



PPS-jaarrapportage 2019

De PPS-en die van start zijn gegaan onder aansturing van de topsectoren dienen jaarlijks te rapporteren over de inhoudelijke en financiële voortgang. Voor de inhoudelijke voortgang dient dit format gebruikt te worden. Voor PPS-en die in 2019 zijn afgerond is een apart format "PPS-eindrapportage" beschikbaar.

De jaarrapportages worden integraal gepubliceerd op de websites van de TKI's/topsector. Zorg er s.v.p. voor dat er geen vertrouwelijke informatie in de rapportage staan.

De PPS-jaarrapportages dienen voor 1 maart 2020 te worden aangeleverd bij de TKI's via info@tkitu.nl of info@tki-agrifood.nl. Voor Wageningen Research loopt de aanlevering via een centraal punt.

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
Adres projectwebsite	..
Startdatum	1 jan 2017 (effective start date/start PhDs was 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.

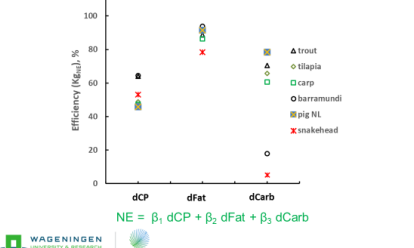
De penvoerder heeft namens het consortium de jaarrapportage	<input checked="" type="checkbox"/> goedgekeurd <input type="checkbox"/> niet goedgekeurd
Eventuele opmerkingen over de jaarrapportage:	Great progress, no additional remarks

Inhoudelijke samenvatting van het project

Probleemomschrijving	In terms of feed formulation/evaluation, the aquaculture sector is running behind compared to other farm animals such as pig and poultry. 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
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	<p>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.</p>
Doelen van het project	<p>What should the project deliver:</p> <ul style="list-style-type: none"> • 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	
Beoogde resultaten 2019	<ul style="list-style-type: none"> - Regular project meetings with involved companies. - Presentation of obtained results so far at conferences/meetings - PhD-1: <ol style="list-style-type: none"> 1. Further construction of large data base on tilapia to do a meta-analysis on maximal protein deposition rate; protein and energy deposition in relation to nutritional and environmental factors. Performing meta-analysis and writing paper. 2. Performing/analysis of Exp 1 on dose response of protein intake at 2 dietary energy level on protein deposition in Nile tilapia. To assess if tilapia has an optimal DP/DE ratio for maximal protein gain. 3. Performing experiment and analysis of histology of Exp 2 on effect of feeding level and age of Nile tilapia regarding the potential of muscle fibre recruitment. In other words till which age is growth in Nile tilapia related to increasing the amount of muscle fibres. 4. Preparation of Exp 3 (starting early 2020) on the effect of amino acid balances at early age on muscle fibre recruitment and later life growth potential in Nile tilapia. Does early life nutrition effect the optimal DP/DE ratio in later life? - PhD-2: <ol style="list-style-type: none"> 1. Finalizing first paper on NE-formulas in common carp and barramundi (finishing of activity 2018). 2. Performing and analysing exp 1. in Vietnam for estimating NE formula on snakehead (originally it was planned to do pangasius end 2018 but no good quality pangasius fingerling were available, therefore this was altered into snakehead). 3. Preparing, performing and analysing exp 2. for: a) estimating NE formula for African catfish; b) determining the impact of diet

	<p>composition on the location of growth (protein and fat gain) in different compartment with the body.</p> <ol style="list-style-type: none"> 4. Preparing exp 3 for estimating NE formula in pangasius (start early 2020; extra activity). 5. Preparing exp 4 for determining the impact of dietary starch level on blood glucose profiles in snakehead and pangasius. This is aimed to understand the reason for the low energetic utilization efficiency of digested carbohydrate in carnivorous fish compared to more herbivorous/omnivorous fish.
<p>Behaalde resultaten 2019</p>	<ul style="list-style-type: none"> - Project meetings with involved companies were held on: 5th of March (Wageningen); 9th of October (at EAS Berlin); furthermore regular skype meetings with companies. - Each PhD gave a poster presentation at the EAS in Berlin (October 2019); NE concept was brought within EU course on fish nutrition at INRA StPee France (November 2019); Presentation by both PhDs & project leader obtained results so far in the project for the aquaculture team within De Heus (4th November 2019); - Results of PhD-1: <ol style="list-style-type: none"> 1. Meta-analysis. Data base ready & analysis done. First draft review/meta-analysis paper made December 2019. 2. Exp 1 on dose response of DP intake done; and fully analysed preliminary results presented at EAS Berlin as poster. 3. Experiment Exp 2 ran from May till December 2019. Half of the histology analysis are finished. 4. Preparation of Exp 3 (starting early 2020) done. Experiment started 2nd week January 2020. - Results of PhD-2: <ol style="list-style-type: none"> 1. Publication on NE formulas for Common carp and barramundi in Aquaculture (2019)(see literature list below). 2. Exp 1. all analysis done. NE formula for snakehead is available and communicated to involved companies. Draft paper has been written. Paper will be finish early 2020. 3. Exp 2 all analysis done. NE formula for Afrikan catfish is made and communicated to involved companies. Paper needs to be written in 2020. Analysis of body compartments is 50% finished. 4. Preparation of Exp 3 (estimating NE formula in pangasius) and of Exp 4 (impact of dietary starch level on blood glucose profiles in snakehead and pangasius) are done. Experiment will be run early 2020. - Summary of results of NE formulas obtained in the project is given in the below figure: <div style="text-align: center;"> <p>Energy evaluation: NE formula estimation</p>  <p>WAGENINGEN UNIVERSITY & RESEARCH</p> </div>
<p>Beoogde resultaten 2020</p>	<ul style="list-style-type: none"> - Minimally 2 project meetings in 2020. - Each PhD gives a presentation (oral or poster) at conference (most likely EAS Ireland). - Inclusion of NE concept and results in teaching and courses. - Targets PhD-1: <ol style="list-style-type: none"> 1. Submission of paper on Meta-analysis/review. 2. Submission of paper on Exp 1 dose response of DP intake at 2 energy levels. 3. Finalizing histology of Exp 2 and writing finishing first draft paper.

	<ol style="list-style-type: none"> 4. Running and analysing Exp 3 (amino acid imbalance/balance in early life on optimal DP/DE ratio in later life). First draft of paper and presentation of results at EAS. 5. Preparation and running Exp 4 (impact environmental conditions in early live on muscle fibre recruitment and optimal DP/DE ratio in later life). The environmental condition needs to be decided in consultation with companies. <p>- Results of PhD-2:</p> <ol style="list-style-type: none"> 1. Submission of paper on NE formula for snakehead (Exp 1). 2. Submission of paper on NE formula in African catfish (Exp 2) maybe together with NE formula in pangasius (Exp 3). Presentation of these results at EAS in Ireland. 3. Analysis of body compartments of Exp 1, 2 and 3 (snakehead, African catfish and pangasius) will be finished. Draft paper will be made. 4. Analysis of Exp 4 (impact of dietary starch level on blood glucose profiles in snakehead and pangasius), depending on results, either separate draft paper or included in the NE formula paper on pangasius. 5. Preparation and running Exp 5, impact of body weight (or temperature) on NE formulas in Nile tilapia.
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<p>Opgeleverde producten in 2019 (geef de titels en/of omschrijvingen van de producten / deliverables of een link naar de producten op de projectwebsite of andere openbare websites)</p>
<p><u>Wetenschappelijke artikelen:</u></p> <p>Phan, L.T.T.; Groot, R.; Konnert, G.D.P.; Masagounder, K.; Figueiredo-Silva, A.C.; Glencross, B.D.; Schrama, J.W. 2019. Differences in energy utilisation efficiencies of digestible macronutrients in common carp (<i>Cyprinus carpio</i>) and barramundi (<i>Lates calcarifer</i>). <i>Aquaculture</i> 511: 634200.</p>
<p><u>Externe rapporten:</u></p>
<p><u>Artikelen in vakbladen:</u></p>
<p><u>Inleidingen/posters tijdens workshops, congressen en symposia:</u></p> <p><u>PhD-1:</u></p> <ol style="list-style-type: none"> 1. Oral presentation at WIAS Science Day 2019 (Lunteren, 15th of March 2019): Konnert, G.; Gerrits, W.; Gussekloo, S.; Schrama, J. 2019. Bodyweight and dietary protein-to-energy ratio affect rate and efficiency of protein deposition in Nile tilapia (<i>Oreochromis niloticus</i>). 2. Poster presentation at EAS 2019 (Berlin, 7th – 10th of October 2019): Konnert, G.D.P.; Martin, E.; Gerrits, W.W.J.; Gussekloo, S.W.S.; Masagounder, K.; Mas-Munoz, J.; Schrama, J.W. 2019. Protein deposition in Nile tilapia (<i>Oreochromis niloticus</i>): the interplay between daily protein and energy intake. <p><u>PhD-2:</u></p> <ol style="list-style-type: none"> 1. Poster presentation at EAS 2019 (Berlin, 7th – 10th of October 2019): Phan, L.T.T.; Masagounder, K.; Mas-Munoz, J.; Schrama, J.W. 2019. Effect of dietary macronutrient variation on energy utilisation efficiency in snakehead (<i>Channa striata</i>).

Signed, 6 February 2020

Dr.ir. M.M.J.A. Rijnen