

# **POULTRY WASTE MANAGEMENT: A CASE STUDY OF WASTE MANAGEMENT PRACTISE IN PENANG, MALAYSIA**

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## **ABSTRACT**

*Poultry industry in Malaysia and many parts of the world are facing many challenges, especially in term of waste management. This study investigate the presented poultry waste and the method of poultry waste management been used in two selected area in poultry farm. Quantitative methods of interviews are used to gain the opinion of the owners of poultry farms in this study. Besides that, a literature review was conducted to identify poultry waste that available and methods that been used to disposal of poultry waste in other country. By examining the poultry waste impacts in the two selected poultry farm in Penang area, this study suggests appropriate and possible methods to overcome or minimize poultry waste in Malaysia's poultry farms.*

### **Keywords:**

*Poultry, farming, poultry waste, waste management practice, Malaysia*

## **1.0 INTRODUCTION**

Poultry farming is one of the important sources to generate income for Malaysia's economy. In recent years, poultry farms in Malaysia have growth rapidly, indirectly had creates many employment opportunities for many people and contributes toward improving living standard of people. Poultry farm mainly are provide meat and eggs, but in the same time it also generates large quantities of waste materials. This poultry waste had a negative impact on the environment too. Waste that been generate may caused pollution, reduce the quality of life and also become physically abrasion to an unwanted material, such as waste product. Follow by the rapid growth of poultry industry, poultry waste problem that getting serious has become a concern in Malaysia.

The project deliverable is a report describing the poultry waste issue in Malaysia's poultry industry,

discussing the poultry waste management in that been used in local poultry industries. Finally, compare those disposal method with other country and then give some suggestion on improve the poultry waste management in Malaysia. The objective of this project is to identify the different type of waste available in Malaysia's poultry farm and also the methods that been commonly used by local poultry industries for disposal poultry waste In this research paper will also compare the waste management practice in Malaysia poultry farm with other country.

The purpose of this paper is to study the poultry waste issue in two selected area in Penang, Malaysia and how local poultry industries managed it in order to do a comparison with other countries and come out with some suggestion on how local Malaysia can improve their poultry waste management.

## **2.0 LITERATURE REVIEW**

The literature review will be continues have a discussion on an overview and definition of poultry, poultry waste and the issues of the important. This research paper will also review the method of disposal the poultry waste and the problems that occur when processing the poultry waste management system. Besides that, there will also discuss about the closed housing system and its advantage to poultry farm in term of controlled the poultry wastes.

### **2.1 Overview and Definition of Poultry**

Poultry farming is "the raising of domesticated birds such as chickens, turkeys, ducks, and the geese, for the purpose of farming meat or eggs for food. Poultry are farmed in great numbers with chickens being most numerous". There are 3 different types of poultry farm: bleeding farm, broiler farm and layer farm. In Malaysia, many farms specialise in raising broiler for meat production and raising chickens for their eggs. Worldwide, the poultry

industry is growing rapidly and contributes towards addressing key national development goals, as well as, in improving the standard of living of people through poverty alleviation and creating employment opportunities (Agblevor et al., 2010). As increasing demand for protein poultry meat and eggs throughout the world, poultry farming has become one of the most important parts of worldwide agriculture. Besides that, poultry industry in Asia is growth rapidly to meet the ever increasing demand.

**Table 2.1:** Leading Broiler Meat Producers in Asia

Country	2000	2005	2006	2007	2008	2009	2010	2011E	2012F	2013F
China	9,269	10,200	10,350	11,291	11,840	12,100	12,550	13,200	13,730	14,279
India	1,080	1,900	2,000	2,240	2,400	2,550	2,650	2,900	3,200	3,520
Iran	803	1,237	1,360	1,468	1,566	1,610	1,650	1,723	1,775	1,828
Indonesia	804	1,126	1,260	1,295	1,350	1,409	1,465	1,515	1,540	1,566
Turkey	662	978	946	1,012	1,170	1,250	1,430	1,614	1,687	1,763
Japan	1,091	1,166	1,258	1,250	1,255	1,282	1,290	1,235	1,270	1,305
Thailand	1,070	950	1,100	1,050	1,170	1,200	1,280	1,380	1,420	1,477
Malaysia	786	904	922	931	945	945	945	950	955	960

## 2.2 Poultry Waste

The wastes that generate from poultry farms are separate to 2 types that include solid waste and wastewater. Solid waste is bedding material, litter, manure, feather, dead birds and hatchery waste (empty shells, broken eggs and intestines) while the waste water is comes from washing and disinfection of chickens houses.

### 2.2.1 Dead Birds

Chickens dead may causes by many reasons, and the dead birds consider as one type of waste material in the poultry farm. Factors that cause death of chickens including attack by viruses or illnesses, change of temperature in chicken house, chickens diseases and picking behaviour of the chickens.

### 2.2.2 Dropping or Manure

Chicken manure is generally a waste material that refers to faeces and urine produced by chickens which is organic in nature. The manure is acquired by cleaning of the poultry houses on regular basis where thin bedding layers are removed along with such manure. Therefore, the manure is basically the waste from chicken dropping and other mixtures (Farhan Sheikh, 2013).

### 2.2.3 Litter or Bedding Material

Jesse L. Grimes (2004) define poultry litter as a mixture of excreta, feed, feathers, and bedding material but also generally refer both new and unused bedding material as litter. The material that can be used as litter or bedding materials are sawdust, wood shaving, straw, hulls, pine shaving and many other materials that are contain high moisture absorbing capacity.

### 2.2.4 Hatchery Waste

According to Phil Glatz, Zhihong Miao and Belinda Rodda (2011), the solid hatchery waste comprises empty shell, infertile eggs, dead embryos, late hatchings and a viscous liquid from eggs and decaying tissues. The wastewater comes from water used to wash down incubators, hatchers and chick handling areas.

### 2.2.5 Wastewater

In poultry farm, wastewater is been produced by washing and disinfection of chickens houses. Brian Harry Kiepper (2003) explain that wastewater enter to environment through either “point” or “non-point” source. Wastewater that comes from diffuse sources such as the runoff from agricultural fields or parking lots is defined as non-point (Welch and Lindell, 1992).

## 2.3 Poultry Waste Management

A poultry farm produces large amount of waste materials everyday and those waste materials like manure and dead birds may attract flies, pests and cause bad smell. Management of the increasing volume of poultry wastes is now being recognized as a serious challenge (Ribaud et al. 2003). Worldwide, there are several ways been used to dealing with the poultry waste that will be discussing below.

### 2.3.1 Burning

Burning is a very common method for disposing the poultry waste materials for many poultry farm, especially for the small-scale poultry farm. By using this method, the dead birds are fully burned at very high temperatures using tyres, diesel, woods or other fuels materials. One of the advantage of this type of disposal method is it can controlled the spreading of disease. But in some country, this waste disposal method not a preferred method for them to handle the poultry waste due to burning may lead to atmospheric pollution such as air pollutant.

### 2.3.2 Compositing

Eldridge R. Collins (2009) define the compositing process is converts a material with potential odour and other nuisance problems into a stabilized product that is reasonably odour and pathogen free, and which is a poor breeding substrate for flies and other insects. This compositing process is carried out by successive microbial population which function under increasing temperatures to break down organic materials into gaseous carbon dioxide, water, minerals, and stabilized organic matter (Evanylo et al., 2009).

Many poultry farm use this compositing system due to its ability to reduce poultry litter, disposal of carcasses, stabilise trace minerals and reduce odours (Turnell et al., 2007; Bonhotal et al., 2008). Besides that, compositing can help to controlled chicken diseases outbreaks; it also can be done with the equipment that available in most of the poultry farm at any time of the year; hence it is economical (Bonhotal et al., 2008).

### 2.3.3 Incineration

Blake et al. (2008) recognized incineration as one of biologically safest method of disposal, eliminating the threat of disease. Incineration of dead birds that is burnt the dead birds with sufficiently high temperature in the incinerator. This disposal method will not create any odour problem if properly maintained and operated. Besides that, poultry litter can be incineration to generate heat or produce electricity. Incineration is simple and sanitary but incinerator is costly to buy and operated it. Therefore, this incineration method is less been used in the large-scale of poultry farm to handle large amount of litters and dead birds.

### 2.3.4 Rendering

Rendering is a process of using high temperature and pressure to convert whole animal and poultry carcasses or their by-products with litter or no value to a safe, nutritionally and economically valuable feed ingredient (J.C. Moreki and S.C. Chiripasi, 2011). According to Council for Agricultural Science and Technology (2008), rendering is combine s bleeding, cooking, pressurizing, fat melting, water evaporation, and microbial inactivation. Rendering is one of the preferred methods for poultry farm for disposal of dead birds. This is because besides compositing, rendering is the potential environmental and bio-security risk of dead bird disposal method.

### 2.3.5 Burial

Burial is one types of method for disposal of dead birds other than burning and rendering. Olexa and Goldfarb (2008) state that the carcasses may not be disposed of by dumping on any public road or right-of-way left where they may be consumed by animal. According to Malone (2005), on-farm burial has been the predominant disposal option for many catastrophic mortality events such as avian influenza outbreaks.

### 2.3.6 Feed for Livestock

Smith and Wheeler (1979) stated that poultry litter and manure are used as livestock feed in most countries. Poultry litter or manure been used for livestock feed since many years ago due to it is low cost protein, fiber and mineral for those livestock such as lamb, cows, horses, sheep, turkey and others. Poultry litter safe to be used as a feed stuff for cattle if processed properly to eliminate pathogens. With good management and appropriate withdrawal, feeding litter does not result in harmful residues in animal products. The higher value of poultry litter as a feed stuff than fertilizer justifies transportation of the waste outside of areas where the waste is produced.

### 2.3.7 Anaerobic Digestion System

This system is one of the system that been widely used for manure management. Anaerobic digestion is a biological process in which poultry waste material is converted into energy under anaerobic conditions. Through anaerobic digestion system may produces one type of gas – methane gas. Methane gas can then be used for energy to replace fossil fuels and thereby to reduce carbon dioxide emissions (Mohd Amirul Asyraf Bin Ahmad, 2011) as it can be gas cleaned and used as a renewable energy in households for cooking and heating (Collins et al., 2002).

A biogas production system must be specially designed and requires regular attention by someone familiar with the needs and operation of the digester. Besides that, this biogas production technology has widely developed in many countries such as India, China, USA, Australia and others. Associated manure handling equipment and gas utilization components are also required. The digester does not remove significant nutrients and requires environmentally responsible manure storage and handling system. Anaerobic digestion reduces pathogens and odours, requires little land space for treatment, and may treat wet and pasty wastes (Braber, 1995; Shih, 1987, 1993). In addition, any releases to air, water, and land from the process can be well controlled (Braber, 1995; Shih, 1987, 1993).

## **2.4 Challenges Associated with Disposal of Poultry Waste**

The main challenge for the poultry industry in general is cost for disposal poultry waste. No matter what method been used for managed the poultry waste there will be needed of money. Therefore, poultry industry may generally think how to turn all the waste into economically-valuable outputs using low-cost treatment systems. Based on the huge volume of waste generated by the industry needs to be treated using bioprocesses to produce feed fertilizer and fuels. These processes need to be applied to the organic waste streams (e.g., poultry manure, hatchery waste) and turn the cost of waste disposal into a source of income, recycle nutrients and reduce pollution.

## **3.0 METHODOLOGY**

This chapter discusses the methodology method that I used to get data in this research. This research methodology will described and explain based on the objective and aims of the study. In this study, researcher will focus on the both primary data and secondary data which researcher interview to local poultry farm to get the first-hand information and review the previous literature and news article in libraries and internet.

In this study, this research is to find the study of what the poultry waste that available in local poultry industry and what disposal methods that been used by the poultry farmer to management the wastes. Furthermore find out what is the possible action should be taken in order to improve the poultry waste management.

## **4.0 FINDINGS**

In data analysis, research is presenting finding from Heng Huat Farm and Teoh Siong Hong Farm which are located at Luar Kampung Valdor, Sungai Bakap, Pulau Pinang. The information gathered is based on interviewing with Mr.Tan Joo Heng who is manager of Heng Huat Farm and Mr.Teoh Heng Soon who is the manager of Teoh Siong Hong Farm. During interview, the research questions mostly are based on the objectives of the study.

### **4.1 Farm Background**

#### **4.1.1 Heng Huat Farm**

Heng Huat Farm is established in year 1950 by the grandfather of Mr. Tan Joo Heng. At the time, the business was only one farm with 1000 hundred chickens and production capacity of 500 eggs per

day. Heng Huat Farm is combines of broiler and layer farm. From a small backyard farm in early 1950's, Heng Huat Farm with about 63 years experience has developed into a medium sizes poultry farm in Malaysia. The type of housing that been used in the farm is conventional system. There are ten workers in Heng Huat Farm. There are fourteen chicken houses with 50,000 chickens inside. The sizes of each chicken houses is 300×26 meter. Heng Huat Farm is located at Seberang Perai Selatan, Pulau Pinang. For their chicken housing system, Heng Huat Farm did not put any litter or bedding material at the floor. This is because the chickens are raise in metal cage that place three feet above the land. They have changes their feeding system from manual to automation feeding system. Furthermore, Heng Huat Farm did not store any unnecessary pile litter or chicken feed. There had a company that produces chicken feed allocated near to Heng Huat Farm. The farm will direct buy the needed chicken feed or pile litter from the company while needed. For houses cleaning, it will be done after the chickens been sold out to other. Mostly nine to eleven month a times.

#### **4.1.2 Teoh Siong Hong Farm**

Teoh Siong Hong Farm having layer and broiler farming operation in the early 1976 years, which established by the late father of Mr. Teoh Heng Soon. This poultry farm has the experienced for 37 years and type of housing that used in this poultry farm is also conventional system. There are six chicken houses with sizes 250×24 meter with 20,000 chickens in the farm. Teoh Siong Hong Farm is a small-sizes farm with only 2 workers working in the farm. The production capacity of Teoh Siong Hong Farm is about 5000 eggs per day. Same as Heng Huat Farm, they raise the chicken in metal cages which did not need to put any litter or bedding material. Therefore, there are no litter wastes that will be generated in the farm. They feed their chicken three times per day. They feed their chicken by using semi-automation feeding system. They will control the feed that will be given to each chicken which 105gram while weather is hot and 110 gram while the weather is cool. They did not stock pile litter or chicken feed too. They will buy it while needed. Besides that, they will clean the chicken houses nine to eleven month a times

### **4.2 Poultry Waste available in the Farm**

The common poultry wastes that can be found on both farms are manure, dead birds, hatchery waste and wastewater. As both the Heng Huat Farm and Teoh Siong Hong Farm did not used litter in their chicken housing. Therefore they did not face any problems for storing or used of litter. Both of the farm raise they chickens in a large "metal" cages

and place higher than the land which three feet above. The manure or dropping of the chickens directly drop to the land. This is easy for them to collect the waste – manure.

### **4.3 Disposal Method of Poultry Waste**

Both of the poultry farm that been visited to are used the same disposal method for manage the poultry waste. For dead birds, the workers of poultry farm may correct it and put it in a bin. Every day, there will have people come and collect it and send for landfill or burning. Some of the poultry farm may uses the dead birds as feed for livestock but this method are not recommended due to health issues. Other than that, hatchery waste such as broken eggs is all send for landfill or burning. In local poultry farm, there are no related technologies that can change the waste into valuable sources. For manure, worker of the farm will collected it after a period of time and sell it for composting. The manure will be composite and send for gardening uses, mostly are send to Cameron Highland. The chicken houses will be cleaned up eight to nine month a time. The wastewater that been generate, they just let it flow into the land.

## **5.0 DISCUSSION**

Based on the interview with Mr. Tan Joo Heng who is farm owner from Heng Huat Farm and Mr. Teoh Heng Soon who is farm manager from Teoh Siong Hong Farm, researcher found that the poultry waste management in both poultry farm are not in the best condition in some area but they have develop in order to improved their waste management practises. The inefficiency of their poultry waste management in both poultry farms are because they are using conventional housing system. As Mr. Tan Joo Heng stated that, they are trying to develop new technology or method to improve the current poultry waste management. Mr. Tan explain that the poultry waste management in the poultry farm is a responsibility that must be complying as a responsible poultry farmer. It's not only for owns benefits, but also for the environment and health issues. Mr. Teoh also stated that their poultry farm is trying to do some changes for improved the current poultry waste management in their farm. They are ready to develop or bring in some new technologies for improve their poultry waste management and also improved the performances of their farm. Mr. Teoh also stated that if financial situation of their poultry farm is available, they may changes their housing system to closed housing system in order to improve their poultry waste management.

## **6.0 LIMITATIONS**

There are few limitations along the research done. Firstly, researcher is difficult to gain the detailed information about the poultry farm operation and poultry waste management practises in both poultry farm: Heng Huat Farm and Teoh Siong Hong Farm. Although researcher successful make appointment with both poultry farm manager, but just given two hours interview, that is including photo session and visit to the their poultry farm. Due to the limitation of time, not very much could be asked clearly to the managers causing the information that researcher get are not in depth.

In addition, financial is also as a limitation since the project is not funded, researcher need to spent own money in order to complete the research, such as phone credit to make appointment and transportation fee for visiting to particular poultry farms. To some extent, these all limitation will seriously affect the smooth and effectiveness of the project goal and schedule.

## **7.0 RECOMMENDATIONS**

Some solutions to solve the poultry waste problems have been found through assessing the current poultry farm situation, waste that available in the farm and also their disposal method. Incineration, rendering and anaerobic digestion system are very effective method for disposal poultry waste but in Malaysia, these all methods are not well developed in local poultry farm due to the huge cost.

Researcher would suggest that change the housing type from conventional system to closed housing system would be the solution for management the poultry waste. As Closed-house system is tunnel ventilated that uses huge suction fans to maintain a relatively cooler ambient temperature in poultry houses. The strong airflow also helps to keep poultry dropping dry, thus avoid foul smell arising from wet droppings. Besides that, the automatic feeding system may reduce the waste of litter or feeding material. Wastewater problem also will be well managed with the closed housing system.

## **8.0 CONCLUSIONS**

As a conclusion, the poultry waste management of Heng Huat Farm and Teoh Siong Hong Farm are not so effectiveness compares to global poultry waste management. There are only a few methods that available in Malaysia. Some of the poultry waste disposal method that been conducted in other countries did not develop in Malaysia due to cost and technology limitation. With a better poultry waste management, poultry farm could improve

their poultry production quality and profitability. Image of poultry farm will be improved also. Lastly, in the opinion of the researcher, the poultry farm can improved their poultry housing into closed housing system in order to improve the poultry waste management. Besides that, poultry farm must take managed of poultry waste in the farm as their responsibilities that must be comply instead of government requirement.

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