



## Managing odour pollution from livestock sources in Malaysia: Issues and challenges

Zaini Sakawi<sup>1</sup>, Lukman Ismail<sup>2</sup>

<sup>1</sup>Environmental Management Program, Faculty of Social Science and Humanities, <sup>2</sup>School of Social, Development & Environmental Studies, Faculty of Social Science and Humanities, Universiti Kebangsaan Malaysia

Correspondence: Zaini Sakawi (email: zaini@ukm.edu.my)

### Abstract

Odour pollution from livestock farms can adversely affect quality of life and human environment. There is a dearth of study on this type of odour pollution in Malaysia despite its relatively widespread media coverage. The impact of such pollution not only created inconveniences but also exposed the surrounding population to certain diseases. This study highlighted some of the salient issues and challenges related to livestock-originated odour pollution management in Malaysia. Enhanced monitoring of the odour pollution was suggested in order to ensure control of concentration and intensity of the odour from the livestock to maintain conducive living environment for the community.

**Keywords:** environmental issues, environmental management, odour pollution, odour management, pollution monitoring, types of odour pollution

### Introduction

Generally, livestock industries in developing countries have increased at the rate of 3% yearly for the past two decades and is expected to further increase until 2020 (Delgado et al., 1999). Malaysia is one of the developing countries with increasing activities in livestock industry. Livestock industry is a third generator of growth for Malaysian economy. According to the statistics issued by the Department of Statistic Malaysia (2011), the livestock output has been steadily increasing from the year 2006 up to 2010. Table 1 shows that the output for beef (45%), mutton/lamb (50%), pork (8%), poultry (25%), eggs (26.8%) and dairy (47.3%).

Food and Agriculture Organization of the United Nations (FAOSTAT), data for international comparison indicated that Malaysia's livestock products were at the top 15<sup>th</sup> in Asia; with fowl/duck (2<sup>nd</sup>), chicken (7<sup>th</sup>), pork (11<sup>th</sup>) and dairy (12<sup>th</sup>). In 2010, the distribution of abattoirshad also increased in several states per types of livestock such as buffaloes, cattle, goats, lambs and swines (Table 2). According to the statistics, pig slaughter houses were the most active in Malaysia, with 1, 405,111 followed by cattle (102,409), goats (22,775), buffaloes (10,320) and lambs (4,105). High pork production has turned Malaysia into a major pork exporter in South East Asia, particularly to Singapore (Department of Veterinary Malaysia, 2012).

**Table 1. Livestock production in Malaysia 2006-2010**

Commodity	Beef	Mutton, lamb	Pork	Poultry	Eggs	Milk
Unit	('000 metric/tonnes)					(Mil. Litre)
2006	31.9	1.6	216.7	1, 035.4	465.0	45.5
2007	35.0	1.8	200.1	1, 100.0	492.0	51.1
2008	38.3	2.0	195.1	1, 162.6	523.0	56.5
2009	42.2	2.2	206.0	1, 202.0	556.2	62.3
2010	46.5	2.4	234.0	1, 295.6	589.6	67.0

**Table 2. Distribution of major abattoirs per livestock's in Malaysia 2010**

Livestock's	States
Buffaloes	Perak and Terengganu
Cattle	Kelantan, Johor and Selangor
Goats	Selangor
Lambs	Kelantan and Selangor
Pigs	Johor, Perak and Sarawak

The increase of livestock breeding activities is a positive development to Malaysian economy. Nevertheless, these brought out new issues of odour problems originated from large scale livestock farms. Odour is a component of the environment which can be either organic and inorganic. Odour can also be referred to as properties and qualities of sources that could effect, stimulate or receivable by the senses. Odour is a quality receivable or detectable by the senses in the form of aroma, fragrance or foul smell (Sakawi et al., 2011; Zaini et al., 2011)

Based on Table 3, there are various sources of odour. Odour sources from livestock activities such as poultry and pork were at average level for odour emission; with an average spread between 50 metres to 1000 metres. In reality, odour threat should not be taken lightly for it is capable of violating daily activities of the local population. This phenomenon is caused by the proximity of odour source to the settlement of the population (Fukuyama, 2004).

**Table 3. Classification of sources per scale of odour release**

Scale of odour release	Source of odour release	Distance (meter)
Large	Sawmill, Fish processing factory, rayon and celluloid.	1,000 – 5,000
Medium	Poultry and pig farms, septic treatment, coffee factory, printing, auto and steel welding, chemical factory, rubber factory, food factory and composting facility.	50-1,000
Small	Restaurant, laundry, pet shop, bakery, auto workshops, salon, public toilets, septic tanks and waste collection station.	5-50

According to reviews by Othman et al. (2006), the Department of Environment (DOE) Malaysia received 1082 cases on odour issues and pollution. The trend indicated that odour issues are increasing each year. Reports on the cases were often linked to various industries such as livestock, chemical industries, rubber processing industries, oil palm, urban solid wastes, sewage treatment plants, petroleum industries and others. The increase of complaints come from the sensitive receivers near the odour source clearly indicated that odour problem has affected their lives.

Then Page et al. (2008) also express that health issues related to odour pollution usually have an impact on a variety of diseases such as respiratory and skin diseases. The common complaints around the

country of health problems due to odour from livestock areas are related to the eyes, nose, sore throat, headache and drowsiness (Schiffman, 1998).

In conclusion, various management approaches should be developed to maintain sustainable environment. Any location of livestock farms, types of livestock and management techniques should be studied to avoid negative effect onto the population. Odour management is not new to affect humanlife.

In Malaysia, odour pollution issues have been widely covered by various media. Odour nuisance is a major environmental concern. Therefore studies on odour pollution should be heavily emphasized toward effective management of odour issues in Malaysia. These calls for collaboration between the government, livestock farms management, and the veterinary services department to enhance public awareness toward sustainable odour management of livestock farms.

### Odour management issues in developed countries

Odour measurement is a challenging and complex undertaking. Many developed countries have established their own standards to determine the accuracy of the measurements. The variances between those standards are shown in Table 4 (Zhang et al., 2009). The European standards prEN3725 has now become a global standard referred to comprehesively by many other countries such as Austria, Belgium, Denmark, Finland, France, Greece, Germany, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom (McGinley & McGinley, 2001). Sneath (2004) indicated that among the criteria set by the standard is prequirement for odour analysis instrument, selection of panel of evaluator and use of specific laboratory.

**Table 4. International odour standards**

Countries	Odour Measurement Standards
Australia / New Zealand	AS/NZS 4323.3:2001
Netherland	NVN 2820
European Union	prEN 13725
France	AFNOR X-43-101
Germany	VDI 3881
United States of America	ASTM E679-91 and ASTM E544-99

Meanwhile, in Asia, Japan and South Korea had laws related to the control and management of odour in their respective countries. Japan in 1972 had introduced the law for the control of dangerous odour. The impact of the law has reduced complaints on odour emitted from the factories and livestock farms. Then in 2002, Japan Ministry of Environment published a book on quality control and safety guarantees for the measurement of olfactometry. The implication of the publication was that, Japan has succeeded in establishing a sytem of odour control, laws on odour regulations, by laws for local authorities, measurement methods, certification for consultancies and process of quality control (Kenji, 2004).

In South Korea, the implemenattion of odour control is under the law for Air Rehabilitation. Presently, it is being amended to be at par with that of Japane which was more systematic and efficient in terms of measurement on fields and laboratories (Sung, 2004).

### Odour from livestock in Malaysia

Management and control of odour in Malaysia is still at its early step of study. Weaknesses in these aspects of odour control have been discussed by the environmental experts. Among the challenges due to odour issues in Malaysia are the weakness of the complain system, limited studies on the issues, lack of standardization, specific laws and poor enforcement.

### *Weaknesses of complain system*

Odour problem is not an overnight phenomenon. It is an issue that build itself over an extended period, increase its intensity gradually from the sources such as livestock farms, dumpsite, sewerage treatments plants and then overwhelm the local population. The impression that made the issues seemingly insignificant is due to poor complain system through which the people could lodge their issues.

The affected population did not have sufficient knowledge and access to complain about the odour issues. They are not clear to whom and what they need to do to lodge their complaint. However there are also attitudes of some public members who are ignorant of odour issues, hence the issues persist. The authorities such as the DOE in particular and the Department of Veterinary Services therefore should conduct active promotion to the public so that they are able to report on the activities causing the issues in the environment.

### *Limitation of research and tools*

There has been an increase of studies on odour issues in Malaysia recently. Nevertheless, their focus tends to be more on odour originated from sources such as dumpsites and sewerage treatment plants. Issues on odour from the livestock have not been given much attention. Furthermore, in availability of proper technological tools for its measurement also constrained such research. Such instruments are only owned by a handful of research institutes such as Malaysia Rubber Research Institute, Malaysian Agricultural Research and Development Institute (MARDI) and The National University of Malaysia (UKM) and a few other institutions.

### *Lack of specific gas measurement standards*

The lack of specific standards for odour measurement contributes to the perennial occurrence of odour issues in this country. Malaysia is lagging behind compared to other developed Asian countries like Japan and South Korea whose standards have been well established (Kenji, 2004; Sung, 2004).

Malaysia also does not have clear and specific guidelines on the measurement of gas concentration originated from the livestock farms. Many research conducted previously resorted to use foreign standards and guidelines as their critical reference. Recommended gas measurement for livestock farms such as the poultry, dairy and pork is a shown in Table 5 (Chastain, 1999).

**Table 5. Recommended gas concentration for management of air quality and odour from livestock farms (poultry, dairy & pork)**

Gas	Odour	Max Concentration
Carbon Dioxide	Nil	3,000 ppm
Ammonia	Acrid	15 ppm
Hydrogen Sulphide	Foul	3 ppm
Carbon Monoxide	Nil	50 ppm

### *Lack of specific laws and ineffective enforcement system*

Specific laws are instrument for enforcing effective odour management. Until now, the issues urging for formulation of specific laws and regulations are still prevalent due to the aforementioned constraints. As show in Table 6, existing federal and state veterinary laws only pertain to livestock management, disease control, abattoirs, animal exports, animal-based food products, and the ethics for veterinary officers (Department of Veterinary Services Malaysia). Based on the existing laws, there are no specific provisions for regulating odour pollution. This resulted in the perennial problems of enforcement and

controlling the pollution. No effective actions could be taken on livestock owners whose operations have seriously affected the surrounding population.

**Table 6. Veterinary laws in Malaysia**

State Laws	Federal Laws
Cattle Rearing Control Enactment 1971	Animal/Livestock Act 1953
Pig Rearing Control Enactment 1991	Abattoirs Act
Animal/Livestock Farming Enactment (Selangor) 2007 [Regulations] (State of Selangor) 2008]	Animal Food Act 2009
Animal/Livestock Farming Enactment (Selangor) 2007	Veterinary Doctor Act 1974

### Mitigation of odour from the livestock farms

There have been many studies on mitigation of the odour by the researchers in foreign countries (Sham Sani, 1982; Zhang, 1997; Jacobson et al., 1998; Power, 1999; Zhu, 2000; McCrory et al., 2001; Varel, 2002; Moore et al., 2008; Valli et al., 2008; Zimu et al., 2011). The mitigation management can be adapted by Malaysian livestock owners as a strategy to control the odour issues. Among steps that can be taken are improving the management of the livestock excrements and yard cleanliness; establishing buffer zones, use of microorganisms, vegetable oil spray, use of additional chemical, manipulation air flow, livestock diet and indoor livestock rearing.

#### *Management of livestock excrement and yard cleanliness*

Effective management of livestock excrements and clean livestock yards shall reduce the intensity rate of odour concentration from the livestock farms. In actual sense, reduction of odour is difficult to be evaluated and proven through written document. Nevertheless, many experts of the opinion that reduction can be measured via the workers and local population in the vicinity of the livestock farms.

#### *Establishing buffer zone between livestock farms and surrounding areas*

This method of management is to reduce the gas and odour pollution released into the air. The buffer zone is built of trees around the livestock farms. The trees not only able to moderate temperatures of the environment but also filter dirty air through it (Sham Sani 1982). The breadth of the buffer zone shall be between 200 m to 3 km. Trees suitable for the purpose are those that emit fragrances such as bush (*acacia farnesiana*) and herbs (*tulsi* and *turmeric*).

#### *Animal diet manipulation*

Nutritional factors may be a way to reduce odour pollution from livestock farms. Patterns of the nutrition intake can influence the rate of the release of odour at the livestock farms. The odour concentration could be reduced by consumption of suitable food intake for each type of the animals. The given nutrients should fulfil the animal need and not in excess which contributes to odour problem. This posed a major challenge to the owners to maintain a balance between odour control and animal health without compromising the quality of their meat, eggs or dairy products.

### *Indoor livestock rearing*

Valli et al. (2008) conducted a comparative study on traditional and indoor livestock practice to see their level of odour pollution. Their study involved cattle, pigs, and poultry. The measurement of odour was through the use of dynamic olfactometry, an instrument based on European standard prEN 13725. Samplings were taken at two periodic intervals when the animals were resting and active. Traditional method indicated higher odour emission compared to the indoor method. It proved that indoor technique was able to reduce the emission between 25% to 60%.

### *Vegetable oil spray*

Vegetable oil spray is a new method to reduce the odour which traps dust in the air within the livestock sheds. The dust is actually hazardous to both livestock and human health for it absorbs and spreads toxic gas and foul odour. Through vegetable oil spray, the dust density in the air could be reduced (Zhang, 1997).

The study also found that the concentration of hydrogen sulphide in the farm sheds was reduced up to 60% when sprayed with vegetable oil, but the level of ammonia gas remain unchanged for it was not undissolved with the presence of oil. The spray should be conducted once a day for optimum results. According to a study by the University of Minnesota, it was found that there was a difference between pigs farms sprayed with vegetable oil and those which did not. The content of dust at the sprayed farms was found to have reduced up to 50% compared to the ones untreated (Jacobson, 1998)

### *Use of additional chemical*

Chemical substance is an option to control odour and gas release (Le et al., 2005). One of the chemical substances is mineral salt. According to Moore et al (2008), mineral salt is a product which is capable to reduce effluence of ammonia up to 99%. Other than that, the mixing of chemical such as antimicrobial plant-derived oils, thymol and carvacrol into the animal waste to prevent degradation and reduces odour. In addition, mixing also preserves the nutrients found in waste until the waste can be recycled and used as fertilizer in agriculture (Varel, 2002)

### *The use of effective microorganisms (EM)*

Microorganism is proven to have reduced the spread of odour in the environment. Among the concentration that can be reduced is the ammonia gas. This gas is hazardous to the health animals and may lead to blindness and death. EM contains selected species of microorganisms that include predominant populations of lactic bacteria (Higa & Parr, 1994). Weijiong and Yongzhen (2001) has use of effective microorganisms to suppress malodour of poultry manure. Feeding trials consisted of adding EM either to drinking water and feed, or to both water and feed, and comparing the result with non-EM controls. EM markedly reduced the malodour level of the poultry manure, associated mainly with dramatic decrease in the ammonia (NH<sub>3</sub>) level, 42% to 70% lower than the controls. That result indicate that EM use in poultry operation has great potential for suppressing malodour of manure, improving sustainable production and protecting the environment, all on a cost effective basis.

### *Rotary atomizers*

The use of rotary atomizer technique was found to be highly effective to control odour pollution from the major source. Eventhough its use involved high costs, according to CPCB (2008), this method is proven to have been successful to reduce generation of odour. The atomizers uses centrifugal action by a spinning inner mesh to force droplets on to an outer mesh which 'cuts' the water into atoms. The rotary atomizers produces millions of microscopic droplets of water up to 238 billion from single little droplets

that are thinner than a human hair and a fine spray which cover up to 30 metres. This creates a fine mist, which is more effective with a minimal use of water and electricity.

## Conclusion

Odour pollution is a new field of research area which has been gaining more attention among Malaysian researchers. Nevertheless, studies on livestock-originated odour pollution are still in its infancy compared to those in developed countries. There are many issues and challenges still faced by the local authorities to actualise an integrated odour management control. Among them are weaknesses of complain system, constraints to increase innovative research, establishment of standards and laws toward collective system for control and management.

Effective odour management could be attained through mitigation strategies such as proper management of livestock excrements and stockyard cleanliness; odour buffer zones between livestock farms and vicinities; usage of microorganism; vegetable oilspray; use of additional chemical, manipulation of animal diet and indoor livestock rearing.

Research on livestock-originated odour pollution have contributed to knowledge of odour management in Malaysia. It contributes knowledge on tools for measurement, standardization and types of gas to be coded as legal acts and guidelines. Furthermore, it could be the benchmark for managing livestock odour by local authorities engaged in decision-making and enforcement actions.

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