

Product Environmental Footprint for Feed Production in Thailand

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Extended Abstract

Food industry in Thailand is one of the high-volume exports. According to the statistics, in 2014, exports accounted for 27% of chicken production, which is ranked fourth in the world and ranked first in the EU (42%) [1], it presents the majority market share. This study aims to prepare and support Thailand industries to export to the EU single market by using product environmental footprint (PEF) to be a tool for evaluating the quality of products on environmental perspective. The study complied with methodology and environmental footprint impact category to conform to the PEF guide [2]. Also this study is a part of the shadow pilot project of the PEF, which led by the National Science Technology and Innovation Policy Office (STI) and National Metal and Materials Technology Center (MTEC) that collaborated with one of the large chicken industries named Betagro Public Company Limited.

In a nutshell, the environmental impacts of chicken feed shall be assessed whole life cycle from cradle to grave, which covered from raw materials acquisition stage to disposal stage, by considering the functional unit was 1 kg of chicken feed products. The main ingredients of chicken feed should be provided the protein and energy to improve chicken health as with increasing in size and to produce more eggs. Maize, wheat, rice bran and soy bean meal are majorly used for chicken feed which contain high nutritive values, and therefore most widely used in animal feed industries because they contain less in fat and high in proteins. The composition of feed by each recipe based on age of chicken (breeder and broiler) and the growth stage of the chicken.

The mainly environmental impact categories of chicken product has feed production (approximately value more than 50% by weight) and the significant environmental impact categories were climate change, freshwater eutrophication, freshwater ecotoxicity, water resource depletion and land use. The results found that the main contribution to environmental impacts of feed production is raw materials acquisition, especially maize from Thailand and soybean meal from Argentina. In worldwide typically use maize starch for main ingredient of poultry feed because its energy source is highly digestible for poultry. In addition, the plant protein source traditionally used for feed manufacture is soybean meal, which is the preferred source for poultry feed [4]. However, the environmental impact of broiler feed shows higher than breeder feed that because the ratio of maize in boiler feed to tonne feed is 1:0.46 whereas breeder feed 1: 0.54. Thus, this study focuses on the feedstuffs of broiler feed with percentage of protein is retained. The percentage of crude protein in feedstuffs as shown in table 1 [5,6].

Table 1: the percentage of crude protein in poultry feed.

Feedstuffs	Crude protein (% of dry matter)
Maize	8.5
Soybean	49.40
Cassava root meal	2.5
Palm kernel cake (PKC)	17.2

Sensitivity analysis is selected to investigate the feedstuffs of feed production that aims to reduce the environmental impacts. Three scenarios as shown in table 2, have been set as following:

1. Base case scenario: the typically main ingredient used
2. Scenario A: cassava starch is used for replacing the maize starch

3. Scenario B: Palm kernel cake (PKC) is replaced for soy bean meal and PKC can be used only 10% following the recommended levels of PKC in the feeds [6]

Table 2: The percentage of feedstuffs in different scenarios (% by mass dry matter).

Feedstuffs	Base case Scenario	Scenario A	Scenario B
Maize	54	-	54
Soy bean meal	25	25	15
PKC	-	-	10
Cassava	1	65	1

According to the scenarios, the results, which shown in Fig. 1, present that Scenario A reduces the environmental impact on Land used because cassava produces 3.5 tonne of cassava product with 1 rai of agricultural land occupation. Apart from that, maize is produced 0.6 tonne by using same size of cultivated area. Also, Freshwater eutrophication is consequently high because of amount of fertilizer consumption. Moreover, to retain the percentage of protein, animal have to feed 3.4 times more than typical recipe. Scenario B, PKC is used 10% for soy bean meal; the significant impact categories are decreased. Interestingly, the impact on Freshwater ecotoxicity is dropped as the PKC is part of solid waste from palm oil production so that the wastewater also reduced.

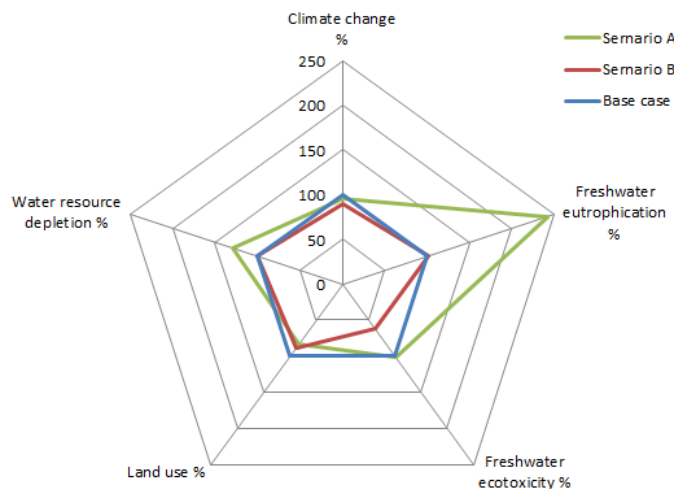


Fig. 1: The significant impact categories on different scenarios.

However, considering on feedstuffs of the scenarios, Scenario B demonstrates the best environmental impacts but Scenario A presents better than others in economics view because the price of cassava chip is cheaper than maize [7]. Moreover, cassava chip usually used in diverse industries such as cassava starch and ethanol, also the volume of cassava in feedstuffs needed more than 3 times of maize. Thus, Scenario B is more suitable than Scenario A, especially in term of waste utilization, owing to in year 2011-2015 reports the consumption and production of biodiesel from palm product increased is 2.05 to 20.03 [7], number of waste will be progressive. Additionally, this scenario also presents the idea to replace the product from other countries by considering the products and waste of product in our country. In conclude, the results from our study can be applied to improve the sustainable development of feed production in Thailand. According to is the process of raw materials acquisition is the main contribution on environmental impacts, so that Thai feed mill association has to concern about this issue to make the sustainability happen in Thailand.

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