EXPERT OPINIONS

June 2022

AGRIBALYSE 3.1

AGRIBALYSE CHANGE REPORT 3.0.1/3.1/3.1.1

Change Report

REPORT

ADEME
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Abstract

AGRIBALYSE 3.1, is a French agricultural and food consumption Life cycle inventory (LCI) database. It is produced in the frame of the AGRIBALYSE program, which has been running since 2009 lead by ADEME and INRAE, with the support of numerous organizations and experts.

AGRIBALYSE is providing LCIs for 2500 food items registered in CIQUAL, the national nutritional database (ANSES, 2017), with similar ID number and boundaries, enabling consistent connections between nutritional and environmental properties.

In October 2022, AGRIBALYSE 3.1 was released after the previous AGRIBALYSE 3.0.1. This report describes the changes that have been made leading to the release of AGRIBALYSE 3.1.

In June 2023, AGRIBALYSE 3.1.1 corrective patch was published in order to correct certain specific points ahead of the publication of version 3.2, scheduled for 2024.

Résumé

AGRIBALYSE 3.1, est une base de données française d'inventaires de cycle de vie (ICV) de produits agricoles et de consommation alimentaire. Elle est produite dans le cadre du programme AGRIBALYSE, mené depuis 2009 par l'ADEME et l'INRAE, avec le soutien de nombreux organismes et experts.

AGRIBALYSE fournit les ICVs de 2500 produits alimentaires enregistrés dans CIQUAL, la base de données nutritionnelle nationale (ANSES, 2017). Chaque aliment possède un numéro d'identification et des limites similaires, permettant de réaliser des liens cohérents entre les propriétés nutritionnelles et environnementales.

En octobre 2022, AGRIBALYSE 3.1 a été publié succédant à la version AGRIBALYSE 3.0.1. Ce rapport décrit les changements qui ont été réalisés et qui conduisent à la sortie d'AGRIBALYSE 3.1.

En juin 2023, un patch correctif AGRIBALYSE 3.1.1 a été publié afin de corriger certains points spécifiques en amont de la publication de la version 3.2, prévue courant 2024.

1 Introduction

The Agribalyse 3.0 database was released in September 2020, and was soon updated to version 3.0.1 with some corrections. In October 2022, version 3.1 was released, with many corrections and improvements as presented in this document.
The scientific documentation available on the Agribalyse[1] website has also been updated.
These changes mainly include methodological improvements within targeted data (work in connection with technical centres and institutes), the inclusion of additional data, the updating of background library data (Ecoinvent and WFLDB), and the correction of errors from version 3.0.1.

Several errors relating to inventories or methodological aspects have been corrected. The main corrections are detailed in the "corrections" sub-chapters.

2 General or methodological updates

2.1 Background data updates

Data copied from other databases and used in the background by Agribalyse has been updated:

- Ecoinvent 3.5 data has been updated to Ecoinvent 3.8 – some data copied from Ecoinvent 3.5 has therefore become obsolete, replaced by new versions.
- WFLDB 3.1 data has been updated to WFLDB 3.5 – the background for WFLDB 3.5 data has also been updated and uses Ecoinvent 3.8 data, not Ecoinvent 3.5 data.

2.2 CIQUAL code updates

The CIQUAL database was updated in 2020, with the deletion or modification of certain CIQUAL products and codes.
Agribalyse version 3.1 is now based on this version of the CIQUAL database, with the following changes:

- **CIQUAL codes modified as a result of the update to the CIQUAL 2020 database:**

CIQUAL 3.0	AGB 3.0 name	CIQUAL 3.1	AGB 3.1 name
25004	Sauerkraut, without garnish, drained	25220	Sauerkraut, without garnish, drained, cooked
19049	Milk, semi-skimmed, vitamin fortified, UHT	19037	Milk, semi-skimmed, vitamin D fortified, UHT
23020	Rum baba, prepacked	19688	Rum baba, prepacked
13079	Tamarind, immature fruit, pulp, raw	13080	Tamarind, mature fruit, pulp, raw
26204	European plaice, raw	26055	European plaice, raw

- **Products removed as a result of the update to the CIQUAL 2020 database:**

CIQUAL 3.0	AGB 3.0 name	Outcome
19537	Dairy drink or fermented milk or yogurt, plain, with sugar	Deleted
11020	Grey pepper, powder	Deleted
76008	Mineral sparkling water (Auvergne), bottled, strongly mineralized	Deleted

[1] https://doc.agribalyse.fr/documentation/documentation-complete

76040	Mineral sparkling water (Soultzmatt), bottled, averagely mineralized	Deleted
76064	Mineral still water (Caramulo), bottled, very lightly mineralized	Deleted
76068	Mineral still water (Highland spring), bottled, lightly mineralized	Deleted
76077	Mineral still water (Talians), bottled, strongly mineralized	Deleted
76073	Mineral water (San Benedetto), bottled, lightly mineralized	Deleted
23403	Pizza pastry base	Deleted
28478	Pork, rind, raw	Deleted
18032	Soft drink, carbonated, without fruit juice, reduced sugar	Deleted
30118	Swiss sausage, intended to be cook	Deleted
16735	Vegetable fat (margarine type), spreadable, 30-40% fat, light, unsalted, with plant sterols esters	Deleted
5203	Wine, red, 10°	Deleted, replaced by CIQUAL 5214 "Wine, red"
5204	Wine, red, 11°	
5205	Wine, red, 12°	
5208	Wine, red, 13°	
5211	Wine, white, dry, 11°	Deleted, replaced by CIQUAL 5215 "Wine, white, dry"
5200	Wine, white, 11°	
5206	Wine, rose, 11°	Deleted, replaced by CIQUAL 5216 "Wine, rosé"

- **Agribalyse codes (adapted from CIQUAL codes) amended for 3.1:**

CIQUAL 3.0	AGB 3.0 name	CIQUAL 3.1	AGB 3.1 name
13014_3	Strawberry, raw	13014_1	Strawberry, raw
13014_1	Strawberry in season, raw	13014_2	Strawberry, in-season, raw
13014_2	Strawberry off season, raw	13014_3	Strawberry, off-season, raw
13090	Mandarin, pulp, raw	13024_1	Mandarin, pulp, raw
13082	Clementine, pulp, raw	13024_2	Clementine, pulp, raw
13025_2	Mango, pulp, raw	13025_1	Mango, pulp, raw
13025_1	Mango by plane, pulp, raw	13025_2	Mango, pulp, raw (Brazil by plane)
20047_3	Tomato, raw	20047_1	Tomato, raw
20047_1	Tomato, in season, raw	20047_2	Tomato, in season, raw
20047_2	Tomato, off season, raw	20047_3	Tomato, off season, raw
20061_2	French bean, raw	20061_1	French bean, raw
20061_1	French bean by plane, raw	20061_2	French bean, raw (Kenya by plane)
25415	Cheeseburger, double, from fast foods restaurant	25415_1	Cheeseburger, double, from fast foods restaurant
7815	Wheat tortilla wrap, to be filled	7815_1	Wheat tortilla wrap, to be filled
9340	Quinoa, raw	9340_1	Quinoa, raw
9341	Quinoa, boiled/cooked in water, unsalted	9341_1	Quinoa, boiled/cooked in water, unsalted

2.3 Integration of the OLCA-Pest model

In version 3.0.1, across all agricultural data (Agribalyse and data copied from Ecoinvent and WFLDB), it is considered that 100% of the active ingredients used for plant protection are emitted into the soil (Ecoinvent model).
The OLCA-Pest[2] model was published in 2021 in order to improve the representativeness of active ingredient emissions into air, water, soil and plants by crop type. This model has been integrated into Agribalyse agricultural data, a task undertaken in collaboration with Ecoinvent. The integration of the model into the data is further described in the specific Agribalyse[3] agricultural data report.
This integration into Agribalyse does not affect the data copied from Ecoinvent and WFLDB, which will be updated with this model in the near future.

2.4 Integration of carbon storage/removal values in soils

In version 3.1, carbon storage and removal associated with changes in land use and agricultural practices was integrated into Agribalyse data for permanent and temporary field crops and grasslands. The data used for this integration is from INRAE's 4 per 1000 study[4]. The integration of these values into the inventories is described more precisely in the specific report on Agribalyse agricultural data[5].

2.5 Emission model update

2.5.1 N2O model update

N2O emissions have been updated on MEANS-InOut by replacing the IPCC 2006 model with the IPCC 2019 model.
Nitrogen inputs from mineral, organic fertilisers and crop-residue nitrogen produce both direct and indirect N2O emissions. The N2O emission factors of the IPCC 2019 model depend on the location of the product. This is correlated with climate (temperate or tropical). The IPCC 2019 model generally attributes a humid climate to France. The IPCC 2019 model defines a humid climate zone as follows: (1) in temperate and boreal areas, where potential evapotranspiration >1 and (2) in tropical areas, where annual precipitation >1000 mm.

A presentation of the evolution of N2O emission factors can be consulted in the tables in Annex 1

2.5.2 NH3 model update concerning fruit and vegetable LCIs

The NH3 Emep 2006/2009 model was replaced by Emep 2016. The modified LCIs are presented in Annex 2.

2.6 Organic fertiliser update (emission factor and N content)

The MAFOR project has proposed new references for organic fertilisers. These references have been used in MEANS-InOut through an organic fertiliser update. This update involves the following potential changes:

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[2] Thomas Nemecek, Assumpció Antón, Claudine Basset-Mens, Céline Gentil-Sergent, Christel Renaud-Gentié, et al. Operationalising emission and toxicity modelling of pesticides in LCA: the OLCA-Pest project contribution. International Journal of Life-Cycle Assessment, Springer Verlag, 2022
[3] Koch P. and Salou T., 2020. AGRIBALYSE®: Methodological Report-Agriculture Component Version 3.0; initial version v1.0 2014. Ed ADEME, Angers, France. 319 p.
[4] Sylvain Pellerin et al. 2020. Stocker du carbone dans les sols français, Quel potentiel au regard de l'objectif 4 pour 1000 et à quel coût ? Rapport scientifique de l'étude, INRA (France), 540 p.
[5] Koch P. and Salou T., 2020. AGRIBALYSE®: Methodological Report-Agriculture Component Version 3.0; initial version v1.0 2014. Ed ADEME, Angers, France. 319 p.

- Change in the fertilisers' total N content
- Change in the fertilisers' ammoniacal N content
- Change in the ammonia emission factor associated with these fertilisers.

The table in Annex 3 lists the changes made relating to the organic fertilisers referenced in MEANS-InOut. The changes are highlighted in grey.
Annex 3 lists the LCIs affected by changes relating to organic fertilisers.

In AGRIBALYSE 1, the quantities of organic fertiliser used for crops were based on total nitrogen inputs. Thus, in all the technical itineraries of AGRIBALYSE 1, the quantities of fertiliser used were modified so as to recover the total nitrogen input initially targeted. Thus, this update has potential consequences for ammonia emissions, but the consequences for other nitrogen emissions have been reduced.

The most important changes are:
- Dry and pasty sewage sludge: decrease in total TAN/N ratio and decrease in ammonia emission factor ➔ less NH3 emission per kg of total N added
- For all organic fertilisers not derived from livestock production, an emission factor of "miscellaneous liquid = 0.4" or "miscellaneous solid = 0.81" was used. The source of this emission factor is not documented in AGRIBALYSE 1 (methodological report, processing chain...). The MAFOR project proposes to replace it with a factor = 0.066 kg of N_NH3 emitted per kg of TAN (or 0.08 kg of NH3 emitted per kg of TAN); this factor is derived from EMEP (2019) recommendations. This will greatly reduce NH3 emissions from vegethumus fertilisers, feather meal, sugar factory lime refuse, etc.

2.7 Correction of land occupation flows

Some land occupation and transformation flows used in Agribalyse 3.0.1 were not characterised by calculation methods (e.g. EF 3.0), resulting in negative impacts (particularly for greenhouse products). These flows have been corrected: replacing "occupation, /transformation from, /transformation to, heterogeneous, agricultural" with "occupation, /transformation from, /transformation to, annual crop, greenhouse" for greenhouse data and replacing "occupation, /transformation from, /transformation to, heterogeneous, agricultural" flows with "occupation, /transformation from, /transformation to, unspecified, used" for field operations.

2.8 Correction of nitrogen fertiliser data

In version 3.0.1, a phosphate fertiliser ("Ammonium nitrate phosphate (ANP), as P2O5, at plant (WFLDB)/RER U" entry) was used instead of a nitrogen fertiliser ("Ammonium nitrate phosphate (ANP), as N, at plant (WFLDB)/RER U" entry) in average nitrogen fertiliser data ("Average mineral fertiliser, as N, at regional storehouse/FR U" and "Ammonium nitrate, as N/FR U" entries) but also in plant data (e.g. "Soft wheat grain, conventional, protein improved quality, 15% moisture, at farm gate/FR U" entry).
These mismatches were corrected in version 3.1 by calling up the nitrogen fertiliser data (see the relevant LCIs in Annex 2). These changes result in an increase in the impacts of agricultural products, with the manufacture of nitrogen synthetic fertiliser having more impact than the manufacture of phosphate synthetic fertiliser.

2.9 Elimination of negative emissions of heavy metals (interim approach)

In version 3.0.1, the SALCA-M model used in agricultural data (Agribalyse, Ecoinvent, WFLDB) to represent heavy metal flows at plot level sometimes had negative flow balances. These balances could have a negative impact on impact indicators such as ecotoxicity or human toxicity, in relation to very high emission factors for some ingredients in the calculation methods used (EF 3.0). Pending improvement of the SALCA-M models and emission factors in the calculation methods, negative heavy metal flows in agricultural data have been set to zero (temporary approach for version 3.1). Where appropriate, this is mentioned in the comments on the relevant flows.

2.10 Miscellaneous corrections

	Correction made
Documentation	Correction of the percentage for anaerobic digestion and industrial composting at the supermarket stage
Documentation	Correction of the documentation on end-of-life transport packaging at the consumer stage

3 Changes to upstream agricultural data

3.1 Improvements

3.1.1 Improvement and addition of amino acid data

Version 3.0.1 included 5 amino acid manufacturing data entries modelled under the Ecoalim programme: lysine, methionine, threonine, tryptophan and valine, which were used in animal feed rations. This modelling was based on production inventories submitted by Ajinomoto (an amino acid manufacturer) in 2012.

For version 3.1, METEX-Noovistago (formerly Ajinomoto) provided Agribalyse with inventories from a Life-Cycle Assessment of its amino acids, carried out in 2018 and validated by a critical review,

In total there are eight new amino acids: lysine HCl, liquid lysine, tryptophan, valine, arginine, isoleucine, leucine, histidine. These representative inventories of certain production areas were also duplicated and adapted to correspond to other production regions, in order to produce consumption mixes representing average amino acids on the French market. Finally, a proxy was used to render the production of two amino acids whose inventories were unavailable: lysine sulphate, approximated using lysine HCl, and histidine, approximated using arginine.

In order to respect the confidentiality of the amino acid manufacturing data provided, these have been aggregated (available only in the “System” version). As regards consumption mixes, these were constructed on the same model as food consumption mixes (at least 70% of the French supply, adjusted to 100%, on the basis of market data provided by METEX-Noovistago).

3.1.2 Distinction of certain production mixes between season / off-season

In version 3.0.1, only tomatoes and strawberries had different seasonal and off-season consumption mixes (differences in origin and production patterns). In version 3.1, the consumption mixes of cucumber and aubergine were also distinguished to adapt the agricultural production data used:

- For cucumber, the off-season mix now uses data for cucumber production under a heated greenhouse (Ecoinvent data used in Agribalyse 3.0.1) while the seasonal mix uses, as a

proxy, French tomato production data, since it has a production mode similar to cucumber (CTIFL recommendation). The off-season cucumber consumption mix is used for the "industrial" cucumber subsequently used in recipes, and the seasonal cucumber consumption mix is used for raw cucumber products.

- For aubergine, the Ecoinvent data used in Agribalyse 3.0.1 represented production in a heated greenhouse. In Agribalyse 3.1, only a mix of seasonal aubergine consumption is used (for the raw aubergine product) and by proxy French courgette agricultural production data due to its similar production mode (CTIFL recommendation).

These changes did not result in any changes to CIQUAL products (codes identical to version 3.0.1).

3.1.3 Improvement of certain imported product inventories

Several exotic commodities in the database have been improved with CIRAD's recommendations on the most common practices and their better representation within the LCA. All recommendations are in the specific report[6] available on the Agribalyse documentation website. The following improvements have been implemented for Agribalyse 3.1:

- **Almond**: a different proxy was used to better represent practices for the relevant supply areas, resulting in a reduced impact.
- **Pineapple**: for pineapple from Costa Rica, data representing production in that country was used instead of a global proxy. As a result of this change, the products' impact has increased.
- **Banana**: for the West Indies, bananas representing the entire production cycle were used, and for the other origins, data representative of the areas concerned was used instead of average data. This has reduced the products' impact.
- **Coffee**: the supply mix between Arabica and Robusta (and associated origins) has been adapted, resulting in a slight decrease in the products' impact.
- **Clementine**: the Agribalyse data on the Moroccan clementine was used instead of the Spanish mandarin, because it better represents observable practices in Spain, which leads to an increase in the product's impact.
- **Orange**: for some origins, a more representative proxy of practices in the targeted areas was selected, reducing the products' impact.
- **Orange juice:** data representing industrial oranges instead of fresh oranges was used, resulting in a reduced impact.
- **Brazilian soybean**: in order to better represent the impacts of deforestation on the supply of Brazilian soybeans, Ecoinvent soybeans (averaged over several production regions) are used for animal feed in Agribalyse livestock data.
- **Vanilla**: the data used, from Ecoinvent, has been adapted to better represent production in Madagascar (reduction in yield, mechanisation, and no change in land use). This change caused an increase in the single score impact of the products concerned, due to the fact that the initial data on vanilla had a negative impact on land use, linked to the change in land use.

In the medium term, other products may be improved as a result of CIRAD's recommendations.

[6] ACOSTA-ALBA Ivonne, BIARD Yannick, AVADI Angel, CIRAD, ACV-CIRAD Group. 2021. Analysis of inventories of agricultural raw materials imported from "southern countries" - AGRIBALYSE 3.0. 39 p.

3.1.4 Use of better agricultural proxies

As a result of the evolution of the databases used in the background, and the improvement or creation of certain data by Agribalyse partners, certain consumption mixes have been improved using products representing the appropriate agricultural production, or better proxies. The updated consumption mix is as follows (data used in parentheses):

- Black mulberry (Blackberry, WFLDB)
- Blackberries (Blackberry, WFLDB)
- Blueberries (Blueberry, WFLDB)
- Cranberries (Cranberry, WFLDB)
- Elderberries (Elderberry, WFLDB)
- Raspberries (Raspberry, WFLDB)
- Strawberry (Strawberry for processing, open field, conventional, Agribalyse)
- Grapefruit (Agribalyse)
- Pummelo (Grapefruit for juice, Agribalyse)
- Hazelnuts (Hazelnut, in shell, WFLDB)
- Mushroom (Agaricus bisporus mushroom, WFLDB)
- Parsley (Parsley, fresh, WFLDB)
- Pepper - renamed Green bell pepper (Bell pepper, Ecoinvent)
- Radish (Radish, Ecoinvent)
- Red cabbage (Cabbage red, Ecoinvent)
- White cabbage (Cabbage white, Ecoinvent)
- All spices: Turmeric, Saffron, Fenugreek, Curry, Cumin, Cloves, Cinnamon, Cardamom, Caraway (using Agribalyse's "Black pepper, dried" data instead of Ecoinvent's data on Vanilla)
- Quinoa (Quinoa, intensive production, WFLDB)
- Maize grain (Maize grain, conventional, 28% moisture, national average, Agribalyse)
- Norway lobster – renamed Lobster, consumption mix/FR U (Agribalyse)
- Salmon - renamed Salmon, fillet, raw, consumption mix/FR U (Agribalyse)
- Honey (Honey, WFLDB)

3.1.5 Improvement of the electricity generation mix used for banana production in the West Indies

The electricity generation mix used for banana production in the French West Indies has been updated, taking into account the specificities of Martinique and Guadeloupe on the basis of the composition of the local electricity generation mix (data provided by INRAE - "MOISA team"). These changes result in an increase in the overall impact of the banana due to the composition of the electricity generation mix.

3.2 Corrections

3.2.1 Alfalfa inventory correction

LCI concerned: Alfalfa, conventional, for animal feeding, at farm gate/FR U

The technical itinerary data used to generate this LCI have been modified: the quantity of crop residues (stems and leaves) was corrected. This quantity is now estimated from the yield of the last year of production and not from all 3 years of production. The quantity of crop residues related to collars and roots was not modified. This will reduce N2O emissions from crop residues (in addition to the reduction from the change in emission factor).

3.2.2 Carrot, with water footprint inventory correction

LCI concerned: Carrot, conventional, main season, Aquitaine, with water footprint, at farm gate/FR U

The *Nature input* flow, "Water, river 4000 m3" has been removed.

Rationale:

In this inventory there were initially two irrigation flows: Water river 4000 m3 and Water river 3409.5 m3. The Carrot, conventional, main season, Aquitaine, with water footprint, at farm gate/FR U inventory was obtained by copying the Carrot, conventional, main season, Aquitaine, at farm gate/FR U (without water footprint) inventory, with modification of water flows. And in this Carrot, conventional, main season, Aquitaine, at farm gate/FR U (without water footprint) LCI there is already a Water river 4000 m3 flow.

Comment from the author of the data (Dominique Grassely): "There is indeed one too many, I'm inclined to think it's the 4,000 that needs to be removed."

3.2.3 Organic wine grape inventory correction

in the LCI	reference flow replacement	by
Grape, organic, PDO, dry white wine, system number 1, at vineyard gate/FR U	483,750 kg	450,000 kg
Grape, organic, PDO, dry white wine, system number 2, at vineyard gate/FR U	316050 kg	294000 kg
Grape, organic, PDO, dry white wine, system number 3, at vineyard gate/FR U	222750 kg	202500 kg
Grape, organic, PDO, dry white wine, system number 4, at vineyard gate/FR U	173250 kg	157500 kg
Grape, organic, PDO, dry white wine, system number 5, at vineyard gate/FR U	74250 kg	67500 kg

Rationale:

Error in yield calculation: the average yield calculated over productive years is also applied over non-productive years. Taking as an example "Grape, organic, PDO, dry white wine, system number 1, at vineyard gate/FR U": it is considered in the LCA data that the plot produces 43*11,250 kg of grapes, i.e. 43 productive years with a yield of 11,250 kg/ha/year. However, the 43-year lifespan normally concerns productive + non-productive years, and 11,250 kg/ha corresponds to the yield of productive years. Normally, the output of this LCA data should thus be 40*11,250: 40 productive years + 3 non-productive years.

System 2: replacement of 43 productive years by 40 at 7,350 kg/ha/year of yield

System 3: replacement of 33 productive years by 30 at 6,750 kg/ha/year of yield

System 4: replacement of 33 productive years by 30 at 5,250 kg/ha/year of yield

System 5: replacement of 33 productive years by 30 at 2,250 kg/ha/year of yield

3.2.4 Conventional pear inventory correction

in the LCI	replacement of the orchard life stage	by
Pear, conventional, at orchard/FR U	Apple and Pear seedlings, conventional, at production site/FR U	Pear, plantation and destruction, conventional (phase), at orchard/FR U

Rationale: among perennial productions, the conventional pear LCI was one of the few that did not have a "planting and destruction" phase. In addition, this phase of orchard life was described in MEANS-InOut, and the Pear, plantation and destruction, conventional (phase), at orchard/FR U inventory was present in the AGRIBALYSE database. This replacement therefore corrects a mistake in the Pear, conventional, at orchard/FR LCI

3.2.5 Miscellaneous corrections

Nomenclature corrections:
Some names have been updated in the new version of Agribalyse 3.1. The new names are listed in the following table:

Initial name	New name
Squash, autumn, under tunnel, conventional, at farm gate/FR U	Zucchini, autumn, under tunnel, conventional, at farm gate/FR U
Squash, conventional, national average, at farm gate/FR U	Zucchini, conventional, national average, at farm gate/FR U
Squash, national average, at farm gate/FR U	Zucchini, national average, at farm gate/FR U
Squash, open field, conventional, at farm gate/FR U	Zucchini, open field, conventional, at farm gate/FR U
Squash, seedling for autumn protected crop, conventional, at production site/FR U	Zucchini, seedling for autumn protected crop, conventional, at production site/FR U
Squash, seedling for springtime protected crops, conventional, at production site/FR U	Zucchini, seedling for springtime protected crops, conventional, at production site/FR U
Squash, seedling for sprintime protected crop, organic, at production site/FR U	Zucchini, seedling for sprintime protected crop, organic, at production site/FR U
Squash, seeds, conventional, at farm gate/FR U	Zucchini, seeds, conventional, at farm gate/FR U
Squash, springtime, under tunnel, conventional, at farm gate/FR U	Zucchini, springtime, under tunnel, conventional, at farm gate/FR U
Squash, springtime, under tunnel, organic, at farm gate/FR U	Zucchini, springtime, under tunnel, organic, at farm gate/FR U
Pear, first production years, organic (phase), at oprchard/FR U	Pear, first production years, organic (phase), at orchard/FR U
Autumn- Winter leek seedling, conventional, at production site/FR U	Autumn- Winter leek seedling, conventional, at production site/NL U
Leek, early seedling, conventional, at production site/FR U	Leek, early seedling, conventional, at production site/MA U

Other corrections

Step	Correction made
Agricultural	Hemp straw: correction of CO2 streams, and hemp by-products: correction of economic allowances
Consumption mix	"Palm": clarified as "Palm heart"
Consumption mix	"Apricot, pitted, dried", "Raisin", "Prune", "Fig, dried": correction of the drying process and release quantities
Consumption mix	Adaptation of the mix to distinguish between 2 mixes: Asian algae / French algae
Consumption mix	"Poppy" (vanilla proxy) replaced by "Poppy seed" (linen proxy)

3.3 News agricultural product data

3.3.1 Addition of Meadow and Beef Cattle inventories from the organic LCA project

In Annex 4, the table presents the list of inventories from organic farming for meadows and beef cattle from the organic LCA project. These inventories have been incorporated into the Agribalyse 3.1 update

3.3.2 New Lupin inventory (Ecoalim)

We created new LCIs on Means-InOut from data provided by Terre Inovia (data created for Ecoalim) which were then added to the list of products on Agribalyse. These LCIs are listed in the table below:

Lupin, conventional, national average, at farm gate, production/FR U
Winter lupin, 2013, conventional, national average, at farm gate, production/FR U
Winter lupin, 2015, conventional, national average, at farm gate, production/FR U
Spring lupin, 2013, conventional, national average, at farm gate, production/FR U
Spring lupin, 2015, conventional, national average, at farm gate, production/FR U

3.3.3 Inventory replacement (Alfalfa)

The following processes have been updated by changing the raw data from which they are derived:

AGRIBALYSE 3.0 process	Name of the 3.1 "replacement" LCI
Alfalfa, conventional, for dehydration, animal feed, at farm gate, production/FR U	Alfalfa, conventional, for dehydration, animal feed, at farm gate, production/FR U
Dehydratation of alfalfa, processing/FR U	Dehydratation of alfalfa, new energies, processing/FR U
Alfalfa, dehydrated, conventional, at feed plant/FR U	Alfalfa, dehydrated, with new energies process, conventional, at feed plant/FR U

This work was carried out on the basis of work by Pascal Thiébeau (INRAE) with Luzerne de France on data representing more than half of the production of dehydrated alfalfa in France, over the period 2016-2019 (data collection, modelling of the average technical route, average energy mix of dehydration). The LCIs were generated by the MEANS team. The likelihood of differences in environmental impacts between the two versions was verified by Aurélie Wilfart.

3.3.4 New inventories

Seven agricultural inventories were added in version 3.1 by Gingko21. Information on these products (scope, modelling hypotheses, outcomes...) can be found in the specific reports [7] : "Specific reports of 7 agricultural production inventories, Gastaldi, Gingko21, 2022, 90p."
The added inventories are:

Beetroot for juice, conventional, at farm gate/FR U
Black pepper, conventional, at farm gate/VN U
Chicory roots, conventional, at farm gate/FR U

[7] https://doc.agribalyse.fr/documentation/documentation-complete

Kiwi FR, conventional, national average, at orchard/FR U
Quinoa FR, conventional, at farm gate/FR U
Grapefruit for juice, conventional, at farm gate/US U
Salmon farmed, conventional, at farm gate/NO U

4 Amendments to the stages concerning agri-food products

4.1 Improvements

4.1.1 Improved milling product inventories

Based on the recommendations of the ANMF (National Association of French Milling), certain milling products have been improved:

- Improved recipes: margarine was removed from bread recipes and the amount of water in the rye bread recipe was adjusted,
- Improved package weights for certain milling products: 5 g for a bag of baguette bread, packaging of flour and bran in paper instead of plastic and cardboard respectively (10 g per bag),
- For wheat bran: use of milling wheat bran data instead of starch residue.

4.1.2 Improved dairy product inventories

Several types of dairy product have been improved thanks to ACTALIA's recommendations:

- **Cheese:** in version 3.0.1, all types of cheese were based on 6 pieces of ACYVIA data (cow/goat/ewe milk cheeses, each one distinguished between soft and hard). For version 3.1, this data was duplicated to create an entry for each cheese, and the cheese yields (kg milk/kg cheese) were adapted for each. By-product quantities and associated allowances have also been updated accordingly.
- **White cheese:** In version 3.0.1, all types of white cheese were based on data from Ecoinvent. This data was duplicated to obtain one entry per cottage cheese with an appropriate yield (kg milk/kg cottage cheese). Furthermore, for all of them, the milk used was adapted (French average milk instead of world milk), the processing electricity was also adapted (electricity from the French network), and ingredients besides milk were removed (fruit, grains, etc.)
- **Cream:** the data representing types of cream is based on the same Ecoinvent data as used for white cheeses. The same adaptations have therefore been made.
- **Butter:** in version 3.0.1, all types of butter are based on WFLDB data (unsalted butter and salted butter). This data was duplicated to obtain one entry per butter with a suitable yield (kg milk/kg butter). The quantities of by-products and associated allowances were also adjusted. As with white cheeses, the milk used was adapted (French milk instead of world milk) and the electricity was also adapted (French network). Finally, an extra "cream" input has been removed.
- **Milk:** in version 3.0.1, all types of milk were derived from ACYVIA data on pasteurised milk. For version 3.1, this milk pasteurisation data has been duplicated to distinguish whole milk, semi-skimmed milk, and skimmed milk (yield in kg milk in input/kg milk in output). In addition, transport between the farm and the creamery has been taken into account by calling up the consumption mix instead of milk exiting the farm, in the pasteurisation data. This consumption mix has been updated to adapt the milk transport

distance (75km per lorry) to replace the generic EFP (Environmental Farm Plan) model used previously, and using a refrigerated mode of transport.

- **Concentrated milk:** in version 3.0.1, concentrated milk was based on data from the WFLDB. This figure has been adapted by calling up average French milk instead of world milk.
- **Milk powder:** in version 3.0.1, concentrated milk was based on data from the WFLDB. This data has been adapted by calling up average French skimmed milk instead of world milk and adapting the yield (kg milk/kg concentrated milk).
- **Mixed fat:** recipes were adjusted using adapted butter instead of an average butter.

These adjustements resulted in a change in the impacts of these products: the use of French milk compared to world milk and the adaptation of the yields of generic data have led to an overall reduction in the impact of products such as butter, yoghurt and cream. For cheese and milk, the adaptation of yields (higher or lower than generic yields) has led to increases or reductions in impact depending on the product.

4.1.3 Improved edible fractions of certain fruit and vegetables

The inedible fractions of several fruit and vegetables (including tropical products such as bananas) have been updated to better represent the impacts of peeling losses (concerning consumers or, for processed products, industry). Loss percentages have been updated in Annex 2 of the Food methodological report[8].

4.1.4 Improved canning and freezing data

As part of the re-modelling of certain products (see below), the CTCPA (Technical Centre for the Conservation of Agricultural Products) was able to model canning and deep-freezing processes specific to certain types of products. These processes could be used for the database's frozen and canned products. Added processes include:

- Canning corn
- Canning fruits or vegetables
- Canning ready meals
- Canning root vegetables
- Canning sardine or mackerel
- Canning tuna
- Canning vegetables

These processes are described in more detail in the data-specific report[9].

4.1.5 Improved data on storage times and losses at the distribution and supermarket stages

As part of the re-modelling of certain products (see Table 1), the CTCPA was able to provide recommendations on the storage times and methods of certain products, as well as the associated loss percentages. These improvements are also described in more detail in the data-specific report.

[8] https://doc.agribalyse.fr/documentation/documentation-complete

[9] COLOMBIN Margaux, AUDOYE Pauline, FARRANT Laura, LABAU Marie-Pierre, CTCPA, July 2022. Rapport Méthodologique pour les produits élaborés CTCPA AGRIBALYSE V3.1 : INVENTAIRES PRODUITS, PROCEDES ET DONNEES SUR LES PERTES ET LE STOCKAGE. 79 pages.

4.1.6 Improved drying process data for dried herbs and fruit

In version 3.0.1, the drying of herbs did not take into account the yield (kg dried herb/kg herb before drying) – this was amended in version 3.1 taking into account a methodology similar to that of fruit (quantity of water contained in the products according to CIQUAL). Since mint is used as a proxy for herbs, the amount of water for mint was taken into account for the yield of all herbs. It was considered that all herbs were dried by passive drying (the "sun drying" dummy process). For fruit, yields were also updated with this methodology.

4.1.7 Improved data on several products by Agribalyse partners and external contributors

Some products have been improved by Agribalyse partners and consulting firm Gingko21 with regards to their qualities. Information on these products (scope, modelling hypotheses, outcomes, etc.) can be found in the specific methodological reports available on the documentation website[10].

Data modifier	French name	English name	CIQUAL
CTCPA	Haricot vert, appertisé, égoutté	French bean, canned, drained	20062
	Haricot vert, surgelé, cuit	French bean, frozen, cooked	20071
	Maïs doux, appertisé, égoutté	Sweet corn, canned, drained	20066
	Pâtes à la bolognaise (spaghetti, tagliatelles…)	Bolognese-style pasta (spaghetti, tagliatelle…)	25085
	Petit salé ou saucisse aux lentilles, préemballé	Salt-cured pork belly with lentils	25010
	Petits pois, appertisés, égouttés	Garden peas, canned, drained	20036
	Ravioli à la viande, sauce tomate, appertisé	Ravioli filled with meat, in tomato sauce, canned	25019
	Sardine, à l'huile, appertisée, égouttée	European pilchard or sardine, in oil, canned, drained	26034
	Thon albacore ou thon jaune, au naturel, appertisé, égoutté	Yellowfin tuna, canned in brine, drained	26181
	Truite d'élevage, fumée	Trout, farmed, smoked	27029
ITERG	Huile combinée (mélange d'huiles)	Combined oil (blended vegetable oils)	17700
	Huile combinée, mélange d'huile d'olive et de graines	Combined oil (mix of olive oil and seeds oil)	17701
	Huile d'arachide	Peanut oil	17040
	Huile de colza	Rapeseed oil	17130
	Huile de lin	Linseed oil	17180
	Huile de noisette	Hazelnut oil	17210
	Huile de palme raffinée	Palm oil, refined	16150
	Huile de pépins de raisin	Grapeseed oil	17350
	Huile de soja	Soy oil	17420
	Huile de tournesol	Sunflower oil	17440
	Huile d'olive vierge extra	Olive oil, extra virgin	17270

[10] https://doc.agribalyse.fr/documentation/documentation-complete

	Huile pour friture, sans précision	Frying oil	16128
GINGKO 21	Boisson à base d'avoine, nature, préemballée	Oat-based drink, plain, prepacked	18905
	Boisson à l'amande, nature, non sucrée, non enrichie, préemballée	Almond drink not sweet, not fortified, prepacked	18107
	Boisson au soja, nature, non enrichie, préemballée	Soy drink, plain, prepacked	18900
	Boisson cacaotée ou au chocolat, instantanée, sucrée, prête à boire (reconstituée avec du lait demi-écrémé standard)	Instant cocoa or chocolate beverage, with sugar, ready-to-drink (reconstituted with standard semi-skimmed milk)	18104
	Bonbon dur et sucette	Hard candy and lollipop	31059
	Bonbon gélifié	Jelly candy	31060
	Bouillon de légumes, déshydraté reconstitué	Broth, stock or bouillon, vegetables	25948
	Chicorée, poudre soluble	Chicory, powder, instant	18152
	Escargot en sauce au beurre persillé, préemballé, cuit	Snail in parsley butter, cooked	10042
	Guimauve ou marshmallow	Candies, marshmallows	31050
	Jus multifruit - base orange, multivitaminé	Mixed fruits juice, orange based, multivitamin	2011
	Kiwi, pulpe et graines, cru	Kiwi fruit, pulp and seeds, raw	13021
	Pain, sans gluten	Bread, gluten free	7130
	Pâtes sèches, sans gluten, crues	Dried pasta, gluten-free, raw	9874
	Poivre noir, poudre	Black pepper, powder	11015
	Saumon fumé	Salmon, smoked	26037
	Saumon, bouilli/cuit à l'eau, élevage	Salmon, boiled/cooked in water, farmed	26217

Table 1 Improved food inventories in version 3.1

As part of the canned and frozen products enhanced by the CTCPA, specific canning/deep-freezing processes were also reused for other canned/frozen products in the database.

4.2 Corrections

4.2.1 Correction of products delivered in “ambient” storage

Products in “ambient” storage had errors in energy and water consumption and refrigerant emissions at the supermarket and distribution stages, related to an error in reversing storage times between short/medium/long ambient. Consumption has been adjusted to match the PEF model. The associated documentation (Asselin et al. 2022)[11] has also been corrected: Tables 31 and 34.

[11] Asselin-Balençon A., Broekema R., Teulon H., Gastaldi G., Houssier J., Moutia A., Rousseau, V., Wermeille A., Cornelus M., Colomb V. 2022. AGRIBALYSE v3.1: the French LCI database on Agriculture and Food. Methodology for the food products. Initial publication 2020. Agribalyse 3.1 update - October 2022.

4.2.2 Correction of storage and delivery type for certain data

Some products did not have the right type of storage and delivery at the supermarket and distribution stages (e.g. ambient instead of cold or vice versa). These entries have been corrected, the reference on the delivery type being Table 33 of the Agribalyse documentation (Asselin et al. 2022)[11].

In addition, the CTCPA also made recommendations on the delivery type of certain products, which have been implemented

4.2.3 Correction of package forming data

Products in the packaging stage using the plastic package forming process mistakenly called up two additional forming processes – steel and aluminium. Both processes have been deleted from the corresponding data.

4.2.4 Correction of paper packaging ratios

Packaging quantity/kg product ratios for paper-wrapped products were incorrect in the modelling (0.1 kg paper/kg product). They were corrected to match the initial assumptions (0.01 kg paper/kg product).

4.2.5 Correction of cooking time for fried products

In version 3.0.1 the cooking time for "pan-fried" products at low and high power had been switched. This has been corrected in the corresponding products.

4.2.6 Correction of packaging for legumes

Packaging for uncanned legumes has been updated (low-density polyethylene or LDPE instead of steel). In addition, consumer cooking has been removed for uncooked legumes.

4.2.7 Miscellaneous corrections

Step	Correction made
Transformation	Fresh sausage: deletion of pork double counting
Transformation	Apple juice, orange juice: adaptation of the amounts of energy required for the pasteurisation stage
Transformation	"Atlantic herring, smoked, plain": correction of the quantity of fish called up on input
Packaging	"Water, Bottled": removal of a package incorrectly called up
Recipes	"Croutons": Removal of duplicate inputs
Recipes	"Rye bread, and wheat": Replacement of 0.0555 g water/kg by 0.35 g water/kg
Recipes	"Bread, home-made, with flour for home-made bread preparation", "Bread, French bread, ball, 400", "Bread, French bread, baguette", "Bread, French bread, baguette, unsalted": removal of margarine
Recipes	"Biscuit (cookie), with vegetal fat": adaptation from "Biscuit (cookie), plain" recipe
Recipes	"Pizza, chicken": ham replaced with chicken
Recipes	"Black pudding (blood sausage)": replacement of two beef offal inputs with a pork offal input

Recipes	White chocolate: WFLDB recipe adopted (as with dark chocolate and milk chocolate)
Recipes	“Oat flakes”: creation of a recipe in which oat flour proxies for oat flake products. For the pre-cooked oat flake product, a cooking process has been added.
Recipes	"Peanut butter or peanut paste": addition of an industrial cooking process
Recipes	“Asian noodles, flavoured, dehydrated”: adaptation of the quantities of pasta called up
Recipes	Tomato concentrate: distinction made between a concentrate recipe and a double concentrate recipe (adapted from WFLDB recipes) and adaptation of the quantities of tomatoes called up on input
Recipes	“Fish burger, fast food restaurant”, “Surimi, filled w/ cheese” and “Surimi, on sticks, in slices or grated, crab flavour”: addition of fish fillet as an ingredient instead of an empty ingredient
Consumption	“Spring still water (Cristaline)”: addition of the energy consumption under cool storage
Consumption	“Lemonade”: elimination of the addition of water by consumers (already counted upstream)
All	Algae: correction of densities used (1 instead of 0.56)
All	Correction of raw-to-cook R2C parameters for cooked pasta and cooked chickpeas
All	Correction of inedible parts recorded for lamb rib, raw turkey thigh, scoter ball, scallop, red mullet and split pea

4.3 New food data

54 new products have been added in version 3.1 compared with version 3.0.1 (new CIQUAL codes). These products have been modelled by the partners of Agribalyse mentioned below. Information on these products (scope, modelling hypotheses, outcomes...) can be found in the specific methodological reports[12].
The products added are:

Data creator	**French name**	**English name**	**CIQUAL**
CTCPA	Carottes râpées, avec sauce, préemballées	Grated carrots	26257
ITERG	Bouchées ou émincé au soja et blé (ne convient pas aux véganes ou végétaliens), préemballé	Soy-based sliced	25224
	Boulette végétale au soja et/ou blé, préemballée	Plant-based ball with wheat and/or soybean, prepacked	25589
	Burger végétarien	Veggie burger	25415_2
	Escalope végétale ou steak à base de soja	Soy patty or vegetable escalope	20914
	Galette de céréales aux légumes (sans soja), préemballé	Cereal patty (without soybean)	25234

[12] https://doc.agribalyse.fr/documentation/documentation-complete

	Galette ou pavé au blé et soja (convient aux véganes ou végétaliens), préemballé	Plant-based patty or steak from wheat and soybean (vegan), prepacked	25593
	Galette ou pavé au soja et légumes, préemballé	Soy-based patty, plain (vegetable steak), prepacked	25596
	Haché végétal à base de soja, préemballé	Soy-based minced, prepacked	30181
	Huile d'avocat	Avocado oil	17100
	Nuggets soja et blé (convient aux véganes ou végétaliens), préemballé	Soybean and wheat-based nuggets (vegan)	25227
	Protéine de soja texturée	Soy protein, textured, rehydrated, from soy flour	20591_1
	Protéine de soja texturée, réhydratée	Soy protein, textured, dehydrated, from soy flour	20591_2
	Sauce végétale type bolognaise, préemballée	Vegetable Bolognese sauce	11219
	Saucisse végétale au blé ou seitan, préemballé	Plant-based sausage with wheat or seitan	25232
	Saucisse végétale au tofu (convient aux véganes ou végétaliens), préemballée	Plant-based sausage with tofu (vegan)	20337
	Seitan, préemballé	Seitan | Chilled | Cardboard | Pan frying | at consumer/FR	25598
	Spécialité végétale type jambon cuit, préemballée	Plant-based ham, prepacked	1030
	Tofu fumé, préemballé	Tofu, smoked	20912
	Wrap végétarien	Wheat tortilla wrap, to be filled	7815_2
GINGKO 21 (for reference see the document "Rapports spécifiques aux 50 nouveaux ICV créés, Gastaldi, Gingko21, 2022, 707 p.")	Boisson à la noix de coco, nature, préemballée	Coconut water	18907
	Boisson à la noix de coco, nature, préemballée	Coconut-based drink	18907
	Bouillon de boeuf, déshydraté reconstitué	Broth, stock or bouillon, beef	25930
	Bouillon de volaille	Broth, stock or bouillon, poultry	25947
	Coulis de fraise	Strawberry, coulis	0003
	Coulis de framboise	Raspberry, coulis	0004
	Crabe ou Tourteau, bouilli/cuit à l'eau	Crab, boiled/cooked in water	10025
	Homard, bouilli/cuit à l'eau	Lobster, boiled/cooked in water	10009
	Insecte (Mouche Soldat Noir)	Dried deffated black soldier fly protein	0005
	Jus d'ananas, à base de concentré	Pineapple juice, reconstituted from a concentrate	2000
	Jus d'ananas, pur jus	Pineapple juice, pure juice	2073

	Jus de betterave	Beetroot juice, pure juice	0001
	Jus de carotte, pur jus	Carrot juice, pure juice	2006
	Jus de citron, pur jus	Lemon juice, pure juice	2028
	Jus de fruits rouges	Mixed red fruits juice, pure juice	0002
	Jus de mangue, frais	Mango juice, fresh	2023
	Jus de pamplemousse (pomelo), pur jus	Grapefruit juice, pure juice	2027
	Jus de raisin, pur jus	Grape juice, pure juice	2016
	Jus de tomate, pur jus (aliment moyen)	Tomato juice, pure juice (average)	2053
	Jus d'orange, à base de concentré	Orange juice, reconstituted from a concentrate	2012
	Jus multifruit - base pomme, standard	Fruit juice, mixed - apple base, standard	2048
	Nectar d'abricot	Apricot nectar	2043
	Nectar de banane	Banana nectar	2366
	Nectar de mangue	Mango nectar	2370
	Nectar de pêche	Peach nectar	2371
	Nectar de poire	Pear nectar	2054
	Nectar d'orange	Orange nectar	2375
	Quinoa FR, cru	Quinoa FR, raw	9340_2
	Sirop d'agave	Syrup, agave	31089
	Sirop d'érable	Syrup, maple	31034
	Spécialité végétale type fromage à tartiner, au soja, préemballée	Plant-based spread-cheese type, with soybean, prepacked	1027
	Spécialité végétale type fromage en tranche, sans soja, préemballée	Plant-based cheese, without soybean, prepacked, sliced	1029_1
	Spécialité végétale type fromage râpé, sans soja, préemballée	Plant-based cheese, without soybean, prepacked, shredded	1029_2

Certain CIQUAL codes have been duplicated (_1 or _2) in the case where several versions of a product exist (e.g. vegetarian version of a non-vegetarian product).
For quinoa (CIQUAL 9340), the objective is to distinguish a product with French quinoa (product modelled by GINGKO21, bearing the suffix _2) from a product with an average quinoa (bearing the suffix _1). French quinoa was also used for CIQUAL's cooked quinoa product (CIQUAL 9341).

5 Corrections and improvements for Agribalyse 3.1.1 patch

In June 2023, an Agribalyse 3.1.1 patch was released to correct and improve certain specific points ahead of the release of Agribalyse 3.2 in 2024.

The corrections made are as follows:

Corrections made	Details of the operation	Data concerned
Correction of ICV representing Brazilian soya for animal feed	Creation of a LCI representing non-deforested Brazilian soya from Ecoinvent LCIs for different regions of Brazil and use of this LCI in the downstream stages (for LCIs for soya-based products not involving deforestation).	- Soybean, not associated to deforestation {BR}| market for soybean | Cut-off, U - Adapted from Ecoinvent
	Removal of former Ecoalim ICVs representing soya "with deforestation".	- Soybean grain, tillage, slurry, South, animal feed, at farm gate {BR} U - Soybean grain, South, slurry, average, animal feed, at farm gate {BR} U - Soybean, South average, animal feed, at farm gate {BR} U - Soybean grain, South, Chem. fertilzation average, animal feed, at farm gate {BR} U - Soybean grain, tillage, fert chem, South, animal feed, at farm gate {BR} U Soybean grain, tillage Centerwest, animal feed, at farm gate {BR} U - Soybean, Center west average, animal feed, at farm gate {BR} U - Soybean BR, associated to deforestation, animal feed, at french port {FR} U - Soybean meal BR, crushing in France, common process meal and oil, at french mill, associated to deforestation {FR} U - Soybean meal BR, crushing in France, animal feed, at french mill, associated to deforestation {FR} U - Soybean oil BR, crushing in France, animal feed, at french mill, associated to deforestation {FR} U - Soybean lecithin BR, crushing in France, animal feed, at french mill, associated to deforestation {FR} U - Soybean meal, crushing in Brazil, common process meal and oil, at mill, associated to deforestation {BR} U Soybean meal, crushing in Brazil, animal feed, at mill, associated to deforestation {BR} U - Soybean meal BR, crushing in Brazil, animal feed, at french port, associated to deforestation {FR} U - Soybean oil, crushing in Brazil, animal feed, at mill, associated to deforestation {BR} U - Soybean oil BR, crushing in Brazil, animal feed, at french port, associated to deforestation {FR} U - Soybean grain, no tillage, slurry, South, animal feed, at farm gate {BR} U

		- Soybean grain, no tillage, fert chem, South, animal feed, at farm gate {BR} U - Soybean grain, no tillage Centerwest, animal feed, at farm gate {BR} U
	Addition of ICV for processing average Brazilian soya (ecoinvent soya)	- Soybean cooking-pressing, processing {FR} U - Soybean dehulled and partially deoiled meal, dehulling-cooking-pressing in France, at mill {FR} U - Soybean dehulled grains, animal feed, at transformation plant {FR} U - Soybean dehulling, processing {FR} U - Soybean partially deoiled meal, cooking-pressing in France, at mill {FR} U - Soybean hulls, animal feed, at transformation plant {FR} U - Soybean crude oil, dehulling-cooking-pressing in France, at mill {FR} U - Soybean crude oil, cooking-pressing in France, at mill {FR} U
	Adjustment of the quantities of soya entering the seed drying processes	- Soybean BR, average, animal feed, at french port {FR} U - Soybean BR, not associated to deforestation, animal feed, at french port {FR} U - Soybean meal, crushing in Brazil, common process meal and oil, at mill, average {BR} U - Soybean meal, crushing in Brazil, common process meal and oil, at mill, not associated to deforestation {BR} U
Addition and adaptation of intermediate LCIs for animal feed	Addition of ICV representing several raw materials at the storage organisation stage.	- Barley, feed grain, basis scenario without lever, stored and transported, processing {FR} U - Barley, feed grain, protein crop scenario, stored and transported, processing {FR} U - Barley, feed grain, systematic covercropping scenario, stored and transported, processing {FR} U - Maize grain dried, basis scenario without lever, stored and transported, processing {FR} U - Maize grain dried, protein crop scenario, stored and transported, processing {FR} U - Maize grain dried, systematic covercropping scenario, stored and transported, processing {FR} U - Maize grain dried, basis scenario without lever, processing {FR} U - Maize grain dried, protein crop scenario, processing {FR} U

		- Maize grain dried, systematic covercropping scenario, processing {FR} U - Rapeseed grain, basis scenario without lever, dried, stored and transported, processing {FR} U - Rapeseed grain, protein crop scenario, dried, stored and transported, processing {FR} U - Rapeseed grain, systematic covercropping scenario, dried, stored and transported, processing {FR} U - Soft wheat grain, basis scenario without lever, stored and transported, processing {FR} U - Soft wheat grain, protein crop scenario, stored and transported, processing {FR} U - Soft wheat grain, systematic covercropping scenario, stored and transported, processing {FR} U - Sunflower grain, basis scenario without lever, dried, stored and transported, processing {FR} U - Sunflower grain, protein crop scenario, dried, stored and transported, processing {FR} U - Sunflower grain, systematic covercropping scenario, dried, stored and transported, processing {FR} U - Lupin, conventional, stored and transported, processing {FR} U - Sunflower oil, UA, animal feed, at french port {FR} U
	Change of name for several animal feed ICVs	- Feed barley, basis scenario without lever, at farm gate {FR} U - Feed barley, protein crop scenario, at farm gate {FR} U - Feed barley, systematic covercropping scenario, at farm gate {FR} U - Grain maize, basis scenario without lever, at farm gate {FR} U - Grain maize, protein crop scenario, at farm gate {FR} U - Grain maize, systematic cover cropping scenario, at farm gate {FR} U - Rapeseed, basis scenario without lever, at farm gate {FR} U - Rapeseed, protein crop scenario, at farm gate {FR} U - Rapeseed, systematic covercropping scenario, at farm gate {FR} U - Soft wheat grain, basis scenario without lever,at farm gate {FR} U - Soft wheat grain, protein crop scenario, at farm gate {FR} U - Soft wheat grain, systematic cover cropping scenario, at farm gate {FR} U

		- Sunflower grain, basis scenario without lever, at farm gate {FR} U - Sunflower grain, protein crop scenario, at farm gate {FR} U - Sunflower grain, systematic covercropping scenario, at farm gate {FR} U - Soft wheat grain, conventional, Great Britain, animal feed, at french port {FR} U
Correction of lead and mercury emissions for certain agricultural LCIs Agribalyse	ETM emissions linked to the application of organic fertilisers led to an overestimate of the quantities of lead and mercury emitted into the soil (linked to an old bibliographical source). A temporary correction (pending more accurate values for Agribalyse 3.2), a patch has been put in place on the inventories concerned: lead emissions to soil have been divided by 100 and mercury emissions to soil have been divided by 13 : reduce the impact of LCIs.	- 274 agricultural ICV agribalyse concerned
Corrections to fertiliser inputs in certain agricultural LCIs	Adjustment of the quantities of nitrogenous fertilisers used as inputs in certain Agribalyse agricultural LCIs: the quantities of fertilisers were overestimated : reduced impact of the LCIs.	- 52 agricultural ICVs concerned
Correction of refrigerant emissions for ICV frozen green beans	The emissions of refrigerants at the Distribution stage were expressed in kg, leading to an overestimation of the impact. The unit has been adjusted with grams : reduce the impact of the product.	- French bean, frozen, raw, processed in FR | Frozen | LDPE | at distribution {FR} U
Correction of transport quantity in ICV tuna	Transport was expressed in tkm, leading to an overestimation of impacts. The unit was adjusted with kgkm : reduce the impact of the product.	-Tuna, plain, canned, drained, processed in FR | Ambient (long) | Already packed - Steel | at packaging {FR} U
Correction of flows in the LCI for shrimp farming	Some of the flows were underestimated by a factor of 1000 compared with the scientific publication used to create the LCI, resulting in an underestimation of the impact : an increase in the impact of the product.	Fresh shrimps, China production {FR} U
Correction of R2C and inedible parts in shrimp ICVs	Adjustment of input quantities to remove the non-edible part, which was overestimating the impact : reducing the impact of the product.	- Squid, raw, processed in FR | Chilled | PS | No preparation | at consumer {FR} [Ciqual code: 10001] U - Shrimp, frozen, raw, processed in FR | Frozen | LDPE | at supermarket {FR} U
	Use of whole shrimp ICV (consumption mix) instead of fillets : reduce product impact	- Deep water pink shrimp, raw, processed in FR | Chilled | PS | at packaging {FR} U
	R2C added : increase product impact	- Shrimp or prawn, cooked, processed in FR | Chilled | PS | No preparation | at consumer {FR} [Ciqual code: 10007] U
	Addition of a cutting stage for frozen fish and seafood (and associated losses) : increase product impact	- Hake, fillet, raw, frozen at processing {FR} U - Saithe, fillet, raw, frozen at processing {FR} U - Shrimp, fillet, raw, frozen at processing {FR} U

Correction of gas consumption for the preparation of pan-fried products	Products cooked in a pan at the consumer's premises underestimated the amount of gas required for cooking : increase in impact.	- 39 ICV of pan-fried products
Correction of an input in the LCI for onion seed	The quantity of input representing onion plants was incorrect, resulting in negative impacts : increase in LCI impact.	- Onion, seeds, conventional, at production site {FR} U
Correction of the types of cheese used in the consumer mixes	Correction of the types of cheese leaving the plant used in the consumption mix : low changes in product impact	- Abondance cheese, from cow's milk, consumption mix {FR} U - Beaufort cheese, from cow's milk, consumption mix {FR} U - Cantal cheese, from cow's milk, consumption mix {FR} U - Cheddar cheese, from cow's milk, consumption mix {EN} U - Comte cheese, from cow's milk, consumption mix {FR} U
Correction of inaccurate flows in 2 ICV	Adjusting the quantity of an input in 2 LCIs	- Raspberry, at farm {RS} - Adapted from WFLDB U - Shrimp feed, in mass unit {FR} U
Correction of the carbon stock evolution inventory	Correction of the value of the flux of organic carbon taken from the air, which was too low : have no impact on the results (not characterised).	- Land use change, soil organic carbon changes for annual crops and temporary meadows {FR} U
Removal of duplicate ICV organic pork	The ICV "Pig, organic, national average, at farm gate {FR} U" was a duplicate of the ICV "Fattened pig, organic, national average, at farm gate {FR} U".	- Pig, organic, national average, at farm gate {FR} U
Improving the LCIs used in the pomelo consumption mix	The LCIs representing grapefruit production in the US have a high impact, specific to production in this country. The pomelo consumption mix used these LCIs for other regions as a proxy, resulting in a high impact for the product. LCIs representing orange production in the countries concerned were used instead → reduce the impact of the product.	- Grapefruit (inc. pomelos), consumption mix {EN} U
Distinction between reconstituted and non-reconstituted CIQUAL soluble chicory products	The product present in Agribalyse 3.1 was a chicory reconstituted with water at the consumer's without mention of this specificity in the name. The product was distinguished as reconstituted chicory at the consumer (CIQUAL 18152_2) and chicory not reconstituted at the consumer (18152_1).	-Chicory, powder, instant, non rehydrated, processed in FR | Ambient (long) | Glass | Water cooker | at consumer {FR} [Ciqual code: 18152_1] U - Chicory, powder, instant, ready-to-drink, processed in FR | Ambient (long) | Glass | Water cooker | at consumer {FR} [Ciqual code: 18152_2] U

ANNEXES

Annex 1: N2O model update

Table 1: Evolution of direct N2O emission factors for fertilisers and crop residues			
Situation	Emission source	Emission Factor (EF) 2006	EF 2019
Default	mineral fertilisers	0.01	0.01
humid climate	mineral fertilisers	0.01	0.016
dry climate	mineral fertilisers	0.01	0.005
Default	organic fertilisers	0.01	0.01
humid climate	organic fertilisers	0.01	0.006
dry climate	organic fertilisers	0.01	0.005
Default	crop residues	0.01	0.01
humid climate	crop residues	0.01	0.006
dry climate	crop residues	0.01	0.005

Table 2: Evolution of direct N2O emission factors from on-pasture manure			
Situation	species concerned	Former Emission Factor (EF)	New EF Value
Default	Other cattle (veal, beef, suckler)	0.02	0.004
humid climate	Other cattle (veal, beef, suckler)	0.02	0.006
dry climate	Other cattle (veal, beef, suckler)	0.02	0.002

Table 3: Evolution of indirect N2O emission factors			
Situation	emission source	Former Emission Factor (EF)	New EF Value
Default	Volatile N (NH3, NO)	0.01	0.01
humid climate	Volatile N (NH3, NO)	0.01	0.014
dry climate	Volatile N (NH3, NO)	0.01	0.005
Default	Leached N (NO3)	0.0075	0.011
humid climate	Leached N (NO3)	0.0075	0.011
dry climate	Leached N (NO3)	0.0075	0.011

FAO, Global ecological zones for FAO forest reporting: 2010 Update, Rome: Food and Agriculture Organization of the United Nations, 2012. http://www.fao.org/docrep/017/ap861e/ap861e00.pdf

Annex 2: Inventories affected by ammonium nitrate, NH3, N2O and organic fertiliser changes

Caption: (O: Yes, N: No

LCI affected by the correction	Ammonitrate LCI correction AN	Model update NH3	Model update N2O	Organic fertiliser update
Alfalfa, conventional, for animal feeding, at farm gate/FR	N	N	O	O
Alfalfa, conventional, for dehydration, animal feed, at farm gate, production/FR	N	N	O	O
Apple and Pear grafts, conventional, at production site/FR	N	O	O	N
Apple and Pear rootstock, conventional, at production site/FR	N	O	O	N
Apple and Pear seedlings, conventional, at production site/FR	N	N	O	O
Apple, conventional, non scab-tolerant, first production years (phase), at orchard/FR	O	N	O	O
Apple, conventional, non scab-tolerant, full production years (phase), at orchard/FR	O	N	O	O
Apple, conventional, non scab-tolerant, plantation and destruction (phase), at orchard/FR	O	N	O	O
Apple, conventional, scab-tolerant, first production years (phase), at orchard/FR	O	N	O	O
Apple, conventional, scab-tolerant, full production years (phase), at orchard/FR	O	N	O	O
Apple, conventional, scab-tolerant, plantation and destruction (phase), at orchard/FR	N	N	O	O
Apple, organic, first production years (phase), at orchard/FR	N	N	O	O
Apple, organic, full production years (phase), at orchard/FR	N	N	O	O
Apple, organic, plantation and destruction (phase), at orchard/FR	N	N	O	N
Autumn irrigated leek, conventional, at farm gate/FR	O	O	O	O
Autumn- Winter leek seedling, conventional, at production site/FR	O	O	O	O
Baled grass, permanent meadow, with clover, Northwestern region, at farm/FR	O	N	O	O
Baled grass, permanent meadow, without clover, Auvergne, at farm/FR	O	N	O	O
Baled grass, permanent meadow, without clover, Northwestern region, at farm/FR	N	N	O	O
Baled grass, temporary meadow, with clover, Northwestern region, at farm/FR	N	N	O	O
Baled grass, temporary meadow, without clover, Northwestern region, at farm/FR	O	N	O	O
Baled hay, permanent meadow, with clover, Northwestern region, at farm/FR	N	N	O	O
Baled hay, permanent meadow, without clover, Auvergne, at farm/FR	O	N	O	O

Baled hay, permanent meadow, without clover, Northwestern region, at farm/FR	O	N	O	O
Baled hay, temporary meadow, with clover, Northwestern region, at farm/FR	N	N	O	O
Baled hay, temporary meadow, without clover, Northwestern region, at farm/FR	O	N	O	O
Banana, full production years (phase), mixed production, West Indies, at farm gate WI/	N	N	O	O
Banana, plant grubbing and non productive (phase), mixed production, West Indies, at farm gate WI/	N	N	O	O
Banana, vitroplant production and tree nursery (phase), mixed production, West Indies, at farm gate WI/	N	N	O	O
Banana, young plantation (phase), mixed production, West Indies, at farm gate WI/	N	N	O	O
Carrot, conventional, early, Aquitaine, at farm gate/FR	N	N	O	O
Carrot, conventional, fall, Creances, Lower Normandie, at farm gate/FR	N	N	O	O
Carrot, conventional, fall, Mont St. Michel, Lower Normandie, at farm gate/FR	N	N	O	O
Carrot, conventional, fall, Val de Saire, Lower Normandie, at farm gate/FR	N	N	O	O
Carrot, conventional, main season, Aquitaine, at farm gate/FR	N	N	O	O
Carrot, conventional, winter, Aquitaine, at farm gate/FR	N	N	O	O
Carrot, conventional, winter, Creances, Lower Normandie, at farm gate/FR	N	N	O	O
Carrot, conventional, winter, Mont St. Michel, Lower Normandie, at farm gate/FR	N	N	O	O
Carrot, conventional, winter, Val de Saire, Lower Normandie, at farm gate/FR	N	N	O	O
Carrot, organic, Lower Normandy, at farm gate/FR	N	N	O	O
Carrot, seed, conventional, at farm gate/FR	N	N	O	O
Carrot, seed, organic, at farm gate/FR	N	N	O	O
Cauliflower seed, conventional, at production site/FR	O	O	O	O
Cauliflower seedling for summer crop, conventional, at production site/FR	N	O	O	O
Cauliflower seedling for winter crop, conventional, at production site/FR	N	O	O	O
Cauliflower seedling for winter crop, organic, at production site/FR	N	O	O	O
Cauliflower, summer, conventional, at farm gate/FR	O	O	O	O
Cauliflower, winter, conventional, at farm gate/FR	O	O	O	O
Cauliflower, winter, conventional, N management with Pilazo and electrical harvesting assistance, at farm gate/FR	O	O	O	O
Cauliflower, winter, conventional, nitrogen management with decision support tool Pilazo, at farm gate/FR	O	O	O	O
Cauliflower, winter, conventional, replacement of part of mineral nitrogen by organic manure, at farm gate/FR	O	O	O	O
Cauliflower, winter, conventional, with harvesting electrical assistance, at farm gate/FR	O	O	O	O

Cauliflower, winter, conventional, with previous crop seeded under clover, at farm gate/FR	O	O	O	O
Cauliflower, winter, organic, at farm gate/FR	N	O	O	O
Cherry, full production, conventional, national average, at orchard/FR	O	N	O	N
Cherry, period without production, national average, at orchard/FR	N	N	O	N
Cherry, plantation and destruction, conventional (phase), at orchard/FR	N	N	O	N
Chicory witloof seed, conventional, at production site/FR	O	O	O	O
Chicory witloof, early, conventional, root production, at farm gate/FR	N	O	O	O
Chicory witloof, early, conventional, storage and forcing, at farm gate/FR	N	O	O	O
Chicory witloof, late, conventional, root production, at farm gate/FR	N	O	O	O
Chicory witloof, late, conventional, storage and forcing, at farm gate/FR	N	O	O	O
Chicory witloof, season, conventional, root production, at farm gate/FR	N	O	O	O
Chicory witloof, season, conventional, storage and forcing, at farm gate/FR	N	O	O	O
Chicory witloof, season, organic, root production, at farm gate/FR	N	O	O	O
Chicory witloof, season, organic, storage and forcing, at farm gate/FR	N	O	O	O
Cider apple, full production period, conventional (phase), at orchard/FR	O	N	O	O
Cider apple, low yield production period, conventional (phase), at orchard/FR	O	N	O	O
Cider apple, period without yield, conventional (phase), at orchard/FR	O	N	O	O
Cider apple, plantation and destruction, conventional (phase), at orchard/FR	O	N	O	O
Cider apple, tree seedling, conventional (phase), at tree nursery/FR	O	N	O	O
Clementine, first production years (phase), Souss, at orchard/MA	O	N	O	O
Clementine, full production period (phase), Souss, at orchard/MA	O	N	O	O
Clementine, non productive period (phase), Souss, at orchard/MA	O	N	O	O
Clementine, tree seedling (phase), Souss, at tree nursery/MA	O	N	O	O
Cocoa, first production years (phase), conventional, Cabruca, at orchard/BR	O	N	O	O
Cocoa, full production period years (phase), conventional, Cabruca, orchard/BR	N	N	O	O
Cocoa, tree seedling (phase), Cabruca, at tree nursery/BR	N	N	O	O
Coffee bean (Robusta), depulped, full production period year (phase), Brazil, at farm gate/BR	O	N	O	O
Coffee bean (Robusta), first year, plantation (phase), Brazil, at farm gate/BR	O	N	O	O
Coffee bean (Robusta), second year (phase), Brazil, at farm gate/BR	O	N	O	O
Coffee bean (Robusta), third year (phase), Brazil, at farm gate/BR	O	N	O	O
Durum wheat grain, conventional, national average, at farm gate/FR	O	N	O	O

Durum wheat seed, conventional, national average, at farm gate/FR	O	N	O	O
Feed barley, average from 6 optimized case study, basis scenario, at farm gate/FR	O	N	O	O
Feed barley, average from 6 optimized case study, protein crop scenario, at farm gate/FR	O	N	O	O
Feed barley, average from 6 optimized case study, systematic covercropping scenario, at farm gate/FR	O	N	O	O
French bean, conventional, national average, at farm gate/FR	O	N	O	N
Grafted vine plant, nursery (phase), production and varieties mix, at tree nursery/FR	N	N	O	O
Grafted vine, plantation/destruction (phase), conventional, variety mix, Beaujolais, at vineyard/FR	N	N	O	O
Grafted vine, plantation/destruction (phase), conventional, variety mix, Languedoc-Roussillon, at vineyard/FR	N	N	O	O
Grain maize, average from 6 optimized case study, basis scenario, at farm gate/FR	N	N	O	O
Grain maize, average from 6 optimized case study, scenario protein crop, at farm gate/FR	O	N	O	O
Grain maize, average from 6 optimized case study, scenario systematic cover cropping, at farm gate/FR	O	N	O	O
Grape, early production (phase), integrated, AOC, Beaujolais, at vineyard/FR	N	N	O	O
Grape, early production (phase), integrated, variety mix, Languedoc-Roussillon, at vineyard/FR	N	N	O	O
Grape, early production (phase), organic, AOC, Maconnais, at vineyard/FR	N	N	O	O
Grape, early production (phase), organic, variety mix, Languedoc-Roussillon, at vineyard/FR	N	N	O	O
Grape, full production (phase), integrated, AOC, Beaujolais, at vineyard/FR	N	N	O	O
Grape, full production (phase), integrated, variety mix, Languedoc-Roussillon, at vineyard/FR	N	N	O	O
Grape, full production (phase), organic, AOC, Maconnais, at vineyard/FR	N	N	O	O
Grape, full production (phase), organic, variety mix, Languedoc-Roussillon, at vineyard/FR	N	N	O	O
Grass silage, horizontal silo, permanent meadow, without clover, Auvergne, at farm/FR	O	N	O	O
Grass silage, horizontal silo, temporary meadow, with clover, Northwestern region, at farm/FR	N	N	O	O
Grazed grass, permanent meadow, with clover, Northwestern region, on field/FR	N	N	O	O
Grazed grass, permanent meadow, without clover, Auvergne, on field/FR	N	N	O	O
Grazed grass, permanent meadow, without clover, Northwestern region, on field/FR	O	N	O	O
Grazed grass, temporary meadow, with clover, Northwestern region, on field/FR	N	N	O	O
Grazed grass, temporary meadow, without clover, Northwestern region, on field/FR	N	N	O	O

Leek, early planted, conventional, at farm gate/FR	N	O	O	O
Leek, early seedling, conventional, at production site/FR	N	O	O	O
Leek, early sown, conventional, at farm gate/kg/FR	N	O	O	O
Leek, seeds, conventional, at production site/FR	O	O	O	O
Leek, winter non-irrigated, conventional, at farm gate/FR	N	O	O	O
Lettuce, autumn under tunnel, conventional, at farm gate/FR	N	O	O	O
Lettuce, open field, conventional, at farm gate/FR	O	O	O	O
Lettuce, seed, conventional, at production site/FR	N	O	O	O
Lettuce, seedling for autumn crop, conventional, at production site/FR	N	O	O	O
Lettuce, seedling for winter crop, conventional, at production site/FR	N	O	O	O
Lettuce, winter under tunnel, conventional, at farm gate/FR	O	O	O	O
Maize grain, conventional, 28% moisture, national average, animal feed, at farm gate/FR	O	N	O	O
Maize grain, seed, conventional, national average, animal feed, at farm gate/FR	O	N	O	O
Mango, first production years (phase), conventional, Val de San Francisco, at orchard/BR	O	N	O	O
Mango, full production years (phase), conventional, Val de San Francisco, at orchard/BR	O	N	O	O
Mango, plantation and destruction (phase), conventional, Val de San Francisco, at orchard/BR	N	N	O	O
Melon, open field, conventional, at farm gate/FR	N	O	O	O
Melon, organic, at farm gate/FR	N	O	O	O
Melon, protected crop, conventional, at farm gate/FR	N	O	O	O
Melon, seed, conventional, at production site/FR	N	O	O	O
Melon, seedling for crop under low tunnel, conventional, at production site/FR	N	O	O	O
Melon, seedling for open field crop, conventional, at production site/FR	N	O	O	O
Melon, seedling for protected crop, conventional, at production site/FR	N	O	O	O
Melon, seedling, organic, at production site/FR	N	O	O	O
Melon, under low tunnel, conventional, at farm gate/FR	N	N	O	O
Oat grain, national average, animal feed, at farm gate/FR	O	N	O	O
Onion sets, conventional, at production site/FR	N	O	O	O
Onion, long-day planted, conventional, at farm gate/FR	N	O	O	O
Onion, long-day sown, conventional, at farm gate/FR	N	O	O	O
Onion, seeds, conventional, at production site/FR	O	O	O	O
Onion, short day sown, conventional, at farm gate/FR	N	O	O	O
Peach, first production years, conventional (phase), at orchard/FR	O	N	O	O
Peach, first production years, organic (phase), at orchard/FR	N	N	O	O
Peach, full production years, conventional (phase), at orchard/FR	O	N	O	O
Peach, full production years, organic (phase), at orchard/FR	N	N	O	O
Peach, plantation and destruction, conventional (phase), at orchard/FR	O	N	O	O
Peach, plantation and destruction, organic (phase), at orchard/FR	N	N	O	O
Peach, tree seedling (phase), conventional and organic, at tree nursery/FR	N	N	O	O
Pear, first production years, conventional (phase), at orchard/FR	N	O	O	O

Pear, first production years, organic (phase), at oprchard/FR	N	O	O	O
Pear, full production years, conventional (phase), at orchard/FR	N	O	O	O
Pear, full production years, organic (phase), at orchard/FR	N	O	O	N
Pear, period without production, conventional (phase), at orchard/FR	O	O	O	O
Pear, period without production, organic (phase), at orchard/FR	N	O	O	O
Pear, plantation and destruction, conventional (phase), at orchard/FR	O	O	O	O
Pear, plantation and destruction, organic (phase), at orchard/FR	N	O	O	O
Pineapple, mixed production, Reunion Island average, at production site/RE	N	N	O	O
Potted shrub, growing period (phase), outdoor phase, low density, at production site/FR	N	N	O	O
Potted shrub, wintering (phase), in greenhouse, high density, at production site/FR	N	N	O	O
Rapeseed, average from 7 optimized case study, basis scenario, at farm gate/FR	N	N	O	O
Rapeseed, average from 7 optimized case study, protein crop scenario, at farm gate/FR	O	N	O	O
Rapeseed, average from 7 optimized case study, systematic covercropping scenario, at farm gate/FR	O	N	O	O
Rapeseed, conventional, 9% moisture, national average, animal feed, at farm gate, production/FR	O	N	O	O
Rapeseed, seed, conventional, national average, animal feed, at farm gate/FR	O	N	O	O
Rose (cut flower), soilless, heated and enlighted, conventional pest management, at greenhouse/FR	O	N	O	O
Rose (cut flower), soilless, heated and enlighted, integrated pest management, at greenhouse/FR	O	N	O	O
Rose (cut flower), soilless, low-heated, conventional pest management, at greenhouse/FR	O	N	O	O
Rose (cut flower), soilless, low-heated, integrated pest management, at greenhouse/FR	O	N	O	O
Silage maize, conventional, national average, animal feed, at farm gate, production/FR	O	N	O	O
Silage sorghum, national average, animal feed, at farm gate/FR	O	N	O	O
Soft wheat grain, average from 11 optimized case study, basis scenario,at farm gate/FR	O	N	O	O
Soft wheat grain, average from 11 optimized case study, scenario protein crop, at farm gate/FR	O	N	O	O
Soft wheat grain, average from 11 optimized case study, scenario systematic cover cropping, at farm gate/FR	O	N	O	O
Soft wheat grain, conventional, breadmaking quality, 15% moisture, at farm gate/FR	O	N	O	O
Soft wheat grain, conventional, national average, animal feed, at farm gate, production/FR	N	N	O	O
Soft wheat grain, conventional, protein improved quality, 15% moisture, at farm gate/FR	O	N	O	O
Soft wheat grain, organic (model type), after Alfalfa, Central Region, at farm gate/FR	N	N	O	O

Soft wheat grain, organic (model type), after fava beans, Central Region, at farm gate/FR	N	N	O	O
Soft wheat, seed, conventional, national average, animal feed, at farm gate/FR	N	N	O	O
Sorghum grain, conventional, national average, animal feed, at farm gate/FR	N	N	O	O
Sorghum seed, national average, animal feed, at farm gate/FR	N	N	O	O
Soybean, national average, animal feed, at farm gate/FR	N	N	O	N
Spring barley seed, conventional, malting quality, animal feed, at farm gate/FR	N	N	O	O
Spring barley, conventional, downgraded quality, animal feed, at farm gate/FR	N	N	O	O
Spring barley, conventional, malting quality, animal feed, at farm gate/FR	N	N	O	O
Spring faba bean, conventional, national average, at farm gate/FR	N	N	O	O
Spring faba bean, conventional, reduced protection, at farm gate/FR	N	N	O	O
Spring faba bean, organic (model type), Central Region, at farm gate/FR	N	N	O	O
Spring lupin, 2013, conventional, national average, at farm gate, production/FR	N	N	O	N
Spring lupin, 2015, conventional, national average, at farm gate, production/FR	N	N	O	N
Spring pea seed, conventional, 15% moisture, animal feed, at farm gate, production/FR	N	N	O	O
Spring pea, conventional, 15% moisture, animal feed, at farm gate, production/FR	N	N	O	O
Squash, autumn, under tunnel, conventional, at farm gate/FR	N	O	O	O
Squash, open field, conventional, at farm gate/FR	O	O	O	O
Squash, seedling for autumn protected crop,conventional, at production site/FR	N		O	O
Squash, seedling for springtime protected crops, conventional, at production site/FR	N	O	O	O
Squash, seedling for sprintime protected crop, organic, at production site/FR	N	O	O	O
Squash, seeds, conventional, at farm gate/FR	N	O	O	O
Squash, springtime, under tunnel, conventionel, at farm gate/FR	N	N	O	O
Squash, springtime, under tunnel, organic, at farm gate/FR	N	N	O	N
Starch potato seed, conventional, national average, at farm gate/FR	N	N	O	O
Starch potato, conventional, national average, at farm gate/FR	N	N	O	O
Strawberry, misted tip plant for open field crops, conventional, at production site/FR	O	O	O	O
Strawberry, open field, conventional, at farm gate/FR	N	O	O	O
Strawberry, runners, conventional, at production site/FR	N		O	O
Strawberry, soil protected crops, non-heated, conventional, at farm gate/FR	O	O	O	O
Strawberry, soilless protected crops, frost protection, conventional, at farm gate/FR	O	O	O	O
Strawberry, soilless protected crops, heated, conventional, at farm gate/FR	O	O	O	O

Strawberry, soilless protected crops, non-heated, conventional, at farm gate/FR	O	O	O	O
Strawberry, tray plants, for soilless frost-protected crops, conventional, at production site/FR	O	O	O	O
Strawberry, tray plants, for soilless heated crops, conventional, at production site/FR	O	O	O	O
Strawberry, tray plants, for soilless non heated crops, conventional, at production site/FR	O	O	O	O
Sugar beet roots seed, conventional, national average, animal feed, at farm gate, production/FR	O	N	O	O
Sugar beet roots, conventional, production year 2005, at farm gate/FR	O	N	O	O
Sugar beet roots, conventional, production year 2006, at farm gate/FR	N	N	O	O
Sugar beet roots, conventional, production year 2007, at farm gate/FR	O	N	O	O
Sugar beet roots, conventional, production year 2008, at farm gate/FR	N	N	O	O
Sugar beet roots, conventional, production year 2009, at farm gate/FR	O	N	O	O
Sunflower grain, average from 2 optimized case study, basis scenario, at farm gate/FR	N	N	O	O
Sunflower grain, average from 2 optimized case study, protein crop scenario, at farm gate/FR	N	N	O	O
Sunflower grain, average from 2 optimized case study, systematic covercropping scenario, at farm gate/FR	N	N	O	O
Sunflower grain, conventional, 9% moisture, national average, animal feed, at farm gate, production/FR	N	N	O	O
Sunflower, seed, conventional, national average, animal feed, at farm gate, production/FR	N	N	O	O
Tomato, average basket, conventional, heated greenhouse, national average, at greenhouse/FR	N	N	O	O
Tomato, average basket, conventional, soil based, non-heated greenhouse, at greenhouse/FR	N	N	O	O
Tomato, conventional, new closed glasshouse, unavoidable energy and biomass, runoff recycling, at farm gate/FR	N	O	O	O
Tomato, conventional, new glasshouse, biomass and natural gas, runoff recycling, at farm gate/FR	N	O	O	O
Tomato, conventional, new glasshouse, natural gas, no runoff recycling, at farm gate/FR	N	O	O	O
Tomato, conventional, new glasshouse, natural gas, runoff recycling, at farm gate/FR	N	O	O	O
Tomato, conventional, new glasshouse, unavoidable energy and natural gas, runoff recycling, at farm gate/FR	N	O	O	O
Tomato, conventional, old glasshouse, natural gas, no runoff recycling, at farm gate/FR	N	N	O	O
Tomato, medium size, conventional, heated greenhouse, at greenhouse/FR	N	N	O	O
Tomato, medium size, conventional, soil based, non-heated greenhouse, at greenhouse/FR	N	N	O	O

Tomato, organic, greenhouse production, national average, at greenhouse/FR	N	N	O	O
Tomato, seedling (phase), conventional, soil based prod., national average, at production site/FR	N	N	O	O
Tomato, seedling (phase), conventional, soilless production, national average, at production site/FR	N	N	O	O
Tomato, seedling (phase), organic, soil based prod., national average, at production site/FR	N	N	O	O
Tomato, seedling for heated crop, conventional (phase), at production site/FR	N	O	O	O
Triticale grain, conventional, national average, animal feed, at farm gate, production/FR	O	N	O	O
Triticale grain, organic (model type), Central region, at farm gate/FR	N	N	O	O
Triticale grain, seed, conventional, animal feed, national average, at farm gate/FR	O	N	O	O
Walnut, grafts, conventional, at production site/FR	N	O	O	O
Walnut, rootstock, conventional, at production site/FR	O	O	O	O
Walnut, traditional varieties, first production years, conventional (phase), at orchard/FR	N	O	O	O
Walnut, traditional varieties, first production years, organic (phase), at orchard/FR	N	O	O	O
Walnut, traditional varieties, full production years, conventional (phase), at orchard/FR	N	O	O	O
Walnut, traditional varieties, full production years, organic (phase), at orchard/FR	N	O	O	O
Walnut, traditional varieties, period without production, conventional (phase), at orchard/FR	N	O	O	O
Walnut, traditional varieties, period without production, organic (phase), at orchard/FR	N	O	O	O
Walnut, traditional varieties, plantation and destruction, conventional (phase), at orchard/FR	N	O	O	O
Walnut, traditional varieties, plantation and destruction, organic (phase), at orchard/FR	N	O	O	O
Walnut, tree seedling, conventional and organic, at production site/FR	O	O	O	O
Walnut, varieties with lateral fructification, first production years, conventional (phase), at orchard/FR	N	O	O	O
Walnut, varieties with lateral fructification, full production years, conventional (phase), at orchard/FR	N	O	O	O
Walnut, varieties with lateral fructification, period without production, conventional (phase), at orchard/FR	N	O	O	O
Walnut, varieties with lateral fructification, plantation and destruction, conventional (phase), at orchard/FR	N	N	O	O
Ware potato seed, conventional, at farm gate/FR	N	N	O	O
Ware potato, conventional, for fresh market, firm flesh varieties, at farm gate/FR	N	N	O	O
Ware potato, conventional, for fresh market, other varieties, at farm gate/FR	N	N	O	O
Ware potato, conventional, for industrial use, at farm gate/FR	N	N	O	O
Winter barley seed, conventional, malting quality, animal feed, at farm gate/FR	N	N	O	O

Winter barley, conventional, malting quality, animal feed, at farm gate/FR	N	N	O	O
Winter forage barley, conventional, animal feed, at farm gate/FR	N	N	O	O
Winter lupin, 2013, conventional, national average, at farm gate, production/FR	N	N	O	N
Winter lupin, 2015, conventional, national average, at farm gate, production/FR	N	N	O	N
Winter pea seed, conventional, 15% moisture, at farm gate/FR	N	N	O	O
Winter pea, conventional, 15% moisture, at farm gate/FR	N	N	O	O

Annex 3: MEANS-InOut organic fertiliser update

	Values before update				Values after update			
	N content (g/kg fertiliser)		Emission factor		N content (g/kg fertiliser)		Emission factor	
Fertiliser name	Total N	Ammoniacal N (TAN)	Associated fertiliser type (choice of emission factor)	Emission factor	Total N	Ammoniacal N (TAN)	Associated fertiliser type (choice of emission factor)	Emission factor
Limed urban sludge	7.5	5.3	Miscellaneous, liquid	0.4	5.2	0.1		0.5
Liquid urban sludge	3	2.1	Miscellaneous, liquid	0.4	3	0.27	Sewage sludge	0.5
Pasty urban sludge	10	3.2	Miscellaneous, solid	0.51	9	0.5	Sewage sludge	0.5
Dry urban sludge	40	12.8	Miscellaneous, solid	0.81	40.4	0.8	Sewage sludge	0.5
Straw cattle manure compost	8	0.4	Medium factor, solid	0.71	6.7	0.6	Compost	0.8
Urban compost (household waste)	6	0.6	Medium factor, solid	0.71	6	0.6285	Compost	0.8
Urban plant compost	8	0.8	Medium factor, solid	0.71	7.8	0.4	Compost	0.8
Sugar factory lime refuse	9.6	1.0	Miscellaneous, liquid	0.4	9.6	0.96	Other organic waste	0.066
Feather meal	130	6.5	Medium factor, solid	0.71	92.6	1.5	Other organic waste	0.066
Meat meal	130	6.5	Medium factor, solid	0.71	92.6	1.5	Other organic waste	0.066
Dried laying hen droppings	38.15	4.0	Laying hens (laying hens and parents), solid	0.69	39.5	3.2	Laying hens (laying hens and parents), solid	0.69
Bovine manure, deep litter	5.8	0.6	Other Cattle (young cattle, beef cattle and suckling cows), solid	0.79	5.9	0.9	Other Cattle (young cattle, beef cattle and suckling cows), solid	0.79
Cattle manure, stall and soft	5.1	1.5	Other Cattle (young cattle, beef cattle and suckling cows), solid	0.79	4.5	1.4	Other Cattle (young cattle, beef cattle and suckling cows), solid	0.79
Average cattle manure	5.45	1.1	Other Cattle (young cattle, beef cattle and suckling cows), solid	0.79	4.8	0.9	Other Cattle (young cattle, beef cattle and suckling cows), solid	0.79
Broiler chicken manure	19.125	3.3	Broilers (broilers and parents), solid	0.79	21.9	3	Broilers (broilers and parents), solid	0.79
Undiluted bovine slurry	3.5	1.8	Other cattle (young cattle, beef cattle and suckling cows), liquid	0.55	3.4	1.3	Other Cattle (young cattle, beef cattle and suckling cows), liquid	0.55

Diluted bovine slurry	1.6	0.8	Other cattle (young cattle, beef cattle and suckling cows), liquid	0.55	1.4	0.8	Other Cattle (young cattle, beef cattle and suckling cows), liquid	0.55
Rabbit slurry (scraper system)	3.52	2.1	Average factor, liquid	0.51	3.3	1	Average factor, liquid	0.51
Concentrated beet pulp	9.6	1.0	Miscellaneous, liquid	0.4	9.6	0.96	Other organic waste	0.066
5 - 6 - 8 Usable in organic agriculture	50	2.5	Miscellaneous, solid	0.81	50	2.5	Other organic waste	0.066
6 - 3 - 9 Usable in organic agriculture	60	3.0	Miscellaneous, solid	0.81	60	3	Other organic waste	0.066
6 - 4 - 10 Usable in organic agriculture	60	3.0	Miscellaneous, solid	0.81	60	3	Other organic waste	0.066
7 - 9 - 0 Usable in organic agriculture	70	3.5	Miscellaneous, solid	0.81	70	3.5	Other organic waste	0.066
8 - 5 - 6 Usable in organic agriculture	80	4.0	Miscellaneous, solid	0.81	80	4	Other organic waste	0.066
Distillation vinasse	9.6	1.0	Miscellaneous, liquid	0.4	9.6	0.96	Other organic waste	0.066
Sewage plant sludge	7.62	5.4	Miscellaneous, liquid	0.4	7.62	5.4102	Sewage sludge	0.5
Pork slurry straw compost	6.1	1.7	Medium factor, solid	0.71	7.4	0.9	Compost	0.8
Straw-based pig manure compost	13.3	1.4	Medium factor, solid	0.71	13.3	1.3	Compost	0.8
Duck slurry (for roasting or force-feeding)	6.16	2.5	Other poultry (ducks), solid	0.54	6.1	2.8	Other poultry (ducks), solid	0.54
Organic amendment, class B	20	1.0	Miscellaneous, solid	0.81	19.5	2	Other organic waste	0.066
Castor oil cake	50	5.0	Miscellaneous, solid	0.81	50	5	Other organic waste	0.066
Poultry manure compost	24.7	2.5	Medium factor, solid	0.71	24.7	2.47	Compost	0.8
Feather and blood meal	138	6.9	Medium factor, solid	0.71	138	6.9	Other organic waste	0.066
10 - 0 - 0 Usable in organic agriculture	100	19.3	Miscellaneous, solid	0.81	100	19.26605505	Other organic waste	0.066
9 - 5 - 0 Usable in organic agriculture	90	4.5	Miscellaneous, solid	0.81	90	4.5	Other organic waste	0.066

Annex 4: List of organic LCIs included in the Agribalyse 3.1 update

All plant production LCIs in this list have been affected by the update of the N2O IPCC 2006/2019 model. They were not affected by the organic fertiliser update.

Alfalfa, organic, system number 1, at farm gate/FR U
Alfalfa, organic, system number 2, at farm gate/FR U
Alfalfa, organic, system number 3, at farm gate/FR U
Alfalfa, organic, system number 4, at farm gate/FR U
Alfalfa, organic, system number 5, at farm gate/FR U
Baled grass, permanent meadow, organic, suckler cow and beef fattening system number 1, at farm gate/FR U
Baled grass, permanent meadow, organic, suckler cow and beef fattening system number 3, at farm gate/FR U
Baled grass, permanent meadow, organic, suckler cow and beef fattening system number 4, at farm gate/FR U
Baled hay, permanent meadow, organic, suckler cow and beef fattening system number 1, at farm gate/FR U
Baled hay, permanent meadow, organic, suckler cow and beef fattening system number 2, at farm gate/FR U
Baled hay, permanent meadow, organic, suckler cow and beef fattening system number 3, at farm gate/FR U
Baled hay, permanent meadow, organic, suckler cow and beef fattening system number 4, at farm gate/FR U
Baled hay, temporary meadow, organic, system number 5, at farm gate/FR U
Blue lupine, organic, at farm gate/FR U
Broiler, organic, system number 1, at farm gate/FR U
Broiler, organic, system number 2, at farm gate/FR U
Calf, 14 days old, organic, milk system number 1, at farm gate/FR U
Calf, 14 days old, organic, milk system number 2, at farm gate/FR U
Calf, 14 days old, organic, milk system number 3, at farm gate/FR U
Calf, 14 days old, organic, milk system number 4, at farm gate/FR U
Calf, 14 days old, organic, milk system number 5, at farm gate/FR U
Calf, weaned, 4 months old, organic, suckler cow system number 1, at farm gate/FR U
Calf, weaned, 7 months old, organic, suckler cow system number 3 at farm gate/FR U
Calf, weaned, 8 months old, organic, suckler cow system number 2, at farm gate/FR U
Calf, weaned, 9 months old, organic, suckler cow system number 4, at farm gate/FR U
Chickpea, organic, system number 1, at farm gate/FR U
Cow milk, organic, system number 1, at farm gate/FR U
Cow milk, organic, system number 2, at farm gate/FR U
Cow milk, organic, system number 3, at farm gate/FR U
Cow milk, organic, system number 4, at farm gate/FR U
Cow milk, organic, system number 5, at farm gate/FR U
Cropping system number 1, organic, at farm gate/FR U
Cropping system number 10, organic, at farm gate/FR U
Cropping system number 11, organic, at farm gate/FR U
Cropping system number 2, organic, at farm gate/FR U
Cropping system number 3, organic, at farm gate/FR U
Cropping system number 4, organic, at farm gate/FR U
Cropping system number 5, organic, at farm gate/FR U
Cropping system number 6, organic, at farm gate/FR U
Cropping system number 7, organic, at farm gate/FR U
Cropping system number 8, organic, at farm gate/FR U
Cropping system number 9, organic, at farm gate/FR U
Cull cow, organic, milk system number 1, at farm gate/FR U
Cull cow, organic, milk system number 2, at farm gate/FR U
Cull cow, organic, milk system number 3, at farm gate/FR U

Cull cow, organic, milk system number 4, at farm gate/FR U
Cull cow, organic, milk system number 5, at farm gate/FR U
Cull ewe, organic, system number 1, at farm gate/FR U
Cull ewe, organic, system number 2, at farm gate/FR U
Cull ewe, organic, system number 3, at farm gate/FR U
Cull hen, organic, system number 1, at farm gate/FR U
Cull hen, organic, system number 2, at farm gate/FR U
Cull sow, organic, national average, at farm gate/FR U
Cull sow, organic, system number 1, at farm gate/FR U
Cull sow, organic, system number 2, at farm gate/FR U
Cull sow, organic, system number 3, at farm gate/FR U
Cull sow, organic, system number 4, at farm gate/FR U
Egg, organic, system number 1, at farm gate/FR U
Egg, organic, system number 2, at farm gate/FR U
Fattening cattle, female, organic, beef fattening system number 1, at farm gate/FR U
Fattening cattle, female, organic, beef fattening system number 2, at farm gate/FR U
Fattening cattle, female, organic, beef fattening system number 3, at farm gate/FR U
Fattening cattle, female, organic, beef fattening system number 4, at farm gate/FR U
Fattening cattle, male, organic, beef fattening system number 3, at farm gate/FR U
Fattening cattle, male, organic, beef fattening system number 4, at farm gate/FR U
Grain maize, organic, system number 1, at farm gate/FR U
Grain maize, organic, system number 2, at farm gate/FR U
Grain maize, organic, system number 3, at farm gate/FR U
Grape, organic, PDO, dry white wine, system number 1, at vineyard gate/FR U
Grape, organic, PDO, dry white wine, system number 2, at vineyard gate/FR U
Grape, organic, PDO, dry white wine, system number 3, at vineyard gate/FR U
Grape, organic, PDO, dry white wine, system number 4, at vineyard gate/FR U
Grape, organic, PDO, dry white wine, system number 5, at vineyard gate/FR U
Grazed grass, permanent meadow, organic, suckler cow and beef fattening system number 1, at farm gate/FR U
Grazed grass, permanent meadow, organic, suckler cow and beef fattening system number 2, at farm gate/FR U
Grazed grass, permanent meadow, organic, suckler cow and beef fattening system number 3, at farm gate/FR U
Grazed grass, permanent meadow, organic, suckler cow and beef fattening system number 4, at farm gate/FR U
Lamb, organic, system number 1, at farm gate/FR U
Lamb, organic, system number 2, at farm gate/FR U
Lamb, organic, system number 3, at farm gate/FR U
Organic suckler cow system, system number 1, newborn calf, at farm/FR U
Organic suckler cow system, system number 2, newborn calf, at farm/FR U
Organic suckler cow system, system number 3, newborn calf, at farm/FR U
Organic suckler cow system, system number 4, newborn calf, at farm/FR U
Pig, organic, national average, at farm gate/FR U
Pig, organic, system number 1, at farm gate/FR U
Pig, organic, system number 2, at farm gate/FR U
Pig, organic, system number 3, at farm gate/FR U
Pig, organic, system number 4, at farm gate/FR U
Silage maize, organic, system number 1, at farm gate/FR U
Sorghum, organic, system number 1, at farm gate/FR U
Soybean grain, organic, at farm gate/CN U
Soybean grain, organic, at farm gate/IN U
Soybean grain, organic, system number 1, at farm gate/FR U
Soybean grain, organic, system number 2, at farm gate/FR U
Soybean grain, organic, system number 3, at farm gate/FR U
Soybean grain, organic, system number 4, at farm gate/FR U
Soybean grain, organic, system number 5, at farm gate/FR U
Spelt, organic, at farm gate/FR U

Spring barley, from intercrop, organic, system number 1, at farm gate/FR U
Spring barley, from intercrop, organic, system number 2, at farm gate/FR U
Spring barley, organic, system number 1, at farm gate/FR U
Spring barley, organic, system number 2, at farm gate/FR U
Spring barley, organic, system number 3, at farm gate/FR U
Spring barley, organic, system number 4, at farm gate/FR U
Spring faba bean and spring barley intercrop, organic, system number 1, at farm gate/FR U
Spring faba bean and spring wheat intercrop, organic, system number 1, at farm gate/FR U
Spring faba bean, from intercrop, organic, system number 1, at farm gate/FR U
Spring faba bean, from intercrop, organic, system number 2, at farm gate/FR U
Spring faba bean, organic, system number 1, at farm gate/FR U
Spring faba bean, organic, system number 2, at farm gate/FR U
Spring pea and spring barley intercrop, organic, system number 1, at farm gate/FR U
Spring pea and spring wheat intercrop, organic, system number 1, at farm gate/FR U
Spring pea, from intercrop, organic, system number 1, at farm gate/FR U
Spring pea, from intercrop, organic, system number 2, at farm gate/FR U
Spring wheat, from intercrop, organic, system number 1, at farm gate/FR U
Spring wheat, from intercrop, organic, system number 2, at farm gate/FR U
Suckler cull cow, organic, suckler cow system number 1, at farm gate/FR U
Suckler cull cow, organic, suckler cow system number 2, at farm gate/FR U
Suckler cull cow, organic, suckler cow system number 3, at farm gate/FR U
Suckler cull cow, organic, suckler cow system number 4, at farm gate/FR U
Sunflower grain, organic, system number 1, at farm gate/FR U
Sunflower grain, organic, system number 2, at farm gate/FR U
Sunflower grain, organic, system number 3, at farm gate/FR U
Sunflower grain, organic, system number 4, at farm gate/FR U
Sunflower grain, organic, system number 5, at farm gate/FR U
Triticale grain, from intercrop, organic, system number 1, at farm gate/FR U
Triticale grain, from intercrop, organic, system number 2, at farm gate/FR U
Triticale grain, from intercrop, organic, system number 3, at farm gate/FR U
Triticale grain, from intercrop, organic, system number 4, at farm gate/FR U
Triticale grain, organic, system number 1, at farm gate/FR U
Triticale grain, organic, system number 2, at farm gate/FR U
Triticale grain, organic, system number 3, at farm gate/FR U
Winter barley, from intercrop, organic, system number 1, at farm gate/FR U
Winter barley, from intercrop, organic, system number 2, at farm gate/FR U
Winter barley, organic, system number 1, at farm gate/FR U
Winter barley, organic, system number 2, at farm gate/FR U
Winter faba bean and winter barley intercrop, organic, system number 1, at farm gate/FR U
Winter faba bean and winter wheat intercrop, organic, system number 1, at farm gate/FR U
Winter faba bean and winter wheat intercrop, organic, system number 2, at farm gate/FR U
Winter faba bean, from intercrop, organic, system number 1, at farm gate/FR U
Winter faba bean, from intercrop, organic, system number 2, at farm gate/FR U
Winter faba bean, from intercrop, organic, system number 3, at farm gate/FR U
Winter faba bean, organic, system number 1, at farm gate/FR U
Winter faba bean, organic, system number 2, at farm gate/FR U
Winter faba bean, organic, system number 3, at farm gate/FR U
Winter faba bean, organic, system number 4, at farm gate/FR U
Winter oat, organic, system number 1, at farm gate/FR U
Winter pea and triticale grain intercrop, organic, system number 1, at farm gate/FR U
Winter pea and triticale grain intercrop, organic, system number 2, at farm gate/FR U
Winter pea and triticale grain intercrop, organic, system number 3, at farm gate/FR U
Winter pea and triticale grain intercrop, organic, system number 4, at farm gate/FR U
Winter pea and winter barley intercrop, organic, system number 1, at farm gate/FR U

Winter pea and winter wheat intercrop, organic, system number 1, at farm gate/FR U
Winter pea and winter wheat intercrop, organic, system number 2, at farm gate/FR U
Winter pea, from intercrop, organic, system number 1, at farm gate/FR U
Winter pea, from intercrop, organic, system number 2, at farm gate/FR U
Winter pea, from intercrop, organic, system number 3, at farm gate/FR U
Winter pea, from intercrop, organic, system number 4, at farm gate/FR U
Winter pea, from intercrop, organic, system number 5, at farm gate/FR U
Winter pea, from intercrop, organic, system number 6, at farm gate/FR U
Winter pea, from intercrop, organic, system number 7, at farm gate/FR U
Winter rapeseed, organic, at farm gate/FR U
Winter wheat, from intercrop, organic, system number 1, at farm gate/FR U
Winter wheat, from intercrop, organic, system number 2, at farm gate/FR U
Winter wheat, from intercrop, organic, system number 3, at farm gate/FR U
Winter wheat, from intercrop, organic, system number 4, at farm gate/FR U
Winter wheat, organic, system number 1, at farm gate/FR U
Winter wheat, organic, system number 10, at farm gate/FR U
Winter wheat, organic, system number 11, at farm gate/FR U
Winter wheat, organic, system number 12, at farm gate/FR U
Winter wheat, organic, system number 13, at farm gate/FR U
Winter wheat, organic, system number 14, at farm gate/FR U
Winter wheat, organic, system number 15, at farm gate/FR U
Winter wheat, organic, system number 16, at farm gate/FR U
Winter wheat, organic, system number 17, at farm gate/FR U
Winter wheat, organic, system number 18, at farm gate/FR U
Winter wheat, organic, system number 2, at farm gate/FR U
Winter wheat, organic, system number 3, at farm gate/FR U
Winter wheat, organic, system number 4, at farm gate/FR U
Winter wheat, organic, system number 5, at farm gate/FR U
Winter wheat, organic, system number 6, at farm gate/FR U
Winter wheat, organic, system number 7, at farm gate/FR U
Winter wheat, organic, system number 8, at farm gate/FR U
Winter wheat, organic, system number 9, at farm gate/FR U
Wool, organic, system number 1, at farm gate/FR U
Wool, organic, system number 2, at farm gate/FR U
Wool, organic, system number 3, at farm gate/FR U
Baled grass, permanent meadow, organic, system number 1, at farm gate/FR U
Baled grass, permanent meadow, organic, system number 2, at farm gate/FR U
Baled grass, temporary meadow, organic, system number 3, at farm gate/FR U
Baled hay, permanent meadow, organic, system number 1, at farm gate/FR U
Baled hay, permanent meadow, organic, system number 2, at farm gate/FR U
Baled hay, permanent meadow, organic, system number 3, at farm gate/FR U
Baled hay, permanent meadow, organic, system number 4, at farm gate/FR U
Baled hay, permanent meadow, organic, system number 5, at farm gate/FR U
Baled hay, permanent meadow, organic, system number 6, at farm gate/FR U
Baled hay, temporary meadow, organic, system number 1, at farm gate/FR U
Baled hay, temporary meadow, organic, system number 2, at farm gate/FR U
Baled hay, temporary meadow, organic, system number 3, at farm gate/FR U
Baled hay, temporary meadow, organic, system number 4, at farm gate/FR U
Baled hay, temporary meadow, organic, system number 5, at farm gate/FR U
Grass silage, temporary meadow, organic, system number 1, at farm gate/FR U
Grass silage, temporary meadow, organic, system number 2, at farm gate/FR U

Grass silage, temporary meadow, organic, system number 3, at farm gate/FR U

Grass silage, temporary meadow, organic, system number 4, at farm gate/FR U

Grass silage, temporary meadow, organic, system number 5, at farm gate/FR U

Grazed grass, pasture at farm, organic, system number 1, at farm gate/FR U

Grazed grass, permanent meadow, organic, system number 1, at farm gate/FR U

Grazed grass, permanent meadow, organic, system number 2, at farm gate/FR U

Grazed grass, permanent meadow, organic, system number 3, at farm gate/FR U

Grazed grass, permanent meadow, organic, system number 4, at farm gate/FR U

Grazed grass, permanent meadow, organic, system number 5, at farm gate/FR U

Grazed grass, permanent meadow, organic, system number 6, at farm gate/FR U

Grazed grass, summer pasture and pasture at farm, organic, system number 1, at farm gate/FR U

Grazed grass, summer pasture, organic, system number 1, at farm gate/FR U

Grazed grass, temporary meadow, organic, system number 1, at farm gate/FR U

Grazed grass, temporary meadow, organic, system number 2, at farm gate/FR U

Grazed grass, temporary meadow, organic, system number 3, at farm gate/FR U

Grazed grass, temporary meadow, organic, system number 4, at farm gate/FR U

Organic suckler cow system, system number 1, newborn calf, at farm/FR U

Organic suckler cow system, system number 2, newborn calf, at farm/FR U

Organic suckler cow system, system number 3, newborn calf, at farm/FR U

Organic suckler cow system, system number 4, newborn calf, at farm/FR U

Organic suckler beef fattening farm, system number 1, 1 year old fattening cattle, female, at farm/FR U

Organic suckler beef fattening farm, system number 1, 2 years old fattening cattle, female, at farm/FR U

Organic suckler beef fattening farm, system number 1, cull bull, at farm/FR U

Organic suckler beef fattening farm, system number 1, more than 2 years old fattening cattle, female, at farm/FR U

Organic suckler beef fattening farm, system number 2, 1 year old fattening cattle, female, at farm/FR U

Organic suckler beef fattening farm, system number 2, 2 years old fattening cattle, female, at farm/FR U

Organic suckler beef fattening farm, system number 2, cull bull, at farm/FR U

Organic suckler beef fattening farm, system number 2, more than 2 years old fattening cattle, female, at farm/FR U

Organic suckler beef fattening farm, system number 3, 2 years old fattening cattle, female, at farm/FR U

Organic suckler beef fattening farm, system number 3, 2 years old fattening cattle, male, at farm/FR U

Organic suckler beef fattening farm, system number 3, cull bull, at farm/FR U

Organic suckler beef fattening farm, system number 3, more than 2 years old fattening cattle, female, at farm/FR U

Organic suckler beef fattening farm, system number 3, more than 2 years old fattening cattle, male, at farm/FR U

Organic suckler beef fattening farm, system number 4, 1 year old fattening cattle, female, at farm/FR U

Organic suckler beef fattening farm, system number 4, 1 year old fattening cattle, male, at farm/FR U

Organic suckler beef fattening farm, system number 4, 2 years old fattening cattle, female, at farm/FR U

Organic suckler beef fattening farm, system number 4, 2 years old fattening cattle, male, at farm/FR U

Organic suckler beef fattening farm, system number 4, cull bull, at farm/FR U

Organic suckler beef fattening farm, system number 4, more than 2 years old fattening cattle, female, at farm/FR U

Organic suckler beef fattening farm, system number 4, more than 2 years old fattening cattle, male, at farm/FR U

Organic suckler cow system, system number 1, 1 year old heifer, at farm/FR U

Organic suckler cow system, system number 1, 14 days old calf, at farm/FR U

Organic suckler cow system, system number 1, 2 years old heifer, at farm/FR U

Organic suckler cow system, system number 1, cull cow fattening, at farm/FR U

Organic suckler cow system, system number 1, cull cow, at farm/FR U

Organic suckler cow system, system number 1, more than 2 years old heifer, at farm/FR U

Organic suckler cow system, system number 1, newborn calf, at farm/FR U

Organic suckler cow system, system number 2, 1 year old heifer, at farm/FR U

Organic suckler cow system, system number 2, 14 days old calf, at farm/FR U

Organic suckler cow system, system number 2, 2 years old heifer, at farm/FR U

Organic suckler cow system, system number 2, cull cow fattening, at farm/FR U

Organic suckler cow system, system number 2, cull cow, at farm/FR U

Organic suckler cow system, system number 2, more than 2 years old heifer, at farm/FR U

Organic suckler cow system, system number 2, newborn calf, at farm/FR U

Organic suckler cow system, system number 3, 1 year old heifer, at farm/FR U

Organic suckler cow system, system number 3, 14 days old calf, at farm/FR U

Organic suckler cow system, system number 3, 2 years old heifer, at farm/FR U

Organic suckler cow system, system number 3, cull cow fattening, at farm/FR U

Organic suckler cow system, system number 3, cull cow, at farm/FR U

Organic suckler cow system, system number 3, more than 2 years old heifer, at farm/FR U

Organic suckler cow system, system number 3, newborn calf, at farm/FR U

Organic suckler cow system, system number 4, 1 year old heifer, at farm/FR U

Organic suckler cow system, system number 4, 14 days old calf, at farm/FR U

Organic suckler cow system, system number 4, 2 years old heifer, at farm/FR U

Organic suckler cow system, system number 4, cull cow fattening, at farm/FR U

Organic suckler cow system, system number 4, cull cow, at farm/FR U

Organic suckler cow system, system number 4, more than 2 years old heifer, at farm/FR U

Organic suckler cow system, system number 4, newborn calf, at farm/FR U

EXPERT OPINIONS

ABOUT ADEME

The French Environment and Energy Management Agency (ADEME) is active in the implementation of public policy in the areas of the environment, energy and sustainable development. The Agency provides expertise and advisory services to businesses, local authorities and communities, government bodies and the public at large, to enable them to establish and consolidate their environmental action. As part of this work
ADEME helps finance projects, from research to implementation, in the areas of waste management, soil conservation, energy efficiency and renewable energy, raw materials savings, air quality, noise abatement, circular energy transition and food wastage abatement.
ADEME is a public agency under the joint authority of the Ministry for an Ecological and Solidary Transition and the Ministry for Higher Education, Research and Innovation.

THE COLLECTIONS
OF ADEME

THEY DID IT
ADEME the catalyst: Stakeholders talk about their experiences and share their know-how.

EXPERT OPINIONS
ADEME the expert: It reports on the results of research, studies and collective achievements undertaken under its auspices.

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ADEME the adviser: It provides objective analyses using regularly updated statistical indicators.

KEYS FOR ACTION
ADEME the facilitator: It produces practical guides to assist stakeholders in implementing their projects methodically and/or in accordance with the regulations.

HORIZONS
ADEME, focused on the future: It provides a realistic, forward-looking vision of the issues involved in the energy and ecological transition to help everyone build a better future.

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