

## ENVIRONMENT

**Title:** A meta-analysis of life cycle assessments on environmental footprints of five representative finishing swine diets – NPB#17-159

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### Scientific Abstract:

The objective of this project is to quantify the carbon, water and land footprint of a standard corn-soybean finishing swine diet and four alternative diets through a systematic review of related LCA studies, as well as a synthetic LCA. From literature and survey, we have identified the following five representative diets in the USA: Corn-Soybean meal, Corn-Soybean meal-low DDGS, Corn-Soybean meal-high DDGS, Corn-Soybean meal-DDGS-Bakery-Middlings, and Sorghum-Soybean meal. The global warming footprint of corn production in USA is estimated to be 0.311 kg CO<sub>2</sub> eq./kg in 2017, as comparing with 0.2 to 0.53 kg CO<sub>2</sub> eq./kg in literature. Estimation of the environmental footprints of soybean meal, DDGS, and wheat middling are greatly affected by the allocation methods used. Using the economical allocation method usually result in less environmental footprints of these feed ingredients, comparing with the mass allocation method, because more environmental footprints are allocated to more valuable co-products, such as crude soy oil, ethanol, or, wheat bran. The global warming footprint of DDGS in USA is only 0.242 kg CO<sub>2</sub> eq./kg based on current price. Introducing DDGS into the standard Corn-SBM diet will generally reduce the environmental footprints in global warming, land use, and water consumption at the feed production stage. Since the global warming footprint at the feed production stage and at the management are almost equally important in the overall global warming footprint of swine production. When DDGS is used in swine diet, the benefit of reducing global warming footprint at the feed production stage may be offset by the potential increasing global warming footprint at the management or animal production stage. The environmental footprints of the five representative diets at the feed production stage on a per pound live weight were calculated and summarized in one table. At the feed production stage, the global warming footprint of the five diets ranges from 0.782 to 1.474 kg CO<sub>2</sub> eq. per kg live weight; the land use footprint ranges from 2.086 to 5.729 m<sup>2</sup>a crop eq. per kg live weight; the water consumption footprint ranges from 0.328 to 0.952 m<sup>3</sup> per kg live weight. Among the identified five representative diets, the Sorghum-SBM diet has the highest global warming and land use footprint, followed by the Corn-SBM-DDGS-Bakery-Middlings diet. Nevertheless, the Sorghum-SBM diet has the lowest water consumption footprint, while the standard Corn-SBM diet has the highest water consumption footprint.

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