



Danish Research Centre for Organic Farming



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## Application

for research funding under the research programme:

### Research in Organic Food and Farming

International Research Co-operation and Organic Integrity

#### (DARCOF III 2005-2011)

Funded by the Ministry of Food, Agriculture and Fisheries  
under the Finance and Appropriation Act, Sections 24.33.02.10

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**1. Project title and acronym**

**Organic Aquaculture – the linkage between sustainable production and superior products [ORAQUA]**

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**2. Project manager**

Senior Advisory Scientist Alfred Jokumsen, Danish Institute for Fisheries Research, (DIFRES), North Sea Centre, P.O. Box 101, DK-9850 Hirtshals.  
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**3. The project is within the following research project theme  
Theme 3.2.3: Organic Fish Production**

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**Please submit 2 hard copies and 1 electronic version to:**

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#### 4. Partners:

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 Ph. +45 3396 3257, Fax + 45 3396 3260. E-mail: [ajo@dfu.min.dk](mailto:ajo@dfu.min.dk)  
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- Partner 2** Danish Institute for Fisheries Research, Department of Seafood Research (DIFRES-FF).  
 - DTU, building 221, DK-2800 Lyngby. Ph. +45 45252593,  
 Fax +45 4588 4774. Email: [hhn@dfu.min.dk](mailto:hhn@dfu.min.dk)
- Partner 3** BioMar A/S, Mylius Erichsensvej 35, 7330 Brande. Ph. + 45 97180722,  
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#### *Private companies*

Please see enclosure 1.

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#### 5. Contact persons:

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#### 6. Project staff:

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7. **Project duration:** 4 years From: 01-01-2007 To: 31-12-2010

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## 8. Participants in Advisory Group

- Jacob Bregnballe, Chairman of the Danish Aquaculture Organisation, Vejlsøvej 51, Bygn. F., 8600 Silkeborg. Ph. 89212260 / 59517228 / 20680994. E-mail: [jb@danaq.dk](mailto:jb@danaq.dk).
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## 9. Main objectives:

This project aims to contribute to the successful development of organic trout farming in Denmark by investigating critical issues. Specific objectives are:

- New relevant vegetable protein sources as ingredients in organic fish feed in replacement of fish meal
- Availability of relevant organic produced vegetables with high protein content, including the possibilities of concentrating the protein fraction of existing protein sources with relevant amino acid profile compared to that of fish meal, a high digestibility and competitive price (taking into account organic principles)
- The effect of the organic vegetable protein sources on growth and digestibility in rainbow trout
- The influence of organic protein and –oil on eating quality
- The influence of organic vegetables on the health and welfare of farmed fish
- Investigation of the production strategies by case studies of organic systems of production
- To disseminate the results of the project to the aquaculture industry, consumers, regulatory authorities and the scientific community

The results of the project are intended to contribute significantly to the development of Danish organic aquaculture and should so allow organic fish farming to respond more effectively to the challenges it faces.

## 10. Project summary in Danish:

Opdræt af økologiske fisk har gennem de seneste år vundet indpas i en række europæiske lande, men denne niche produktion er endnu ikke blevet fast forankret i Danmark. Fem dambrug er officielt godkendt til økologisk produktion og siden den 1. marts 2005 har godkendt økologisk fiskefoder været tilgængeligt. Foderet produceres dog på Teknologisk Institut, idet produktionen (ca. 120 tons om året) endnu er for lille til, at det er kommercielt interessant for de danske foderfabrikker. Den første danske økologiske regnbueørred med det røde Ø-mærke blev introduceret på markedet den 6. september 2005. Der er derfor begrænset med praktiske erfaringer med problemstillingerne knyttet til opdræt af økologiske fisk i Danmark. Dette projekt har til formål at fremme produktionen af økologiske fisk i Danmark med forskning indenfor de mest kritiske områder i kæden, der forbinder økologisk foderproduktion, økologisk fiskeopdræt og forbrugeren.

Det er især behovet for konkurrencedygtige vegetabiliske proteinkilder med et højt proteinindhold med relevant aminosyresammensætning i forhold til fiskemel, som er centralt for udviklingen af den økologiske fiskeproduktion i Danmark. I planteavls- og grovvaresektoren er der et generelt stærkt ønske og behov for vegetabiliske råvarer med et betydeligt højere proteinindhold end i de eksisterende vegetabiliske foderstoffer. Der vil derfor fra projektets start blive taget initiativ til et samarbejde med landbrugs-sektoren på dette område, herunder producenter af økologiske foderingredienser. Det vil således blive forsøgt at forene viden ressourcerne i erhverv og forskning med det overordnede mål, at øge anvendelsen af økologiske vegetabilier i fiskefoder. Gennem denne fremad rettede og innovative indsats er det målsætningen at aktivere de viden- og teknologi ressourcer, der findes i landbrugs- og grovvaresektoren samt akvakultur sektoren. I takt med, at resultaterne af denne indsats måtte resultere i innovative konkrete tiltag indbygges dette i WP2, hvor der evt. må prioriteres i ellers planlagte aktiviteter Jf. beskrivelse heraf i WP2 og samarbejdsaftale med Teknologisk Institut.

Som udgangspunkt vil der blive fremstillet optimerede økologiske fiskefoder typer i hvilke fiskemel erstattes af bæredygtige økologisk dyrkede vegetabiliske proteinkilder. Kvaliteten af de økologiske fodertyper undersøges med hensyn til fordøjelighed og næringsstof tilgængelighed. Til disse undersøgelser knyttes undersøgelser af foderkonvertering og specifik vækstrate hos fiskene. Endelig indgår udvalgte fodertyper tillige i casestudier på 2 udvalgte økologiske dambrug med henblik på undersøgelse af vækst og foderudnyttelse af det økologiske fiskefoder.

I sammenhæng med foderforsøgene foretages mindre undersøgelser af evt. effekter på fiskenes sundhed og velfærd, herunder undersøgelse af sundhedstilstand på dambrugene i forbindelse med case studier på udvalgte dambrug. Case studierne vil afdække centrale aspekter i driftsmetoder og problemstillinger på de respektive dambrug.

Med henblik på at sikre høj kvalitet af økologiske fisk undersøges effekten af de økologiske forsøgsfodertyper på produktkvaliteten. Disse undersøgelser omfatter objektive sensoriske og biokemiske analyser af kødet med henblik på at opnå et helhedsbillede af spisekvaliteten.

Resultaterne fra projektet vil blive formidlet til akvakultur sektoren, forbrugere, myndigheder og forskere ved møder med erhvervet og ved publikationer i videnskabelig -, industriel - og populær litteratur.

Det skal dog tilføjes, at en positiv udvikling af økologisk fiskeopdræt i Danmark også er betinget af, at der sker en harmonisering af de økologiske regelsæt i Europa.

## 11. Budget:

<b>Budget for each participating institution. Name of institution: Danish Institute for Fisheries Research, Dept. of Marine Ecology and Aquaculture (DIFRES-HØKa – Hirtshals)</b>						
Budget item	From Ministry of Food, Agriculture and Fisheries		From place of work		From other sources	
	Pers. Months	DKK	Pers. Months	DKK	Pers. Months	DKK
Sal./Acad.	9	410.475				
Sal./Tech.	3	92.625				
Equipm.						
Oper. Exp.		50.000				
Others <sup>*)</sup>		47.804				
<b>Total dir. Costs</b>		<b>600.904</b>				
OH-20%		120.181				
<b>Total year 2007</b>		<b>721.085</b>				
Sal./Acad.	9	430.950				
Sal./Tech.	6	194.350				
Equipm.						
Oper. Exp.		60.000				
Others <sup>*)</sup>		36.971				
<b>Total dir. Costs</b>		<b>722.271</b>				
OH-20%		144.454				
<b>Total year 2008</b>		<b>866.725</b>				
Sal./Acad.	9	452.400				
Sal./Tech.	5	170.083				
Equipm.						
Oper. Exp.		60.000				
Others <sup>*)</sup>		32.567				
<b>Total dir. Costs</b>		<b>715.050</b>				
OH-20%		143.010				
<b>Total year 2009</b>		<b>858.060</b>				
Sal./Acad.	3	158.275				
Sal./Tech.						
Equipm.						
Oper. Exp.						
Others		5.204				
<b>Total dir. Costs</b>		<b>163.479</b>				
OH-20%		32.696				
<b>Total year 2010</b>		<b>196.175</b>				
<b>Total – 4 years</b>		<b>2.642.045</b>				

\*) Including subcontracting (BioMar A/S)

<b>Budget for each participating institution. Name of institution: Danish Institute for Fisheries Research, Dept. of Marine Ecology and Aquaculture (DIFRES-HØKb – Frederiksberg)</b>						
<b>Budget item</b>	<b>From Ministry of Food, Agriculture and Fisheries</b>		<b>From place of work</b>		<b>From other sources</b>	
	<b>Pers. Months</b>	<b>DKK</b>	<b>Pers. Months</b>	<b>DKK</b>	<b>Pers. Months</b>	<b>DKK</b>
Sal./Acad.	2	91.216				
Sal./Tech.	0,5	15.438				
Equipm.						
Oper. Exp.		5.000				
Others		10.000				
<b>Total dir. Costs</b>		121.654				
OH-20%		24.331				
<b>Total year 2007</b>		<b>145.985</b>				
Sal./Acad.	2	95.767				
Sal./Tech.	0,5	16.196				
Equipm.						
Oper. Exp.		5.000				
Others		10.000				
<b>Total dir. Costs</b>		126.963				
OH-20%		25.392				
<b>Total year 2008</b>		<b>152.355</b>				
Sal./Acad.	2	100.533				
Sal./Tech.	0,5	17.008				
Equipm.						
Oper. Exp.		5.000				
Others		12.000				
<b>Total dir. Costs</b>		134.541				
OH-20%		26.909				
<b>Total year 2009</b>		<b>161.450</b>				
Sal./Acad.	2	105.517				
Sal./Tech.	0,5	17.875				
Equipm.						
Oper. Exp.		5.000				
Others		12.000				
<b>Total dir. Costs</b>		140.392				
OH-20%		28.078				
<b>Total year 2010</b>		<b>168.470</b>				
<b>Total – 4 years</b>		<b>628.260</b>				

<b>Budget for each participating institution. Name of institution: Danish Institute for Fisheries Research, Dept. of Seafood Research (DIFRES-FF)</b>						
<b>Budget item</b>	<b>From Ministry of Food, Agriculture and Fisheries</b>		<b>From place of work</b>		<b>From other sources</b>	
	<b>Pers. Months</b>	<b>DKK</b>	<b>Pers. Months</b>	<b>DKK</b>	<b>Pers. Months</b>	<b>DKK</b>
Sal./Acad.	2	91.217				
Sal./Tech.	2	61.750				
Equipm.						
Oper. Exp.		30.000				
Others		45.000				
<b>Total dir. Costs</b>		<b>227.967</b>				
OH-20%		45.593				
<b>Total year 2007</b>		<b>273.560</b>				
Sal./Acad.	4	191.533				
Sal./Tech.	2	48.588				
Equipm.						
Oper. Exp.		150.000				
Others		5.000				
<b>Total dir. Costs</b>		<b>395.121</b>				
OH-20%		79.024				
<b>Total year 2008</b>		<b>474.145</b>				
Sal./Acad.	3,5	175.933				
Sal./Tech.	1	51.025				
Equipm.						
Oper. Exp.		100.000				
Others		5.000				
<b>Total dir. Costs</b>		<b>331.958</b>				
OH-20%		66.392				
<b>Total year 2009</b>		<b>398.350</b>				
Sal./Acad.	0,5	26.379				
Sal./Tech.						
Equipm.						
Oper. Exp.						
Others						
<b>Total dir. Costs</b>		<b>26.379</b>				
OH-20%		5.276				
<b>Total year 2010</b>		<b>31.655</b>				
<b>Total – 4 years</b>		<b>1.177.710</b>				

<b>Budget for each participating institution. Name of institution: Danish Technological Institute (TI)<sup>1)</sup>.</b>						
<b>Budget item</b>	<b>From Ministry of Food, Agriculture and Fisheries</b>		<b>From place of work</b>		<b>From other sources</b>	
	<b>Pers. Months</b>	<b>DKK</b>	<b>Pers. Months</b>	<b>DKK</b>	<b>Pers. Months</b>	<b>DKK</b>
Sal./Acad.	6	289.800	5	241.500		
Sal./Tech.	2	62.500				
Equipm.						
Oper. Exp.		25.000				
Others		5.000				
<b>Total dir. Costs</b>		<b>382.300</b>		<b>241.500</b>		
<b>OH-20%</b>		<b>76.460</b>		<b>48.300</b>		
<b>Subcontractor</b>		<b>40.000</b>		<b>60.000</b>		
<b>Total year 2007</b>		<b>498.760</b>		<b>349.800</b>		
Sal./Acad.	9	454.125				
Sal./Tech.	4	130.633				
Equipm.						
Oper. Exp.		25.000				
Others		5.000				
<b>Total dir. Costs</b>		<b>614.758</b>				
<b>OH-20%</b>		<b>122.952</b>				
<b>Subcontractor</b>		<b>50.000</b>				
<b>Total year 2008</b>		<b>787.710</b>				
Sal./Acad.	7	369.250				
Sal./Tech.	4	136.500				
Equipm.						
Oper. Exp.		10.000				
Others		5.000				
<b>Total dir. Costs</b>		<b>520.750</b>				
<b>OH-20%</b>		<b>104.150</b>				
<b>Subcontractor</b>		<b>50.000</b>				
<b>Total year 2009</b>		<b>674.900</b>				
Sal./Acad.	1	55.125				
Sal./Tech.						
Equipm.						
Oper. Exp.						
Others		5.000				
<b>Total dir. Costs</b>		<b>60.125</b>				
<b>OH-20%</b>		<b>12.025</b>				
<b>Total year 2010</b>		<b>72.150</b>				
<b>Total – 4 years</b>		<b>2.033.520</b>		<b>349.800</b>		

<sup>1)</sup> Incl. protein enrichment activities (cf. Cooperation Agreement)

\*) Sub-contractor. The budget required for The Food Production Engineering group (FPE) at BioCentrum- Technical University of Denmark (DTU) – WP2-subtask2.4 will be DKK 200 distributed as follows over 2½ years ending in month 30 of the project: 2007: DKK 100; DKK 2008: 50 and DDK 2009: 50. FPE has already other activities planned which will deal with extrusion of other products. These activities

also include development of models for extrusion processes, hence there will be synergy between the activities. The matching funding during the period sums up to DKK 175 distributed as follows: 2007: DKK 50; 2008: DKK 100 and 2009: DKK 25. Thus the total effort will be: 2007: DKK 150; 2008: DKK 150 and 2009: DKK 75. Furthermore FPE will participate with 2.5 month of senior researchers over the 2½ years from Associate Professors Alan Friis and Bo Jensen and Professor Jens Adler-Nissen.

<b>Budget for each participating institution. Name of institution: The Danish Aquaculture Organisation (DAO).</b>						
<b>Budget item</b>	<b>From Ministry of Food, Agriculture and Fisheries</b>		<b>From place of work</b>		<b>From other sources</b>	
	<b>Pers. Months</b>	<b>DKK</b>	<b>Pers. Months</b>	<b>DKK</b>	<b>Pers. Months</b>	<b>DKK</b>
<b>Sal./Acad.</b>	1	45.608				
<b>Sal./Tech.</b>						
<b>Equipm.</b>						
<b>Oper. Exp.*)</b>		35.000				
<b>Others</b>		10.000				
<b>Total dir. Costs</b>		90.608				
<b>OH-20%</b>		18.122				
<b>Total year 2007</b>		<b>108.730</b>				
<b>Sal./Acad.</b>	1,25	59.854				
<b>Sal./Tech.</b>						
<b>Equipm.</b>						
<b>Oper. Exp.*)</b>		68.000				
<b>Others</b>		10.000				
<b>Total dir. Costs</b>		137.854				
<b>OH-20%</b>		27.571				
<b>Total year 2008</b>		<b>165.425</b>				
<b>Sal./Acad.</b>	1,25	62.833				
<b>Sal./Tech.</b>						
<b>Equipm.</b>						
<b>Oper. Exp.*)</b>		68.000				
<b>Others</b>		10.000				
<b>Total dir. Costs</b>		140.833				
<b>OH-20%</b>		28.167				
<b>Total year 2009</b>		<b>169.000</b>				
<b>Sal./Acad.</b>	1	52.758				
<b>Sal./Tech.</b>						
<b>Equipm.</b>						
<b>Oper. Exp.</b>						
<b>Others</b>		10.000				
<b>Total dir. Costs</b>		62.758				
<b>OH-20%</b>		12.552				
<b>Total year 2010</b>		<b>75.310</b>				
<b>Total - 4 years</b>		<b>518.465</b>				

\*) Operational exp. includes Analyses Total DKK 60.000; Veterinarian investigations: Total DKK 51.000; partial costs of experimental feed: Total DKK 60.000.

<b>Budget for the entire project – broken down by calendar year</b>						
<b>Budget item</b>	<b>From Ministry of Food, Agriculture and Fisheries</b>		<b>From place of work</b>		<b>From other sources</b>	
	<b>Pers. Months</b>	<b>DKK</b>	<b>Pers. Months</b>	<b>DKK</b>	<b>Pers. Months</b>	<b>DKK</b>
Sal./Acad.	20	928.317	5	241.500		
Sal./Tech.	7,5	232.313				
Equipm.						
Oper. Exp.		145.000				
Others		117.804				
<b>Total dir. costs</b>		1.423.434		241.500		
<b>OH-20%</b>		284.686		48.300		
<b>Subcontractor</b>		40.000		60.000		
<b>TOTAL-Y 2007</b>	<b>28</b>	<b>1.748.120</b>		<b>349.800</b>		
Sal./Acad.	25,25	1.232.229				
Sal./Tech.	12	389.767				
Equipm.						
Oper. Exp.		308.000				
Others		66.971				
<b>Total dir. costs</b>		1.996.967				
<b>OH-20%</b>		399.393				
<b>Subcontractor</b>		50.000				
<b>TOTAL-Y 2008</b>	<b>37,5</b>	<b>2.446.360</b>				
Sal./Acad.	22,75	1.160.950				
Sal./Tech.	11	374.616				
Equipm.						
Oper. Exp.		243.000				
Others		64.567				
<b>Total dir. Costs</b>		1.843.133				
<b>OH-20%</b>		368.627				
<b>Subcontractor</b>		50.000				
<b>TOTAL-Y 2009</b>	<b>34</b>	<b>2.261.760</b>				
Sal./Acad.	7,5	398.054				
Sal./Tech.	,5	17.875				
Equipm.						
Oper. Exp.		5.000				
Others		32.204				
<b>Total dir. Costs</b>		453.133				
<b>OH-20%</b>		90.627				
<b>TOTAL-Y 2010</b>	<b>8</b>	<b>543.760</b>				
<b>TOTAL – 4 Y's</b>	<b>106,5</b>	<b>7.000.000</b>	<b>5</b>	<b>349.800</b>		
<b>Total project</b>	<b>111, 5 manmonths</b>			<b>DKK 7.349.800</b>		

**Total funding from The Ministry of Food, Agriculture and Fisheries:**

**DKK 7.000.000**

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**12. Signatures:**

<b>Name</b>	<b>Institute</b>	<b>Date</b>	<b>Signature</b>
<b>Project manager:</b> Alfred Jokumsen			
<b>Institute management:</b> Research director Helge A. Thomsen; DIFRES			
<b>Institute management:</b> Research director Torger Børresen; DIFRES			
<b>Institute management:</b> Research director Ole Christensen; BioMar			
<b>Institute management:</b> Director Lars Germann, Technological Institute			
<b>Institute management:</b> Director Brian Thomsen; Danish Aquaculture Organisation			

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**12. Description of the project:**

Please see attached Annex 1.