Abattoir waste pdf

Due to the high consumption rates of resources, cities face serious problems with large quantities of waste, characterised by inadequate disposal technologies, high management costs and the negative impact of waste on the environment. Slaughterhouses, or slaughterhouses, are an important source of water and air pollution worldwide. Waste produced by slaughterhouses in Nigeria includes condemned organs, carcasses, blood, skins, horns, hooves, hairs, paunch contents and carcass trimmings. The main waste management practice at the Bodija slaughterhouse is dumping. This document assesses the environmental and public health impact of unhygienic waste disposal. The waste management in the Bodija slaughterhouse is aesthetically unattractive, environmentally friendly and also makes the meat unhealthily processed and offered for sale. The waste disposal techniques of developed countries have been assessed. Recommendations are proposed to promote the safe disposal of offal and to limit disposal methods to internationally permitted methods. The disposal of offal is a major environmental challenge in all parts of the world. The chemical properties of offal are similar to those of urban wastewater, but the former is highly concentrated wastewater with 45% soluble and 55% suspended organic composition. Blood has a very high COD of about 375,000 mg/L and is one of the main dissolved pollutants in offal water. In developing countries, there is no organised strategy for the disposal of solid and liquid waste produced in slaughterhouses. The solid offal is collected and deposited in landfills or open areas, while the liquid waste is sent to municipal sewers or bodies of water, endangering public health and terrestrial and aquatic life. Wastewater from slaughterhouses is notorious for causing a sharp increase in the BOD, COD, total solids, pH, temperature and turbidity, and can even lead to deoxygenation of water bodies. Anaerobic digestion of Abattoir Wastes Anaerobic digestion is one of the best options for offal management that leads to the production of high caloric value biogas, reduction of greenhouse gas emissions and effective pollution control in slaughterhouses. Anaerobic digestion can achieve a high degree of COD and BOD removal of slaughterhouse effluent at a significantly lower cost than comparable aerobic systems. The disposal of offal is a major environmental challenge in developing countries of Asia and Africa The biogas potential of offal is higher than other organic waste such as animal manure and is in the range of 120-160 m3 of biogas per tonne of waste. The carbon-nitrogen ratio of offal however quite low (4:1) that requires co-fermentation with high C:N substrates such as animal manure, food waste, crop residues, poultry litter etc. Abattoir effluent has a high COD, a high BOD and a high moisture content making it very suitable for biogas production. Abattoir wastewater also contains high concentrations of hanging solids, including pieces of fat, fat, hair, feathers, manure, grit, and undigested feed that will contribute to the slowly biodegradable of organic matter. Under anaerobic treatment processes, the up-flow anaerobic silt blanket (UASB) is widely used for anaerobic digestion of offal. Abattoir waste is a high protein substrate and can lead to sulphide formation during anaerobic degradation. The increased concentration of sulphides in the digester can lead to higher concentrations of hydrogen sulfide in the biogas that can inhibit methanogens. In addition to sulphides, ammonia is also formed during the anaerobic fermentation process that can increase the pH in the digester (>8.0), which may be growth-limiting for some VFA-consuming methanogens. Salman Zafar is an ecopreneur, consultant, consultant, speaker and journalist with expertise in waste management, waste-to-energy, renewable energy, environmental protection, conservation and sustainable development. Its geographical areas of interest are Asia, the Middle East, Africa and Europe. Salman is the founder of EcoMENA, a popular volunteer organization based in Qatar. He is also founder and CEO of BioEnergy Consult, a renowned consulting firm active in the biomass, waste-to-energy and waste management segments. Salman is a professional environmental writer with more than 350 popular articles to his name. He is proactively creating mass environmental awareness in different parts of the world. Salman Zafar can be reached on salman@ecomena.org or salman@bioenergyconsult.com Open access peer-reviewed chapterBy Raghupathi Matheyarasu, Balaji Seshadri, Nanthi S. Bolan and Ravi NaiduSubmitted: April 16, 2014That: September 23, 2014Edied: May 6, 2015DOI: 10.5772/59312Water is the most precious resource that exists naturally on Earth; However, global fresh water is only less than 3% and increased population density [1] has increased the pressure on global freshwater resources [2]. More importantly, the effects on the quality and quantity of fresh water are enormous in the current era of industrialisation, modernisation, exploitation and poor resource management practices. The increase in the world's population and the decrease in the availability of clean water limits human activities, especially industries. Most industrial processes require a huge amount of water, which discharges wastewater almost as well [3]. Wastewater comes from both household and industrial sources, untreated discharges of wastewater often contain a significant amount of pollutants, nutrients and pathogens [4]. Industrial processes require a huge amount of water to meet the quality of products with customer satisfaction. The main industrial sources of waste water are canning factories, dairies, sugar factories, breweries and distilleries, beverage industry, fertilizer production, pulp and paper, tanneries and yeast production [5]. Among the industries that have a high volume volume meat industries act as an important source with the increase in human intake. Agriculture and related industries consumed the largest volume of water in 2009-2000, with more than 50 % of Australian water consumption [6]. Unsafe water and sanitation practices are responsible for more deaths worldwide from diseases than any war claim [7]. A quarter of the world's population does not have safe drinking water [8]. In order to overcome the pressure on freshwater sources resulting from industry, sustainable alternative methods are needed that will reduce the pressure on global freshwater resources and meet the demand of water for households, industries and agriculture [9]. The industrial sector faces a wide range of environmental problems worldwide, particularly in the field of sustainable wastewater management. With strict environmental laws in most developed countries, industries are needed to establish existing cost-intensive treatment methods, including phytoremediation, land treatment and landscaped wetlands [10, 11]. Therefore, the development of a low-cost wastewater management technology is needed to treat wastewater from different sources. Among the cheap technologies, tipping is the most popular and most followed technology for its ease in handling and easy maintenance [12]. However, long-term discharge of wastewater builds up the levels of nutrients, organic matter and heavy metals that pose a different threat in terms of soil degradation and pollution of surface and underground water resources. For example, growing plants on wastewater-treated soils can emerge as a sustainable measure for the management of water resources, which can be referred to as phytoremediation. This approach is not only energy efficient and aesthetically appealing method of sanitize sites with low to moderate levels of pollution, but can also be used in conjunction with other more conventional methods. It will provide potential solutions to reduce the cost of meat production and it will also contribute to the protection of our natural resources for the future generation. Total freshwater consumption is reduced by water-efficient techniques and reuse of water where water sources are scarce [13]. This book chapter aims to describe the effects of wastewater irrigation on soil fertility and productivity, assessment, mitigation, and farm nutrient budget-based wastewater-driven nutrient. Approximately 90 percent of the world's wastewater produced remains untreated, leading to widespread water pollution. An estimated estimate of global wastewater production is approximately 30-70 cubic meters per person per year, which has significant impact on the natural environment [14]. Worldwide, meat industry act as a major source of industrial wastewater, for example in Australia, meat industry generates an average of 7225 ML/year. Concerns about the conservation of water resources have led to new innovations for the sustainable management of Australia's wastewater in usable water Over the past 30 years, the reuse of wastewater for agriculture has increased as a result of the decline of fresh water sources, dry weather, heavy run-off loss and overexploitation [15]. The sources of wastewater are illustrated in Figure 1.Sources of wastewater flowsGlobaal water consumption doubles every 20 years and by the year 2025 two out of three people in the world will live under water scarcity, especially in underdeveloped and some developing countries [3]. More than 1.1 billion people around the world have no access to safe drinking water and 2.4 billion to adequate sanitation. As a result, a child dies every 15 seconds from water-related diseases [16, 17]. The health of a person depends on the quality and quantity of water for maintaining good health and strong life. Since agriculture, households and industries are the three sectors that consume most of the water, they generate large amounts of wastewater. In Australia, for example, domestic wastewater alone is produced with 44165 nests per person per year [18], the total land of 1040.3GL/year [6]. Waste water which has been used at least once and has therefore been rendered unsuitable for reuse without treatment is collected and transported through sewers [19]. Industrialization has positively increased the number of industries around the world, and this adept growth has significant implications for the natural environment. Since, Australia is one of the driest countries in the world, with a very minimal river drain (about 1%) [20], it is necessary to reuse all wastewater discharged to natural environment. It is important to characterize wastewater before it is reused for many purposes. The nature of wastewater depends on the type of industry and the processed material. For example, the waste water discharged from the slaughterhouse is different from winery; hence the understanding on chemical characteristics is important. Abattoir wastewater derives organic cargoes from various sources. Animal manure contributes significant amounts of pollutants to the offal containing N, P and organic carbon [21]. Compared to other wastewater sources, slaughterhouse wastewater flows have the highest concentration of organic load, with increased COD (8000 mg/L), proteins (70 %) and floating solids (15-30 mg/L) [22]. Pig gery effluent contains 158-1025 mg/L of N; 11-123 mg P; 97-1845 mg/L of K and 103-2870 mg/L of Na with other beneficial micronutrients [23]. According to the APL-AMIC projects report, water use, feed grain supply and the management of nutrients in piggery effluents are the main environmental challenges facing Australian pig breeds [24]. Pig-y wastewater and by-products can be used as valuable alternatives to agricultural production Fertilisers. Wastewater discharged from wineries is rich in nutrients; it contains 1-128 mg N/L; 1-33 mg P /L; 19-1250 mg K/L and 18-880 mg Na /L [23]. Organic load or waste load in the waste water of the winery increases the nutrient nutrient (sodium and potassium) and BZV of wastewater, which can lead to salinity and sodicity [25]. Dairy farm generates large amounts of wastewater rich in nutrients especially N and P. Dairy wastewater consists of urine, faeces, chemicals from cleaning, and solid waste (cow manure). This shall contribute 15-200 mg N/L; 11-160 mg P /L; 11-160 mg K /L [26]. Typical characteristics and nutritional composition of different agricultural industries wastewater is shown in Table-1.ConstituentsDomesticTextileAbattoirsPiggeryDairy effluentOlive millWinerySS (mg L-1)350245200044728-19002.8-12660-2000TDS (mg L-1)850113035003100-8600138-8500500-2200K (mg L-1)100-40097-184511-1601710019-1250Na (mg L-1)20-150623 (103-2870)60-80740018-880N (mg L-1)50- 70100-150854 (158-1025)15-2000.09-3.21-128pH10.27.37.5-85.6-84.2-74-10P (mg L-1)203.4100-400109 (11-123)11-1601.11-33BOD₅ (mg L-1)3002271300-750040320-17501.5-100COD (mg L-1)240-4402120100-2501120-33606.4-162TOC (mg L-1)2.5201-6664Oil & Grease (mg L-1)150100-100068-2402.26ReferencesHuanget al., 2010. [60] Yusuff, I don't know what to do. 2004. [61] Mittal. 2004.Damien Batstone., 2012. [31,62] EPA-SA., 2009. [23] EPA-SA., 2009. Marimoli et al., 2011. [23,26]. Anastasiou, 2011. [63] EPA-SA., 2009. [23] Characteristics and forms of wastewater from selected sources SS – Floating solids; TDS – Total dissolved solids; BOD – Biological oxygen demand; COD – Chemical oxygen demand; TOC – Total organic carbon Treatment of wastewater, before reuse is most important to prevent the excess load of contaminants such as solids, organic matter, nutrients and pathogens [27]. For example, untreated abattoir wastewater is unsuitable for reuse or discharge into the receiving environment. It will cause serious environmental risks in the receiving environment, such as eutrophication, soil degradation, nutrient leaching, groundwater pollution, greenhouse gas emissions and impacts on ecosystem value; therefore, a proper reduction in pollutant levels at the preceding stage is essential. The different environmental effects of wastewater disposal methods from a slaughterhouse are described in table 2.Removal methodsImpactsEvaporated pond• Odour emission• Toxiciva• Pathogens (pathogens)• Organic substances and inorganic loadsIrrigation landscape agriculture• Odour• Soil contamination • Soil contamination• Potential for transporting heavy metals to food chain• Bioconcentration, Bioaccumulation, BiomagnificationRiverSteamslakes• High load of organic and inorganic pollutants• High load of BOD• Pathogenic organism• Unsuitable for irrigation• Odor• Eutrophication• Death of fish• Loss of biodiversity / decrease in ecosystem valueCoastal / ocean• Loss of fish culture• Odor• High Odor• High of organic and inorganic pollutants• Climate change• Global warmingInfiltration-Natural-Artificial• Groundwater contamination• Loss of groundwater quality• Aquifer blockage• Long-term effects in flora and fauna. Wastewater treatment methods and their consequences before it reaches the receiving environments, in order to maintain minimum standards for pollutants [28]. Effective methods of treating wastewater should remove the pollutants, nutrients, organic load, fat, oil fold, blood and pathogens from the waste water to ensure the low content of toxic substances in the final discharge fluent [29]. Abattoir wastewater treatment includes several methods to treat the meat industry wastewater and preserve the bio-richness of an ecosystem. There are three main types of treatment technologies (primary, secondary, tertiary) that can be used to treat wastewater from the slaughterhouse (Figure 2). A typical slaughterhouse wastewater treatment plant needs three types of storage system or pond to reuse the treated wastewater in irrigating agricultural crops, the first is anaerobic pond, followed by aerobic/optional ponds rather than a polishing/irrigation pond [29]. Each wastewater treatment technique is assessed in the form of merit and merit through economic feasibility, technical availability and socio-cultural acceptability. This type of evaluation is very important to adopt the wastewater recycling method for the current and future. Wastewater treatment methodsThe first treatments include screening, vangekkens, floatation, equalization and settlers. Primary treatment includes screening, dissolved air whistle (DAF) and power equalization [30]. Pre-treatments are processes that remove coarse solids; coarse floating matter and primary treatments remove easily fixable solids, usually through sedimentation [31]. Pre-treatment methods can be used to minimise organic load and BOD in wastewater. Pre-treatment methods such as screening and sedimentation help to reduce 60% of solids and 25-35% of the BOD wastewater load [32]. Anaerobic process includes lagoons, anaerobic contact anaerobic filter, anaerobic sequencing batch reactor (ASBR), up-flow anaerobic sludge blanket (UASB). An aerobic system includes besaister lagoons, active sludge process, oxidation locks, sequencing batch reactors and drip filters. The advantage of lagoons in wastewater treatments is a high efficiency in the disposal of organic matter (BZ), and at the same time very poor in the disposal of N and P [33]. The pollutants that remain after primary treatments can be removed through secondary treatment methods, including fine floating solids, colloidal and dissolved organic matter by biological/chemical treatment by aerobic or anaerobic process. Anaerobic contact reactors (ACR) are the best treatment system that reduces the BOD level by 90% and removes volatile solids by 41-67%. problem with anaerobic reactors is odour production, which can be kept to a minimum by installing synthetic floating covers on the lagoons, to prevent odour and capture biogas [34]. Temperature is one of the limiting factors of anaerobic lagoon, which determines the efficiency of lagoons and most anaerobic lagoons are more effective when the temperature is above 21ºC [35]. In many aerobic anaerobic stabilisation ponds are most commonly used for the treatment of wastewater from slaughterhouses and their efficiency varies from place to place, for example in New Zealand, the ponds remove less than 35 % of N [36]. Anaerobic lagoons can be an effective wastewater treatment technology, as the BOD can reduce 97%, 95% cod and SS 96% [37]. It is therefore considered to be the best available treatment technology for slaughterhouse wastewater, as waste water from the meat industry is rich in organic pollutants [38,39]. This method is most popular in countries such as the US and Australia mainly because they have suitable climate and large land availability to adopt anaerobic lagoons in wastewater treatment [34]. In the meat industry, waste water, N and P, can be biologically disposed of using the granular sludge method, with a disposal efficiency of TN-86%, TP-74 % and COD-68 % [40]. The removal of nutrients is an important treatment process in the treatment of wastewater from the slaughterhouse and is the last or tertiary treatment. Nutrients such as N and P are introduced into the receiving area if industries fail to remove nutrients before they are disposed of in locations. Majority of industries reuse their wastewater for various purposes especially irrigating the crops/lawn. Environmental factors of an effective treatment system are shown in Figure 3.This helps to maintain soil fertility, productivity and durability, while emissions into the river, the ocean requires appropriate nutritional removal techniques to reduce nutrient concentrations to a minimum acceptable level. Advanced treatment processes (Grains sludge, Sequencing batch reactors, integrated aerobic-anaerobic film reactor, aerobic-anaerobic stabilization pond, Anaerobic treatment methods) helps reduce the concentration of nutrients in the wastewater, mainly N and P. Eco toxicity level of wastewater quality standards and their use are summarized in Table 3.ParameterIrrigationSewer large citySewer Are small townCoastal surface waterInland surface waterReuse non drinkable(a)BOD (mg L-1)Site specific4000600101010000pH6.5-8.56.0-10.0.0-9.05.0-9.0.0.0.0.06.5-8.5.5-5.8.0 TDS (mg L-1000NANANA50001000Coliforms (Org 100 mL-1)1000Gee limit10002001000TN (mg L-1)Site specific500101510150Abattoir wastewater quality (Source: MLA-RPDA-1998); (a) Typical for non-drinkable reuse. Factor influencing the wastewater management plan with phytore mediationThe effects of offal water on the natural environment can be broadly classified into three categories, health and social effects, economic effects and ecological effects. Air-related problems in offal can be dust, flies and odour that will have a major impact on the adjacent areas. Slaughterhouses are commonly known as dirt due to various pollutants or dust production activities such as return and slaughter [41]. Wastewater transports various microbes that can pollute water sources [42], leading to the spread of pathogens from one place [31]. This can lead to a wide range of diseases such as cholera, typhoid and dysentery [43]. Discharges of waste water from a slaughterhouse without proper disinfection lead to the occurrence of meat-based infections due to the high populations of E. coli and Salmonella sp. [44]. Odour is a common problem associated with offal [45]. Odour is a problem if wastewater from slaughterhouses is not fully treated to control biological oxygen demand (BOD), which can lead to anaerobic conditions [34,46]. Most meat industry sites reported that causing stench and noise is a serious problem for the local community. The most common sources of odour emissions from the meat industry are:Wastewater storage pond & wastewater treatment areas. Wastewater irrigation sites/landRendering and by-products plantTruck deliveries for rendering Animal waste such as urine and faecesThe most common sources of noise are:Boiler steam blowdownBellowing livestockCollection/loss of aesthetic value can be observed in the majority of industrial zones and landfills. It has a significant impact on the loss of land value and aesthetics, ultimately reducing further urban development. Waste water from slaughterhouses disrupts the recreational use of the waterways due to, for example, odour nuisance and aesthetic facilities [46]. Most slaughterhouses are located away from urban areas due to the cost of land and the high capital requirement for waste and wastewater disposal [28]. Offal water significantly increases the cost of treating wastewater, disposing and recovery of contaminated sites [47]. Estimated cost disposal methods $1.95/kL discharge into sewer $1.55/kL discharged into waterways $0.60/kL discharged in landAbattoir wastewater treatment and disposal requires high costs. For example, in Canada about Can$0.70-1.60/m3 and in the United States, approximately US, is $20/0.159 m3 or US$30-40/m3 are paid by the meat processing industry for the disposal of beef slaughter residues [38]. Most small and medium-sized slaughterhouses do not have the tertiary and prior treatment facilities due to the high capital involved in these methods [31, 38]. Disposal of poorly treated and untreated wastewater in a country will reduce the value of land, both through cost and productivity. Abattoir wastewater is usually treated mechanically and also biological treatment system in ponds. Leakage of wastewater from ponds can lead to serious contamination of groundwater due to infiltration of nitrate and phosphate [46]. As wastewater discharges from slaughterhouses carry a significant amount of pollutants that are disposed of in the country high investment, which may lead to the loss of land value [34]. Removal of slaughter water without proper treatment leads to a deterioration of water quality. Wastewater with its rich nutrient content can lead to abundant growth of algae (algal blooms) that kills fish and other aquatic flora and fauna [34]. Abattoir wastewater wastewater the rich nutritional content (nitrate and phosphate) from animal manure and various processes directly influences the growth of algae in the aquatic ecosystem. Productive growth of algae is referred to as algal blooms, which poses a direct threat to the ecosystem. Soil contamination is caused by discharges of poorly treated wastewater, which can contain heavy metals, organic compounds, inorganic compounds, soluble salts and pathogens. In the absence of effective management strategies, pollutants find routes to enter groundwater and the food chain, creating serious threats to the natural environment and humans. Wastewater can be used to irrigate the crops, but the concentration of pollutants and nutrients loaded above the threshold level will cause serious soil problems, including soil salinity [48]. Improper nutrient management in the wastewater system leads to the deposition of excess nutrient in landfills and further causes a possible effect on soil fertility and productivity. Continuous discharge of offal wastewater over the same site results in soil contamination, affecting soil biodiversity and productivity. Consequently, productive land and clean water resources are becoming scarce due to the following problems [29]:Wastewater from the stabilisation pond; effluent evaporation-Increased salinitySurfactants derived from equipment cleaning-Increased alkalityOrganic/solids /manure transfer to wastewater and wetlands-increased turbidityThe administrative removal of wastewater system may create an opportunity for contamination of groundwater due to nitrate leaching, and many other direct and indirect effects may also occur [33]. Universally, soil pollution is caused by industrial, mining, household and municipal waste, and in Australia industries and mining are the two main sectors of soil pollution. Discharge of untreated abattoir wastewater can cause serious threats in the receiving environments, changing the micro and macro environment of the recipient countries. The removed nutrients and other pollutants can cause spatial and temporal heterogeneity in benthic populations and also predominance of organisms such as oligochates and diptera that can also affect humans [49]. Abattoir wastewater discharged into the river can have a major impact on species diversity and the development of aquatic organisms. The presence of a high BOD will have a major impact on spatial and temporal heterogeneity of macro invertebrates [49]. Bioaccumulation and biomagnification of contaminants in fish present in abattoir effluent can affect aquatic ecosystems entire food cycle or food web and pose serious threats to native flora and fauna [46]. Untreated waste water discharged into landfills transports heavy metals that can affect soil properties. Wastewater from slaughterhouses acts as a source of important nutrients (N and P) and micronutrients such as calcium, sodium, magnesium, sulphur and iron and trace heavy metals such as cadmium, cobalt, nickel, copper and and and [38] Meat production is an important source of global greenhouse gas (GHG) emissions, which emit methane, nitrous oxide and carbon dioxide at various stages. Livestock farming is one of the most important activities responsible for greenhouse gas emissions worldwide [50]. Greenhouse gases are emitted by direct energy consumption and indirectly by the production of raw materials, herding, the movement of animals, the transport of products, the slaughter, cleaning and dressing of the animal product, waste and waste water. Meat consumption will be high in 2020 and consumption growth is expected in 2050; asia-pacific [44]. In recent years, meat production and consumption has increased significantly and is predicted to peak in 2020. Global meat consumption per capita is expected to increase from 32.9 kg /rwt in 2011 to 35.4 kg /rwt in 2020 [44]. A recent study by the European Union shows that ruminants (cows, sheep and goats) have the highest carbon footprint [50]. Total net greenhouse gas emissions from EU livestock farming were estimated at 661 mt carbon dioxide equivalent (CO_2-eq), which amounts to around 9-13 % of the total greenhouse gas emissions for the EU agricultural sector; 23% methane, 24% nitrous oxide, 21% CO_2 (energy consumption), 29% CO_2 (land use). A significant amount of greenhouse gases emitted by the global animal industry, which is more than all the cars in the world combined and a large proportion of those 18 % nitrous oxide and methane emissions; both gases have a much more powerful greenhouse gas effect than carbon dioxide [51]. Livestock farming accounts for 5-50% of the total contribution, but can vary from place to place [52]. The total contribution consists of pigs-0.4%, sheep-3.4%, cattle-2.7% and cattle-11.2%, which emit on average 554 kg of CO_2-e/tonne of warm standard carcass weight [47]. In the meat industry, large quantities of water are used to wash the carcasses of the slaughtered animals and to clean the equipment in slaughterhouses. The waste water generated during these processes contains a high organic load, fat content and concentrations of N, P and Na. The majority of wastewater undergoes primary and secondary treatments before it is released into the environment. The discharged effluents can be used for irrigation because it contains free source of nutrients that may increase production and also reduces the input of fertilizers. However, this requires proper N-management to minimise possible groundwater contamination. Other environmental considerations include the increase in dissolved salts that cause the salinity of the soil or sodicity and accumulation of P in the soil. Phytore mediation can be a viable cost-effective remediation technique to effectively manage nutrients in the soil and reduce water resources pollution. By growing suitable plant species in the wastewater irrigated land, excess nutrients can be phytoextracted by the plants for growth. A large amount of biomass can be produced for energy generation or as a feed source for grazing animals. Understanding Understanding nutrient cycling in a wastewater irrigated ecosystem is necessary to prevent food loss to the environment. Nitrogen cycle: The waste water from the slaughterhouse contains nitrogen in organic forms; this is converted into ammonia by ammonification (NH4+). This process is strengthened by bacteria in anaerobic conditions. Ammonia further oxidized in nitrite and nitrate by nitrification process using nitrifying bacteria. At the end, nitrate converted into nitrogen gas by denitrification activity in the presence of optional microorganisms. This is the typical N-cycle in an abattoir wastewater irrigated ecosystem. Similarly, (phosphor cycle) P occurs as both organic and inorganic (phosphate) forms in the waste water discharged from the slaughterhouse. With more than 80 % of P occurring in the organic form, plant growth depends on the conversion of organic P into inorganic forms. In general, the P cycle in irrigated soils of wastewater is the most complicated compared to N due to phosphate downfall or accumulation. Nutrient Budget is an accounting approach that combines, absorbing and depositing the cumulative effects of nutrient input, which can help manage nutrients by identifying production targets and opportunities for improvements in the efficiency of nutrient use and thus reducing the risk of the effects of nutrients outside the business [53]. Budgeting nutrients for a wastewater treated ecosystem is more important than a farm food budget. Waste water from the treatment pond (open pond treatment) can be used as irrigation water for fodder grown in the land treatment area. Abattoir wastewater usually contains a high concentration of nutrients, such as N 250 mg/L and P 30 mg/L. The annual nutrient load used for mass balance was calculated with the following equation. Nutrient intake=nutrient requirements per kg of biomass* total biomass feed input produced=nutrient concentration/L * Total amount of irrigationThe nutrification budgeting of nutrients contributes to minimizing environmental impacts such as nutrient loss to the atmosphere, leaching and overdose, and efficient nutrient management for sustainable production. Abattoir wastewater irrigation significantly increased the total dry matter yield, and the absorption of nutrients into the soil. The production of dry matter and the absorption of nutrients were a proportionate response to the application of the irrigation rate. Therefore, an effective recapture of all nutrients discharged from the agricultural industry is possible, thus redeeming a significant part of this requirement. Farm nutrient budget can be calculated using information obtained from nutrient input or wastewater irrigation rate-plant uptake - soil test. These are the essential tools to calculate the effective budget for nutrients to prevent food loss for the environment. Abattoir wastewater irrigation significantly increases the absorption of nutrients into the soil and the resulting total dry matter yield. Sparkling et al [54] noted that wastewater irrigation significantly increases annual and total herbal production and take high N and P from the bottom. Similar results of [55] concluded that wastewater irrigation has positive effects on plant growth and development (crop height). A recent study on the nutritional budget of an offal water irrigated soil showed the effect of prolonged irrigation of wastewater on soil fertility (Figure 4). However, growing suitable plants for the production of animal feed and the production of bioenergy can help the industry to gain additional benefits. The study site covers 32 hectares (16 hectares currently irrigated) and receives approximately 216 megalitres (ML) abattoir wastewater annually. This waste water contains 250 mg/L N and 30 mg/L P. The land treatment site has received a total of 2025kgN/ha, 405kg P/ha and 1350kg K/ha plus trace elements. In total, this site was loaded with 32.4t N, 6.4P and 21.6t of K per year. The production of dry matter and the absorption of nutrients were proportional to the speed of application. The application rate to the land treatment site was 216 megalitres (ML)/year and the total production of dry matter was 110 tonnes in 2012. A total of 6t N, 1.3t P and 4.7t K respectively, was removed by herbage as nutrient intake each year. This is about 10% of that total that is applied. Effect of long-term irrigation of wastewater on soil fertilityIt is most essential that industries should apply different best practices/inexpensive technologies to reduce their water use and costs [34]. Irrigation of wastewater is a potentially inexpensive approach to wastewater management and can act as a good source of nutrients for infertile soil [34]. Australia, with different meat-based industries should manage animal waste and wastewater with low cost technology [4]. The amount of organic load, N and P, and organic carbon concentration can be reduced by prior collection of manure before washing away, which will reduce the high concentration of pollutants effluent load [24]. Phytoremediation of offal is an appropriate technology for the management of nutrients and metals [56]. Abattoir wastewater is a richest source of N and P; therefore, it can be treated as an alternative source of nutrient supplier for poor fertile soil [56, 57]. The following steps are important for waste reduction and low-cost wastewater treatment techniques, the discharged waste water must not exceed the acceptable level of nutrients and pollutants. Microbial community must be eradicated by disinfection in order not to guarantee pathogens and to minimise bio-threats. The environmental standards (legislation/law) established by the State Environmental Authority /EPA must be strictly observed. Pollution levels to be reduced by different treatment techniques to maintain the quality of the environment. Nutrient (N and P) levels are maintained in the permitted level of discharge. In order to prevent odour emissions, a significant amount of BOD should be reduced. Disposal of organic, solids, fats, oil and fat do through various waste disposal process. It is very important to ensure that zero zero standards for pollutants in the disposal of slaughterhouses are most satisfactory for different reuse process. Slaughterhouse wastewater treatment system and its efficiency are directly affected by several factors. Low cost/cost effective treatment technologies, available space/site, site sensitivity to odor, characterization of the treatment system, labor availability/mechanical energy, electrical energy/energy, transportation facility and climate apply to vary in place to place [58]. Worldwide, the reuse of wastewater has steadily increased in the amount of water in crop production. Wastewater irrigation meets 1% of Australian demand for agricultural water through reuse. Wastewater acts as both water source and dietary supplement. This is an additional benefit for the agricultural sector, especially water scarce region. This proposed sustainable concept illustrated in Figure 5, Phytoremediation of contaminated soil with offal wastewater using high biomass producing plant species may be a cost-effective technology to convert contaminated soil into cultivable land. Consequently, the plants used not only act as sanitants, but the biomass produced can also be used for energy production, paper production and feed for grazing animals. The Australian National Water Commission-2011[59] water initiative encourages various wastewater reuse and recycling research, and development programs in particular cost-effective technology to meet national water demand both current and future. Wastewater reuse is an important part of sustainable water management, reusing water from various wastewater sources after the removal of the pollutants, nutrients and pathogens provide room for water security. Conceptual framework of an effective low-cost wastewater treatment planWe would like to thank CRC CARE for providing funding (no. 4.2.1.11/12) to conduct research into nutrient management in wastewater discharged soil.