



MINISTERIET FOR  
FAMILIE- OG  
FORBRUGERANLIGGENDER

Ministeriet for Fødevarer, Landbrug og Fiskeri  
Direktoratet for Fødevarerhverv



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 2005-2010)

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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- Project title and acronym** (acronym max. 10 letters):  
**Increased integrity in organic dairy production through natural sources of vitamins and minerals and non-antibiotic health control**  
ECOVIT
  - 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):  
Torben Werner Bennedsgaard  
Project scientist, Ph.D.  
Danish Institute of Agricultural Sciences (DIAS)  
Dept. of Animal Health, Welfare and Nutrition (SVE)  
P. O. Box 50  
8830 Tjele  
Fax: 8999 1500  
Tlph: 89991541

**Please submit 15 hard copies and 1 electronic version to:**

Danish Research Centre for Organic Farming  
Research Centre Foulum  
P.O. Box 50  
DK-8830 Tjele

Tel. +45 89 99 16 75  
Fax. +45 89 99 16 73  
E mail: foejo@agrsci.dk  
Web site: www.darcof.dk

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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):

#### **3.4.1 Vitamin- og mineralforsyning, sygdomsforebyggelse og robuste husdyr**

The project focuses on the integrity of the feeding regime in dairy herds and in the handling of disease. The focus on dairy herds allow us to focus on an optimization of the choice of crops and feeding strategy to improve selfsufficiency of vitamins and minerals and to work with health control without antibiotics based on experiences of well established farms with several years of organic experience. We have chosen to focus on the dairy herd, since the organic swine and poultry production faces another type of problems that would not integrate naturally in the project. We have also reached the conclusion that changes in breeds or breeding of the dairy cows would be less promising strategies for the research questions.

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

Danish Institute of Agricultural Sciences (DIAS)  
Dept. of Animal Health, Welfare and Nutrition (SVE)  
P. O. Box 50  
8830 Tjele  
Fax: 8999 1500  
Tlph: 89991541

Danish Institute of Agricultural Sciences (DIAS)  
Dept. of Agroecology (JPM)  
P. O. Box 50  
8830 Tjele  
Fax: 8999 1500  
Tlph: 89991541

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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):

Project Scientist, Ph.D.  
Torben Werner Bennedsgaard  
Danish Institute of Agricultural Sciences (DIAS)  
Dept. of Animal Health, Welfare and Nutrition (SVE)  
Group of Disease Mechanisms, -Markers and -Prevention  
P. O. Box 50  
8830 Tjele  
Fax: 89 99 15 00  
Tlph: 89 99 15 41  
[TorbenW.bennedsgaard@agrsci.dk](mailto:TorbenW.bennedsgaard@agrsci.dk)

Senior scientist, Ph.D.  
Troels Kristensen  
DIAS  
Dept. of Agroecology (JPM)  
Group of Farming Systems  
P. O. Box 50  
8830 Tjele  
Tel: 89 99 12 33  
Fax: 89 99 12 00  
[Troels.Kristensen@agrsci.dk](mailto:Troels.Kristensen@agrsci.dk)

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

Senior scientist  
Troels Kristensen  
DIAS  
Dept. of Agroecology (JPM)  
Group of Farming Systems  
P. O. Box 50  
8830 Tjele  
Tel: 89 99 12 33

Fax: 89 99 12 00

[Troels.Kristensen@agrsci.dk](mailto:Troels.Kristensen@agrsci.dk)

Scientist  
Lisbeth Mogensen  
DIAS  
Dept. of Agroecology (JPM)  
Group of Farming Systems  
P. O. Box 50  
8830 Tjele  
Tel: 89 99 12 23  
Fax: 89 99 12 00

[Lisbeth.Mogensen@agrsci.dk](mailto:Lisbeth.Mogensen@agrsci.dk)

Senior scientist  
Karen Søgaard  
DIAS  
Dept. of Agroecology (JPM)  
Group of Crop Production  
P. O. Box 50  
8830 Tjele  
Tel: 89 99 18 34  
Fax: 89 99 12 00

[Karen.Soegaard@agrsci.dk](mailto:Karen.Soegaard@agrsci.dk)

Senior scientist,  
Søren Krogh Jensen  
DIAS  
Dept. of Animal Health, Welfare and Nutrition (SVE)  
Group of Nutrition and Production Physiology  
P. O. Box 50  
8830 Tjele  
Tel: 89 99 11 17  
Fax: 89 99 11 66

[SorenKrogh.Jensen@agrsci.dk](mailto:SorenKrogh.Jensen@agrsci.dk)

Senior scientist  
Jakob Sehested  
DIAS  
Dept. of Animal Health, Welfare and Nutrition (SVE)  
Group of Animal Nutrition and Environmental Impact  
P. O. Box 50  
8830 Tjele  
Tel: 89 99 13 84  
Fax: 89 99 13 78

[Jakob.Sehested@agrsci.dk](mailto:Jakob.Sehested@agrsci.dk)

Senior scientist  
Mette Vaarst  
DIAS  
Dept. of Animal Health, Welfare and Nutrition (SVE)  
Group of Herd Health and Production Management  
P. O. Box 50  
8830 Tjele  
Tel: 89 99 13 44  
Fax: 89 99 15 00  
[Mette.vaarst@agrsci.dk](mailto:Mette.vaarst@agrsci.dk)

Senior scientist  
Torben Larsen  
Danish Institute of Agricultural Sciences  
Dept. of animal health, welfare and nutrition  
Group of disease mechanisms, -markers and -prevention  
P. O. Box 50  
8830 Tjele  
Tel: 89 99 11 57  
Fax: 89 99 15 00  
[Torben.Larsen@agrsci.dk](mailto:Torben.Larsen@agrsci.dk)

Project Scientist  
Torben Werner Bennedsgaard  
Danish Institute of Agricultural Sciences  
Dept. of animal health, welfare and nutrition  
Group of disease mechanisms, -markers and -prevention  
P. O. Box 50  
8830 Tjele  
Tel: 89991541  
Fax: 8999 1500  
[TorbenW.Bennedsgaard@agrsci.dk](mailto:TorbenW.Bennedsgaard@agrsci.dk)

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7. **Project duration:** 4 years From: 01/2007 To: 12/2010  
(please give month and year in 'From' / 'To')

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

The main objectives of the project are to improve the integrity of organic dairy farming by evaluating strategies for an adequate supply of vitamins and minerals to the dairy herd from organically grown feedstuffs and furthermore to improve the health of organic dairy cows without use of allopathic treatments.

The effect on vitamin (A, D, E) and mineral (Zn, Cu, Se) supply dependent on factors like crop type, soiltype, time of harvest, conservation and storage, and the composition of the ration is described. Strategies for supply of minerals and vitamins in dairy herds are evaluated, and finally the consequences of an integrated supply of vitamins and minerals on herd level are analysed through system analysis.

In the project the international and national experience on handling of diseases without antibiotics is also evaluated. And controlled studies on the most promising disease treatments with natural medicine are conducted.

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

Den økologiske produktion bygger på de økologiske principper og målsætninger bl.a. om naturlighed, minimering af ressourceforbrug og recirkulation af næringsstoffer.

I de seneste år er kravene til den økologiske mælkeproduktion blevet strammet, så der i dag er tale om 100% økologisk fodring, begrænsning af anvendelsen af syntetiske vitaminer og en målsætning om anvendelse af alternativer til antibiotika. Disse nye krav har gjort selvforsyning, eller brug af udelukkende dansk produceret økologisk foder mere aktuelt, hvilket også er i overensstemmelse med kredsløbsprincippet. Sådanne strategier vil øge betydningen af hvilket foder der produceres på den enkelte bedrift, konservering og lagring af foderet og fodersammensætningen. Vores hypotese er, at foderrationen gennem hele året kan sammensættes så vitaminbehovet er opfyldt og at mineralindholdet også vil kunne opfyldes på visse jordbundstyper.

Vitaminer og mineraler er af stor vigtighed for dyrenes trivsel, sundhed og produktion, ligesom de har indflydelse på produkternes spise- og ernæringsmæssige kvalitet. Det højeste indhold af vitaminer findes i de friske grønne blade på afgrøderne. En række urter og afgrøder kan desuden indeholde særligt store mængder af et eller flere mineraler. Derfor har de senere års fokusering på majsdyrkning har en uheldig sideeffekt, da både vitamin- og mineralindholdet er meget lavt i majs – sammenlignet med græsmarksplanter. Mineral- og vitaminindholdet og sammensætningen vil være påvirkelig af tidspunktet i vækstsæsonen, afgrødemængde og dyrkningsjordens indhold af mineraler. Viden herom vil kunne anvendes til styring mod specifikke mål. Mange danske økologiske kvægbrug findes på sandjord (JB 1-3), hvor jordens eget indhold af mineraler er begrænset, hvilket muligvis kan bevirke, at selvforsyning ikke kan opnås i alle tilfælde. For malkekvæget er der desuden problemer med at sikre forsyningen med de fedtopløselige vitaminer A og E, især i konserverede og lagrede fodermidler. I projektet undersøges betydningen af afgrødevalg gennem kontrollerede markforsøg og ved undersøgelser på udvalgte landbrug med forskellig jordbonitet. I et parallelt forløbende ph.d. studie undersøges behovet for sollys for at sikre D-vitaminforsyningen.

Mens mineralerne normalt ikke tabes under lagring, sker der et kontinuert tab af vitaminer under lagring af konserveret grovfoder. I projektet undersøges betydningen af konserveringsmetode, høstbetingelser og afgrødevalg for størrelsen af dette tab. De opnåede resultater anvendes til at gennemføre kontrollerede forsøg med foderrationer optimeret efter optimal vitamin- og mineralforsyning fra naturlige kilder samt efter optimal produktionsøkonomi. Det komplekse samspil mellem afgrødevalg, dyrkningsforhold og tilgængeligheden af vitaminer og mineraler betyder at der i dag i høj grad suppleres med uorganiske mineraler og vitamintilskud i de økologiske besætninger. I enkelte tilfælde ses dog tegn på underforsyning hos dyrene i form af påvirket produktion eller sundhed. I projektet vurderes mineralstatus i en række malkekvægsbesætninger der har fået information om de kendte muligheder for integreret vitamin- og mineralforsyning og der analyseres for eventuelle sammenhænge til dyrenes sundhedsstatus (mastitis-indikatorer). Under kontrollerede forsøgsbetingelser undersøges konsekvenserne af integreret vitamin- og mineralforsyning via strategisk fodervalg og fodermanagement på foderforsyning, produktion samt vitamin- og mineralstatus hos køer og kalve.

Det økologiske regelsæt indeholder i dag et krav om anvendelse af alternativer til antibiotika, hvis disse alternativer har en dokumenteret effekt. I USA er anvendelse af antibiotika helt forbudt i produktionen af økologiske produkter. Centralt i begge regelsæt er dog at forebygge frem for at behandle ved at benytte en driftsform, der skaber sunde og robuste dyr. Konsekvenserne alternative strategier under danske forhold er fortsat ikke fuldt belyst, og valg af alternativer til antibiotika baserer sig stort set på den enkelte landmands egne erfaringer. Dokumentation af de anvendte præparater, der primært bygger på planter som aloe vera og hvidløg, styrkelse af mineralforsyning med bl.a. tangprodukter og sten samt på alternativ medicin som akupunktur og homøopati, er meget mangelfuld, hvilket betyder at EU-reglernes krav ikke har nogen reel betydning i dag. I projektet indsamles erfaringer med sygdomshåndtering uden antibiotika i USA, samt hvilke alternative strategier til sundhedsfremme der anvendes i danske besætninger med lavt antibiotika forbrug. De mest lovende strategier undersøges gennem kontrollerede eksperimenter.

Ændret afgrødevalg og fodersammensætning påvirker den samlede drift af den økologiske gård. For at belyse mulighederne for at opnå en integreret mineral- og vitaminforsyning gennemføres en systemanalyse af konsekvenserne på en række økologiske kvæggårde. På baggrund af projektets resultater udvikles værktøjer til modellering og simulering af forskellige strategier for integreret vitamin- og mineralforsyning.

**10. 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 each participating institution — Name of institution: DIAS, total							
Budget item		From Ministry of Food, Agriculture and Fisheries		From place of work		From other sources	
		Person months	1000 DKK	Person months	1000 DKK	Person months	1000 DKK
1st calendar year 2007	Salaries/academic staff	29,6	1413,6	8	261	4	130
	Salaries/techn.-adm. staff	25,7	726,2	0	0	0	0
	Equipment		0,0		0		0
	Operational expenses		536,9		8		0
	Others (please specify below)		201,0		117		0
<b>Total direct costs</b>			2877,7		387		130
Overhead (20 % of direct costs)			575,5		282		26
<b>Total</b>			3453,2		669		156
2nd calendar year 2008	Salaries/academic staff	28,9	1409,2	8	272	4	136
	Salaries/techn.-adm. staff	34,5	998,6	0	0	0	0
	Equipment		0,0		0		0
	Operational expenses		786,1		9		0
	Others (please specify below)		207,8		376		0
<b>Total direct costs</b>			3401,7		657		136
Overhead (20 % of direct costs)			680,3		331		27
<b>Total</b>			4082,0		988		163
3rd calendar year 2009	Salaries/academic staff	22,2	1136,4	4	142	2	71
	Salaries/techn.-adm. staff	15,9	483,4	0	0	0	0
	Equipment		0,0		0		0
	Operational expenses		436,1		5		0
	Others (please specify below)		0,0		300		0
<b>Total direct costs</b>			2055,9		447		71
Overhead (20 % of direct costs)			411,2		288		14
<b>Total</b>			2467,1		735		85
4th calendar year 2010	Salaries/academic staff	15,8	870,6	0	0	0	0
	Salaries/techn.-adm. staff	2,0	69,0	0	0	0	0
	Equipment		0,0		0		0
	Operational expenses		58,9		0		0
	Others (please specify below)		0,0		0		0
<b>Total direct costs</b>			998,5		0		0
Overhead (20 % of direct costs)			199,7		145		0
<b>Total</b>			1198,1		145		0
<b>Total for the 5 years</b>			11200		2536		404

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	1000 DKK	Person months	1000 DKK	Person months	1000 DKK	
1st calendar year 2007	Salaries/academic staff	22,6	1070	8	261	4	130
	Salaries/techn.-adm. staff	17,0	460	0	0	0	0
	Equipment		0		0		0
	Operational expenses		353		0		0
	Others (please specify below)		20		40		0
	<b>Total direct costs</b>		1903		301		130
Overhead (20 % of direct costs)		381		60		26	
<b>Total</b>		2284		361		156	
2nd calendar year 2008	Salaries/academic staff	22,4	1078	8	272	4	136
	Salaries/techn.-adm. staff	26,5	745	0	0	0	0
	Equipment		0		0		0
	Operational expenses		600		0		0
	Others (please specify below)		30		300		0
	<b>Total direct costs</b>		2453		572		136
Overhead (20 % of direct costs)		491		114		27	
<b>Total</b>		2944		686		163	
3rd calendar year 2009	Salaries/academic staff	15,7	791	4	142	2	71
	Salaries/techn.-adm. staff	11,0	322	0	0	0	0
	Equipment		0		0		0
	Operational expenses		290		0		0
	Others (please specify below)		0		300		0
	<b>Total direct costs</b>		1403		442		71
Overhead (20 % of direct costs)		281		88		14	
<b>Total</b>		1684		530		85	
4rd calendar year 2010	Salaries/academic staff	9,3	511	0	0	0	0
	Salaries/techn.-adm. staff	0,0	0	0	0	0	0
	Equipment		0		0		0
	Operational expenses		6		0		0
	Others (please specify below)		0		0		0
	<b>Total direct costs</b>		517		0		0
Overhead (20 % of direct costs)		103		0		0	
<b>Total</b>		621		0		0	
<b>Total for the 5 years</b>		7428,5		1578		404	

**Others: expenses to research stations and private farms**  
**From other sources: Grant from SOAR to PhD student**

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	1000 DKK	Person months	1000 DKK	Person months	1000 DKK	
1st calendar year 2007	Salaries/academic staff	7,0	343,4	0,0	0,0	0	0
	Salaries/techn.-adm. staff	8,7	266,4	0,0	0,0	0	0
	Equipment		0,0		0,0		0
	Operational expenses		183,9		8,1		0
	Others (please specify below)		181,0		77,5		0
<b>Total direct costs</b>			974,6		85,6		0
Overhead (20 % of direct costs)			194,9		222,1		0
<b>Total</b>			1169,5		307,7		0
2nd calendar year 2008	Salaries/academic staff	6,5	331,6	0,0	0,0	0	0
	Salaries/techn.-adm. staff	8,0	253,2	0,0	0,0	0	0
	Equipment		0,0		0,0		0
	Operational expenses		186,1		8,9		0
	Others (please specify below)		177,8		76,2		0
<b>Total direct costs</b>			948,7		85,1		0
Overhead (20 % of direct costs)			189,7		216,1		0
<b>Total</b>			1138,4		301,2		0
3rd calendar year 2009	Salaries/academic staff	6,5	345,1	0,0	0,0	0	0
	Salaries/techn.-adm. staff	4,9	161,6	0,0	0,0	0	0
	Equipment		0,0		0,0		0
	Operational expenses		146,1		5,3		0
	Others (please specify below)		0,0		0,0		0
<b>Total direct costs</b>			652,8		5,3		0
Overhead (20 % of direct costs)			130,6		199,1		0
<b>Total</b>			783,3		204,4		0
4th calendar year 2010	Salaries/academic staff	6,5	359,1	0,0	0,0	0	0
	Salaries/techn.-adm. staff	2,0	69,0	0,0	0,0	0	0
	Equipment		0,0		0,0		0
	Operational expenses		52,9		0,0		0
	Others (please specify below)		0,0		0,0		0
<b>Total direct costs</b>			481,0		0,0		0
Overhead (20 % of direct costs)			96,2		144,9		0
<b>Total</b>			577,2		144,9		0
<b>Total for the 5 years</b>			3668		958		0

Others: Expenses to research stations and private farms

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**11. Signatures:**

Name	Institute	Date	Signature
<b>Project manager:</b> Torben Werner Benedsgaard			
<b>Institute management:</b>			
<b>Institute management:</b>			
<b>Institute management:</b>			
<b>Institute management:</b>			
<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.