

Carbon footprint of soybean products in the Brazilian context

Scachetti, Michelle Tereza¹; Fernandes, Matheus H. N. ¹, Lanes, Vitória F. de¹



presenting author: vitoria.lanes@partners.basf.com

¹ FEE – Fundação Espaço ECO®, BASF SA, São Bernardo do Campo, SP

1. Background and Objectives

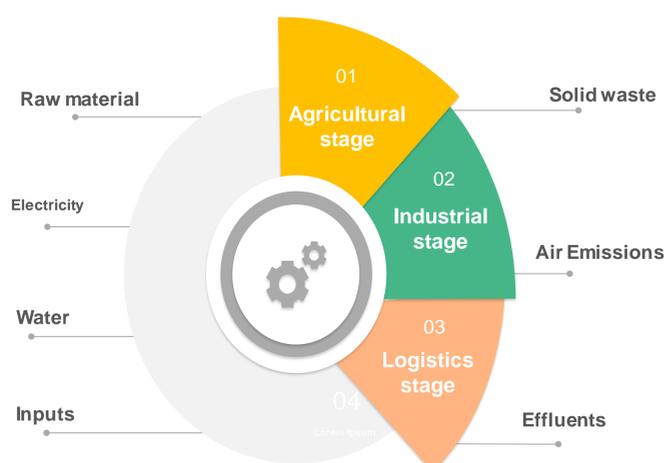
Brazilian agriculture products have been questioned in the external scenario because they associate their production with deforestation, specially that derived from soy. Studies widely disseminated in Europe bring the results for the soybean meal (SM) and soybean protein concentrate (SPC) produced in Brazil in the range of 6kg CO_{2eq}/kg of product, reaching up to 7.4kg CO_{2eq}/kg of product when considered the worst-case scenario, most of those emission linked to Land Use Change (LUC).

2. Methods

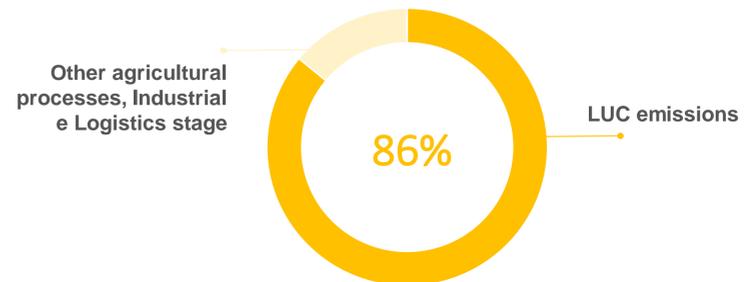
- **Mato Grosso (yellow):** SPC Suppliers; **Goiás (green):** SM suppliers



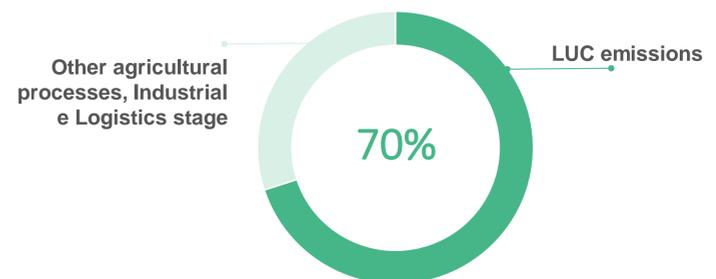
- BRLUC is a method to estimate CO₂ emissions related to land use change in Brazil, based on time-series statistics and according to international standards. The version used in the study was updated in October 2020, with updates from 1998 to 2018.
- The company (omitted) developed a study to quantify the GHG emissions of the SPC and SM produced in its units, using the PAS 2050:2011 method, in a cradle-to-gate approach, applying mass allocation, focusing on understanding the relevance of each stage of the product lifecycle, considering LUC.
- The functional unit (FU) defined for the study was 1kg of product.
- The life cycle of the products produced by the company is divided into three stages



3. Results



The life cycle emission of 1kg of SPC was **4.2kgCO_{2eq}/kg**. With 4,02 coming from the agricultural stage, 0,034 from the industrial stage and 0,162 from the logistic stage. LUC emissions are responsible for 86% of the total. According to BRLUC v1.3 model, Mato Grosso is the state with the highest GHG emissions per hectare of soybeans production area. The state presents a LUC emission factor of 12.5tCO_{2eq}/ha each year in the most conservative scenario of the method.



The life cycle emission of 1kg of SM was **1.2kgCO_{2eq}/kg**, With 1,02 coming from the agricultural stage, 0,053 from the industrial stage and 0,169 from the logistic stage. LUC emissions are responsible for 70% of the total. According to BRLUC v1.3 model, Goiás presents a LUC emission of 3.16tCO_{2eq}/ha each year in the "conservative scenario" (scenario that attributes the expansion of soybean production area happening primarily on areas with more carbon stock, such as areas with native vegetation, and then in areas with lower carbon stock, such as pastures) adopted in this study.

4. Conclusions

Considering the results for mass allocation, which allows a fairer comparison between studies, although there may be still methodological differences between them, it has been found a favorable result when compared to studies widely disseminated in Europe, which bring results for the Brazilian product in a range of 6kg CO_{2eq}/kg of SPC (Sintef, 2017), and can reach up to 7.35kg CO_{2eq}/kg of product (Sintef, 2011) when considered the worst-case scenario.

Thus, the results obtained in this study for the SPC produced by the company at Mato Grosso represents an estimate that is approximately 30% lower compared to the studies, in the case of Goiás, the estimate can be 7.3 times lower when compared to the worst-case scenario.

