PPS-jaarrapportage 2018

Algemene gegevens	
PPS-nummer	AF-16174
Titel	Energy evaluation of fish feeds
Thema	Duurzame Veehouderij
Uitvoerende kennisinstelling(en)	1) WUR-ASG Dep. Dierwetenschappen (AFI/ANU/EZO) 2) WUR-ASG Wageningen Livestock Research
Projectleider onderzoek (naam + emailadres)	Dr.ir. J.W. Schrama (johan.schrama@wur.nl)
Penvoerder (namens private partijen)	Dr.ir. M. Rijnen, De Heus Animal Nutrition B.V.; Ede; The Netherlands
Contactpersoon overheid	
Totale projectomvang (k€)	760 k€ (Gevraagde publieke financiering: inzet TKI toeslag 200 k€)
Adres projectwebsite	
Startdatum	1 jan 2017 (effective start date/start PhDs 1 sept 2017)
Einddatum	End of 2021

Goedkeuring penvoerder/consortium De jaarrapportage dient te worden besproken met de penvoerder/het consortium. De TKI's nemen graag kennis van eventuele opmerkingen over de jaarrapportage.	
De penvoerder heeft namens het consortium de jaarrapportage	X goedgekeurd □ niet goedgekeurd
Eventuele opmerkingen over de jaarrapportage:	Beide projecten zijn erg goed opgestart en naast genoemde literatuurstudies is het eerste experiment uitgevoerd en gerapporteerd. Zeer tevreden over voortgang, samenwerking en rapportage.

Planning en voortgang (indien er wijzigingen zijn t.o.v. het projectplan svp toelichten)	
Loopt de PPS volgens planning?	Yes. (as mentioned last year, start PhD 1 september 2017, thus project start 7 month after Jan 2017. Because of 2 PhD being involved in this projects, this implies that project will run till at least august 2021.
Zijn er wijzigingen in het consortium/de projectpartners?	There are no changes in the consortium
Is er sprake van vertraging en/of uitgestelde opleverdatum?	So far no major delay. Only planned experiment with Pangasius, was delayed by 4 months due to health problems with fish.
Is er sprake van inhoudelijke knelpunten, geef een korte beschrijving	No, content related bottleneck. Only some delay due to later start of experiment with Pangasius in Vietnam. But seems feasible to compensate.
Is er sprake van afwijkingen van het ingezette budget/de begroting?	No.

Korte omschrijving inhoud/doel PPS Wat is er aan de hand en wat doet het project daaraan? Wat gaat het project opleveren en wat is het effect hiervan?
In terms of feed formulation/evaluation, the aquaculture sector is running behind compared to farm animals. E.g., the pig sector applies net energy (**NE**) evaluation systems already since decades, which is a prerequisite for precision feeding. In fish feed formulation, energy is only evaluated with

respect to digestibility, thereby omitting potential differences of the different macronutrients affecting/stimulating growth. Currently, a diversification of ingredients in fish feeds is taken place due to the growth of the sector and the increasing price and the decreasing availability of fish meal and oil. A NE approach in fish feed formulation that takes into account the dietary macronutrient composition will therefore improve current feed practices in aquaculture contributing to amongst others: improved resource-use efficiency and less waste production/environmental impact, thereby improving water quality and welfare of fish and as a result the total profitability of the sector. The project aims to develop NE evaluation systems for different fish species, which are currently lacking and to enable the implementation of these NE systems into feed formulation with respect to nutrient requirements (i.e., balancing energy content of diets, on NE basis, with other nutrients like protein). The project comprises 2 PhD-projects. PhD-1 studies the requirements of Nile tilapia to maximize body weight gain and optimize body composition in relation to optimal dietary net energy (NE) content. In other words PhD-1 will work on how to apply the developed NE systems in fish feed formulation and look at factors influencing the optimal protein to NE ratio in diets. The NE-formulas/evaluation systems are developed by PhD-2. The utilization efficiency for growth shows considerable between-species and within-species variability. PhD-2 will assess physiological and environmental factors affecting the NE-evaluation. A NE approach is novel in fish feed formulation. NE-equations for fish are not available. The feed industry is looking forward to apply NE-evaluation equations in aquafeed formulation, indicated by the contribution/participation of the PPS-partners in this project. NE-evaluation will facilitate an improved resource-use efficiency, stimulate the diversification of ingredient use, stimulate the valorisation of ingredients not usable as human food (i.e. lower quality ingredients) and enable precision feeding (balanced diets) in fish that minimize environmental impacts. Overall NE-equations for fish will make an important contribution in ensuring future human demand for high quality proteins originating from fish for The Netherlands, Europe and globally.

What should the project deliver:

- The project should generate knowledge on the optimal protein to energy (i.e., NE) ratio in fish diets with a focus on tilapia (PhD-1).
- The project should generate knowledge on NE-formulas for fish (PhD-2).

Resultaten 2018

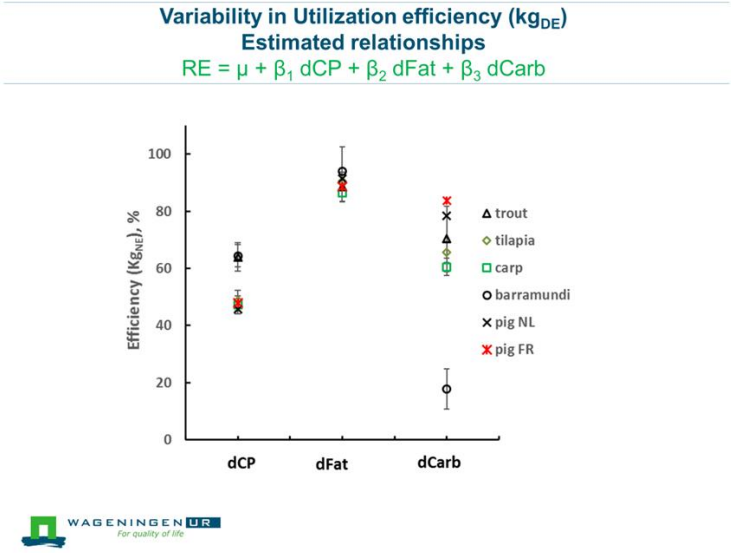
Geef een korte beschrijving van de high-lights van 2018
Geef een korte beschrijving van de projectdeliverables 2018

Activities done in 2018:

- Project meetings with involved companies were held on: 19th of April; 26th of June; 2nd of October.
- Early 2018, both PhDs finished their WIAS research proposal; after submission both were approved. Thus both PhDs met this requirement for being WIAS PhD.
- Both PhDs followed (basic) courses for TSP; e.g. Animal experiment course (article 9).
- Application for licence to do animal experiment for PhD-1 part was written before summer and submitted shortly after summer and CCD approval obtained October 2018.
- PhD-1 constructed a large data base on tilapia (from in house data [12 studies] and literature [45 studies]) to do a meta-analysis on maximal protein deposition rate; protein and energy deposition in relation to nutritional and environmental factors. PhD-1 has been working/analysing these data.
- PhD-1 autumn, preparation of first experiment with fish (starting Jan 2019): writing research protocol; formulation of diets, etc.
- PhD-2 construction with MSc student on data base for estimating NE-formulas in carp species; In house data for Common carp were sufficient to estimate NE equation for common carp (this was experiment designed to study energy retention in common carp in relation to dietary marco nutrient composition done for Evonik); Data obtained from literature were of too low quality to make a good data set.
- For PhD-2, a data base was obtained from Brett Glencross on barramundi (Asian seabass). From this data base a NE equation was estimated for barramundi.
- PhD-2 prepared the protocol to do an experiment with Pangasius in collaboration with De Heus (in kind contribution: Julia Mas Munoz). Feed were formulated and produced in August and PhD-2 left for Vietnam to perform the experiment.
- PhD-2 analysed the data of carp and barramundi (see above) and wrote abstract for ISFNF in Las Palmas for an oral presentation and wrote on the data set his first

publication (to which PhD-1) also contributed. Paper was submitted 18th of December to Aquaculture.
- PhD-2 trying to start experiment in Vietnam, but due to health and logistic issue the experiment with Pangasius was stopped. In November (2018) till January (2019) the experiment was carried out to estimate a NE formula for snakehead.

Deliverables obtained in 2018:
- CCD permission for doing animal experiment for project of PhD1 "Optimal protein-to energy ratio for Nile tilapia diets" (application no. AVD1040020186485).
- CCD permission for doing animal experiment for project of PhD2 "Development of net energy evaluation systems for fish feeds" (application no. AVD1040020186665).
- Publication of NE formulas for Nile tilapia and Rainbow trout in Br. J. of Nutrition. This was the start of the current project (see literature list below).
- Oral presentation at "5th Aqua Pre-Symposium: Nutrition and Health of Fish" which was held by EVONIK before the start of the ISFNF (Int. Symp. on Fish Nutrition and Feeding) held on 2nd of June 2018 Las Palmas de Gran Canaria, Spain. Title presentation was "Energy evaluation of feed: species comparison in fish".
- Oral presentation at ISFNF conferences on the data from the Common carp and Barramundi regarding NE formulas. Title presentation "Variability across and within fish species in energy utilization efficiency".
- Submission of first article PhD-2 in December 2018 to Aquaculture with the title "Differences in energy utilisation efficiencies of digestible macronutrients in common carp (*Cyprinus carpio*) and barramundi (*Lates calcarifer*)"



Major results so far:
- NE formulas have been estimated for the following fish species: Nile tilapia; Rainbow trout; Common carp and Barramundi (summarized in above figure).
- Energetic utilization efficiency is: quite constant between fish species for fat (also comparable to pigs); showing moderate differences for protein between fish species; however large variability is present for the carbohydrate fraction.

Aantal opgeleverde producten in 2018 (geef in een bijlage de titels en/of omschrijvingen van de producten of een link naar de producten op de projectwebsite of andere openbare websites)			
Wetenschappelijke artikelen	Rapporten	Artikelen in vakbladen	Inleidingen/workshops
1 artikel published 1 artikel submitted			1 invited talk 1 oral prestentation/ abstract op ISFNF
Titels/omschrijvingen van belangrijkste producten in 2018 (max. 5) en hun doelgroepen			

Bijlage: Titels/omschrijvingen van alle producten in 2018 of een link naar deze producten op de projectwebsite of andere publieke websites

Wetenschappelijke artikelen gepubliceerd in 2018:

Schrama JW, Haidar MN, Geurden I, Heinsbroek LTN & Kaushik SJ. 2018. Energy efficiency of digestible protein, fat and carbohydrate utilisation for growth in rainbow trout and Nile tilapia. British Journal of Nutrition 119:782-791.

Wetenschappelijke artikelen gepubliceerd in 2018:

Phan LTT, Groot R, Konnert GDP, Masagounder K, Figueiredo-Silva AC, Glencross BD & Schrama JW. Submitted Dec 2018. Differences in energy utilisation efficiencies of digestible macronutrients in common carp (*Cyprinus carpio*) and barramundi (*Lates calcarifer*). Aquaculture submitted.

Invited talk:

Schrama JW. 2018. Energy evaluation of feed: species comparison in fish. 5th Aqua Pre-Symposium: Nutrition and Health of Fish. 3rd June 2018, Las Palmas de Gran Canaria, Spain.

Oral presentation (with abstract):

Schrama J., Phan T, Geurden I, Glencross BD & Kaushik SJ. 2018. Variability across and within fish species in energy utilization efficiency. 18th International Symposium on Fish Nutrition and Feeding, Las Palmas de Gran Canaria, Spain. Abstract.