

AGRICULTURAL WASTE MANAGEMENT (AWM) SYSTEM IN MUKIM ULU TELOM, CAMERON HIGHLANDS, PAHANG

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Abstract - Cameron Highlands is one of the largest area of agriculture sector in peninsular Malaysia because of the temperature are mild are very conducive to a wide range of sub-tropical crops. Nowadays, the volume of agriculture waste generation in Cameron Highlands are increased due to the increasing number of production of agriculture plantation. It happen because of agriculture waste management (AWM) system still very lack comprehensive especially on the understanding and involvement in the waste management system and the awareness on important of agriculture waste management in Cameron Highlands are in low level. Based on these issues came out with the aim which is to integrate the proper AWM system. The objective is to investigate the various stages that are involved in agriculture waste management system and examine the role of formal and informal stakeholders in agriculture waste management system and the policies and strategies involved in AWM system. A qualitative method was used for this research by observing the process (stages) of agriculture waste management system in study area. The outcome of this research is expected to assist the stakeholder involved, to enhance the proper AWM system and to increase the target of waste minimisation in Malaysia.

Keywords - Agriculture Waste Management (AWM), Agriculture Waste Management System, Sustainable Development Goals

1 INTRODUCTION

According to the Department of Statistics Malaysia Official Portal (2018), agriculture sector has been played an important role in economic development for country revenue. Based on their statistics, in 2018, agriculture sector stood at 8.1% or RM89.5 billion to the Gross Domestic Product (GDP). Exports and imports increased 5.4% and 0.9% respectively as compared to 2015 (Environmental Impact Assessment Report, 2017). This is because, agriculture sector is essential for human needs and important for our livelihood This sector comprises various sub-sectors including oil palm, rubber, livestock, forestry and logging, fisheries, aquacultures and other agriculture (vegetables, fruits, flowers and others). Agriculture activities can produce food which is a main need to human for survival. Approximately 70% of the people directly rely on agriculture as a mean of living (Department of Statistics Malaysia, 2016). Therefore, the higher the production of agriculture product, the higher the production of agriculture waste.

Based on this statement, it can be attributed to the issues that occurred in Cameron Highlands where the agriculture waste was not managed properly. Cameron Highlands is one of the largest area of agriculture sector in peninsular Malaysia because of the temperature are mild with an average daytime reading of 24°C and night-time reading of 14°C are very conducive to a wide range of sub-tropical crops. Cameron Highlands is located on the main range of Peninsular Malaysia and It lies between 1070m and 1830m above mean sea level. There are two major catchments, i.e. Telom Catchment (11000 ha) in the north and Bertam Catchment (7200 ha) in the south. These catchments provide water resources for irrigation, domestic consumption, recreation and the production of hydroelectric power (Official Portal of Cameron Highlands District Council, 2018). Therefore, this is important to maintain the quality of the water nearby that area to prevent from any pollution occurred to the water catchment.

The local authorities who in charge the agriculture waste management need to be taken this issue seriously because it involved the environmental sustainability (Agamuthu, 2009). In 2017, Pulvis identified three core areas that contribute to the sustainability which are economic development, social development and environmental protection. Accordinplying the good

agriculture waste management is one of the way of environmental protection. From this issue come out with the aim of the research which to integrate the proper AWM system and to enhance the best level of AWM system in agriculture plantation. This aim can be achieving by identified the various stages that are involved in agriculture waste management system and examine the role of formal and informal stakeholders in agriculture waste management system and the policies and strategies involved in AWM system. This is because there is less study towards the agriculture waste management and most of the study only concentrated on housing, commercial, industrial and poultry (Sharma et.al, 2018). Besides, agriculture waste management in Malaysia are still leaking in involvement of stakeholder. The environmental problems of agriculture can be addressed in large part by the interaction of several actors or stakeholders. Stakeholders are people and organizations having an interest in good waste management, and participating in activities that make that possible (Sakawi, 2014).

2 LITERATURE REVIEW

The word ‘agriculture waste’ it constantly links it with the agriculture plantation. Definition of agriculture waste is waste produced as a result of various agriculture operations. It includes other wastes from farms and poultry houses; harvest waste; fertilizer run- off from fields and pesticides that enter into water, air or soils (Glossary of Environment Statistics, 2018). Poor agriculture waste management are detected in contribution major sources of environmental issues. (Peter, 2010). As earlier noted, agriculture development is usually accompanied by wastes from the irrational application of intensive farming methods and the abuse of chemicals used in cultivation, remarkably affecting rural environments in particular and the global environmental in general. The waste generated is dependent on the type of agriculture activities carried out. (Johari et.al, 2012).

Referring to the Environmental Impact Assessment Report from Green Hope Consultancy Sdn. Bhd. (2018), agriculture plantation activity will be implemented with proper management with site preparation, clearing, setup of nursery, planting, harvesting and re-planting within three (3) development stage which are pre-development, development and post-development. Each of the stages have their own production of waste as describe detail in Table 1 below.

Table 6 Type of Wastes Involved for Agriculture Plantation

| Phase | Type of Wastes Involved |
|--|--|
| <u>Pre-Development Phase</u> <ul style="list-style-type: none"> • Site Suitability Analysis • Site Preparation : clear and removed the existing vegetation to enable earthwork <ul style="list-style-type: none"> ○ Preparation of nursery ○ Seed selection | <ul style="list-style-type: none"> - Grass - Germination tray - Plastic bag - Cocoa peat |
| <u>Development Phase</u> <ul style="list-style-type: none"> • Planted suitable seedlings or planting stocks from the nursery will be transplanted on prepared planting fields • Care of vegetable crops (Watering, Fertilizing, Controlling Pests and Diseases) | <ul style="list-style-type: none"> - Plastic bag - Waste from fertilizer - Waste from pesticide |
| <u>Post – Development Phase</u> <ul style="list-style-type: none"> • Maintenance • Harvesting • Packaging • Re-planting/abandonment | <ul style="list-style-type: none"> - The rotten products - Waste from the packaging activity - Waste from previous crop - Cocoa peat |

(Sources: Environmental Impact Assessment Report, 2018)

Based on the Table 1 above, it shows that every phase contributes agriculture waste production. Hence, if the production of agriculture waste can be control at every phase, it will minimize the production of waste in that plantation area. As mentioned by the Natural Resources Conservation Service, United States Department of Agriculture (2019), an agriculture waste management system (AWMS) is

a planned system in which all necessary components are installed and managed to control and use by-products of agriculture production in a manner that sustains or enhances the quality of air, water, soil, plant, animal, and energy resources.

2.1 Various stages of AWM System

AWMS components with properly siting can improve efficiency, minimize adverse effects, and improve aesthetics (Natural Resources Conservation Service, United States Department of Agriculture, 2019). The specific components of an AWMS (Figure 1) will vary depending on the type of waste and local ordinances. Therefore, according to Lina (2014), various physical components are needed to implement at all agriculture plantation in order to educate the workers how to manage their agriculture waste in agriculture plantation. However, Manaf, et al, (2009) mention that recent development indicates that the Malaysian government has taken forward to deal with such problems in municipal solid waste management across the municipalities through closed dumping sites, upgrading existing conventional landfills to sanitary status, constructing new transfer stations and giving serious priority for an alternative disposal system in the near future. Thus, it also can be implement for AWM system using the same concept as municipal solid waste (MSW).

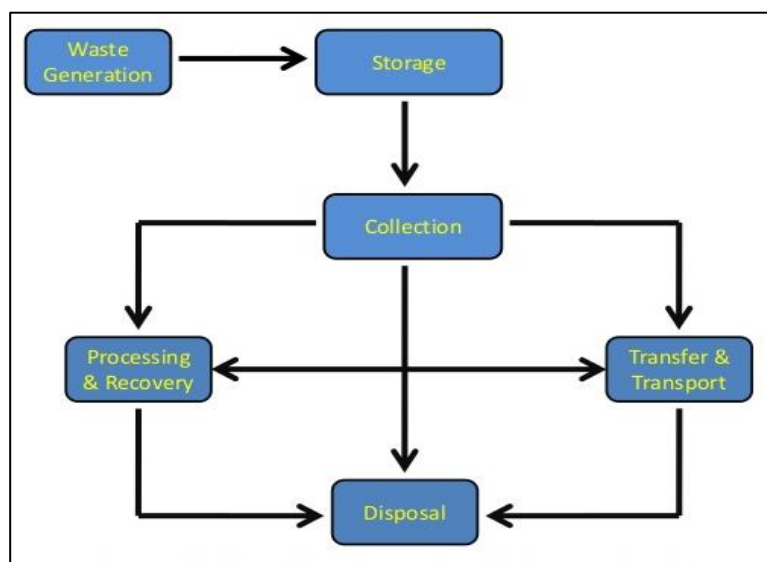


Figure 1 General Component of Waste Management System
(Source: Kreith, 2012)

2.2 Involvement of Stakeholder

According to Fauziah, (2011), the environmental problems of agriculture plantation can be addressed in large part by the interaction of several actors/stakeholders as presented in Table 2. National, state and local governments, research institutions and the academic, the public, NGOs, the private sector and funding agencies will all have a role to play to support priority actions. Stakeholders are people and organisations having an interest in good waste management and participating in activities that make that possible. They include enterprises, organisations and all others who are engaged in some waste management activity.

Stakeholders may generate waste, function as service providers or participate as state or local government departments, non-governmental organisations (NGOs) and other organisations concerned with certain aspects of waste management. Identification of the stakeholders and their interests is important in coordinating their participation and involvement in various waste management activities. The local authorities are generally aware of the health risks and environmental problems caused by poor waste management as mentioned by Simon, et.al (2007).

Table 2 Role of Agencies that Involve in Agriculture Waste Management System

| Type of Agencies | Roles |
|--------------------|--|
| Federal Government | <ul style="list-style-type: none"> • National policy and programme formulation • Legislation • Funding of facilities and equipment • Research and development • Human resources and development • Public awareness and education • Coordination and consultation with stakeholders • Setting of national standards and service levels • Monitoring and enforcement • Regulatory agency for privatization • Economic policies. |
| State Government | <ul style="list-style-type: none"> • State-level policy and programme formulation • Consultation and coordination with federal government • Promotion and coordination of local authority cooperation • Allocation of land and facilities • Approval of inter-state movement of waste and location of facilities • Assisting, monitoring and auditing local authorities • Financial and other assistance for local authorities • Formation of coordinating AWM committee. |
| Local Authorities | <ul style="list-style-type: none"> • Assist state government in formulation of policies • Enforce AWM legislation at the local level • Monitor, audit and enforce concessionaire service levels • Incorporate local requirements in operational plans • Raise public awareness and promote education on waste minimization and recycling • Provide advice on planning, siting and operating local facilities • Enforce laws on illegal dumping, littering and open burning • Collect tariffs and make payments as appropriate • Collect, collate and disseminate appropriate data and information. |
| Service Providers | <ul style="list-style-type: none"> • Cooperate and assist government and local authorities in implementation of policies • Continuously improve expertise and efficiency • Promote and develop expertise and efficiency of sub-contractors • Adopt a long-term business vision for adequate levels of equipment, facilities and service levels • Self-regulate and minimize the need for local authority intervention • Promote public education and awareness • Promote waste minimization and reduction strategies • Collect, collate and disseminate useful data • Undertake or support R&D initiatives. |

(Source: Joseph, 2006)

3 METHODOLOGY

The present study is based on surveys (interviews) and on-site observations. The research was undertaken in selected agriculture plantation in Mukim Ulu Telom, Cameron Highlands, Pahang. Based on the data documentation from Department of Agriculture of Cameron Highlands, to date, there are 1,813 agriculture plantations in Mukim Ulu Telom and only 88 farm are selected where they have been certified to myGAP and myOrganic certificate holders. MyGAP is stand for Malaysian Good Agriculture Practices and it was launched by the Minister of Agriculture and Agro-based Industry while myOrganic is a rebranding of the organic certification scheme which combines crops, livestock and aquaculture subsectors to recognize farms that practice organic farming. The data is collected by using interview question with recorder and a camera for capture the image around the study area that related with agriculture waste.

4 RESULTS AND DISCUSSIONS

Based on interviews and on-site observation analysis, it has been classified into several constraints and problem. Common factors that may hinder any waste management programme include (but are not limited to) the following items.

- Less study towards the agriculture waste management.
- Non-availability of adequate funds, as waste handling is lower down the priority list when compared with other issues such as infrastructure development and industrialization
- Lack of proper waste disposal sites, thus increasing transfer, treatment and disposal costs.
- Lack of expertise and manpower to run the programme.
- Indifference of the population towards waste reduction and recycling.
- Illegal waste dumping practice.
- Lack involvement of stakeholder
- Inefficient use of resources (money, transportation, equipment, manpower, time, etc).

The Figure 2 shows some of the poor agriculture waste management that captured at study area, Cameron Highlands, Pahang. Based on interview analysis, this happen because most of the agriculture plantation do the illegal waste dumping practice because they didn't know where and how to dump their waste. The figure below shows the waste are dumping at the roadside and at any open land space.



Figure 2 View of Poor Agriculture Waste Management System at Mukim Ulu Telom, Cameron Highlands

Referring on the waste management system element involvement, it can be classified to several stages that can be implement in AWMS. The selection stages are:

- Generation: This is the stage when materials becomes waste and is discarded – in agriculture plantation.
- Storage: Keeping the waste in place or containers which is the responsibility of the project proponent and the workers.
- Collection: This has to do with transportation of the agriculture waste from the point of storage to the point of disposal dumping site (Cameron Highland's Incinerator), two stages are involved in the collection stages; The direct collection, which makes uses only one means of transportation

i.e. the waste is picked up from the point of storage in a truck that takes it to the disposal site, The second stage collection carries the waste from the storage facility to the transfer station, at the transfer station, the waste is loaded into the secondary stage, to transport the refuse to the disposal site.

- Disposal: The final destination of agriculture waste, usually it is dumped on land at a tip, this may be done in an engineered and hygienic.

Besides, Figure 3 below shows the conceptual framework that produced from the literature review based on the agriculture waste management system. The theoretical framework are includes the step and process, system and also the stakeholder involvement in each of the part or section.

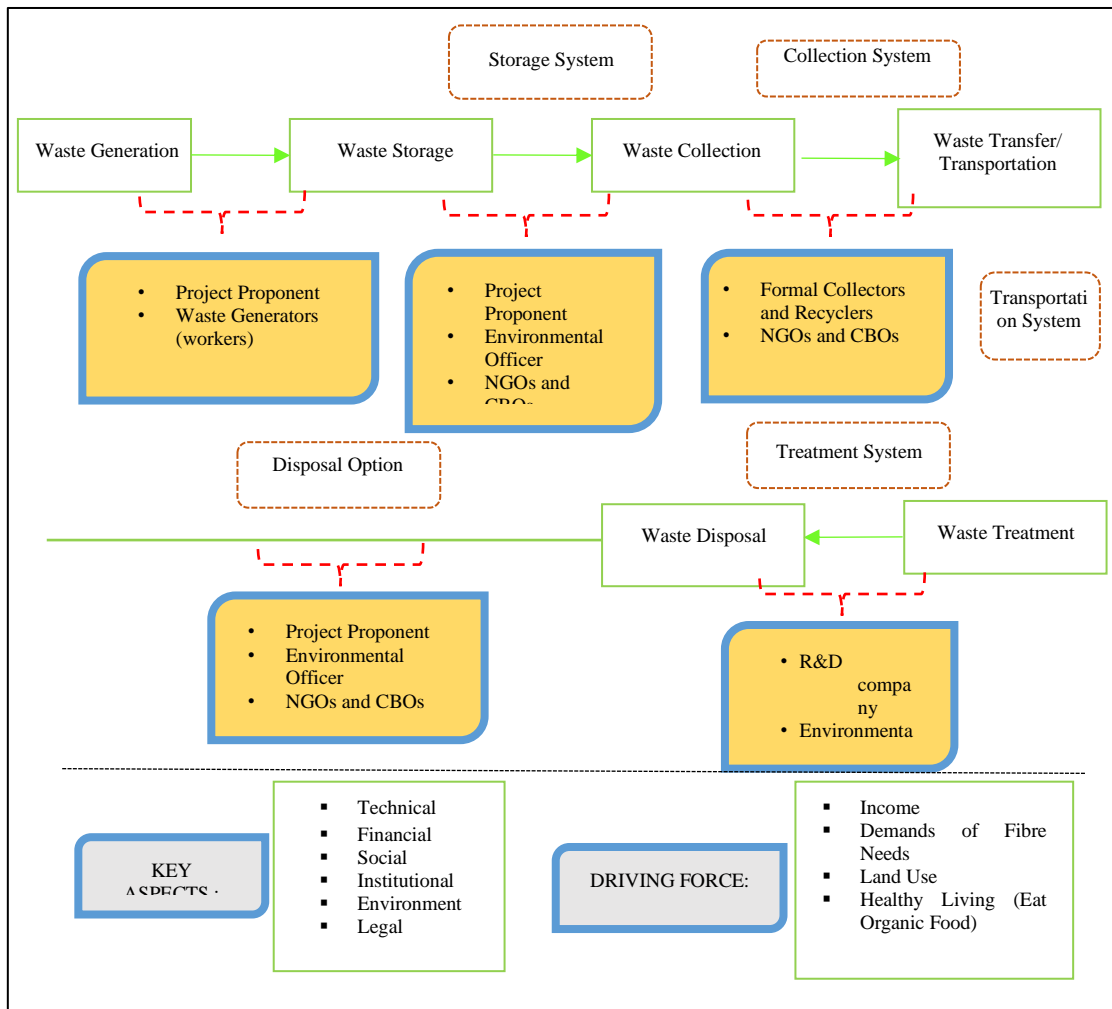


Figure 3 Theoretical Framework for Agriculture Waste Management System

4 CONCLUSIONS

As a conclusion from this analysis, the AWM system at the agriculture plantation are very poor and will give environmental degradation at the Mukim Ulu Telom, Cameron Highlands. Furthermore, regarding to the real-life situation the results from this research will be as a guidance for all agriculture sector (agriculture plantation) to plan and managed the agriculture waste management in order to achieve the full satisfaction, reduce and minimise the impacts to the environment. Other than that, the research will assist an organization in making a best decision in managing the agriculture waste management in the agriculture plantation.

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