**SANFEED Application-form 2019/2020**

**1. Personal data**

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| Full Name: |
| Name under which you publish: |
| Fiscal ID number: |
| ID document: |
| Birth date: |
| Nationality: |
| Gender: |
| Father's name: |
| Mother's name: |
| Work address: |
| Residential Address: |
| Work Phone: |
| Residential Phone: |
| Email: |
| Fax: |
| Cell phone: |

**2. Academic degrees**

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| Year: |
| Degree: |
| Final grade: |
| Degree granting institution: |
| School/College/Campus: |
| Thesis title (if applicable): |
| Supervisor: |
| Co-supervisor: |
| Scientific area: |
| Number of curricular years: |
| Program title: |

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| Year: |
| Degree: |
| Final grade: |
| Degree granting institution: |
| School/College/Campus: |
| Thesis title (if applicable): |
| Supervisor: |
| Co-supervisor: |
| Scientific area: |
| Number of curricular years: |
| Program title: |

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| Year: |
| Degree: |
| Final grade: |
| Degree granting institution: |
| School/College/Campus: |
| Thesis title (if applicable): |
| Supervisor: |
| Co-supervisor: |
| Scientific area: |
| Number of curricular years: |
| Program title: |

**3. Present research interests:**

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| 2. |  |
| 3. |  |

**4. SANFEED topic(s)**

*Candidates can apply to one or more topics, and in the case of multiple choices the topics should be ranked (1 to 4) according to the preference:*

* **Topic I: Improving fish growth and composition models to optimize fish nutrition and rearing practices (WP1)**

**Supervisory team:** Tomé Silva (SPAROS); Luísa Valente (ICBAS, CIIMAR)

**Industrial Representative**: Luís Conceição (SPAROS)

**Host Institutions**: ICBAS; CIIMAR; SPAROS

**Description of the research programme**

The application of fish growth and composition models are increasingly seen as an objective way of optimizing feed formulation and feeding regime in commercial fish rearing operations, in order to ensure high biological and economical efficiency of the process, along with minimal environmental impacts. In this work, we focus on three species: Nile tilapia, Senegalese sole and Atlantic salmon.

Though there is a wide range of possible modeling approaches, from extremely simple models (based on concepts/parameters such as “relative growth rate”, “feed conversion rate” or “thermal growth coefficient”), to more detailed models (based on bioenergetic and/or biochemical principles). Currently, models of the simple type are in more widespread use, in part due to the fact they are more easily interpretable to a layman. On the other hand, as the availability of data increases, the use of overly simple models entails a performance gap that can only be bridged through the exploitation of models of higher complexity (e.g. simple bioenergetic models, dynamic energy budget models, metabolic models), with a higher sensitivity to a more diverse range of dietary and environmental factors.

Regardless of modeling approach, an essential aspect is to have enough information on basic aspects of fish physiology, behavior and bioenergetics (namely, voluntary feed intake, body composition information, information on mass/energy changes under differing combinations of temperature profiles, feeding regimes and feed compositions). For this purpose, information from several sources (public and private) needs to be collected and compiled, and remains a central aspect of any modeling work.

The goal of this work is thus to collect the necessary information and use it to develop and calibrate models of fish growth and composition of varying complexity, comparing them on the basis of sound statistical principles (e.g. under a cross-validation framework), in order to objectively evaluate the relative performance of different models in the support of cost-efficient production solutions for the fish species under consideration.

* **Topic II: Novel functional ingredients in petfood (WP3)**

**Supervisory team:** Ana Rita Cabrita (ICBAS-UP, LAQV, REQUIMTE); Margarida Maia (ICBAS-UP, LAQV, REQUIMTE); Sofia Lima (FFUP, LAQV, REQUIMTE)

**Industrial Representative**: Elisabete Matos (Sorgal)

**Host Institutions**: ICBAS; REQUIMTE; FFUP; Sorgal

**Description of the research programme**

Commercially available pet food varies greatly in terms of ingredients, nutritional composition and manufacturing process. Selection of ingredients is a key aspect in terms of feed cost and consumer demand. Despite most of the market formulas are based on animal and vegetable ingredients the choice of ingredients is broader, including the use of a specific organism, the part of that organism and the form in which it will be included. All these parameters will affect, among others, diet cost, stability, nutritional composition, and technological requirements.

In typical pet foods, the most currently used protein sources are chicken, beef, pork, lamb, turkey, salmon, menhaden, meat-by products and poultry by-product meal, among the animal sources, and soybean meal and corn gluten meal, among the plant sources. However, the development of novel ingredients will contribute for the sustainability of the pet food sector and the development of functional pet foods. These functional foods will provide optimal nutritional value and promote the animal health status. Indeed, novel proteins may help prevent the development of protein-related sensitivities or allergies. Given the recent anthropomorphism of pets, the selected ingredients need simultaneously to be acceptable by the owners and nutritious and palatable to the pets. Due to the economic and cultural differences among societies, a “one-size-fits-all” strategy for sustainability is not possible.

More sustainable ingredients with a lower impact on the environment may include by-products, single-cell organisms and lower order animals. In the present proposal the novel feeds to be selected will be adjusted according to the strategy of the company. However, and regarding protein sources, insects (e.g., housefly, cricket, grasshopper, mealworm, black soldier fly, cockroach), squid and herring meals have been proposed as a high-quality protein source. Microalgae could be regarded as energy or protein sources depending on the species considered, as well as a source of bioactive compounds.

Additionally, the development of nanoparticles for oral delivery of bioactive compounds is also proposed as an emerging solution to improve bioavailability of nutritive elements and the development of functional ingredients. Indeed, hydrophilic and hydrophobic molecules as antioxidants and vitamins can be incorporated within the nanoparticles that respond to external or internal stimuli, such as pH or oxidative stress, and thus could be used to control the release of the bioactive compound.

The workplan will comprise in vitro and in vivo studies to evaluate the nutritional and functional properties of the selected ingredients and formulated nanoparticles.

* **Topic III: “One food”: A holistic approach to algae as feed to different animal models (WP3)**

**Supervisory team:** Margarida Maia (REQUIMTE, LAQV, ICBAS-UP); Joana Laranjeira Silva (Allmicroalgae); António Mira da Fonseca (ICBAS-UP, REQUIMTE, LAQV)

**Industrial Representatives**: Helena Abreu (Algaplus); Júlio Abelho (Allmicroalgae)

**Host Institutions**: ICBAS; REQUIMTE; Algaplus; Allmicroalgae

**Description of the research programme**

Recently, nutrition has moved on to the concept of functional nutrition. Functional nutrition involves the use of ingredients or supplements containing biologically active compounds with benefits beyond meeting the animals’ nutritional requirements, namely on health promotion. Among functional feeds, algae emerge as one of the most promising to be used in animal nutrition.

Algae are a diverse group of photosynthetic organisms, including microalgae and macroalgae, that are remarkable sources of nutrients and bioactive compounds. When fed to different animal species, as ingredient or supplement, both microalgae and macroalgae species were reported to improve growth, immune system, reproductive performance, increase the number of eggs, or promote overall health. However, these effects vary with algae species and with cultivation condition within species.

Nutrition plays a major role on animals’ performance, productivity, health, welfare, and environmental impact. This role is independent of the animal species, their habitat, digestive system particularities and feeding habits. Thus, this proposal aims to evaluate a novel algae product in animal feeding using a new approach. A bend of microalgae and macroalgae species (rather than individual species) will be assessed in different animal models in a holistic approach to nutrition: “one food”. Thus, the novel algae blend will be included in the diet of terrestrial and aquatic animals, carnivorous, omnivorous, and herbivorous, either monogastric and poligastric, and their effects on the overall nutrition evaluated. This proposal is expected to contribute to the development of a novel functional feed of high added value and of potential use to a broad variety of animal species.

The workplan will include several tasks, as detailed chemical composition, *in vitro* digestibility assays and *in vivo* trials, which will be later adjusted according to the companies’ interests.

* **Topic IV: “Farming for You” - Increasing consumer awareness of farmed fish (WP4)**

**Supervisory team:** Luísa Valente (ICBAS-UP, CIIMAR), Luís M. Cunha (FCUP/ GreenUPorto), Manuela Pintado (ESB-UCP/ CBQF)

**Industrial Representative**: Rui Costa Lima (Sense Test)

**Host Institutions**: ICBAS; CIIMAR; FCUP; GreenUPorto; CBQF; Sense Test

**Description of the research programme**

Aquaculture productivity is oriented to improve food security offering healthy, safe and tailor-made seafood to consumers. This topic will focus on different strategies able to contribute to a sustainable growth of aquaculture using distinct strategies: a) the selection of more sustainable ingredients to include in fish diets, under a circular economy approach; b) the natural fortification of fish fillets to provide functional foods for human consumption; c) the evaluation of consumer awareness for farmed fish produced with distich nutritional strategies.

The objectives will be reached by:

1) Selecting by-products from the agrofood sector, produced in large quantities and with recognised nutritional value. Among these, vegetable-origin by-products (carrot, tomato and coriander) with functional properties (antioxidant and immunostimulant) will be compared with animal by-products (blood and hydrolysate blood fraction) rich nutritional sources and produced in very high amounts. These products will be chemically characterised and included in diets for European sea bass. At the end of the trials the following parameters will be determined:

a) growth performance and feed utilisation

b) nutritional value of the flesh for human consumption

c) muscle anti-oxidant capacity

d) analysis of fillet texture profile (TPA)

e) descriptive and dynamic sensory profiling of fish fillets

2) The consumer awareness for farmed fish produced with the above-mentioned nutritional strategies will be evaluated. Circular economy is a EU priority, but the acceptability of such products for human consumption is often questionable and needs to be further evaluated. Different approaches will be carried out, including interviews and surveys to consumers, evaluating how to build consumer’s trust, reduce perceived risk and improve valorisation.

**5. Research project synopsis** (maximum 5,000 characters including spaces)

*Candidates have to prepare a project synopsis by themselves for evaluation of their* skills, abilities and capabilities, and *that should include:*

1. *Summarized state of the art related to the selected topic (about 1000 characters);*
2. *Proposal of a timely objective for a PhD thesis within the topic mentioned above, or the preferential one, if multiple topics have been chosen (about 300 characters);*
3. *Brief description of tasks to be developed to attain the objectives proposed above (about 3700 characters).*