ecoinvent 3.11 Dataset Documentation

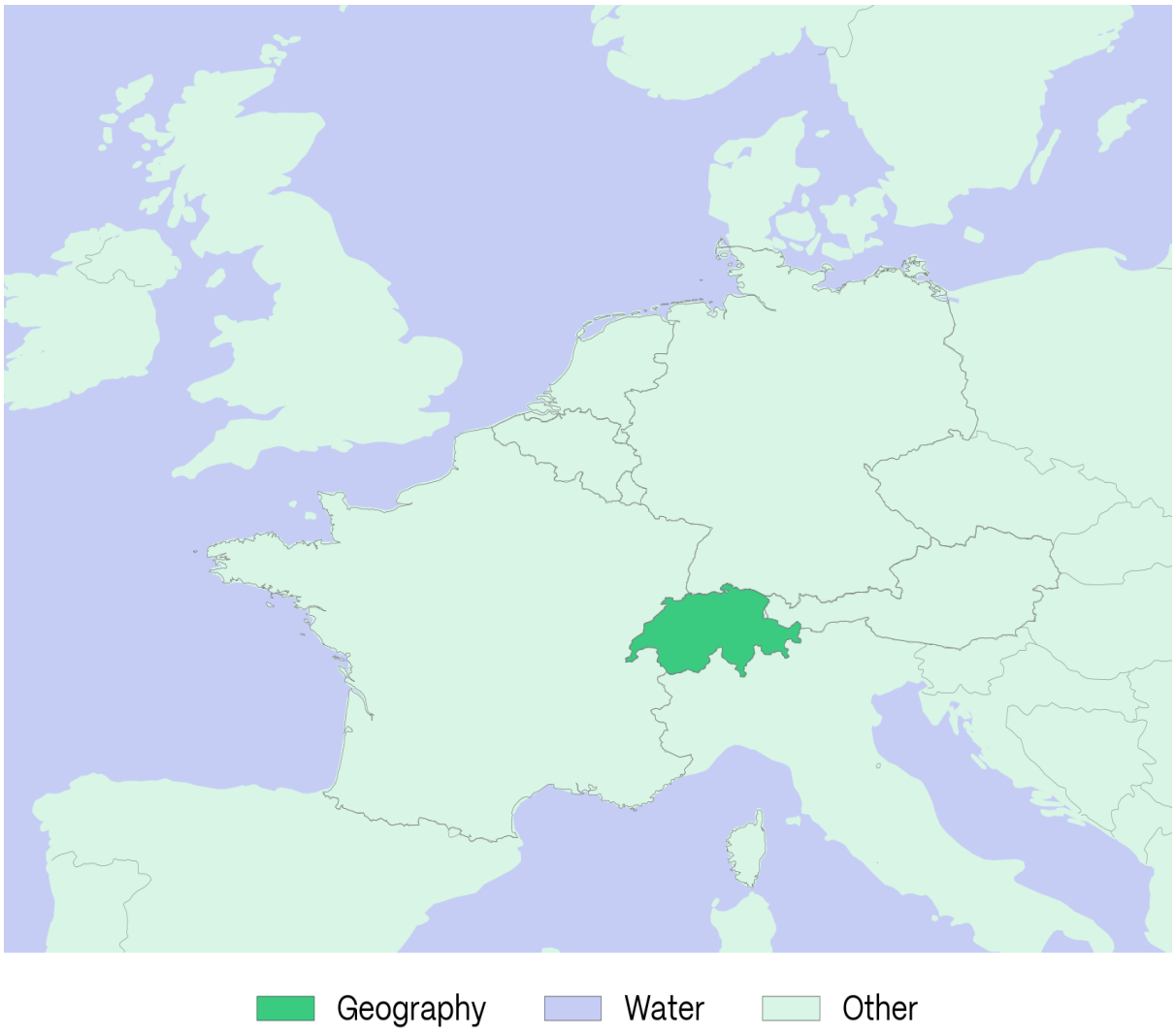
'combine harvesting – CH – combine harvesting'

Note: This document contains only an extract of the information in the dataset. Additional data about properties of exchanges, mathematical relations, parameters, and contact information for authors and reviewers are available within the dataset, i.e. in ecoSpold format.

Table of Contents

Dataset Identification

Activity name	combine harvesting
Geography	Switzerland
Time period	1991-01-01 to 2024-12-31 - Valid for the entire period
ISIC rev.4 ecoinvent	0161:Support activities for crop production
Reference product	combine harvesting
CPC classification	86119: Other support services to crop production
Dataset type	Ordinary transforming activity
Technology level	New
Version - system model	3.11 - Allocation, cut-off



Dataset Authorship

Data entry	Silvio Blaser,
Data generator	Silvio Blaser,

Exchange Summary

Reference product	Byproduct classification	Amount
combine harvesting	allocatable product	1 ha

Inputs from technosphere	Amount
diesel	33.3 kg
harvester	6.3 kg
shed	0.00858 m2

Emissions to air	Amount
Ammonia	0.000666 kg
Benzene	0.000243 kg
Benzo(a)pyrene	9.99e-07 kg
Cadmium II	3.33e-07 kg
Carbon dioxide, fossil	1.03e+2 kg
Carbon monoxide, fossil	0.32 kg
Chromium III	1.67e-06 kg
Copper ion	5.66e-05 kg
Dinitrogen monoxide	0.004 kg
Methane, fossil	0.0043 kg
NMVOC, non-methane volatile organic compounds	0.145 kg
Nickel II	2.33e-06 kg
Nitrogen oxides	1.7 kg
PAH, polycyclic aromatic hydrocarbons	0.00011 kg
Particulate Matter, < 2.5 um	0.149 kg
Selenium IV	3.33e-07 kg
Sulfur dioxide	0.0336 kg

Zinc II	3.33e-05 kg

Emissions to soil	Amount
Cadmium II	8.82e-07 kg
Lead II	3.78e-06 kg
Zinc II	0.00238 kg

Dataset Description

General comment
This dataset represents an example of a typical combine harvesting. The working width is 4.5m. The functional unit (FU) is one ha harvested. The operation time is 1.3 h/FU. [This dataset was already contained in the ecoinvent database version 2. It was not individually updated during the transfer to ecoinvent version 3. Life Cycle Impact Assessment results may still have changed, as they are affected by changes in the supply chain, i.e. in other datasets. This dataset was generated following the ecoinvent quality guidelines for version 2. It may have been subject to central changes described in the ecoinvent version 3 change report (http://www.ecoinvent.org/database/ecoinvent-version-3/reports-of-changes/), and the results of the central updates were reviewed extensively. The changes added e.g. consistent water flows and other information throughout the database. The documentation of this dataset can be found in the ecoinvent reports of version 2, which are still available via the ecoinvent website. The change report linked above covers all central changes that were made during the conversion process.]

Included activities start
From agricultural field foreseen to be processed.

Included activities end
This activity ends with the delivery of harvesting by combined harvester.The dataset includes the diesel fuel consumption and the amount of agricultural machinery and of the shed attributed to harvesting. It was also taken into consideration the amount of emissions to the air from combustion and the emission to the soil from tyre abrasion during the work process. The following activities where considered part of the work process: preliminary work at the farm, such as attaching the adequate machine to the tractor; driving to field (with an assumed distance of 1 km); field work (for a parcel of land of 1 ha surface); driving to farm and concluding work, like uncoupling the machine. The overlapping during the field work is considered. The dataset doesn't include the grain production, straw treatment, dust other than from combustion and noise.

Sampling procedure
Data on fuel consumption and emissions of CO, HC and NOx are expert estimations based on measurements for comparable activities. The other emissions were calculated basing on literature data and the measured fuel consumption.

Extrapolations
Processes are typical procedures for Switzerland around the year 2000, they are not statistical average processes.

Technology comment
The inventories are based on measurements made by the Swiss Federal Research Station for Agricultural Economics and Engineering of Taenikon (FAT). Fuel consumption and emissions were taken from recent literature of ART, expert's estimations or unpublished data.

Geography comment
The inventory applies for Swiss Agricultural Field Work processes.

Time period comment
Measurements were made in the last few years (1999-2001).

Detailed Information For Exchanges

Reference product	Annual prod.vol.	Amount
combine harvesting	1.45e+5 ha	1 ha

Production volume: 1.45e+5 ha
Production volume comment: FAOSTAT data year 2011 (total area of cereals)

Inputs from technosphere	Amount
diesel	33.3 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 1.23; **Pedigree matrix:** [1, 4, 5, 1, 1]

harvester	6.3 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 1.23; **Pedigree matrix:** [1, 4, 5, 1, 1]

shed	0.00858 m2

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
This exchange has an activity link directly to the producing activity because the product is primarily consumed in the same geographical area where it is produced.
Uncertainty distribution: lognormal; **GSD2:** 1.79; **Pedigree matrix:** [1, 4, 5, 1, 1]

Emissions to air	Subcompartment	Amount
Ammonia	non-urban air or from high stacks	0.000666 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 1.37; **Pedigree matrix:** [1, 2, 5, 1, 3]

Benzene	non-urban air or from high stacks	0.000243 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 1.37; **Pedigree matrix:** [1, 2, 5, 1, 3]

Benzo(a)pyrene	non-urban air or from high stacks	9.99e-07 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 2.31; **Pedigree matrix:** [1, 2, 5, 1, 3]

Cadmium II	non-urban air or from high stacks	3.33e-07 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 2.31; **Pedigree matrix:** [1, 2, 5, 1, 3]

Carbon dioxide, fossil	non-urban air or from high stacks	1.03e+2 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 1.27; **Pedigree matrix:** [1, 2, 5, 1, 3]

Carbon monoxide, fossil	non-urban air or from high stacks	0.32 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 2.30; **Pedigree matrix:** [1, 4, 5, 1, 1]

Chromium III	non-urban air or from high stacks	1.67e-06 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 2.31; **Pedigree matrix:** [1, 2, 5, 1, 3]

Copper ion	non-urban air or from high stacks	5.66e-05 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 2.31; **Pedigree matrix:** [1, 2, 5, 1, 3]

Dinitrogen monoxide	non-urban air or from high stacks	0.004 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 1.37; **Pedigree matrix:** [1, 2, 5, 1, 3]

Methane, fossil	non-urban air or from high stacks	0.0043 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 1.37; **Pedigree matrix:** [1, 2, 5, 1, 3]

NMVOC, non-methane volatile organic compounds	non-urban air or from high stacks	0.145 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 1.33; **Pedigree matrix:** [1, 4, 5, 1, 1]

Nickel II	non-urban air or from high stacks	2.33e-06 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 2.31; **Pedigree matrix:** [1, 2, 5, 1, 3]

Nitrogen oxides	non-urban air or from high stacks	1.7 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 1.33; **Pedigree matrix:** [1, 4, 5, 1, 1]

PAH, polycyclic aromatic hydrocarbons	non-urban air or from high stacks	0.00011 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 1.82; **Pedigree matrix:** [1, 2, 5, 1, 3]

Particulate Matter, < 2.5 um	non-urban air or from high stacks	0.149 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 1.82; **Pedigree matrix:** [1, 2, 5, 1, 3]

Selenium IV	non-urban air or from high stacks	3.33e-07 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 1.37; **Pedigree matrix:** [1, 2, 5, 1, 3]

Sulfur dioxide	non-urban air or from high stacks	0.0336 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 1.27; **Pedigree matrix:** [1, 2, 5, 1, 3]

Zinc II	non-urban air or from high stacks	3.33e-05 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 2.31; **Pedigree matrix:** [1, 2, 5, 1, 3]

Emissions to soil	Subcompartment	Amount
Cadmium II	agricultural	8.82e-07 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 1.33; **Pedigree matrix:** [1, 4, 5, 1, 1]

Lead II	agricultural	3.78e-06 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 1.33; **Pedigree matrix:** [1, 4, 5, 1, 1]

Zinc II	agricultural	0.00238 kg

Comment: Proxy, based on 'Agricultural Field Work Processes' - pdf-document on the dedicated talk page of ecoinvent (www.ecoinvent.org/talk-pages)
Uncertainty distribution: lognormal; **GSD2:** 1.33; **Pedigree matrix:** [1, 4, 5, 1, 1]

Selected Impact Assessment Results

Method	Category	Indicator	Score
Ecological Scarcity 2021	total	UBP	3.56e+5 UBP
EF v3.1	material resources: metals/minerals	abiotic depletion potential (ADP): elements (ultimate reserves)	0.00171 kg Sb-Eq
IPCC 2021	climate change: total (excl. biogenic CO2)	global warming potential (GWP100)	1.76e+2 kg CO2-Eq

Direct Impact Contributions

Ecological Scarcity 2021, total, UBP: 3.56e+5 UBP

Exchange	Amount	Impact (UBP)	Impact %
Carbon dioxide, fossil air - non-urban air or from high stacks	1.03e+2 kg	1.03e+5	28.93%
market for harvester GLO - harvester	6.3 kg	8.81e+4	24.74%
market for diesel CH - diesel	33.3 kg	6.32e+4	17.74%
Nitrogen oxides air - non-urban air or from high stacks	1.7 kg	5.61e+4	15.76%
Particulate Matter, < 2.5 um air - non-urban air or from high stacks	0.149 kg	2.38e+4	6.7%
shed construction CH - shed	0.00858 m2	1.13e+4	3.17%
Zinc II soil - agricultural	0.00238 kg	5.24e+3	1.47%
NMVOC, non-methane volatile organic compounds air - non-urban air or from high stacks	0.145 kg	1.74e+3	0.49%
Benzo(a)pyrene air - non-urban air or from high stacks	9.99e-07 kg	1.10e+3	0.31%
Dinitrogen monoxide air - non-urban air or from high stacks	0.004 kg	1.08e+3	0.3%
Carbon monoxide, fossil air - non-urban air or from high stacks	0.32 kg	5.12e+2	0.14%
Sulfur dioxide air - non-urban air or from high stacks	0.0336 kg	4.03e+2	0.11%
Zinc II air - non-urban air or from high stacks	3.33e-05 kg	1.57e+2	0.04%
Methane, fossil air - non-urban air or from high stacks	0.0043 kg	1.29e+2	0.04%
Copper ion air - non-urban air or from high stacks	5.66e-05 kg	96.2	0.03%

8 minor direct contributors have been omitted for clarity

EF v3.1, material resources: metals/minerals, abiotic depletion potential (ADP): elements (ultimate reserves): 0.00171 kg Sb-Eq

Exchange	Amount	Impact (kg Sb-Eq)	Impact %
market for harvester GLO - harvester	6.3 kg	0.00164	95.91%
shed construction CH - shed	0.00858 m2	4.74e-05	2.78%
market for diesel CH - diesel	33.3 kg	2.23e-05	1.3%

IPCC 2021, climate change: total (excl. biogenic CO2), global warming potential (GWP100): 1.76e+2 kg CO2-Eq

Exchange	Amount	Impact (kg CO2-Eq)	Impact %
Carbon dioxide, fossil air - non-urban air or from high stacks	1.03e+2 kg	1.03e+2	58.45%
market for harvester GLO - harvester	6.3 kg	40.5	22.97%
market for diesel CH - diesel	33.3 kg	29.9	16.95%
shed construction CH - shed	0.00858 m2	1.63	0.93%
Dinitrogen monoxide air - non-urban air or from high stacks	0.004 kg	1.09	0.62%
Methane, fossil air - non-urban air or from high stacks	0.0043 kg	0.128	0.07%

Source

First author	Nemecek, T.
Additional author(s)	Kägi, T., Blaser, S.
Title	Life Cycle Inventories of Agricultural Production Systems
Year	2007
Volume number	15

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