

Effect of Climate Change on Food Security in Relation with the Empact of Food Industries Emission: A Review

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Abstract ion
Food security and environmental issues are growing, bringing about the need for more sophisticated control of industrial emissions and waste. Emissions and waste from food processing industries are one of the potential sources of climate change and food insecurity that have remarkable effects on environment interlinked with food productivity and nutritional status. It is also reducing fertility of land, degradation of natural ecosystem and purity of water, productivity of seeds, efficiency of pesticides and endurance of agrobiodiversity used for food production. Chemical residues and food containments in the form of wastes emitted from dairy, brewery, winery, beverage, fruits and vegetable, meat and poultry processing industries have been reconsidered as the cause for climate change. Therefore, there must be strategies to alleviate climate change due to food industry residues, chemicals and wastes. This could be achieved by reducing loss and waste in the food system, recycling and preserving resources to satisfy human food security aspiration and climate change regulation. To this end, food processing industries should maintain their emission, wastes, and use environmentally friendly materials during processing and packaging which are essential for the well being of the world environment by reversing the greenhouse effect, preventing soil erosion, ensuring replacement of trees, protecting watercourse, preserving fertility and related impacts. Therefore, the purpose of this review is to investigate the scientific cause of climate changes due to food industry emission and how this resulting food loss and food insecurity.
Keywords: food security, climate change, food waste, food containments, waste management

Introduction

Food processing industries play an important role in the economic development of every country. However, a strongly growing food processing industry greatly magnifies the problems of waste management, pushing the management of waste (solid, gas and liquid) as well as pollution to the forefront of environmental challenges (Bregman et al;. 1996). This paper has focused on food production in intensive systems and its impacts on the environment. The review captures most of the issues associated with food production, as environmental impacts related to backyard or mixed extensive systems are marginal because of the limited concentration of wastes and reliance on locally available sources of feed, such as food residues and crop residues. Generally, the environmental impacts of the sector are substantial (DEFRA, 2006). Food processing is associated with a variety of pollutants, including oxygen-demanding substances, ammonia, solids, nutrients (specifically nitrogen and phosphorus), pathogens, trace elements, antibiotics, pesticides, hormones, odour and other airborne emissions (Bregman et al;. 1996).

This paper analyses the environmental impacts arising from intensive food production, and evaluating such impacts across the food chain and all environmental media. The paper also presents technical options to mitigate environmental impacts, such as improvements to farm management, animal-waste management and nutrition management, along with options to reduce the impacts of intensive food production (National Industrial Pollution Prevention Program 1999).

The excessive generation of waste arises in food the industry due to the following factors: inefficient technology, inadequate processing, inadequate reuse and recycling of materials, lack of awareness of knowledge about waste management, wastewater treatment, and poor environmental regulation, enforcement and environmental education and under-priced natural resources (Larson, R. 1997). Additionally, failures in environmental management, in particular in developing countries, are factors causing serious environmental pollution and research for improvements in the food production and environmental protection is inadequate (Browen et al;. 2008).

It is actually difficult to avoid the generation of organic waste in the processing progress, particularly in food processing industry. Food processing industry basically generates three types of waste: 1. solid waste of rejected raw material, residues in the production process packaging, 2. wastewater results from process of cooling, heating, and processing, and 3. air pollutants from boilers and heaters. Principally the application of zero emissions methods can be successful in small, medium, and large sized companies in minimization, reusing, and eliminating waste (Browen et al;. 2008)..

An important environmental impact of the both plant animal processing industry results from the discharge of wastewater (FAO 2005). When surface water is polluted by wastes emitted from the industries, result species death and reduce biodiversity because of oxygen demand and ammonia content of the waste.

Introduction of waste nutrients contribute to eutrophication and associated blooms of toxic algae and other toxic micro-organisms. Human and animal health impacts are associated with drinking contaminated water (pathogens and nitrates) and contact with contaminated water. Trace elements (e.g. arsenic, copper, selenium and zinc) may also present human health and ecological risks. Antibiotics, pesticides and hormones may have low-level but long-term ecosystem effects. Moreover groundwater impacts associated with pathogens and nitrates in drinking water may cause underlying groundwater to become unsuitable for human consumption (Ziegler, F., 2006).

The second environmental impacts of food industry waste include air and atmosphere related impacts. The impacts include those on human health caused by ammonia, hydrogen sulfide, other odour-causing compounds, particulates and contribution to global warming due to carbon dioxide and nitrous oxide emissions from the production process and other related activities such as feed production and transport of finished products (Cederberg et al;. 2009). Additionally, volatilized ammonia can be re-deposited and contribute to eutrophication, acidification and damage to vegetation and sensitive ecosystems. Nutrients and trace elements released from food processing industries can accumulate in the soil and become toxic to plants. Other indirect impacts include ecosystem destruction and biodiversity erosion associated with the expansion of food production into natural habitats and the overexploitation of non-renewable resources for food production (EPA, 1999).

Concerning impact of air emission, recent epidemiological evidence suggests that much of the health damage caused by exposure to particulates is associated with particulate matters smaller than 10µm (PM_{10}). These particles emitted from food industries have potential to penetrate most deeply into the lungs, causing a large spectrum of illnesses (e.g. asthma attack, cough, bronchitis). Emissions of particulates include ash, soot and carbon compounds, which are often the result of incomplete combustion. Acid condensate, sulphates and nitrates as well as lead, cadmium, and other metals can also be detected. Air pollution by sulfur oxides is a major environmental problem. This compound is harmful to plant and animal life, as well as many building materials.

Another problem of great concern is acid rain which is caused by the dissolution of sulfur oxides in atmospheric water droplets to form acidic solutions that can be very damaging when distributed in the form of rain. Acid rain is corrosive to metals, limestone, and other materials. Nitrogen oxides also dissolve in atmospheric water droplets to form acid rain. Carbon dioxide released to the atmosphere also alters the greenhouse phenomenon when heat radiation from earth is absorbed by the gases causing a surface temperature increase.

Release of Freon, Chloro-Fluoro-Carbon (CFC), during refrigeration and cooling process also result climate change by depleting ozone layer and which is considered to be Ozone destroying substances (http://es.epa.gov/oeca/ccsmd/food/mecgfp.htm). Finally, air emissions such as ammonia vapor are a severe irritant to eyes, causes vomiting, diarrhea, sweating and coughing. High concentration can cause respiratory arrest and water vapor in the form of humidity affects the human respiratory system for people working in the industries.

Environmental Issues in Some Food Processing Sectors

Organic solid wastes including the rinds, seeds, skin, and bones from raw materials and processing operations combined with inorganic solids in the form of packaging solid wastes obtained from food processing industries and excessive packaging items are the key environmental issues for the food industry sectors.

The waste emitted from food processing industries of dairy, winery, brewery, meat poultry and fruit-vegetable increase the organic matter constitute such as biochemical oxygen demand (BOD), total organic carbon (TOC), chemical oxygen demand (COD) and depletes oxygen when discharged in water (UNIDO. 2009).

This leads to the death of fish and other aquatic organism, generate odors due to anaerobic decomposition. This also changes the alkalinity /acidity of the water and microbial activity in biological wastewater treatment process and affects the solubility of heavy metals in the soil toxicity in waters which affect crop growth.

Nutrients such as nitrogen, phosphorus, and potassium released from food waste affect the eutrophication or algal bloom when discharged to water or stored in lagoons which can cause undesirable odors in the lagoon. The presence of nitrogen as nitrate and nitrite in drinking water supply can be toxic to infants and toxic to crops in large amounts. In addition, to this other wastes emitted from the industries increase the deposition of heavy metals such as cadmium, chromium, cobalt, copper, nickel, lead, zinc, and mercury in the soil and cause sodicity and salinity of the soil. This affects soil structure, resulting in surface crusting, low infiltration, low hydraulic conductivity, low porosity and leading to a reduction of oxygen uptake. The overall impact on soil phenomenon reduces light transmission in water, thus compromising the ecosystem, health and smothers habitats (UNIDO. 2009).

Reverse of Climate Quality by Food Industry Impacts

It is well known that food industries can reverse the climate quality due to the release of waste and residues to their environment. For instance, the organic components of the wastewater from dairy processing operations can be classified as proteins, lactose and fat. These will affect the environment in different ways depending on their biodegradability and their solubility (Thomassen, M. 2008). The organic components in dairy processing waste water are highly biodegradable to river oxygen and affect the oxygen level and biochemical oxygen demands. In waterways, bacteria will consume the organic components of the waste.

The process of biodegradation in waterways consumes oxygen according to the following equation: organic material + $O_2 \rightarrow CO_2 + H_2O$ + Bacteria. Measures of the amount of oxygen that are consumed by bacteria are the Biochemical oxygen demand (BOD5) and the chemical oxygen demand (COD). BOD5 is measured as the amount of oxygen that is consumed by bacteria in decomposing the waste over a 5 day period at 20^oC. In both cases the organic material is converted to carbon dioxide and water, but with the BOD5 test some of the organic matter is converted to new bacterial cells. Oxygen is very important in rivers, primarily because it supports fish and other aquatic organisms. It is therefore essential that discharges to rivers maintain an oxygen concentration. In order for this to be the case the discharge to the river must not increase the river BOD5 depending on the re-aeration characteristics of the rivers. Wastewaters that are highly colored are likely to alter the colour of a receiving water (Thomassen, M. 2008)..

Dairy factory wastes probably contain little soluble colour, although after various forms of treatment true colour may result. Colloidal and particulate components in the waste reflect light back to an observer. This is known as apparent colour. The concept of turbidity is closely related to this phenomenon. Milk wastes contain significant quantities of material that will result in turbidity of discharges and affect the quality of water for use.

Other Inorganic Constitutes which Affect Environment

Release of inorganic constitutes, such as Nitrogen and Phosphorus from food processing industries to their environment have great impacts. One of the industry's main aims is to recover the protein (organic nitrogen component) of the waste and convert it to saleable products (US EPA. 2004). Nitrogen is, therefore, a very important component of the dairy factory wastewaters. Some protein will be lost to the waste streams. Bacteria convert the nitrogen in proteins to the inorganic forms including ammonia, and the ammonium, nitrite and nitrate ions. Each of these inorganic forms of nitrogen has different environmental effects. Nitrate ions are toxic in high concentrations to both humans and livestock.

In young infants, nitrate can be converted to the nitrite form, absorbed into the bloodstream and convert hemoglobin to mehta hemoglobin that cannot transport oxygen. The condition of metha hemoglobin anemia affects infants less than six months in age because they lack the necessary enzyme to reconvert the metha hemoglobin back to hemoglobin. Livestock can also suffer from metha hemoglobin anemia. Since ruminants have a more neutral stomach pH and rumen bacteria that reduce nitrates to nitrite, deaths from metha hemoglobin anemia can occur. This usually results from the consumption of nitrate rich feed. Inorganic forms of nitrogen (nitrate, nitrite and ammonium ions) and inorganic phosphates act as plant nutrients in waterways (Witteman 2007).

Most aquatic ecosystems are very sensitive to temperature. The temperature is also an important consideration when water supplies are to be used for drinking water purposes. It is usual to require that wastewater discharges will not alter the natural temperature of a water way by more than 2 degrees. Wastewater application to water and soils is a common method of waste treatment in food industries in developing countries and affects both the land and crop productivity. In general, major waste released to the atmosphere, to ground water and soil causes the leaching and immobilization of resources important for the ecosystem (US EPA. 2004)..

Meat Processing Effluents/Food Losses

Meat processing effluents generally exhibit high organic loads due to the presence of blood, fat, manure and undigested stomach contents, high levels of fat, fluctuations in pH due to the presence of caustic and acidic cleaning agent, high levels of nitrogen, phosphorus, salt and high temperature. Air emissions from meat processing plants are mostly attributed to energy consumption. Steam, which is used for rendering and cleaning operations, is generally produced in on-site boilers. Air pollutants generated from combustion include oxides of nitrogen and sulphur and suspended particulate matter. For operations that use refrigeration systems based on chlorofluorocarbons (CFCs), the fugitive loss of CFCs to the atmosphere is an important environmental consideration, since these gases are recognized to be a cause of ozone depletion in the atmosphere. For such operations, the replacement of CFC-based systems with non- or reduced-CFC systems, such as ammonia, is important (World Bank 1996).

Food Packaging Wastes and Environmental Impacts

The disposal of food packaging materials such as corrugated paper board, metals, aluminium, plastic, glass and wood to land fill and water body cause environmental pollution due to the presence of non degradable materials (World Bank 1997).

Energy and Water Consumption of Food Industry

Food industries are subjected to high water and energy consumption during cooking, lighting, refrigeration, space heating, water heating, cooling, ventilation, office equipment. This high energy consumption increases the environmental impacts by reducing energy efficiency and release wasted burner heat to their environment (SEAM, 1998).

Food Industry Impacts in Relation to Climate Changes and Food Security

As it can be observed from the above reviews food industry wastes and other potential emissions have strong impact on climate changes and directly related with the productivity of crops and quality of water used for different purposes. Food security and environmental issues are growing, bringing about the need for more sophisticated control of industrial emissions and waste. Emissions and waste from food processing industries are one of the potential sources of climate change and food insecurity that have remarkable effects on environment interlinked with food productivity and nutritional status (Rapoport, et. Al 2007).

It is also reducing fertility of land, degradation of natural ecosystem and purity of water, productivity of seeds, efficiency of pesticides and endurance of agrobiodiversity used for food production. These impacts result farm income, food availability, access to food, stability of food suppliers, food consumption and food security among rural population (New York State Department of Environmental Conservation. 2001). Problems of food security do not necessarily result from inadequate domestic food supplies, as is widely believed, but from lack of productive and nutritive crops on the part of nations and of households. The concept of food security is multi-faceted and has evolved considerably over time. When the concept of food security coined it was to mean food self-sufficiency at global or national level, which is broader and subsumes the notion of producing sufficient quantity of food in a given country, and analysts advocated production self-sufficiency as a strategy for nations to achieve food security.

As is well known, enough food available at global and national levels is necessary condition for households to have access to food, but it is not sufficient. Households must also have the necessary resources to acquire that food and at the same time meet other basic needs. In recognition that the quest to food security is a long-term and multi-sector challenge, institutional strengthening and capacity building is included as an essential element of the strategy. Therefore, the sense of food security in this review is related with climate change and food industry emissions. The change in climatic quality due to industry emission can affect the growth of high value crops and livestock. Therefore those, industry emissions can affect agricultural development and industrialization (FAO 2007).

Improvement Potentials

It is possible to improve the impacts of climate change by developing industry based strategies and some of the potential methods are discussed as follow:

Waste Minimization

It is the most important climate change monitoring mechanism through reduction in the generation of waste, reuse of waste materials/by-products and recycling of waste materials. The driving force for waste minimization for the food industry is improved yields of product, reduced effects on the environment and lower waste treatment costs (World Bank 1997).

Applying Zero Emissions Approach

This approach emphasize on reduction or total elimination of effluent from food processing industry. Implies the optimization through an integrated system of processes and requires the industries to redesign manufacturing processes to efficiently use both raw material within the process and waste towards the aim of sustainability (U.S. Environmental Protection Agency (EPA) 1998). The food processing industry requires agricultural raw materials; derived primarily from crops, plants, and fresh fruits; as process input materials. Output for those processes are food, products and huge amounts of waste (solid, gas and liquid). Unfortunately, the amount of waste could be a serious environmental pollution source regarding sanitary environmental issues.

If waste treatment and waste management methods have not been applied thoroughly, the negative effects on the environment and human will be very serious, especially the negative effects of odors, leachate, and spreading of pathogens at open-landfill sites. So, the meaning of zero emissions is expressed regarding no solid waste, no wastewater, no gases to contribute greenhouse gasses, no energy losses in general.

Water Reuse and Treatment Practices.

The reuse of water and chemicals is driven by economic and environmental considerations. Problems with the disposal of wastewater have resulted in attempts to reduce the volume of wastewater and the components of the wastewater. At some sites, water is in short supply and the reuse of water is an attractive option. The following strategy can be used to achieve the optimal water usage in a factory by minimizing the use of water in the present plant, reusing water where possible without treating it first, treating wastewater to allow its reuse, optimizing the use of reused water, and designing or select new plant to use less water.

Improving Packaging and Processing Technology

Application of advanced packaging and processing technology for reducing potentially degrading impacts and waste avoidance. Use of advanced techniques to control specific portions of the manufacturing process to reduce wastes and increase productivity. The application of advanced technology for recovery and by processing of the out products from processing industries are time tested methods to minimize environmental impacts. Emissions obtained during processing activates can be converted to by product and resource input through the application of bio-processing and recycling technologies in food processing sector (Evirowise 1997).

Managing Industry Effluents for Food and Other Income Generation

It is true that there are many effluents from processing industries which affect the climate, mainly dairy and meat processing industries are the most important ones. However, it can manage the effluents for food and income purpose by reprocessing and recovering the losses. The recovery or reprocessing of losses from processing industry plays important role in supporting the local economy by contributing to stregthening food security, food self-sufficiency , nutrition, and medicine, generating additional income and offering opportunities for processing enterprises. To this end, there must be an effort to reduce food scurity crise by minimizing climate impacts and recovering food loss for income and food for the sustainable human aspiartion.

Conclusion

The above reviews illustrate food processing is associated with a variety of pollutants, including oxygen-demanding substances, ammonia, solids, nutrients (specifically nitrogen and phosphorus), pathogens, trace elements, antibiotics, pesticides, hormones, odour and other airborne emissions. This excessive generation of waste arises in food industries considered as environmental impact. Those chemical residues and food containments in the form of wastes emitted from food processing industries are one of the potential sources of climate change and food insecurity. They have also remarkable effects on environment interlinked with food productivity, food loss and nutritional status of crops and livestock.

The overall impacts of those emissions reducing fertility of land, degradation of natural ecosystem and purity of water, productivity of seeds, reversing the greenhouse effect, efficiency of pesticides and endurance of agrobiodiversity used for food production. This clearly shows that climate issues need for more sophisticated control of industrial emissions and waste in order to overcome problems related with food loss and food security. Therefore, Food processing industries should maintain their climate quality through sufficient technology for adequate processing, recycling and reusing actions. There is also need from processing industries to regulate climate changes via waste management and wastewater treatment strategies. Such waste monitoring and quality improvement mechanism can reduce effects on the environment and food security problems. The food industries should protect their climate by applying appropriate improvement on their drainage, cleaning operation, recovery of downgraded products, stack loss, effluent discharges and start-up and shut-down processing. Therefore, it is possible to alleviate food security problems by reducing climate impacts due to industry wastes and emissions.

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References

Bregman, J.I; Kelly, Craig; Melchor; James. _Environmental Compliance Handbook_. Boca Raton, Florida: CRC Press, 1996.

Brown, M.E. and Funk, C.C. (2008). Climate - Food security under climate change. Science 319 (5863): 580-581.

Cederberg, C., Sonesson, U., Davis, J. & Sund, V., 2009b, Greenhouse gas emissions from production of meat, milk and eggs in Sweden 1990 and 2005, SIK-Rapport 793, SIK – Institutet för Livsmedel och Bioteknik, Göteborg, ISBN 978-91-7290-284-8 *Devices (Charcoal Grilling)*, EPA-600/R99-048, Washington, DC, June 1999.

Environmental Impacts of Food Production and Consumption, DEFRA, 2006, Environmental Impacts of Products, European Science and technology Observatory and Institute.

EPA, 1999: U.S. Environmental Protection Agency, *Emissions from Street Vendor Cooking*

Evirowise (1997) Cost-effective membrane technologies for minimising waste and effluents. Envirowise GG054 guide. http://www.envirowise.gov.uk/envirowisev3.nsf/0/271E6D3ED5C90D5880256CE5004C6FBB/$File/GG054.pdf> 31.5.2004.

FAO (2005). The State of the Food Insecurity in the World 2005. FAO, Rome. Available online at: ftp://ftp.fao.org/docrep/fao/008/a0200e/ a0200e.pdf [Accessed on the 20 January 2009].

FAO: *Climate Change and Food Security* (2007). See *www.fao.org/ clim/docs/climatechange_foodsecurity.*

Food Industry Water and Energy Conservation, SEAM Project, 1998. Guide, http://www.bsdglobal.com/tools/bt_zep.asp

Larson, Ronald B. 1997. Key Developments in the Food Distribution System. Working Paper 97-08. The Retail Food Industry Center. University of Minnesota, St. Paul, Minnesota.

National Industrial Pollution Prevention Program – Support for Environmental Assessment and Management, Food industry sector study, 1999.

New York State Department of Environmental Conservation. March 2001. Environmental Self-Assessment for the Food Processing Industry.

Rapoport, et. al. "VOC Emissions from Breweries." 20 Nov 2007. http://www.epa.gov/ttn/chief/old/memos/ef/brew_feb1992.pdf>

Thomassen, M. (2008) Environmental impact of dairy cattle production systems –an integral assessment. Wageningen: WIAS.

U.S. Environmental Protection Agency (EPA). Office of Solid Waste and Emergency Response. 1998c. *Characterization of Municipal Solid Waste in the United States: 1997 Update.* EPA530-R-98-007. Washington, DC.

UNIDO. Pollution from food processing factories and environmental protection. United States EPA *Environmental Compliance Guide for Food Processors*. 1999. http://es.epa.gov/oeca/ccsmd/food/mecgfp.htm

US EPA. 2004b. Effluent Limitations Guidelines And New Source Performance Standards For The Meat And Poultry Products Point Source Category. (40 CFR 432) Federal Register: September 8, 2004. Washington, D.C.: U.S. EPA. Available at http://www.epa.gov/fedrgstr/EPA-WATER/2004/September/Day 08/w12017.htm (Introduction to Clean Water Act: http://www.epa.gov/region5/water/cwa.htm)

Witteman Company. "Carbon Dioxide Recovery from a Brewery." 20 Nov 2007. http://www.pureco2nfidence.com/launch/index.php?option=com_content&task=view&id=50&Itemid=129

World Bank (1996) Pollution Prevention and Abatement: Fruit and Vegetable Processing. Draf Technical Background Document. Environment Department, Washington, D.C.

World Bank, 1997. "Industrial Pollution Prevention and Abatement: Breweries." Draft Technical Background Document. Environment Department, Washington, D.C.

Ziegler, F., 2006. Environmental Life Cycle Assessment of seafood products from capture fisheries. PhD thesis, Göteborg University, Dept. of Marine Ecology / SIK, The Swedish Institute for Food and Biotechnology. SIK report 754

Figure 1 Environmental impacts due to wastes emitted from the food system

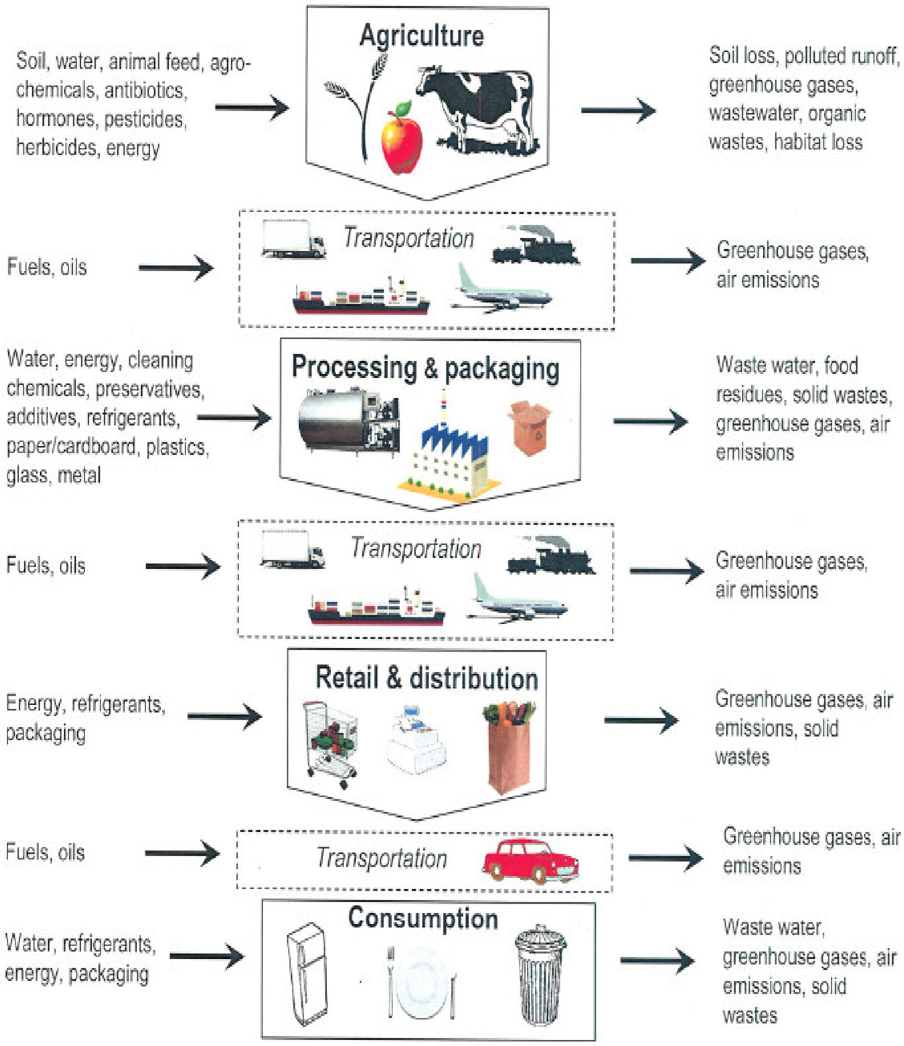


Figure 2 Source of wastes at different processing operation.

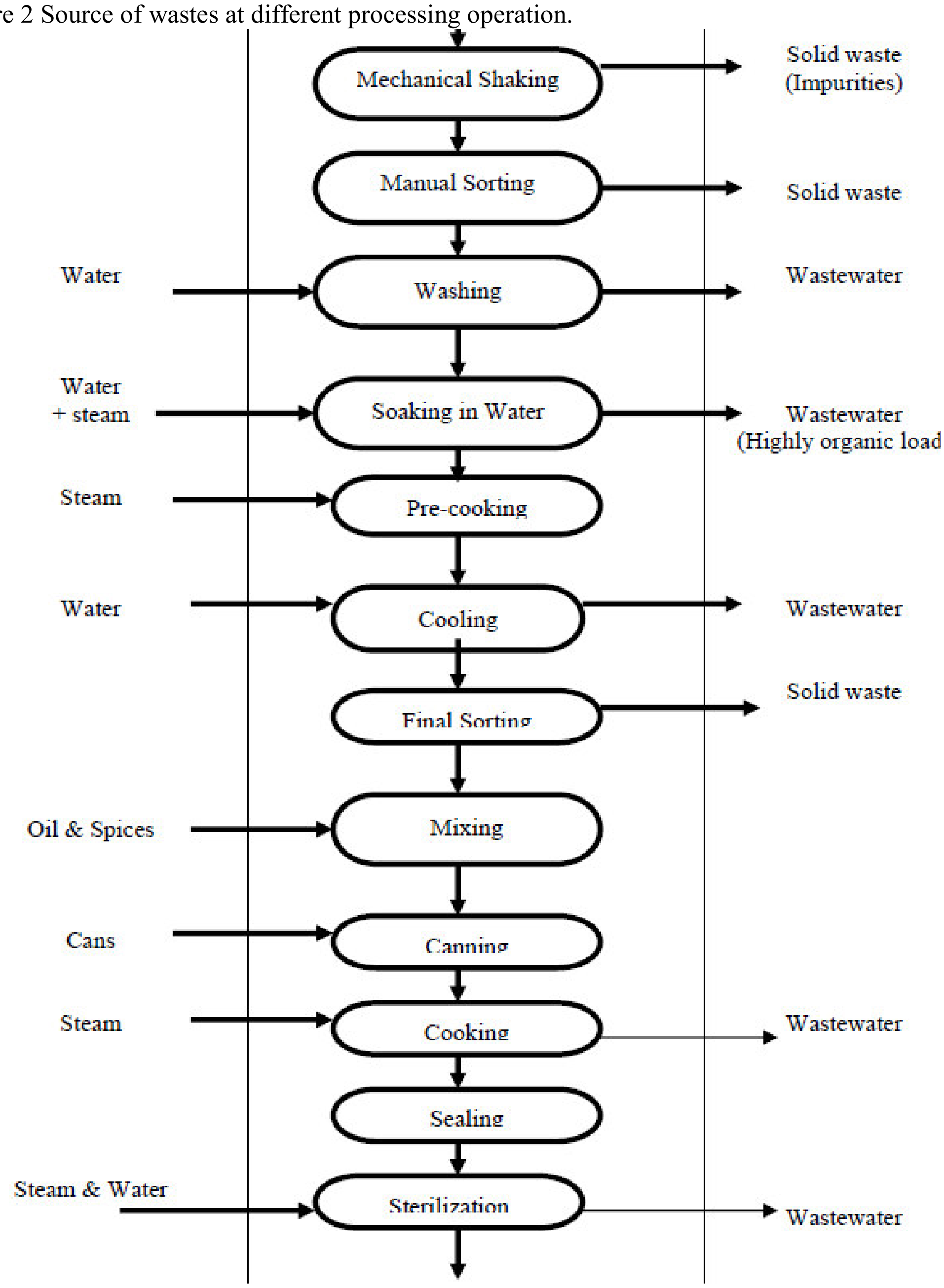


Figure 3 Types of food industry emissions.

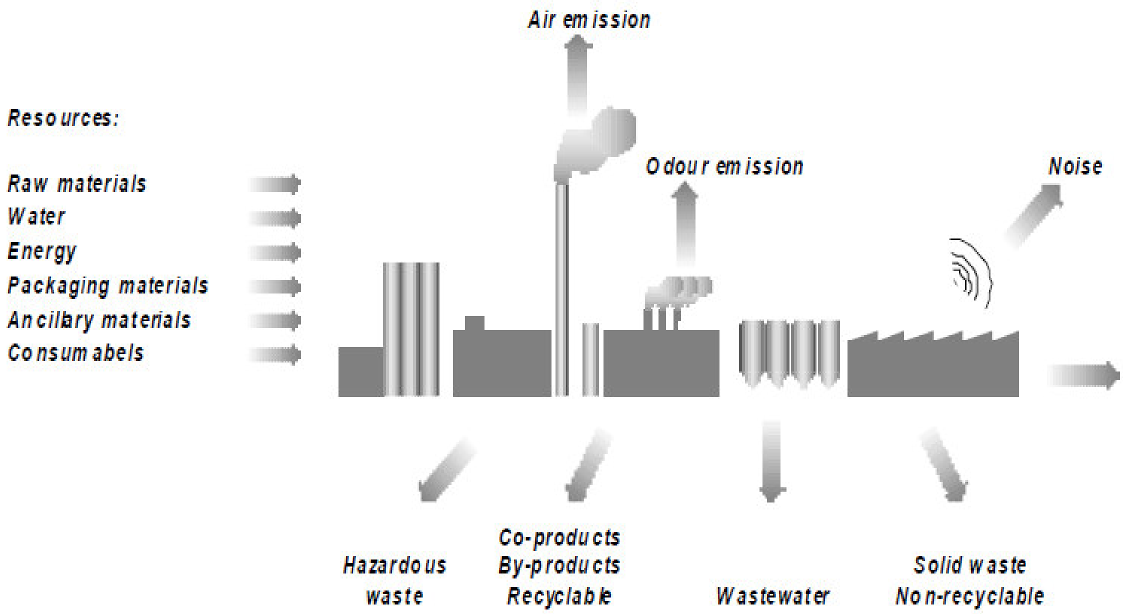


Figure 4 Organic components of the waste from dairy processing

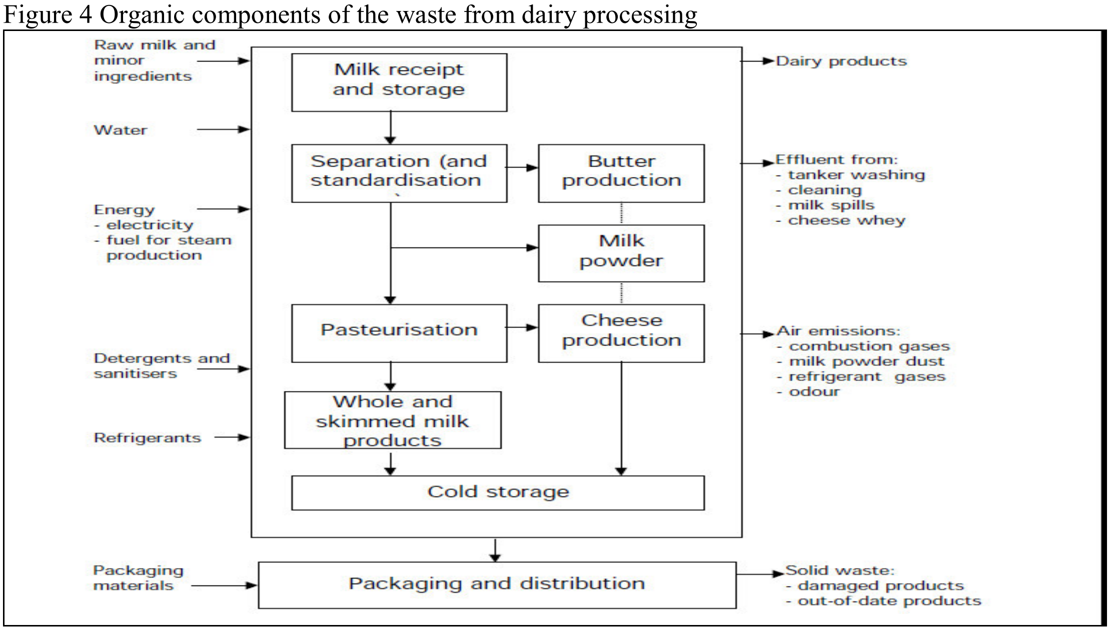


Table 1 the general environmental issues in meat processing

Process	Environmental issue
Reception of livestock Truck washing Cattle washing	Effluent containing manure wastes High water consumption Noise
Stunning and bleeding	Effluent with high organic load, especially if blood is discharged
Hide treatment (pigs)	Energy consumption for hot water used in scalding Generation of putrescible by-products Effluent with a high content of organic matter
Splitting and evisceration	Energy consumption for equipment sterilisation Generation of putrescible by-products Effluent with high organic load
Refrigeration	High energy consumption Fugitive losses of refrigerants, e.g. CFCs or ammonia
Cutting and boning	Electricity consumption Generation of putrescible by-products Energy consumption for equipment sterilisation
Casing and offal processing	Effluent with very high organic load Very high water consumption
Rendering	Effluent with very high organic load Potential for odour generation High energy consumption
Cleaning	High water consumption Consumption of chemicals Large volumes of effluent with high organic load

Figure 5 packaging material waste.

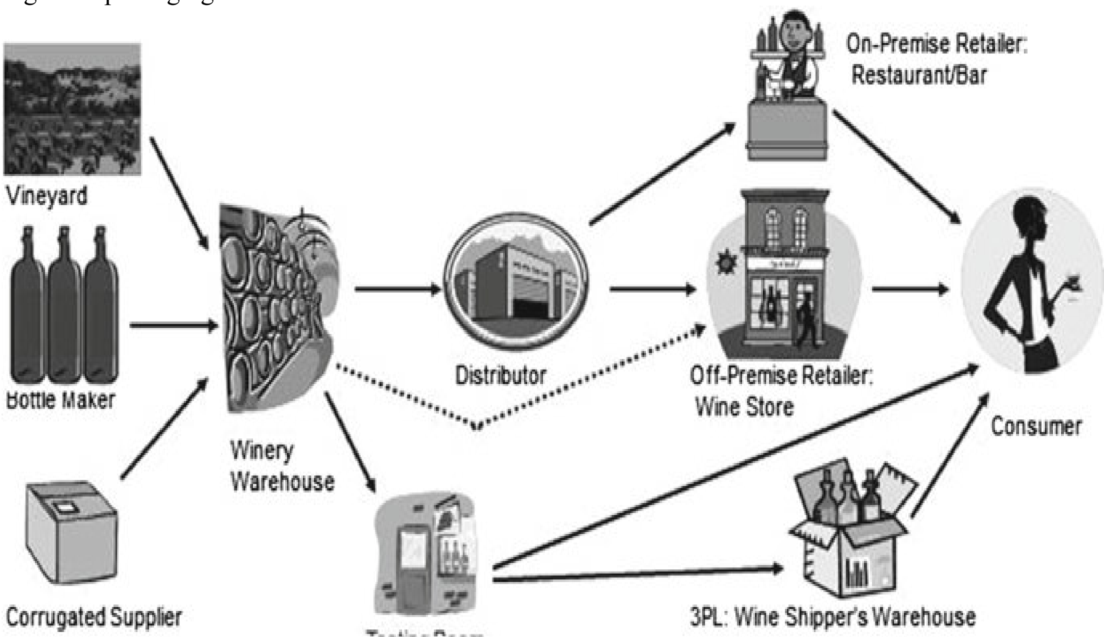


Figure 6 Climate Changes and Food Security

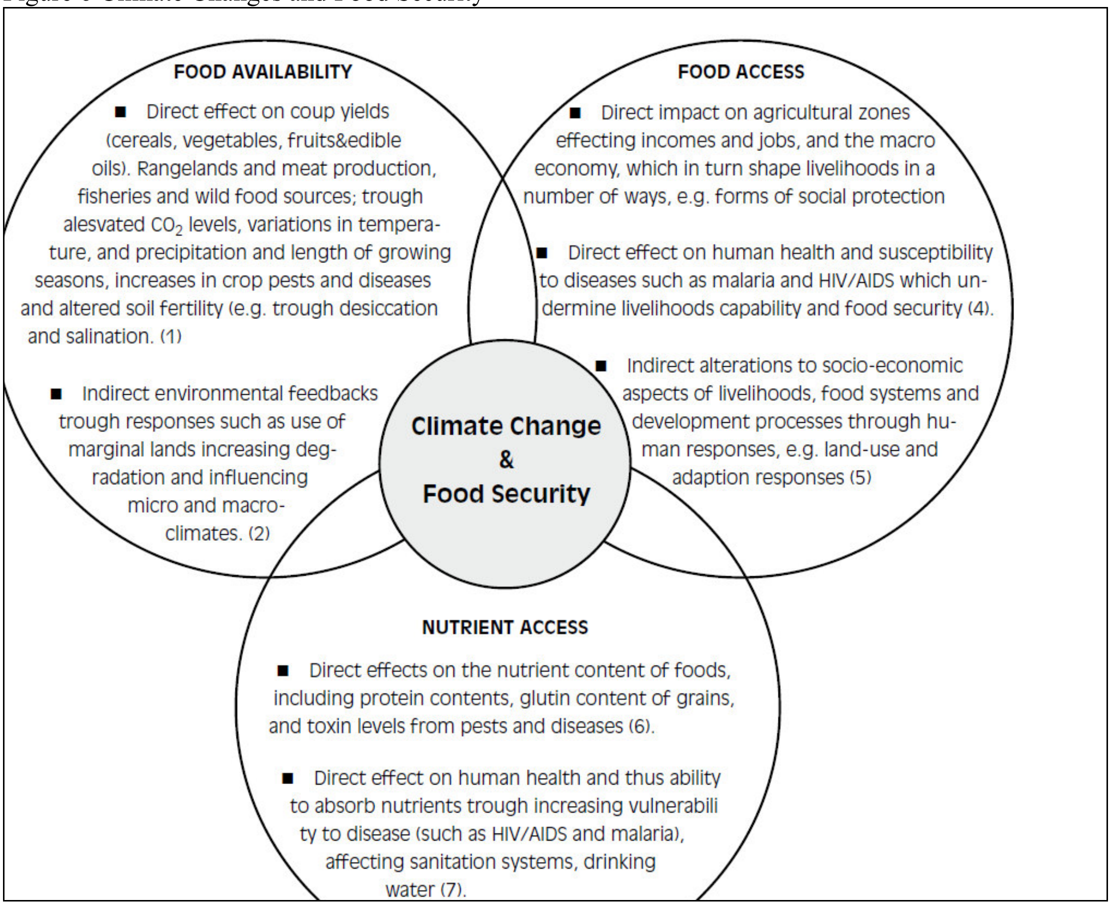


Figure 7 Waste minimization mechanism in food industries.

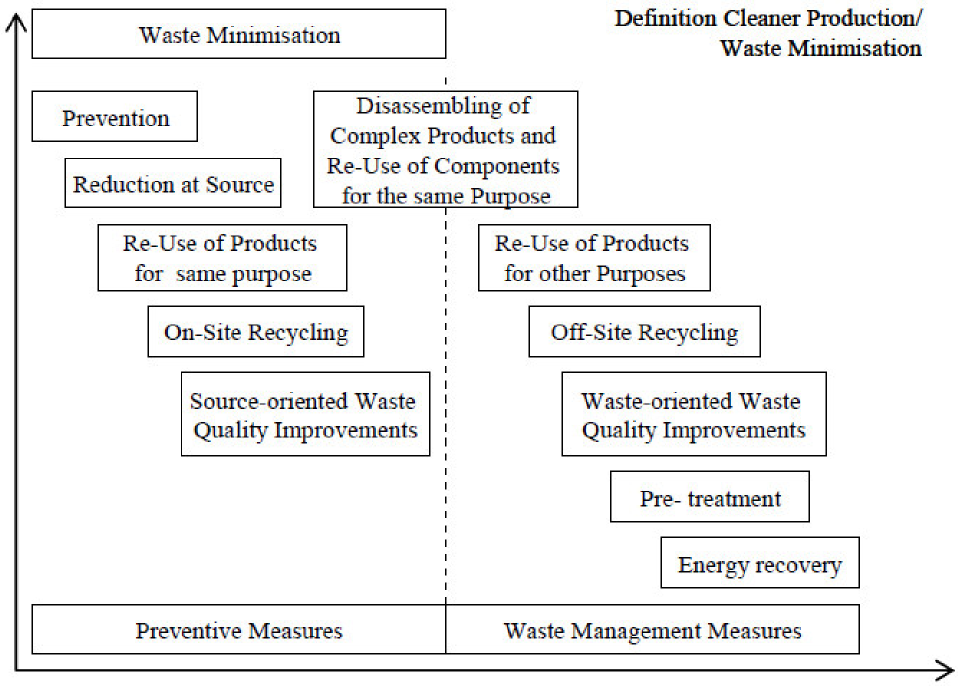
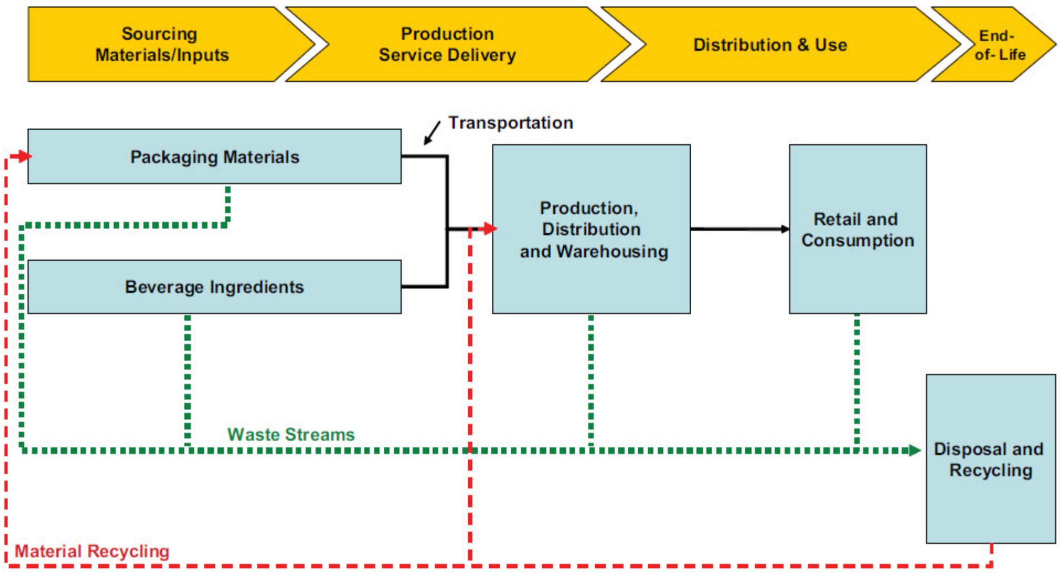


Figure 8 Bioprocess and waste recovery technology for food industry out puts.



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