Danish Research Centre for
Organic Food and Farming

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)

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1. Project title and acronym:

Biomass and bioenergy production in organic agriculture – consequences for soil fertility, environment, spread of animal parasites and socio-economy.
Acronym: BioConcens

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2. Project journal number

3304-FOJO-05-26

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3. Project period (month, year)

Start of project: 01-01-2007
End of project: 31-12-2010

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

A. Project summary

Table A.1: Work package list

WP	WP title	Responsible	Budget	Start	End	Deliverable No.

No.		scientist	mill. DKK			
1	Co-production of biogas, bio-ethanol and animal feed from organic raw materials	Mette Hede-gaard Thos-men (MHT)	4.838	Jan 07	Dec 10	D1.1-D1.7
2	Strip intercropping system for biomass production	Henrik Hauggaard-Nielsen (HHN)	2.155	Jan 07	Dec 10	D2.1-D2.4
3	Effects of bioenergy production on soil quality and survival of parasites and weed seeds.	Anders Jo-hansen (AJ)	2.524	Jan 07	Dec 10	D3.1-D3.7
4	Emissions of greenhouse gases from strip intercropping and green/animal manures	Per Ambus (PA)	2.278	Jan 07	Dec 10	D4.1-4.4
5	Scenarios for bioenergy production in organic agriculture and socio- economic analysis	Lars Henrik Nielsen (LHN)	2.100	Jan 07	Dec 10	D5.1-D5.5
6	Coordination	Erik Steen Jensen (ESJ)	105	Jan 07	Dec 10	D6.1-D6.2
Total			14.000			

Objectives and expected achievements

WP1

- Conversion of grass-clover, animal manure, energy crops (maize and rye) and agro-industrial by-products from organic farming to biogas, bioethanol and fodder protein in laboratory and full scale studies.
- Design of a process for co-production of biogas and bioethanol/protein fodder and evaluation of energy balances.

WP2

- To determine the effect of intercropping a grass-clover based perennial forage crop mixture (soil fertility building crop) and annual biomass crops in strips on the biomass and grain yields compared to sole cropping of the same species.
- To determine the potential interactions between intercrop border rows and associated mechanisms responsible for a potentially improved resource use (e.g. nutrients, light, water) compared to sole cropping.
- To determine the effects of green manure from the soil fertility-building strip on the annual bio-mass crops and the effect on plant growth of nutrients and residues recycled from biogasification.

WP3

- To determine soil quality as affected by application of animal manure (non-treated, processed in biogas reactors or aerobically decomposed)
- Determine trends in the effects of the manure treatments on the genetic and functional diversity of micro-biota, the soil structure, and the organic matter content and its quality over the entire project period.
- To measure the capability of biogasification processes in inactivating parasite eggs in the manure (especially Ascaris suum, which acts as an indicator organism)
- To determine the effect of biogasification on the survival of weed seeds in manure.

WP4.

- To determine emissions of nitrous oxide (N2O) associated with the production of plant biomass in strip-intercropping
- To determine emissions of non-CO2 greenhouse gases (N2O and CH4) associated with i) the application of bioenergy residues for agronomic purposes, and ii) the storage (pre-treatment) of green/ animal manure for bioenergy utilization.
- To evaluate quality parameters and C-sequestration potential of bio-energy residues

WP5

- To carry out detailed partial analyses of socio-economic and corporate-economic, environmental and energy balance effects of investigated alternatives in WP1 to WP4 within organic agriculture. The socio-economic analyses include quantification and monetization of externalities. Partial analyses form part of the basis for the selection and setting up of scenarios.
- To model matter flows and greenhouse gas balances for grass clover based crop rotations, and organic biogas energy production systems.
- To define scenarios and carry out scenario analyses of overall corporate and socio-economic, environmental and energy balance consequences of integrating biogas and bio-ethanol production in organic agriculture. The scenario analyses will focus on the potentials for grass clover based biogas energy production systems, and multi-functionality impact assessments of the positive and negative externalities of such systems. Furthermore, the scenario analyses will reflect overall effects of strip cropping systems and complementary energy crop production investigated in WP1 to to WP4. The alternative scenarios will be evaluated relative to existing practice in organic agriculture.

WP6

- Co-ordination of the research activities and dissemination of results.

Midterm results and progress

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

WP1

Task 1.1 Biogas and bioethanol potential of selected raw materials
All substrates for biogas and ethanol potential have been obtained with the exception of organic cattle manure and organic inoculum for biogas production that is expected to be delivered in week 38. The characterization of the substrates is initiated and estimations of the biogas potential will be initiated in week 38 or 39.

Task 1.2 Biogas production
We have initially examined the market for appropriate lab-scale biogas reactors able to treat manure and the reactors will be ordered end of September.

Task 1.4 Co-production of biogas and ethanol
Fermentation of germinated grains for bioethanol production is well under way and the results have been satisfactory. It was shown that fermentation of malt was an efficient and fast process. The yield after 48 h was actually higher than achieved with commercial enzymes. Already after 24 h 90 % of the ethanol had been produced. In fermentation with 20 % water soluble sugars, 65 g/L of ethanol was formed. It was also possible to exchange 50% of the malt with un-malted rye starch and still achieve the same ethanol yield.

Organic cheese-whey from Thise Dairy has been used for ethanol production by fermentation with the lactose-fermenting yeast *Klyveromyces marxianus*. The optimum conditions for *K. marxianus* were found to be pH 6 and a temperature of 40°C. It was possible to ferment whey by directly inoculation of the yeast giving an ethanol-yield of approx. 0.5% in batch fermentations of raw non-sterilized whey.

Task 1.5 Pilot and full scale test
Preliminary pilot-scale biogas experiments with maize have been performed using thermophile and mesophile conditions. Smaller scale experiments with grass have been carried to examine if the process can be fed with a mixture of grass, water, and re-circulated degassed materials. Results have shown that the best feed is re-circulated degassed material or fresh manure compared to water. Furthermore, biogas experiments in pilot- and laboratory scale have been performed with residue from ethanol fermentation and potato waste from the potato starch production.

WP2
In collaboration with the WP3 and WP4 workpackage leaders a complete one-factorial randomized design with four replicates was decided for the general field design. Together with sub-contractor KU Life it was agreed to establish the trials in the organic Combined Food and Energy system (organic since 1995) at KU Life Taastrup. It is a 7.5 ha area divided into sub areas of 200, 50, 100 and 150 meter field lengths separated by hedgerows of willow, hazel and alder. There is a four year rotation established within the four sub-areas consisting of barley undersown with clover-grass, 1st year clover-grass, 2nd year clover-grass and winter wheat. Under the leadership of WP2 each growth cycle will be initiated in the 1st year clover-grass field by moulding the sward in specific strips (6 x 14 meter) according to the sowing of the annual autumn sown biomass crops leaving the other part of the sward as the soil-fertility building strip (SFB). The WP2 maize strip cropping system is placed in the 50 meter field, and the rye-vetch intercrop system in the 100 meter field. The moulding took place 28 August and the plots will be sown ultimo September or primo October depending on the local climatic conditions for appropriate seedbed preparation.

WP3
Task 3.1
The work in WP3 has involved a 6-month stay at Landcare Research in NZ, working as a guest scientist together with Drs Bryan Stevenson and Graham Sparling, to get familiar with the catabolic response profile (CRP) method. The CRP method (together with the MicroResp method – see section H) is regarded the best method to measure the functional diversity of microbial communities in soil and is a key-technique in Task3.1 and 3.2. This method was successfully applied in WP3 experimental work conducted at the Landcare Research. The work included two NZ soils from organic farming systems (Templeton and Ballantray, respectively) and treatments with three types of biomaterials: 1) waste stream material from bioethanol production (based on rye straw; 2) rye straw; 3) clover-grass mixture - as well as a control with no amendment. In this way the effects of the waste material on soil quality parameters could be compared with the unfermented input material (rye straw) and a commonly uses fertilizer (clover-grass). Biomaterials were produced in accordance with organic principles by WP1,2 partners in BIOCONCENS. Preliminary analysis of the CRP data indicates that the functional diversity of the soil is generally very high and not significantly different between any of the treatments or time of harvest. Principal component analysis shows (in general) that this method can distinguish between the treatments - not least at 10 mg biomaterial g^{-1} dry soil. Likewise, results for the soil concentration of mineral N show only little dif-

ference between treatments, except at the highest level of amendment where bioethanol waste material caused a substantial drop in the nitrate concentration – probably due to the readily available C in this material. However, these results have to be interpreted together with the results for the remaining assays to get a more clear picture of how the waste materials from bioethanol production affects the soil quality.

Task 3.3
Ascaris suum eggs have been isolated from porcine faeces and are currently used for in vitro incubation experiments in buffer and at a range of temperatures realistic for Danish biogas plants. Experimental systems in small-scale biogas reactors have been designed in co-operation with WP1 and are expected to be finalised within 2007, while experiments in large-scale reactors are being planned to start early 2008.

WP4
For measurements of greenhouse gas soil-air exchange in strip-intercrops, a static flux-chamber has been developed and manufactured. The chambers have been installed in the experimental site in order to commence the monitoring program in August 2007 (D4.1)

WP5
Kick-off meeting activities only.

WP6
The whole-day kick-off meeting of the project was held on the 8. May at Risø DTU. The participant discussed and formulated the main values for them as project and there was a presentation of the six work-packages and dissemination activities. The next project meeting (2-day) will be held in November 07.

C.2 Fulfilment of deliverables and milestones

Deliverables list

Workpackage 1						
Deliverable No	**Deliverable title**	**Lead scientist**	**Delivery date**	**Allocated scientific person moths**	**Type of deliverable**	**Fulfilled (ok) or deviations (d)***
D1.1	Paper on pilot scale experiments with biogas and protein production from energy crops	ABT	M24	2	S	
D1.2	Development and validation of a model for digestion of biomass for energy and protein.	ABT	M26	14	S	
D1.3	Paper on new designs for high dry-matter anaerobic digestion systems of biomass.	ABT	M30	2	S	
D1.4	Paper on potential biomass, crops and wastes from organic farming for biogas production.	ABT	M31	5	S	
D1.5	Paper on combined biogas and ethanol production using most relevant biomass materials from organic	ABT	M44	14	S	

	farming.					
D1.6	Paper on combined biogas and protein fodder production in organic farming using grass-clover and whey-permeate as raw materials.	ABT	M45	3	S	
D1.7	2 Ph.d. theses including aspects of "combined biogas, ethanol and protein production in organic farming".	ABT	M42	39	R	

** Deviations are to be further discussed in D*

Milestones list (from application)

Workpackage 1			
Mileston No	**Milestone title**	**Delivery date**	**Fulfilled (ok) or deviations (d)***
M1.1	A biogas process for efficient utilization of energy crops and manure in organic farming	M15	
M1.2	Development of a digester running on energy crops with high dry matter	M15	
M1.3	Development of natural enzymes for ethanol production in organic farming	M25	

** 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.).

Workpackage 2						
Deliverable No	**Deliverable title**	**Lead scientist**	**Delivery date**	**Allocated scientific person moths**	**Type of deliverable**	**Fulfilled (ok) or deviations (d)***
D2.1	Paper on the effects of strip intercropping concept with perennial diversified grass-clover strip and annual maize and winter rye-winter vetch intercrop as energy crops	HHN	M36	10	S	
D2.2	Report on the competitive interactions between strips of perennial diversified grass-clover and an-nual maize and winter rye-winter vetch intercrop with special emphasis on light and water utilization	HHN	M44	4	R	
D2.3	Paper on resource use by annual-perennial strip intercrop system for bioenergy production as influenced by application of grass-clover green manure and residues from biogasification	HHN	M47	10	S	

D2.4	Dissemination in farmers magazines on the potential benefits of strip intercropping	HHN	M48	1	O	

Workpackage 2			
Mileston No	**Milestone title**	**Delivery date**	**Fulfilled (ok) or deviations (d)***
M2.1	Preliminary evaluation of the effect of strip intercropping perennials with annual bioenergy crops has been determined	M24	
M2.2	Light and water utilization between intercropped strips has been determined	M30	
M2.3	The effect of organic residue from green manure, animal manure and biogasified animal manure on energy crop yield has been determined	M36	
M2.4	Characterization of N conservation by growing maize as compared to winter rye-winter vetch mixture in strip intercropping systems	M42	

Workpackage 3						
Deliverable No	**Deliverable title**	**Lead scientist**	**Delivery date**	**Allocated scientific person moths**	**Type of deliverable**	**Fulfilled (ok) or deviations (d)***
D3.1	Publication on short-term effects of manure treatment (composted/degassed) on soil quality biological indicators	AJ	26	10	S	
D3.2	Dissemination in farmers magazine on effects of manure treatment (composted degassed) on soil quality biological indicators	AJ	32	4	P	
D3.3	Publication on remains from biogas/bioethanol production effects on soil quality biological indicators	AJ	40	8	S	
D3.4	Publication describing the development of soil quality parameters (biological and soil structure) on longer terms as affected by the types of manure application	AJ	48	6	S	
D3.5	Publication evaluating the soil quality parameters used in the project	AJ	46	4	S	
D3.6	Report on the capacity of bioenergy-generating reactors in inactivating parasite eggs	AR	26	4	R	
D3.7	Report on effect of pretreatments and biogasification on weed seed	AJ	32	4	R	

	survival					

** Deviations are to be further discussed in D*

Workpackage 3			
Mileston No	**Milestone title**	**Delivery date**	**Fulfilled (ok) or deviations (d)***
M3.1	Field small-scale facility established	10	Ok
M3.2	Data set for short-term effects of manure and waste materials from bioenergy-generating reactors on soil biota	18	(ok)
M3.3	Results on long-term effects (field experiment) on manure/cropping system effects on soil quality	40	
M3.4	Data set on the effect of biogasification processes on the survival of weed seeds	22	
M3.5	Termination of the parasitological analyses	24	

** Deviations are to be further discussed in D*

Workpackage 4						
Deliverable No	**Deliverable title**	**Lead scientist**	**Delivery date**	**Allocated scientific person moths**	**Type of deliverable**	**Fulfilled (ok) or deviations (d)***
D4.1	Dataset for N_2O emissions from strip intercropping for evaluation of management practice (WP2) and sustainability (WP5)	PA	M16,28, 36	16	O	
D4.2	Knowledge on N_2O and CH_4 emissions from biomass pre-treatment and post application of remains to evaluate sustainability (WP5)	PA	M24, 36	7	O	
D4.3	Assessment of the degradability and C-sequestration potentials of bio-energy waste for evaluation of soil fertility (WP3)	PA	M36	7	O	
D4.4	Publication on N_2O emissions from strip intercropping	PA	M42	2	S	

** Deviations are to be further discussed in D*

Milestones list

Workpackage 4			
Mileston No	**Milestone title**	**Delivery date**	**Fulfilled (ok) or deviations (d)***
M4.1	Established gas flux chambers in strip-intercropping sys	M8	OK

M4.2	Achieved data for field emissions of N_2O	M34	
M4.3	Completed point-source measurements of N_2O, CH_4 and CO_2	M34	

Deliverables list (from application)

Workpackage 5						
Deliverable No	**Deliverable title**	**Lead scientist**	**Delivery date**	**Allocated scientific person moths**	**Type of deliverable**	**Fulfilled (ok) or deviations (d)***
D5.1	Economic assessment of bio-ethanol and biogas production in organic agriculture.	LHN	M42		S	
D5.2	Scenarios for bio-energy production in organic agriculture and socio economic analysis.	LHN	M52		S	
D5.3	Energy catchment farm database and GIS-map	TDA	M38		O	
D5.4	Paper submitted on dynamic modelling of the effects of bioenergy production on crop production, nitrate leaching and greenhouse gas emissions	JEO	M46		S	
D5.5	Paper submitted on the multifunctional role of bioenergy production in organic agriculture. An energy catchment case study (co-deliverable with the DARCOFIII financed project Refugia).	TDA	M48		S	

** Deviations are to be further discussed in D*

Milestones list (from application)

Workpackage 5			
Mileston No	**Milestone title**	**Delivery date**	**Fulfilled (ok) or deviations (d)***
M5.1	Method completion and detailed definition of reference and alternative scenarios.	M28	
M5.2	Definition of grass clover production systems to be modelled, and Selection of a relevant area for the energy catchment analyses, and definition of the farm data to be required from central databases	M32	
M5.3	Completion o f model tools developments in accordance with desired level of description. This includes adapting of the FarmGHG and the FASSET model to the grass clover systems defined	M36	
M5.4	Completion of data collection for partial analysis of corporate and socio-economy of biogas production within organic agriculture.	M34	
M5.5	Completion of data collection for partial analysis of corporate and socio-economy of bio-ethanol production within organic agricul-	M38	

	ture.		
M5.6	Results on: Partial analysis of economy of biogas production within organic agriculture.	M40	
M5.7	Results on: Partial analysis of economy of bio-ethanol production within organic agriculture.	M38	
M5.8	Results on: Analysis of economy of combined bio-ethanol and biogas production within organic agriculture.	M40	
M5.9	Model results on crop production, nitrate leaching and greenhouse gas emissions from the grass clover energy production systems defined	M44	
M5.10	Results on the multifunctional role of bioenergy production in the energy catchment	M46	
M5.11	Model results on: Scenarios for bio-energy production in organic agriculture and socio economic analysis.	M50	

** Deviations are to be further discussed in D*

Workpackage 6						
Delive-rable No	**Deliverable title**	**Lead scien-tist**	**Delivery date**	**Allocated scientific person moths**	**Type of de-liver-able**	**Fulfilled (ok) or devia-tions (d)***
D6.1	Annual Reports	ESJ	M13, 26,37,48	4	R	
D6.2	Popular articles (7/year)	ESJ	M12, 24, 36, 48	7	R	

Milestones list

Workpackage 6			
Mileston No	**Milestone title**	**Delivery date**	**Fulfilled (ok) or devia-tions (d)***
M6.1	Annual project meetings	M3, 11, 23, 35, 45	M3 was moved to M5 and OK

D. Description of deviations and subsequent adjustments of plans

In the original WP2 description it is stated that after two years the strips are interchanged and subsequent first year maize and winter rye-winter vetch intercrop will be sown in the previous grass-clover strips besides a SFB strip (clover-grass) in the strips previously grown with biomass crops. Using such design two circles of the strip intercrop system can be conducted during the project period. However, it has been discussed to change this slightly, because the precrop effect from incorporation of clover-grass swards are very well described and will also be included in the FØJO III CROPSYS project, where the BioConcens WP4 leader is participating. Likewise is the undersowing of clover-grass in cereals a standard procedure and well-described in the literature. Thus, in agreement with the project coordinator it has been decided to conduct three replicates of the biomass strip including i) maize as compared to rye – vetch intercrop followed by ii) winter triticale. Undersowing of clover-grass below triticale and interchange of the two strips will not be conducted. However, it will be a part of evaluating the strip cropping system including relevant scientific literature.

Project publications and other products

1. Products from Organic Eprints archive

Hauggaard-Nielsen, H; Ambus, P; Dalgaard, T; Johansen, A; Jørgensen, U; Nielsen, A.M.; Nielsen, L.H.; Olesen, J.E.; Roepstorff, A; Skytte, K; Smith, J.E.; Thomsen, A.B.; Thomsen, M.H. and Jensen, E.S. (2007) Biomass and bioenergy production in organic agriculture. Consequences for soil fertility, environment, spread of animal parasites and socio-economy. BioConcens, a 4-year interdisciplinary project.. Poster presented at 23rd NJF Congres, Faculty of Life Sciences, University of Copenhagne, Denmark, 26-29 June, 2007.

E.S., Jensen (2006) Skal energien øverst på det økologiske jordbrugs dagsorden?. *Forskningsnytt om økologisk landbruk i Norden*(4):pp. 3-4.

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

* 25-75% financed by DARCOF
** 5-25% financed by DARCOF

F. Scientific education

MSc Piotr Oleskowic –Popiel is employed as ph.d.-student in WP1 starting 1. September 2007. The first year of the Ph.D. is funded by a national grant from the Foundation for Organic Agriculture (FØL).

G. National and international cooperation

FREMAD project funded by the Danish Engestofte & Søholt foundation (www.berntsenfonden.dk) focusing on Danish biomass resources to be used for biofuel production to the transportation sector.
"Udviklingsinitiativer inden for biobrændsel og Biobrændstoffer I Region Sjælland" funded by Vækstforum Sjælland with participation of Roskilde University, Grønt Center and Risø DTU.

Co-operation with the DARCOF-III project “The effect of cropping systems on production and the environment (CROPSYS)”. The co-operation emphasizes development of measurement techniques and assessment of soil-crop interactions in the context of GHG emissions.

Risø DTU is involved in a series of national and international projects on co-production of 2G bioethanol biogas incl. cooperation with Dong Energy and Xergy.

Critical reflection on the project

WP1

As part of task 1.4 simultaneous saccharification and fermentation (SSF) of C6 sugars in grain using Bakers yeast and natural enzymes produced from germination of the grain will be demonstrated and optimized. The aim is to develop an ethanol production from grain that does not require addition of commercial enzymes, which are produced by GMO-fungi. It has been discussed if the GMO-produced enzymes could be used as a reference within the scope of this project - which should follow organic concepts and it was decided that GMO-enzymes could be used for reference experiments when comparing germination with more conventional processes.

WP2

At a meeting between WP1, WP2, WP3 and WP4 (where choice of raw-materials and exchange of degassed biomass and ethanol-residue were discussed) it was decided not to include deep-litter as a raw material for biogas production, and as a result the degassed deep litter will also not be used in WP2-4. However, deep litter will still be characterized in task 1.1 for both biogas and ethanol potential. Instead it was decided to use cattle liquid manure throughout the project, because it was the general understanding that this is a more interesting and more available substrate in organic farming. Deep litter is apparently not used so much any more in OF due ri the high cost and requirement of straw for other uses and deep litter is not a suitable substrate for biogas fermentation due to its very compacted nature (Henrik Møller pers. comm.)

BioConcens is regarded as an interdisciplinary project where e.g. the field activities will involve almost all participants and it requires sometimes time consuming communication between project partners. It is important that such communication is as time-efficient as possible taking into account the sometimes very busy everyday life most of the people involved in the project are experiencing. On the other hand some time needs to be allocated when participating in such a challenging project in order to secure that the quality of this communication is sufficient according to reach the ambitious goals set for the BioConcens project. It is recommended to try and formalise this collaboration a little more than during these early steps of the project in order to secure that the BioConcens consortium are aware of the needs for information and change of ideas/decisions to make across disciplines and WPs. It can be very frustrating to realise something could have been improved if just the knowledge was transferred from one partner to the other. The social atmosphere in the consortium is likewise important and it should be prioritised by the coordinator to keep the spirit in the remaining part of the project period on at least the same level as during these early stages of the project. At later stages it might even be more important to put emphasis towards integrating social activities within the scientific discussion and exchange to secure that the present nice environment in the consortium are maintained.

WP3

The CRP technique used for measuring the functional diversity in soil microbiota has proven stabile and relevant for the experimental work in WP3 - but also very laborious. However, a new development of the CRP method (using the same biological principles), MicroResp, has been developed. It is not so time consuming as the CRP technique and also seems even slightly more sensitive than the original method. Therefore, the MicroResp method will be employed, instead of CRP, in the rest of the experiments in WP3. This is not expected to have any impact on the project, except enhancing the quality of the data slightly.

Regarding experiments with parasite survival in biogas reactors, WP3 will use cattle manure instead of deep litter, as pointed out above. Moreover, Task3.3 will probably be finalized earlier than planned (June 2008) because the project had the opportunity to employ a scientist, particulary skilled with this area, to work on the project for this period of time, only.

WP6

The 12 months delay of the project have made the coordination a much bigger task than usual. The reason may be that the scientists engaged in developing together the research proposal cannot initiate their ideas within a reasonable time due to postponement. Therefore they need time to restart and build again the links which where formed during proposal writing. It is expected, however, that we will be able to re-create the spirit from the "days of idea generation and formulation" via the project meetings and other means of interaction.

8. Budget

A. Account for any change in budgets

The main reason for the lower consumption in 2007 is the post-poned start of the project due to a delayed funding contract and the need to use co-funding for a phd project in 2007 by other staff in the project. Minor amounts of operational costs was moved from 2007 to 2008.

B. Budget for the whole project (1.000 DKK)

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

Year: 2007	Original budget	Consump-tion 2007	Expected consump-tion 2008	2009	2010		Total
Man-months							
Scientific personnel	52.2	30.0	62.5	58.6	43.0		194.1
Technical personnel	15.1	13.9	17.1	11.8	5.2		48.0

Year: 2007	Original budget	Consump-tion 2007	Expected consump-tion 2008	2009	2010		Total
Salaries							
Scientific personnel	2117	1308	2777	2767	2154		9006
Technical personnel	460	445	582	413	199		455
Other operational costs	224	186	375	189	152		902
Equipment	94	92	13	11	5		121
Others (please specify)							
Direct costs	2895	2031	3747	3379	2510		11667
Indirect costs (20% of direct costs)	579	406	749	676	502		2333
Total	3474	2437	4497	4055	3012		14000

Comments: The main reason for the lower consumption in 2007 is the post-poned start of the project due to a delayed contract and the need to use co-funding for a phd project in 2007 by other staff in the project.

9. Signatures and stamps

Name	Institute	Date	Signature
Head of project Erik Steen Jensen	 Biosystems Department Risø National Laboratory DTU	 25. September 2007	

Appendix I. Detailed budget

A. Budget for each participating institute (1.000 DKr)

Name of Institute and department: Risø DTU

Year: 2007	Original budget	Consump-tion 2007	Expected consump-tion 2008	2009	2010		Total
Man-months							
Scientific personnel	32,3	10,6	42,5	44	30,5		127,6
Technical personnel	7	6,5	9	7,5	4,5		27,5

Year: 2007	Original budget	Consump-tion 2007	Expected consump-tion 2008	2009	2010		Total
Salaries							
Scientific personnel	1315	504	1895	2030	1505		5934
Technical personnel	246	232	331	284	178		1025
Other operational costs	146	127	242	119	111		599
Equipment	50	50					
Others (please specify)							
Direct costs	1756	912	2468	2433	1793		7606
Indirect costs (20% of direct costs)	351	182	494	487	359		1522
Total	2107	1095	2962	2919	2152		9128

Comments:
The main reason for the lower consumption in 2007 is that a funding was obtained from another source for the last non-funded year of the ph.d. student in WP1. The funding could only be used for research activities in 2007, but the PhD student could only be employed starting from 1. September. Consequently, the more permanent staff had to work on these resources so the DARCOF funding for this staff could be allocated for the ph.d. student later in the project.

A. Budget for each participating institute (1.000 DKr)

Name of Institute and department: Agroecology, Faculty Agricultural Science, AU

Year: 2007	Original budget	Consump-tion 2007	Expected consump-tion 2008	2009	2010	2011	Total
Man-months							
Scientific personnel	1,2	0,05	3,15	4,1	4,0		11,3
Technical personnel	1,3	0	2,7	1,8	0,7		5,2

Year: 2007	Original budget	Consump-tion 2007	Expected consump-tion 2008	2009	2010		Total
Salaries							
Scientific personnel	65	2	168	226	230		626
Technical personnel	40	0	86	58	21		165
Other operational costs	21	11	32	30	23		96
Equipment	2	0	13	11	5		29
Others (please specify)							
Direct costs	128	13	299	325	279		917
Indirect costs (20% of direct costs)	26	2	60	65	56		183
Total	154	16	359	390	335		1100

B. Budget for each participating department (1.000 DKK)

Name of Institute and department: AG-Eng, Faculty of Agriculture, AU

Year: 2007	Original budget	Consump-tion 2007	Expected consump-tion 2008	2009	2010		Total
Man-months							
Scientific personnel	6,5	6,5	5	2,5	0,5		14,5
Technical personnel	3	3	1	2,5			6,5

Year: 2007	Original budget	Consump-tion 2007	Expected consump-tion 2008	2009	2010		Total
Salaries							
Scientific personnel	247	247	188	129	27		591
Technical personnel	78	78	27	71			176
Other operational costs	42	42	29				71
Equipment							
Others (please specify)							
Direct costs	368	368	244	200	27		839
Indirect costs (20% of direct costs)	74	74	49	40	5		168
Total	442	442	293	240	32		1007

Comments:

Name of Institute and department: NERI

Year: 2007	Original budget	Consump-tion 2007	Expected consump-tion 2008	2009	2010	2011	Total
Man-months	1	1	90	89			3
Scientific personnel	1	1		89			3
Technical personnel							

Year:2007	Original budget	Consump-tion 2007	Expected consump-tion 2008	2009	2010	2011	Total
Salaries							
Scientific personnel	4377	4500	4170	3820	3932	00	16420
Technical personnel							
Other operational costs	500 0	300	550	400	180		1430
Equipment							
Others (please specify)							
Direct costs	4870	4800	4720	4220	4110		17850
Indirect costs (20% of direct costs)	3570	960	940	840	820		3570
Total	21420	5760	5670	5060	4930		21420

Comments:

NERI requests an allowance to transfer 20 DKK for operational costs from 2007 to 2008. This is because some of the supplies for PLFA analysis planned to be purchased in 2007 will instead be purchased in year 2008.

Name of Institute and department: Environment and resources, DTU

Year: 2007	Original budget	Consump-tion 2007	Expected consump-tion 2008	2009	2010	2011	Total
Man-months							
Scientific personnel	1	1	1				2
Technical personnel	3	3	3				6

Year:2007	Original budget	Consump-tion 2007	Expected consump-tion 2008	2009	2010	2011	Total
Salaries							
Scientific personnel	28	28	28				56
Technical personnel	66	66	68				134
Other operational costs	8	8	8				16
Equipment							
Others (please specify)							
Direct costs	101	101	103				204
Indirect costs (20% of direct costs)	20	20	21				41
Total	121	121	124				245

Comments:

Name of Institute and department: KU-Life

Year: 2007	Original budget	Consump-tion 2007	Expected consump-tion 2008	2009	2010	2011	Total
Man-months							
Scientific personnel	2	2	2				4
Technical personnel	2	2	2				4

Year:2007	Original budget	Consump-tion 2007	Expected consump-tion 2008	2009	2010	2011	Total
Salaries							
Scientific personnel	78	78	81				159
Technical personnel	69	69	71				140
Other operational costs	10	10	10				20
Equipment							
Others (please specify)							
Direct costs	157	157	162				319
Indirect costs (20% of direct costs)	31	31	32				62
Total	188	188	194				382

Comments:

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

Name of Institute and department:

Comment: No change in relation to application.

Year:	Original budget	Consump-tion 2005/2006	Expected consump-tion 2007	2008	2009	2010	Total
Man-months Scientific personnel Technical personnel							

Year:	Original budget	Consump-tion 2005/2006	Expected consump-tion 2007	2008	2009	2010	Total
Salaries Scientific personnel Technical personnel							
Other operational costs							
Equipment							
Others (please specify)							
Direct costs							
Indirect costs (20% of direct costs)							
Total							

Comments: