



## **Progress Report 2007 and Application for Continuation in 2008**

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  
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1. Project title and acronym

**The role of Organic Farms as refugia for biodiversity**

**REFUGIA**

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2. Project journal number

3304-FOJO-05-08-01

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3. Project period (month, year)

<b>Start of project:</b>	01.01-2007
<b>End of project:</b>	31.12-2010

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4. Head of project

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## 7. Midterm description of the project, its results and progress, and application for continuation in 2008

### A. Project summary

Organic farming generally is acknowledged for the positive effects on biodiversity and other landscape services. However, the intensity of farming has changed significantly through the last decade as ranks of traditional holistic organic farmers has been augmented by much more economically driven new organic farmers. At the same time there have also been steady improvements in farming methodology and crop types resulting in efficiency in organic farming which can often rival its conventional counterparts. Therefore, large variations occur between organic farms. The present project aims at increasing society's and consumers' knowledge about the impact of organic farming on nature by investigating the role of different types of organic farms as refugia for biodiversity.

This is addressed within the work packages 2-7 by:

- 1) Investigating the structure, diversity and intensity of organic farming, and its role for multifunctionality in Denmark. (WP 2)
- 2) Investigating weed-insect food chains for two crops within intensively and extensively cultivated organic fields in order to compare with existing data for conventional farms. This will give information about the amount of non-crop food available for birds and small mammals feeding in the fields and about whether organic fields sustain more food chains than conventional fields. (WP 3)
- 3) Investigating the plant produced food resources in terms of flowering period and weed seeds available for insects, birds and small mammals in hedges and field margins at organic and conventional farms. The data will show whether the documented differences in the flora between hedge vegetation at organic and conventional farms are mirrored in the resource availability. (WP 4).
- 4) Investigating the role of organic farms as genetic sources for species in the arable land by analysing the genetic diversity and population structure of "wild" species in the arable landscape. This will be performed assuming firstly that the upland habitats in hedgerows and fields/grassland of organic farms function both as islands and corridors connecting the islands for flora and fauna, and secondly, that the use of pesticides in conventional agriculture causes frequent local extinction and re-colonisation events of weed and invertebrates. Such events will indirectly affect smaller mammals and farmland birds due to local extinction of food-items. The impact on genetic structure may vary according to the species in question depending amongst others on the species' dispersal ability. This will be addressed by focussing on the three species, grey partridge (*Perdix perdix*), ground beetle (*Bembidion lamprus*.) and field vole (*Microtus agrestis*) representing three different taxa with different dispersal abilities (WP5 and 6).
- 5) Investigating the impact that organic farms have on the wildlife content of the landscape by creating a set of landscape configurations using the information from WP2 on the agricultural extensiveness and distribution of organic farms and from WP 2, 3 and 4 on the species ecology, genetic patterns and species diversity. Modeling tools will be used to synthesize this information and to create a set of indices for describing the ability of a landscape configuration of organic farms to support a range of wildlife. The resulting landscape wildlife index (LWI) will have the potential to be used by interest groups to determine which scenarios result in the optimum wildlife potential from their particular viewpoint (WP7). This index will provide an effective way of measuring 'nature quality' from a faunal perspective and will provide the ability to make a direct estimate of the contribution of organic farms to the overall value of the landscape for a range of agricultural species. In this way an organic farmer can evaluate the impact that he could have as an individual on biodiversity via the choices he might make regarding the intensity with which he farms.

**Table A.1: Work package list (from application)**

WP No.	WP title	Responsible scientist	Budget DKK	Start	End	Deliverable No.
1	Project management	LWA	161.941	03.01.2007	31.12.2010	D1.1-D1.2
2	The structure, diversity and in-	TDA	708.920	03.01.2007	31.03.2010	D2.1-D2.4

	tensity of organic farming in Denmark, and its role for multi-functionality.					
3	The role of organic farms as refuges for species diversity with focus on food-chains.	MBP	1.375.398	03.01.2007	31.12.2010	D3.1-D3.5
4	Field margins and hedge bottom vegetation as "breadbaskets" in the agricultural landscape.	BST	455.335	03.01.2007	31.12.2010	D4.1-D4.4
5	The role of organic farms as refugia for species diversity with focus on small mammals.	TSJ	1.278.954	03.01.2007	31.12.2010	D5.1-D5.6
6	The role of organic farms as genetic sources for species in the arable land.	LWA	2.169.942	03.01.2007	31.12.2010	D6.1-D6.5
7	The role as refugia and biological sources: a synthesis.	CJT	836.796	03.01.2007	31.12.2010	D7.1-D7.4
<b>Total</b>			6.987.286			

## B. Objectives and expected achievements

**Visionary objectives:** To increase society's, decision-makers and consumers' knowledge about the multifunctional role of organic farming- especially focusing on the impact of organic farming on nature.

### Immediate objectives:

To investigate food chains, species diversity and genetic diversity and cohesion in the wild flora and fauna in organic farming related to conventional farming, and to test the following refugia hypotheses:

#### *Hypotheses*

- 1) Species diversity is higher in ecosystems found in organic fields compared to conventional fields. Population sizes of many species are still higher in organic fields compared to conventional farming – even on intensive organic farms.
- 2) Extensively cultivated organic fields have higher species numbers and higher densities of weeds and arthropods than intensively cultivated organic fields
- 3) Organic farms possess a higher number of functioning weed – herbivore food chains than conventional farms, which gives the foundation for more insect life in organic fields.
- 4) The documented differences in herbal species richness and composition between organic and conventional borders and hedges result in higher availability of plant produced food, e.g. weed seeds.
- 5) Organic farms have a role as refuges (food chains, species- and gene bank) for the species in the arable land that are declining in the conventional farmland.
- 6) The local extinction of plants, invertebrates and smaller mammals happens more frequently on conventional farmland due to use of pesticides, structural differences (fewer suitable habitats) and different ways of production, that reduces the biodiversity at the species and gene level

## C. Midterm results and progress

### C.1 Description (summary) of main results and conclusions for each year

REFUGIA is running from the 1st of January 2007 to 31st of December 2010. At the moment we are in the process of collecting and processing data for the different milestones and deliverables (see below).

C.2 Fulfilment of deliverables and milestones  
(To be completed for each work package)

Deliverables list (from application)

<b>Workpackage 1</b>						
<b>Deliverable No</b>	<b>Deliverable title</b>	<b>Lead scientist</b>	<b>Delivery date</b>	<b>Allocated scientific person moths</b>	<b>Type of deliverable</b>	<b>Fulfilled (ok) or deviations (d)*</b>
D1.1	Annual status report including milestones from all WP's	LWA	31.12.2007	0.5	R	OK
D 1.2	Final report of the results of the WP's	LWA (all)	31.12.2010	1	R	ok

\* Deviations are to be further discussed in D

Milestones list (from application)

<b>Workpackage 1</b>			
<b>Milestone No</b>	<b>Milestone title</b>	<b>Delivery date</b>	<b>Fulfilled (ok) or deviations (d)*</b>
M1.1	Upstart of the project	03.01.07	ok
M1.2	Annual co-ordination meeting	31.08.07	ok

\* Deviations are to be further discussed in D

(The nature of the deliverables must be indicated by S = publication in scientific journal with peer review; P = publication in journals without peer review; R = reports; C = presentation at meetings and congresses or O = other types of deliverables, e.g., prototypes, models, websites, etc.).

## Deliverables list (from application)

<b>Workpackage 2</b>						
<b>Deliverable No</b>	<b>Deliverable title</b>	<b>Lead scientist</b>	<b>Delivery date</b>	<b>Allocated scientific person moths</b>	<b>Type of deliverable</b>	<b>Fulfilled (ok) or deviations (d)*</b>
D2.1	A popular paper on the multifunctional role of organic agriculture in Denmark.	TDA	31.09.2008	1.2	P	
D 2.2	Web based maps over organic farming structure and development in Denmark	MBG	31.03.2009	2.98(tech).	O	
D 2.3	A scientific paper submitted on the development of remote sensing techniques for analysing within field structural diversity. The paper will include a comparison of different fields from organic and conventional farms in order to try to identify significant differences between organic and conventional farms.	PKB	31.03.2010	4	S	
D 2.4	A scientific paper submitted on the multifunctional role of organic agriculture (co-deliverable with the DARCOFIII financed project Bioconcens. Case study on the multifunctional role of organic bioenergy production).	TDA	31.03.2010	2.05	S	

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## Milestones list (from application)

<b>Workpackage 2</b>			
<b>Milestone No</b>	<b>Milestone title</b>	<b>Delivery date</b>	<b>Fulfilled (ok) or deviations (d)*</b>
M2.1	Relevant farm sites for empirical data collection in WP3, WP4, WP5 and WP6 and the modelling in WP7 is defined together with these WPs	03.01.07	d
M2.2	An organic farm typology ready for implementation in GIS	01.04.08	
M2.3	Farm typology incl. information on organic/conventional farming coupled to field polygons in the GIS-landscapes, and delivered to WP7	06.06.09	
M2.4	National grid maps of farming structure development in Denmark ready.	01.12.08	
M2.5	Remote sensed images ready for habitat diversity analysis of organic farms and fields	31.03.09	

- Deviations are to be further discussed in D

<b>Workpackage 3</b>						
<b>Deliverable No</b>	<b>Deliverable title</b>	<b>Lead scientist</b>	<b>Delivery date</b>	<b>Allocated scientific person moths</b>	<b>Type of deliverable</b>	<b>Fulfilled (ok) or deviations (d)*</b>
D3.1	A scientific paper comparing the weed density and diversity in organic with the meas-	MBP	submitted 30.06.2009	3.0	S	

	measurements from conventional farming from Topping et al. (2004).					
D3.2	A scientific paper comparing the insect density and diversity in organic with the measurements from conventional farming from Topping et al. (2004).	MBP	submitted 31.01.2010	3.0	S	
D3.3	Popular publication comparing weed and insect diversity and densities in extensively and intensively cultivated organic fields.	MBP	submitted 31.03.2010	1.75	P	

<b>Workpackage 3</b>					
<b>Milestone No</b>	<b>Milestone title</b>			<b>Delivery date</b>	<b>Fulfilled (ok) or deviations (d)*</b>
M3.1	Investigation farms selected			31.03.07	ok
M 3.2	Sampling programme planned in detail			31.03.07	Ok
M 3.3	Sampling programme 2007 finished			31.07.07	ok
M3.4	Sampling programme 2008 finished			31.07.08	
M3.5	Investigation on food chains planned in detail			31.03.08	
M3.6	Sampling of data for food chain analyses finished			31.08.08	

\* Deviations are to be further discussed in D

- Deviations are to be further discussed in D
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<b>Workpackage 4</b>						
<b>Deliverable No</b>	<b>Deliverable title</b>	<b>Lead scientist</b>	<b>Delivery date</b>	<b>Allocated scientific person months</b>	<b>Type of deliverable</b>	<b>Fulfilled (ok) or deviations (d)*</b>
D4.1	A scientific paper comparing the insect density and diversity in organic with the measurements from conventional farming from Topping et al. (2004).	BST	submitted 31.03.2010	2.2	S	
D4.2	A popular Danish publication on flowering period, flowering frequency and seed production in hedges on organic and conventional farms.	BST	submitted 31.12.2010	1.1	P	

<b>Workpackage 4</b>					
<b>Milestone No</b>	<b>Milestone title</b>			<b>Delivery date</b>	<b>Fulfilled (ok) or deviations (d)*</b>
M4.1	Sampling programme for flowering period and seed production planned in detail			30.04.07	ok

M4.2	Sampling programme 2007 finished	30.09.07	ok
M4.3	Sampling programme 2008 finished	30.09.08	
M4.4	Results made available for the synthesis	31.01.09	

\* Deviations are to be further discussed in D

<b>Workpackage 5</b>						
<b>Deliverable No</b>	<b>Deliverable title</b>	<b>Lead scientist</b>	<b>Delivery date</b>	<b>Allocated scientific person moths</b>	<b>Type of deliverable</b>	<b>Fulfilled (ok) or deviations (d)*</b>
D5.1	Publication 1: Dispersal patterns of small mammals in organic and conventional farms (submitted, April 2008)	TSJ	30.04.2008	8	S	
D5.2	M.Sc. Thesis (June 2008)	TSJ	31.07.2008	1	O	
D5.3	Publication 2: Small mammal diversity and density in organic and conventional farms (submitted March 2008)	TSJ	31.03.2009	8	S	
D5.4	Congress poster 2: As above (August 2009)	TSJ	31.08.2009	0.5	O	
D5.5	Congress poster 1: As above (August 2010)	TSJ	31.08.2010	1	O	

\* Deviations are to be further discussed in D

<b>Workpackage 5</b>			
<b>Milestone No</b>	<b>Milestone title</b>	<b>Delivery date</b>	<b>Fulfilled (ok) or deviations (d)*</b>
M5.1	Establishment of grids and traplines, genetic sampling	31.05.07	d
M5.2	Dispersal studies and telemetry of small mammals	31.09.07	ok
M5.3	Genetic sampling publication 1	31.05.08	d
M5.4	Nature quality sampling	31.09.08	d
M5.5	Data analysis publication 2	31.12.09	
M5.6	Models, synthesis and final report.	30.06.10	

\* Deviations are to be further discussed in D

<b>Workpackage 6</b>						
<b>Deliverable No</b>	<b>Deliverable title</b>	<b>Lead scientist</b>	<b>Delivery date</b>	<b>Allocated scientific person moths</b>	<b>Type of deliverable</b>	<b>Fulfilled (ok) or deviations (d)*</b>
D6.1	Scientific publication: Genetic dispersal rate and direction of the field vole <i>Microtus agrestis</i> . Conventional versus organic farming (Ph.D).	LWA	submitted 31.07.2010	4	S	d
D6.2	Scientific publication: Genetic dispersal rate and direction of the grey partridge, <i>Perdix perdix</i> . Conventional versus organic farming (Ph.D).	LWA	submitted 31.07.2010	4	S	d

D6.3	Scientific publication: Impact of dispersal ability on genetic differentiation and the estimated migration rates and directions in conventional versus organic farming (Ph.D).	LWA	submitted 31.07.2010	4.5	S	d
D6.4	Scientific publication: Genetic dispersal rate and direction of the ground beetle, <i>Bembidion lamrpus</i> . Conventional versus organic farming.	LWA	submitted 31.10.2010	8.9	S	d
D6.5	Ph.D. thesis delivered.	LWA	31.07.2010	2	O	d
D6.6	Report: The role of organic farms as genetic sources for species in the arable land.	LWA	31.12.2010	3	R	

\* Deviations are to be further discussed in D

<b>Workpackage 6</b>					
<b>Milestone No</b>	<b>Milestone title</b>		<b>Delivery date</b>	<b>Fulfilled (ok) or deviations (d)*</b>	
M6.1	Testing of primers for the ground beetle, field vole and grey partridge and start of genetic analyses in the laboratory start.		01.09.07	d	
M6.2	Ph.D. start		01.08.07	d	
M6.3	Genetic analyses of the three species in the laboratory continued from the first sampling period and second sampling period (Ph.D. and technician) finished.		31.12.08		
M6.4	Genetic analyses of the grey partridge (depending on sampling success) finished.		31.03.09		
M6.5	Data analyses of the genetic data completed and writing of papers in process. Feeding data to WP7.		31.12.09		
M6.6	Writing papers and Ph.D. completed (31.07.10).		31.07.10	d	
M6.7	Development of migration model for the ground beetle completed and writing of scientific publications (submitted) and report completed.		31.12.10	d	

\* Deviations are to be further discussed in D

<b>Workpackage 7</b>						
<b>Deliverable No</b>	<b>Deliverable title</b>	<b>Lead scientist</b>	<b>Delivery date</b>	<b>Allocated scientific person moths</b>	<b>Type of deliverable</b>	<b>Fulfilled (ok) or deviations (d)*</b>
D7.1	Scientific publication on modelling the impact of landscape configuration of organic farms on the population genetics of field voles (Ph.D.).	CJT	31.07.2010	1.8	S	
D7.2	Scientific publication: Evaluating the interaction between farming management, and organic farm structure and the population and spatial dynamics of the species modelled in ALMaSS.	CJT	30.09.2010	2	S	
D7.3	Scientific publication on the development and application of the landscape index for wildlife.	CJT	31.12.2010	2	S	
D7.4	Report 1: Evaluation of the role of organic farming in the landscape for the range of indicator species chosen.	CJT	31.12.2010	3 + 5 from other VIP	R	

\* Deviations are to be further discussed in D

<b>Workpackage 7</b>			
<b>Milestone No</b>	<b>Milestone title</b>	<b>Delivery date</b>	<b>Fulfilled (ok) or deviations (d)*</b>
M7.1	Scenario inputs data (configurations) completed	30.06.08	
M7.2	ALMaSS Scenarios completed	31.12.09	
M7.3	Development and application of landscape index complete	30.06.10	
M7.4	Report (D7.1) (Project conclusion )	31.12.10	

\* Deviations are to be further discussed in D

## D. Description of deviations and subsequent adjustments of plans

**WP2:** M2.1 should select relevant farm sites for empirical data collection in WP3, WP4, WP5 and WP6. January 2007 the first meeting was held where the participants went to inspect the digitalised study areas near Bjerringbro to investigate whether this area was suitable for the empirical data collection. The website <http://www.djfgeo.dk/refugia/> was created to exchange information regarding map and farms. At the following two meetings in Silkeborg and Århus, the selection work continued. Finally, it was concluded that it was not possible to find all the relevant study areas within the 10X10 km digitalised Bjerringbro area, and it was decided to include localities outside this area as well. Most of the relevant farmers have been contacted and it is expected that all farmers are contacted by the end of 2007. M2.1 will then be fulfilled but delayed compared to the date 03.01.07.

**WP5:** M5.1 should establish grids and traplines of the field vole in order to collect samples for the genetic analysis of the species. In spring 2007 study areas at Kalø and Bjerringbro, Denmark were chosen for the genetic sampling of the field vole representing both organic and conventional farms. The areas contained hedges, meadows, small biotopes, ditches etc. Unfortunately, the population size of the field voles was very low which made it impossible to collect sufficient number of individual for the genetic analysis. In total 274 mice representing eight different species was trapped and only 21 were field voles. Due to the low density of the species the collection-period will be extended to include individuals trapped in autumn 2007 and winter 2007/2008. M5.3 "Genetic sampling publication 1" will be postponed due to the low number of field voles in spring and autumn 2007.

M5.4 "Nature quality sampling" spring and autumn 2008. For the biodiversity index based on the small mammalian fauna it was difficult to find suitable areas due to difficulties finding the wanted nature types and crop, and finding information on landowners. To get a suitable number of nature types and crops, the study area was extended beyond the digitalised 10X10 km area at Kalø and Bjerringbro. All contacted landowners were positive and wanted to participate in the project. The biodiversity study will consist of four parts involving 1) hedges, 2) small biotopes, 3) fields with crop, 4) grass areas.

**WP6:** In "The role of organic farms as genetic sources for the species in the arable land" a Ph.D. student was included, but conditioned on 2/3 funding from ISOBIS and University of Aarhus. The title of the project is "Landscape population genetics and the role of organic farming". However, the application round for Ph.D. funding has changed and the results of the application will not be available before the end of September start October. WP6 consists of genetic analyses of three species, grey partridge, field vole and a beetle. The field vole and beetle is a part of the Ph.D. project where the student amongst others should develop microsatellite primers for the beetle. Furthermore, as stated in WP5, the population sizes of field voles are extremely low this year, which made sample collection for the genetic analysis impossible. Samples from the grey partridge will be collected at the end of the year 2007 in connection with snow. Therefore there is no basis for starting analysis in the laboratory this year.

## E. Project publications and other products

### 1. Products from Organic Eprints archive

None

### 2. Other products (oral presentations, public meetings, field days, etc.)

There is no scientific publication from the project due to the early days. However, information on the project is given at the website <http://www.refugia.elr.dk>, <http://www.refugia.elr.dk/uk/>, <http://www.foejo.dk/>, <http://www.darcof.dk/>, and in FØJOeNyt, "Nyhedsbrev fra FØJO" August 2007, DMUNyt no. 14 6. Sept. 2007, AU-gustus no.2 June 2007: Økologi v.s. markens dyr og planter. pp 28-29

## F. Scientific education

A master student was connected to WP2, but due to personal reasons the student stopped and it is not known when the work will be resumed.

A master student, Kimmie Knakkegaard Christensen, is connected to WP4. The objective of the thesis is to analyse the data from the hedges and to look at the effect of the herbicide "Starane" on the flowering time and pollen production of dandelion and red clover. The thesis is expected to be finished spring 2008 and will contribute considerable to the knowledge regarding the effect of herbicides on flowering.

A master student, Rasmus Høyer, is connected to WP5. The thesis will be based on results of the telemetry part of the project.

A Ph.D. student is included in WP6 conditioned on additional funding can be found. The purpose of the project "Landscape population genetics and the role of organic farming" is to analyse the landscape genetics of the ground beetle and the field vole from nearby conventional and organic farms in order to identify the microevolutionary processes of gene flow and drift within the two kind of farming methods to address the role of organic farms as gene resource. Hence, to a) analyse the amount of genetic diversity and possible reduction of genetic diversity (bottleneck) in the two species on organic and conventional farms, b) analyse the genetic population structure of the two species and c) to estimate the spatial scale and direction of dispersal. Furthermore, the empirically identified migration patterns should be used to validate migration patterns obtained from existing agent-based behaviour models (ALMaSS) of the beetle and the field vole. Subsequently ALMaSS will be used to scale the results from local field site to landscape scales to investigate the potential impact of different landscape configurations of organic farms on the population genetics of the two species.

### **G. National and international cooperation**

There is continuous international cooperation with the partners in the EU-network "Landscape Tomorrow" (<http://www.landscape-tomorrow.org/>) and with the EU-project MEA-scope (<http://www.mea-scope.org/>).

### **H. Critical reflection on the project**

The project has just started and most of the planned sampling collection has been conducted.

In WP2 the work plan will follow the description. Additionally the participants in WP2 have been asked to contribute to DARCOF's comprehensive synthesis of growth and development in organic farming.

For WP3 the planning and sampling was conducted 3-4 times depending on the crop. Sampling was delayed due to difficulties finding the fields. The work regarding species identification of insects, weighing of plant material and the planning of next years sampling are ongoing. Furthermore the collected data from 2007 are being processed.

For WP4 the M4.1 are fulfilled although there amount of time used was considerable higher for NERI/TERI than planned due to difficulties finding the suitable areas, fields and hedges. Furthermore, there might be problems regarding the different types of organic and conventional farms (extensive and intensive) represented by the sampled hedges because the farms were not characterised as planned by WP2. This problem has been presented to the project manager. The sampling went as planned and the rest of the sampling will be finished (M4.2) by September 2007. Data processing and sorting of collected material is ongoing.

For WP5 the major problems were defining suitable areas that could fulfil the different parts of the project because the areas should be found within the landscape digitalised in the ALMaSS model (WP7).

For WP6 the project included a Ph.D. study where the genetic analysis depended on samples from the field vole and a ground beetle. Due to the low numbers of field voles and the altered conditions for Ph.D. funding it was unwise to start the analysis in the laboratory. If the Ph.D. is granted the delay will postpone the completion of the Ph.D. to the end of 2011, and will delay D6.6 and either D6.1 or D6.4 depending on the starting time of the Ph.D.

## 8. Budget

### A. Account for any change in budgets

Deviations regarding milestones and deliverables given above accounts for the changes in the budgets from the different institutions and departments participating in the project. The changes are specified in the different budgets under "Comments" for each department.

### B. Budget for the whole project (1.000 DKK)

Total consumption of funds from DARCOF and expected consumption this year and coming years

Year:	Original budget	Consumption 2005 /2006	Expected consumption 2007	2008	2009	2010	Total
Man-months							
Scientific personnel	80		11.2	30.05	16.4	22.35	80
Technical personnel	49.28		18.26	28.45	2.32	0.25	49.29

Year:	Original budget	Consumption 2005/2006	Expected consumption 2007	2008	2009	2010	Total
Salaries							
Scientific personnel	3659509		470331	1347248	757527	1084403	3659509
Technical personnel	1527144		558488	898824	73844	7950	1539106*
Other operational costs	620087		174438	306849	74842	59000**	615129**
Equipment	16000		16000				16000
Others (please specify)	5000					5000**	5000**
Direct costs	5822740		1219257	2550913	906171	1156353	5832694*
Indirect costs (20% of direct costs)	1164546		243852	510182.6	181234.4	231270.2	1166539*
Total	6987286		1463109	3061096	11087405	1387623	6999233*

#### Comments:

\*The observed difference between the original budget and the budget in the progress report is due to moving work from 2007 to 2008. The two NERI departments will pay the difference.

\*\* A failure happened in the original budget as the "Others" was added to the operational costs.

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9. Signatures and stamps

Name	Institute	Date	Signature
Head of project			

## Appendix I. Detailed budget

### A. Budget for each participating institute (1.000 DKr)

Name of Institute and department: **Aarhus University, Faculty of Agricultural Sciences, Inst. of Agroecology and Environment. Research Centre Foulum.**

Year:	Original budget	Consumption 2007	Expected consumption 2008	2009	2010	Total
Man-months						
Scientific personnel	1	1	3.75	2	1.5	
Technical personnel	1.25	1.26	1.15	0.32	0.25	

Year:	Original budget	Consumption 2007	Expected consumption 2008	2009	2010	Total
Salaries						
Scientific personnel	50950	50950	197825	110400	88550	
Technical personnel	39500	39500	35825	10000	7950	
Other operational costs	20000	20000	25000	22800	25000	
Equipment	16000	16000				
Others (please specify)						
Direct costs	126450	126450	258650	143200	121500	
Indirect costs (20% of direct costs)	25290	25290	51730	28640	24300	
Total	151740	151740	310380	171840	145800	

**Comments:** No changes

Name of Institute and department: **Natural History Museum, Aarhus, Wilhelm Meyers Allé 210, 8000 Aarhus C**

Year:	Original budget	Expected consumption 2007	2008	2009	2010	Total
Man-months	23	7.8	7.3	5.9	2.0	23
Scientific personnel	19.5	5.8	5.8	5.9	2.0	19.5
Technical personnel	3.5	2.0	1.5			3.5

Year:	Original budget	Expected consumption 2007	2008	2009	2010	Total
Salaries						
Scientific personnel	822251	237981	242748	248716	92806	822251
Technical personnel	99948	56628	43320			99948
Other operational costs	185000	128000	42000	15000		185000
Equipment						
Others (please specify)	5000				5000	5000
Direct costs	1112199	422609	328068	263716	97806	1112199
Indirect costs (20% of direct costs)	222439	84522	65614	52743	19561	222440
Total	1334638	507131	393682	316459	117367	1334639

**Comments:**

The numbers of man months (scientific) are changes to 5.8 mth in 2007, 5.8 mth in 2008 and additional 4.9 months in 2009.

**B. Budget for each participating department (1.000 DKK)**

Name of Institute and department: **National Environmental Research Institute (NERI), University of Aarhus, Department of Terrestrial Ecology, Vejlsovej 25, P.O. Box 314, DK- 8600 Silkeborg**

Year: 2007	Original budget	Consumption 2005/2006	Expected consumption 2007	2008	2009	2010	Total
Man-months							
Scientific personnel	16.55		3.4	3.5	4	5.65	16.55
Technical personnel	42		15	25	2	0	42

Year:2007	Original budget	Consumption 2005/2006	Expected consumption 2007	2008	2009	2010	Total
Salaries							
Scientific personnel	778865		151995	161161	189708	276001	778865
Technical personnel	1306947		462360	790697	63844		1316901
Other operational costs	74000		23000	20000	17000	14000	74000
Equipment							
Others (please specify)							
Direct costs	2159812		637355	971858	270552	290001	2169766
Indirect costs (20% of direct costs)	431962.4		127471	194371.6	54110.4	58000.2	433953.2
Total	2591774.4		764826	1166229.6	324662.4	348001.2	2603719.2

**Comments:**

6 technical months are moved from 2007 to 2008 due to changes in WP6.

Name of Institute and department: **National Environmental Research Institute (NERI), University of Aarhus, Department of Wildlife Ecology and Biodiversity, Grenåvej 12, 8410 Rønne, Denmark**

Year: 2007	Original budget	Consumption 2005/2006	Expected consumption 2007	2008	2009	2010	Total
Man-months							
Scientific personnel	35.7		1	17	4.5	13.2	35.7
Technical personnel	0.8			0.8		0	0.8

Year:2007	Original budget	Consumption 2005/2006	Expected consumption 2007	2008	2009	2010	Total
Salaries							
Scientific personnel	1610668		29405	745514	208703	627046	1610668
Technical personnel				26974			26974
Other operational costs	263287		3438	219849	20000	20000	263287
Equipment							
Others (please specify)							
Direct costs	1873955		32843	992337	228703	647046	1900929
Indirect costs (20% of direct costs)	374791		6569	198467	45741	129409	380186
Total	2248746		39412	1190804	274444	776455	2281115

**Comments:**

1.4 man months are moved from 2007 to 2008. 138.000 DKR operational costs are moved from 2007 to 2008.

**C. Budget for co-financing from each participating institute (1.000 DKK)**

Name of Institute and department: **Aarhus University, Faculty of Agricultural Sciences, Inst. of Agroecology and Environment. Research Centre Foulum**

Year:	Original budget	Consumption 2005/2006	Expected consumption 2007	2008	2009	2010	Total
Man-months							

Salaries							
Scientific personnel							
Technical personnel							
Other operational costs							
Equipment							
Others (please specify)							
Direct costs							
Indirect costs (20% of direct costs)							
<b>Total</b>	195587		38060	77853	43103	36571	195587

**Comment:** Co-financing consists of the difference between the allowed indirect costs (20 %) and the actual indirect costs.

Name of Institute and department: **National Environmental Research Institute (NERI), University of Aarhus, Department of Terrestrial Ecology, Vejlsovej 25, P.O. Box 314, DK- 8600 Silkeborg**

Year:	Original budget	Consumption 2005/2006	Expected consumption 2007	2008	2009	2010	Total
Man-months							

Salaries							
Scientific personnel							
Technical personnel							
Other operational costs							
Equipment							
Others (please specify)							
Direct costs							
Indirect costs (20% of direct costs)							
<b>Total</b>	<b>2073419.52</b>		<b>611860.8</b>	<b>932983.68</b>	<b>259729.92</b>	<b>278400.96</b>	<b>2082975.4,</b>

**Comment:** Co-financing consists of the difference between the allowed indirect costs (20 %) and the actual indirect costs (116 %)

Name of Institute and department: **National Environmental Research Institute (NERI), University of Aarhus, Department of Wildlife Ecology and Biodiversity, Grenåvej 12, 8410 Rønne, Denmark**

Year:	Original budget	Consumption 2005/2006	Expected consumption 2007	2008	2009	2010	Total
Man-months							

Salaries							
Scientific personnel							
Technical personnel							
Other operational costs							
Equipment							
Others (please specify)							
Direct costs							
Indirect costs (20% of direct costs)							
<b>Total</b>	<b>1824899</b>		<b>31529</b>	<b>952644</b>	<b>219555</b>	<b>621164</b>	<b>1824892</b>

**Comment:** Co-financing consists of the difference between the allowed indirect costs (20 %) and the actual indirect costs (116 %)

