The Importance of Quality Animal Feed

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Description

Azolla is a small, free-floating water fern with a global distribution. Azolla can be used as a feedstock because it is high in proteins, fatty acids, amino acids and vitamins. Low economic productivity in some countries due to increased import costs is still ongoing if the future still depends on the same sources of protein, soybeans and maize. This paper reviews the studies on the use of azolla in livestock, poultry and fish nutrition as a promising source of a feed ingredient.

A systematic literature review according to prisma method was performed using Scopus, Science Direct and Pubmed. Only studies conducted using primary data were considered. Protein content in azolla species is in a range of 21–26%, dry matter, while fatty acids ranged from 41% to 66% dry matter. Azolla is rich in various classes of active compounds such as phenolic content, caffeoylquinic acid derivatives, tannins, and carotene. Azolla has been shown to improve the growth rate of animals, depending on the percent of inclusion in animal's diet. The most common species of azolla used as animals' feedstock is Azolla pinnata. The impact of azolla as a feed ingredient in the food production system on the environment has been addressed, including greenhouse gas emissions, carbon footprint, low land requirements, and amino acid-enriched feedstuffs. Future study on labour cost minimization, life cycle analysis, and optimization techniques should be carried out.

As the global population grows, so does human food consumption, resulting in increased food demand. This increasing demand has led farmers to meet high trade for animal ingredient for livestock, poultry, and fish nutrition industries. According to United Nations (2019), the global population is rising by 2 billion persons in the next 30 years, from the current 7.7 billion to 9.7 billion in 2050. There are several reports that global food production is needed to be doubled by 2050. Food production through agricultural industries is expected to increase by approximately 60% in the next 40 years so that the population around the world can be supplied with food in an appropriate quantity and quality.

Soybeans and maize are the most common protein sources used by animal producers across the world. In a certain countries, there are a few reasons why current feed imports are unsustainable. For example, in Malaysia raw ingredients for feedstock are not manufactured within the country 100% of feed ingredients such as soybean meal, fishmeal, and cornmeal are imported. The country spends about RM3.2 billion (US$1.5 Billion) yearly importing three million tonnes of maize from Argentina. The dependency on imported animal food is inconsistent with the Sustainable Development Goals (SDGs) by the United Nations Development Programme (UNDP) which have been set for many countries, including Malaysia. Increasing market price of broiler production will affect the cost of living in Malaysia due to increase in the price of food production. To address this problem, different protein sources need to be more exploited to maintain a lower-cost protein supply. Currently, the Malaysian government is attempting to cut down on imported animal feed and finding alternative sources of protein to attain sustainability. Following the COVID-19 pandemic, the government took this step to proceed at a more sustainable pace for the benefit of the economy. Furthermore, animal food production may significantly contribute to a number of environmental issues due to farming activities, including acidification from ammonia leaching, climate change from greenhouse gas emissions, deforestation, soil erosion, desertification, plant biodiversity loss, and water pollution depending on the food system production used.

Azolla is a type of aquatic fern and is native to the tropics and subtropics and warm temperate region of Africa, Asia, and the Americas. It forms a one-of-a-kind symbiotic relationship with filamentous cyanobacteria like Nostoc and Anabaena, which then act as nitrogen fixers. These aquatic macrophytes, azolla can normally be found in natural water habitats such as lakes, paddy fields, freshwater pond areas, slow-moving rivers or irrigation channels. Furthermore, in the paddy field, azolla is grown either as a mono crop or as and intercrop and incorporated into the mud or soil to increase soil humus and nutrient content. Azolla is believed to be a promising prospective feed ingredient that can assist farmers in achieving sustainability, which is characterized as being both economically and environmentally viable, feed ingredient that do not compete with a human food source, and low land requirement. Previously, these aquatic fern have been used as alternative protein feed for various animal industries chicken, duck, and quail, and aquaculture industries prawn, fish. Further, it has been also used in mono gastric herbivore such as horses and rabbits.

Traditional rice monoculture is often energy-inefficient because of the large amount of non-renewable energy investment, and leads to negative environmental impacts. This study conducted a joint economic, energy, and life-cycle assessment (LCA) to obtain a comprehensive understanding of the economic and environmental sustainability of Rice Monoculture (RM), Rice-Crayfish co culture (RC), Rice-Loach co culture (RL), and rice-catfish co-culture (RA). Economic analysis showed that the total profit of RM, while this increased by 172.3%–345.5% in coculture modes. Energy analysis showed that RM outperformed the coculture modes in net energy and energy use efficiency. LCA showed that the environmental footprint varied depending on the functional unit. The coculture modes had a larger environmental footprint than RM, on a per hectare basis across at least six of ten impact categories. The higher nutrition and economic profits meant that the coculture modes had a lower impact per nutrient density unit, and lower impact per RMB yuan across all ten impact categories compared with RM. These findings show that although the energy efficiency of the coculture mode was lower than RM, it showed promise due to its diverse foods with higher nutrition, increased economic benefits, and lower environmental impact.