GH? AT ONCE/m^3 or liter/
   ☐ 30-100m^3 ☐ 100-200 m^3 ☐ MORETHAN 200 m^3
3. THE FREQUENCIES OF WATER PROVIDING FOR FLOWERS PER DAY?
   ☐ ONE TIMES ☐ TWO TIMES ☐ THREE TIMES ☐ MORETHAN THIS
4. IS THERE ANY TYPES OF IRRIGATION MECHANISM, WHICH CAN SAVE THE LOSS OF WATER?
   ☐ YES ☐ NO
5. IF YES, WHAT KINDS OF IRRIGATION SYSTEM DO YOU USE?
   _____
6. IS THERE ANY RECYCLING OF WASTE WATER FOR RE-UTILIZATION?
   ☐ YES ☐ NO
7. HOW MANY LITRE OF WATER USED PER DAY FOR ALL GH/FARM?
   ☐ WHEN THE FARM BEGIN ☐ AFTER A YEAR'S ☐ RECENTLY

RELATED TO SOIL

1. HOW THE FLOWER PLANTED?
   ☐ DIRECTLY TO THE SOIL ☐ USING HYDRO PHONIC ☐ POT BED ☐ MIXED OTHER ☐
2. HOW MANY OF HECTARE/GH/ PLANTED WITH SOIL BED? AND POT BED? OR HP?
   SOIL BED_____ POTBED_____ HYDRO PHONIC_____

NO.	NAME OF THE CHEMICALS RECENTLY USED IN THE FARM	PRICE	WHO CLASS/1-4/	KNOWN SIDE EFFECT ON ENVIRONMENT

3. WHY DO YOU CHOOSE HARMFUL/DANGEROUS CHEMICALS?
   ☐ EFFECTIVE ☐ THE COST IS CHEAP? ☐ OTHER
4. THE ESTIMATED AMOUNT OF SOIL PH? AND FERTILITY RATE? AFTER CHEMICAL UTILIZATION.
   WHEN THE FARM BEGIN ☐ AFTER A YEAR'S ☐ THE RECENT STATUS ☐

5. DO YOU USE METHYL BROMIDE FOR PEST CONTROL?
   ☐ YES ☐ NO
6. WHAT IS THE SOURCE OF YOUR ENERGY CONSUMPTION?
   ☐ ELECTRICITY ☐ GENERATOR ☐ BOTH

RELATED TO HUMAN HEALTH

1. WHAT KINDS OF VISIBLE HEALTH IMPACT & INJURIES APPEARS ON WORKERS?_____
   _____
   _____
   _____
2. IS THE WORKERS PROPERLY USING HEALTH PROTECTING MATERIALS?
   ☐ YES ☐ NO
3. IF YES, WHAT ARE THEY?
   _____
   _____
   _____
4. IS THERE ANY MEDICAL TREATMENT AFTER AND BEFORE INJURIES? ☐ YES NO ☐
5. IF YES, WHAT KINDS OF TREATMENTS GIVEN?_____
   _____
   _____
6. HOW MANY PERSONNEL PARTICIPATING PER GH/Ha TO SPRAY CHEMICALS?_____
7. HOW MANY PERSONNEL PARTICIPATING TOTALLY IN THE FARM TO SPRAY CHEMICALS_____

RELATED TO WASTE DISPOSAL

1. HOW AND WHERE THE SOLID WASTE IS DISPOSED?
   BURIED ☐ MOVE TO PERMITTED OPEN AREA ☐ DISPOSED ON LAND ☐ OTHER ☐
2. HOW AND WHERE THE LIQUID WASTE IS DISPOSED?
   WATER BODY ☐ IN TO THE LAND ☐ IN TO THE GROUND ☐ RECYCLED ☐ OTHER ☐

3. IS THERE ANY WASTE TREATMENT SYSTEM APPLIED?/BEFORE DISPOSING THE WASTE/
   ☐ YES ☐ NO
4. WHAT KINDS OF VISIBLE IMPACT DOES BRING THE WASTE TO THE SURROUNDING ENVIRONMENT/WATER POLLUTION/ AND ON SOCIETIES/SMELL/ BEE PRODUCTION/GRAZING LAND NEAR BY? /*FOR RESIDENT*/

   _____
   _____
   _____
   _____
   _____
5. PH OF WATER BODY AROUND THE FARMING AREA? _____

RELATED TO EIA

1. DO YOU HAVE YOUR OWN EIA DOCUMENT? YES ☐ NO ☐
2. DOES EPA PROPERLY REGULATE AND REVIEW YOUR ACTIVITY? ☐ YES NO ☐
3. IF YES, HOW THE EPA FOLLOW UP YOUR ACTIVITY?

   _____
   _____
4. DO YOU HAVE YOUR OWN ENVIRONMENTAL SPECIALISTS? /TO ANALYZE THE IMPACTS/.
   ☐ YES ☐ NO
5. DO YOU ACCEPT AND EXERCISED THE CODE OF PRACTICES COMPILED BY (EHPEA)?
   ☐ YES ☐ NO
6. DO YOU USE ORGANIC FERTILIZER?
   ☐ YES ☐ NO
7. WHAT WAS THE LAND USE BEFORE THE FARM LAND ESTABLISHED?
   FOREST ☐ FARM LAND ☐ OTHER ☐
8. LAND COVER AND WATER CONSUMPTION BEFORE A YEAR'S (5 OR 10) AND NOW?

   _____
   _____

FOR EPA

1. HOW MANY FLORICULTURE INDUSTRIES IS FOUND IN DEBREZEIT?_____
2. HOW MANY OF THEM HAVE EIA?_____
3. HOW THE EPA REGULATE AND IMPLEMENTE THE LAW? RELATED TO FLOWER INDUSTRY?_____

   _____

4. IS THERE ANY CHEMICAL STANDARDS STATED BY EPA? WHICH IS UTILIZED BY INDUSTRY?
5. THE CHEMICAL USAGE STANDARD BY WORLD HEALTH ORGANIZATION IS PROPERLY IMPLEMENTED BY THE INDUSTRIES?
6. IS THERE ANY SECTORAL POLICIES DIRECTLY RELATED TO FLORICULTURE INDUSTRY?
7. DOES ETHIOPIA HAVE SEA/STRATEGIC ENVIRONMENTAL ASSESSMENT/? WHY?
8. HOW IS THE IMPORTANCE AND EFFECTIVENES OF SEA AS COMPARE AS TO EIA? /OPINION/
9. IS EIA IS EFFECTIVE IN ORDER TO ASSESS THE IMPACT IN FLORICULTURE INDUSTRY?
10. THE CHEMICALS ARE KNOWN BY EPA BEFORE USED BY THE INDUSTRY?
11. WHAT WILL BE THE FUTURE PLAN OF EPA ACCORDING TO PREPARE THE SEA FOR THE FUTURE IN DIFFERENT SECTORAL ISSUES?
12. WHAT ARE THE CHEMICALS LEGALY KNOWN AND ALLOWED BY EPA, TO BE USED BY INDUSTRIES?

NO.	NAME OF THE CHEMICALS	PRICE	WHO CLASS/1-4/	KNOWN SIDE EFFECT ON ENVIRONMENT

13. HOW MANY FLOWER PROJECT OWNER'S PASS THROUGH EIA? FROM THE PAST 10 YEARS TO NOW? AND PROVIDE EISR (ENVIRONMENTAL IMPACT STUDY REPORTS)?

    _____

    _____

    _____

14. DO YOU KNOW ABOUT METHYL BROMIDE UTILIZATION BY FLOWER FARMS?

    _____

    _____

15. STANDARDS TO CONTRO DISCHARGE OF POLLUTANTS FROM AGRICULTURE SECTOR IS NOT YET BEEN FORMULATE (TILL 2010) WHY? AND IF FORMULATED WHO IS RESPONSIBLE FOR THIS? MOA OR EPA?

    _____

    _____

    _____

16. DO YOU THINK EIA IS EXERCISED PROPERLY AND IMPLEMENTED?

    _____

    _____

17. DOES TRADE & INDUSTRY MINSTER, INVESTMENT AGENCY, MINSTRY OF HEALTH AND MINSTRY OF AGRICULTURE REVIEW EIA?

    _____

    _____

    _____

    _____