Peer Community In
Animal Science

15N as a marker for feed efficiency in beef cattle

Marcos Marcondes *based on reviews by Emilio Mauricio Ungerfeld and 1 anonymous reviewer*

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A recommendation of:

Identifying cattle with superior growth feed efficiency through their natural 15N abundance and plasma urea concentration: a meta-analysis.

Cantalapiedra-Hijar G, Morel I, Sepchat B, Chantelauze C, Miller GA, Duthie CA, Ortigues-Marty I, Dewhurst RJ *(2022), Zenodo, 5783960, ver. 3 peer-reviewed and recommended by Peer Community in Animal Science* https://doi.org/10.5281/zenodo.5783960

Submitted: 07 December 2021, Recommended: 28 April 2022

Recommendation

Identifying individuals with a more remarkable feed efficiency may positively affect the profitability and sustainability of the beef industry (Cruz et al., 2010; Basarab et al., 2013). However, although most international nutrient requirements systems predict animal feed efficiency, intake data is usually unavailable at the farm level, and ranking animals based on efficiency might be challenging. In this sense, using differences in the occurrence of

isotopic N between animal and diet (Δ15Nanimal-diet) might become a natural biomarker to determine feed efficiency at the farm level. This methodology was firstly demonstrated by Guarnido-Lopez et al. (2021). In the present study by Cantalapiedra-Hijar et al. (2022), the authors evaluated the extent to which Δ15Nanimal-diet can be used as a marker for feed efficiency in beef animals. For this, a meta-analysis was conducted using a database including 759 individual records for performance and N isotopic discrimination measured in plasma or muscle (Δ15Nanimal-diet; n = 749) and plasma urea concentration (n = 659). The database was composed of 37% Charolais, 15% Simmental, and 40% of beef crossbreds. The results confirmed that Δ15Nanimal-diet could discriminate animals with at least 0.10 kg/kg difference in feed efficiency. Furthermore, the Δ15Nanimal-diet marker also successfully discriminated the feed efficiency of two animals from the same contemporary group if they differ by at least 0.06 kg/kg of FCE. However, when trying to predict feed efficiency, using the two candidate biomarkers did not improve estimates. Lastly, when data from biomarkers were combined with performance data, improvement in the predictions was observed. Nonetheless, the present results warrant more studies to evaluate the use of Δ15Nanimal-diet as a biomarker for feed efficiency since it could be used not only for feed efficiency discrimination but also in genetic selections.

References

Cantalapiedra-Hijar G, Morel I, Sepchat B, Chantelauze C, Miller GA, Duthie CA, Ortigues-Marty I, Dewhurst RJ (2022). Identifying cattle with superior growth feed efficiency through their natural 15N abundance and plasma urea concentration: A meta-analysis. Zenodo, 5783960, ver. 3 peer-reviewed and recommended by Peer community in Animal Science. https://doi.org/10.5281/zenodo.5783960.

Cruz GD, Rodríguez-Sánchez JA, Oltjen JW, Sainz RD (2010). Performance, residual feed intake, digestibility, carcass traits, and profitability of Angus-Hereford steers housed in individual or group pens. J. Anim. Sci. 88:324-329. https://doi.org/10.2527/jas.2009-1932.

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Guarnido-Lopez P, Ortigues-Marty I, Taussat S, Fossaert C, Renand G, Cantalapiedra-Hijar G (2021). Plasma proteins Δ15N vs. plasma urea as candidate biomarkers of between-animal variations of feed efficiency in beef cattle:

Phenotypic and genetic evaluation. Animal 15:100318. https://doi.org/10.1016/j.animal.2021.100318.

Evaluation round #2

DOI or URL of the preprint: **https://doi.org/10.5281/zenodo.5783960**

Version of the preprint: 2

Author's Reply, 05 May 2022

Dear Dr. Marcos Marcondes,

Thank you again for your time and the opportunity to revise and improve our manuscript. We have applied the last minor comments raised by the Dr. Ungerfeld and changed the format of the manuscript as recommended by PCI Animal Science. We hope that these last minor changes will allow your recommandation.

It has been a pleasure our first experience with PCI.

Best regards,

Gonzalo Cantalapiedra-Hijar

Decision by Marcos Marcondes, *05 May 2022*

Dear Authors,

Both reviewers recommended the publication of your pre-print after a minor review. Please check the file attached.

Thank you for submiting your manuscript to PCI Animal Science

Kind regards

Marcos

Reviewed by anonymous reviewer, 10 Apr 2022

I believe the authors have answered or at least tried to answer most of the questions previously raised. The manuscript reads considerably better and I believe the content will contribute to the community.

Reviewed by Emilio Mauricio Ungerfeld, 20 Apr 2022

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Evaluation round #1

DOI or URL of the preprint: **10.5281/zenodo.5783961**

Version of the preprint: 1

Author's Reply, 15 Mar 2022

Dear Dr. Marcos Marcondes,

Thank you for your time and the opportunity to revise and improve our manuscript. Reviewers have raised relevant questions we try to address in the new version. Our responses are preceded by [AU], and the line number given in the end of some responses refers to the line number in the revised manuscript. In addition, all changes in the revised manuscript are highlighted in yellow. We acknowledge the constructive comments made by reviewers and we trust that the quality of the paper has been improved in the new version by taking them into consideration. Please accept our apologies, there were some graphical mistakes in figure 1 and 6 we have solved in the new version.

Anonyme reviewer

Dear Authors,

Thank you for the opportunity in reviewing the manuscript entitled "Identifying cattle with superior growth feed efficiency through their natural 15N abundance and plasma urea concentration: A meta-analysis", from Cantalapiedra-Hijar et al. In fact, alternatives to assess feed efficiency are currently needed, and thus, studies like this one are relevant to the scientific community.

[AU]: Thank you for your positive feedback and contributing to the initiative of PCI Animal Science.

There are, however, some major and minor concerns in regard to the study that would be beneficial if answered. Those are:

Major comments:
Some of the concerns are regarding the use of Δ15Nanimal-diet for predicting FCE and RFI. I think it would greatly contribute to the manuscript if the authors

could explain more throughout about the biological mechanisms behind using such marker and why it is associated with NUE. I understand previous studies might have gone into more detail about it, but this work needs to stand alone in terms of readability and understanding by the scientific community.

[AU]: We agree with this comment. Following your suggestion, we have added a short summary on the principle by which this new isotopic biomarker is linked to the N use efficiency in ruminants (L90-L97)

It was also not clear if DMI and ADG were measured or estimated. I would recommend the authors include the method (e.g., Calan gate) in Table 1 or describe it in the material and methods for each of the studies as many are not published yet.

[AU]: Feed efficiency was measured by gold standard methods, thus individual daily DM intake and ADG were measured (and not estimated) in every trial for a minimum of 56 days. This point is now explicitly addressed in L141-142. We have also added the method used in each trial to measure individual DM intake in L143-149 (Table 1 was already full of information and was difficult to put more information there).

Another concern is regarding FCE measurements not being reliable to the point of promoting a too high error in FCE correlations, as suggested by the authors in the manuscript. Could the authors explain which FCE measurement had such high variability and why? Some information is hard to access by reading since many studies are not published yet, so the Material and Methods should be especially well described in this study.

[AU]: Sorry, we are not completely sure to understand your interpretation here and what you meant by "which FCE measurement had such high variability and why". In case the reviewer refers to L400-L412 of the first version, we only said that the lack of strong correlations between the biomarker and phenotype could also arise from the measurement errors associated to FCE and not only to the biomarker's inaccuracy. As any other phenotype, FCE includes measurement errors that are logically involved in the error of prediction but we did not mean that FCE measurements are not reliable in our conditions. We did not aim either to point at the weaknesses of a particular trial for explaining the lower performance of the biomarker but we preferred to identify best practices that could strengthen the relationship between biomarkers and phenotypes. In this regard, we identified that one of the trials showing the highest correlation between FCE and 15N corresponded to the only experiment where BW was recorded every week and we discussed that ADG measurement has a higher weight on FCE errors than DMI measurements. In addition, a new analysis included in the new version highlighted also that there is no relationship between

test duration and the potential of the biomarker to reflect FCE variations (L462-465). We hope that details included in the revision will help the reader to have a clearer vision of the methods used in each trial.

In regard to the unpublished data, are those not yet published or not going to be published?

[AU]: All not yet published studies have been already or are intended to be submitted to peer-review journals.

Perhaps another good comparison of the data would have been between published vs. unpublished studies as published data have gone through peer-review already.

[AU]: While we may understand your concern about non-published data, we do not really see the point to conduct a comparison between published vs unpublished trials. We do not expect to have better/stronger relationships because the data are already peer-reviewed. Several meta-analyses in animal science have been already conducted by using unpublished data. Here we include some examples where unpublished datasets have been used in meta-analysis in the Journal of Dairy Science: Carriquiry et al., 2008; Desnoyers et al., 2009; Krizsan et al., 2010; Rabiee et al., 2010; Poppy et al., 2012; Brandao et al., 2020; Matamoros et al., 2020; Correa-Luna et al., 2022.

In general, readability would be considerably improved if the authors review the manuscript by breaking down paragraphs and sentences into shorter ones, which some are mentioned below.

[AU]: Thank you for this suggestion. We have tried to break down some long paragraphs in order to improve their readability.

Minor comments:

Lines 20-21: Try to specify the breed of the animals here and throughout the manuscript. Were those cross-bred? Were multiple breeds used in the study?

[AU]: All this information is consultable in the open-source file associated with the manuscript as well as in Table 1. However, following your suggestion we have added this information in the abstract (LXX) and material and methods (L21-L22).

Line 41: Would average daily gain together with $\Delta 15$Nanimal-diet not add collinearity in the prediction?

[AU]: Both predictors show a low correlation within contemporary group as shown in Figure 6 (r2 = 0.06) this is why we did not check for collinearity. However, following your comment we have conducted a variance inflation factor analysis to be sure that both predictors can be included in the same model. VIF values are now presented in Table 6 and as you can check they are close to 1 which indicate a very low degree of collinearity.

Line 117-118: What were these days relative to?

[AU]: We meant the duration of feed efficiency tests in the different trials (from 56d the shortest ones to 259d for the longest one). We have changed the word "ranged" by "lasted" to improve the understanding.

Line 120-122: Was breed included in the statistical model? Have the authors tested if breeds differ in the predictions?

[AU]: This is a very good question that unfortunately we cannot completely address in this study because the breed effect is in most conditions confounded by the random effect of study. However, following your interesting suggestion, we have attempted to make a sub dataset with those few experiments including different breeds and categorizing animals as late vs early (or intermediate) maturing breeds. We have further tested if this effect and its interaction with the biomarker was significant. Although the sub-dataset was relatively small (n = 312) a trend (P = 0.06) for Late vs Early maturing breeds to have a greater FCE response to changes in $\Delta 15N_{animal-diet}$ has been highlighted with this new analysis. Material and methods, results and discussion has been extended to include results from this new and interesting analysis.

Line 125: Correct the word 'Tables' to singular.

[AU]: Done

Lines 127-141: It is not clear if the 'observed DMI' was actually measured or estimated for feed efficiency calculations. If they were in fact measured, was DMI measured on an individual basis for all animals? since many predictions considered the individuals and not only pen? Please, these details need to be more clearly described in this section.

[AU]: Yes, DMI was actually measured on an individual and daily basis for all animals and experiments and never estimated. Our predictions from biomarkers are thus at the individual level. Details have been added to be clearer on this point (L141-142).

Lines 135-141: These results should be described in the Results section only. Also, what factors could explain much of a difference in prediction variation between DMI calculations considering or not CG?

[AU]: Sorry, we think that these kinds of details should be given in material and methods. We describe how RFI has been calculated and the output parameters associated with the model. We prefer therefore to keep them in this section, because it is not really a result from our study. Concerning your second point this is a classical result in RFI models when calculated from different cohorts or studies. As explaining in L152-158 our CG effect includes the effect of study, the effect of diet and the effect of pen, so it should explain much of the observed DMI variance in our dataset (almost 50% of total variance)! In meta-analysis the study effect is usually the main factor explaining total variance, since it integrates animal and environment variability across sites.

Line 174: Was collinearity tested when combining predictors?

[AU]: Predictors show a low correlation within contemporary group as shown in Figure 6 for Δ15N and ADG ($r^2 = 0.06$) this is why we did not check for collinearity. However, following your comment we have conducted a variance inflation factor analysis to be sure that both predictors can be included in the same model. VIF values are now presented in Table 6 and as you can check they are close to 1 which indicate a very low degree of collinearity. We have completed the description in Material and Methods to explain this step clearly (L276-282).

Lines 201-208: Check journal recommendations to define acronyms such as RMSEP and RSR.

[AU]: As far as we know, there is not journal recommendations in PCI Animal Science. However, we have decided to define RMSEP at first use. For RSR the definition was already done in the first version (ratio of RMSEP to the standard deviation)

Lines 223-224: Add a brief explanation on why RFI was already free of the CG effect.

[AU]: Done (L262-263)

Line 238: Make sure results later described in the discussion section, such as R^2 from some equations are properly reported in the Results section first. Please, double-check for all of the results described elsewhere including some from the Material and Methods sections.

[AU]: Done for the discussion. We prefer however to keep the RFI model statistics in the material and methods as usually done.

Lines 364-368: This sentence is confusing; please, consider rewording it.

[AU]: Agree the sentence has been broken down in two sentence and reworded.

Line 399: Replace the word “adapted” with “suitable”.

[AU]: Done, thank you.

Lines 405-419: Were the FCE measurements measured or estimated/predicted in the studies used for the meta-analysis? How was RFI calculated if numbers were based on predictions?

[AU]: Daily DMI and ADG were individually measured in all studies (n = 749 individual observations) and never predicted. FCE was then calculated (n = 749 individual observations) from DMI and GMQ measurements. When we talk about predictions in the paper it refers to the models developed to predict FCE (or RFI) from biomarkers but for that we need first phenotypes measured by standard methods. Hope this explanation and changes introduced in material and methods will improve the understanding on this point.

Line 427: Replace the word “adapted” with “suitable”.

[AU]: Done, thank you.

Lines 429-433: Consider breaking down this sentence into two or more. How would a decrease in N intake increase performance in inefficient animals?

[AU]: Agree, the sentence has been broken down and slightly reworded for a better understanding. A mistake was in the sentence, we meant an increase in feed efficiency rather than in performances. The cited references give some explanation and interpretation on why these two dietary interventions (feed restriction or higher F:C ratio in diets) will improve feed efficiency of inefficient RFI cattle. In brief, because RFI is highly correlated with nutrient intake, the lesser nutrient intake you promote through dietary intervention the higher the feed efficiency (low RFI values).

Lines 438-445: Please, break it down into 2 or more paragraphs.

[AU]: Following your comment we have slightly shortened the second paragraph and introduced points as i), ii) and iii) to allow a better reading.

Line 453: Replace “here established” with “herein proposed”.

[AU]: Done, thank you.

Line 445-450: Consider breaking it down into more paragraphs, and add the name of major machine brand/method used for the average analysis time as well as the region where it is $16.00 the sample (i.e. France). Correct currency sign to before the price (i.e. $16.00 and not 16$).

[AU]: Thank you. As explained before we have also introduced here points i), ii) and iii) to allow a better reading. Analytical method (EA-irms) and currency (15.00 €) have been introduced, respectively.

Lines 467-470: Add an explanation on why fat accretion contributes to the relationship of FCE and Δ15Nanimal-diet?

[AU]: In early-maturing breeds the contribution of fat deposition to body weight gain is greater compared with late-maturing breeds. Because Δ15N is biologically linked to protein rather than fat deposition, it should capture only the part of FCE related to protein deposition and thus working worse for predicting FCE in early maturing breeds. In this regard, adding fat accretion measurements for predicting FCE in addition of Δ15N has been proved to improve the models. A slight modification has been introduced to highlight this point in L523-524. In addition, the new analysis considering the type of breed strengthen our arguments on this point (L526-532).

Lines 486-487: Correct r2 to R2.

[AU]: Done

Lines 498-512: The conclusions sound a little too strong based on the findings of the study. Please, acknowledge some of the drawbacks described above, such as the high error from RFI measurements that limited the interpretation of some of the results.

[AU]: We had tried to conclude only based on results from this study, but we may acknowledge that the identified drawbacks have not been put forwards in the conclusion. Following your comment, the conclusion has been slightly modified to integrate the fact that the prediction errors obtained at the individual level are still considered to be high for breeding purposes.

Table 1: ID#1 study name and year need to be corrected (it is 2014 and not 2004).

[AU]: Done

Table 2: Delete R2 from the footnote, as there is no superscript for this abbreviation in the table, yet there is no need for description as well.

[AU]: Done

Table 3: Define RSE.

[AU]: Done

Figures 1, 4, and 6: Add to each graph their respective statistical data, such as P-values, n, correlation coefficient, etc.

[AU]: Thank you for your suggestion. However, because some graphs are already rich in symbols we prefer to keep all these statistics in the figure title.

Second reviewer: Emilio Mauricio Ungerfeld

This manuscript presents a careful and thorough analysis of the relationship between feed efficiency as measured through two different metrics (feed conversion efficiency and residual feed intake) and two biomarkers, namely 1) the difference in 15N abundance in animal tissues (plasma in all but one study in which muscle was sampled) and feed, and 2) plasma urea concentration. The analysis is a nice follow up of recent research conducted by this group and others. The manuscript is well written although the writing may be improved in some specific passages indicated under Specific comments. The methods are sound and the results interesting. The Discussion following the presentation of results is thoughtful and the research is novel and has important implications to ruminant productivity and sustainability.

[AU]: Thank you for positive feedback and contributing to the initiative of PCI Animal Science.

I have the following comments for the authors to consider:

Major:

1) Would it make sense to weight by the experiment duration normalized to unity?

[AU]: This is a complex question. To the best of our knowledge weighting is applied in meta-analysis to give more importance to those studies with greater sample size or alternatively to balance for variance differences among studies. In this context, we wonder what will be the objective to weight by experimental duration. Should we admit that feed efficiency tests are better with 259d vs 56d on test and give more weight to the former ones in our meta-analysis? Sorry to

answer you by a question, but we are not sure that this approach can be useful in our conditions. Previous published meta-analysis from our team have never considered the duration of measurements as a criterium for weighting studies and we prefer not to weight by experiment duration. However, following your suggestion a posteriori analysis was performed to evaluate if higher correlations between feed efficiency and biomarkers were obtained with longer trials. This analysis revealed no clear pattern between duration and the ability of the biomarker reflect between-animal variation in feed efficiency. Two lines have added in this regard (L463-464).

2) Statistical analyses: it may be easier for readers to follow if the statistical models as equations were presented earlier in the text before providing further details on, for example, R commands or model selection through AIC and BIC.

[AU]: Agree with this comment. Changes were introduced accordingly.

3) If the type of animal (i.e. bulls, heifers or steers) was introduced into the model, both as a main effect and as an interaction with the biomarkers, would it be significant?

[AU]: Thank you for this question. Unfortunately, the type of animal is completely confounded with the random effect of study and from our point of view it cannot be analyzed in our experimental setup since none of the trial have tested different type of animals (within-study). Another similar question, raised by reviewer 1, is to consider the breed in the model since for some particular trials this factor (breed) was present within study. In this regard, we have developed two different equations for early and late maturing breeds between FCE and both biomarkers. Material and methods, results and discussion have been extended accordingly.

4) Line 189 and throughout (e.g. right panel in Figure 1). I assume that by "dietary" or "diet" the authors mean the dietary treatment in each study? It might be less ambiguous to say "treatment"

[AU]: Agree. Dietary or diet has been changed throughout the manuscript to treatment or dietary treatment.

5) ADG was at the end of the day the best predictor. I agree with the authors that the use of the biomarkers and especially 15N abundance can certainly improve the prediction of FCE based on ADG, but I think a very important point to highlight in the Abstract and Conclusions is that ADG was still the best single predictor.

[AU]: Agree with this comment. We had addressed this concern in the discussion but following your suggestion it appears now clearly stated also in the abstract and conclusions.

6) A comment without request for modification: Could there be any use of analyzing and studying delta 15N(animal – feed) measured in hair? Thoughts for future research

[AU]: Thank you very much for your suggestion. Indeed, we have already tested the potential of hair 15N as a biomarker of feed efficiency in cattle (Meale et al., 2017) but predictions seem slightly worse than that obtained with plasma or muscle likely because hair do not undergo turnover and 15N values represent longer and variables periods.

Abstract Line 38. Specify which percentage does "extreme animals" refer to

[AU]: Sorry but this specification was already shown in the first version "the top 20% highest and lowest animals within-CG in terms of RFI and FCE (extreme animals)"

Introduction

Line 70. Suggest "ranking individual animals"

[AU]: Done

Line 77. I think there is a leap in the explanation regarding feed sorting. Consider expanding with one or two sentences to clarify the point

[AU]: Done, thank you.

Materials and Methods Lines 119-120. Did the authors try running the analyses both with and without Study #8, as 15N abundance was not measured in plasma urea but in muscle?

[AU]: In a previous experiment from our team (Nasrollahi et al.2020) we obtained similar relationships between Δ15N and feed efficiency regardless the isotopic analysis was conducted on plasma or muscle. We did not try to remove study ID#8 because we consider that all animal proteins once the isotopic equilibrium is reached has similar isotopic signatures (excepting the case of hair where no turnover exist). We have added in L178-181 the following statement to justify it: According to previous results from our team (Nasrollahi et al., 2020) and to allow sufficient time to reach an isotopic equilibrium, Δ15Nanimal-diet

measured from either muscle (#ID8) or plasma proteins have the same potential to predict feed efficiency and thus were treated similarly in this meta-analysis.

Lines 124-125. “Table 1”

[AU]: Done

Lines 136-141. Perhaps it would be useful to readers to include the equation showing how DMI is calculated by regressing against CG, ADG and mBW0.75, with RFI equating the residuals in the regression

[AU]: Done

Lines 143 and 146. “analyses”

[AU]: Done

Line 150. Please inset space between number and units

[AU]: Done

Line 163. Subscript in N2

[AU]: Done

Line 167. “measured”

[AU]: Done

Lines 219-229. I recommend adding the equation for the statistical model

[AU]: Done (L257-260)

Discussion Lines 334-335. This is valid when animals are fed TMRs, as in the present analysis, but differences between DMI and N intake may occur in grazing systems

[AU]: Agree, but we do not intend at this stage any extrapolation from our results to the grazing context.

Line 340. “VandeHaar”

[AU]: Done, thank you.

Line 372. “with growing heifers”

[AU]: Done

Line 373. Please insert space i.e. 20% CP

[AU]: Done

Lines 387-389. Not sure that I understand the intention correctly. Does it mean that only 11 or 6% of the animals within a CG would differ by 0.06 or 0.08 kg/kg and would thus be estimated to have significantly different FCE using 15N abundance or urea N, respectively?

[AU]: Your understanding is correct. In our dataset, on average 11% of animals within-contemporary group differed by at least 0.06 kg/kg of FCE while only 6% differed by at least 0.08 kg/kg of FCE. Because the minimal significant difference was established at 0.06 and 0.08 kg/kg of FCE for 15N and plasma urea, respectively, they allowed to discriminate 11% and 6% of individuals. Because we acknowledge that these proportions are not too high we state it in the conclusion to admit that they might not be robust biomarkers for breeding programmes (L566).

Line 392. Insert comma after Moriasi et al. (2007)

[AU]: Done

Line 448. Which currency is this? Is it US dollars?

[AU]: Yes, it was reported on dollars. However, because the analyses were done in France we have changed the currency to euros.

Line 454. Insert comma after "Interestingly"

[AU]: Done

Line 455. Is simple or mixed models meant by "both approaches"? I would mention both approaches to be explicit

[AU]: Yes, we meant both mixed effect models and simple regression based on residuals. Corrected.

Lines 454-461. I agree with the reasoning with the following caveat: to me the relationship goes beyond only a high correlation but also represents a response of a similar magnitude. It seems to me that a high correlation between both variables does not necessarily require a similar slope in their respective relationships with delta 15N(animal-diet).

[AU]: Agree with your reasoning as well, but we only compared slopes between studies and not the degree of correlation. The response of NUE to 15N variation in the past meta-analysis (slope of -0.035) was similar to the one obtained in the present study between FCE and 15N (slope close to -0.034).

Line 486. Suggest using "Rather," instead of "On the other hand,"

[AU]: Done

Conclusions Line 502. "contrasting"

[AU]: Done

Table 1, second column heading. Perhaps "type of animal" would be a better description than "sex", as other aspects are also considered

[AU]: Agree, changed.

Figure 1. If possible, using different colors would allow for better distinction of the different types of animals

[AU]: Thank you for your suggestion. However, because we do not know the guidelines of the journal where this paper, if accepted, will published we prefer to keep them in black and white at this stage.

Decision by Marcos Marcondes, *15 Mar 2022*

Dear Mr. Cantalapiedra-Hijar:

Expert reviewers have evaluated your manuscript entitled " Identifying cattle with superior growth feed efficiency through their natural 15N abundance and plasma urea concentration: a meta-analysis" which you submitted to PCI Animal Science. I inform you that, based on the reviewers' comments and my assessment, some major reviews are recommended at this moment.

Please check below the comments made by two independent reviewers.

Thank you for considering the PCI Animal Science for your research.

Sincerely,
Dr. Marcos Marcondes
Washington State University
116 Clark Hall, Pullman, WA 99164

marcos.marcondes@wsu.edu

Reviewed by Emilio Mauricio Ungerfeld, 02 Mar 2022

Download the review

Reviewed by anonymous reviewer, 14 Mar 2022

Dear Authors,

Thank you for the opportunity in reviewing the manuscript entitled "Identifying cattle with superior growth feed efficiency through their natural 15N abundance and plasma urea concentration: A meta-analysis", from Cantalapiedra-Hijar et al. In fact, alternatives to assess feed efficiency are currently needed, and thus, studies like this one are relevant to the scientific community. There are, however, some major and minor concerns in regard to the study that would be beneficial if answered. Those are:

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In regard to the unpublished data, are those not yet published or not going to be published? Perhaps another good comparison of the data would have been between published vs. unpublished studies as published data have gone through peer-review already.

In general, readability would be considerably improved if the authors review the manuscript by breaking down paragraphs and sentences into shorter ones, which

some are mentioned below.

Minor comments:

Lines 20-21: Try to specify the breed of the animals here and throughout the manuscript. Were those cross-bred? Were multiple breeds used in the study?
Line 41: Would average daily gain together with Δ15Nanimal-diet not add collinearity in the prediction?
Line 117-118: What were these days relative to?
Line 120-122: Was breed included in the statistical model? Have the authors tested if breeds differ in the predictions?
Line 125: Correct the word 'Tables' to singular.
Lines 127-141: It is not clear if the 'observed DMI' was actually measured or estimated for feed efficiency calculations. If they were in fact measured, was DMI measured on an individual basis for all animals? since many predictions considered the individuals and not only pen? Please, these details need to be more clearly described in this section.
Lines 135-141: These results should be described in the Results section only. Also, what factors could explain much of a difference in prediction variation between DMI calculations considering or not CG?
Line 174: Was collinearity tested when combining predictors?
Lines 201-208: Check journal recommendations to define acronyms such as RMSEP and RSR.
Lines 223-224: Add a brief explanation on why RFI was already free of the CG effect.
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Lines 364-368: This sentence is confusing; please, consider rewording it.
Line 399: Replace the word "adapted" with "suitable".
Lines 405-419: Were the FCE measurements measured or estimated/predicted in the studies used for the meta-analysis? How was RFI calculated if numbers were based on predictions?
Line 427: Replace the word "adapted" with "suitable".
Lines 429-433: Consider breaking down this sentence into two or more. How would a decrease in N intake increase performance in inefficient animals?
Lines 438-445: Please, break it down into 2 or more paragraphs.
Line 453: Replace "here established" with "herein proposed".
Line 445-450: Consider breaking it down into more paragraphs, and add the name of major machine brand/method used for the average analysis time as well as the region where it is $16.00 the sample (i.e. France). Correct currency sign to before the price (i.e. $16.00 and not 16$).

Lines 467-470: Add an explanation on why fat accretion contributes to the relationship of FCE and Δ15Nanimal-die?
Lines 486-487: Correct r2 to R2.
Lines 498-512: The conclusions sound a little too strong based on the findings of the study. Please, acknowledge some of the drawbacks described above, such as the high error from RFI measurements that limited the interpretation of some of the results.
Table 1: ID#1 study name and year need to be corrected (it is 2014 and not 2004).
Table 2: Delete R2 from the footnote, as there is no superscript for this abbreviation in the table, yet there is no need for description as well.
Table 3: Define RSE.
Figures 1, 4, and 6: Add to each graph their respective statistical data, such as P-values, n, correlation coefficient, etc.