Perspective

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# Sustainable Protein Source for Animal Feed

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## Description

Azolla, a diminutive free-floating water fern found worldwide, possesses considerable potential as a feedstock due to its rich content of proteins, fatty acids, amino acids and vitamins. Despite its nutritional value, some countries face economic challenges, particularly concerning increased import costs associated with traditional protein sources like soybeans and maize. This paper offers a comprehensive review of studies exploring Azolla's utility in livestock, poultry and fish nutrition as a promising alternative feed ingredient. Azolla species exhibit a protein content ranging from 21% to 26% of dry matter, with fatty acid levels ranging from 41% to 66% of dry matter. Additionally, Azolla is abundant in various active compounds, including phenolic content, caffeoylquinic acid derivatives, tannins and carotene.

### Animal feed imports

Research indicates that Azolla inclusion in animal diets positively impacts growth rates, with Azolla pinnata being the most commonly utilized species. Furthermore, the paper addresses the environmental implications of incorporating Azolla into food production systems, such as reduced greenhouse gas emissions, a smaller carbon footprint, lower land requirements and the production of amino acid-enriched feedstuffs. Future studies should focus on minimizing labor costs, conducting life cycle analyses and optimizing techniques.

As global population growth drives increased food consumption, there is a corresponding rise in demand for animal ingredients in the livestock, poultry and fish nutrition industries. The United Nations forecasts an additional 2 billion people by 2050, necessitating a doubling of global food production. Agricultural industries are expected to increase food production by approximately 60% over the next four decades to meet the needs of a growing population, ensuring both quantity and quality of food supplies worldwide.

Currently, the Malaysian government is striving to curtail its reliance on imported animal feed and is actively seeking alternative protein sources to foster sustainability. This strategic shift gained momentum in the aftermath of the COVID-19 pandemic, as the government recognized the need for a more sustainable approach to benefit the economy. Moreover, the production of animal feed can significantly contribute to various environmental issues stemming from farming activities, including acidification due to ammonia leaching, climate change from greenhouse gas emissions, deforestation, soil erosion and desertification, loss of plant biodiversity and water pollution, contingent upon the food system production employed.

### Alternative protein source

Soybeans and maize stand out as the primary protein sources utilized by animal producers worldwide. However, in certain countries, the reliance on current feed imports poses sustainability challenges. Take Malaysia, for instance, where the entirety of feedstock ingredients isn't domestically produced; instead, 100% of essentials like soybean meal, fishmeal and cornmeal are imported. Annually, Malaysia expends approximately RM 3.2 billion (US$1.5 Billion) on importing three million tonnes of maize from Argentina alone. This heavy dependency on imported animal feed contradicts the Sustainable Development Goals (SDGs) outlined by the United Nations Development Programme (UNDP), which Malaysia, among other nations, is committed to achieving and it's imperative to explore alternative protein sources that can sustain a cost-effective protein supply.

Azolla, an aquatic fern indigenous to tropical and subtropical regions as well as warm temperate areas of Africa, Asia and the Americas, offers a unique solution. It forms a symbiotic relationship with filamentous cyanobacteria. Typically found in natural water habitats like lakes, paddy fields, freshwater pond areas, slow-moving rivers or irrigation channels, azolla is cultivated in paddy fields either as a monocrop or intercrop and subsequently incorporated into the soil to enhance soil humus and nutrient levels. Azolla emerges as a promising feed ingredient that aligns with sustainability goals by being economically and environmentally viable, non-competitive with human food sources, and requiring minimal land. Previously utilized as an alternative protein feed in various animal industries such as poultry (chicken, duck, quail) and aquaculture (prawn, fish), azolla has also shown promise in monogastric herbivores like horses and rabbits.