

**Effects of anaerobically digested manure on soil fertility - establishment of a long-term study under Norwegian conditions (SOILEFFECTS) (Kompetanseprosjekt med brukermedvirkning - NATUROGNAERING)**

Application Number: ES459032 Project Number: 0

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## Applicant

### Project Owner

Institution / company (Norwegian name)	Bioforsk Organic Food and Farming
Faculty	
Institute	
Department	
Address	Gunnars veg 6
Postal code	6630
City	Tingvoll
Country	Norway
E-mail	okologisk@bioforsk.no
Website	www.bioforsk.no
Enterprise number	988983837
Auditor	Office of the Auditor General
eAdministration	

### Project administrator

First name	Turid
Last name	Strøm
Position/title	Director
Phone	+47-404 81 867
E-mail	turid.strom@bioforsk.no
Confirmation	<input checked="" type="checkbox"/> The application has been approved by the Project Owner

### Project manager

First name	Anne-Kristin
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**Application Number: ES459032 Project Number: 0**

Last name	Løes
Institution / company (Norwegian name)	Bioforsk Økologisk
Faculty	
Institute	
Department	
Address	Gunnars veg 6
Postal code	6630
City	Tingvoll
Country	Norway
Position/title	Senior researcher
Academic degree	Dr. scient
Preferred language	Bokmål
Phone	+47-404 79 962
E-mail	anne-kristin.loes@bioforsk.no

## Project info

### Project title

Project title	Effects of anaerobically digested manure on soil fertility - establishment of a long-term study under Norwegian conditions (SOILEFFECTS)
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### Primary and secondary objectives of the project

Primary and secondary objectives	<p>The main aim is to establish a field experiment to compare long-term effects of anaerobically digested versus non-digested manure (slurry) on crucial soil physical, chemical and biological characteristics, and report the results achieved in the early transition period.</p> <p>Secondary aims:</p> <ul style="list-style-type: none"> <li>-Localize appropriate sites for a long-term field experiment within Tingvoll research farm, and conduct the initial site characterization.</li> <li>-Observe effects of the early transition period (3 years) on soil fauna (earthworms and other key fauna organisms)</li> <li>-Observe effects of the early transition period on soil physical, chemical and microbiological conditions (soil density; soil pH, nutrients, organic matter content and quality; accumulated respiration, microbial community diversity).</li> <li>-Measure the effect of digested manure on the local Tingvoll earthworm population by pot experiments under controlled environmental conditions.</li> </ul>
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-Characterize the activity of microorg. and important members of soil fauna

## Project summary

The project SOILEFFECTS will identify potential risks and benefits for soil fertility when animal manure is anaerobically digested for biogas production. In systems with preferably closed cycles of nutrients and organic matter, such as organic farms, soil fertility cannot be easily maintained by purchased nutrients, and manure quality is crucial. Anaerobic digestion of animal manure for biogas utilization decreases the amount of organic carbon (C) applied to the soil, especially easily degradable C fractions. This may affect soil biology, for instance because earthworms and microorganisms compete about this C as a source of feed. Less earthworm activity would impact negatively soil structure and fertility. Less C application to the soil may also more directly affect soil physiochemical characteristics, because soil organic matter (humus) is an essential component of cultivated soil, heavily impacting soil structure, quality and fertility.

### Project summary

A long-term experiment will be established on Tingvoll research farm (organically managed), where a biogas plant is built in 2010 to digest the manure from the herd of 25 dairy cows. Initial characterization of the soil biology, chemistry and physics will be done and the effects of the manure treatment will be studied after the first transition period of 2-3 years. Trials will be done on fertile and on less productive, recently cultivated soil to reveal the effect of the digested versus the non-digested manure as a soil conditioner. To test the digested and non-digested manures in a stressed system, the fertile topsoil will be removed on half of the plots. Soil respiration, enzyme activities and humus fractionations will be measured. Pot experiments with earthworm will bring more detailed knowledge about these key species, and additionally mites and collembolans will be recorded.

Project partners: Bioforsk, Århus University Denmark, FiBL Switzerland, Biodynamic Research Association Sweden, Norwegian farmers' unions.

## Funding scheme

### Supplementary info from applicant

Programme/ activity	NATUROGNAERING
Application type	Knowledge building project with user involvement
Topics	
Other relevant programmes/ activities/ projects	The project is relevant for ongoing projects described in an attached letter from the Norwegian Centre for Bioenergy Research.
Discipline(s)/ specialist field	Soil science (chemistry, physics, biology)

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If applying for additional funding, specify project number	
Have any related applications been submitted to the Research Council and/or any other public funding scheme	Yes
If yes, please provide further information	This application is one of 5 to be coordinated by the Norwegian Centre for Bioenergy Research. Details about the coordination and the titles of the projects are described in a letter attached to this application.

## Progress plan

### Project period

From date (yyyymmdd)	20101001
To date (yyyymmdd)	20140930

### Main activities and milestones in the project period (year and quarter)

Milestones throughout the project	From		To	
Establish field experiments, manure tanks	2010	4	2011	1
Visit Aarhus university, soil biol. methods	2011	1	2011	2
Initial soil sampling	2011	2	2011	2
1st growing season, manure analysis, yields	2011	2	2011	3
Peer-reviewed paper, initial soil conditions	2011	4	2012	1
2nd growing season, manure analysis, yields	2012	2	2012	3
First soil fauna sampling to reveal effects	2012	2	2012	2
Half-way seminar, evaluation and revision	2012	3	2012	3
Seminar and conference contributions	2012	4	2013	1
3rd growing season, manure analysis, yields	2013	2	2013	3
Peer-reviewed papers	2013	3	2014	3
4th growing season, manure analysis, yields	2014	2	2014	3
Completion, final report, int. conferences	2014	2	2014	3
Pot experiments with earthworms	2013	3	2014	1

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## Budget

### Cost plan (in NOK 1000)

	2010	2011	2012	2013	2014	2015	2016	2017	Sum
Payroll and indirect expenses	210	305	265	295	320				1395
Procurement of R&D services	40	574	95	539	130				1378
Equipment		50							50
Other operating expenses	42	75	75	70	115				377
<i>Totals</i>	292	1004	435	904	565				

#### Specification

Payroll.. = Work carried out at Bioforsk Organic  
 Procurement of R&D service = Work at Aarhus University and Bioforsk Arable Crops, analyses, resource team.  
 Equipment= Manure tanks  
 Other operating expenses = Travels, printing etc.  
 A specified budget is enclosed for information, se attachments.

### Cost code (in NOK 1000)

	2010	2011	2012	2013	2014	2015	2016	2017	Sum
Trade and industry		50	50	50					150
Independent research institute	237	724	340	664	485				2450
Universities and University Colleges									0
Other sectors									0
Abroad	55	230	45	190	80				600
<i>Totals</i>	292	1004	435	904	565				

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## Funding plan (in NOK 1000)

	2010	2011	2012	2013	2014	2015	2016	2017	Sum
Own financing									0
International funding									0
Other public funding	50	160	160	160					530
Other private funding	50	60							110
From Research Council	192	784	275	744	565				2560
<i>Totals</i>	292	1004	435	904	565				

### Specification

The line "Other public funding" has here been used to describe funding from Norwegian Farmers' Union (se attached letter of confirmation). Other private funding is composed of 60000 NOK from Norwegian Center for Ecological Agriculture (NORSØK) and 50000 NOK from Sparebanken Møre. The final amount of funding from Sparebanken Møre is not yet finally decided. If adjustments in the budget are required, this will be arranged by negotiations with RCN. The letter of confirmation from Sparebanken Møre will be submitted to RCN as soon as we receive it.

## Fellowship

Type of fellowship

Doctoral fellowship

From date (yyyymmdd)

To date (yyyymmdd)

## Partners

**Partners under obligation to provide professional or financial resources for the implementation of the project**

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**Application Number: ES459032 Project Number: 0**

Institution/ company	BIOFORSK
Department/ section	
Address	Bioforsk Organic, 6630 Tingvoll, Norway
Postal code	1432
City	ÅS
Country	Norge
Enterprise number	988983837
Contact person	Anne-Kristin Løes
Contact tel.	+47-404 79 962
Contact e-mail	anne-kristin.loes@bioforsk.no
Partner's role	Research activity

2

Institution/ company	BIOFORSK
Department/ section	
Address	Bioforsk Arable Crops, Apelsvoll, 2849 KAPP, Norway
Postal code	1432
City	ÅS
Country	Norge
Enterprise number	988983837
Contact person	Hugh Riley
Contact tel.	+47-406 22 630
Contact e-mail	hugh.riley@bioforsk.no
Partner's role	Research activity

3

Institution/ company	Aarhus University
Department/ section	National Environmental Research Institute
Address	Dep of Environmental Chemistry and Microbiology
Postal code	DK-4000
City	Roskilde
Country	Denmark

**Effects of anaerobically digested manure on soil fertility - establishment of a long-term study under Norwegian conditions (SOILEFFECTS) (Kompetanseprosjekt med brukermedvirkning - NATUROGNAERING)**

**Application Number: ES459032 Project Number: 0**

Enterprise number	0
Contact person	Anders Johansen
Contact tel.	0045-46301316
Contact e-mail	ajo@dmu.dk
Partner's role	Research activity

4

Institution/ company	Research Institute of Organic Agriculture (FiBL)
Department/ section	FiBL Switzerland
Address	Ackerstrasse
Postal code	CH-5070
City	Frick
Country	Switzerland
Enterprise number	0
Contact person	Paul Mäder
Contact tel.	+41 62 865-7232
Contact e-mail	paul.maeder@fibl.org
Partner's role	Research activity

5

Institution/ company	Biodynamic Research Institute
Department/ section	
Address	Skilleby gård
Postal code	S-153 91
City	Järna
Country	sweden
Enterprise number	0
Contact person	Artur Granstedt
Contact tel.	+46 8 551 577 0
Contact e-mail	artur.granstedt@jdb.se
Partner's role	Research activity

6



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**Application Number: ES459032 Project Number: 0**

Institution/ company	Landbruk Nordvest
Department/ section	Local division of the Norw.Agric.Extension Service
Address	Hovsvegen 25
Postal code	N-6600
City	Sunddalsøra
Country	Norway
Enterprise number	0
Contact person	Ivar Bakken
Contact tel.	+47-906 03 561
Contact e-mail	ivar.bakken@lr.no
Partner's role	Research activity

7

Institution/ company	Møre og Romsdal Bondelag
Department/ section	Local div. of Norwegian Farmers' Union
Address	PB 2047 Moldegård
Postal code	N-6402
City	Molde
Country	Norway
Enterprise number	0
Contact person	Gunnar Wentzel
Contact tel.	+47-71202890
Contact e-mail	gunnar.wentzel@bondelaget.no
Partner's role	Financing and Research activity

8

Institution/ company	Møre og Romsdal Bonde-og Småbrukarlag
Department/ section	Local div. of Norw.Farmers and Smallholders' Union
Address	Ormbostad
Postal code	N-6694
City	Foldfjorden
Country	Norway

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**Application Number: ES459032 Project Number: 0**

Enterprise number	0
Contact person	Øystein Ormbostad
Contact tel.	+47-90627786
Contact e-mail	oeorm@online.no
Partner's role	Research activity

9

Institution/ company	NORSØK/Tingvoll sol- og bioenergiserter
Department/ section	
Address	Gunnars veg 6
Postal code	6630
City	Tingvoll
Country	Norway
Enterprise number	969840383
Contact person	Kristin Sørheim
Contact tel.	+47-95286060
Contact e-mail	kristin.sorheim@neasonline.no
Partner's role	Financing and Research activity

10

Institution/ company	Sparebanken Møre (local bank)
Department/ section	
Address	P.O. Box 121
Postal code	6001
City	Ålesund
Country	Norway
Enterprise number	937899319
Contact person	Nils Husby
Contact tel.	+47-71 53 06 62
Contact e-mail	nils.husby@sbm.no
Partner's role	Financing

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## Attachments

### Project description

Filename	SOILEFFECTS project description.pdf
Reference	ES459032_001_1_Projektbeskrivelse_20100421

### Curriculum vitae (CV) with list of publications

Filename	cv_hugh riley aug 2009.pdf
Reference	ES459032_002_1_CV_20100420

Filename	CV engelsk RP 2005 til 2010 SOILEFFECTS.pdf
Reference	ES459032_002_2_CV_20100420

Filename	AKL_CVENG_2006_2010.pdf
Reference	ES459032_002_3_CV_20100420

Filename	CVArturG.pdf
Reference	ES459032_002_4_CV_20100420

Filename	CV_plus-publications_Maeder_Jan_2010.pdf
Reference	ES459032_002_5_CV_20100420

Filename	CV_AJO_one page_UK21 04 2010.pdf
Reference	ES459032_002_6_CV_20100421

### Statement from core financing companies

**Effects of anaerobically digested manure on soil fertility - establishment of a long-term study under Norwegian conditions (SOILEFFECTS) (Kompetanseprosjekt med brukermedvirkning - NATUROGNAERING)**

**Application Number: ES459032 Project Number: 0**

Filename	201004 Bioforsk prosjekt gardsbasert biogass MRB.pdf
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Reference	ES459032_014_1_ErklaeringBedrifter_20100420
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Filename	NORSOK confirmation.pdf
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Reference	ES459032_014_3_ErklaeringBedrifter_20100421
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Filename	Brev fra NB.pdf
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Reference	ES459032_014_4_ErklaeringBedrifter_20100421
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## Referees

Filename	List of proposed referees.pdf
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Reference	ES459032_005_1_Fagekspertter_20100420
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## Other items

Filename	Landbruk Nordvest deltaking.pdf
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Reference	ES459032_010_1_Annet_20100420
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Filename	Norsk prosjektsammendrag final version.pdf
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Reference	ES459032_010_2_Annet_20100420
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Filename	Coordination letter OJS 20042010.pdf
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Reference	ES459032_010_4_Annet_20100420
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Filename	Brev fra Smaabrukarlaget.pdf
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Reference	ES459032_010_5_Annet_20100421
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