Recycled agricultural film

Pure North

Environmental product declaration

Programme The International EPD® System

Programme operator EPD International AB

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in accordance with ISO 14025

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THE INTERNATIONAL EPD® SYSTEM

pure north

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PROGRAMME-RELATED INFORMATION

Product group classification: UN CPC 8942
PCR 2013:08 Plastic waste and scrap recovery (recycling) services; Version 2.13; 2021-04-22
PCR review was conducted by The Technical Committee of the International EPD® System. Review chair: Lars-Gunnar Lindfors. Contact via info@environdec.com
Independent third-party verification of the declaration and data in accordance with ISO14025:2006 ☒External ☐Internal covering ☐ EPD process certification ☒ EPD verification
Procedure for follow-up during EPD validity involves third party verifier ☐ Yes ☒ No
The EPD owner has the sole ownership, liability and responsibility of the EPD.
EPDs within the same product category but from different programmes may not be comparable. For further information about comparability, see ISO 14025.

COMPANY INFORMATION

Pure North Recycling ehf., hereafter Pure North or PN, is a plastic recycling company located in Hveragerði, Iceland. Pure North uses environmentally friendly energy sources where geothermal energy has the main role. Currently, they are the only company in Iceland that fully recycles plastic. The aim of their recycling is to make plastic back into plastic and to complete recycling while leaving as small of a carbon footprint as possible in the process as no chemical substances are used in the processing. The Pure North process is based on Icelandic ingenuity, is environmentally friendly and unique in the world (1).

PRODUCT DESCRIPTION

Agricultural film is a plastic that is used for the purpose of keeping and preserving hay from farms which is then used to feed livestock e.g. cattle, horses, or sheep. The film is rolled around the hay, and when the hay has been used the film is placed in a container where it begins a journey to be recycled. Agricultural film is primarily made from linear-low density polyethylene (LLDPE), which are polymers commonly made by co-polymerization of ethylene with longer chain olefins.

APPLICATION

The LLDPE agricultural film is turned into pellets in the recycling process. These pellets can substitute virgin LLDPE pellets, and the products made from the pellets include plastic pallets, permeable ground stabilizing systems, safety tapes, pipe materials and more.

CONTENT DECLARATION

Post recycling material is >98% LLDPE. The material is pelletized but can have different colors, dependent on the color of the input material. The pellets can be white, grey, black, green or have a pink hue. The pellets may smell of smoke because of residues that may enter the pelletizer, although organic material is burnt away when the plastic is melted at 240°C. The product's technical characteristics and composition is presented in the table below (Table 1). Products do not contain any REACH SVHC substances in amounts greater than 0.1% (1000 ppm).

Table 1. Technical datasheet for the product.

Parameters	PN LLDPE pellets
Origin of the material	Post-consumer recycled agricultural film, LLDPE
Moisture content (%)	0,05-0,1%
Bulk density (kg/m3)	540-560
Calorific value (Mj/kg)	43
Contaminants (%)	
PVC content	N/A
Metal content	0%
Paper/cellulose content	N/A
Other contaminants	N/A
Max total contaminants	<1%
Packaging	PP big bags, 3 kg.

3.6 FURTHER INFORMATION

The LLDPE agricultural film collected is solely from Iceland and is transported from all across the country.

LCA INFORMATION

GOAL OF STUDY

This study aims to generate an environmental profile for reycycled LLDPE agricultural film by Pure North in Iceland. Type III EPD is to be generated and made public via the International EPD system.

EPD TYPE

Product specific.

DECLARED UNIT

The declared unit of the LCA is the recycling of **1000 kg** of agricultural film waste. The average is based on the mass of the product produced and the reference year for this LCA is 2021 from January to November.

GOAL AND SCOPE

This LCA evaluates the environmental impacts of the recycling of 1000 kg of agricultural film waste from cradle-to-gate.

BACKGROUND DATA

Specific data from manufacturer is used in combination with LCA databanks provided by OpenLCA. In OpenLCA the various datasets from the Environmental Footprints (EF) database are integrated into one database. It contains datasets from the Life Cycle Data Network (ILCD)[1].

PRODUCT SUSTAINABILITY SOFTWARE

OpenLCA 1.10.3.

DATA QUALITY

Energy mix and other processes are valid for the production site in Hveragerði in Iceland. PN provided data for one-year of operation for the year 2021. Modelling of the life cycle of PN's agricultural film was performed using OpenLCA software developed by GreenDelta. All relevant background life cycle inventory (LCI) datasets were gathered from EF databanks. The data quality for the entire study can be judged as good (measured directly at a specific process site or scaled from measurements).

TIME REPRESENTIVENESS

All primary data used in this study are for the year 2021 and are thought to represent the manufacturing process for at least the next five years.

GEOGRAPHICAL SCOPE

Europe.

ALLOCATIONS

Energy and water inputs were allocated as well as the wastewater output between the different products produced at the site. This was to ensure that the flows of materials and energy, as well as the associated emission releases into the environment, are related exclusively to the recycling of 1000 kg of LLDPE agricultural film.

COMPARABILITY

EPDs within the same product category but from different programmes may not be comparable.

CUT-OFF RULES

All raw materials and consumable item inputs, associated internal transports and external transports, as well as process energy use, are included in the LCA study. It is considered that the total potential neglected input flows are much less than 0.1% of total energy, area, area-time activities and mass.

[1] *https://eplca.jrc.ec.europa.eu/LCDN/contactListEF.xhtml*

SYSTEM BOUNDARY

Product environmental performance was assessed using Life Cycle Assessment (LCA), from the extraction of raw materials to the distribution of the finished products. The study was conducted in compliance with the ISO 14040 standard and the product category rules set forth in PCR 2013:08 v.2.13 Plastic waste and scrap recovery (recycling) services, approved by the International EPD® System technical committee. Use phase of the recycled material is not included in the system boundaries.

Activities included in Upstream, Core and Downstream phases of Pure North. recovery process are illustrated in Figure 1. The scope of this study is "Gradle to gate" covering the upstream, core and downstream stage.

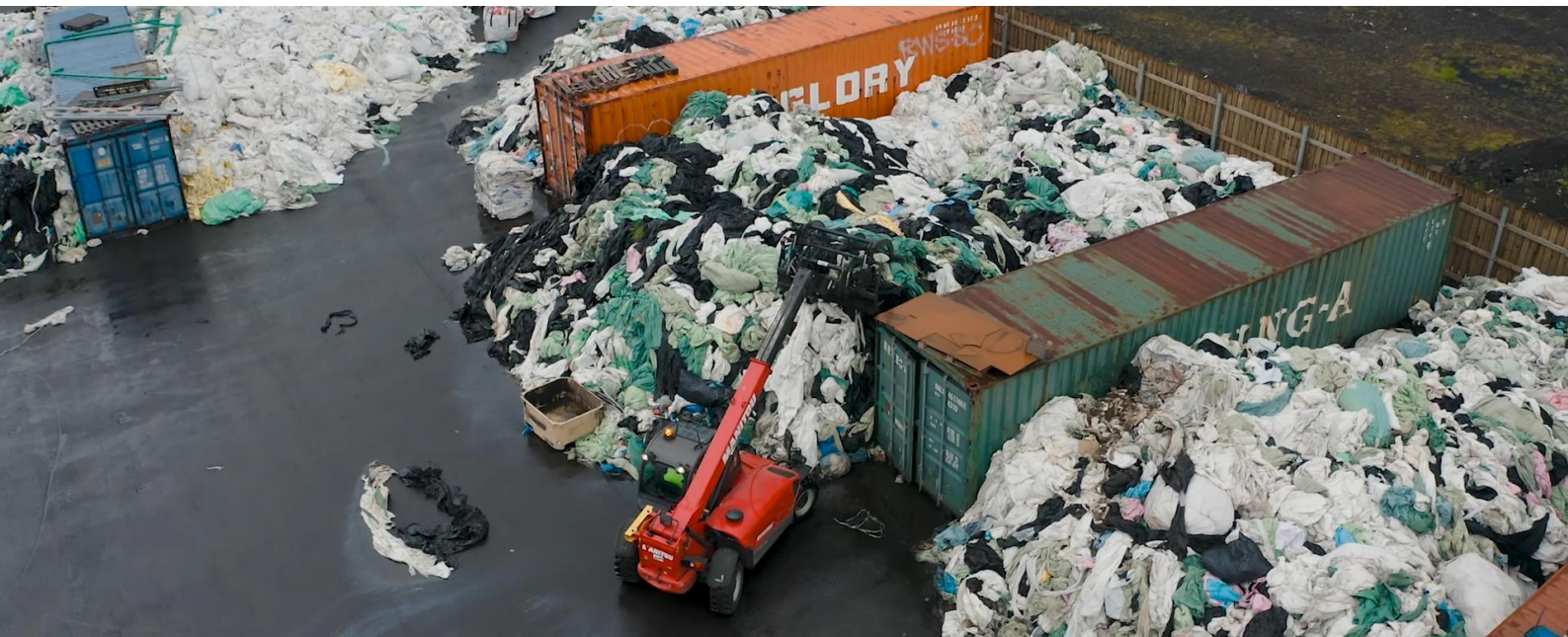
PRODUCTION PROCESS

The main steps of the recycling of LLDPE agricultural film is illustrated in Figure 1. The agricultural film collected is solely from Iceland and it's transported from across the whole country, and delivered to PN by road. The plastic waste originates from consumers of agricultural film which in most cases are industrial users (i.e. farms), except for neglible percentage of hobby horse owners.

When the waste plastic has reached PN, large waste items (non-items) are picked out of the material pre-recycling and collected in large PP bags which get picked up by a waste collection company. During processing, waste such as gravel, sand and ice is separated from the plastic.

The mechanical recycling process of the agricultural film at PN's facility starts by it being shredded into pieces of 50 to 100 mm in size. The plastic pieces are then cleaned in a tumbler using steam and hot water. In the second cleaning stage the plastic is placed in a sediment tank where sand is separated from the plastic. Water is then pressed from the plastic using a screwpress, after which the plastic is shredded further. When the plastic has been shred it is dried using a two-stage drying method to reduce moisture and unwanted material, if any is left. The third drying stage is then applied upon the plastic using hot air from geothermal steam, after which the plastic is pelletized by melting and extruding it in moulds.

After the LLDPE has been pelletized it is shipped to PN's customers in Iceland and in Hull, United Kingdom.



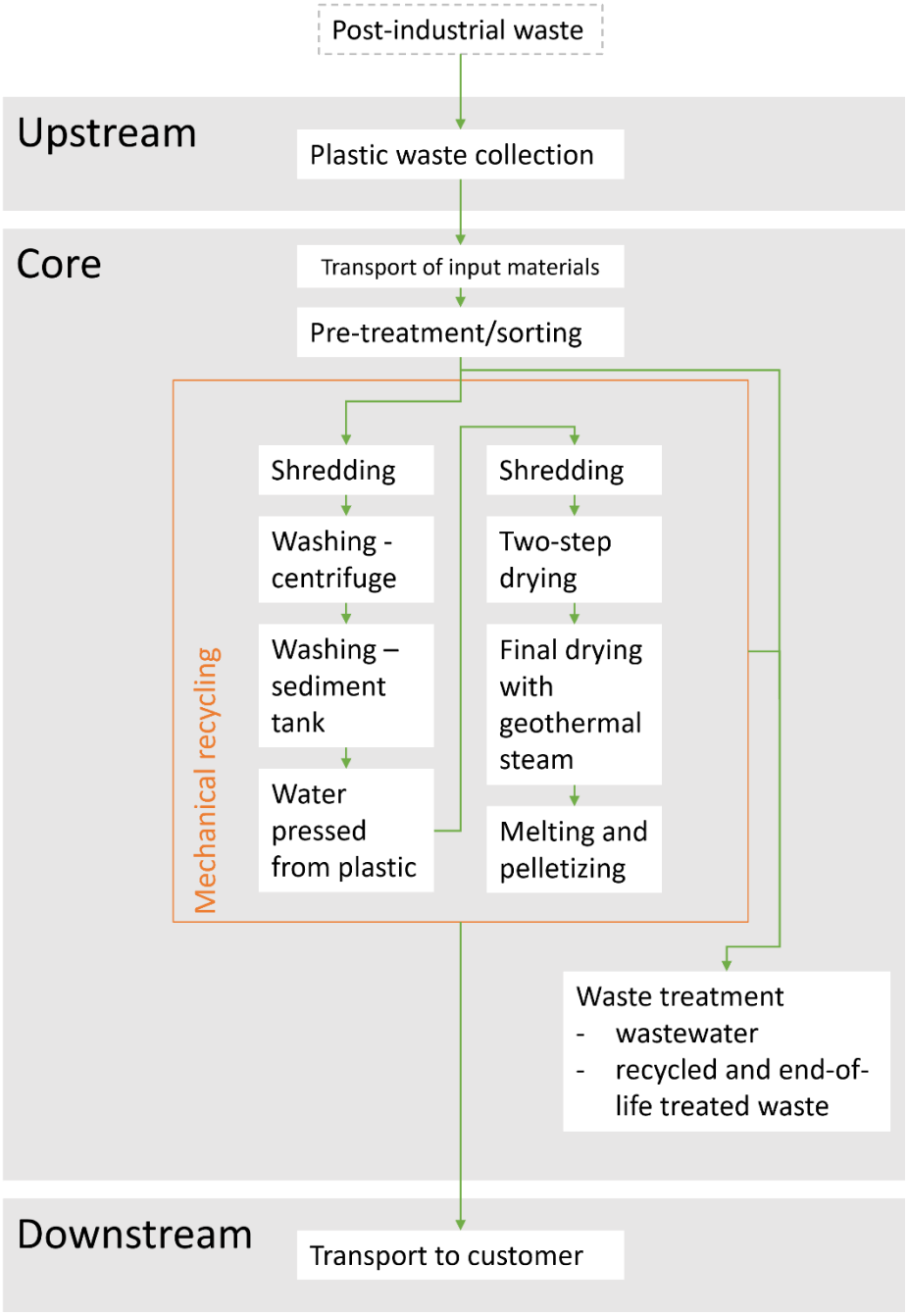


Figure 1. Flow model for the production of recycled agricultural film at PN

LCA: RESULTS

The environmental impacts are declared according to PCR 2013:08, parameters and units. The environmental impact results refer to 1000 kg of input material, being post-consumer agricultural film that goes through the recycling process at Pure North in Iceland. The LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. Table 2 and Table 3 show the LCIA results for the recycling of a 1000 kg of agricultural film waste by PN. The product is delivered in reused big bags made of PP. Also, the product does not contain any biogenic carbon content.

Table 2. Impact categories and environmental impact generated by recycling of 1000 kg of agricultural film waste by Pure North (2021)

Parameter		Unit	Upstream	Core	Downstream	TOTAL
Parameters describing environmental impacts						
Global warming potential (GWP)	Fossil	kg CO_2 eq	13,6	34,4	2,98	51,0
	Biogenic	kg CO_2 eq	2,41E-02	4,79E-02	2,18E-03	7,42E-02
	Land use and land transformation	kg CO_2 eq	9,78E-02	4,74E-02	7,89E-03	1,53E-01
	TOTAL	kg CO_2 eq	13,7	34,5	2,99	51,2
Acidification potential (AP)		kg SO_2 eq	3,16E-02	3,95E-01	4,53E-01	8,79E-01
Eutrophication potential (EP)		kg PO_4^{3-} eq	7,12E-03	3,49	4,30E-02	3,54
Photochemical ozone formation potential (POFP)		kg NMVOC eq	1,13E-02	3,75E-01	3,60E-01	7,47E-01
Abiotic depletion potential – Elements		kg Sb eq	9,04E-07	1,27E-04	4,32E-07	1,29E-04
Abiotic depletion potential – Fossil resources		MJ, net calorific value	186	273	186	644
Water scarcity potential		m^3 eq.	5,28E-01	26,9	6,00E-02	27,5

Table 3. Paramenters describing resource use, primary energy for 1000 kg of agricultural film waste recycled at Pure North

Parameter	Unit	Upstream	Core	Downstream	Total
Parameters describing resource use, primary energy					
Use of renewable primary energy excluding renewable primary energy used as raw materials (PERE)	MJ	10,7	14 700	1,26	14 700
Use of renewable primary energy resources used as raw materials (PERM)	MJ	0	0	0	0
Total use of renewable primary energy resources (PERT)	MJ	10,7	14 700	1,26	14 700
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (PENRE)	MJ	186	273	186	644
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ	34 600	0	0	34 600
Total use of non-renewable primary energy resources (PENRT)	MJ	34 800	273	186	35 200
Parameters describing resource use, secondary materials and fuels, use of water					
Use of secondary material (SM)	kg	823	0	0	823
Use of renewable secondary fuels (RSF)	MJ	0	9090	0	9090
Use of non-renewable secondary fuels (NRSF)	MJ	164	132	168	464
Net use of fresh water (FW)	m^3	3,50E-01	31,6	3,63E-02	31,9
Other environmental information describing waste categories					
Hazardous waste disposed (HWD)	kg	0	0	0	0
Non-hazardous waste disposed (NHWD)	kg	0	0	0	0
Radioactive waste disposed (RWD)	kg	0	0	0	0
Other environmental information describing outflows					
Components for re-use (CRU)	kg	0	0	0	0
Materials for recycling (MRF)	kg	0	0	1,64	1,64
Materials for energy recovery (MER)	kg	0	0	0	0
Exported energy (EE)	MJ per energy carrier	0	254	0	254

Table 4. Environmental impact per 1 kg of recycled LLDPE agricultural film by Pure North (2021)

Parameter		Unit	Upstream	Core	Downstream	TOTAL
Parameters describing environmental impacts						
Global warming potential (GWP)	Fossil	kg CO_2 eq	2,49E-02	6,29E-02	5,45E-03	9,33E-02
	Biogenic	kg CO_2 eq	4,42E-05	8,76E-05	4,00E-06	1,36E-04
	Land use and land transformation	kg CO_2 eq	1,79E-04	8,69E-05	1,44E-05	2,80E-04
	TOTAL	kg CO_2 eq	2,51E-02	6,31E-02	5,47E-03	9,37E-02
Acidification potential (AP)		kg SO_2 eq	5,78E-05	7,23E-04	8,29E-04	1,61E-03
Eutrophication potential (EP)		kg PO_4^{3-} eq	1,30E-05	6,39E-03	7.87E-05	6,49E-03
Photochemical ozone formation potential (POFP)		kg NMVOC eq	2,07E-05	6,87E-04	6,59E-04	1,37E-03
Abiotic depletion potential – Elements		kg Sb eq	1,65E-09	2,33E-07	7,91E-10	2,36E-07
Abiotic depletion potential – Fossil resources		MJ, net calorific value	3,40E-01	5,00E-01	3,40E-01	1,18
Water scarcity potential		m^3 eq.	9,67E-04	4,92E-02	1,10E-04	5,03E-02

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