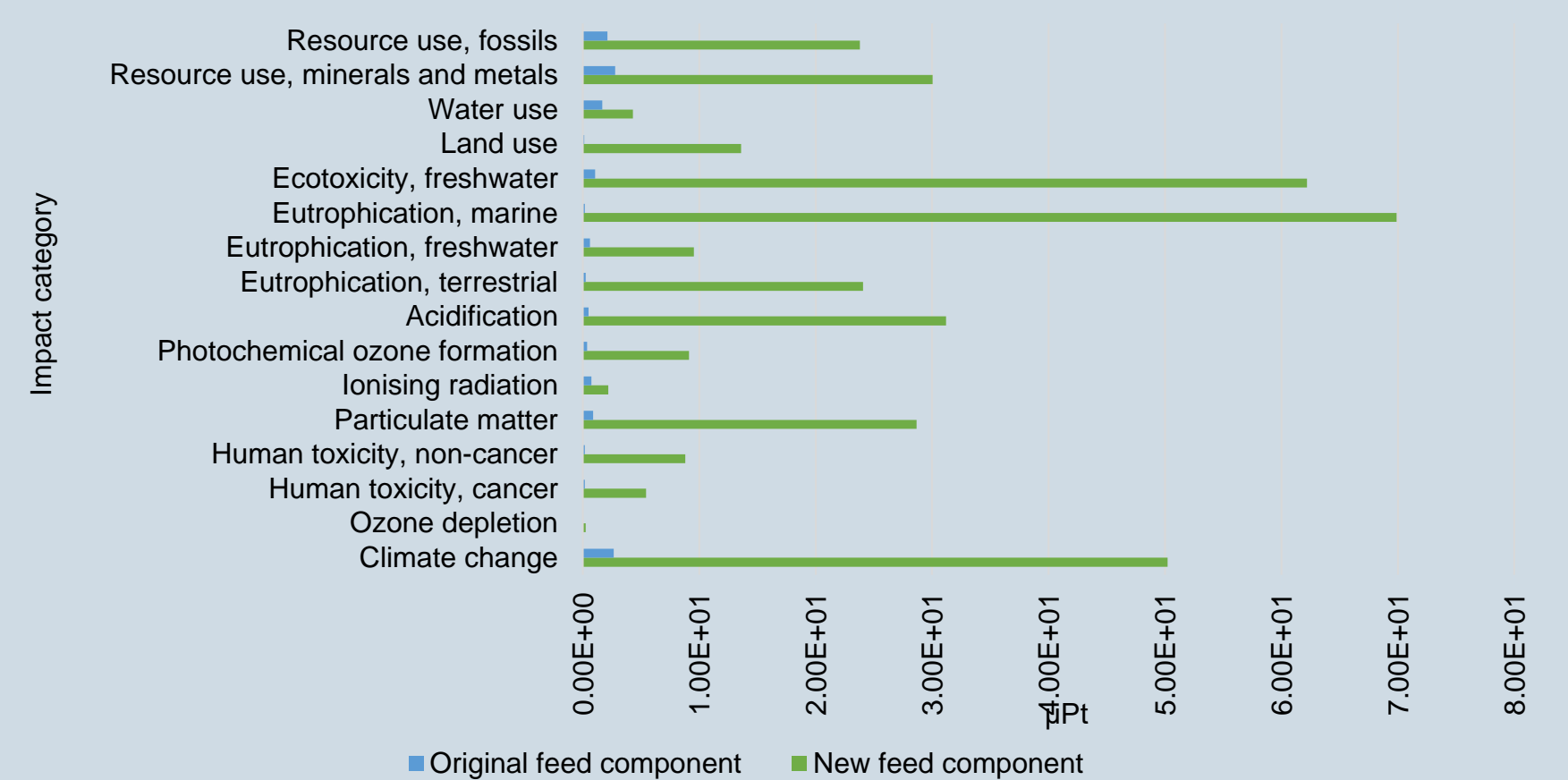
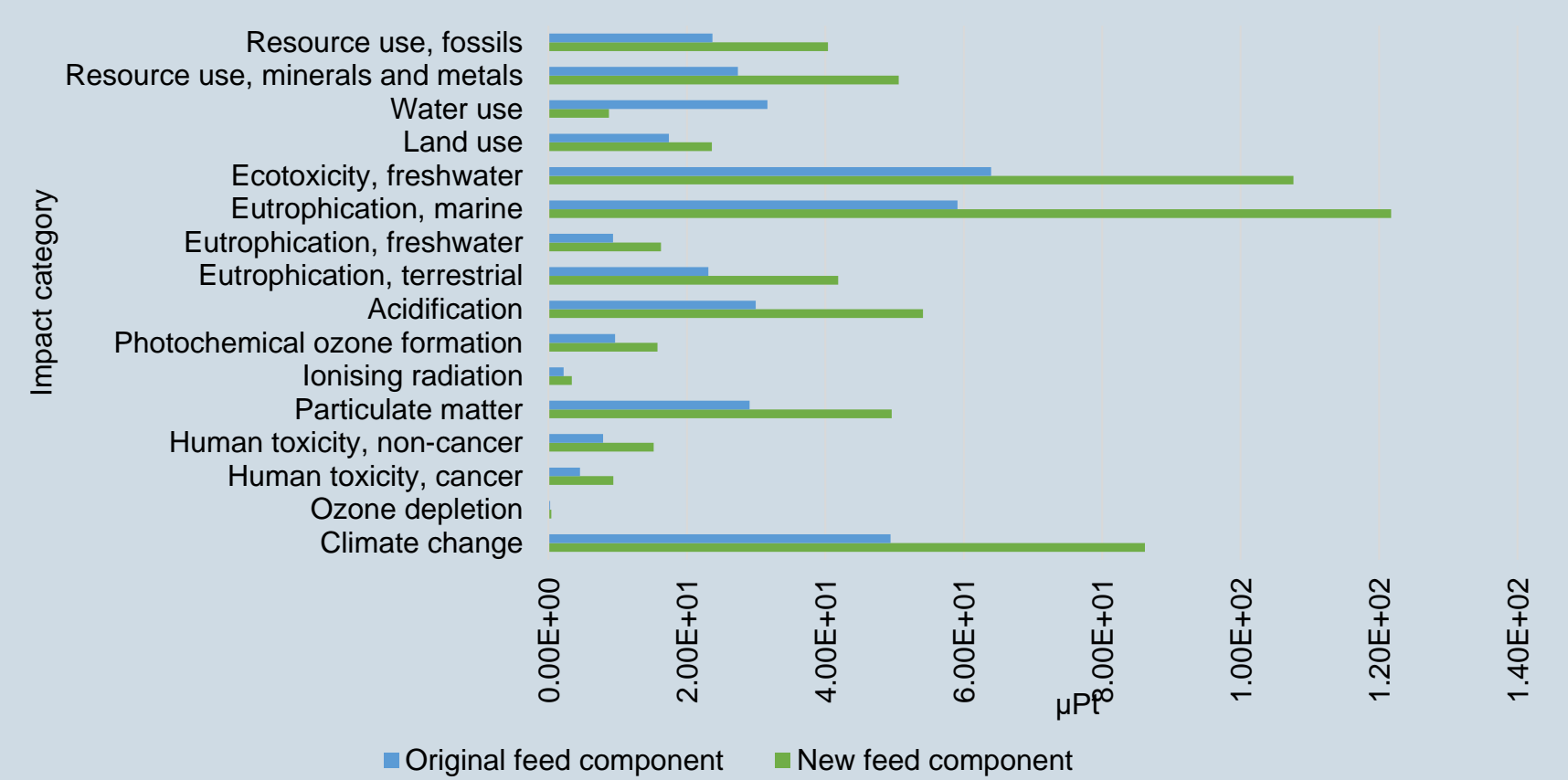


The insect protein alternatives had a lower environmental impact than the plant protein alternative. However, the choice of feed during the breeding process can have a significant impact on the alternative of insect proteins.



Introduction

One way to reduce environmental impact is to choose more sustainable fish feed. Fish feed must be rich in protein and energy to meet fish's nutritional requirements. One option is to choose a more sustainable source of protein, which makes up 18-50% of the total fish diet.

Over the past two decades, it has been recognized that fish meal resources are limited, and other alternatives are being chosen as a source of protein for fish feed. Insect meal is considered a sustainable source of protein because it uses by-products, does not require agricultural land to grow insects, uses little water, and there is an opportunity to reduce greenhouse gas emissions if food waste is used as feed. One of the alternatives to a fish meal is plant proteins because it is more environmentally friendly and economically beneficial.

In this study is environmental impact assessment for three-protein alternatives - Black Soldier Fly, Yellow Mealworm, and Soybean protein and results is expressed by PEFCR categories, and sensitivity analysis is for insect feed.

Methods

Functional Unit in this study is 1 kg of protein and LCA is "cradle to the gate". The LCA inventory section has a complete list of raw materials to produce one functional unit for all products. Results is from EF 3.0 method, which makes impact assessment according to PEFCR assessment categories.

Results and conclusions

Total single score value for Black Soldier fly protein is $1.43E+01$ μ Pt, for Yellow Mealworm protein is $3.89E+02$ μ Pt, and for Soybean protein is $9.72E+01$ μ Pt.

Sensitivity analysis was performed for protein production where feed composition was changed. The following sensitivity analysis was performed because the Yellow Mealworm protein alternative feed produced the largest effect. A sensitivity analysis was carried out for both insect alternatives and in both cases, the environmental impact was lower with the original feed structure and insect feed can increase or decrease the overall environmental impact of the product.

Visual conclusion

