Fakulta rybářství
a ochrany vod
Faculty of Fisheries
and Protection
of Waters

Jihočeská univerzita
v Českých Budějovicích
University of South Bohemia
in České Budějovice
Czech Republic

Confidential

Review of USB FFPW PhD Thesis

First name(s), surname, titles of the PhD student: M.Sc. Marcellin Rutegwa	**First name(s), surname, titles of supervisor:** RNDr. Bořek Drozd, Ph.D.
Title of PhD thesis: **Pond ecosystem dynamics in terms of production ecology**	

REVIEWER:

Surname: van Dam	**Institution:** IHE Delft Institute for Water Education Delft, the Netherlands
Name: Anne	
Titles: PhD, MSc	**E-mail:** a.vandam@un-ihe.org
Please describe your professional relationship to the PhD student: He is a graduate from our MSc programme in limnology.	**Please describe your field of expertise:** aquaculture, wetland ecology and management, ecosystem services,

QUESTIONNAIRE

Originality, scientific importance, perspectives and impacts of results presented in the PhD thesis for basic and/or applied research

Evaluate competitiveness of the PhD thesis in the international context and compare its level with the current state of the art in the field **(extent ¼ – ½ page)**:

The strongest point in terms of originality and scientific importance of this thesis is Chapter 4 which deals with methane emissions from fishponds. The climate change impacts of aquaculture systems is a research topic that generally needs more work so the contribution of this chapter is important. The other part of the thesis are of high quality and very relevant in terms of quantifying the nutrient retention of these pond systems. This could contribute to an assessment of the broader ecosystem services of semi-intensive fishponds in the landscape, which is relevant for policy making in the area of water quality management and nature conservation (e.g EU-WFD). However, this latter aspect, although touched upon briefly in the introduction of some chapters, was not worked out very much which in my opinion limits the impact of the thesis a little bit. I would have expected the final discussion chapter to elaborate on this some more.

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Elaboration of the PhD thesis, objectives of the work and deliverables

Evaluate the overall level of elaboration of the PhD thesis (structuring of the main text, comprehensibility, logicality of the chapters and their ordering) and the originality of the selected approaches to solve the objectives; evaluate publications and whether the results described correspond to objectives of the PhD thesis **(extent ¼ – ½ page)**:

The thesis is structured well, with a clear introduction and objectives, and chapters addressing each of the specific objectives stated in the introduction chapter. The writing is good, concise, comprehensible and with a clear logical buildup. Methods are state-of-the art, with good statistical analysis and clear figures. Two of the chapters have been published in well-established, high-quality international peer-reviewed journal, confirming the quality of the work delivered.

My only point of mild criticism for the thesis is the general discussion chapter (Chapter 5). Although the chapter gives a good overview of the work presented in the previous chapters, I miss a discussion from a wider perspective which places the research in a broader context. This context is hinted at, e.g. in the second paragraph of the general discussion where it says: "Fishponds noly only produce fish but also perform other ecosystem functions such as nutrients and organic matter retention, local climate and flood regulation, serving as recreation sites and habitat for endangered species. ..... Safeguarding production and non-production functions of fishponds are key challenges faced by fishery managers". However, the general discussion then mainly repeats the discussion points from the previous chapters, and does not analyse what the results mean for these other ecosystem functions. I can imagine that these old pond landscapes are important for water quality regulation, so what can be said about that, taking the results of the research in this thesis into account? And what about these other functions, vis-á-vis fish production from these ponds? I would have expected a few paragraphs about that in the final chapter. It would also be interesting to think about what these results mean for pond aquaculture globally. These fishpond systems in the Eastern Europe are quite unique, but can we learn something from these results for e.g. tropical fishponds that produce a large part of the aquaculture production in the world? That would have been an interesting point for discussion. This point does not diminish the research work done in any way, but it could have given more value and potential impact to the thesis as whole, and would have demonstrated the broader insight in the significance of the work that can be expected of someone with a doctoral degree.

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OVERALL COMMENTARY ON THE PhD THESIS

Please write comments in extent of 1-2 pages:

One of the questions I have is about temporal and spatial heterogeneity of these ponds. Only a limited number of sampling points were used in these studies, and most of them quite close to the pond banks. These are big ponds, the main ponds all larger than 20 ha, so can we assume that the data from these sampling stations are representative for the whole area? To what extent are fish distributed regularly over the pond area, or is it possible that they concentrate at the feeding sites? (Perhaps cereals are distributed evenly over the whole pond area). In any case, this is what I would worry about if I had to look at such a large system and I wonder if this has been a consideration. I realize that there are lots of practical limitations when doing this work in the field but I might have expected some discussion of this.

In the same way, I wonder about the temporal variation. In Chapter 4, methane concentrations and emission rates are reported on a monthly basis, and the seasonal trends are discussed based on these monthly measurements. But from Chapter 2 we know that the short-term variations (perhaps even daily) in temperature and DO can be quite strong, and it is likely that these are translated into short-term variation in the methane-related processes too. So is it enough to have monthly measurements of methane concentrations and emission, or is this frequency too low?

I note the discussion on the supplementary feeding with cereals on p. 30. It is suggested that the digestibility of cereals is low, and that this is a reason for the low carbon efficiency in the ponds. It seems to me that another option would be that these cereals were only partially consumed, or even not consumed at all. Is this a possibility? They then become more like an extra pond input. This relates to an old discussion of "feeding the fish or feeding the pond" which was the subject of some research at Wageningen University in the recent past (https://www.wur.nl/en/activity/PhD-thesis-Feeding-fish-or-pond...-Kazi-Ahmed-Kabir-.htm). I noticed that the pond inputs were reduced in the second cycle of experiments (in Chapter 3), but there was not much discussion or conclusion about this. What would happen if feeding and manuring in this pond (especially because it is at the bottom of a cascade) would be reduce much more or even stopped? Would fish production be much lower? Would it be better to use different guidelines for inputs into these ponds?

FINAL RECOMMENDATION

- [x] **PhD Thesis can be recommended for defence**
- [ ] **PhD Thesis can be recommended with reservations for defence**
- [ ] **PhD Thesis can not be recommended for defence**

Delft, 05 July 2020 — Anne A. van Dam

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Date and place — Name and signature