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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 2005-2010)

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

Application deadline 15th March 2005 at 12:00 a.m.

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1. **Project title and acronym** (acronym max. 10 letters):

**Organic Milk of High Quality – Development of Production Concepts Based on grazing of the Dairy Cows and Gentle Treatment of the Milk during Handling and Processing**

**ORMILKQUAL**

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2. **Project manager** (name, title, address, telephone, fax and e-mail. For projects in which several institutes participate, one project manager must be appointed to head the project):

**Jacob Holm Nielsen**  
**Head of Research Unit**  
**Department of Food Science**  
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3. **The project is within the following research project theme** (name of the project theme according to 'Invitation til projektansøgninger'. Include argumentation, max. 10 lines, if the project is only a part of a project theme):

### 3.2.1 Organic dairy products based on grazing

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#### 4. Participating institute(s) (name, address, telephone, fax and e-mail):

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The Royal Veterinary and Agricultural University  
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#### 5. Contact persons (title, name, address, telephone, fax and e-mail of one contact person appointed to represent each participating institute):

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#### 6. Project staff (title, name, address, telephone, fax and e-mail):

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Stig Purup  
 Senior Scientist  
 Danish Institute of Agricultural Sciences (DIAS)  
 Department of Animal Welfare and Nutrition

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7. **Project duration: 4** years From: 0106 To: 1209  
 (please give month and year in 'From' / 'To')

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8. **Main objective(s)** (maximum 10 lines):

To establish a basic understanding of i) how feeding with high levels of grass and legumes influence the overall quality of organic milk and dairy products and document how a sustainable, intensive and economic sound dairy production can be obtained together with a high quality organic milk with a composition and flavour different from conventionally produced milk. ii) milking strategies for sustainable milk production based on feeding with high levels of grass and legumes iii) how novel and gentle pasteurisation processes can improve flavour of milk, retain the native enzymes and milk proteins and improve the functionality of the milk for processing, and hereby exploit the necessary knowledge to set up different production concepts covering the chain from production of pasture to consumer perception and willingness to pay for high quality products, which can ensure production of economical sustainable organic milk and dairy products of differentiated and high quality.

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9. **Project summary in Danish** (approximately 1 page, suitable for publication):

Integriteten i den danske økologiske mælkeproduktion vil kunne forbedres hvis man kan formindske indkøbet af fodermidler og i stedet basere produktionen på anvendelse af hjemmeproducerede fodermidler. Dette bør være baseret på øget afgræsning og anvendelse af græs og bælglplanter i grovfoderet gennem hele året og være med til at styrke nærhedsprincippet således at man baserer sin fodring på de produkter der er naturlige for en given egn. Endvidere bør man i hele kæden fra malkning basere produktionen på skånsom håndtering og forarbejdning og derigennem styrke forsigtighedsprincippet indenfor den økologiske produktion

Målet med projektet er at skabe baggrund for produktion af økologisk høj kvalitetsmælk og højt forarbejdede økologiske mejeriprodukter med en velbeskrevet historie og en sammensætning, der adskiller sig fra konventionelt produceret mælk, ligesom der vil være fokus på at den økologiske mælk behandles skånsomt i hele processen fra malkning til den efterfølgende forarbejdning

Forskningsindsatsen vil være helhedsorienteret og baseret på 1) anvendelse af store mængder afgræsning/græsmarksprodukter i fodringen af malkekoen, 2) anvendelse af en skånsom håndtering og pumpning af mælken i forbindelse med malkning 3) introduktion af nye skånsomme pasteuriseringsteknologier der kan bibeholde mælkens oprindelige egenskaber og 4) have fokus på forbrugernes opfattelse og markedsføring af økologisk høj kvalitets mælk.

### ***Produktion af økologisk højkvalitets mælk baseret på anvendelse af afgræsning og høj andel af bælglplanter i foderrationen***

Udviklingen af nye mælketyper sker på baggrund af specialproduktioner af mælk med anvendelse af store mængder af forskellige bælglplanter og urter i foderrationen for at belyse overførslen af prækursors for aromakomponenter eller direkte overførsel af flavourkomponenter. Endvidere gennemføres gårdstudier baseret på anvendelse af mere realistiske andele af bælglplanter og minimale mængder af majsbaserede produkter i foderrationen for herigennem at udvikle af et fodringskoncept rettet mod, at den økologiske mælkeproducent kan producere en mælk med en sammensætning, ernæringsmæssige egenskaber og smag der adskiller sig fra konventionelt produceret mælk. Udvikling af dette produkt vil ske under hensyntagen til produktivitet, dyrevelfærd og økonomi i produktionen, ligesom der vil blive belyst om køerne har præferencer mht, valg af forskellige bælglplanter og urter.

Øget anvendelse af bælglplanter og afgræsning vil medføre at mælkenes fedtsyresammensætning vil ændres i en sådan grad, at det er betydende for mælkenes oxidative stabilitet hvorfor en vigtig indsats vil omhandle muligheden for at imødegå oxidation i mælken ved at sikre at koen har en optimal vomfunktion og hydrogeneringsevne samt en tilstrækkelig tilførsel af betydende antioxidanter.

De producerede mælketyper karakteriseres i relation til sammensætning, indhold af udvalgte flavourkomponenter, oxidative stabilitet og sensoriske egenskaber og sammenhænge mellem sensoriske egenskaber og mælkenes kemiske sammensætning undersøges. Der gennemføres endvidere studier af forbrugerens villighed til at betale en merpris for disse nyudviklede mælketyper og det undersøges om specifikke forbrugersegmenter har en præference for disse mælketyper.

### ***Skånsom håndtering og pumpning af mælken i forbindelse med malkning***

En af de væsentligste årsager til kvalitetsforringelse af økologisk mælk er den pumpning, der foregår på gården i forbindelse med malkning hvilket forårsager en ødelæggelse af mælkenes fedtkugler. Dette giver ophav til øget niveau af frie fedtsyrer i mælken og i økologiske uhomogeniserede mælkeprodukter vil ødelæggelse af mælkenes fedtkugler give øget risiko for dannelse af flødeprop i produkterne under lagring. Undersøgelser af dannelsen af flødeprop vil blive undersøgt i relation til denaturering af mælkenes agglutinerer der kan hindre aggregering af fedt i mælkekartonen. Introduktionen af AMS systemer har indført store kvalitetsforringelser i relation til øget lipolyse og ødelæggelse af mælkenes fedtkugler og hvis man kun anvendte mælk fra AMS systemer formodes det at man ville kunne smage at denne mælk er harsk. Samtidig er mobile AMS systemer en af de fremtidige malkningsteknologier der kan sikre afgræsning i store besætninger. Man må forvente at de novo syntesen af mælkefedt vil reduceres, hvilket formodes at kunne påvirke mælkefedtkuglens stabilitet ved mekanisk stress. Dette belyses i forbindelse med udvikling af nye mælketyper baseret på afgræsning.

### ***Skånsomme pasteuriseringsmetoder der kan bibeholde mælkenes oprindelige egenskaber***

En af de behandlinger, der påvirker mælkenes egenskaber er pasteuriseringen. Nye metoder til pasteurisering af mælk er udviklet, og disse bygger på en hurtig opvarmning af mælken til meget høje temperaturer men i et meget kort tidsrum (infusions pasteurisering). Undersøgelser har vist, at denne metode er mere skånsom ved mælken end traditionel lavpasteurisering, idet der kun forekommer en moderat denaturering af mælkenes proteiner men at metoden samtidig har en høj drabseffekt på bakterier og sporer. Vigtigst er det, at undersøgelser har vist, at denne pasteurisering form sikrer produktion med en friskhed der overgår konventionelt lavpasteuriseret mælk. Indsatsen sigter mod, at etablere en skånsom pasteurisering af økologisk mælk, under hensyntagen til smag og holdbarhed men også at undersøge hvorledes disse nye metoder påvirker mælkenes funktionelle egenskaber i relation til processering.

Viden opnået ved gennemførelse af projektet vil blive kommunikeret internationalt og nationalt samt danne baggrund for anbefalinger for både primærproduktion såvel som forarbejdningsindustrien.

**Budget:**

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The proposed budget must be inclusive of increases in the level of salaries and prices and specified on an annual basis. The proposed budget must specify the number of man-months and related salary costs for scientific staff and non-scientific staff, other direct costs and costs to buy equipment. To this should be added an overhead contribution of 20% of the direct costs.

Salary levels must not exceed union levels for comparable positions in the Public Service (e.g. laboratory assistant, researcher or senior researcher).

Official journeys must follow government regulations.

The applicants are generally expected to procure and make available all necessary equipment for the project themselves. Only in exceptional cases when this is not possible may expenditures for the acquisition of equipment be included in the budget for consideration.

Funding is provided exclusive of the recipient's input VAT (purchase VAT) and output VAT (sales VAT).

For government institutes funding is provided in accordance with the budget guidelines issued by the Ministry of Finance for research activities receiving programme funding and the funding is only granted for one year at a time.

If private business partners co-finance or take part in the project otherwise then all partners have to enter a co-operation agreement or provide other kind of documentation of the co-operation cf. 'Invitation til projektansøgninger'.

Note that budgets must be made for the entire project as well as for each participating institution.

Budget for the entire project—broken down by calendar year							
Budget item		From Ministry of Food, Agriculture and Fisheries		From place of work		From other sources	
		Person months	DKK	Person months	DKK	Person months	DKK
1st calendar year 2005	Salaries/academic staff						
	Salaries/techn.-adm. staff						
	Equipment						
	Operational expenses						
	Others (please specify below)						
<b>Total direct costs</b>							
Overhead (20 % of direct costs)							
<b>Total</b>							
2nd calendar year 2006	Salaries/academic staff	51.0	1,747,444				
	Salaries/techn.-adm. staff	19.2	576,208				
	Equipment		51,000				
	Operational expenses		455,390		4,600		
	Others (please specify below)		179,700		58,500		
<b>Total direct costs</b>			3,009,742		63,100		
Overhead (20 % of direct costs)			601,628		215,000		
<b>Total</b>			3,611,370		278,100		
3rd calendar year 2007	Salaries/academic staff	56.5	2,258,686				
	Salaries/techn.-adm. staff	20.3	634,448				
	Equipment		10,600				
	Operational expenses		615,467		9,500		
	Others (please specify below)		64,000				
<b>Total direct costs</b>			3,583,201		9,500		
Overhead (20 % of direct costs)			716,480		274,000		
<b>Total</b>			4,299,681		283,500		
4th calendar year 2008	Salaries/academic staff	51.5	2,107,044				
	Salaries/techn.-adm. staff	20.5	670,565				
	Equipment		10,900				
	Operational expenses		644,171		9,800		
	Others (please specify below)		64,000				
<b>Total direct costs</b>			3,496,680		9,800		
Overhead (20 % of direct costs)			699,355		295,800		
<b>Total</b>			4,196,035		305,600		
5th calendar year 2009	Salaries/academic staff	17.0	844,391				
	Salaries/techn.-adm. staff	11.9	401,469				
	Equipment						
	Operational expenses		310,184		6,700		
	Others (please specify below)		21,000				
<b>Total direct costs</b>			1,577,044		6,700		
Overhead (20 % of direct costs)			315,409		305,000		
<b>Total</b>			1,892,673		311,700		
<b>Total for the 5 years</b>			13,999,759		1,178,900		

Budget for each participating institution — Name of institution: DIAS, ARK						
Budget item	From Ministry of Food, Agriculture and Fisheries		From place of work		From other sources	
	Person months	DKK	Person months	DKK	Person months	DKK
1st calendar year 2005	Salaries/academic staff					
	Salaries/techn.-adm. staff					
	Equipment					
	Operational expenses					
	Others (please specify below)					
<b>Total direct costs</b>						
Overhead (20 % of direct costs)						
<b>Total</b>						
2nd calendar year 2006	Salaries/academic staff	23	759,418	1	54,269	
	Salaries/techn.-adm. staff	10,3	306,356			
	Equipment		-			
	Operational expenses		250,290		86,000	
	Others (please specify below)					
<b>Total direct costs</b>		1,316,064		140,269		
Overhead (20 % of direct costs)		263,213		28,054		
<b>Total</b>		1,579,277		168,323		
3rd calendar year 2007	Salaries/academic staff	21,5	917,618	1	56,983	
	Salaries/techn.-adm. staff	9,4	292,651			
	Equipment					
	Operational expenses		252,093		86,000	
	Others (please specify below)					
<b>Total direct costs</b>		1,462,362		142,983		
Overhead (20 % of direct costs)		292,472		28,597		
<b>Total</b>		1,754,834		171,580		
4th calendar year 2008	Salaries/academic staff	20,5	919,812	1	59,832	
	Salaries/techn.-adm. staff	9,4	307,965			
	Equipment					
	Operational expenses		241,990		86,000	
	Others (please specify below)					
<b>Total direct costs</b>		1,469,767		145,832		
Overhead (20 % of direct costs)		293,953		29,166		
<b>Total</b>		1,763,720		174,998		
5th calendar year 2009	Salaries/academic staff	4	217,391	1	62,823	
	Salaries/techn.-adm. staff	2,0	71,769			
	Equipment					
	Operational expenses		36,484			
	Others (please specify below)					
<b>Total direct costs</b>		325,644		62,823		
Overhead (20 % of direct costs)		65,128,8		12,565		
<b>Total</b>		390,773		75,388		
<b>Total for the 5 years</b>		5,488,605		590,288		

Budget for each participating institution — Name of institution: DIAS, JPM						
Budget item	From Ministry of Food, Agriculture and Fisheries		From place of work		From other sources	
	Person months	DKK	Person months	DKK	Person months	DKK
1st calendar year 2005	Salaries/academic staff					
	Salaries/techn.-adm. staff					
	Equipment					
	Operational expenses					
	Others (please specify below)					
<b>Total direct costs</b>						
Overhead (20 % of direct costs)						
<b>Total</b>						
2nd calendar year 2006	Salaries/academic staff	9	401,700			
	Salaries/techn.-adm. staff	6.8	197,400			
	Equipment		36,000			
	Operational expenses		119,800		4,600	
	Others (please specify below)1		179,700		58,500	
<b>Total direct costs</b>		934,600		63,100		
Overhead (20 % of direct costs)		187,000		215,000		
<b>Total</b>		1,121,600		278,100		
3rd calendar year 2007	Salaries/academic staff	7	320,100			
	Salaries/techn.-adm. staff	8.6	261,500			
	Equipment		10,600			
	Operational expenses		238,600		9,500	
	Others (please specify below)2		64,000			
<b>Total direct costs</b>		894,800		9,500		
Overhead (20 % of direct costs)		179,000		274,000		
<b>Total</b>		1,073,800		283,500		
4th calendar year 2008	Salaries/academic staff	7	333,200			
	Salaries/techn.-adm. staff	8.6	272,600			
	Equipment		10,900			
	Operational expenses		285,700		9,800	
	Others (please specify below)2		64,000			
<b>Total direct costs</b>		966,400		9,800		
Overhead (20 % of direct costs)		193,300		295,800		
<b>Total</b>		1,159,700		305,600		
5th calendar year 2009	Salaries/academic staff	10	498,000			
	Salaries/techn.-adm. staff	7.9	259,700			
	Equipment					
	Operational expenses		223,700		6,700	
	Others (please specify below)2		21,000			
<b>Total direct costs</b>		1,002,400		6,700		
Overhead (20 % of direct costs)		200,500		305,000		
<b>Total</b>		1,202,900		311,700		
<b>Total for the 5 years</b>		4,558,000		1,178,900		

Budget for each participating institution — Name of institution: KVL-DT						
Budget item	From Ministry of Food, Agriculture and Fisheries		From place of work		From other sources MFF	
	Person months	DKK	Person months	DKK		
1st calendar year 2005	Salaries/academic staff					
	Salaries/techn.-adm. staff					
	Equipment					
	Operational expenses					
	Others (please specify below)					
<b>Total direct costs</b>						
Overhead (20 % of direct costs)						
<b>Total</b>						
2nd calendar year 2006	Salaries/academic staff	12	291200			
	Salaries/techn.-adm. staff					
	Equipment					
	Operational expenses		60,300			
	Others (please specify below)					
<b>Total direct costs</b>		351,500				
Overhead (20 % of direct costs)		70,300				
<b>Total</b>		421,800				
3rd calendar year 2007	Salaries/academic staff	12	330,840			
	Salaries/techn.-adm. staff					
	Equipment					
	Operational expenses		63,315			
	Others (please specify below)					
<b>Total direct costs</b>		394,155				
Overhead (20 % of direct costs)		78,431				
<b>Total</b>		472,586				
4th calendar year 2008	Salaries/academic staff	12	342,032			
	Salaries/techn.-adm. staff					
	Equipment					
	Operational expenses		66,481			
	Others (please specify below)					
<b>Total direct costs</b>		408,513				
Overhead (20 % of direct costs)		82,102				
<b>Total</b>		490,615				
5th calendar year 2009	Salaries/academic staff					
	Salaries/techn.-adm. staff					
	Equipment					
	Operational expenses					
	Others (please specify below)					
<b>Total direct costs</b>						
Overhead (20 % of direct costs)						
<b>Total</b>						
<b>Total for the 5 years</b>		1,385,001				

Budget for each participating institution — Name of institution:KVL-SENS						
Budget item	From Ministry of Food, Agriculture and Fisheries		From place of work		From other sources	
	Person months	DKK	Person months	DKK	Person months	DKK
1st calendar year 2005	Salaries/academic staff					
	Salaries/techn.-adm. staff					
	Equipment					
	Operational expenses					
	Others (please specify below)					
<b>Total direct costs</b>						
Overhead (20 % of direct costs)						
<b>Total</b>						
2nd calendar year 2006	Salaries/academic staff	6	252,000			
	Salaries/techn.-adm. staff	2	70,000			
	Equipment		15,000			
	Operational expenses		25,000			
	Others (please specify below)					
<b>Total direct costs</b>		362,000				
Overhead (20 % of direct costs)		72,000				
<b>Total</b>		434,000				
3rd calendar year 2007	Salaries/academic staff	12	509,000			
	Salaries/techn.-adm. staff	2	70,000			
	Equipment					
	Operational expenses		50,000			
	Others (please specify below)					
<b>Total direct costs</b>		629,000				
Overhead (20 % of direct costs)		126,000				
<b>Total</b>		755,000				
4th calendar year 2008	Salaries/academic staff	12	512,000			
	Salaries/techn.-adm. staff	2.5	90,000			
	Equipment					
	Operational expenses		50,000			
	Others (please specify below)					
<b>Total direct costs</b>		652,000				
Overhead (20 % of direct costs)		130,000				
<b>Total</b>		782,000				
5th calendar year 2009	Salaries/academic staff	3	129,000			
	Salaries/techn.-adm. staff	2	70,000			
	Equipment					
	Operational expenses		50,000			
	Others (please specify below)					
<b>Total direct costs</b>		249,000				
Overhead (20 % of direct costs)		50,000				
<b>Total</b>		299,000				
<b>Total for the 5 years</b>		2,270,000				

Budget for each participating institution — Name of institution:DIAS-SVE						
Budget item	From Ministry of Food, Agriculture and Fisheries		From place of work		From other sources	
	Person months	DKK	Person months	DKK	Person months	DKK
1st calendar year 2005	Salaries/academic staff					
	Salaries/techn.-adm. staff					
	Equipment					
	Operational expenses					
	Others (please specify below)					
<b>Total direct costs</b>						
Overhead (20 % of direct costs)						
<b>Total</b>						
2nd calendar year 2006	Salaries/academic staff	1	43,126			
	Salaries/techn.-adm. staff	0,1	2,452			
	Equipment					
	Operational expenses					
	Others (please specify below)					
<b>Total direct costs</b>		45,578				
Overhead (20 % of direct costs)		9,115				
<b>Total</b>		54,693				
3rd calendar year 2007	Salaries/academic staff	4	181,128			
	Salaries/techn.-adm. staff	0,3	10,297			
	Equipment					
	Operational expenses		11,459			
	Others (please specify below)					
<b>Total direct costs</b>		202884				
Overhead (20 % of direct costs)		40,577				
<b>Total</b>		243,460				
4th calendar year 2008	Salaries/academic staff					
	Salaries/techn.-adm. staff					
	Equipment					
	Operational expenses					
	Others (please specify below)					
<b>Total direct costs</b>						
Overhead (20 % of direct costs)						
<b>Total</b>						
5th calendar year 2009	Salaries/academic staff					
	Salaries/techn.-adm. staff					
	Equipment					
	Operational expenses					
	Others (please specify below)					
<b>Total direct costs</b>						
Overhead (20 % of direct costs)						
<b>Total</b>						
<b>Total for the 5 years</b>		298,153				

## 11. Signatures:

Name	Institute	Date	Signature
<b>Project manager:</b> <b>Jacob H. Nielsen</b>	Dept of Food Science, Danish Institute of Agricultural Sciences		
<b>Institute management:</b> <b>Henrik J. Andersen</b>	Dept of Food Science, Danish Institute of Agricultural Sciences		
<b>Institute management:</b> <b>Jesper W. Petersen</b>	Dept of Agroecology, Danish Institute of Agricultural Sciences		
<b>Institute management:</b> <b>Grete Bertelsen</b>	Dept. of Food Science, KVL		
<b>Institute management:</b> <b>Kirsten Jakobsen</b>	Department of Animal Welfare and Nutrition DIAS		
<b>Institute management:</b>			

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**12. Description of the project:**

The description of the project must be given in Annex 1 and according to the guidelines described herein.