Comments

Date:	Document: Greenhouse gas emissions and fossil energy demand from poultry supply chains

Name: Bo Weidema

Organisation: 2.-0 LCA consultants

PUBLIC REVIEW of the first set of LEAP Partnership guidelines
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*Type of comment: ge = general te = technical

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xi		Glossary	Attributional	te	This is not a definition. Use the one from the "feed supply chains" document, or the more authoritative one from UNEP/SETAC Shonan Database Guidelines: "System modelling approach in which inputs and outputs are attributed to the functional unit of a product system by linking and/or partitioning the unit processes of the system according to a normative rule."	Change to: "System modelling approach in which inputs and outputs are attributed to the functional unit of a product system by linking and/or partitioning the unit processes of the system according to a normative rule." or use the same definition as in the "feed supply chains" document: "process-based modelling intended to provide a static representation of average conditions, excluding market-mediated effects"
xi		Glossary	Boundary	te	The definition here is equal to that given for "System boundary"	Delete
xi		Glossary	Carbon dioxide equivalent	te	"impact" is too unspecific	Change "impact" to "accumulated radiative forcing over a specified time horizon"
xi		Glossary	Carbon storage	te	term is not used in the document	Delete
xi		Glossary	Consequential LCA	te	The A in LCA stands for Assessment. Thus, LCA Assessment is a pleonasm. Also, the assessment is not necessarily on different choices, but can be on "a" choice.	Change to "Consequential LCA describes how relevant environmental flows will change in response to a decision."
xii		Glossary	Containers and packaging	te	Would it not be more reasonable to call this term "Retail packaging"?	Change the name of the term defined here to "Retail packaging"
xii		Glossary	Co-production	te	This is not the normal usage of this term. Co-production is normally understood as encompassing both joint production (as defined here) and combined production, where the co-product outputs can be individually varied. Without good reasons, definitions should not deviate from normal usage.	Delete the second sentence.
xii		Glossary	Co-product	te	It is probably not intended that wastes and emission outputs should be included in this definition (see definition of "Output"). Co-products are normally understood as product outputs, whether goods or services. Without good reasons, definitions should not deviate from normal usage.	Change "Output" to "Product" and delete second sentence.

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xiii		Glossary	Joint production	te	This is the definition of combined production. Joint production is when the products *cannot* be independently varied.	Change the name of the term defined here to “Combined production”
xiii		Glossary	Life cycle inventory	te	If this is only for a unit process, rather than for a life cycle (product system), then the appropriate term would be “Unit process inventory”	Change the name of the term defined here to “Unit process inventory”
xiv		Glossary	Primary packaging materials	te	This definition is unclear and not in line with normal usage. Primary packaging is normally understood to be the packaging that is directly in contact with the product, as opposed to secondary packaging. Packaging, bot primary and secondary, which reach the consumers is called “retail packaging” as opposed to “wholesale packaging”.	Bring definition in line with normal usage.
xiv		Glossary	Process centre	te	This term is not logical and not in general use.	Change the name of the term defined here to “Repackaging facility”
xiv		Glossary	Product parts	te	This term is not precise and not in general use for this definition.	Change the name of the term defined here to “Retail cuts”
xiv		Glossary	Product(s)	te	The purpose of the second sentence is unclear.	Delete or clarify
xiv		Glossary	Proxy data	te	Text is unclear	Change “in an LCA for a product produced” to “as input to a production process located”
xiv		Glossary	Removal	te	The term removal is also used in other meanings in this document.	Change the name of the term defined here to “GHG removal”
xv		Glossary	Secondary data	te	The NOTE appears to suggest that secondary data are always of lower quality than primary data, which is not always the case.	Add “or of lower quality” after “not available”
xv		Glossary	Secondary packaging materials	te	Without good reasons, definitions should not deviate from normal usage. What is defined here is normally called “wholesale packaging” as opposed to “retail packaging”. Secondary packaging is normally understood to be the packaging that is not directly in contact with the product, as opposed to primary packaging, irrespective of whether it reaches the consumer or not.	Change the name of the term defined here to “Wholesale packaging”

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xv		Glossary	Stocking density	te	Density must be expressed as a ratio.	Change to: "The number of poultry per spatial volume"
xv		Glossary	System boundary	te	Without good reasons, definitions should not deviate from normal usage. The definition provided is a definition of the criteria for setting system boundaries, not the system boundaries themselves.	Change to "The boundary between the activities included in the system and the system environment"
xvi		Glossary	Unit Process	te	The last sentence represents only one possible LCI model (the attributional) and is not part of the definition of a unit process.	Delete the last sentence
xvi		Glossary	Volatile Solids	te	The second sentence is not fully correct. More precisely, the VS is the part of the sludge that is combusted at 550°C after 2 hours.	Delete second sentence or clarify.
4	1-3	2.2		ge	The choice of an attributional approach is in conflict with the target audience and application areas provided on page 2, line 9-14, the statement that LCA can be used as a decision support tool (page 6, line 14; page 9, line 20, and page 10, line 11), as well as with the many references later in the document to ISO 14040/44 (which does not support an attributional approach). It is important to be aware that LCA is not the same as Environmental Performance Assessment (which is regulated in ISO 14031); see the Introduction to ISO 14040: "LCA is one of several environmental management techniques (e.g. risk assessment, environmental performance evaluation, etc…) and might not be the most appropriate technique to use in all situations." The important difference is that Environmental Performance Assessment is made on an organization, i.e. a multifunctional activity. As soon as we wish to isolate one specific product from a multifunctional production system, LCA is required, and here the handling of co-products becomes crucial. A true accounting approach, with mass balances etc., is only possible for a multifunctional (unallocated) system, and thus not for an allocated, attributional product system. An attributional approach cannot say anything about the environmental performance of a product, only about the	Change to: "These guidelines are generally based on the consequential approach to life cycle modelling. The approach refers to process-based modelling, intended to provide a static representation of the consequences of the production and/or consumption of an additional amount of product."

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					environmental performance of that part of the product system that is included according to the chosen allocation rules for by-products. This is why ISO 14040/44/49 recommends the use of system expansion to avoid allocation, and generally describes a consequential approach to system modeling. The main reason for this is that ISO 14040/44/49 is intended for supporting improvements, which requires LCAs that provides information on the consequences of these improvements. The main problem of choosing an attributional approach is that the results cannot be used for decision support regarding improvements of the analysed systems, simply because the results do not reflect the environmental consequences of such improvements. The results will be misleading if they by mistake should anyway be used for decision-making. It does not seem wise for an international guideline to adopt a modeling approach that cannot be used for decision support.	
7	9	4.2		te	It may be typical to limit the assessment to natural resources, but the purpose of these guidelines should not be to perpetuate such a limited understanding.	Delete “natural”
26	22	8.3		te	Eaten not only in Asian countries	Delete “Asian”
26	28-32	8.3		te	This recommendation is not consistent with the recommendation on the next page, line 1-2. It would be incorrect not to distinguish between different cuts of meat, meat products, and other edible parts, when these are sold on different markets and at different prices, since their degree of substitutability varies, which shall be expressed in the functional unit. It may be useful to provide a more detailed description of how to define the functional unit.	Replace this text by a more detailed text on the procedure for defining the functional unit, e.g. based on *B P Weidema, H Wenzel, C Petersen, K Hansen (2004):* The product, functional unit and reference flows in LCA. København: Miljøstyrelsen. (Environmental News 70), with sufficient real life examples of poultry products.
27	19-22	8.3		te	If the payment to the farmer is based on carcass weight, this may still be the appropriate functional unit at the farm gate. The functional unit does not imply that the corresponding reference flow excludes the remaining parts of the live weight. The critique here is thus based on a misconception of the role of the functional unit relative to the reference flow.	Delete or strongly modify!

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27	23	8.3		te	The section lacks a paragraph or two to describe the difference between the functional unit and the reference flow.	Add a section on how to determine the reference flow, with adequate examples, showing the relation to the functional unit.
30	3-6	8.4.2		te	The text here deals with allocation ("impacts are divided evenly by mass over all such products"), which really belongs to another chapter. It is incorrect not to distinguish between different edible parts, when these are sold on different markets and at different prices, since their degree of substitutability varies, as expressed by the functional unit. That there are no significant biophysical and nutritional differences between the products does not mean that there cannot be other significant differences that make them different in a comparison or substitution context.	Delete
30	20-24	8.4.3		te	If something is included with an estimate, it is not excluded. When everything is included with estimates from the scoping analysis, it is inconsistent and confusing to require only 95% to be accounted for.	Change the last part of the paragraph after the word "system" in line 20 to: "can be included with an estimate from a scoping analysis (Section 8.2). An exception to this is in cases where significant environmental impact is associated with a small mass input (e.g. some material may be present in small quantities, yet still have a relatively large environmental impact)."
32	2-6	8.4.5		te	It appears an unnecessary complication to have different recommendations/requirements for applications that involve alternate systems. Often a study that was first intended as stand-alone is later used in a comparison.	Consider simplifying by making it a general requirement to include capital goods, i.e. deleting the section except the last 6 words.
33	4	8.5		te	For a general impact category as "Fossil energy demand" it is not relevant to use Lower Heating Value of the raw materials, since this depends on the specific combustion conditions (extent to which the reaction products are condensated and the heat used). The higher heating value is therefore less situation-dependent and more useful in a generic resource assessment. See also Frischknecht R, Heijungs R, Hofstetter P. (1998). Einstein's lessons for energy accounting in LCA. Int. J. LCA 3(5):266 – 272, which could be used as a reference here.	Change "Lower" to "Higher"

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34	9-14	9.1		te	ISO14044:2006 does not have a section 9. And in the section on allocation (Clause 4.3.4) there is no mentioning of "bio-physical causality" or "physical properties such as mass, or protein or energy content" as "other relationships". On the contrary, the original standard text (ISO 14041) contains this clarification: "The resulting allocation will not necessarily be in proportion to any simple measurement such as the mass or molar flows of coproducts". The only specific causal relationship mentioned is economic value, as already quoted in the extensive ISO step 1-3 quote on page 33-34.	Delete
34	16	9.1		te	The product displaced in a system expansion shall be the same as when the similar product is used as an input (ISO 14044 clause 4.3.4.2: "Allocation procedures shall be uniformly applied to similar inputs and outputs of the system under consideration). Thus, displacing the average product is not consistent when the similar product used as an input is modeled as the marginal. The procedure for determining the input is described in ISO 14049 clause 6.4 as a marginal input, not an average: "The supplementary processes to be added to the systems must be those that would actually be involved when switching between the analysed systems. To identify this, it is necessary to know: - whether the production volume of the studied product systems fluctuate in time (in which case different submarkets with their technologies may be relevant), or the production volume is constant (in which case the base-load marginal is applicable), - (. . .) whether (. . .) the inputs are delivered through an open market, in which case it is also necessary to know: - whether any of the processes or technologies supplying the market are constrained (in which case they are not applicable, since their output will not change in spite of changes in demand),	Delete

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					- which of the unconstrained suppliers/technologies has the highest or lowest production costs and consequently is the marginal supplier/technology when the demand for the supplementary product is generally decreasing or increasing, respectively." Besides that, when the by-product is part of the average, the resulting system cannot be solved mathematically.	
34	17	9.1		te	To be more precise, change "co-product" to "by-product" here, since system expansion can be applied to non-determining co-products (by-products) only.	Change "co-product" to "by-product"
34	18-19	9.1		te	"Sharing the credit" of an avoided burden is not a meaningful concept, since the avoided burden is exactly the share of burden that is assigned exclusively to the determining product. The difference in procedure when dealing with a determining product and a non-determining product (by-product) flow could use some additional treatment here.	Change to: "Differentiating whether one is dealing with a determining product flow or a non-determining (by-)product flow. The determining product receives the full avoided burden from the systems displaced by the by-products and carries the full burden of the co-producing system and any other treatment activities required until the marginal output of the by-product reach the point where it can substitute (displace) a determining product from another activity. As a dependent co-product, the non-determining by-product does not receive any burden from the co-producing system, but since it is constrained by the demand for the determining product, it cannot provide a marginal supply to the market. An additional demand for the by-product must therefore be provided by the system that is otherwise displaced by additional outputs of the by-product. However, if the by-product is not fully utilized, i.e. if the marginal output of by-product is undergoing waste treatment, there is no displaced system on the margin, and an additional demand for the by-product is provided by a reduction in the waste treatment, and not by any other displaced system."
34	23	9.2		te	To avoid confusion, the term "step" in this context should only be used about the ISO procedure.	Delete: "his involves a three-step approach and t"
34	25	9.2		te	To avoid confusion, the term "step" in this context should only be used about the ISO procedure. The subdivision in 3 groups	Change to: "Avoid allocation by sub-division"

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					is an unnecessary complication.	
34-35	line 30 on p. 34 to line 23 on p. 35	9.2		te	It is not all processes and activities that should be divided, but only those that leads to the reduction in the number of co-products for which system expansion is needed. The difference between flow 1.b. and flow 1 c is unclear. The division at this point gives an unnecessarily complicated description and leads to a duplication of identical decision boxes in step 2 and 3 in the current Figure 12. By including here all forms of subdivision, also those currently described under Step 2 (page 35-36), the description becomes more clear and straightforward. Note that Step 2 describes combined production (variable output proportions), not joint production (fixed output proportions) Note that layer operations have not been included here since the outputs of layer operations are not individually variable when the operations are optimized for egg output.	Change to: "In the first step "ISO step 1a subdivision", subdivision of the farm/processing facility into production units should be done when this implies that co-products can be assigned specifically to one production unit, for example: - packaging or post-processing storage that can be assigned to one specific product only; - inputs of feed, pesticides, operations, climate control, internal transport or drinking water for a specific bird type at a multi-species poultry farm. When feed is provided to multiple animal species, the animal growth requirements may be used to apportion the shared feed between the species. Some general inputs, such as internal transport, capital goods and office overheads, which cannot be directly attributed to specific production units, but are nevertheless necessary for the operation of all production units, can normally be assigned to each production unit in proportion to the causal relationship that determines increased need for each input, such as weight, volume, or area (transport, roads, buildings) or revenue (office and accounting)."
35	24-28	9.2			The text here suggests that there are situations where avoided production cannot be unambiguously identified. However, since the input to a market is identified by the same procedure whether the market output is decreasing (avoided inputs) or increasing (normal inputs), the avoided production can be determined with the same degree of (un)ambiguity as any other market input to the product system. If the procedure that is generally accepted for identifying upstream market inputs is discarded just because the sign of the flow has been inversed, this places into question the entire procedure by which we link our product systems, and can therefore not be used as an argument for not applying the procedure specifically for	Change to "System expansion (ISO step 1b) should be applied whenever possible. It is always possible to determine the avoided production with the same degree of unambiguity as any other market input to the product system, by using the same procedures for identifying the avoided production as those used for determining the other inputs to the product system, cf. ISO 14049 clause 6.4: "The supplementary processes to be added to the systems must be those that would actually be involved when switching between the analysed systems. To identify this, it is necessary to know:

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					avoided production. Thus, system expansion should be accepted as adequate in all cases where the subdivision by physical causality has not been possible. Since the procedure for identifying suppliers to a market is not widely known, due to its convoluted placement in ISO 14049, it may be helpful to quote this ISO text, in parallel to the quote on p. 36 of the allocation section in ISO 14044.	- whether the production volume of the studied product systems fluctuate in time (in which case different submarkets with their technologies may be relevant), or the production volume is constant (in which case the base-load marginal is applicable), - (. . .) whether (. . .) the inputs are delivered through an open market, in which case it is also necessary to know: - whether any of the processes or technologies supplying the market are constrained (in which case they are not applicable, since their output will not change in spite of changes in demand), - which of the unconstrained suppliers/technologies has the highest or lowest production costs and consequently is the marginal supplier/technology when the demand for the supplementary product is generally decreasing or increasing, respectively." In practice, the avoided production is included in the product system by changing the non-determining co-products to inputs with a negative sign, whereby they directly cause a reduction in the contribution from the suppliers determined by the above procedure."
35	28-31	9.2			It is a misunderstanding that it should be a condition for system expansion that the avoided product shall be fully equivalent. It is adequate that the by-product and the avoided product have the same functional unit, so that the substitution will occur in practice. If a difference between the by-product and the avoided product cause differences in the downstream lifecycle of the by-product compared to the avoided product, these differences are assigned to the determining product, just like any other downstream treatment activity that is caused by the additional amount of by-product.	Change to: "The avoided product shall have the same functional unit as the by-product, so that the substitution will occur in practice. However, the by-product may have other properties compared to the avoided product, not included in the functional unit, which may cause differences in the downstream lifecycle of the by-product. Such differences shall be assigned to the determining product of the co-producing activity that gives rise to the by-product."
35	32-33	9.2			This text is confusing and unnecessary.	Delete "; however, at the inventory level there is no corresponding reduction in the emissions or exchanges with

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						the environment"
35-36	33-2	9.2			The erroneous use of system expansion of determining products is not isolated to backyard and diversified systems. The error should be described more clearly, so that the reader will understand why this should not be done.	Change to: "System expansion shall not be applied to the determining product of a farm/processing facility, but only to the non-determining by-products. For example, the environmental burden of cattle manure cannot be identified by expanding the manure system with an avoided cattle production system. Environmental burdens can only be assigned to determining products (hence the name) that cause these burdens, not to the non-determining by-products."
36 and 38	p.36 line 3-13 and p. 38 line 1-4	9.2			The allocation according to physical causalities is equivalent to the subdivision already described, and should be moved up before the system expansion. The relevant parts of the text have already been included in the proposed changed text for line 30 on p. 34 to line 23 on p. 35.	Delete, when proposed change is accepted for line 30 on p. 34 to line 23 on p. 35.
37		9.2	Figure 12	te	The division into 3 steps is unnecessarily complicated and leads to a duplication of identical decision boxes in step 2 and 3 in Figure 7. Essentially, only two steps can be identified from the description: 1) A division of the farm/factory into separate production units; 2) A procedure for the co-products from each production unit. The description in Box 3 is unnecessarily complicated and includes unnecessary procedures. The Box to the right of box 3 is unclear as to what exactly is to be done.	Change Figure 7 to have only two main boxes: One box replacing box 1, to be named "When possible, subdivide the farm/factory further into separate production units" with the decision box: "Is it possible to subdivide the farm/factory further into separate production units?" YES leads to the small box "Draw up…" which is now given the number 2, and the existing box 2 is deleted. NO leads directly into box 3 without passing through box 2. One box 3 (existing), to be named "Convert production units with more than one product into single-product units" in which the decision boxes are changed, so that the first one is "Does the production unit have more than one product?" NO leads to a new box outside box 3: "No allocation needed. Draw up the inventory.", which replaces the existing box to the right of box 3. YES leads to a decision box "Can the output of the co-product be individually varied?" YES leads to "Subdivide the combined production by applying the

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						physical causality between each input and each additional unit of output" and then to the above mentioned box outside of box 3. NO leads to "Identify the determining products and change all other co-products to inputs with a negative sign. Identify the markets for these co-products, and describe the functional unit and name of each co-product accordingly." and then leading on to the above mentioned box outside of box 3.
38	5	9.2		te	To avoid confusion, the term "step" in this context should only be used about the ISO procedure. The unnecessary overlap between step 2 and 3 can be avoided by deleting the heading here.	Delete
38	6-14	9.2		te	This text repeats what is already covered above.	Delete
38	14-17	9.2		te	This is based on a misunderstanding of these standards. PAS 2050:2011 clause 8.5 reads: "Where energy production from CHP is exported to a larger system (e.g. export of electricity to a national electricity network), the avoided GHG emissions arising from the exported energy shall be allocated in accordance with 8.1.1" Clause 8.1.1 describes the standard steps 1a and 1b of ISO 14044.	Delete
38	17-19	9.2		te	This sentence is unclear.	Replace by: "The "footprint" of the avoided product is identical to that which would be used – with a positive sign - in another LCA for a downstream demand of the by-product or avoided product (which have identical functional units)."
38	19-23	9.2		te	The danger for improper interpretation when several LCAs are combined is particularly high these apply different system models and/or allocation methods are combined. This should be reflected in the text.	Replace by: "When several LCAs are combined to obtain an aggregated view of the larger system, it is essential that the system models of the LCAs are the same, so that all burdens caused by the aggregated demand are covered and no burdens are double-counted. For example, when a food crop use the manure from an animal system, and the two systems are combined to view the consequences of the aggregate demand, the consequences of the manure management must be included once and only once, and the fertilizer use must be the full fertilizer requirement of the food

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						crop minus the amount of fertilizer displaced by the manure. This can only be ensured if all inputs are modeled as marginal, and the system expansions are not mixed with other allocation procedures. This guidance strongly encourages no to include aggregated data that applies other methods for allocation, except when necessary when using proxy data for inputs with low significance."
38	24-33	9.2		te	This description ("total value of the flow less than 1 percent") is not consistent with the definition of residual (page xiv: "Materials with economic value are not considered residual"). Based on the description here, it is not obvious what is the purpose for isolating "residues" from other co-products. The mere fact that the revenue from these outputs is low, zero or negative cannot justify a separate treatment. Nor can the fact that "the upstream and production process that produce the outputs are not deliberately modified for the outputs" be a justification for treating these outputs differently from other co-products. The separate definition and description thus becomes an unnecessary complication. The necessary treatment of the residues will contribute emissions to the determining product, just like any other non-determining co-product or waste.	Delete
39	4-15	9.2		te	The speculations here are irrelevant when applying subdivision or system expansion to all co-products.	Delete
39	16-18	9.2		te	When allocation is generally avoided, this section could instead end with some examples of system expansion for various edible meat components (e.g. carcass cuts and edible offal) and other inedible co-products such as hide, blood and renderables.	Replace by some examples of system expansion for various edible meat components (e.g. carcass cuts and edible offal) and other inedible co-products such as hide, blood and renderables (we are willing to assist the authors on this, if desired)
39	26-29	9.2.1		te	This text is not on allocation but on data sources. It is a duplication of the text in Section 11.3. Anyway, to apply worst-case estimates is not a useful recommendation or requirement. Good practice must be to provide a best estimate with a corresponding uncertainty, cf. the requirement in section 10.4, 2nd bullet. Anyway, 100% empty return trips can hardly be	Delete

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					called worst case. In Europe, the worst national average for empty trips is 45% (for Cyprus).	
40	3	9.3		te	An “or” is missing between “combined” and “joint”	Insert “or” between “combined” and “joint”
40	13	9.3		te	Should have been “combined” (variable outputs), not “joint” (fixed outputs)	Change “joint” to “combined”
40	24-29	9.3.1		te	It does not seem helpful and adequate to leave the choice of allocation method open. The purpose of these guidelines should be to make it easier for the reader, not more difficult. Each allocation method provides an answer to a specific question, so when combining several different allocation methods within the same study, both the question and the answer is obscured. Consistently applying system expansion for joint production provides an unambiguous answer to the question of the consequences of a decision, which is the purpose of the majority (if not all) LCAs.	Replace by “The recommendation of this guidance is to apply causal reasoning for all situations of co-production, i.e. subdivision according to physical causalities for all situations of combined production and system expansion (economic causality) for all situations of joint production.”
40-41	34-4	9.3.1		te	It is not only from a nutritional perspective that spent hens are equivalent but also, and more importantly so, from a practical perspective, in that the products fulfill similar roles in a meal. The consistency with the treatment of other meat cuts should not be stressed too much, since this is really a different, less important, and optional choice whether these should be treated together or individually, depending on the scope of the study.	add “ and practical” after “nutritional” in line 34, and “and practical role in a meal” after “nutritional value” in line 1 on page 41. Delete the rest of the paragraph.
42	1-6	9.3.2	Table 2	te	Estimates of broiler production are always available. Therefore no need to resort to biophysical allocation for spent birds. Rendering is a process prior to use of cull birds in pet food and has a clearly valuable product that substitutes the marginal protein source in pet food (soy meal), and additionally produces poultry fat that substitutes other food grade fats. The revenue-based system expansion for meat processing requires a little more text to be adequate. In the case of full utilization of residuals (shells/broken eggs), system expansion is required for the valuable product after	In second row (spent birds): Delete Biophysical causality and second sentence in Basis. In the third row (cull birds): Delete Biophysical causality and change Basis to “Rendering of cull birds provide protein rich by-products that substitute soy meal as the marginal protein source in pet food and poultry fat that on the margin substitutes other food grade oils. Some cull birds may be treated as waste. For Revenue in the fourth and fifth row: Add “-based system expansion” after “Revenue”, change “allocation” to “system expansion” and add “, taking into account when relevant,

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					treatment. In any case, the treatment activity needs to be included.	also differences in consumption activities based on differences in functional units and applications" before the last dot. For Residual in the fifth row: Change the text under Basis to "Shells and broken eggs are seldom fully utilized, which means that a marginal increase in supply should be regarded as additional waste. In case of full utilization (e.g. for animal feed) the avoided product (e.g. marginal soy protein) shall be subtracted from the burdens of treatment."
42 and 43	line 8-14 on p. 42 and line 11-17 on p. 43	9.3.3		te	The recommendation in the initial text on p.42 is not in line with the physical causality, and is inconsistent with the recommendation in the section on p. 43. The suggestion here is to merge the two paragraphs into a consistent requirement. Animal manure is always a by-product that varies with the amount of animal production. All consequences of this must therefore be assigned to the determining product of the animal production. This includes both the on-farm manure handling, the application of the manure on the field and the resulting emissions. When the manure displaces artificial fertilser, the net emissions from the field application thus becomes those of the manure minus those of the corresponding amount of displaced artificial fertilser. This results in a clean separation of the emissions caused by the animal system and those caused by the crop production.	Replace by: "Animal manure is always a by-product that varies with the amount of animal production. All consequences of this shall therefore be assigned to the determining product of the animal production. This includes both the on-farm manure handling, the application of the manure on the field and the resulting field emissions. Utilization of manure as fertiliser results in different emissions from the field than from inorganic fertilisers. When the manure displaces artificial fertilser, the net emissions from the field application thus becomes those of the manure minus those of the corresponding amount of displaced artificial fertilser. Therefore substitution shall require assignment of the field emissions to the animal product, with a subsequent substitution credit of both the production and field emissions associated with the substituted inorganic fertilizer. It is not required to identify the specific inorganic fertiliser products that are substituted. The field crops require fertilization in terms of specific nutrients, not specifically manure or artificial fertilizer. Thus, the fertilization requirements of the field crops shall be modeled as a demand to the general market for each required nutrient. This is then met by a supply from the unconstrained suppliers of fertilser, which does not include manure, due to this being constrained by the demand for the animal products. Consequently, the emissions from the field crops

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						shall be modeled fully and exclusively as the emissions resulting from this marginal supply of artificial fertilizer. This procedure results in a clean separation of the emissions caused by the animal system and those caused by the crop production."
43	1	9.3.3		te	The "heading" is superfluous	Delete the word "**Substitution:**"
43	2-11	9.3.3		te	This text is highly confusing. Since marginal inputs of energy should be used when electricity is used (cf. ISO 14049, clause 6.4) then it must also be marginal energy that is used when substituting inputs. As also discovered by Blonk (2010), the system becomes mathematically unsolvable if averages are used for system expansion. And there seems to be no justification for making different rules for the energy by-product when it is sold relative when it is used in-house or given away for free, which would also be inconsistent with the recommendation in section 11.7.1.	Delete.
43	18-23	9.3.3		te	The physical modeling should not depend on the price of the manure. The emissions and the substitutions will be the same, irrespective of whether the manure is sold or not. The text here becomes superfluous when allocation is generally avoided.	Delete
43-44	24-13	9.3.3		te	The complicated speculations here become irrelevant when the physical causality implied in system expansion is applied.	Delete
44	18	9.3.3		te	Reference to the figure is irrelevant	Delete " since that is path (3a), not (3e)"
44	21-32	9.3.4		te	The rationale for using economic allocation here needs to be explained in more detail. It is not the impracticality of the modeling, but the insignificance of its implications that can be used as rationale. The current text is also not completely consistent with Table 3. There is no justification for making the grouping of products a requirement. It is an optional simplification.	Replace by: "In commercial processing of poultry products, as a single production unit, the main meat products have different functions and markets then than the remaining co-products that are not edible by humans. Therefore allocation based on physical attributes (e.g., mass, protein or fat content) is not appropriate and shall not be employed. However, for the multiple determining edible products, for example chicken feet and chicken meat, which serve a common food market, the net induced changes in consumption may be insignificant, so that the system

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						expansion may be approximated by a simple revenue allocation, or the products may even be grouped together as one average product, depending on the scope of the analysis. Likewise, secondary rendering products that substutite the same products (for example blood, bone, and feather meals that all displace soy as the marginal protein source) may be combined and treated as a single commodity."
47	21	10.2		te	Secondary data may sometimes be of higher quality than primary data.	Add ", of lower quality," after "available"
55	2-4	11.2	Figure 13	te	When avoiding allocation, the wording of box 16 should reflect this.	Box 16, last 3 lines: Change to: "System expansion may be required to isolate each FU"
56	18	11.2		te	There is no contradiction, so a "but" is not meaningful here.	Change "but" to "and"
62	3-5	11.2.3 c)		te	The note seems to suggest that the emissions from land application are not to be assigned to the animals. This would be contrary to the physical causality and would give erroneous system boundaries relative to the avoided emissions.	Delete
63	6-7	11.2.3 c)		te	It is awkward to have the manure emissions split up in two guidelines. Move all manure emissions to this guideline, where they anyway are more relevant.	Account for all manure emissions in this guideline instead of splitting them up between the guidelines.
65	4	11.2.4		te	The term "exclusion" is ill chosen	Change "cut-off criteria for exclusion" to "treatment of"
65	29	11.2.5		te	This should apply to all waste treatment, not only on-farm	Delete "on-farm"
66	6-10	11.3		te	To apply worst-case estimates is not a useful recommendation or requirement. Good practice must be to provide a best estimate with a corresponding uncertainty, cf. the requirement in section 10.4, 2nd bullet. Anyway, 100% empty return trips can hardly be called worst case. In Europe, the worst national average for empty trips is 45% (for Cyprus).	Delete
68	7	11.6 b)	Box 2	te	Update to account for suggested change in the example referred to.	Change "is achieved through an economic or mass allocation, as shown in a subsequent example" to "using different allocation methods is shown in Box 4"

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68	22	11.7.1		te	The economic value is irrelevant for the physical causality	Delete “economic value and”
70	5-6	11.7.2	Box 4	te	The economic value is also used in the system expansion example	Add “and system expansion” after “allocation” (twice)
70	9	11.7.2	Box 4; Table 10	te	Add system expansion to the example	Add “SYSTEM EXPANSION, ” before “ECONOMIC”
70	9	11.7.2	Box 4; Table 10	te	Expand the example to include system expansion If required, space can be saved by deleting the “Average mass” column, since the information is redundant with the “% of total mass”. For easier understanding, add two rows: One “Sum edible” below “Wings” and one “Sum total” at the bottom, thus giving 8 rows of numbers in total. For easier understanding, add the formulas and the parameters EA and MA in the table.	add two rows: One “Sum edible” below “Wings” and one “Sum total” at the bottom, thus giving 8 rows of numbers in total. Use the following 7 column headers: Mass% (M) Revenue% (R) % by economic allocation Induced production in % of TM (I=R*100/EA) Reduced consumption in % of TM (Cr=I-100) Induced consumption in % of TM (Ci=I*(MA-M)/M) Net change in consumption in % of TM (=Cr+Ci) The resulting 7*8 matrix is filled in this way: Column 1: 33;37;6;MA = 76;6.4;7.6;10;TM=100 Column 2: 35;41;13;EA = 89;6;3;2;100 Column 3: 38.64;43.33;7.03;89;6;3;2;100 Column 4: 39.33;46.07;14.61;100;=M*above percentages available for system expansion (for all 3 rows); Column 5: -60.67;-53.93;-85.39; ; ; ; ; Column 6: 51.24;48.56;170.41; ; ; ; ; Column 7: -9.43;-5.38;85.02; ; ; ; ; Change the explanatory text below the table to: ”The table shows – maybe surprisingly - that the price (revenue/mass) for wings is relatively high, compared to the other meat cuts. For the economic allocation result, the meats are grouped, so that the allocation factor for the meats become mass%*EA/MA. For the (ungrouped) inedible parts, the economic allocation factor is the pure revenue%.

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						In the 4 last columns, each row shows the consequences of system expansion: The demand for the amount TM of a specific meat type first provides a revenue that induces a production of the amount shown in column 4. This is equal to the specific meats' proportion of the total revenue for all 3 determining products. Since the induced amount is less than the demanded 100%, the remaining amount must come from other consumers' reduction in consumption of that meat type (column 5). At the same time, the induced production supplies an additional amount of the non-demanded meat cuts, thus inducing an increased consumption of these (column 6), since all markets must be cleared. The net change in consumption is shown in column 7. The net change in consumption is low for the dark meats and breasts, showing that these products could be grouped as one, without introducing any significant error. For wings, on the other hand, the change in consumption of other meat cuts is significant, which shows that it may not be reasonable to group the wings together with the other meat cuts. This is a direct consequence of the significant difference in price of the wings relative to the other cuts."
74	5-6	12.2.3		te	A normalised result cannot be used to say anything about the overall environmental benefit. Since it is a relative value, it can at best express the relative environmental improvement.	Change "greatest overall environmental benefit" to "largest relative environmental improvement".
99	15-18	Appendix A5.		te	When avoiding allocation by system expansion, this recommendation become irrelevant.	Delete paragraph except first sentence.
100-101	line 8, p. 100 to l.14, p. 101	Appendix A6.		te	When avoiding allocation by system expansion, this section becomes irrelevant.	Delete entire section A6.

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