STUDY

Calculating the GHG footprint of Minimum Expenditure Baskets

January 2024

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For CITEPA

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Cover photograph:

1.INTRODUCTION

About Action Contre la Faim France - ACF

Founded in 1979, Action Contre la Faim France – Action Against Hunger France (ACF) is an international non-governmental organization (NGO) that fights hunger worldwide. Conflict, climate change, poverty, unequal access to water and healthcare are all causes of malnutrition. Our mission is to save lives by eliminating hunger through the prevention, detection and treatment of undernutrition, particularly during and after emergency situations linked to conflicts and natural disasters.

ACF has carried out a partial calculation of its greenhouse gas (GHG) emissions in 2010 (baseline 2009), with the aim of determining the main emission sources. When this calculation was carried out, emissions linked to cash transfers were not pre-identified as significant in relation to total emissions, and were not estimated.

Following the decision taken at the end of 2020 with 9 other organizations to assess and reduce the organization carbon footprint by 50% by 2030, ACF is launching its second carbon footprint estimates in 2021 with other members of the Humanitarian Environment Network (REH[1]). This time, the emissions estimate covers all emissions (and not just a pre-selection), and very quickly significant emissions items appear, which can generate considerable variability in the results. Among these, one item seems to represent more than 20% of ACF-France's overall emissions, and which had gone "hidden" until now: cash transfers.

This study responds to the need to estimate the GHG footprint of activities using cash transfers in ACF's main areas of intervention, and seeks to identify the next steps that can be taken to design concrete actions to reduce this footprint. The work was carried out by the CITEPA, a french association, and approximately 80% of this document is taken from the study report published without modification. ACF is responsible for setting the context, interpreting the results and making recommendations.

About CITEPA

CITEPA carries out studies for public and private bodies involved in combating air pollution and climate change. Its activities are varied, ranging from associations (interactive exchanges of information on air pollution and climate change) to studies (inventories, projects, consultancy, and training) between the public and private sectors. Half of CITEPA’s budget comes from French public funds, through the production of inventories of atmospheric pollutant and greenhouse gas emissions, and the other half from the various services it provides for private-sector clients. As a result, CITEPA is recognized for its neutral image and objective, unbiased expertise.

CITEPA would like to thank Action Contre la Faim France for entrusting us with this study. Working hand in hand with the ACF teams enabled us to produce the most accurate analyses possible based on the available/accessible data, while at the same time highlighting avenues for progress. Putting our expertise at the disposal of the humanitarian aid sector is particularly stimulating, rewarding and aligned with our raison d'être of helping to build a sustainable world.

[1] https://www.environnementhumanitaire.org/en/

About this study

Conventional GHG assessment methodologies involve multiplying an input datum, whether derived from a physical flow (liters of fuel oil, number of kits or volume of food distributed) or a monetary flow, by an emission factor (in kgCO_2 e/litres of fuel oil or kgCO_2 e/kit). For monetary flows, the emission factors available are few, and present considerable uncertainty.

Physical data (eg. Kg of rice distributed) × Emission Factor (eg. XX kgCO_2e/kg of rice) = Carbon Emissions (in CO_2equivalent)

Financial data (eg. Amount of cash distributed) × Emission Factor (eg. XX kgCO_2e/USD) = Carbon Emissions (in CO_2equivalent)

For certain types of cash flow, such as activities using cash transfers (CT), there are no reliable, recognized emission factors, nor are there any identified ways of reducing these emissions. At ACF, however, they can represent up to 25 million euros. It therefore seems essential to identify ways of reducing this footprint, in order to significantly reduce the organization's overall emissions.

To estimate the GHG emissions of a CT flow, one possible method is to take the national carbon intensity of the country of intervention, and apply it to GDP (Gross Domestic Product) to obtain an emission factor in gCO_2 e/k$. This method is not very reliable, as it is based on the calculation of national footprints which do not represent the consumption of households benefiting from the cash flow (most deforestation or hydrocarbon exploitation in the national carbon footprint, for example).

One method envisaged consists of estimating the GHG emissions of a household's Minimum Expenditure Basket (MEB*)* in the countries where we operate. MEBs are operational tools used to identify and quantify, in a specific context and at a specific time, the average cost of the basic/essential needs, whether regular or seasonal, of a household representative of the target audience, which can be covered by the local market.

Baskets are a snapshot of the products available in a given country, time and context. Their composition therefore depends on accessibility and specific needs, and may differ from people's consumption habits, in the event of shortages destabilizing markets following a crisis, for example.

The aim of this study is to test the method of estimating GHG emissions from the CT flow by calculating the carbon intensity of the Minimum Expenditure Basket (MEB), to gain a better understanding of the composition of their GHG footprint, and, aware of the weaknesses or otherwise of this method, to identify the main possible actions for reducing these emissions.

ACF France is present in 23 countries, 20 MEB were identified, but only 16 had sufficient data to be used in this study. The emission factors calculated will be used to calculate ACF-France's GHG footprint (*baseline 2021*). An average will be applied to areas for which no MEB usable for the study has been identified.

As ACF is not specialist in GHG estimates (nor do we intend to be), we entrusted the engineering of this calculation and the analysis of MEB constituents to the CITEPA association, recognized for its expertise in GHG accounting. We would like to thank them for their work.

2. EMISSIONS ASSESSMENT

The results of this first part are summarized in a table, an extract of which is presented in Appendix I.

2.1. Methodology

From the outset of the study, it was recognized that there were few, if any, emission factors suitable for the commodities concerned, and for local production and transport conditions. The emissions assessment methodology is based on best practice in terms of the relevance and transparency of emissions assessment, as recommended in ISO 14064. As emission factors adapted to products available on local markets are not available, the vast majority of emission factors used in this study are based on available, recognized and public databases. Table 2 in section 2.4 shows that over three-quarters (83%) of the emission factors come from the "Empreinte" and "Agribalyse" databases.

These two French databases are summarized below:

- **Base Empreinte**

Base Empreinte® is the result of the merger of Base Carbone®, the reference base for carbon accounting by organizations, and Base IMPACTS®, the base used for French environmental labelling of consumer products.

Today, it is the reference database for Article L229-25 of the French Environment Code. It is consistent with article L1341-3 of the French Transport Code and the European Emissions Trading Scheme default values for emission factors (GHG indicators).

It is also the official basis for the French government's environmental labelling program for consumer products and services other than mobility and construction products.
The Base Empreinte® is administered by ADEME, but its orientations and the data it contains are validated by a governance committee and technical committees bringing together various public and private players.

Finally, transparency is one of the cornerstones of the Empreinte® database. Documentation details the assumptions behind the construction of all the data in the database, and provides links to the studies that led to their construction.

The emission factors shown are referenced, with source documentation, and for the most part accompanied by information on the degree of uncertainty.

Example of an emission factor identified in the Empreinte database

- **Agribalyse database**

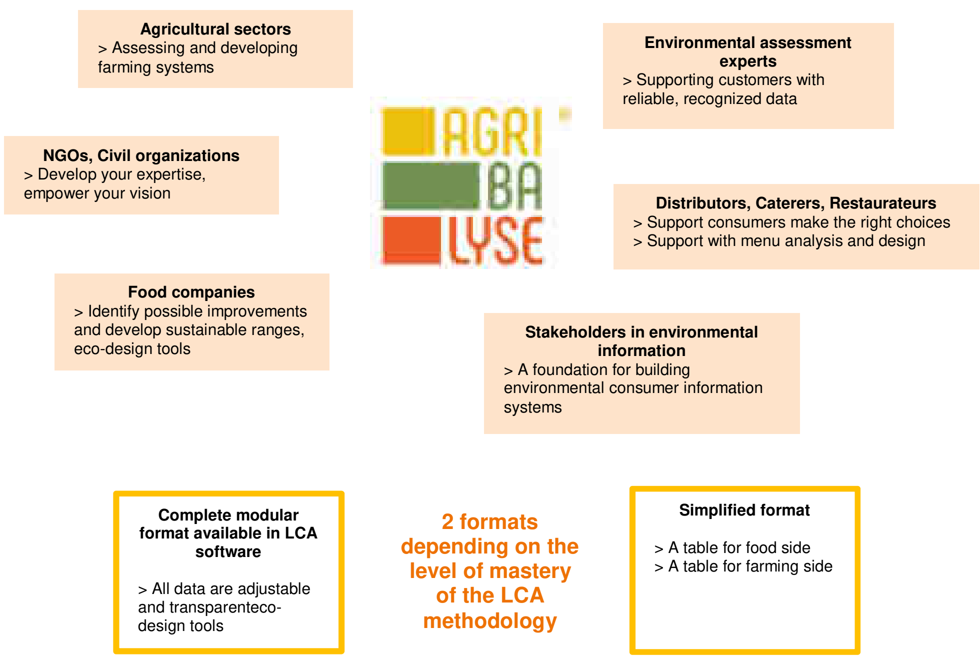
The Base Agribalyse® is an innovative collective program, co-piloted by ADEME and INRAE, which provides reference data on the environmental impacts of agricultural and food products through a database built according to the Life Cycle Assessment (LCA) methodology set out in the ISO 14044 standard.

This method therefore provides indicators of the environmental impact of products, including all the stages involved in their manufacture (from field to plate) and taking into account various environmental issues, including climate.

Extensive documentation (including a User Guide) is available, and a network of experts is on hand to help users of this work.

There are two database formats, depending on the level of mastery of the LCA methodology: a simplified format (a spreadsheet for the food sector and a spreadsheet for the agricultural sector) and a complete modular format available in LCA software.

The various players in the program are shown in the graph below:



The methodology used does, however, have some shortcomings in terms of the completeness of the calculations, as the emission factors for some MEBs items were not found. However, the transparency of the data presented will enable readers to identify these possible biases, which are nonetheless minor in view of this study's objective of providing an initial order of magnitude for GHG emissions from minimum expenditure baskets.

The various steps involved in calculating GHG emissions from MEBs are shown in Figure 1 below, and explained in the following paragraphs.

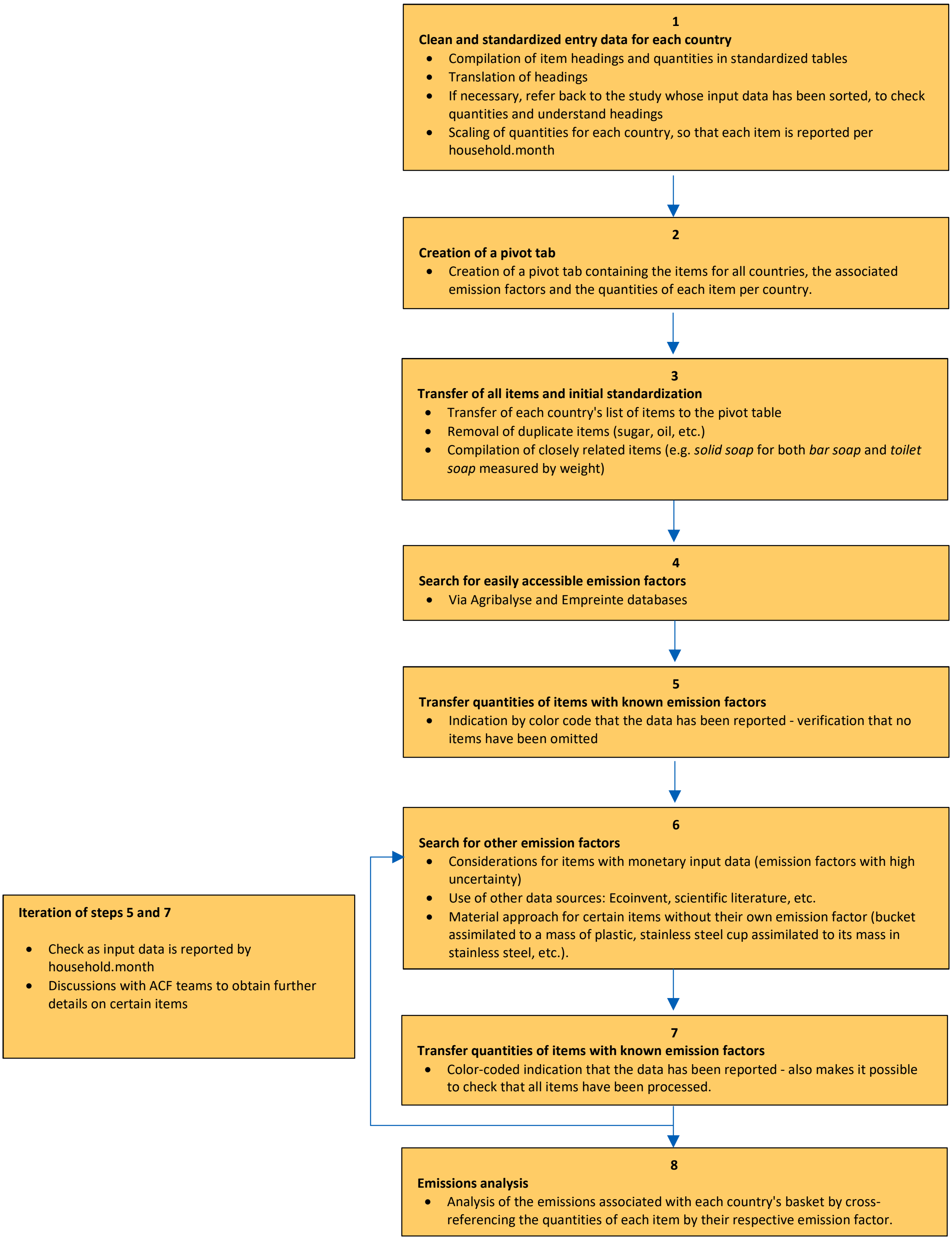


Figure 1 Methodology for calculating basket emissions

2.2. Input data

ACF provided the contents of the baskets and the source studies for the countries to be studied. In all, baskets from 16 countries were analysed. For each country, the composition of the baskets was explained, by category of item (food, hygiene, etc.).

Minimum Expenditure Baskets (MEB)

This basket is defined as the average cost of what a household needs to satisfy its basic needs, on a regular or seasonal basis; it is used to identify and calculate, in a particular context and at a specific time, the average cost of a socio-economically vulnerable household's multi-sector basic needs, which can be monetized and accessed in adequate quality on the local market.

The goods and services included in the MEB must enable households to meet their basic needs and minimum standard of living without resorting to negative coping strategies or compromising their health, dignity and essential means of subsistence. The MEB can be calculated on the basis of household size, which varies from one country or context to another.

The MEB is drawn up as part of a collaborative process involving various players (governments, UN agencies, local and international NGOs) working in different sectors of humanitarian action within a single country: food security, WASH (water, sanitation and hygiene), health, protection and shelter.

It is developed using a variety of approaches:

i. a rights-based approach, which uses assessed needs and standards (e.g. human rights, humanitarian law, Sphere standards, national technical standards) to define the composition of the basket, and local market prices to define its cost;
ii. an expenditure-based approach, which focuses on effective demand by using local consumption patterns to define the composition and cost of the basket;
iii. a hybrid approach, which is a pragmatic option combining fee-based and expense-based elements.

Most MEBs are hybrid to some extent. In some countries, the MEB will include basic foodstuffs and hygiene products; in others, it will include expenditure on education, health, or livelihood restoration (agricultural input kits, for example). <u>The MEB is therefore quite distinct from the usual consumption habits of the population</u>, even if this notion is integrated into the construction of the MEB.

Furthermore, while the MEB is used to identify and calculate the average cost of a household's multi-sector basic needs, it is not the same thing as the value of the cash transfer. It is an important operational tool for calculating the latter.

The value of the cash transfer itself, decided by the stakeholders involved in a humanitarian response, may cover all or part of the MEB; it may be decided to cover only 20%, 50% or 100% of the MEB through a cash transfer intervention (the most common rate of coverage is between 30% and 70%), depending on the context and the capacity of households to cover all or part of their basic needs (for example, if hygiene kits are being distributed in the intervention zone, or if the means of generating income are not totally affected by the shock).

Similarly, while the MEB makes it possible to calculate the value of the financial amount to be transferred to the people targeted by the intervention, the final use of the money received remains the responsibility and discretion of the beneficiary; thus, multi-purpose cash transfers (MPCA or TEUM in french for Transfert d'espèces à usage multiple) are cash transfers specifically designed to cover multiple needs, with a transfer value defined consistently thanks to the MEB estimation. But the final use of the money may cover needs not included in the MEB (e.g. debt repayment, payment of school fees, settlement of health expenses, etc., not all of which are systematically included in the MEB calculation).

Finally, in some cases, the household has already made the expenditure, to meet previous essential needs, and the cash transfer has in fact put the household into debt. If we can assume that the expenditure corresponded to the essential needs that would have been financed by the cash transfer, we can only regret that the expenditure (and its associated emission) has already taken place, thus cutting off any leverage for action to reduce GHG emissions over the duration of the program.

Wherever possible, the data analyzed corresponded to physical flows (i.e. masses, volumes, quantities of equipment), but in some cases, the data were defined in monetary units (education, health, home maintenance, etc.). Where necessary, the data were then recalculated so that the quantities of each basket were related to a household (the number of people per household differed from country to country), and per month.

Items given on an annual basis have therefore been reduced to a monthly basis in order to be able to compare countries by calculation, although physically this does not reflect reality (example: 1/12e of a water boiler counted annually).

The items were then translated into French, clarified by referring to the study if necessary, or by exchanging with the ACF teams. The items were then harmonized, by bringing together certain headings that differed in wording but reflected the same reality (e.g.: bar of soap and soap by weight, combined under the same solid soap item).

2.3. Creating a pivot table

At the same time, a pivot table has been created. This brings together information from the list of items in the baskets, the corresponding quantities in the countries concerned, the emission factors associated with the items, and the corresponding emissions in each country.

2.4. Emission factor research

All references are explained in the Excel calculation file, by Internet links, or, when relevant, with the document used saved and transmitted in the study file.
The search for the most appropriate emission factors for each item followed the flow chart below.

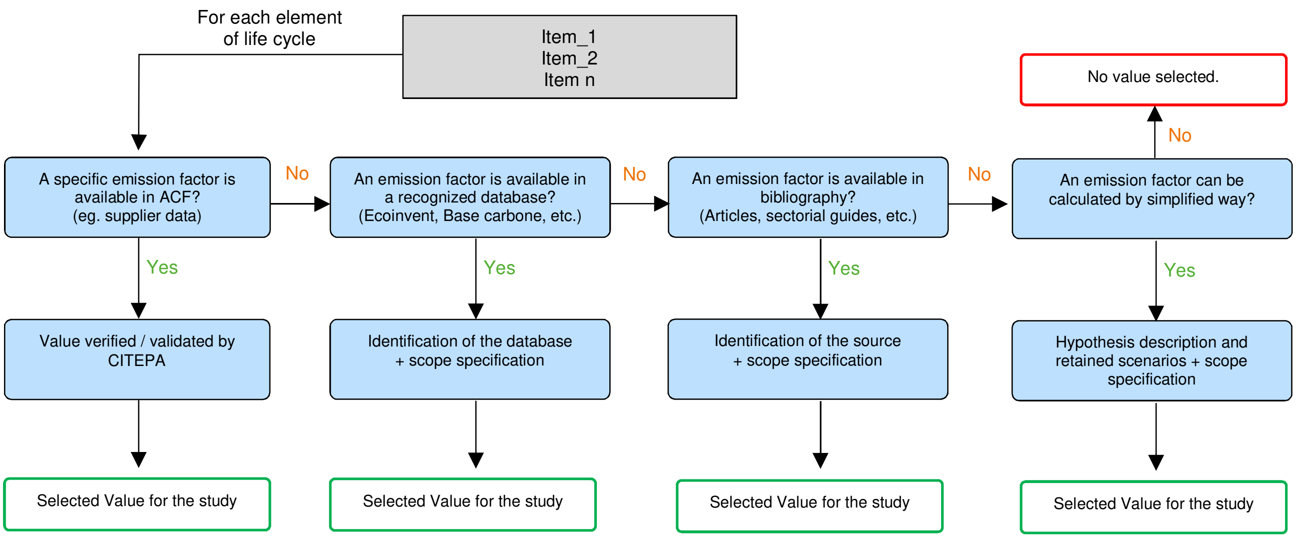


Figure 2 Emission factor search flowchart

Most of the emission factors used come from databases and are specific to the items in the baskets, as explained in the following table.

Origin of emission factors	Number	Part
ACF Suppliers	0	0%
Databases	101	75%
Bibliography (sectorial guides, scientific litterature, Internal studies CITEPA)	11	8%
Material approach calcultation	23	17%
Total	135	100%

Table 1 Breakdown of emission factors

As ACF has no specific supplier-related data, the preferred emission factors were sought in French and international databases. When a relevant emission factor was not available, the item was approximated by its composition.

For example, the item "15L bucket" was reduced to a mass of plastic, based on the standard weight of a 15-liter plastic bucket, and a common plastic for this object. The emission factor specific to the type of plastic chosen was then used. This assumption adds uncertainty to item-related emissions: it takes into account the material's creation phase, but not its shaping phase to make an object, nor the reduction measures put in place to mitigate environmental impact. A calculation presented in Appendix II compares, for two items, the results of a material approach with the emission factors specific to the items.

The following sources were used:

Source	Number	Part
Agribalyse Database	59	44%
Empreinte Database	52	39%
Citepa	4	3%
EcoInvent	2	1%
ICRC	8	6%
ADEME Library	2	1%
Scientific letterature	5	4%
Citepa - From AIE and DEFRA - FE 2016	3	2%
Total	135	100%

Table 2 Sources used for emission factors

The assumptions relating to the CITEPA items are explained in Appendix III. Those relating to emission factors in the Agribalyse database are explained in Appendix IV.
Finally, some items could not be accounted for, either by specific emission factors or by physical approach (e.g. hoe, solar lamp, supply kit). These items remain negligible in number compared with the total number of baskets. Their exhaustive list is given in Appendix IV.

2.5. Scope and uncertainties

For each emission factor, the scope and uncertainty have been recorded, where available.

Overall :

- More than half of the emission factors (61%) explicitly take into account the transport part of the item's life cycle;
- Half of the emission factors (49%) explicitly take into account the waste part of the item's life cycle;
- A third of emission factors (32%) have an explicit uncertainty.

This uncertainty ranges from 5% to 100%, with a median of 50%. Emission factors are therefore not all established with the same perimeter, and even when information on the inclusion of transport or waste was explicit, it was not possible to discriminate their impact on the emission factor. This adds uncertainty to the emissions calculated.

It should be noted that 16 emission factors using monetary ratios (in the form of XX $kgCO_2e$/€) were used, for telecommunications or health services for example. These present a high degree of uncertainty in the very elaboration of the emission factor (80%), but in this study this is added to the uncertainties linked to the very use of monetary data.

In fact, the basic data is expressed in local currency, whose inflation has changed between the time of the study and today. It was necessary to convert this local currency into euros, using the current exchange rate, in order to use the emission factor. These calculations are therefore subject to significant uncertainties.

3. EMISSIONS ANALYSIS

3.1. Overall result

Basket emissions were obtained by multiplying the quantities of each item by its emission factor. The results are shown in Figure 3 below. They represent 7.6 tonnes of CO_2 e, ranging from 150 kgCO_2 e/household.month for Zimbabwe, to a maximum of 740 kgCO_2 e/household.month for Bangladesh, and a median of 290 kgCO_2 e/household.month.

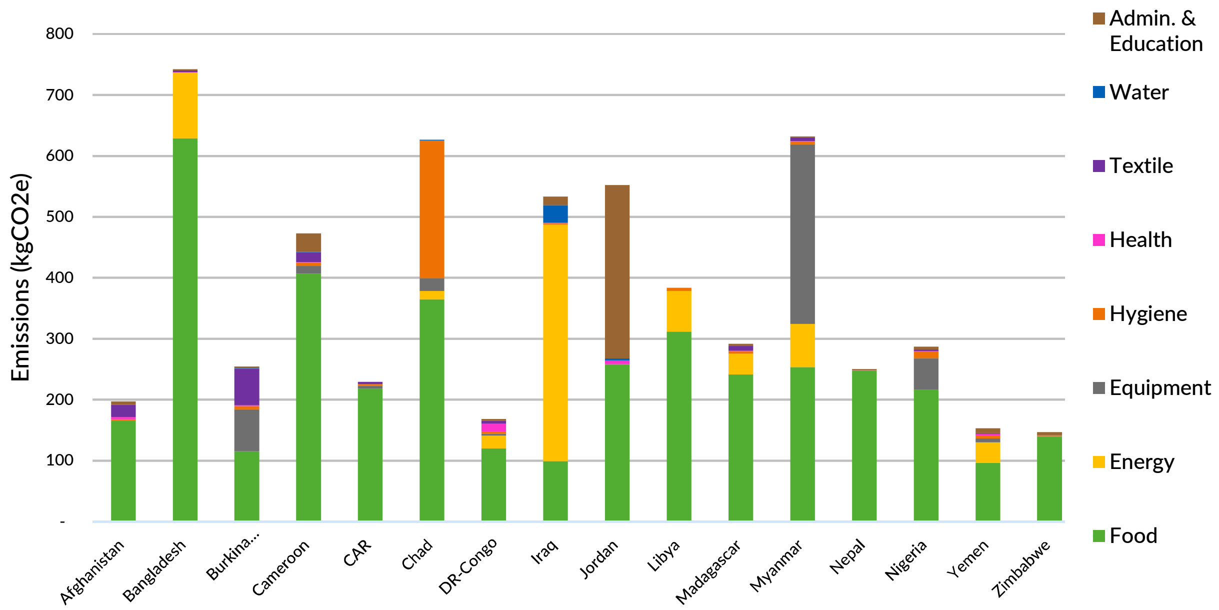


Figure 3 Total basket emissions by country (kg CO2e)

As shown in figure 3 above, the items taken into account in the composition of MEBs vary too widely from one country to another for a study of the GHG footprint of complete baskets (taking into account all the items making up the basket, as well as the number of people making up a household) to be of any use.

As explained in section 2.2, the MEB is a tool used to estimate the amount of products accessible on local markets, and for which households have supply problems despite the presence of products on local markets. Under no circumstances does the MEB reflect the carbon footprint of a complete diet, be it the national average of the country concerned, or the dietary habits of the target audience (e.g. refugee population specifically).

3.2. Specific results

The baskets are not comparable as they stand, as not all categories are present in all countries. Furthermore, they are estimated per month and per household, the size of which varies from country to country (from 4.8 people per household in Madagascar to 7.5 people in Iraq, for example). ACF wishes to keep the result per household (and not per person within a household) as some of the products and services are shared by the household (home maintenance).

Food-related components are the only ones present in all baskets, and in most cases they account for the largest share of basket emissions.

In contrast, the values that emerge from the average trends can be explained by the following findings:

- Iraq includes a significant proportion of energy-related emissions. This category is present in half the baskets (8 countries). For Iraq, the quantity of energy is higher than in the other countries

(330 kWh/month/household selected), and the emission factor associated with energy in this country is high (1175 gCO_2 e/kWh of electricity in Iraq, compared with 430 gCO_2 e/kWh in Myanmar, for example);

- Myanmar includes a relatively high proportion of equipment. The majority of this item is due to the "mattresses" item, whose emission factor is taken from the Base Empreinte ;
- Chad includes a relatively large hygiene section. This is due to the presence of hygiene kits, for which a standard ICRC emission factor has been used (with no further details on the composition of the ICRC hygiene kit);
- Jordan has a relatively high proportion of administrative and educational costs. These results are subject to considerable uncertainty, as they are based on a conversion between the local currency (JOD) and the currency of the emission factor (EUR), and on the use of a monetary ratio, modeled for France. Local conditions are quite different.

3.3. Food

Emissions linked to the "food" category are shown in Figure 4 below.

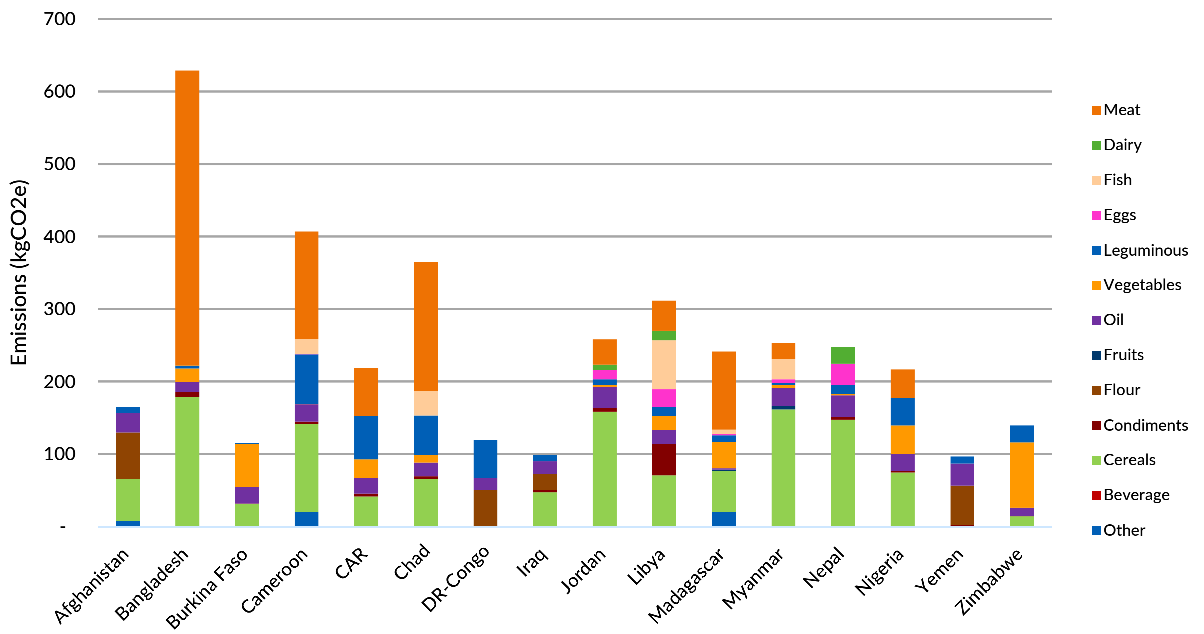


Figure 4 Emissions of food category items, by country (kgCO2e/monthy MEB)

As already mentioned, the contents of baskets from one country to another are not comparable in absolute terms, and this is not the aim of this study: on the one hand, locally available foodstuffs, eating habits and temporality differ from one MEB to another (they therefore present different food categories and items from one another); on the other hand, household size differs from one country to another.

GHG footprints in absolute terms are just an intermediate step, before we apply them to the estimated amount of MEB and calculate the emission factor, in $kgCO_2$ /$ of currency transferred.

However, observation of the absolute values shows us that a group stands out at the very bottom, with the DRC, Iraq, Yemen, Burkina Faso and Zimbabwe. These low emissions can be partly explained by the fact that the baskets do not include animal products, items with a higher emission factor than vegetable products.

At the other end of the scale, Bangladesh stands out at the very top. This can be explained by the high quantity of meat and rice in the basket, items with high emission factors.

Overall, the food groups accounting for most emissions are cereals and meats (59% in all), as shown in Figure 5 below.

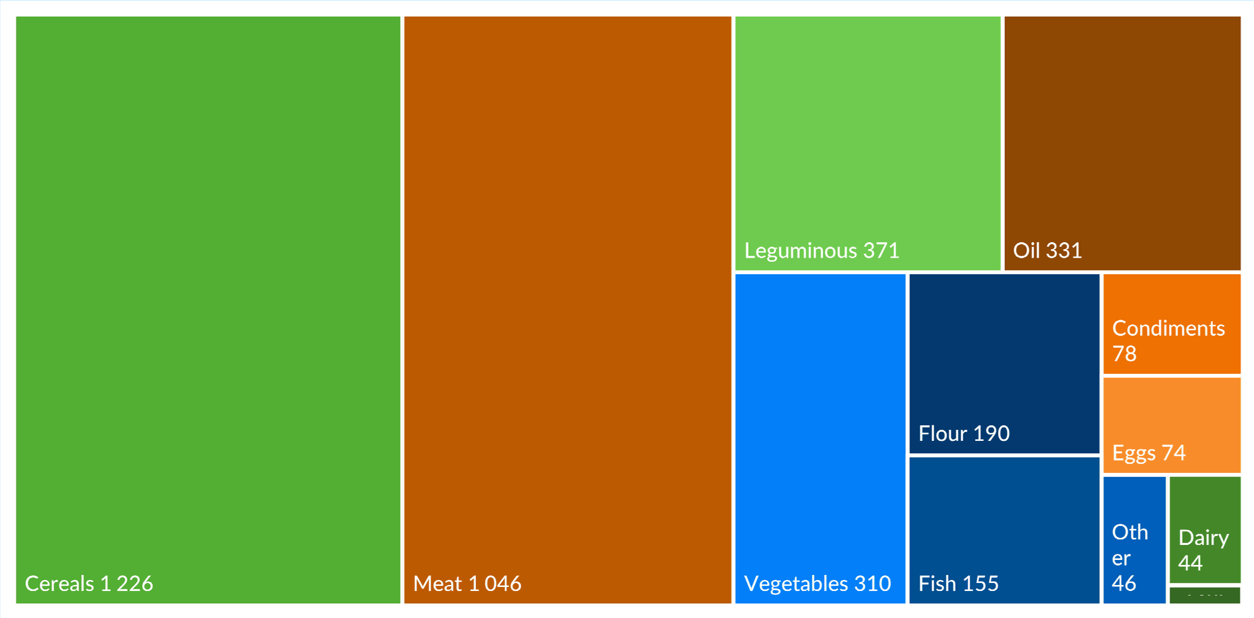


Figure 5 Balance of CO_2 e emissions by "food" item per category, based on all cumulated monthly-MEB emissions (kg CO2e)

In Appendix VI, you'll find further graphs to help you understand and analyse the results of this item.

Among the items in this category are mutton and rice, which together account for almost half (48%) of total food-related emissions. This is due not only to their significant quantity in food baskets, but also to their high emission factor. These items will be examined in greater detail in the final section of this report.

Analysis limits

As explained above, the contents of the baskets vary from country to country, making them incomparable.

In addition, the calculation of emissions associated with items in this category has its limitations. The emission factors used are mainly taken from the Agribalyse database, which evaluates the emissions of various foods for consumption in France. These emission factors therefore take into account the transport phase in the case of France, when for some countries elements are imported from afar, or on the contrary, produced locally. By the same token, farming and breeding practices vary from one country to another, and so do actual emissions.

Cash cost analysis

An analysis taking into account the monetary costs of the baskets was carried out, in order to compare the carbon intensity of costs for the food category in the different countries. To do this, the emissions of this category were reduced to their cost (per USD, using the exchange rate in force at the time of the study). In this way, variations due to household size are taken into account.

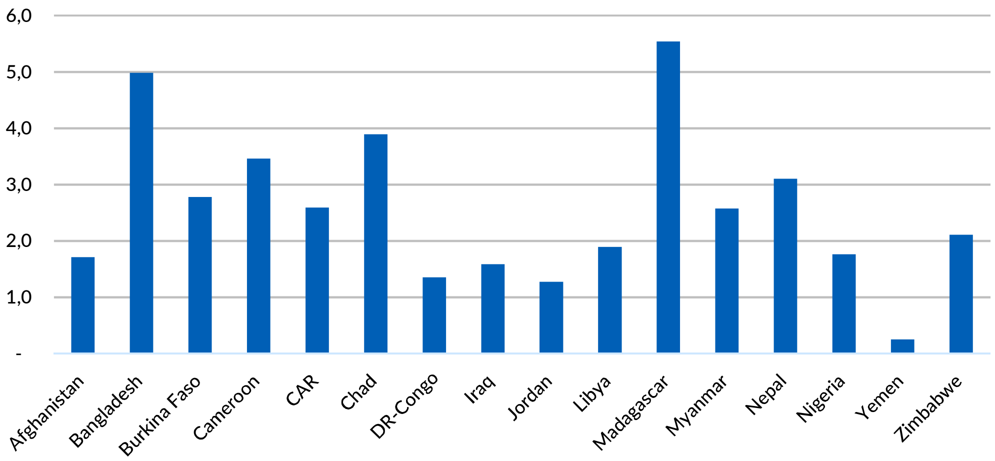


Figure 6 GHG intensity of the MEB food category with meat & fish (kgCO2e/USD)

Carbon intensity depends, on the one hand, on the carbon content of the baskets - this is low for Yemen with an MEB containing only vegetable products, and high for Bangladesh or Madagascar with an MEB containing meat products (Figure 4) - and, on the other hand, on the cost of the basket - which can vary greatly depending on local economic conditions.

In Figure 6 above, the results also take into account both the number of people per household and the cost of the basket components at the time of the study. The study of carbon intensity per person, rather than per household, is not particularly interesting. Indeed, the more people a household contains, the greater the quantities of products in the baskets, and the higher their price: the GHG intensity of the complete basket for a household therefore takes into account the size of the household. The carbon intensity of monthly baskets averages 2.6 $kgCO_2$ e/$ for the food category, with extremes ranging from 0.2 $kgCO_2$ e/$ for Yemen, to 5 and 5.5 $kgCO_2$ e/$ for Bangladesh and Madagascar respectively.

Figure 7 below shows the same calculation as figure 6, GHG intensity of a monthly MEB per household, but this time without meat or fish. ACF wanted to study this case, firstly because meat and fish products are particularly carbon-intensive, and secondly because they are particularly expensive, on average 4.5 times more so. For every USD spent, it is possible on average to buy 1.35 kg of cereal products, compared with less than 300 g of meat or fish.

As the actual amount distributed during the cash transfer only covers a percentage (generally 30 to 70%) of the total price of the estimated MEB, it seems reasonable to assume that, facing a choice of expenditure to d, the public receiving the transfer will direct its choice towards those products that enable it to fill its plate. Following this line of reasoning, the least expensive products in relation to their weight will be selected, and the most expensive products (meat and fish) will thus be deprioritized, which should reduce the GHG intensity of the MEB, since these same products are also the most GHG-emitting.

Nevertheless, the reality seems far more subtle than a simple rule of prioritizing expenditure according to its price by weight. Several studies, including one by the World Food Program (REVA program - Refugee influx Emergency Vulnerability Assessment / Bangladesh / 2018[2]) show that there are significant differences in consumption between different groups (refugees VS national populations living near refugee camps), or depending on whether the household is run by a woman or a man.

We observe that the GHG intensity of MEBs of countries with meat in the basket composition decreases sharply, pointing to meat as a major carbon contributor (65% of Bangladesh's GHG footprint), disproportionate to its budgetary impact. Meat is on average 4.5 times more expensive per weight of product, while it is 10 times more carbon-intensive than cereals with high emissions (rice), and up to 30

[2] https://reliefweb.int/report/bangladesh/technical-report-refugee-influx-emergency-vulnerability-assessment-reva-cox-s

times more carbon-intensive than low-emission foods (wheat, corn, etc.). Without taking meat and fish into account, the average GHG intensity of the MEB studied drops by 2.1 kgCO e/USD.$_{2}$

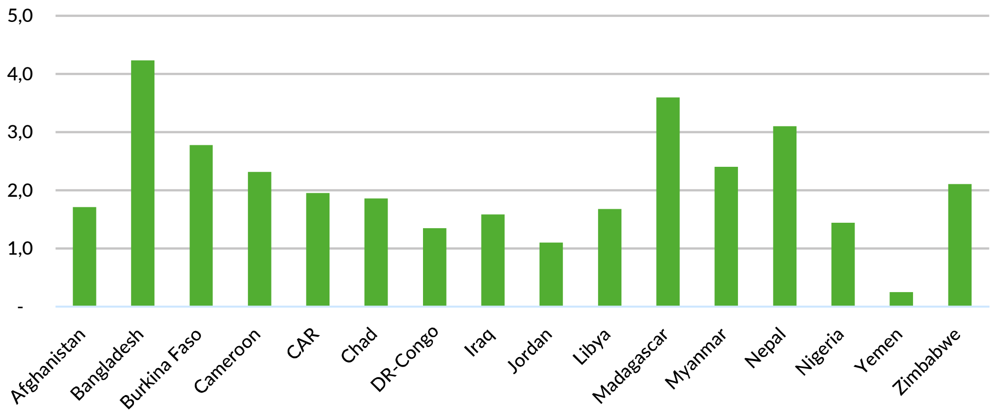


Figure 7: GHG intensity of the MEB food category - excluding meat and fish (kgCO2e/USD)

The comparison between these two average values of 2.1 and 2.6 $kgCO_2e$/USD is edifying: the fact of assuming that beneficiary households will buy meat or fish or not, with the first 50 percent of the total amount of a MEB allocated to them, can vary the emission factor by +/- 15%. Such a variation applied to the approximately 25 million euros of activity linked to Action Contre la Faim's *Cash Transfer Programming*, would alone generate a variation in the organization's overall carbon footprint of 20 $ktCO_2$ e.

In the absence of data on actual consumption using the transferred currency, Action Contre la Faim has assumed the use of meat and fish emission factors for the calculation of its 2021 GHG footprint. It is understood that this assumption is very likely to be unfavorable in relation to actual consumption, which will need to be studied for future iterations of the GHG footprint calculation.

For comparison, Figure 8 below juxtaposes Figures 6 & 7, and the carbon intensity of the countries studied, calculated by the ratio between national emissions in 2021 (source: World Bank database based on data from the ClimateWatch website) and national GDP in 2021 (source: World Bank).

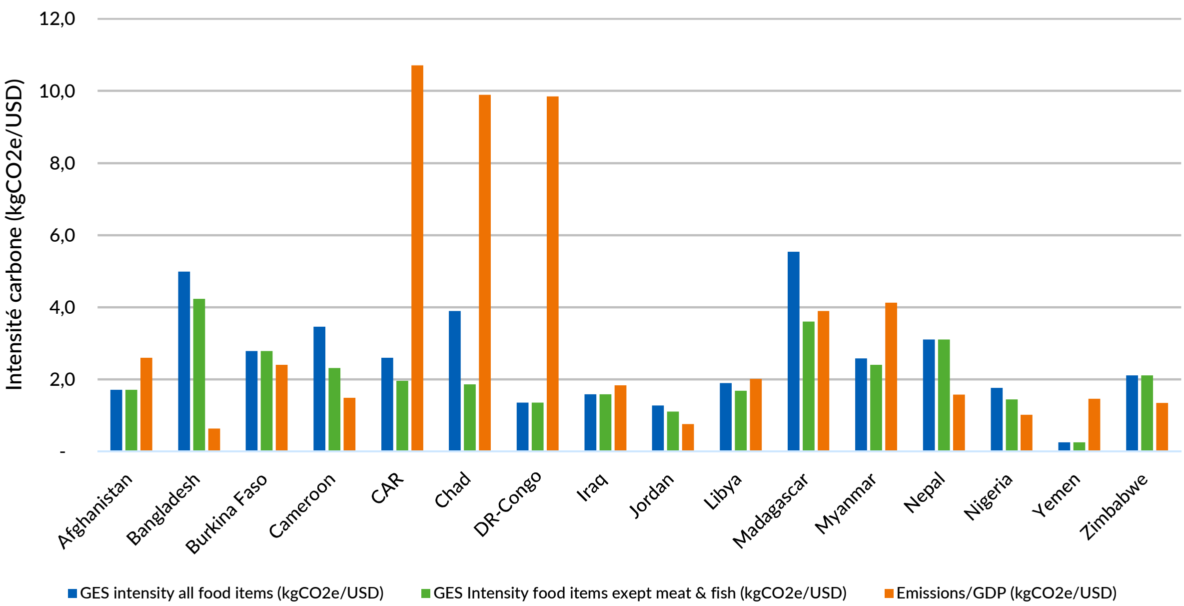


Figure 8 Comparison of the carbon intensity of baskets and the carbon intensity of the economy, by country

Although for some countries, the two methods lead to comparable results, for most of them the discrepancies are significant, and there is no correlation between the GHG intensity of the MEB analysed (with or without meat and fish), and the GDP intensity of the countries concerned.

In terms of GDP intensity, 3 countries in particular (Central African Republic, DRC and Chad) show very high intensities, which can be explained by the over-representation of emissions from agriculture or land use change (deforestation) in their national footprint, and/or by a very low GDP (the year 2021 - post-covid - is taken as the reference).

The low GHG intensity of Bangladesh's GDP can be explained by its very high GDP, while its emissions are limited. Compared with Nigeria, which has a GDP and population similar to that of Bangladesh, the country is 6 times smaller (very low transport emissions) and does not massively exploit hydrocarbons.

The examples of Bangladesh, Central African Republic, DRC, Chad and Yemen show that the carbon intensities of the food content of the MEBs are not correlated with the GHG intensity of their respective GDPs, as the composition of GHG footprints is totally different, and the GDP of a given country is not correlated with the value of the food products concerned (whose price can vary greatly from one region to another, or even from one period to another, depending on the availability of the commodity).

In the case of countries where the GHG intensities of the food content of the MEB and GDP are close, this is either because the majority of the country's emissions are linked to the activities required for food production (and therefore to the content of the baskets), with these activities contributing to GDP at a value close to the price of the products (e.g. Madagascar), or purely by chance (e.g. Iraq, where the majority of emissions - hydrocarbon exploitation, electricity and transport - have little or nothing to do with food production activities).

4. FOCUS ON TEN ITEMS

The final part of the study involved a more in-depth analysis of key items among the baskets studied. The list was restricted to the following items:

- Meat (mutton/goat) ;
- Beef;
- Tuna;
- Rice;
- Wheat flour;
- Millet (millet, millet, sorghum);
- Electricity ;
- Other hygiene items;
- The "mattress" item.

These items have been grouped by family for a more pertinent analysis, as described in the following paragraphs. Oils have been added to the list, given their weight in "food" category emissions.

The aim of this part of the study is not to encourage the modification of theoretical minimum expenditure baskets. Clearly, removing meat from the theoretical MEBs will not stop the beneficiaries from buying the products concerned. The aim is to gain a better understanding of the emissions linked to each product contained in the MEB, and thus identify potential actions aimed at local markets, or aimed at making certain products more accessible on local markets.

4.1. Meat and fish

Meat and fish account for 4% of the total weight of food items (3% for meat and 1% for fish), and 32% of emissions in this category (28% for meat and 4% for fish).
For comparison, we have chosen to include in this focus the other high-protein foods present in ACF baskets: eggs (1% by weight and 2% of food category emissions), and protein crops such as lentils and beans (11% by weight and 9% of food category emissions).

The total quantities of these products are listed in Appendix VII.

The impact of the main types of protein food is shown in Figure 8 below. The emission factor is broken down according to the stage in the food's life cycle (agriculture, transport to the processing site when available, supermarket and distribution, etc.).

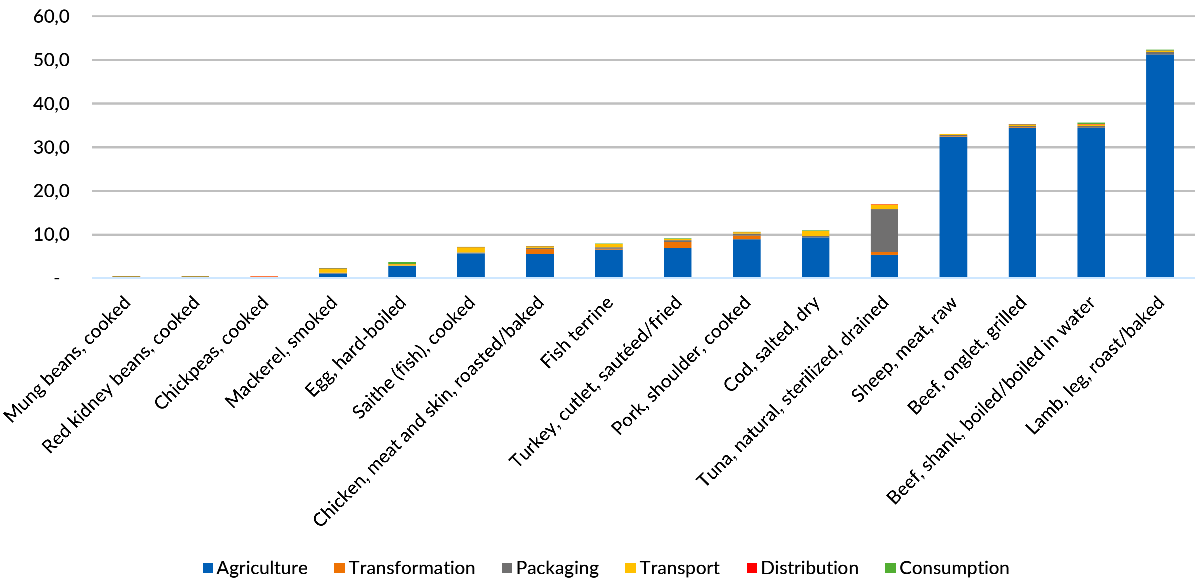


Figure 9 Emissions from common protein-rich products over the entire life cycle (kgCO2e/kg of product)

Generally speaking, protein products from animals are more emissive than those from plants, whether we compare emissions per kg of product or per protein container (graph in Appendix VIII), even if we include emissions from the cooking phase.

Overall, the impact is mainly located during the farming phase. It is important to note that the emission factors, taken from the Agribalyse database, have been calculated for French consumption (the transport and consumption indicated will therefore be different in the case of other geographies and other energy mixes).

For tuna, packaging is what sets this item apart from other fish - canned tuna packaging accounts for half the item's emissions. Excluding packaging, it has the same emissions profile as the rest of the fish.

Apart from the fact that it is possible to reduce the impact of this product category, by giving preference to animal products with the lowest carbon content (white meats, eggs or fish), or by integrating more protein crops, we can see from the graph that a very large proportion of the emissions of most items are generated by the "agriculture" phase. It is therefore also in this phase that we need to analyse the potential for reducing emissions from foods in this category.

4.2. Rice and cereals

Rice alone accounts for 22% of the weight and 26% of the emissions of the food category. More globally, cereals (rice, sorghum, millet, etc.) and tubers (manioc, potatoes) account for 42% of the weight and 34% of the emissions of the food category.

The total quantities of these products are listed in Appendix VII.

For these items, the analysis was carried out in two stages: first comparing raw cereals, then including the cooking phase.

Figure 9 below shows the emissions of several cereals, broken down by life-cycle phase.

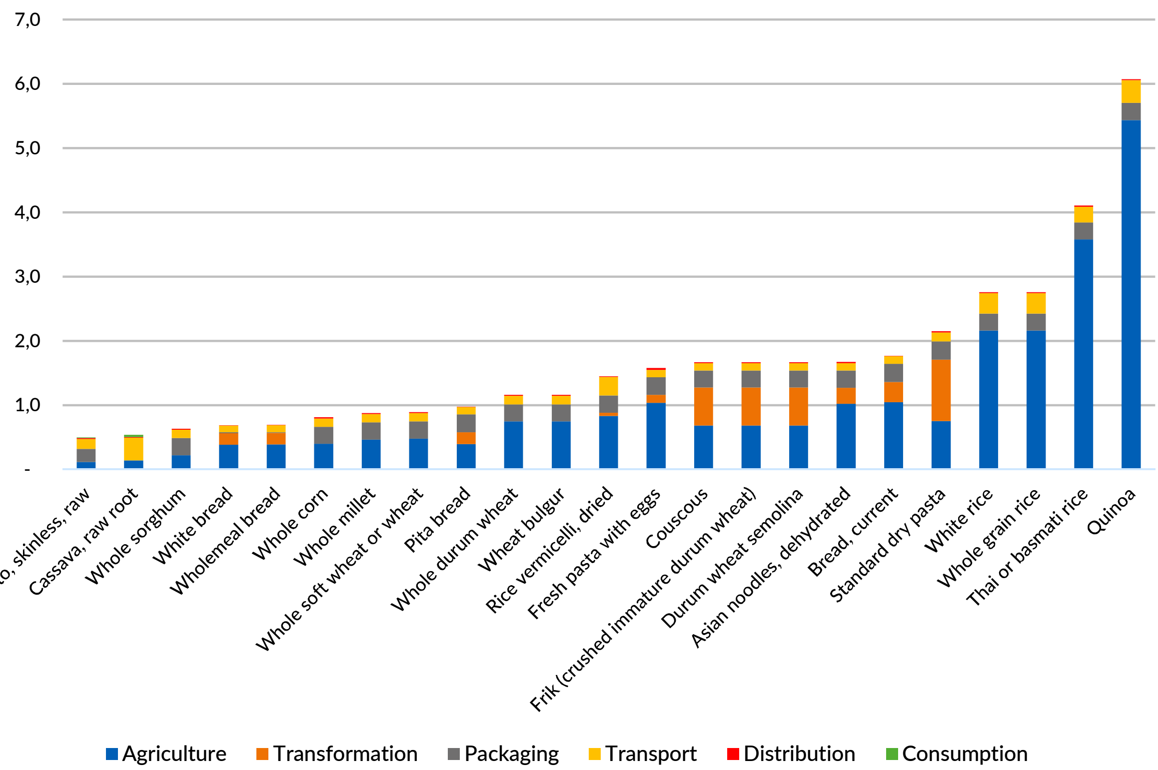


Figure 10 Emissions from cereals and tubers, excluding cooking, over the entire life cycle (kgCO2e/kg of product)

Overall, the farming phase is the one that weighs most heavily in the cereal's life cycle. For some items, the processing phase is also important. The packaging, transport and distribution phases remain low - however, these emission factors apply to France, and these phases could have a different impact depending on the geographical area.

Figure 10 illustrates in particular the weakness of using emission factors from European databases, which do not reflect the emissions actually generated by agricultural practices that can be observed locally. The example of quinoa is particularly revealing: for the production part alone, it is defined at 5.4 $kgCO_2e/kg$ of product in European emission factor databases (between 4.5 and 7 $kgCO_2e/kg$ depending on the database), whereas most known life cycle assessment studies for quinoa produced in the Andes [3][4] [5] present emission factors of between 0.5 and 1.5 $kgCO_2e/kg$ of product. This example of quinoa does not influence the results of the present study (no MEB containing Quinoa), but it is assumed that such discrepancies could be observed, particularly for meat products, as the differences in meat production methods in European countries and in the countries targeted by this study can be very significant.

The cooking phase was then taken into account and added to the previous emission factors. The analysis focused on items present in the ACF baskets studied. For each cereal, the energy required during the consumption phase, as specified in the Agribalyse ratios, was used. The emission factor for natural gas, an energy potentially used for cooking, was then applied to these energy consumptions. The result is shown in Figure 10. The same exercise was carried out with coal and heating oil, the results of which are presented in Appendix IX.

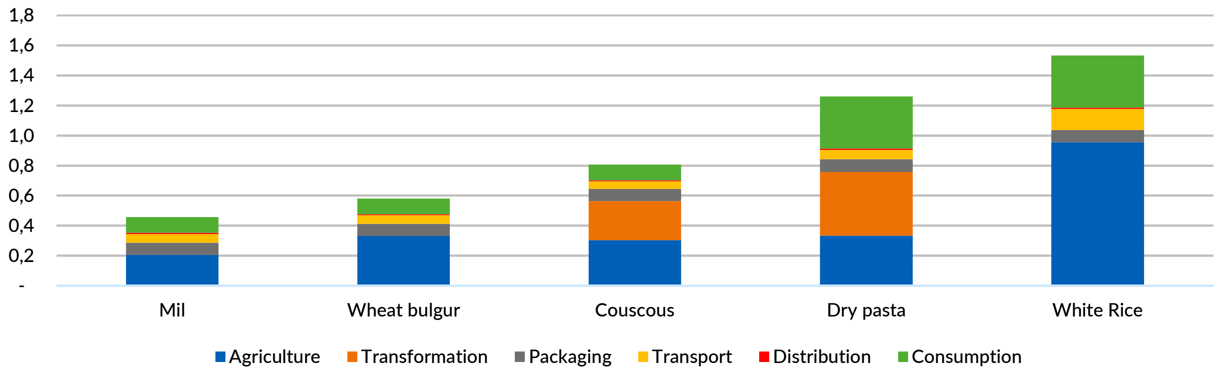


Figure 11 Emissions from cereals, including the cooking phase, by natural gas (kgCO2e/kg of product)

The importance of emissions remains in the same order as without the cooking phase, but the impact of dry pasta and white rice is accentuated by taking this phase into account.
So, to reduce emissions from cereal category items, in addition to giving preference to cereals with low emission factors, it will be relevant to look at the different phases in the cereal life cycle, adapted to local production methods.

4.3. Flours

Flours (wheat, corn and manioc) account for 16% of the weight and 5% of emissions in the food category. The total quantities of these products are listed in Appendix VII.

Figure 11 below shows the emissions of several cereals, broken down by life-cycle phase. The emission factor for cassava flour, taken from an article in the scientific literature, could not be broken down by phase of the cassava life cycle. It does, however, explicitly include a transport phase.

[3] https://ecochain.com/blog/the-environmental-impact-of-quinoa-and-how-we-calculated-it/
[4] https://www.sciencedirect.com/science/article/abs/pii/S0048969718316619
[5] https://www.morningstarfarms.com/content/dam/NorthAmerica/morningstarfarms/pdf/MSFPlantBasedLCAReport_2016-04-10_Final.pdf

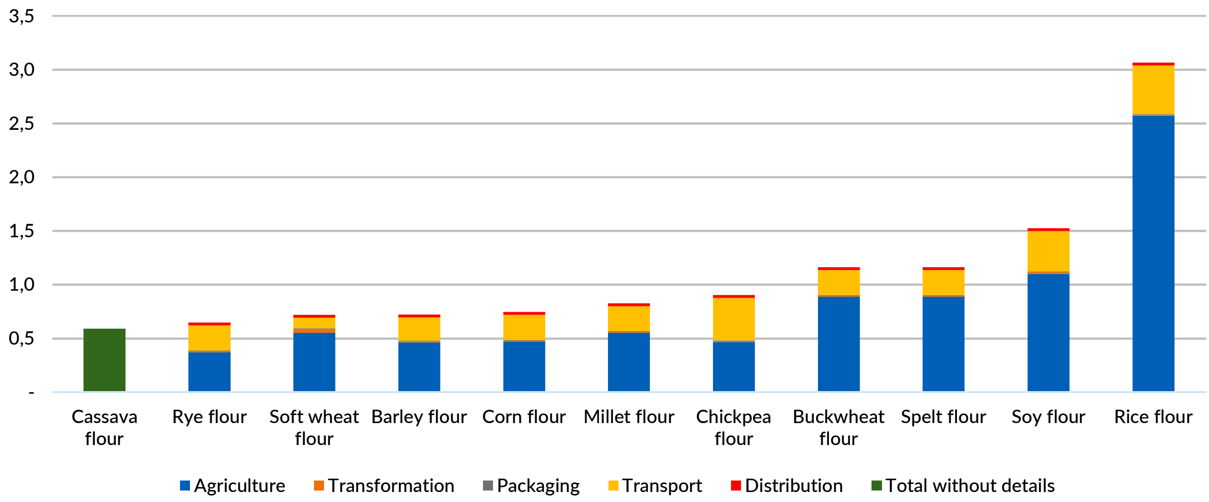


Figure 12 Flour emissions over the entire life cycle (kgCO2e/kg of product)

With the exception of rice flour, the various flours have comparable emission factors. The agricultural phase is the most important in terms of emissions. For these products, transport accounts for a significant proportion of the total impact. Once again, as the emission factor has been established for France, the transport phase is *a priori* different depending on the geographical area.
So, to reduce emissions in this area, it may be worthwhile to focus on the transport phase, and give preference to local flours.

4.4. Oils

Oils (palm, peanut, soybean, blend) account for 5% of the weight and 9% of the emissions of the food category.
The total quantities of these products are listed in Appendix VII.
Figure 12 below shows the emissions of several oils, broken down by life-cycle phase.

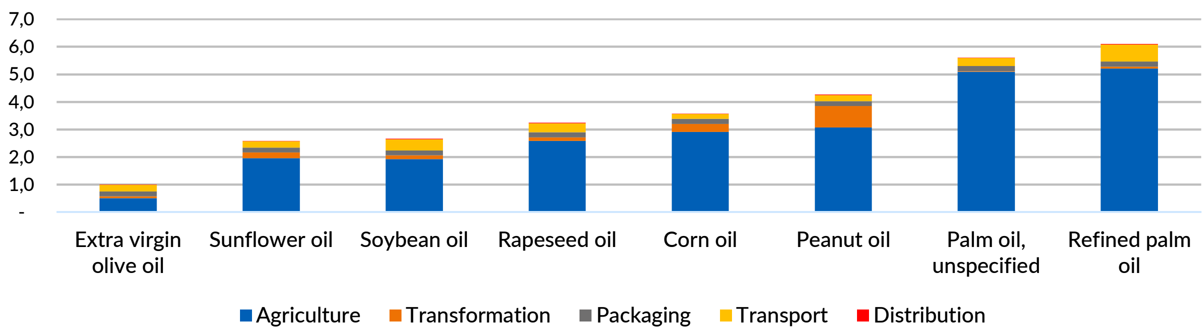


Figure 13 Life-cycle oil emissions (kg CO2e/kg of product)

The most important phase is agriculture. Palm oil stands out at the top end of the scale, with an emission factor slightly higher than the average. At the bottom end, olive oil has a low emission factor.
For items in this category, it may be worthwhile to focus on the agricultural part, the most impactful phase of the life cycle according to the emission factors chosen, and to give preference to oils with the lowest emission factors, and produced locally, without deforestation.

4.5. Electricity

Emissions from electricity depend on the means of production used. This varies from country to country, depending on domestic production and imports. The greater the proportion of fossil fuels in an energy mix, the higher the emission factor. In comparison, emission factors for renewable energies have been explained.

Emission factors are taken from data from the IEA (International Energy Agency) and from the DEFRA database, for 2016 factors. These databases did not present data for some of the countries in this study, which have therefore been set aside (Afghanistan, Burkina Faso, CAR, Madagascar, Chad).

Figure 13 below shows electricity emission factors for several renewable energies and for some of the countries studied in this study. These factors take into account upstream emissions (extraction/distribution/transport of fossil fuels), combustion emissions (from thermal power plants) and line losses.

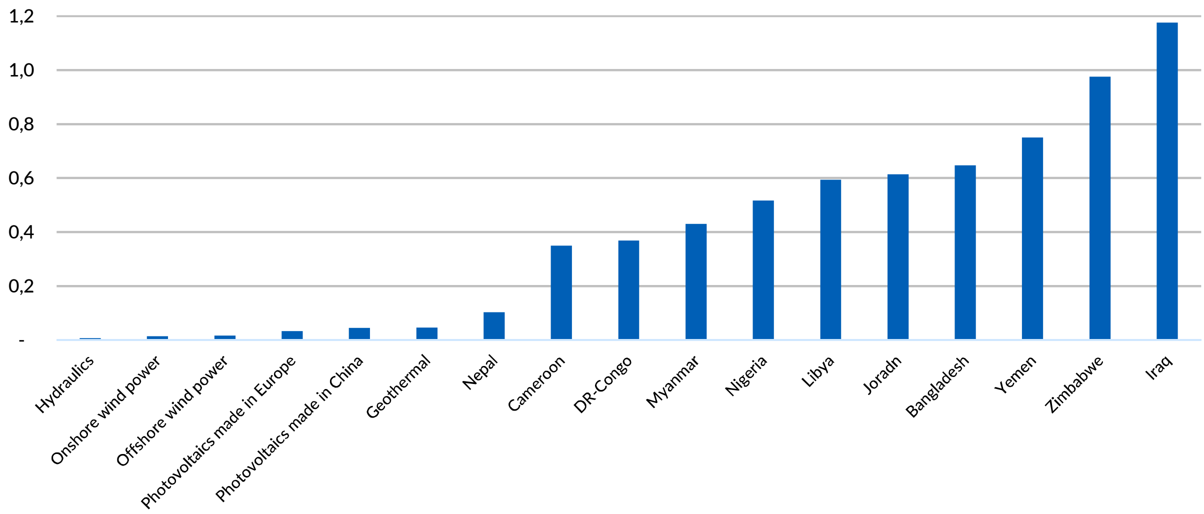


Figure 14 Electricity emissions by country (2016) - (kgCO2e/kWh)

The impact of this category of elements could be reduced with, for example, the installation of structures producing renewable energy.

4.6. Mattresses

The mattress item is present in two of the baskets studied (Nigeria and Myanmar).
The emission factor used, "foam mattress", comes from the Base empreinte. Another possible choice would have been the "spring mattress" factor, with a slightly smaller footprint.

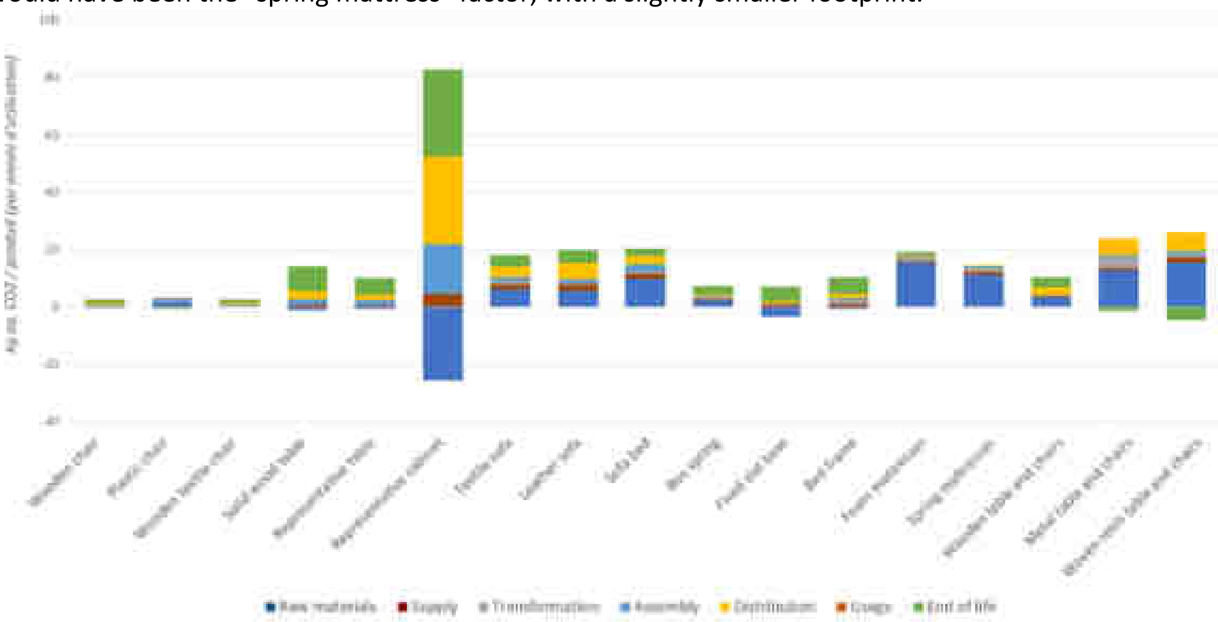


Figure 15 Contribution of different types of furniture to climate change

The impact of mattresses in terms of greenhouse gases is mainly linked to the raw materials used (whether for foam or spring mattresses).
Half of the impact of foam mattresses is due to their composition in flexible polyurethane foam and rubber; whereas for spring mattresses, the major impact is shared between flexible polyurethane foam, spun polyester and steel (Ademe study *Modélisation et évaluation des impacts environnementaux de produits de consommation et biens d'équipement*, available on the internet and attached to this study).

For this item, it may be worthwhile to take a closer look at its composition and consider possible alternatives.

4.7. Other hygiene items

Other hygiene items, in kit form, are included in the Chad basket. This kit consists of various materials ("blankets, mosquito nets, mats, jerry cans, etc."). The emission factor used, "hygiene kit", is taken from an ICRC study, but the sources or composition of the kit are not explained.

For this item, it will be necessary to clarify the physical composition of the kits, in order to assess the associated emissions more accurately and appropriately. At the same time, it would be interesting to contact ICRC in order to provide additional information on the composition of the kit associated with the emission factor retained in the database.

5. ILLUSTRATION OF DIFFERENT EMISSION LEVELS DEPENDING ON PRACTICES

Note: references for this section can be found in Appendix X.

5.1. Differences and similarities between LCA and inventory approaches

National inventories published within the framework of the UNFCCC allocate GHG emissions to a territory on the basis of where they are emitted into the atmosphere. For example, nitrous oxide emissions from soils cultivated with soya in Brazil are included in the Brazilian emissions inventory, even though this soya may be exported for consumption by a dairy cow in France.

A life cycle assessment (LCA) is a method for evaluating (usually multi-criteria) the environmental impacts of a product, service or process along its production chain or "life cycle", from resource acquisition to end-of-life.

Generally speaking, the basic principles of GHG emissions calculation are the same for both UNFCCC emissions reporting exercises and life-cycle analyses. The differences are generally to be found in the perimeters of analysis and the rules for allocating emissions when we seek to reconcile emission processes and production processes.

The 2006 IPCC guidelines (refined in 2019) provide emission factors for this calculation for all anthropogenic greenhouse gas-emitting activities, based on the latest scientific publications. They also provide a protocol to be applied in the event of incomplete or missing data.

On the other hand, more complex methodologies can be used where data are available and it is advisable to implement them, particularly for sectors with high emissions or where uncertainties are high (e.g. emission factor for N_2O from nitrogen fertilizer application on agricultural soils). These more complex method levels are generally the result of emission factors differentiated according to production conditions (environmental characteristics, production technologies, practices, reduction techniques).

5.2. Illustration of different emission levels depending on practices and soil and climate conditions.

As a result, practices and context can lead to different emission levels for the same production. We illustrate this point with two examples: methane emissions from rice production and enteric methane emissions from ruminants.

Methane emissions from rice paddies

Methane emissions from rice paddies are influenced by a number of factors, such as agro-ecological zone, cropping season, cropping intensity (multi-cropping), paddy flooding conditions, quantities and form of organic amendments applied to the soil, soil type, rice variety, etc. (IPCC, 2019[1])
Nikolaisen et al., 2023[2] compile emission factors calculated using an IPCC 2006, 2019 methodology and compare them with measurements for a set of contrasting situations on a global scale. The figures below illustrate the significant variations in emission levels for the same production target.

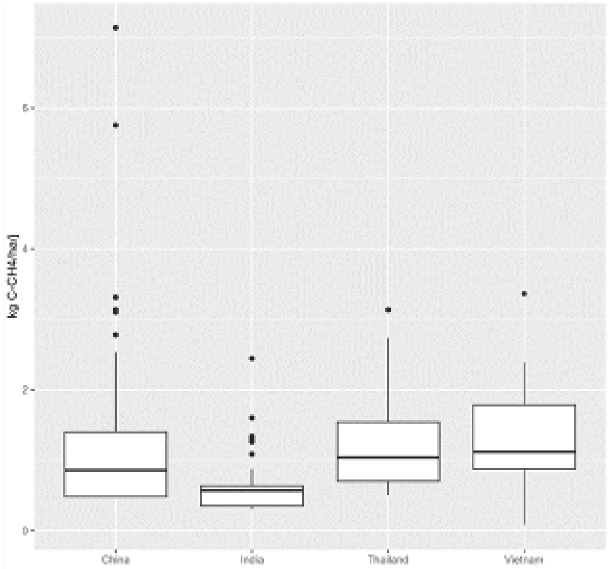


Figure 1.$_4$ CH emissions from rice paddies by country estimated according to the 2019 IPCC methodology - source: Citepa after Nikolaisen et al. (2023)

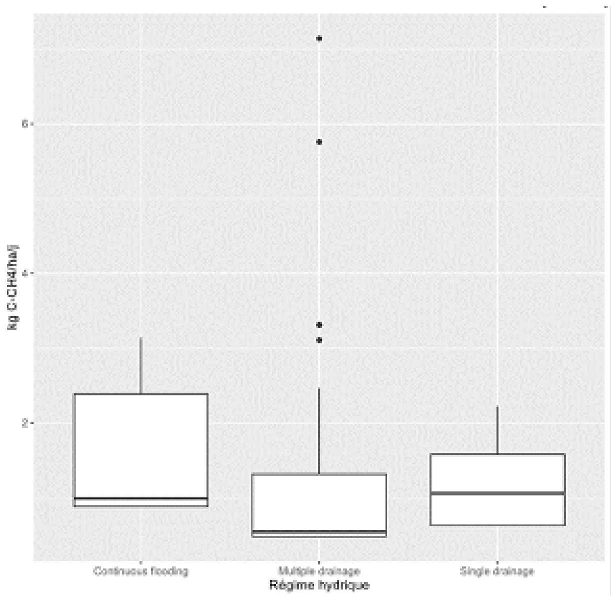


Figure 2: Estimated CH_4 emissions from rice paddies in China according to water regime - source: Citepa after Nikolaisen et al. (2023)

Similarly, in France, methane emissions from rice paddies are differentiated between Camargue (Occitanie & PACA are region of production in south of France) and overseas (French island Mayotte in indian ocean, and South America French Guyana in south America for overseas territories) production.

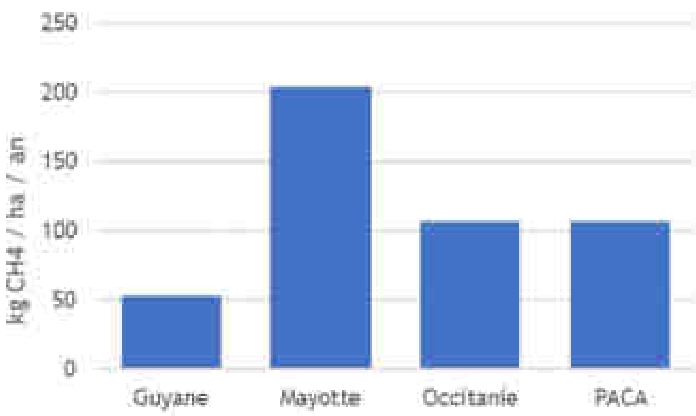


Figure 3: Methane emission factor for rice paddies by location in France - source: Citepa

Some actions to reduce methane emissions from rice paddies are mentioned in Pellerin et al. 2013[3] such as promoting soil aeration in rice paddies by reducing their depth or by regular emptying, which can reduce emissions.

We deduce that rice varieties and cultivation methods can multiply emissions from the same cereal by a factor of 4.

Methane emissions from enteric fermentation

Ruminant animals (cattle, sheep, goats) emit methane when digesting food in the rumen. These emissions can vary according to species, genetics, age, animal weight, and the quantity and quality of feed consumed. The enteric fermentation emission factors described by the 2019 IPCC guidelines thus vary from country to country and from production system to production system (Figure 4). Reduction practices, such as substituting unsaturated lipids for carbohydrates or adding an additive (nitrate) to feed, can reduce methane emissions (Pellerin et al., 2013).

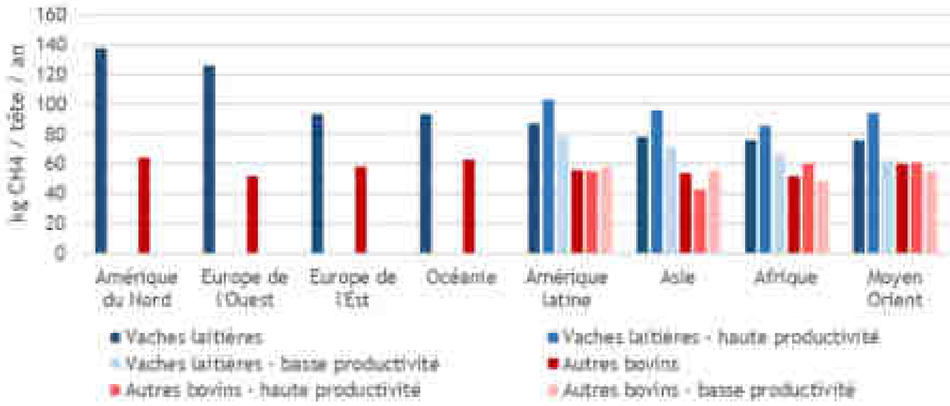


Figure 4: Enteric fermentation emission factor (Tier 1) for cattle by region and productivity level - source: Citepa based on IPCC 2019, volume 4, chapter 10

5.3. Classifying products according to their impact on the climate: the question of traceability

LCAs enable us to compare the environmental impacts of two products at the same stage in the value chain, taking into account differences in production systems. For example, in dairy production, LCA techniques can compare a system where the animals are fed mainly with corn silage and soybean meal with a system where the feed is mainly grass-based.

For consumers, however, access to this information is not guaranteed, and depends on product traceability and available labelling. In France, for example, it may be possible to distinguish between an organic cheese, a PDO or PGI cheese, or a cheese with no official claim. However, in certain cases, two products with different emission levels may have the same packaging. For example, a minced steak from a farm that methanizes its animal manure is indistinguishable from a minced steak from a farm that stores its manure in a slurry pit.

Furthermore, while some quality claims have state-guaranteed or EU-recognized certification with transparent production specifications (as is the case with SIQO[4]), some private standards are not very transparent when it comes to production conditions.

Finally, it should be noted that for many developing countries, traditional production is not always the subject of a quality claim. In fact, consumption in traditional markets is sometimes very high (e.g. in China's "wet markets"), often linked to cultural habits or cold chain control issues. Consumption of "traditional" products (hardy strains, non-standardized production methods, sold live or processed on site) can therefore be significant, with an environmental impact that is probably less studied than that of organized, commercial production.

For example, male chicks from the egg-laying sector are generally destroyed in the organized sector, whereas they may be kept in some countries. While these chickens are clearly less productive than chickens selected for their meat performance (Ross or Cobb type), they can be fed up to 40% of their ration (MacLeod et al., 2013[5]) with co-products and by-products (cookie, milling, canteen, peelings, residents' waste) that enable them to valorize a resource with limited impact on land use. Similarly, in India, crop residues can account for up to 68% of ruminant rations (Opio et al., 2013[6]).

So, while it may seem interesting to categorize foods according to their level of environmental impact, this presents major challenges in terms of methodology, transparency of information and environmental labelling.

5.4. Some limitations of LCA

The Agribalyse database provides environmental impact data in the form of so-called attributional LCA. However, there are generally two types of LCA, depending on the analysis objectives. Attributional LCA provides information on the impacts of processes directly associated with a product's life cycle, while consequential LCA considers the consequences of changes in a product's production level, including indirect effects outside the product's life cycle.

Attributional LCA compares two products obtained under different production conditions, or the evolution of impacts from one to the other. Consequential LCA attempts to take into account the indirect effects induced by a change in market structure. For example, the need for farmland increases when a Label Rouge chicken farm switches to an organic system for the same quantity of meat produced.

This shows that while the Agribalyse database provides good information on the impact of the isolated consumption of certain food products in France, it doesn't give a clear picture of the environmental effects of a profound change in food demand.

Furthermore, in the opinion of the authors of Agribalyse, LCA methodologies have their limits and must "do better" (van der Werf et al., 2020[7]), notably because by relating impacts to the quantity of products, LCAs tend to favor input-intensive production systems. By often focusing on agricultural production, LCAs sometimes overlook other services and impacts generated by farms in terms of water regulation, biodiversity, employment and so on. This observation was also made by the collective expertise "Rôles impacts et services des élevages en Europe" (Dumont et al., 2016[8]).

6. CONCLUSION

6.1. Results

This study represents a further step in the estimation of GHG emissions by refining the use of Minimum Expenditure Baskets (MEBs) to establish emission factors. The results obtained show that the average carbon intensity of the food products making up the MEB is approximately 2.6 $kgCO_2$ e per USD of cash transfer. The vast majority of country offices surveyed are between 1 and 3.5 $kgCO_2$ e/USD.

The study shows that the composition of MEBs is too heterogeneous (sometimes containing energy consumption, sometimes not, sometimes hygiene products, sometimes not) to serve as a basis for a comparison of the carbon intensity of MEBs as a whole. The study focuses on food items, Action Contre la Faim's core mandate, present in the 16 baskets studied.

The GHG estimates of the MEB are strongly influenced by the presence or absence of meat and fish in their composition, which increases the MEB up to double the weight of the basket excluding meat (Cameroon, Madagascar, Chad), or even triple in the case of Bangladesh, where the majority of the footprint (600 $kgCO_2$e/month/household) is due to the presence of meat in the composition of the basket. Excluding meat and fish, the carbon weight of baskets varies between 100 and 250 $kgCO_2$e/month/household, a variation largely explained by the number of people in the household.

Calculating the carbon intensity of MEBs reveals the strong impact of whether or not meat and fish are included in the composition of baskets. As these two products are very carbon-intensive, but have a relatively limited financial impact on the total cost of the basket, they increase the GHG footprint of baskets containing them. Given that humanitarian programs only distribute part of the estimated total amount, the question arises as to whether or not the amounts distributed allow for the purchase of meat & fish, which on the scale of ACF-France could vary the organization's overall footprint by 20,000 tCO_2 e.

Although the GDP intensity method and MEB's intensity method may give similar results for certain countries, no logic or correlation emerges from the analysis, as the two methods measure totally different things. As the MEB intensity method focuses on estimated food items, it is deemed far more reliable than GDP intensity, which takes into account elements unrelated to the products purchased thanks to the cash transfer (typically the exploitation of hydrocarbons in a given country).

The biggest limitation to using the composition of MEBs in carbon footprint calculations is that, as explained in section 2.2, MEBs are a tool for estimating financial requirements for accessing essential products and services. Baskets are representative of a very specific context, and differ according to geographical area, temporality, context, number of people per household and current needs, and accessibility of products on local markets.

They represent a snapshot of the items available in a given situation. As this snapshot is highly variable, so is the composition of the MEB. The MEB is one of the tools used to make estimates, and cannot be representative of the actual use of the sums distributed.

Other limitations linked to the assessment of the emissions of each basket were also highlighted: some input data for the composition of the baskets were reported in local currency units. As inflation, exchange rates between currencies and emission factors per currency unit carry a high degree of uncertainty, the emissions associated with this type of data are subject to a high degree of uncertainty.

Some items have only been approached with emission factors that approximate reality, for example using 2016 emission factors for electricity, whose energy mix may have changed since then, or a material approach to certain items, by approximating their emissions by those of a mass or volume of the material that makes them up, without taking into account the transformation process.

Finally, the emission factors for food and certain other items are taken from a database created for the French territory, with its own geographical and energy specificities. Further work is required to obtain emission factors that correspond to local production methods and supply circuits.

The second part of the study highlights very significant carbon weights between several items that could theoretically fulfil the same function. In at least 4 product categories (Meat & Fish, Rice & Cereals, Oils and Electricity), there is a factor of 3 between the most carbon-intensive and the least carbon-intensive product. ACF sees important possibilities of action that could significantly reduce emissions from activities using cash transfers for food purposes.

6.2. Next steps

Applied to the monetary flow of activities using cash transfers, this method shows that the emissions generated by Action Contre la France would fall within a range of 45 to 70 ktCO_2e. Although there is still considerable uncertainty, the accuracy is sufficient to show that this is a very significant emissions item: approximately 30% of emissions linked to program activities.

Identifying actions to reduce emissions from activities using cash transfers is therefore not an option for reducing overall emissions by 50%, but a mandatory. The stagnation of the footprint of money transfers mathematically generates too important reduction effort to be achieved on other emission items.

While the method of evaluating GHG emissions from food programs using cash transfers by calculating the intensity of the Minimum Expenditure Basket enables us to approach an estimated value deemed realistic, this method has major limitations, in particular that of not being based on products actually purchased. Therefore, Action Contre la Faim does not consider it useful to pursue the development of this method based on the contents of the MEB, as the calculation matrix developed is deemed sufficiently complete.

On the other hand, it seems essential to use the results of field surveys as input data, so as to obtain estimates of the quantities actually purchased, and to carry out research into the emission factors of locally-produced food products.

The stages envisaged for the follow-up to this study:

- Use the calculation matrix developed for this study, and apply it to baskets representative of the purchases actually made by households with the transferred money, adding the cost of carrying out the programs (car kilometers for needs surveys, transfer bank charges, electrical and electronic equipment needed for the transfer, etc.).
- Extend this study to non-food products making up the MEB that could not be studied in this study.
- Identify/research/calculate emission factors adapted to local foodstuffs and production methods, so as to avoid applying European or even French emission factors to local products.
- For major commodities, weigh GHG emissions against other non-GHG environmental impacts (land use, water consumption, production methods, etc.).
- Once the environmental impacts have been properly assessed, identify the risk analysis matrices used in Cash Transfer and propose additions to ensure that these matrices take environmental impacts into account.

Concerning the identified levers of decline:

- Implementation of reduction actions applicable to all activities (optimization of mileage, reuse of survey and training equipment, etc.).
- Conduct pilot project(s) to identify the origin of products available on local markets (products actually supplied), and determine their supply chain.
- Test the possibilities of carrying local products and less carbon-intensive consumption habits, notably through awareness-raising & training initiatives, or equipment campaigns (such as solar ovens or water heaters to reduce energy needs).

Project writing :

- The various results of this study and the proposed next steps support a project co-authored with World-Vision International, Oxfam Internmon and Danish Refugee Council, which is seeking financial support at the time of this publication (January 2024). To request a presentation, or for peer-to-peer discussion on comparison of methodology and/or results of similar or related projects: environmentrequest@actioncontrelafaim.org

7. TABLE OF FIGURES

8. TABLE OF TABLES

9. APPENDIX I: EXTRACT FROM THE PIVOT TABLE

Catégorie	Sous catégorie	Item	Facteur d'émission (xxx kgCO2e/unité)	Unité du FE : kgCO2e/xxx	Intitulé dans la source	Source	Lien	Prise en compte transport	Prise en compte déchets	Incertitude	Commentaire	Cameroun	CAR	Nigéria	RDC	Tchad
Administratif et éducation		Accès à la terre (location ou metayage)	63,61	unité	Food parcel, family, 1 month	ICRC		inconnu	inconnu	inconnu	Dans la base ICRC : "Food parcel, family, 1 month" (sans source ni précision) : plus d'infos sur le FE côté ACF ? Hypothèse sinon : 1 parcelle = 1 ha	0,17				
Administratif et éducation		Acte de naissance (documentation civile)	0,16	€	Service/Administration publiques et défense, sécurité sociale obligatoire	Base empreinte	https://base-empreinte.ademe.fr/donnees/jeu-donnees	inconnu	inconnu	80%		0,91				
Administratif et éducation		Cahier	1,10	livre	Livre de 300g	Base empreinte	Base Empreinte® (ademe.fr)	inconnu	inconnu	45%	FE qui se rapproche le plus d'un cahier			3		
Administratif et éducation		Communication (communication, forfait téléphonique, forfait et recharge)	0,17	€	Service/Télécommunications	Base empreinte	https://base-empreinte.ademe.fr/donnees/jeu-donnees	inconnu	inconnu	80%		1,52		1,97	3,04	0,50
Administratif et éducation		Ensemble de : transports (intended to cover basic needs related to education institutions, health facilities, markets and livelihood opportunities), Communication, Community fees (milling and maintenance of water sources), Access to education and health care	0,28	€	Service/Transport terrestre ; Service/Télécommunications ; Service/Activités pour la santé humaine	Base empreinte	https://base-empreinte.ademe.fr/donnees/jeu-donnees	inconnu	inconnu	56%	Hypothèse : moyenne des FE des items "transport routier", " communication" et "consultation (santé)"					
Administratif et éducation		Fournitures (éducation), papeterie (stylos, crayons, gommes et carnets de notes)	0,37	€	Petites fournitures	Base empreinte	https://base-empreinte.ademe.fr/donnees/jeu-donnees	inconnu	inconnu	50%		2,42			7,41	
Administratif et éducation		Frais de scolarité	0,12	€	Service/ Enseignement	Base empreinte	https://base-empreinte.ademe.fr/donnees/jeu-donnees	inconnu	inconnu	80%		0,86				0,31
Administratif et éducation		Frais d'uniformes	0,60	€	Service/Textile et habillement	Base empreinte	https://base-empreinte.ademe.fr/donnees/jeu-donnees	inconnu	inconnu	80%						
Administratif et éducation		Services publics	0,16	€	Service/Administration publiques et défense, sécurité sociale obligatoire	Base empreinte	https://base-empreinte.ademe.fr/donnees/jeu-donnees	inconnu	inconnu	80%						
Administratif et éducation		Transport routier	0,56	€	Service/Transport terrestre	Base empreinte	https://base-empreinte.ademe.fr/donnees/jeu-donnees	nc	inconnu	80%		32,11		1,97		0,19
Eau		Bouteille d'eau	0,27	kg	Eau embouteillée de source	Agribalyse	https://agribalyse.ademe.fr/app/aliments/18430#Eau_embouteill%C3%A9e_de_source	oui	oui	inconnu						
Eau		Eau (eau potable)	0,13	m3	Eau de reseau/Hors infrastructure	Base empreinte	https://base-empreinte.ademe.fr/documentation/base-carbone?docLink=Eau_de_resseau	oui	non	11%						0,36
Eau		Tablettes de traitement de l'eau (dont Aqua tab)	0,50	€	Service/Produits pharmaceutiques	Base empreinte	https://base-empreinte.ademe.fr/donnees/jeu-donnees	inconnu	inconnu	80%	Pas de FE précis relatif à la composition (sel de sodium en majorité) : unités converties par des ratios monétaires pour utiliser le FE des produits pharmaceutiques	1,52				2,4875
Energie		Combustibles : Charbon de bois / braise / Bois de chauffe	2,11	kg	Charbon sous-bitumineux/PCS entre 17 435 et 23 865 kJ/kg	Base empreinte	https://base-empreinte.ademe.fr/donnees/jeu-donnees	inconnu	inconnu	20%					10	
Energie		Electricité - Iraq	1,18	kWh	Electricité, Iraq	Citepa - à partir de AIE et DEFRA - FE 2016	-	nc	nc	inconnu	Méthodo : conversion du prix pour l'électricité en kWh, selon le facteur du pays ; puis utilisation du FE ademe pour l'électricité du pays considéré					
Energie		Electricité (Bangladesh)	0,65	kWh	Electricité, Bangladesh	Citepa - à partir de AIE et DEFRA - FE 2016	-	nc	nc	inconnu	Méthodo : conversion du prix pour l'électricité en kWh, selon le facteur du pays ; puis utilisation du FE ademe pour l'électricité du pays considéré					
Energie		Electricité (Myanmar)	0,43	kWh	Electricité, Birmanie	Citepa - à partir de AIE et DEFRA - FE 2016	-	nc	nc	inconnu	Méthodo : conversion du prix pour l'électricité en kWh, selon le facteur du pays ; puis utilisation du FE ademe pour l'électricité du pays considéré					
Energie		Gaz	0,24	kWhPCI	Gaz naturel	Base empreinte	https://base-empreinte.ademe.fr/donnees/jeu-donnees	inconnu	inconnu	5%						56,03
Equipement		Assiette	7,71	kg	Acier inoxydable, rouleaux, laminés à froid (304) pour habillement (0% de recyclage)	Base empreinte	https://base-empreinte.ademe.fr/donnees/jeu-donnees	inconnu	inconnu	inconnu	Assimilé à de l'acier inoxydable					
Equipement		Bâche	8,78	unité	Plastique/PEBD/neuf	ICRC		inconnu	inconnu	inconnu	Hypothèse et source de ICRC : assimilé à du plastique (PEBD), puis ramené en unité avec un poids moyen de 4,2kg/unité	0,50	0,17	0,17		

10. APPENDIX II: COMPARISON OF EMISSIONS BY MATERIAL APPROACH AND EMISSION FACTORS DERIVED FROM DATABASES

Item	FE	FE unit	Source FE	Material assimilation	Mass (kg)	Material EF ($kgCO_2$ e/kg)	Source	FE object	Unit	Report
Mattresses	285	kgCO e/unit$_2$	Base Impression	Flexible polyurethane foam	29	9,8	Base Impression	284,5	kgCO e/unit$_2$	100%
Fork	1,3	kgCO e/unit$_2$	Citepa	Stainless steel	0,18	7,71	Base Impression	1,39	kgCO e/unit$_2$	107%

Source Mattress: https://www.lematelas.fr/combien-pese-un-matelas#:~:text=The%20mattress%20in%20foam%203A%20For,weight%20corresponds%20%C3%A0%2015%20kg.
Source Fork: https://www.auvergnecoutellerie.com/articles-pour-le-service-en-salle/179-fourchette-tout-inox-poids-0180-kg.html

The results are similar for both items. They depend on both the mass and material units chosen (here, a mattress for two people, and a fork made entirely of stainless steel). For these two items, the material approach seems to lead to results close to those of the life-cycle approach, but this trend is not systematically verified.

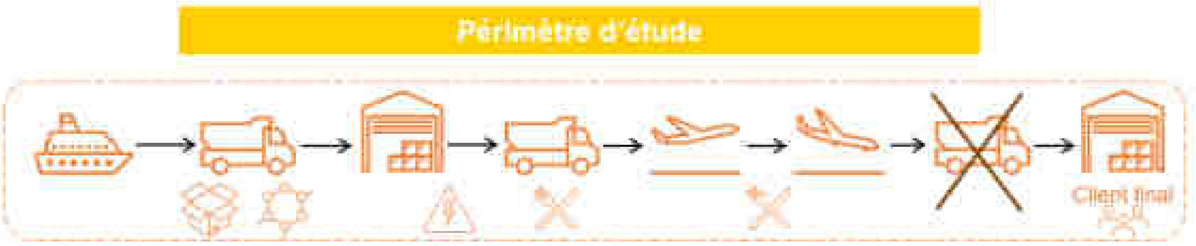
11. APPENDIX III: PERIMETER OF CITEPA EMISSION FACTORS

The items concerned are :

- Cutlery (knife, fork, spoon);
- Second-hand clothes.

11.1. Cutlery

The emission factors for cutlery are taken from a study for one manufacturer. The perimeter used is explained in the diagram below: it takes into account the entire value chain, excluding transport within the end-customer's country.



11.2. Second-hand clothing

The impact of second-hand clothes is due to their transportation, while the other stages of the life cycle are attributable to their initial use.
For this study, and in relation to the general breakdown of the impact on the garment's life cycle, final transport after landfill will represent little: the supply and distribution phases, i.e. the entire transport of raw materials and between factories and points of sale, do not represent the largest part of the emission factor: a fortiori, a single transport from the geographical area of the garment's first use, to the place of its second-hand use, will be minimal.

Mise en forme	41,6 %	9,96 kg
Matières premières	28,1 %	6,72 kg
Assemblage et distribution	22,7 %	5,44 kg
Usage	5,2 %	1,25 kg
Approvisionnement	2,4 %	572,62 g
Total		23,93 kg

Source : Impact CO2

12. APPENDIX IV: AGRIBUSINESS METHODOLOGY

The complete Agribalyse methodological guide is given as a complement to this study, and is available online on the Agribalyse website.
Certain methodological assumptions should be highlighted in the context of this study:

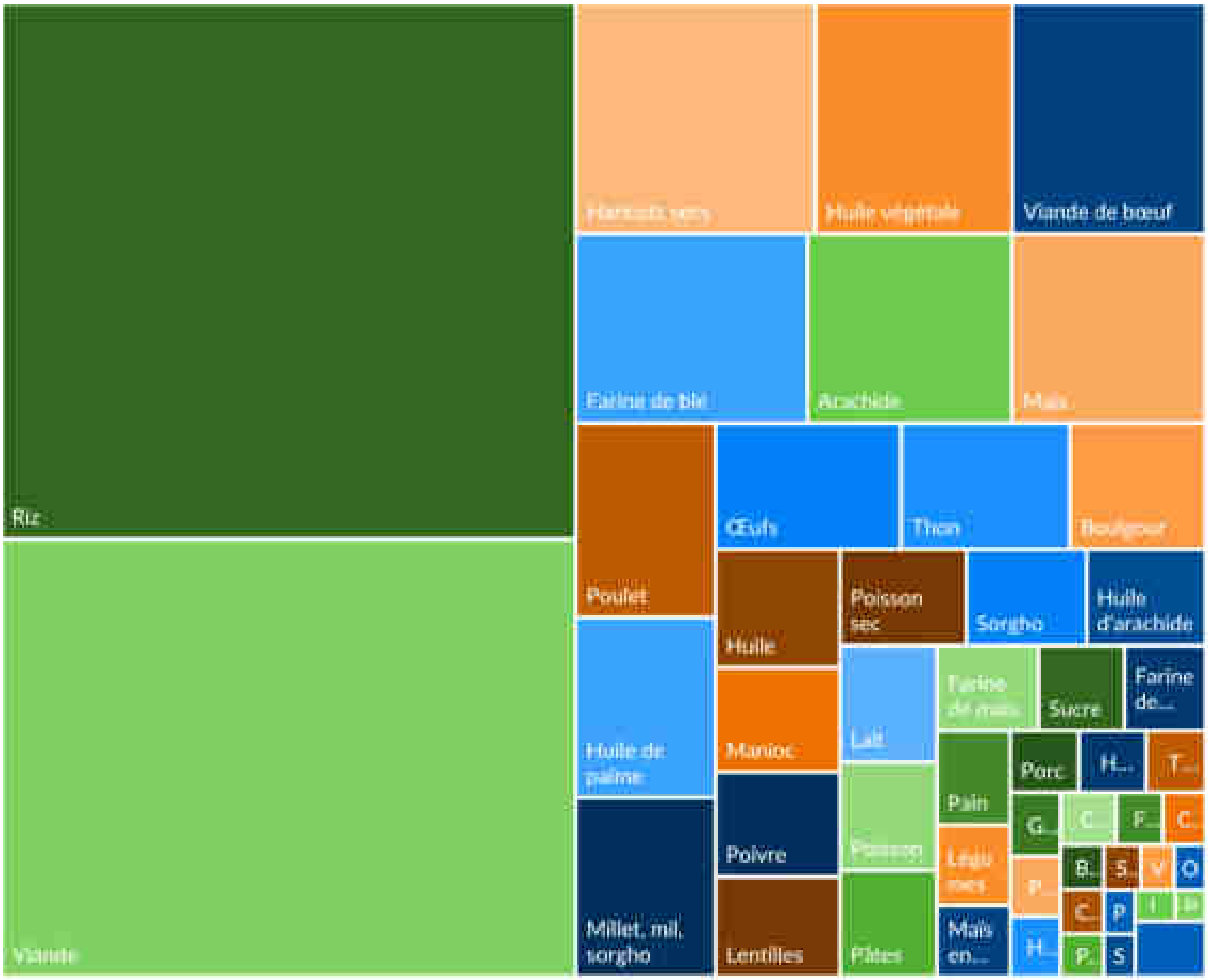
- Transport between each stage of the value chain is included, with the exception of transport between the retail outlet and the consumer's home.
- Food waste and losses are accounted for at every stage of the life cycle, except at the consumer's home.
- The stages of the life cycle are broken down as follows:
    - Agriculture :
        - Production of raw materials from cradle to market mix
        - The origin of raw materials reflects French consumption and therefore depends on the product.
    - Transformation :
        - Transformation of raw materials and blending of processed ingredients (recipe production) - systematically assumed to be in France
    - Packaging :
        - Primary packaging is covered, but not secondary and tertiary packaging.
    - Transport :
        - Transport of raw materials to the processing plant: logistics, from agricultural production to processing, are determined according to the country mix.
        - For food products that are recipes using ingredients that are raw materials and/or processed raw materials, Agribalyse assumes that there is no transport between the processing of the ingredients and the recipes.
        - Downstream transport includes transport from the manufacturing site to the distribution centers, and then from the distribution centers to the supermarkets. It does not include transport from the supermarket to the consumer.
    - Supermarket and distribution
    - Consumption
        - All items refrigerated or frozen during transport are considered to be stored in the consumer's refrigerator or freezer respectively.
        - For certain types of food preparation, such as frying or microwaving, Agribalyse assumes the use of 100% electricity. For other types of preparation, Agribalyse uses a ratio of 40% and 60% for electricity and natural gas respectively.

For further information, please refer to the guide.

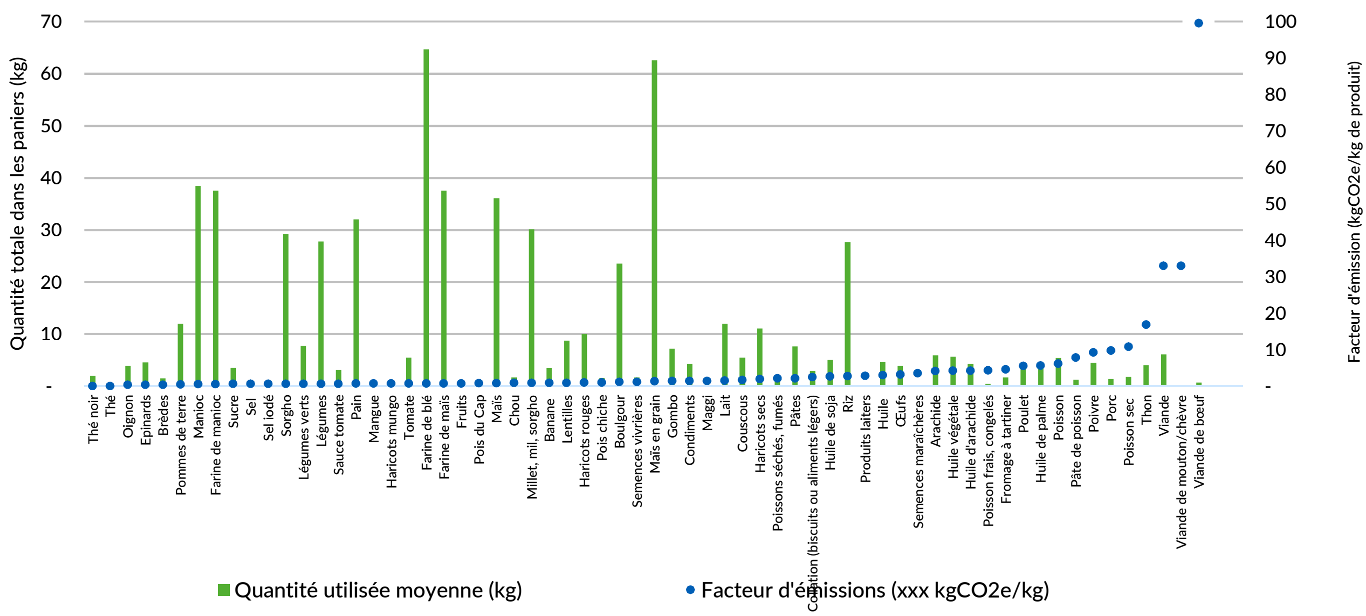
13. APPENDIX V: ITEMS WHOSE EMISSIONS HAVE NOT BEEN TAKEN INTO ACCOUNT

Intitulé	Pays	Commentaire
Materiel local (lattes, tôles, pointes, piquet (poteaux), chevrons...)	Cameroun	Pas de facteur d'émission pertinent
Houes	Cameroun	Pas de facteur d'émission pertinent
Carburant/transports	Nigéria Burkina Faso	Concerne le transport de la nourriture - non retenu dans le périmètre de l'étude - une partie du transport est comptabilisée dans les FE des produits
Water (vendor fees,20L jerrycan)	Nigéria	Non retenu - il est dit que l'eau est à disposition, seuls les frais éventuels sont à régler
Stylo	Nigéria	Pas de facteur d'émission pertinent
Crayon	Nigéria	Pas de facteur d'émission pertinent
Assiette	Nigéria	Pas de facteur d'émission pertinent
Lampe solaire/ lampe à piles et piles	RDC	Pas de facteur d'émission pertinent
Dispositif de lave main	Tchad	Pas de facteur d'émission pertinent
Moyens d'existence	Tchad	En unité monétaire
Loyer	Tchad	En unité monétaire
Maintenance	Tchad	En unité monétaire
Articles ménagers de base	Jordanie	En unité monétaire
Articles d'hygiène	Jordanie Bangladesh	En unité monétaire
Loyer	Jordanie Iraq Yémen Myanmar Népal	En unité monétaire
Permis de travail	Jordanie	En unité monétaire
Torche/lampe solaire résistant aux intempéries et aux chocs	Burklina Faso	Pas de facteur d'émission pertinent
Loyer + charges (électricité et carburant)	Afghanistan	En unité monétaire
Briquet	Myanmar	Pas de facteur d'émission pertinent
Equipements pour la cuisine	Bangladesh	Pas de facteur d'émission pertinent
Eau non potable	Cameroun Jordanie Afghanistan	Pas de facteur d'émission pertinent

14. APPENDIX VI: IMPACT OF FOOD CATEGORY ITEMS



Balance of GHG emissions of food items, not categorized (all monthly MEB cumulated in kgCO2e)



Average quantity of food items in monthly MEB, and associated emission factor

15. APPENDIX VII: WEIGHT OF ITEMS IN SURVEYED BASKETS

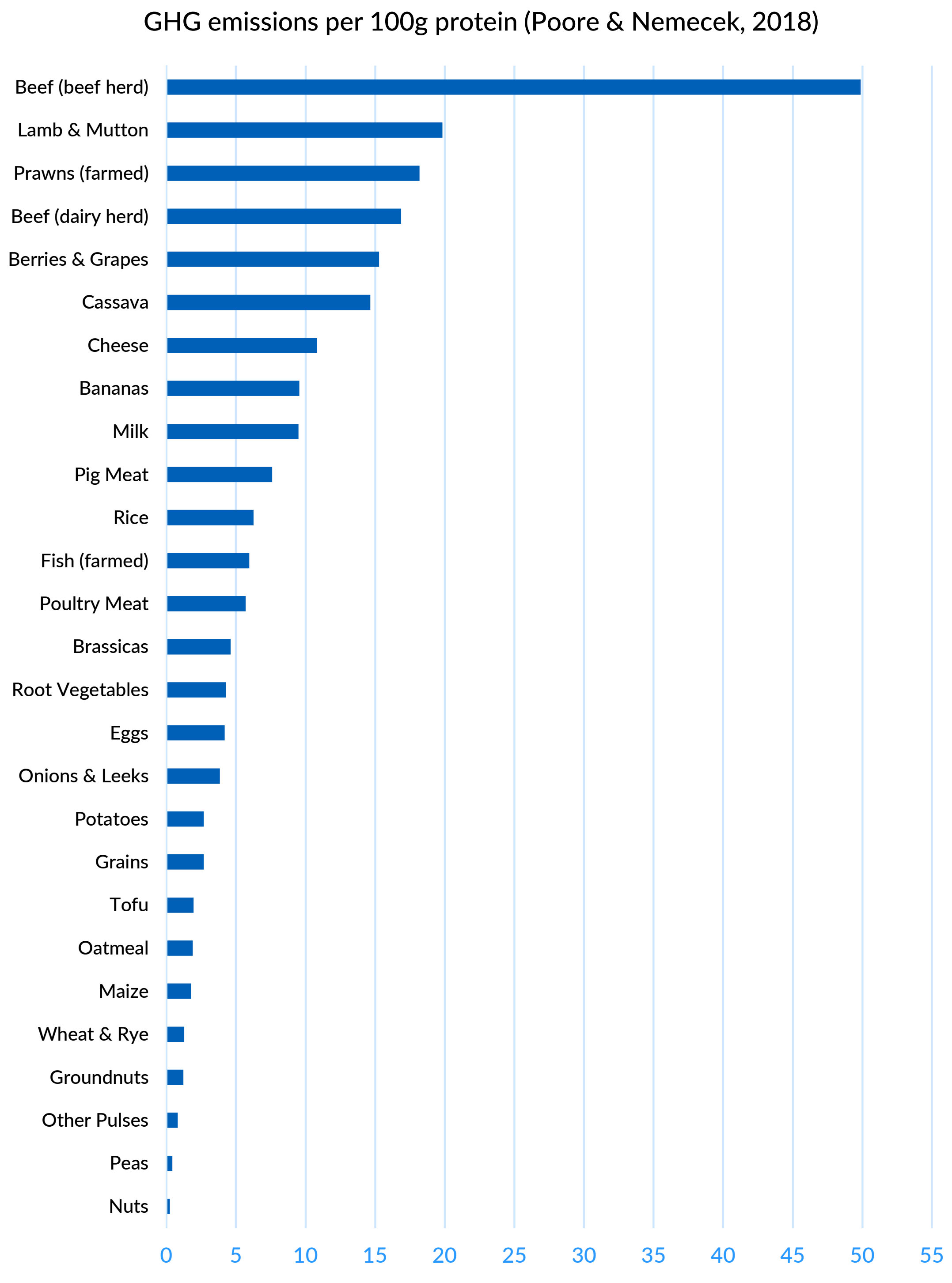
Protein products present in MEBs	Total quantity (kg/househlod/month)
Haricots mungo	0,2
Haricots rouges	10,0
Haricots secs (haricots, haricots secs, haricots de sucre)	90,2
Œufs	23,4
Pâte de poisson	1,2
Pois chiche	3,1
Pois du Cap	0,9
Poisson	5,4
Poisson frais, congelés	0,4
Poisson sec	3,6
Poissons séchés, fumés	2,1
Porc	1,4
Poulet	15,6
Thon	4,0
Viande	24,3
Viande de bœuf	1,4
Viande de mouton/chèvre	0,2

Cereal products present in MEBs	Total quantity (kg/househlod/month)
Riz	355,1
Millet (millet, mil/sorgho)	90,2
Sorgho	58,5
Boulgour	47,0
Pâtes	15,3
Pomme de terre	12,0
Couscous	5,5
Pain	0,2

Flours products present in MEBs	Total quantity (kg/househlod/month)
Farine de blé	194
Farine de maïs	37,5
Farine de manioc	37,5

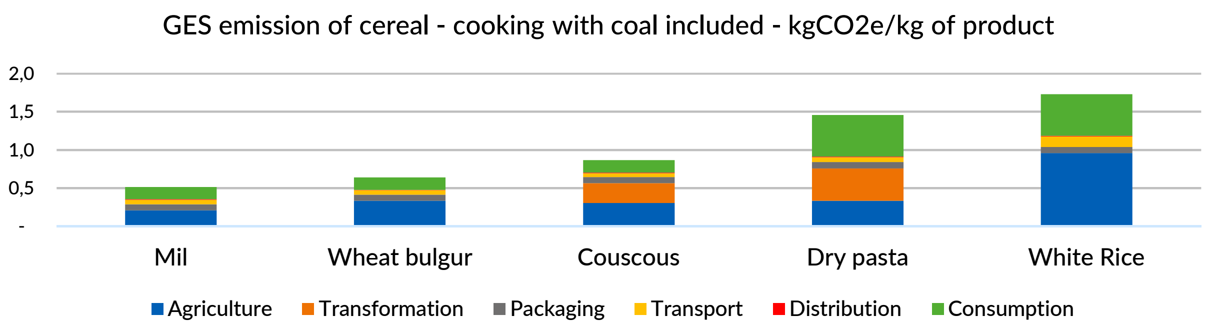
Oils présentes dans les paniers étudiés	Total quantity (kg/househlod/month)
Huile végétale (considéré comme huile d'arachide)	34,03
Huile (considéré comme mélange d'huiles)	15,50
Huile de palme	14,35
Huile d'arachide	8,54
Huile de soja	5,03

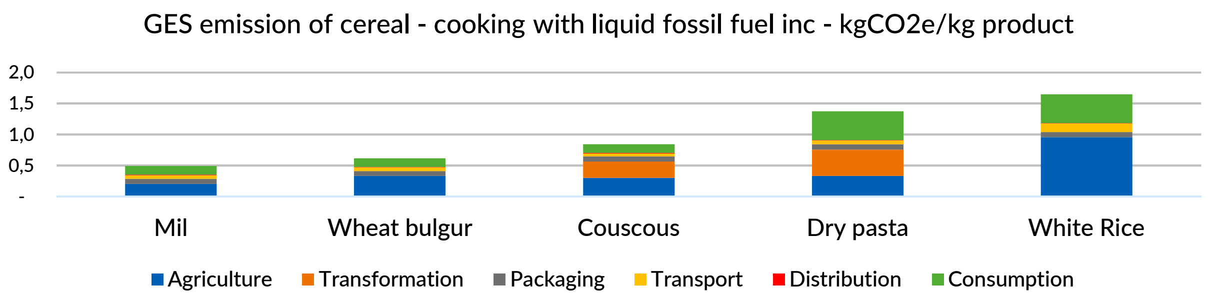
16. APPENDIX VIII: FEED EMISSIONS PER 100G OF PROTEIN

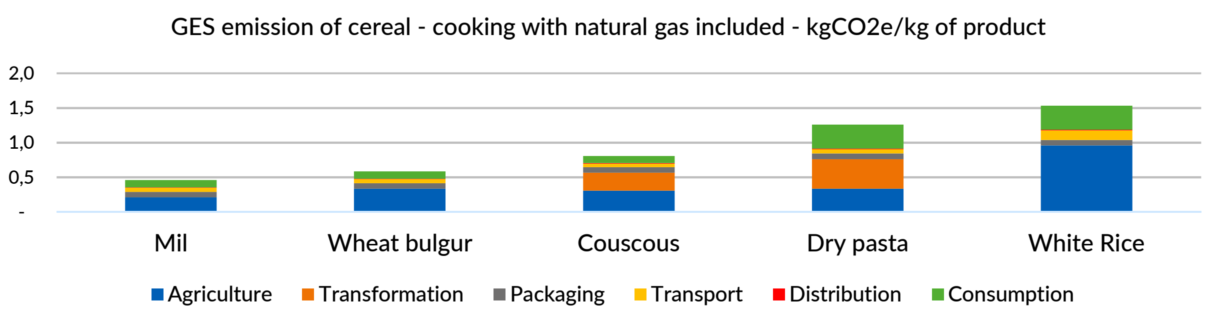


Source: Our World in Data

17. APPENDIX IX: EMISSIONS FROM CEREALS, INCLUDING THE COOKING PHASE, USING COAL, FUEL OIL AND GAS







18. APPENDIX X: BIBLIOGRAPHICAL REFERENCES FOR PART 4

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