Environmental Product Declaration

Reed and sedge pellets “Hygge pellet”

“Nine Voices”

2020, Summer

Environmental Product Declaration

General information

Owner of environmental product declaration	Nine Voices, Kuršių str. 7, Dreverna, Lithuania www.ninevoices.eu Owned by Baltic Environmental Forum Lithuania Kalvarijų str. 8-17 LT-09309 Vilnius Lithuania www.bef.lt
Product	Hygge pellet
Manufacturer	Nine Voices
Manufacturing sites	Dreverna, Lithuania
Product application	Horse (animal) bedding from biomass (grass)
Declared unit	1 kg of product
Date declaration was issued	June, 2020

As the product is unique and does not have product category rules (PCR) the EDP is prepared according ISO 14040:2006 and ISO 14044:2006 standards. The declaration is not externally verified according ISO 14025:2010.

Environmental product declaration data is based on production data for 2020, May.

Prepared by dr. Sigita Židonienė

Product

Reed and sedge pellets “Hygge pellet” are mainly used for horse or another animal bedding. The pellets create a thick and soft bedding layer on concrete – comfortable for a horse. They do not create dust and are hyper absorbent, so, there are no ammonia odors in the stables, just a fresh, comfortable and dry environment. The pellets are made from reeds, sedges and other wetland plant grasses, which horses do not eat, and are high temperature treated, so they do not cause allergies or diseases. It is a natural product from protected areas without any impurities or fertilizers. The production of these pellets is a nature conservation activity. During the production late-cut grass that is no longer suitable for fodder is recycled. In this way we are protecting the home of the rarest Europe’s songbird – the Aquatic Warbler – and other bird species.
This environmental declaration covers pellets made by “Nine Voices” in Dreverna, Lithuania.

Product Materials

Pellets are made from biomass which is harvested in natural wetlands that are situated in Lithuania’s protected areas near the Baltic Sea. These territories are a part of the Natura2000 network. Here, natural wetland vegetation grows and there is no agro-industrial activity, which means a fertilizer and chemical-free environment.

The product consists only from biomass, no additional substances are added.

Production

“Nine voices” recycles the late-cut grass that is not suitable for fodder anymore from home of Aquatic warbler and turns it to a new product – “Hygge pellets”. The late cutting (from the mid of August) is needed to ensure the safety of 2 aquatic warbler broods. Only in August the chicks of the second brood are capable to run away from the machinery and the mowing is allowed. The grass cut so late is not suitable for fodder anymore, therefore there is a problem, where to put huge amount of biomass left in fields. “Nine voices” solves this problem by collecting this grass, avoiding waste and encouraging Aquatic warbler-friendly farming.

The grass in wetlands are mowed from the mid of August. Special modern equipment designed to work in wet conditions, is used. It prevents the soil from harsh damage and consumes less fuel. Then grass is baled into rolls, covered with polypropylene net and transported directly to biomass processing facility (5 km), where it is stored until it needs to be processed into pellets. The biomass is shredded, treated with heat and pressed into pellets. No additional substances are added. Then hot pellets go to the big bags to get cool (in order not to get mould). Pellets are packed mostly in white polypropylene woven big bags – 500 kg per unit. In very rare occasions, the smaller (15 kg per unit) low density polyethylene (LDPE) bags are chosen. Further the packages are prepared for transportation – wrapped into packing film stretch and put on wooden pallets.

Recycling and Waste Processing

The product does not contain any synthetic additives, thus is 100 % biodegradable and therefore suitable for fertilizing fields after use in the stable box. No hazardous waste originates from pellets. Packaging materials waste are handled in accordance with current legal requirements: sorted and delivered for recycling.

Environmental profile

The functional unit of this EPD refers to the manufacture of 1 kg pellets, it covers the life cycle of the product from cradle to the factory gate. The life cycle assessment (LCA) does not include information of the use and end of life stages.

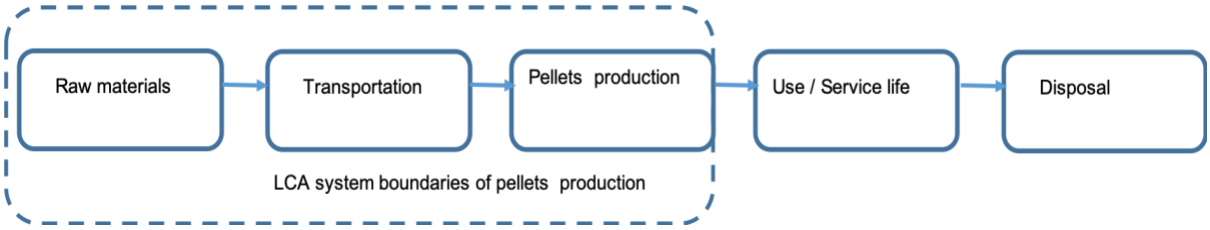

Figure 1. System boundaries of life-cycle assessment. The diagram describes the life-cycle stages of pellets production. LCA excludes the use and end of life life-cycle stages.

SimaPro – the software for comprehensive analysis developed by Pre-Sustainability was used for modelling the life cycle of the product under review. The data required for the upstream chain for which no specific details are available, is taken from the SimaPro database. As product is unique from its origin, for the raw material - the biomass – "grass, organic (RoW) grass production, permanent grassland, organic, extensive" data was used. As for electricity - Electricity, high voltage {LT}| electricity production, wind, 1-3MW turbine, onshore included. The primary data collected at the manufacture's is based on monthly volumes and/or extrapolated.
ReCiPe is a method used for the life cycle impact assessment. Inventory results expressed in 18 midpoint indicators scores.
While conducting LCA, commonly is applied 5 % cut-off rule, that means that the Life Cycle Inventory (LCI) data for a minimum of 95% of total inflows (mass and energy) to the upstream and core module shall be included. However, in this study, wherever data was available, it was included in the study, even if aggregate mass flows for a specific input or output fell below the 5% materiality threshold. The only inflow not included in the LCI model was oil for equipment maintenance.

Table 1. Results of LCA – Environmental impact

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1kg of pellets		
Parameter	Unit	Value
Global warming	kg CO2 eq	0.191800275

Stratospheric ozone depletion	kg CFC-11 eq	0.0000004
Ionizing radiation	kBq Co-60 eq	0.0007641
Fine particulate matter formation	kg PM2.5 eq	0.0004474
Ozone formation, Terrestrial ecosystems	kg NOx eq	0.0013347
Terrestrial acidification	kg SO2 eq	0.0007932
Freshwater eutrophication	kg P eq	0.0000586
Marine eutrophication	kg N eq	0.0007456
Terrestrial ecotoxicity	kg 1,4-DCB	0.6985696
Freshwater ecotoxicity	kg 1,4-DCB	-0.0000104
Marine ecotoxicity	kg 1,4-DCB	0.0002871

Table 2. Results of LCA – Resource use

RESULTS OF THE LCA – RESOURCE USE: 1kg of pellets		
Parameter	Unit	Value
Land use	m2a crop eq	1.8466038
Mineral resource scarcity	kg Cu eq	0.0019705
Fossil resource scarcity	kg oil eq	0.0602273
Water consumption	m3	0.0021054

Table 3. Results of LCA – Human health

RESULTS OF THE LCA – HUMAN HEALTH: 1kg of pellets		
Parameter	Unit	Value
Ozone formation, Human health	kg NOx eq	0.0013073
Human carcinogenic toxicity	kg 1,4-DCB	0.0016004
Human non-carcinogenic toxicity	kg 1,4-DCB	-1.1040799

1 kg of pellets have impact to climate change respectively 0,19 kg CO2 eq. A significant part of all environmental indicators, such as the global warming and stratospheric ozone depletion can be attributed to the diesel, burned in agricultural machinery used for harvesting grass and transportation it to production site. Raw material – grass, has highest impact on land use, but as this unique product is as an outcome of natural land reservation and natural habitats restoration for bids (Aquatic Warbler) the higher score should be considered as positive impact.

Discussion

EDP serves as a tool to compare environmental performance of the same products group. As we could not find EDP for similar products, we made modelled comparison with the most common horse beddings – barley straw, peat and hardwood chips pellets. Our assumptions were that in LCA calculations the only one parameter is changing – raw material – grass, straw, peat or wood chips. All other inputs as transportation, production processes and packaging are the same. For comparison was used EPD (2018) V1.01 method. This method created by Swedish Environmental Management Council is dedicated for creation of EDP. It has 7 main categories (acidification, eutrophication, global warming, photochemical oxidation, abiotic

depletion (elements), abiotic depletion (fossil fuels) and water scarcity. Table 2 shows comparison results of four different bedding types.

Table 2. Comparison of different bedding types

Impact category	Unit	Barley straw bedding	Grass pellets	Peat bedding	Wood pellets bedding
Acidification (fate not incl.)	kg SO2 eq	0.005952	0.001233	0.026057	0.001719
Eutrophication	kg PO4--- eq	0.004584	0.001472	0.004561	0.000325
Global warming (GWP100a)	kg CO2 eq	0.441258	0.187981	129.508202	0.242183
Photochemical oxidation	kg NMVOC	0.002112	0.001577	0.022737	0.002190
Abiotic depletion, elements	kg Sb eq	0.000004	0.000006	0.000117	0.000005
Abiotic depletion, fossil fuels	MJ	3.975983	2.612957	66.706328	3.638229
Water scarcity	m3 eq	0.074393	0.079335	0.663766	0.089058

Grass pellets shows better performance in four of seven categories (acidification, global warming, photochemical oxidation and abiotic depletion, fossil fuels) compared to other bedding types. Peat bedding has worst performance in all impact categories. Figure 2 shows percentage change in impacts across different life cycle impact categories of various bedding types.

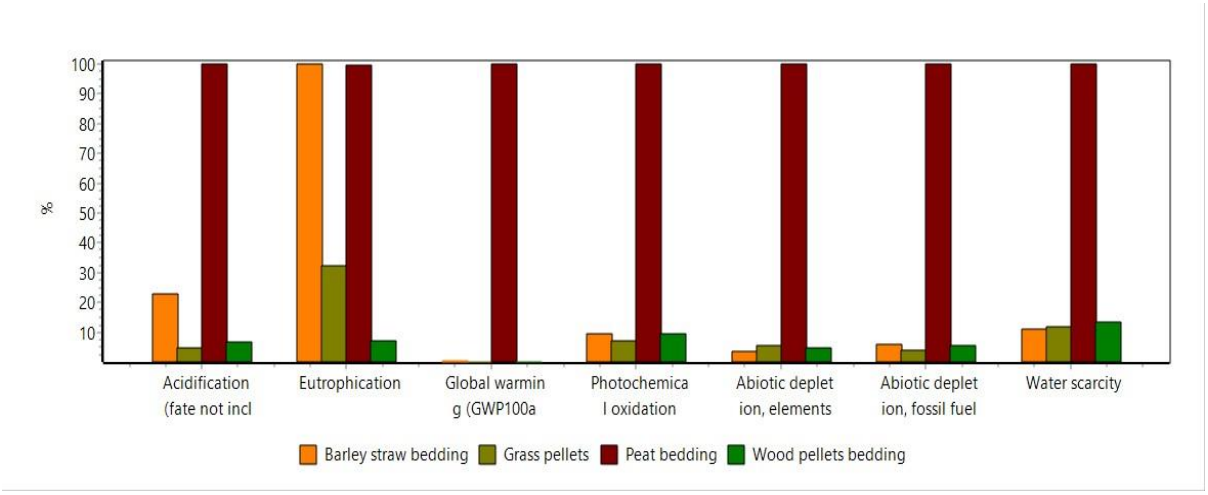

Figure 2. Percentage change in impacts across different life cycle impact categories

There is some additional information on impact categories and various bedding performance in these categories.

Acidification (fate not included) is the impact category that refers to emissions which increase acidity (lower pH) of water and soils and is calculated as kg SO_2 equivalents. Grass and wood chips bedding have similarly low values. While peat bedding has highest value compared to other bedding types. Peatland mostly is considered as acid environment, caused by by-products of microbial decay processes, cation exchange and input of acids from the atmosphere[1].

Eutrophication is impact category expressed in kg PO_4^- equivalents. Eutrophication can be defined as nutrient enrichment of the aquatic environment. Nutrients, as nitrogen and phosphorus, run-off from land is one of the causes of eutrophication[2,3]. Therefore, biomass as crop straws or grass removal from land, or peat harvesting can show higher values for eutrophication impact category compered to tree removal from nature.

Global warming (GW100a) is category that counts the increase in greenhouse gas concentrations, resulting in potential increase in global average surface temperature. Is expressed as kg CO_2 equivalents. The usage of peat as animal bedding has the most significant negative impact in this category, as peatlands are the largest natural terrestrial carbon storage source[4].

Photochemical oxidation is the photochemical creation of reactive substances, like ozone, which affect human health and ecosystems[5]. Peat bedding has biggest negative impact for photochemical oxidation formation compare to other tree bedding types.

Abiotic depletion, elements and abiotic depletion, fossil fuels are impact categories concerned with protection of human welfare, human health and ecosystem health. These impact categories indicators are related to extraction of minerals and fossil fuels due to inputs in the system[6]. The Abiotic Depletion potential is determined for each extraction of minerals and fossil fuels and is measured in antimony equivalents (kg) or MJ of fossil fuels. For abiotic depletion (elements and fossil fuels) straw, grass and wood chips bedding have quite similar impact. While peat is abiotic resource, that removal from nature and use as animal bedding has high negative impact in this impact category.

Water scarcity – is water use midpoint indicator representing the relative available water remaining per area in a watershed after the demand of humans and aquatic ecosystems has been met. Straw, grass and wood chips beddings have quite similar impact on water use. While peat is important element for water management as it holds up to 20 times its own weight in water[7] and therefore the removal.

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[1] https://umaine.edu/oronobogwalk/wp-content/uploads/sites/393/2015/03/Peatland-Acidification-pH.pdf

[2] Coal, oil shale, natural bitumen, heavy oil and peat – vol. Ii - *Environmental and Ecological Aspects of Peat Cutting and Removal* - Eino Lappalainen https://www.eolss.net/Sample-Chapters/C08/E3-04-06-07.pdf

[3] Citation: Chislock, M. F., Doster, E., Zitomer, R. A. & Wilson, A. E. (2013) Eutrophication: Causes, Consequences, and Controls in Aquatic Ecosystems. *Nature Education Knowledge* 4(4):10

[4] https://www.iucn.org/resources/issues-briefs/peatlands-and-climate-change

[5] Niels Jungbluth (2020) Description of life cycle impact assessment methods. ESU-services Ltd., Schaffhausen, Switzerland, http://esu-services.ch/address/tender/

[6] SimaPro database manual. Methods library. Pre Sustainability. https://simapro.com/wp-content/uploads/2020/10/DatabaseManualMethods.pdf

[7] https://www.nationaltrust.org.uk/features/whats-so-special-about-peat

IMPACT2002+V2.15 method was used to compare different type of beddings impact in four damage categories: human heath, ecosystem quality, climate change and resources. Figure 3 represent four different animal beddings impact results to damage categories. Weighted[8] results in mPt[9] is showed in fig. 3. Peat bedding has the biggest negative impact in all damage categories.

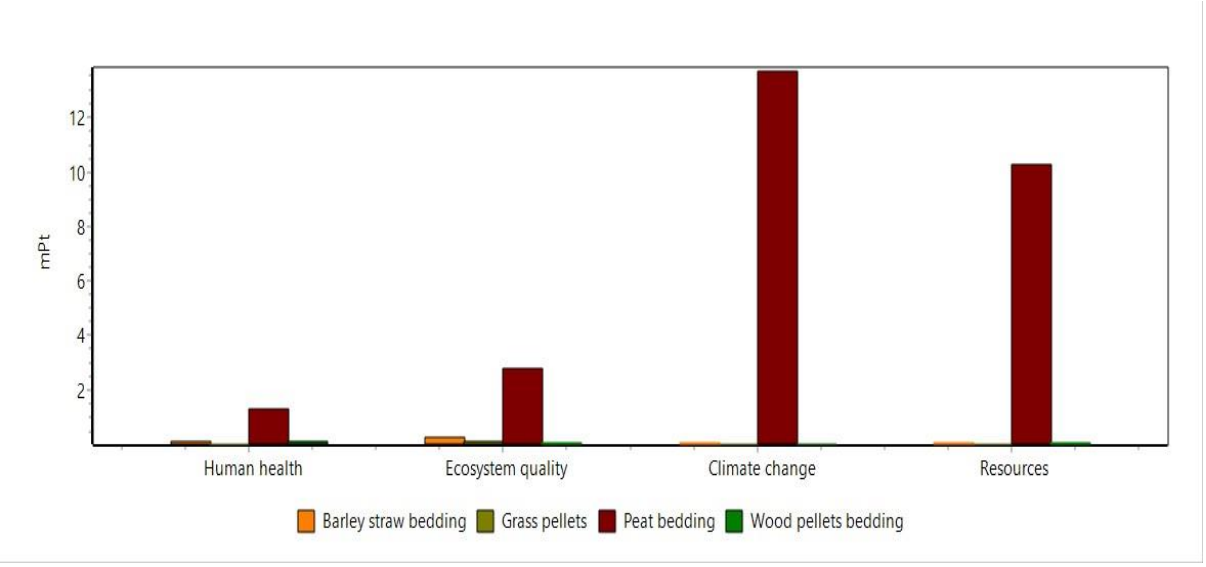

Figure 3. Comparison of four different animal bedding in damage categories.

References

ISO 14025:2010 Environmental labels and declarations – Type III environmental declarations – principles and procedures.

ISO 14044:2006 Environmental management — Life cycle assessment — Requirements and guidelines

ISO 14040:2006 Environmental management — Life cycle assessment — Principles and framework

[8] Weighting is a LCA step, where weighting value is applied to specific environmental impacts to make them comparable.
[9] Pt is a unit "eco-point", that refers to 1/1000th of an average Europeans yearly environmental load.