

CHAPTER

3

VALORISATION OF AGRICULTURAL AND INDUSTRIAL WASTE

Norhayati Pa'e, Khairul Azly Zahan, Daniel Joe Dailin, and Eraricar Salleh

3.1 INTRODUCTION

Waste is a residue develops from primary processing of a product. In food and biomaterials sector, a lot of waste were produced from agriculture and industrial operations. This waste or by-products includes crop residues, fruit pomace, vegetables waste, and livestock's dung from agricultural waste and sometimes acid, ashes and wastewater from industrial waste. This continuous production of waste will cause accumulation and dumping that will have consequences for the well-being of humans, animals and the environment. Therefore, measures to minimize waste generation need to be considered to prevent situations such as greenhouse effect, air pollution and water pollution from happening (Capanoglu et al., 2022).

Currently, the concept of waste as the unwanted by-product is changing into an approach of converting it into other useful product. The word waste is beginning to be seen from another perspective where waste from one process were upcycle and treated as the main source for another process and indirectly, generate wealth. Among the efforts that are often heard is the use of agricultural waste as organic fertiliser (Muda

et al., 2020) as well as bioactive ingredients such as antioxidant and antimicrobial agent (Naqvi et al., 2020). In addition, there are also studies conducted involving the use of waste to produce renewable energy (Kaniapan et al., 2021), which is most likely to take over from the reduction of finite energy sources such as fossils fuel. Efforts such as converting palm oil waste into biodiesel, using cocoa pod husk as fertiliser and processing fruit peels for bioactive compound have successfully reduced agricultural and industrial waste for production of new product such as chemical, nutraceutical, bioactive compound, enzymes and many more. The upcycle of waste can greatly reduce waste generation. Therefore, waste dumping or incineration of waste products which usually lead to generation of carbon footprint and leaking of toxic into soil and water can also be reduce.

Depletion of natural resources, increasing greenhouse emission and others environmental problems increased awareness on the need for sustainable development. Therefore, waste valorisation should be continued as an emerging trend to support efforts towards the sustainable development. This chapter will discuss more about the types of waste generated in food and biomaterial sector specifically agricultural and industrial waste. Furthermore, some examples of the processes involved in waste valorisation and products generate from waste will also be discussed.

3.2 AGRO INDUSTRIAL WASTE GENERATION

Agro industrial wastes are the waste generated from unprocessed agricultural and industrial goods (Obi et al., 2016). Sadh et al. (2018) devided agro industrial waste into two types of residues namely agricultural residues and industrial residues. Some examples of agro industrial waste were shown in Figure 3.1.



Figure 3.1 Two types of agro industrial waste

Residues present in the field after the harvesting of crop processing is called as field waste. These residues are including the stems, stalks, leaves and seedpods. Process waste on the other hand, residues present even after the processing of crops into alternate valuable resource. Husks, seeds, roots, pulps, straw, stubble, bagasses, and molasses are examples of process residues. They are commonly used for animal feedstocks, soil improvement, organic fertilisers, manufacturing and many other processes with specific purposes. On the other hand, agricultural processing industries produced food products like juice, chips, snacks, meats, and confectionary also contributed a significant number of organic wastes and effluents such as fruit/vegetable peels and cake from oil pressing process.

The waste generated is dependent on the type of agricultural activities carried out. In addition to residues from crops cultivation, agro industrial waste also generated from production of agro based product, managing livestock and transporting fruits and vegetables. Most agro industrial waste come from cultivation of crop and plant such as sugar cane bagasse, over-ripe fruits, and pruning, also waste produced throughout the crops cultivation until processing it into end products.