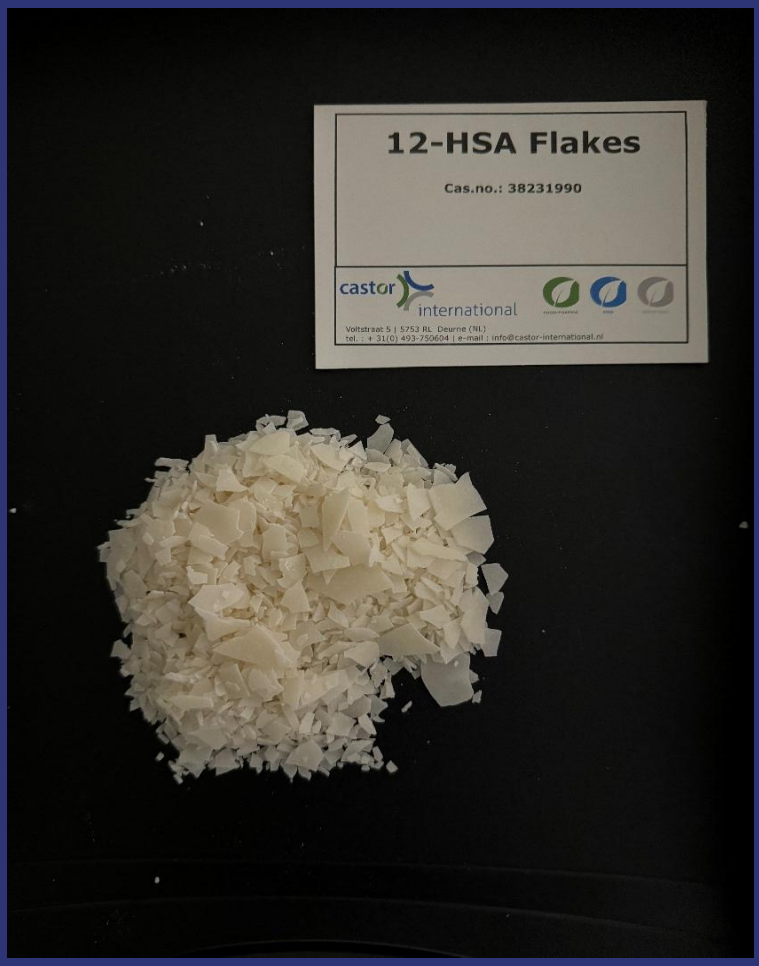
Environmental
Product
Declaration

According to ISO14025+EN15804 A2 (+indicators A1)

This declaration is for:
12-Hydroxy Stearic Acid

Provided by:
Castor International



MRPI® registration
1.1.00746.2025

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COMPANY INFORMATION

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www.castor-international.nl

PRODUCT

12-Hydroxy Stearic Acid

DECLARED UNIT/FUNCTIONAL UNIT

1 kg

DESCRIPTION OF PRODUCT

12-Hydroxy stearic acid is a saturated hydroxy fatty acid. It can be used as lubricant, in cosmetics, coatings, or in rubber production.

MRPI® REGISTRATION

1.1.00746.2025

DATE OF THIS ISSUE

16-12-2024

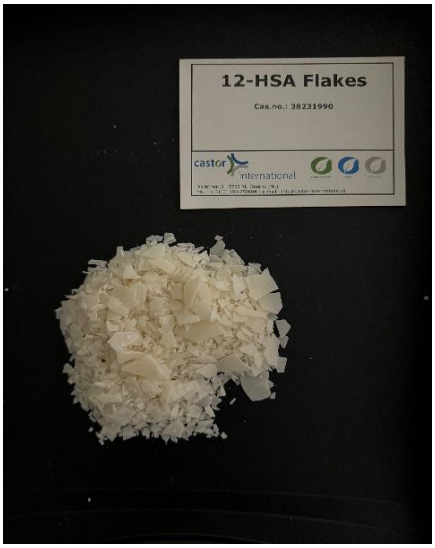
EXPIRY DATE

16-12-2029

SCOPE OF DECLARATION

This MRPI®-EPD certificate is verified by Martijn van Hövell, SGS Search. The LCA study has been done by Ilja Lieshout, EcoReview B.V.. The certificate is based on an LCA-dossier according to ISO14025+EN15804 A2 (+indicators A1). It is verified according to the 'MRPI®-EPD verification protocol November 2020.v4.0'. EPD's of construction products may not be comparable if they do not comply with EN15804+A2. Declaration of SVHC that are listed on the 'Candidate list of Substances of Very High Concern for authorisation' when content exceeds the limits for registration with ECHA.

VISUAL PRODUCT



PROGRAM OPERATOR

Stichting MRPI®
Kingsfordweg 151
1043 GR
Amsterdam

MORE INFORMATION

https://www.castor-international.nl/en/product/12-hydroxy-stearic-acid-12-hsa

Ing. L. L. Oosterveen MSc. MBA Managing Director MRPI	DEMONSTRATION OF VERIFICATION
	CEN standard EN15804 serves as the core PCR [1]
	Independent verification of the declaration an data according to ISO14025+EN15804 A2 (+indicators A1) internal: external: X
	Third party verifier: Martijn van Hövell, SGS Search
	[1] PCR = Product Category Rules

DETAILED PRODUCT DESCRIPTION (PART 1)

12-Hydroxy stearic acid is a saturated hydroxy fatty acid. It is a hydroxy fatty acid that its stearic acid bearing a hydroxy substituent at position 12. The source for the production of 12-hydroxy stearic acid is castor oil which contains up to 85% ricinoleic acid in the form of triglycerides. To produce 12-HSA, castor oil is in a first step subjected to hydrogenation. In a second step the ricinoleic acid gets saturated at the place of the double bond and transforms into 12- hydroxy stearic acid with a NaOH solution. It's a waxy, odourless, tasteless and cream coloured compound in flakes / powder form. It is transported from India to the Netherlands by boat in bulk. The product is not an end product and has a wide array of uses. The reference service life depends on the application of the product.

	kg
12-hydroxy stearic acid	1

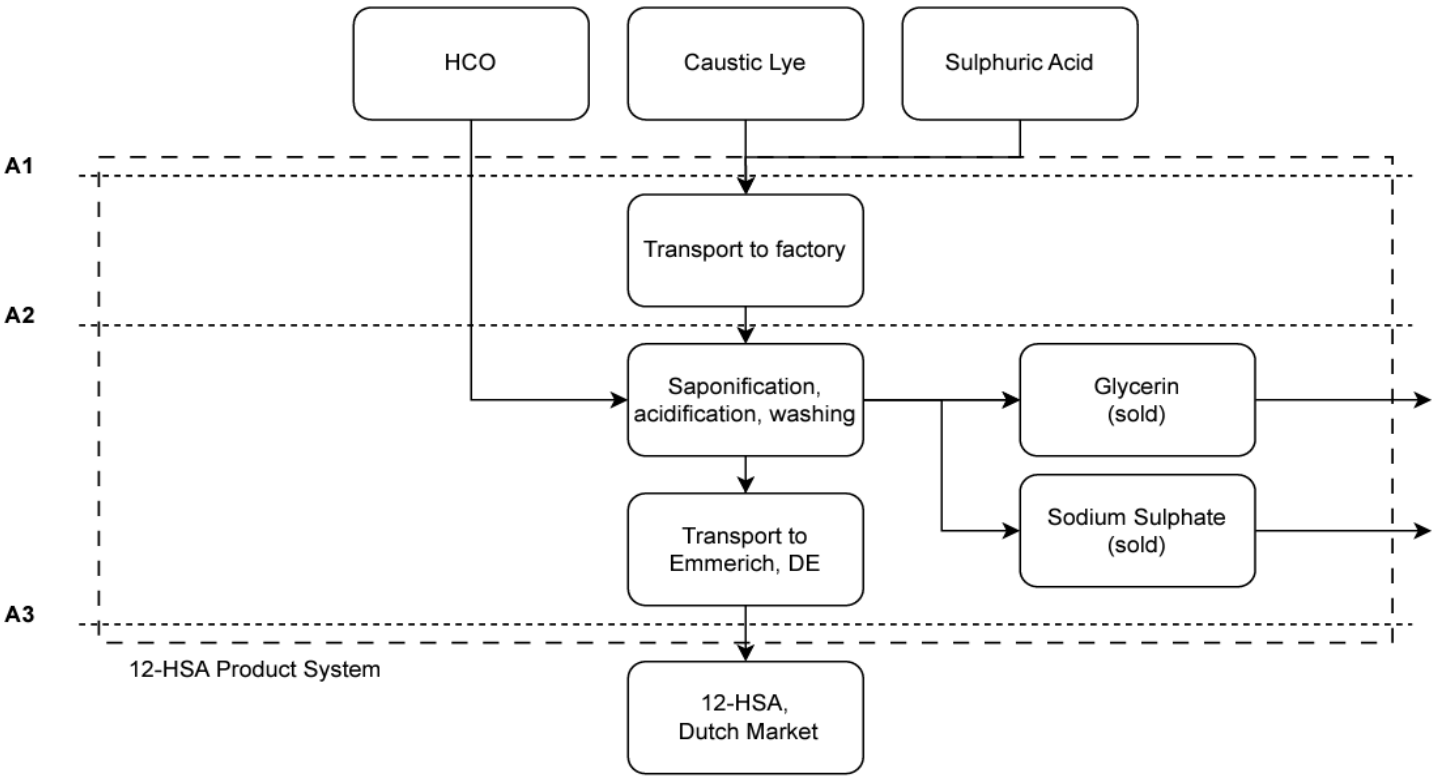
SCOPE AND TYPE

Cradle-to-gate with options. The study was done as a cradle-to-gate, but contains biogenic carbon. According to EN 15804 (section 5.2) an end-of-life has to be taken into account for products that contain biogenic carbon. Therefore, module C and D are also modelled. The product is produced in India and applied in Europe, end-of-life location unknown. The background database is Ecoinvent 3.6. SimaPro software is used. This is a specific EPD from a specific factory dataset.

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USER STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport gate to site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse - Recovery - Recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
x	x	x	ND	ND	ND	ND	ND	ND	ND	ND	ND	x	x	x	x	x

X = Modules Assessed

ND = Not Declared



REPRESENTATIVENESS

The data in this EPD is representative for 12-Hydroxy Stearic Acid (12-HSA) produced by Castor International in a single production plant in India, sold on the European market from Deurne, The Netherlands.

ENVIRONMENTAL IMPACT per functional unit or declared unit (core indicators A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-total	kg CO2 eq	8,39E+00	1,17E-01	9,54E-01	9,46E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,75E-03	8,14E-01	3,46E+00	0,00E+00
GWP-fossil	kg CO2 eq	9,48E+00	1,17E-01	9,53E-01	1,05E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,75E-03	0,00E+00	1,88E+00	0,00E+00
GWP-biogenic	kg CO2 eq	-2,39E+00	0,00E+00	0,00E+00	-2,39E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,14E-01	1,58E+00	0,00E+00
GWP-luluc	kg CO2 eq	1,31E+00	9,06E-05	1,08E-04	1,31E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,47E-06	0,00E+00	6,35E-06	0,00E+00
ODP	kg CFC11 eq	6,39E-07	2,34E-08	2,95E-08	6,92E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,49E-09	0,00E+00	2,48E-09	0,00E+00
AP	mol H+ eq.	3,26E-01	3,62E-03	5,72E-03	3,35E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,91E-05	0,00E+00	1,70E-04	0,00E+00
EP-freshwater	kg PO4 eq.	1,49E-03	5,49E-07	8,25E-04	2,32E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,81E-08	0,00E+00	8,25E-06	0,00E+00
EP-marine	kg N eq.	1,25E-01	9,04E-04	5,98E-04	1,26E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,38E-05	0,00E+00	5,89E-05	0,00E+00
EP-terrestrial	mol N eq.	1,39E+00	1,00E-02	5,98E-03	1,41E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,52E-04	0,00E+00	7,54E-04	0,00E+00
POCP	kg NMVOC eq.	9,81E-02	2,60E-03	4,89E-03	1,06E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,34E-05	0,00E+00	1,63E-04	0,00E+00
ADP-minerals & metals	kg Sb eq.	2,48E-04	8,86E-07	2,16E-06	2,51E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,71E-07	0,00E+00	2,55E-07	0,00E+00
ADP-fossil	MJ, net calorific value	6,31E+01	1,50E+00	7,93E+00	7,25E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,02E-01	0,00E+00	1,86E-01	0,00E+00
WDP	m3 world eq. Deprived	3,41E+00	2,55E-03	4,57E-02	3,46E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,64E-04	0,00E+00	2,46E-02	0,00E+00

GWP-total = Global Warming Potential total

GWP-fossil = Global Warming Potential fossil fuels

GWP-biogenic = Global Warming Potential biogenictotal

GWP-luluc = Global Warming Potential land use and land use change

ODP = Depletion potential of the stratospheric ozone layer

AP = Acidification Potential, Accumulated Exceedence

EP-freshwater = Eutrophication Potential, fraction of nutrients reaching freshwater end compartment

EP-marine = Eutrophication Potential, fraction of nutrients reaching marine end compartment

EP-terrestrial = Eutrophication Potential, Accumulated Exceedence

POCP = Formation potential of tropospheric ozone photochemical oxidants

ADP-minerals & metals = Abiotic Depletion Potential for non-fossil resources [1]

ADP-fossil = Abiotic Depletion for fossil resources potential [1]

WDP = Water (user) deprivation potential, deprivation-weighted water consumption [1]

Disclaimer [1]:

- The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

ENVIRONMENTAL IMPACT per functional unit or declared unit (additional indicators A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PM	Disease inci-dence	2,17E-06	3,57E-09	5,30E-08	2,23E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,06E-10	0,00E+00	7,19E-09	0,00E+00
IRP	kBq U235 eq.	1,64E-01	6,44E-03	5,54E-03	1,76E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,26E-04	0,00E+00	3,83E-04	0,00E+00
ETP-fw	CTUe	2,06E+02	9,93E-01	3,29E+01	2,40E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,07E-02	0,00E+00	6,63E-01	0,00E+00
HTP-c	CTUh	5,76E-08	6,57E-11	4,77E-09	6,25E-08	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,94E-12	0,00E+00	1,71E-10	0,00E+00
HTP-nc	CTUh	5,14E-06	7,85E-10	4,24E-08	5,19E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,92E-11	0,00E+00	2,39E-09	0,00E+00
SQP	-	1,70E+03	2,74E-01	1,72E+00	1,70E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,83E-02	0,00E+00	7,19E-02	0,00E+00

PM = Potential incidence of disease due to PM emissions

IRP = Potential Human exposure efficiency relative to U235 [1]

ETP-fw = Potential Comparative Toxic Unit for ecosystems [2]

HTP-c = Potential Comparative Toxic Unit for humans [2]

HTP-nc = Potential Comparative Toxic Unit for humans, non-cancer [2]

SQP = Potential soil quality index [2]

Disclaimer [1]:

- This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste.

Disclaimer [2]:

- The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

OUTPUT FLOWS AND WASTE CATEGORIES per functional unit or declared unit (A1 / A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	kg	3,46E-04	1,56E-06	1,16E-04	4,64E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,58E-07	0,00E+00	3,39E-06	0,00E+00
NHWD	kg	5,58E-01	4,23E-03	3,50E-02	5,98E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,46E-03	0,00E+00	2,36E-02	0,00E+00
RWD	kg	2,18E-04	1,04E-05	4,33E-06	2,32E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,68E-07	0,00E+00	4,47E-07	0,00E+00
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
ETE	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

HWD = Hazardous Waste Disposed
NHWD = Non Hazardous Waste Disposed
RWD = Radioactive Waste Disposed
CRU = Components for reuse
MFR = Materials for recycling
MER = Materials for energy recovery
EEE = Exported Electrical Energy
ETE = Exported Thermal Energy

RESOURCE USE per functional unit or declared unit (A1 / A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	MJ	5,49E+00	1,19E-02	1,75E-01	5,68E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,27E-03	0,00E+00	8,55E-03	0,00E+00
PERM	MJ	3,83E+01	0,00E+00	0,00E+00	3,83E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	4,38E+01	1,19E-02	1,75E-01	4,40E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,27E-03	0,00E+00	8,55E-03	0,00E+00
PENRE	MJ	6,74E+01	1,59E+00	8,35E+00	7,73E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,08E-01	0,00E+00	2,01E-01	0,00E+00
PENRM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	6,74E+01	1,59E+00	8,35E+00	7,73E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,08E-01	0,00E+00	2,01E-01	0,00E+00
SM	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NSRF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m3	8,49E-02	9,31E-05	1,45E-03	8,64E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,24E-05	0,00E+00	5,93E-04	0,00E+00

PERE = Use of renewable energy excluding renewable primary energy resources
PERM = Use of renewable energy resources used as raw materials
PERT = Total use of renewable primary energy resources
PENRE = Use of non-renewable primary energy resources excluding non-renewable energy resources used as raw materials
PENRM = Use of non-renewable primary energy resources used as raw materials
PENRT = Total use of non-renewable primary energy resources
SM = Use of secondary materials
RSF = Use of renewable secondary fuels
NSRF = Use of non-renewable secondary fuels
FW = Use of net fresh water

BIOGENIC CARBON CONTENT per functional unit or declared unit (A1 / A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
BBCpr	kg C	-6,53E-01	0,00E+00	0,00E+00	-6,53E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,22E-01	4,31E-01	0,00E+00
BCCpa	kg C	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

BCCpr = Biogenic carbon content in product
BCCpa = Biogenic carbon content in packaging

CALCULATION RULES (PART 1)

In this study, the data flows have been modelled as realisticly as possible within the practical feasibility of the LCA practitioner. The data quality is based on the principle that the primary data used for processes, occurring at the production site, must be of higher quality than background data of other processes. The processes used in the production of 12-Hydroxy Stearic Acid are geographically representative, meaning that the production location of 12-Hydroxy Stearic Acid lies within the region for which the relevant Ecoinvent environmental records have been selected. All environmental impacts and economic flows – from sources such as resources, energy, emissions and waste – were quantified and qualified in environmental effects. The rerelease of biogenic carbon dioxide in C has been modelled to compensate for any stored carbon. All known inputs and outputs - like emissions, energy and materials – have been considered in this LCA. And in accordance with EN15804+A2, the total neglected input flows per module do not exceed 5% of energy usage or mass.
The capital goods used (reactor vats, bulk transport containers, factory buildings) have been cut-off, as their contribution to the overall impact per kg is assumed insignificant, considering the amount of kg produced during the lifetime of the factory or the amount of kg transported by a single bulk container.
The reference year for the data is 2022. The chemical production process has two by-products. 96,6 % of the A1-A3 impact is allocated to the production of 12-HSA. 2,7% is allocated to the production of glycerin (glycerol). 0,7% is allocated to the production of Sodium Sulphate.

CALCULATION RULES (PART 2)

Methodology and reproducibility: The process descriptions and quantities in this study are entirely quantitatively reproducible in accordance to the reference standards that have been used. The references of all sources, both primary and public sources and literature, have been documented in the LCA report.

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION (PART 1)

Within A1-A3, 12-HSA is formed from the saponification and acidification of Hydrogenated Castor Oil. It is also transported to the factory gate in Deurne, NL. Beyond, it can be used as input for the chemical industry. It can also be used as lubricant or in the personal care product industry. Assumption is made that 34% of the oil is used as secondary fuel in a blast furnace and 66% of oil is incinerated without energy recovery at end of life. MSDS available upon request.

Standard specifications	
Appearance	creamish flakes or powder
Melting point	min. 70 °C
Colour	max. 6 Gardner
Colour (on 1" Lovibond)	max. 20 yellow / max. 4,5 red
Acid value	min. 175 mg KOH/g
Iodine value	max. 5 g/100g
Hydroxyl value	min. 150 mg KOH/g

Saponification value	175 - 190 mg KOH/g

DECLARATION OF SVHC

None of the substances contained in the product are listed in the “Candidate List of Substances of Very High Concern for authorisation”, or they do not exceed the threshold with the European Chemicals Agency.

REFERENCES

The LCA report is conform ISO14025, EN15804+A2 (incl. A1) and the NMD Bepalingsmethode 1.1.