The analysis of the carbon footprint of stored grains preserved with Myco CURB® ES liquid compared to other grain storage methods

KEY CONCLUSIONS

In collaboration with Dow and Adesco, a gate-to-gate Life Cycle Assessment study was conducted to investigate the greenhouse gas emission in CO_2 equivalents (CO_2-eq) between three different methods of grain (barley and wheat) storage; aeration, drying and preservative addition.

- Myco CURB® ES liquid treated grain reduces up to 3 times the kg CO_2-eq per ton of stored grain compared to aerated and dried grains.
- The Product Carbon Footprint (PCF) of 1 kg of Myco CURB ES liquid is 2.3 kg of CO_2-eq.
- The Life Cycle Assessment of this study in which Myco CURB ES Liquid is used, meets the requirements of ISO 14040 and 14044. Validated by BLONK Consultants.

INTRODUCTION

The growing human population will drive global demand for food and feed, which impacts major grains production (Tilman, 2011). The substantial increase in grain production of as much of 70% is needed, coupled with ensuring that the agriculture environmental footprint created is kept as low as possible. Given the limited resources and availability of uncultivated land, it is projected that grain production needs to come mostly from existing farmland (Gan, 2014).

The rising greenhouse gas emissions globally have elevated concerns on the impact on the planet and effects on climate change. The United Nations have established the 17 global Sustainable Development Goals which aim to restore and promote social, economic and environmental sustainability. Goal 13, "Take urgent action to combat climate change and its impacts" emphasis that actions need to be integrated into national policy, strategies and planning. Therefore, identifying measures to reduce on-farm emissions is a contribution to this goal, in reducing carbon emissions. Sixty-five percent of Agricultural energy emissions in 2050, is expected to come from on farm energy use (World Resources Institute, 2020).

MATERIAL AND METHODS

A gate-to-gate Life Cycle Assessment study was conducted to investigate the greenhouse gas emission in CO_2 equivalents (CO_2-eq) between three different methods of grain (Barley and wheat) storage; aeration, drying and preservative addition (mould inhibitor: Myco CURB ES liquid). The cultivation of grain is considered in this study for the nutritional losses only. This means that only the additional grain is included that is needed to compensate for the nutritional degradation (nutritional losses) due to mould growth and activity.

KEMIN®

DOW®

adesco
competitive by nature

It is expected that no burden shifting to other impact categories such as water-use and land-use will occur through the treatment of grains with Myco CURB ES liquid. Since for the Myco CURB ES liquid treated stored grain method, less additional grain is needed to compensate for nutritional losses, this translated to less land, water, machinery and fertilizers used, that is needed to cultivate these grains.

The study was conducted based on data from Ireland and is applicable to climatic conditions that are typically Atlantic climate conditions (West North Europe) with a high average rainfall along the year, wet harvests, and high ruminant production.

Barley and wheat harvested at approximately 19 to 21% moisture content (mc), were split into three types of grain storage methods (aerated, dried and preservative treated). The electrical energy (kWh/ton) in aeration and drying; the diesel fuel (kg/ton) consumption used in drying; the nutritional losses (in wt% grain loss) and the amount of preservative added (kg/ton) were recorded across the three storage methods. The data was collected from Adesco in Ireland. The cultivation of grain is considered in this study for the nutritional losses only.

Nutritional losses due to nutritional degradation over the period depend on various factors, such as moisture content (final moisture content: aeration (13-15%), drying (12-14%) and preservation (17-18%)), storage time (approximately 3 months), temperature (20 C°) and storage conditions (silos). The expected percentage nutritional losses for dried grain 4-6%, aerated grain 6-9% and Myco CURB ES liquid treated 0.4-0.5%, were calculated using an algorithm, where certain conditions of the grain and storage data from different studies were modelled, and nutritional losses are calculated and represented.

RESULTS AND DISCUSSION

The average electrical energy consumed, diesel fuel usage, nutritional losses and preservative addition, were converted to kg CO_2-eq per ton of grain, using relevant models from the Ecoinvent database (v3.5) and Agri-footprint 5.0.The "carbon footprint" for Myco CURB ES liquid was calculated in collaboration with Dow using the IPCC 2013 method for global warming potential (IPCC 2013 GWP 100a). The result being that the carbon footprint of 1 kg of Myco CURB ES liquid is 2.3 kg of CO_2-eq. The greenhouse gas emissions across all storage methods, as represented by the kg CO_2-eq per ton of grain are represented in Figure 1.

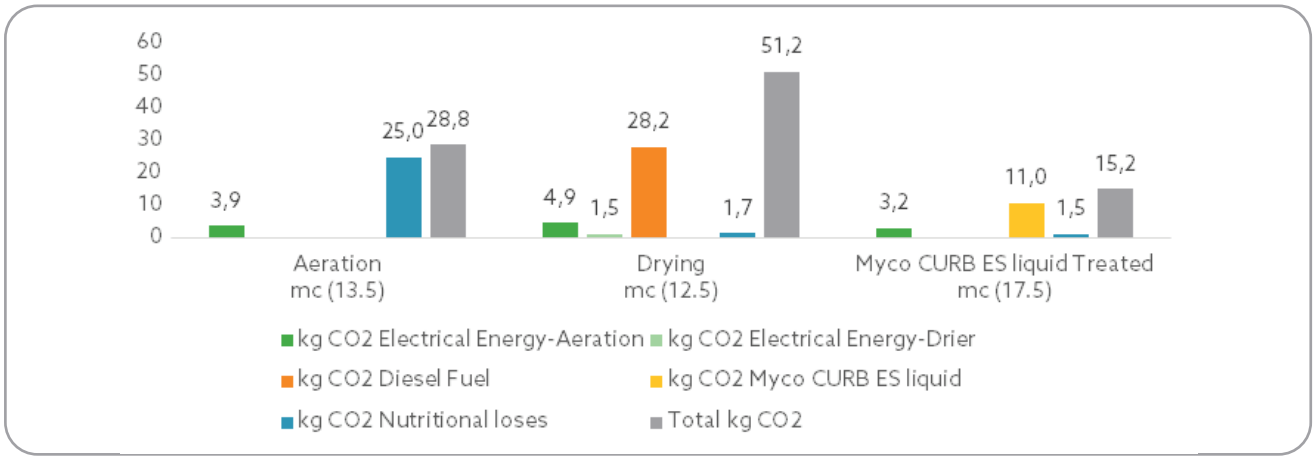

Figure 1. Carbon footprints in CO_2-eq for grains with differing storage methods. **Moisture content (mc)*
Source: Raw trial data supplied by Adesco
LCA and study validated by BLONK consultants

CONCLUSIONS

The results from this study show that drying and aerated grain has the highest climate change impact/carbon footprint compared to Myco CURB ES liquid treated grain. The addition of a mould inhibitor, a preservative, based on propionic acid and a synergistic combination of other organic acids, their salts and surfactants enabled a reduction of approximately 2 to 3 times the carbon footprint in kg CO_2-eq/ton grain stored compared to aeration and drying methods, respectively.

Myco CURB ES liquid used for raw material preservation contributes to environmental sustainability, mitigating the negative effects towards climate change.

REFERENCES

Gan, Y. L. (2014). Improving farming practices reduces the carbon footprint of spring wheat production. Nat Commun 5, 5012.

Tilman, D. B. (2011). Global food demand and the sustainable intensification of agriculture. Proc. Natl Acad. Sci., (pp. 108, 20260–20264. USA.)

World Resources Institute. (2020, August 5). Course 5: Reduce Greenhouse Gas Emissions from Agricultural Production (Synthesis). Retrieved from World Resources Institute: https://research.wri.org/wrr-food/course/reduce-greenhouse-gas-emissions-agricultural-production-synthesis

KEMIN®

DOW®

adesco
competitive by nature