FAO European Cooperative
Research Network
on the Recycling of Agricultural,
Municipal and Industrial
Residues in Agriculture

RAMIRAN

RAMIRAN 2010

14th Ramiran International Conference

Lisboa, Portugal, 12-15 September 2010

PROGRAMME

TREATMENT AND USE OF ORGANIC RESIDUES IN AGRICULTURE:

CHALLENGES AND OPPORTUNITIES
TOWARDS SUSTAINABLE MANAGEMENT

Edited by: Cláudia S. C. Marques dos Santos Cordovil and Luís Ferreira

Instituto Superior de Agronomia
Universidade Técnica de Lisboa

FAO European Cooperative
Research Network
on the Recycling of Agricultural,
Municipal and Industrial
Residues in Agriculture

TREATMENT AND USE

OF ORGANIC RESIDUES

IN AGRICULTURE:

CHALLENGES AND OPPORTUNITIES

TOWARDS SUSTAINABLE MANAGEMENT

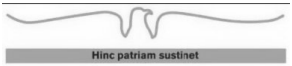
RAMIRAN 2010

14th Ramiran International Conference

PROGRAMME

Lisboa, Portugal, 12-15 September 2010

Edited by: Cláudia S. C. Marques dos Santos Cordovil and Luís Ferreira



Instituto Superior de Agronomia
Universidade Técnica de Lisboa

CONTENTS

1. **CONFERENCE ORGANIZATION / CONFERENCE SECRETARIAT**

CONFERENCE ORGANIZATION

Universidade Técnica de Lisboa,
Instituto Superior de Agronomia,
Tapada da Ajuda, 1349-017 Lisboa - Portugal
Phone: + (351) 21 365 31 00
Website: www.isa.utl.pt
Email: cms@isa.utl.pt

CONFERENCE SECRETARIAT

MUNDICONVENIUS

Avenida 5 de Outubro, 53 - 2º
1050-048 Lisboa - Portugal
Phone: +(351) 21 315 51 35 | Fax: +(351) 21 355 80 02
Website: www.mundiconvenius.pt
Email: ramiran@ramiran2010.net

2. **ORGANIZING BOARD**

Network Coordinators

Tom Misselbrook - North Wyke Research, Devon, UK

Harald Menzi - Swiss Coll. Agric., Zollikofen, Switzerland

President

Cláudia S.C. Marques-dos-Santos Cordovil

Address: Instituto Superior de Agronomia

Tapada da Ajuda

1349 - 017 - Lisboa - Portugal

site: www.isa.utl.pt

E-mail: cms@isa.utl.pt

Elizabeth Almeida Duarte

Luisa Louro Martins

Maria Odete Torres

Miguel Mourato

Rosario Basanta

David Fangueiro

Natalina Costa

3. **SCIENTIFIC COMMISSION**

Airton Kunz
Embrapa Swine and Poultry, Concórdia, Brazil

Barbara Amon
BOKU, Viena, Austria

Björn Vinneras
SVA, Uppsala, Sweden

Cláudia M.d.S. Cordovil
UTL- ISA, Lisboa, Portugal

Colin Burton
Cemagref, Rennes, France

Elizabeth d'Almeida Duarte
UTL- ISA, Lisboa, Portugal

Fiona Nicholson
ADAS, Mansfield, UK

Giorgio Provolo, Univ. Milano, Milano, Italy

Harald Menzi
Swiss Coll. Agric., Zollikofen, Switzerland

Ina Körner
TUHH, Hamburg, Germany

Jan Venglovský
Univ. Košice, Košice, Slovak Republic

Jim Webb
AEA, Didcot, UK

Joachim Clemens
Gewitra, Bonn, Germany

José Martínez
Cemagref, Rennes, France

Ken Smith
ADAS, Wolverhampton, UK

Luís Ferreira
UTL- ISA, Lisboa, Portugal

Matias Vanotti
ARS-USDA, Florence, USA

Paolo Balsari
University of Torino, Torino, Italy

Pierre Gerber
FAO, Rome, Italy

Pilar Bernal
CEBAS-CSIC, Murcia, Spain

Sven Sommer
Syd Dansk University and University Southern Denmark, Odense, Denmark

Thomas Kupper
Swiss Coll. Agric., Zollikofen, Switzerland

Tom Misselbrook
North Wyke Research, Devon, UK

4. **INFORMATION**

Book cover

Portuguese pavement art in Portuguese Calçada Portuguesa, is the traditional pavement used for most pedestrian areas in Portugal and former Portuguese colonies such as Brazil and Macau. Walking along Portuguese streets is a one of a kind adventure as you will be surrounded by gigantic canvases, invading street walls and the paved paths. It was an art founded in Mesopotamia and later introduced to the ancient Greeks and Romans.

Being usually used in sidewalks, it is in plazas and atriums where this art finds its deepest expression. Upon a well compacted trench of argillaceous materials, craftsmen calceteiros lay a bedding of gravel, which will accommodate the limestone or basalt cobblestones, acting as a cement.

Until early XX century, the designs were made by the craftsmen themselves, the calceteiros, inspired by traditional motifs like armillary spheres, ships, compass roses, ropes, crosses, crowns, crests, emblems, ocean waves, seaweed, starfish, anchors, stylized animals and birds, dolphins and crabs. In the fifties the designs changed and began to be made by architects and artists.

In November 1986, the Lisbon City Council created the School of calceteiros in order to renew the actual crew of pavers and promoting the art of paving.

For further information you may visit:

http://issuu.com/rochas.info/docs/manual_da_cal_ada_portuguesa

Acknowledgments

(…) To the journalist António Manuel Esteves Henriques (deceased in 2009), author and promoter of the "The Portuguese Pavements Handbook", our tribute and recognition of the importance of the reference work that left us.

(…) To Direcção Geral de Energia e Geologia, as editor, the provision of copies of the "The Portuguese Pavements Handbook", which were offered by the organization to all members of the Scientific Committee, and by the efforts taken to obtain the cover photo of this book

Carbon footprint

"Aware of the carbon footprint generated during the days of the event and because sustainability is the key issue of the conference, we decided to introduce the good practice of doing the emissions offset .

Therefore the 14th Ramiran International Conference is pleased to announce that all the carbon emissions arising from the energy spent and wastes produced in the venue during this meeting, have been compensated.

Our partner for carbon offsetting is E-Value, who manages a carbon offset projects portfolio and from which you will find a certificate in your bag."

5. **RAMIRAN** - The leading network on Recycling organic residues in agriculture

The "Recycling Agricultural, Municipal and Industrial Residues in Agriculture Network (RAMIRAN)" is a research and expertise network dealing with environmental issues relating to the utilisation of manure and other organic residues in agriculture. It is organized within the framework of the FAO ESCORENA: European System of Cooperative Research Networks in Agriculture (http://www.escorena.net/), which was established in 1974 as a means to promote voluntary research cooperation among interested national institutions involved in food or agriculture in European countries. RAMIRAN evolved in 1996 from the much smaller Animal Waste Network, that had been active since 1978, and the scope was expanded to include many other organic residues (industrial and municipal) which are used on land as organic manures and soil amendments. It is in principal a European network, but also open to interested experts from other parts of the world. It has no official members, but about 400 people from over 30 countries are registered in its participation list.

The network provides an invaluable means of exchanging ideas, information and experiences on topics that are becoming increasingly important at a national and international level. The main objectives of the network are to:

- Promote the exchange of methodologies, materials and processes;
- Progress knowledge on the environmental assessment of organic residues recycling in agriculture;
- Identify research priorities

The main activity of RAMIRAN is a scientific conference organized every two years, usually attended by about 100-150 participants. In the past, RAMIRAN also hosted a number of working groups dealing with more specific topics such as sanitary aspects, gaseous emissions or heavy metals in agriculture. In 2003 a special working group first produced a "Glossary of Terms on Livestock Manure Management" which proved very valuable in harmonizing the use of terms relevant to organic residues and their environmental relevance. Today the focus is on task groups, short-term teams with a clear task that can be achieved in a defined time of ideally 1-2 years and maximum four years. These tasks make use of the potential of RAMIRAN arising from its membership of experts. This means that, for example, surveys about management techniques, environmental, economic or social issues in connection with manure and other organic residues or interdisciplinary studies are ideal topics for such special tasks.

With its participants, RAMIRAN holds a tremendous resource of knowledge and expertise in a wide range of topics across the whole of Europe and, increasingly, other continents. The 14th conference in Lisbon is a historic event, being the largest RAMIRAN conference to date. Over 200 delegates from more than 40 countries will participate and present approximately 300 oral and poster contributions. As Co-chairmen of the Network we congratulate and thank the organizers for this great success!

Tom Misselbrook and Harald Menzi
Network Coordinators

6. **BRIEF HISTORY OF RAMIRAN**

Researchers from several European countries established a network on animal waste utilisation in 1976, with the support of FAO - Food and Agriculture Organization of the United Nations. This network emerged as one of 13 networks of ESCORENA - European System of Cooperative Research Networks in Agriculture, which was founded under the auspices of FAO in 1974.

The network included six sub-networks which in 1990 were aggregated into only 2 working groups and several small groups devoted to the more specific issues related to the subject of wastes. Until that date, the network was solely dedicated to the research and dissemination of knowledge on the subject of animal wastes, and in 1988 published the "Guidelines for an Economical an d Environmentally safe Use of Slurry on Agricultural Land"

Following the success of biennial conferences that were being organized, the network and involvement of its members, it was decided at the Conference of 1996 in Hungary, that this network would be expanded to the Treatment and Utilization of Wastes from industrial and urban origin, which were presented for the first time in 1998 in France. Reflecting this change, the network was renamed RAMIRAN (Research Network on Recycling of Agricultural and Industrial Residues in Agriculture) and in 2000, scientists from countries of other continents, namely America and Asia, were present.

In 1998, Dr. Jose Martinez from Cemagref France assumed the coordination of the network. His dynamism projected Ramiran at an international level, making it an essential landmark to the scientific community and to all those working in all areas related to the Treatment and Use of Organic Wastes in Agriculture. The current coordinators Dr. Harald Menzi and Tom Misselbrook, have kept since 2006 this dynamic network Ramiran in its international profile.

7. **VENUE / CONFERENCE HOTELS**

The 14th Ramiran International Conference will take place at the Fundação Calouste Gulbenkian,

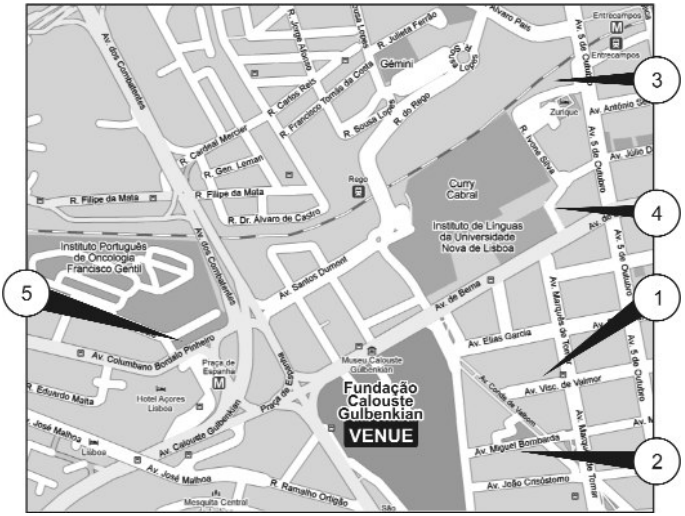
Av. Berna 45 A, Lisboa. Telephone +351 21 782 3000.

All the Hotels booked by the Conference secretariat are within a walking distance to the Gulbenkian Foundation.

From everywhere else in the city, you can access the Gulbenkian Foundation by subway, from one of the following stops: Praça de Espanha (blue line), São Sebastião (blue and red lines) or Campo Pequeno (yellow line).

Buses 16, 56 and 726 stop in front of Gulbenkian Foundation.

MAP



1 - Residencial Itália*** - Av Visconde Valmor, 67, Lisboa, Tel: 217 611 490?

2 - Hotel Olissipo Marquês de Sá*** - Av. Miguel Bombarda, 130, Lisboa, Tel: 21 791 1014

3 - Hotel Vip Executive Zurique*** - R. Ivone Silva, 18, Lisboa, Tel: 21 781 4000

4 - Hotel Vip Executive Barcelona*** - R. Laura Alves, 10, Lisboa, Tel: 21 795 4273

5 - Hotel Açores Lisboa**** - Av. Columbano Bordalo Pinheiro, 3, Lisboa, Tel: 21 722 2920

8. **CONGRESS GENERAL INFORMATION**

REGISTRATION DESK

Registration desk will operate from:

- Monday 13th September : 8h30 - 18h00
- Tuesday 14th September: 8h30 - 18h00
- Wednesday 15th September: 9h00 - 13h30

Congress materials are available at the Registration Desk. The registration and information desks will be located in the "Fundação Calouste Gulbenkian" reception desk.

REGISTRATION FEES

After 5 April 2010 - until 31July 2010:

- Regular Registration: 350€ I Student: 160€

On Site:

- Regular Registration: 400€ I Student: 180€

A copy of the Student card or University registration is required when applying for reduced fee.

REGULAR PARTICIPANTS FEES INCLUDES

All program activities, Welcome Cocktail, Monday and Tuesday lunches, Monday, Tuesday and Wednesday coffee breakes, Closing dinner on tuesday, Proceedings book and Delegate bag.

STUDENTS PARTICIPANTS FEES INCLUDES

Welcome Cocktail, Lunches, Coffee breaks and Delegate Bag. Student fee does not include the Conference dinner.

CONGRESS LANGUAGE - The official language of the Congress is English.

INSURANCE / LIABILITY - Participation in this Congress implies that persons/participants agree that the organizers will not carry any liability. Upon registration, the participant accepts this provision.

PROGRAMME CHANGES - The organisers cannot assume liability for changes in the programme due to external or unforeseen circumstances.

COFFEE-BREAKS - Coffee breaks will be served twice a day; morning and afternoon, at the lobby of the conference hall, near the session rooms.

LUNCH - Lunch on Monday and Tuesday will be served at the lobby of the conference hall, near the session rooms.

CONFERENCE DINNER - The dinner will be held at the Restaurant Tromba Rija:
R. Cintura do Porto de Lisboa, Edifício 254, Armazém 1, 1200-109 LISBOA
213 971 507

BADGES - Due to the holding of another scientific event at the same time as Ramiran, the organization reminds all the participants that it is mandatory to display their identification badges at all times, while they are inside the Gulbenkian Foundation building and gardens.

TRANSPORTATION

ACCESS TO THE CITY CENTRE FROM DE AIRPORT - Lisbon Airport is close to the center of the city (5 km north).

TAXI - A taxi from the Lisbon Airport can take up to 20 minutes depending on traffic and will cost between €12 and €17. It is recommended to have € Euros with you as taxis tend not to accept credit cards.

Always ask for your receipt.

AEROBUS - The Aerobus departs from the airport to the city every 20 minutes from 7.45 am to 8.45 pm and it takes approx. 10 minutes. Each ticket costs €1.30

SPEAKERS INFORMATION

All presentations must be prepared as PowerPoint files 2003 version, and will be loaded on the computer in Session Room. All speakers should send their power point files by 1st September to the email scientific@ramiran2010.net, or bring their presentations stored on a CD-ROM or USB memory stick, and deliver it to the Conference secretariat no later than 2 hours before the start of their session. In case the PowerPoint presentation does not reach the organization in advance or if technical problems arise during the presentation, no additional time will be given for the lecture.

Speakers should contact the Chairperson 15 minutes before the beginning of the session in which their paper is to be presented. The Chairperson will be available in the Conference Hall where the session will take place.

Speakers should be present at the Conference Table from the beginning of the session and remain for the entire duration.

During Oral Sessions (rooms 1 and 2) 12 minutes will be allowed to present each paper; 3 minutes for questions, will be allowed. The only language spoken during the session should be English. If the time allowed for the communication expires, do not under any circumstances accelerate in order to finish the entire presentation but pass directly to the conclusions.

To this regard, it might be useful preparing a slide which illustrates the conclusions in a synthesized version.

The time reserved for each presentation, will be strictly observed, in order to allow the participants to change rooms during the intervals. During the presentation please avoid any companies advertising.

Please note that the use of own laptop computers and traditional slides is not possible.

POSTER PRESENTATION (rooms 3 and 4)

Posters should be set up by authors during the morning of Monday 13th September, and removed on the afternoon of Tuesday, 14th September, until 18h00. All the posters displayed after this time will be removed by the organization and recycled.

A maximum space of 80 cm (width) x 100 cm (height) is available for each poster. Posters should be prepared using resistant material. Please ensure that you are equipped with all necessary fixing materials (like scissors and tape). Drawing pins must not be used.

Posters should be written using large letters as they should be legible from a distance of at least one meter.

A photo of the presenting author, (6x10 cm portrait format) should be placed at the right hand top corner of the poster.

Under no circumstances may posters contain any kind of advertising or commercial propaganda.

All posters will be placed in rooms 3 and 4. Each author should check on the outside map the exact position assigned to his poster. The Staff at the registration desk will be pleased to help you in case of need.

9. **CONFERENCE SUBJECTS**

1- Efficient use of water and slurry management in livestock production systems
2- Management of livestock diet to minimize environmental impact of manure and slurries
3- Production technologies towards sustainability of livestock units
4- Treatment and use of non conventional organic residues in agriculture
5- Environmental, nutrient losses, impact of storage and spreading operations
6- Innovation and technology transfer
7- Pre-processing of manure and organic waste for energy production
8- Technologies/systems for different manure and organic waste treatment options
9- Use of manures and organic wastes to improve soil quality and nutrient balances
10- Integrated manure and organic wastes management at the farm level
11- Economical determinants and strategies for integrated sustainability across Europe
12- Manure and organic residues management approaches in non-European countries
13 - Environmental and sanitary safety aspects of manure and organic residues utilization
14- Use of manures and organic residues for the recovery of degraded and contaminated soils

10. **PROGRAMME AT-A-GLANCE**

	13th September		14th September		15th September	
8:30	Registration		Registration		Registration	
	Room 1		Room 1	Room 2	Room 1	Room 2
9:00			Session 5	Session 9		
9:30	Opening session				Session 13	Session 14
10:15	Plenary Session					
10:30			Poster session 2 (incl. Refreshments)			
10:45	Session 1					
11:00	Coffee break				Coffee break	
11:30	Session 1				Task Groups Presentation	
12:00			Session 6	Session 10	Round Table and Closing	
12:45					Lunch and technical visit for registerd participants	
13:00	Lunch		Lunch			
	Room 1	Room 2				
14:30	Session 2	Session 4	Session 7	Session 11		
15:30	Poster Session 1 (incl. Refreshments)					
15:45			Poster session 3 (incl. Refreshments)			
16:30	Session 3	Task Groups Meeting	Session 8	Session 12		
17:30	End of day 1		End of day 2			
18:00			Sightseeing tour for regular participants			
19:30			Ramiran Dinner			

11. **PROGRAMME**

Sunday, September 12

17:00 - Cocktail at "City Museum" - "*Museu da Cidade*" and pre-registration

Monday, September 13

08:30 - Registration at Fundação Calouste Gulbenkian

ROOM 1

Welcome ceremony and Introductions
Chair: Claudia M.d.S. Cordovil

09:30 - Welcome address: President of the organizing committee -Claudia M.d.S Cordovil
09:45 - Dean of the Technical University of Lisbon - F. Ramoa Ribeiro
09:55 - President of Instituto Superior de Agronomia - C. Noéme
10:05 - Welcome address by the Network Coordinators - T. Misselbrook, H. Menzi
10:15 - Plenary Session - The challenges of sustainable development - F. Duarte Santos

SESSION 1 | LIVESTOCK PRODUCTION MANAGEMENT (subjects 1+2+3)
Chair: José Martinez

10:45 - Water footprint of pigs slaughtered in the Central-Southern states of Brazil - J. Palhares (Brazil) 0066
11:00 - Coffee break
11:30 - Effluent quality from Out-wintering Pads - P. Dumont (UK) 0165
11:45 - Manure production and management on commercial farms - G. Provolo (Italy) 0099
12:00 - Effect of adding fibre sources to pig diets on ammonia volatilisation and methane production from manure - G. Jarret (France) 0158
12:15 - Managing sulphur content of pig diet to control further sulphides production during pig slurry anaerobic storage - P. Peu (France) 0073

12:30 - Effect of water scrubbing on ammonia emissions from a gestating sows building in the south of Europe - M. Aguilar (Spain) 0013

12:45 - Discussion and announcements

13:00 - Lunch sponsored by Terrafertil and Central de Cervejas

SESSION 2 | TREATMENT AND TECHNOLOGIES (subject 7)
Chair: Ina Körner

14:30 - Possibilities to optimise feedstock mixtures for biogas production - T. Amon (Austria) 0029

15:00 - The Probiogas Project: an integrated approach of the anaerobic co-digestion of agricultural wastes for production of biogas and fertilisers - P. Bernal (Spain) 0045

15:15 - The (re)use of mechanical separated solid fraction of digested and not digested slurry in anaerobic digestion plants - P. Balsari (Italy) 0256

15:30 - Poster session 1 incl. Refreshments (1h00)

Split poster presentations in 3 groups

15:30 - Poster subject 1, 2 and 3

15:50 - Poster subject 4

16:10 - Poster subject 5

SESSION 3 | TREATMENT AND TECHNOLOGIES (subjects 7+8)
Chair: Thomas Amon

16:30 - Multi-stage treatment of swine manure - B. M. Salces (Spain) 0018

16:45 - Swine Manure Storage Time Influence on Chemical Flocculation And Solid-Liquid Separation Efficiency - A. Kunz (Brazil) 0166

17:00 - Anaerobic respirometry" as a tool for organic matter fractionation aiming at anaerobic co-digestion modelling - R. Girault (France) 0161

17:15 - Effects of antibiotic residues in fermentation substrates on biogas yield - A. Bauer (Austria) 0304

17:30 - End

ROOM 2

SESSION 4 | LOSSES ON APPLICATION (subject 5)
Chair: Tom Misselbrook

14:30 - Injection of animal slurry to winter cereals - effects on emissions of odour, ammonia, and crop yield - M. N. Hansen (Denmark) 0160

14:45 - Modelling ammonia emissions after field application of biogas slurries - A. Pacholski (Germany) 0237

15:00 - European Agricultural Gaseous Emissions Inventories Researchers Network - gaseous emission factors for solid manure management - S. Sommer (Denmark) 0270

15:15 - Evaluation of Zeolite as a binding agent to Mitigate ammonia loss from pig slurry and manure R. Sakrabani (UK) 0255

15:30 - Poster session 1 incl. Refreshments (1h00)

Split poster presentations in 3 groups

15:30 - Poster subjects 1, 2 and 3

15:50 - Poster subject 4

16:10 - Poster subject 5

SESSION | TASK GROUPS MEETING
Chair: Harald Menzi

16:30 - Anaerobic digestion and digestate utilization in Europe - I. Körner (Germany) 0177

16:45 - Agrobiofilm Project. Development of Enhanced of Biodegradable films for horticulture and viticulture - C. Costa-Rodrigues, (Portugal) 0332

17:00 – "Alto Uruguai Project" - S. Boron (Brazil)

17:15 – Task Groups meeting

17:30 – End

Tuesday, September 14

ROOM 1

SESSION 5 | TREATMENT AND TECHNOLOGIES (subjects 4+7+8)
Chair: Patrick Hunt

09:00 - Removal and Recovery of Ammonia from Liquid Swine Manure and Poultry Litter Using Gas Permeable Membranes - M. Vanotti (USA) 0190
09:30 - Recycling of digestates from biogas production by composting - R. Moral (Spain) 0120
09:45 - Composting of anaerobic digestates for producing added-value materials in agriculture - M. A. Bustamante (Spain) 0234
10:00 - Utilization of wasted sardine oil as co-substrate with pig manure for biogas production - L. Ferreira (Portugal) 0002
10:15 - Physicochemical changes and nutrient dynamics during composting of the solid fraction of dairy cattle slurry - M. Brito (Portugal) 0038
10:30 - Poster session 2 incl. Refreshments (1h30)
Split poster presentations in 4 groups
10:40 - Poster subject 6+7
11:00 - Poster subject 8
11:20 - Poster subject 13
11:40 - Poster subject 10+11+12

SESSION 6 | LOSSES IN STORAGE (subject 5)
Chair: Colin Burton

12:00 - Greenhouse gas emissions from stored slurry with and without different covers - L. Rodhe (Sweden) 0194
12:15 - A floating covering system able to reduce ammonia and GHG emission from the storage of digested slurry - F. Gioielli (Italy) 0228
12:30 - N losses in young beef cattle housing and during their manure storage estimated thanks to N balance, diet and manure management - M. Mathot (Belgium) 0300
12:45 - Discussion
13:00 - Lunch sponsored by Silvex and Fundação Eugénio de Almeida

SESSION 7 | SANITARY AND ENVIRONMENTAL ASPECTS (subject 13)
Chair: Björn Vinnerås

14:30 - Decision support tool for the integration of public health in manure management - J. Ottoson (Sweden) 0125
14:45 - Survival of E. Coli within Farmyard manure heaps - C. Hodgson (UK) 0090
15:00 - Effectiveness of thermal sanitization of piggery slurry using heat exchangers C. Burton (France) 0020
15:15 - Investigation of copper and zinc speciation in pig slurry by a multitechnique approach - E. Doelsch (France) 0034
15:30 - Influence of temperature and moisture on nitrous oxide and carbon dioxide emissions during initial decomposition of N-rich animal residues in soil - T. Sinicco (Italy) 0146
15:45 - Poster session 3 incl. Refreshments (0h45)
Split poster presentations in 2 groups
15:45 - Poster subject 14
16:00 - Poster subject 9

SESSION 8 | SANITARY AND ENVIRONMENTAL ASPECTS (subject 13)
Chair: Jan Venglovsky

16:30 - Inactivation of avian flu and model virus in animal by-product composts - J. Elfving (Sweden) 0222
16:45 - Evolution of ammonia emissions in Switzerland between 1990 and 2007 - H. Menzi (Switzerland) 0139
17:00 - Identification of livestock faecal contamination in surface waters: application of chemical and microbiological tools for Microbial Source Tracking - A. M. Pourcher (France) 0082
17:15 - Fate of Steroid Hormones and Multiple Endocrine Activities in Agricultural Waste Treatment Facilities - S. Combalbert (France) 0227
17:30 - End
18:00 - Sightseeing tour for regular participants, sponsored by Cityrama - “Tickets are required”
19:30 - Dinner at Tromba Rija sponsored by CGD, Unicer and Adega Cooperativa de Portalegre
“Tickets are required”

ROOM 2

SESSION 9 | INNOVATION (subject 6)
Chair: Giorgio Provolo

09:00 - Strategies for the development and uptake of technology - D. Pedley (UK)
09:30 - Using near infrared spectroscopy to predict acetic and propionic acids in biogas processes utilizing different feedstocks - A. Ward (Denmark) 0026
09:45 - Implications of benchmarking biogas plants to improve performance - P. Hobbs (UK) 0122
10:00 - The ES-WAMAR project: a large scale demonstration of environmentally friendly management of swine manure in Aragon, Spain - J. Martinez (France) 0164
10:15 - Assessing regional potentials of waste and energy crop biomass of agrifood systems - Towards an adequate method - M. Kuisma (Finland) 0174
10:30 - Poster session 2 incl. Refreshments (1h30)
Split poster presentations in 4 groups
10:40 - Poster subjects 6+7
11:00 - Poster subject 8
11:20 - Poster subject 13
11:40 - Poster subjects 10+11+12

SESSION 10 | INNOVATION (subject 6)
Chair: Elizabeth Duarte

12:00 - Batch dry anaerobic co-digestion of sheep manure and potato waste - D. Blanco (Spain) 0055
12:15 - Production of value-added chars and activated carbons from animal manure - I. Lima (USA) 0200
12:30 - Plant Fibre Reinforced Polymer Composites in Papua New Guinea - SK Ales (Papua New Guinea) 0140
12:45 - Discussion
13:00 - Lunch sponsored by Silvex and Fundação Eugénio de Almeida

SESSION 11 | APPLICATION (subject 9+14)
Chair: Raul Moral

14:30 - A Hierarchy for Land Application of Organic Wastes - W. Magette (Ireland) 0213
14:45 - Nitrogen use efficiency in smallholder production systems: a case study from central Mexico - R. Parkinson (UK) 0268
15:00 - Phosphorus fertilization of maize seedlings using placement of direct injected animal slurry - J. Petersen (Denmark) 0298
15:15 - Bioenergy residues and biochar as soil amendments: climate-relevant C and N dynamics during decomposition in soils - ML Cayuela (Netherlands) 0319
15:30 - Use of hydrophilic polymers from disposable diapers to restore metal-contaminated soils - A .Varennes (Portugal) 0258
15:45 - Poster session 3 incl. Refreshments (0h45)
Split poster presentations in 2 group
15:45 - Poster subject 14
16:00 - Poster subject 9

SESSION 12 | APPLICATION (subject 9)
Chair: Amarilis de Varennes

16:30 - Long term application of dairy slurry reduces Cd concentration in sunflower (Helianthus anuus L.) - S. Bittman (Canada) 0033
16:45 - Assessment of the nutrient content in farm manures and biosolids via NIRS - L. Sagoo (UK) 0226
17:00 - Optimisation of the RothC model pools to simulate C dynamics after exogenous organic matters application in soils - C. Peltre (France) 0109
17:15 - Effects of co-digestate on the soil properties and crop responses - S. Hong (Corea) 0128
17:30 - End
18:00 - Sightseeing tour for regular participants, sponsored by Cityrama- "Tickets are required"
19:30 - Dinner at Tromba Rija sponsored by CGD and Adega Cooperativa de Portalegre - "Tickets are required"

Wednesday, September 15

ROOM 1

SESSION 13 | GLOBAL STRATEGIES FOR SUSTAINABILITY (subjects 10+11)
Chair: Sven Sommer

09:30 - Potential role of slurry treatment for the underpinning of EU Nitrates Directive derogations - J. Schroder (Netherlands) 0047
09:45 - Manure fertilization on dedicated energy crops: productivity and energy implications - E .Ceotto (Italy) 0061
10:00 - Assessment of dairy wastewater management practices in the northwest region of Portugal - A. C. Rodrigues (Portugal) 0317
10:15 - Biophysical modelling approach for beef cattle manure management and nutrients flow evaluation in Malaysian cattle feedlot - TP Tee (Malasia) 0071
10:30 - Compost is a product in Austria - 8 years experience by the Austrian Compost Quality Association - H. Mueller (Austria) 0112
10:45 - Increase and regulation of biogas production - K. H. Gregersen (Denmark) 0320
11:00 - Coffee break

CLOSING SESSION
Chair: Claudia M.d.S. Cordovil and Tom Misselbrook

11:30 - Presentation of Task Groups - H. Menzi
11:45 - Round table and closing
12:45 - Departure to Technical visit for registered participants

ROOM 2

SESSION 14 | NON EUROPEAN COUNTRIES (subject 12)
Chair: Airton Kunz

09:30 - Slurry management in dairy grazing farms in South American countries - F. Salazar (Chile) 0211
09:45 - Zero waste process for palm oil mills by composting and biological drying - F. Schuchart (Germany) 0247

10:00 - Recycling of organic residues from agricultural and municipal origin in China - M. Roelcke (Germany) 0251

10:15 - Medium size agricultural biogas plants management at ambient temperature: Process control and fluxes - J. Guo (China) 0279

10:30 - Bioenergy in family farming: a new sustainable perspective for the rural sector- C. Bley (Brazil) 0271

10:45 - Evaluation of Tunisian composts properties. Exogenous organic matter used as soil amendment - M. Kammoun Rigane (Tunisia) 0032

11:00 - Coffee break

Coffee breaks sponsored by Central de Cervejas, Delta and Sumol-Compal

12. **SOCIAL EVENTS**

Sunday, September 12

17:00 - Cocktail at "City Museum" - "Museu da Cidade"
(Buses will not be provided)

Where: Campo Grande, 245
How: Metro - Campo Grande Station

Tuesday, September 14

18:00 - Sightseeing tour for regular participants (invitation tickets required)

19:30 - **22:00** - Ramiran dinner at "Tromba Rija" Restaurant (invitation tickets required)

Buses to the Sightseeing tour and conference dinner will depart at 18h00 from the Fundação Calouste Gulbenkian (Venue) main entrance.
After dinner there will be buses transfer back to the Venue.
Inside your conference bag you will find a coloured invitation ticket to the sightseeing tour and dinner.

Wednesday, September 15

13:00 - **16:30** - Technical Visit for Registered Participants

Buses to the techical visit will depart at 13h00 from the Fundação Calouste Gulbenkian (Venue) main entrance. Lunch will be provided.

Inside your conference bag you will find a coloured invitation ticket to the technical visit.
Each bus will have an identification paper of the same colour of your invitation, and this is the bus you must choose.
Each participant must give his/her ticket to the person in charge, outside the bus.

TECHNICAL VISITS:

VALORSUL

AMARSUL, S.A. is the company responsible for the treatment of the approximately 750 thousand tons of Municipal Solid Waste produced, per year, in the municipalities of Amadora, Lisbon, Loures, Odivelas and Vila Franca de Xira.
Its intervention area corresponds to less than 1% of the total area of the country, but it treats almost one sixth of all domestic residues produced in Portugal.

AMARSUL

AMARSUL is responsible by the treatment and valorization of the municipal solid waste produced in the 9 municipalities of Setúbal peninsula, with three ecocenters at Palmela, Seixal and Setúbal.

Selective collection with more than 2000 Ecopoints;
7 Ecocentres (Almada, Alcochete, Barreiro, Moita, Montijo, Seixal e Sesimbra);
2 Selective collection stations (Ecoparks at Palmela and Seixal);
2 Sanitary Landfills (Ecoparks at Palmela and Seixal);
1 Composting processing plant (Ecopark Setúbal);
1 energetic biogas station (Ecopark at Seixal);

The biogas production plant produced enough energy to cover the energetic needs of 4.000 families. The energy produced was forwarded into the National Electrical Net (REN).

13. **POSTER SESSION LIST**

1 - Efficient use of water and slurry management in livestock production systems

W1 0035 **Multi-year application of whole and separated dairy slurry on perennial grass using surface banding: agronomic assessment**

Shabtai Bittman[1], Derek Hunt[1], Martin Chantigny[2], Katherine Buckley[3], Grant Kowalenko[1], Frederic Bounaix[1]

[1]Agriculture and Agri-Food Canada, Agassiz, BC, Canada, [2]Agriculture and Agri-Food Canada, Quebec City, QC, Canada, [3]Agriculture and Agri-Food Canada, Brandon, MB, Canada

W2 0169 **Thin Fraction of Pig Slurry: Nitrogen fertilizer value on grassland. Preliminary results**

Jantine Van Middelkoop[1], Gertjan Holshof[1]

[1]Wageningen UR Livestock Research, Lelystad, Netherlands

W3 0185 **A Pig Slurry Purification option: constructed wetland**

Pablo Sánchez[1], Ana Caballero[1], Ángel Faz[1], Juan Bautista Lobera[2]

[1]Politechnical University of Cartagena, Cartagena, Murcia, Spain, [2]Institute from Murcia of Agricultural and Food Research and Development, La Alberca, Murcia, Spain

W4 0204 **Pig slurry separation and filtration efficiency for on-farm water reuse**

Ricardo Suay[1], Sonia Martinez[1], Ernesto Gómez[1], Enrique Molto[1]

[1]Instituto Valenciano de Investigaciones Agrarias, Moncada, Valencia, Spain

W5 0210 **Water conservation and reuse in poultry slaughterhouse of Matelandia-PR Brasil – A case Study**

Diana Formentini, Ricardo Constanzi, Ansberto Neto, James Morais, Antonio Hashisuca HASHISUCA, Gilson Paulillo.

Unioeste, Cascavel, Parana, Brasil

2 - Management of livestock diet to minimize environmental impact of manure and slurries

D1 0052 Effect of diet fibre content on nitrogen excretion and efficiency in Piemontese young bulls

Davide Biagini[1], Carla Lazzaroni[1]

[1]Department of Animal Science, University of Torino, Grugliasco, Italy

D2 0053 Nutrient balance in intensive dairy cows farms: Preliminary results

Davide Biagini[1], Carla Lazzaroni[1]

[1]Departmente of Animal Science, University of Torino, Grugliasco, Italy

D3 0138 Influence of nutritional technology on water and performance indicators of pig production

Julio Cesar Pascale Palhares[1], Gustavo Julio Monteiro Melo de Lima[1], Arlei Coldebella[1], Daniela Gava[1],

[1]Embrapa Swine and Poultry, Concordia, Santa Catarina, Brazil

3 - Production technologies towards sustainability of livestock units

P1 0260 Manure treatment for green farming systems of the Southeastern USA

Patrick Hunt[1], Keri Cantrell[1], Kyoung Ro[1], Matias Vanotti[1], Ariel Szogi[1], Jeff Novak[1], Phil Bauer[1],

[1]USDA-ARS, Florence, SC, United States

P2 0277 Intensive livestock farming systems across Europe - a review of the current impact from the IPPC directive based on data gathered by questionnaire

Laurence Loyon[1,2], Colin Burton[1,2], Fabrice Guiziou[1,2]

[1]Cemagref, Rennes, France, [2]Université européenne de Bretagne, Rennes, France

P3 0287 Ammonia emissions from woodchip pads used for out-wintering cattle

Tom Misselbrook[1], Vicci Camp[1], Rebecca Murray[1], Paulo Dumont[1], David Chadwick[1], Ken Smith[2], Lizzie Sagoo[3], Richard Hill[4], Andy Scott[1]

[1]North Wyke Research, Okehampton, Devon, United Kingdom, [2]ADAS Wolverhampton, Wergs Road, Wolverhampton, United Kingdom, [3]ADAS Boxworth, Battlegate Lane, Boxworth, Cambridge, United Kingdom, [4]Westlakes Scientific Consulting, Moor Row, Cumbria, United Kingdom

P4 0299 Feasibility of different materials as bedding in loose housing systems for dairy cows

Hendrik Jan van Dooren, Michel Smits, Andre Aarnink, Paul Galama
Wageningen UR Livestock Research, Lelystad, Netherlands

4 - Treatment and use of non conventional organic residues in agriculture

NC1 0006 Admixture of cereal ash into liquid biogas digestate

Johanna Olsson[1], Sven Bernesson[2], Lena Rodhe[1], Eva Salomon[1], Per-Anders Hansson[2]
[1]*JTI - Swedish Institute of Agricultural and Environmental Engineering, Uppsala, Sweden,* [2]*SLU - Swedish University of Agricultural Sciences, Uppsala, Sweden*

NC2 0019 Substitution of peat for composts of municipal wastes in growing media: effects on growth and nutrition of Euphorbia Pulcherrima

F.J. Macías[1], D.J. Arias[1], M.D. Vela[1], R. Solera[2], J.L. García-Morales[2]
[1]*Centro IFAPA de Chipiona.Camino de Esparragosa s/n. 11550, Chipiona (Cádiz), Spain,* [2]*Departamento de Tecnologías del Medio Ambiente. Facultad de Ciencias del Mar y Ambientales. CASEM. Universidad de Cádiz. Polígono Río San Pedro s/n. 11510, Puerto Real (Cádiz), Spain*

NC3 0022 Effect of digestate application on cocksfoot biomass production and quality

Vita Tilvikiene[1], Zydre Kadziuliene[1], Zenonas Dabkevicius[1]
[1]*Instiute of Agriculture, Lithuanian Research Cener For Agriculure and Forestry, Akademija, Lithuania*

NC4 0041 Potential uses of Azolla filiculoides biomass grown in natural ecosystems and urban wastewater

M. Lourdes Costa[1], M. Conceição Santos[2], Francisco Carrapiço[3],
[1]*Escola Superior Agrária de Coimbra, Coimbra, Portugal,* [2]*Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, Lisboa, Portugal,* [3]*Universidade de Lisboa, Faculdade de Ciências, Lisboa, Portugal*

NC5 0046 Use of Limestone from mussel shells in acid soil of Galicia (NW SPAIN)

Julio Taboada[2], Sonia Pereira Crespo[1], Maria Jose Bande Castro[1],
[1]*Centro de Investigacións Agrarias de Mabegondo, A Coruña, Spain,* [2]*A Laxe Organic Farm, Lugo, Spain*

NC6 0051 Composting of organic solid By-Products from table olive processing (OSBTOP)

José L. García-Morales[1], Ruben Angeriz[1], Jorge Gómez[2], Miguel Suffo[3], *[1]Dep. de Tecnologías del Medio Ambiente. Facultad de CC. del Mar y Ambientales. CASEM. Universidad de Cádiz. Pol. Río San Pedro s/n. 11510, Puerto Real (Cádiz), Spain, [2]Ángel Camacho Alimentación, S. L. Av. del Pilar 6. Apdo.4. 41530, Morón de la Frontera (Sevilla), Spain, [3]Dep. de Ingeniería Mecánica y Diseño Industrial. E. U. Ingeniería Técnica Naval. CASEM. Universidad de Cádiz. Pol. Río San Pedro s/n. 11510, Puerto Real (Cádiz), Spain*

NC7 0096 Phosphorus fertilization in the plantation of sugarcane with filter cake enriched with soluble phosphate

Diego Henriques Santos[1], Carlos Sérgio Tiritan[2], José Salvador Simoneti Foloni[3], *[1]UNESP - Univ Estadual Paulista, Botucatu, São Paulo, Brazil, [2]Unoeste, Presidente Prudente, São Paulo, Brazil, [3]Iapar, Londrina, Paraná, Brazil*

NC8 0107 Composting and vermicomposting of settleable solid fish waste (manure) from commercial turbot farm

Purificación Marcet Miramontes[1], Alejandro Guerra[2], Saleta Gonzalez[1], Maria Otero[2], Julio Eiroa[1],
[1] Escuela de Ingeniería Técnica Forestal. Campus de Pontevedra. Universidad de Vigo., Pontevedra, Spain, [2]Centro de Investigacións Mariñas (CIMA), Vilanova de Arousa. Pontevedra., Spain

NC9 0108 Effects of fish manure vermicompost on a soil affected by wildfire

Purificación Marcet Miramontes [1], Alejandro Guerra[2], Saleta Gonzalez[1], Maria Otero[2], Julio Eiroa[1], *[1]Escuela de Ingeniería Técnica Forestal. Universidad de Vigo., Pontevedra, Spain, [2]Centro de Investigacións Mariñas (CIMA)., Pedras de Corón.Vilanova de Arousa. Pontevedra., Spain*

NC10 0121 Characterization and agronomic use of pigeon manure: A case study in the northeast transmontano region (Portugal)

A.M. Villa-Serrano, M.D. Perez-Murcia, A. Perez-Espinosa, J. Moreno-Caselles, L. Galvez-Sola, M.A. Bustamante,
Miguel Hernandez University, Orihuela (Alicante), Spain

NC11 0124 Nitrogen dynamics in a clay loam soil amended with distillery waste compost

C. Paredes[1], E.M. Medina[1], R. Moral[1], M.A. Bustamante[1,2], E. Agullo[1], A. Perez-Espinosa[1], J.A. Cecilia[1],

[1]Miguel Hernandez University, Orihuela (Alicante), Spain, [2]Centro de Edafología y Biología Aplicada del Segura, CSIC, Murcia, Spain

NC12 0131 Effects of organic bioactive substances on phenylpropanoid metabolism in Zea mays L. seedlings

Andrea Ertani [1], Clizia Franceschi [2], Adriano Altissimo [3], Serenella Nardi-[1],

[1]Università degli Studi di Padova, Viale dell'Università 16, 35020 Legnaro, Padova, Italy, [2]R&S ILSA S.p.A., Via Quinta Strada 28, 36071 Arzignano, Vicenza, Italy, [3]Landlab studio associato, Via Quintarello 12/A, 36050 Quinto Vicentino, Vicenza, Italy

NC13 0142 Evaluation of compost from cattle and organic wastes as adsorbent of cadmium ions in aqueous solution

Helder Vasconcelos[1], Dércio Pereira[1], Ana Maria Vasconcelos[1], Luís Antônio Costa[1], *[1]UNIOESTE - State University of Western Paraná, Cascavel, Paraná, Brazil*

NC14 0144 Adsorption of methylene blue dye by pistachio shells

Helder Vasconcelos[1], Carlos Verruchi Jr[1], Ana Maria Vasconcelos[1],

[1]UNIOESTE - State University of Western Paraná, Cascavel, Paraná, Brazil

NC15 0148 Short term effect of organic residues from bioenergy production on soil properties

Antonia Galvez[1,2], Tania Sinicco[1], Lorena Marino[1], Maria Luz Cayuela[3], Maria Dolores Mingorance[2], Claudio Mondini[1],

[1]Research Group of Gorizia, CRA-RPS, Gorizia, Italy, [2]Instituto Andaluz de Ciencias de la Tierra (CSIC-UGR), Granada, Spain, [3]Dept. of Soil Quality, Wageningen University, Wageningen, Netherlands

NC16 0157 Management of spent timber residue from out-wintering pads

Paulo Dumont[1], Dave Chadwick[1], Lizzie Sagoo[3], Ken Smith[2],

[1]North Wyke Rresearch, Okehampton, Devon, EX20 2SB, United Kingdom, [2]ADAS Wolverhampton, Woodthorne, Wolverhampton, WV6 8TQ, United Kingdom, [3]ADAS Boxworth, Cambridge, CB23 4NN, United Kingdom

NC17 0221 **Tailings with manganese and its potential in the production of seedbed**

Karla Virginia Mellado Moreno[1], Adalberto Benavides Mendoza[1], Maria de las Nieves Rodriguez Mendoza[2], Norma Angelica Ruiz Torres[1], Mario Cantú Sifuentes[1], Edmundo Peña Cervantes[1], *[1]Universidad Autonoma Agraria Antonio Narro, Benavista Saltillo Coahuila, Mexico, [2]Colegio de Posgraduados, Montecillo, Texcoco, Edo de Mexico, Mexico*

NC18 0263 **Effect of sugar foam waste and phosphogypsum on a Mediterranean Ultisol under forage cropping**

Ignacio Mariscal-Sancho[1], Pedro González[1], Rafaela Ordóñez[1], Rafael Espejo[1],
[1]Universidad Politécnica de Madrid, Madrid, Spain

NC19 0291 **Carbon and Nitrogen mineralization of organic wastes from sugarcane distilleries: vinasse and yeast waste**

Valério Pita[1], Ernesto Vasconcelos[1], David Fangueiro[1], Fernanda Cabral[1], Henrique M. Ribeiro[1],
[1]UIQA, Instituto Superior de Agronomia, Technical University of Lisbon, Lisbon, Portugal

---

NC20 0309 **Use of diaper polymers as soil conditioner**

Shakib Shahidian[1,2], Ricardo Serralheiro[2,1], Joao Serrano[1,2], Rui Machado[1,2], Celia Toureiro[1,2], Joao Rebocho[2,1],
[1]Univeristy of Evora, EVora, Portugal, [2]ICAAM, Evora, Portugal

---

NC21 0312 **Guidelines for the management of Wineries wastewaters**

Margarida Oliveira[1,2], Elizabeth Duarte[1],
[1]Instituto Superior de Agronomia, Universidade Técnica de Lisboa, Lisboa, Portugal, [2]Escola Superior Agrária de Santarém, Instituto Politécnico de Santarém, Santarém, Portugal

---

NC22 0318 **Effect of an organic residue obtained from Co-Composting wastes from different sources (Human and Animal) on Agricultural soil characteristics**

Gerardo López López[1], Antoni Negre[1], Laura Oliver[1], José María Rovira[1], Isabel Sastre Conde[1], *[1]IRFAP, Conselleria de Agricultura, Palma de Mallorca, Spain*

5- Environmental, nutrient losses, impact of storage and spreading operations

L1 0016 Nitrous oxide emission from a volcanic soil after dairy slurry application

Marta Alfaro[1], Francisco Salazar[1], Pedro Nuñez[2], Erika Vistoso[1], Josué Lagos[1], Luis Ramirez[1], *[1]Instituto de Investigaciones Agropecuarias, Osorno, Chile, [2]The Dominican Republic Institute of Agricultural and Forest Research, Santo Domingo, Dominican Republic*

L2 0048 Nitrogen leaching following a high rate of dairy slurry application on a ryegrass sward of a volcanic soil of Southern Chile

Francisco Salazar[1], Marta Alfaro[1], Tom Misselbrook[2], Josue Lagos[1], *[1]National Institute for Agricultural Research, Remehue Research Centre, Osorno, Chile, [2]North Wyke Research, North Wyke, Devon EX20 2SB, United Kingdom*

L3 0056 Effect of farmyard manure and fertilizer application on N, O and CH fluxes from a volcanic grassland soil in Nasu, Japan

Akinori Mori[1], Masayuki Hojito[1], *[1]National Institute of Livestock and Grassland Science, Nasushiobara, Japan*

L4 0067 Simultaneous emissions and dispersion of the ammonia plume inside and around a dairy farm in Segovia (Spain)

Francisco Sanz[1], Gema Montalvo[2], Angel Luis Goméz[1], Carlos Piñeiro[3], Manuel Bigeriego[4], M. José Sanz[1], *[1]Fundación CEAM, Valencia, Spain, [2]Tragsega, S.A., Madrid, Spain, [3]PigCHAMP, Segovia, Spain, [4]Ministerio de Medio Ambiente y Medio Rural y Marino, Madrid, Spain*

L5 0068 Effects of temperature and dairy cattle excreta characteristics on ammonia emissions from a simulated concrete floor

José Pereira[1,4], Tom Misselbrook[2], David Chadwick[2], João Coutinho[3], Henrique Trindade[4], *[1]Escola Superior Agrária de Viseu, Instituto Politécnico de Viseu, Viseu, Portugal, [2]North Wyke Research, Okehampton, Devon, United Kingdom, [3]Chemistry Centre, Department of Soil Science, Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal, [4]CITAB - Centre for the Research and Technology of Agro-Environment and Biological Sciences, Department of Agronomy, Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal*

L6 0077 Effect of solid and slatted floors and temperature on ammonia and GHG emissions in a scale model of dairy cattle houses

José Pereira[1,4], Tom Misselbrook[2], David Chadwick[2], João Coutinho[3], Henrique Trindade[4],

[1]Escola Superior Agrária de Viseu, Instituto Politécnico de Viseu, Viseu, Portugal, [2]North Wyke Research, Okehampton, Devon, United Kingdom, [3]Chemistry Centre, Department of Soil Science, Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal, [4]CITAB - Centre for the Research and Technology of Agro-Environment and Biological Sciences, Department of Agronomy, Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal

L7 0085 Nitrate leaching from soils amended with different organic residues

João Carneiro[1], João Coutinho[2], Henrique Trindade[3],

[1]Polytechnic Institute of Castelo Branco, Castelo Branco, Portugal, [2]Chemitry Center - University of Trás-os-Montes e Alto Douro, Vila Real, Portugal, [3]CITAB – Centre for the Research and Technology of Agro-Environment and Biological Sciences, University of Trás-os-Montes e Alto Douro, Vila Real, Portugal

L8 0101 Assessment of manure management practices across the EU27

Thierry Bioteau, Colin Burton, Fabrice Guiziou, José Martinez,

Cemagref, Rennes, France

L9 0113 Nitrous oxide emission from grassland and maize grown for biogas production on a clay soil

Anna Techow[1], Klaus Dittert[3], Mehmet Senbayram[3], Robert Quakernack[2], Andreas Pacholski[2], Henning Kage[2], Friedhelm Taube[1], Antje Herrmann[1],

[1]Institute of Crop Science and Plant Breeding -Grass and Forage Science/Organic Agriculture-, Kiel, Schleswig Holstein, Germany, [2]Institute of Crop Science and Plant Breeding -Agronomy and Crop Science-, Kiel, Schleswig Holstein, Germany, [3]Institute of Plant Nutrition and Soil Science, Kiel, Schleswig Holstein, Germany

L10 0126 Assessing the effect of spreading method and incorporation of the nitrification inhibitor DCD, on trace gas emissions from soils amended with slurry

Enda Cahalan[1,2], Christoph Mueller[2], Ronnie Laughlin[3], Catherine Watson[3], David Devaney[1], Deirdre Hennessy[4], Ibrahim Khalil[1], Karl Richards[1],

[1]Teagasc, Johnstown Castle, Wexford, Ireland, [2]UCD, Dublin, Ireland, [3]AFBI, Belfast, Ireland, [4]Teagasc, Moorepark, Cork, Ireland

L11 0141 Crop response by using knife- or shallow injector equipment - benefit or a crop damage?

Lena Rodhe, Magnus Halling,
JTI - Swedish Institute of Agricultural and Environmental Engineering, Uppsala, Sweden

---

L12 0156 Management strategies to reduce nitrogen losses from solid cattle manure

Ghulam Mustafa Shah[1], Ghulam Abbas Shah[1], Egbert Anne Lantinga[1],
[1]Wageningen University and Research Centre, Wageningen, Netherlands

---

L13 0160 Injection of animal slurry to winter cereals - effects on emissions of odour, ammonia, and crop yield

Martin N Hansen[1], Tavs Nyord[2], Torkild Birkmose[3],
[1]Agrotech, Institute for Agri Technology and Food Innovation, Aarhus N, Denmark, [2]University of Aarhus, Faculty of Agricultural Sciences, Foulum, Denmark, [3]Danish Agricultural Advisory Service (DAAS), Aarhus N, Denmark

---

L14 0162 The potential of application timing management to reduce ammonia emissions following cattle slurry application

Stan Lalor[1], Gary Lanigan[1], *[1]Teagasc, Johnstown Castle, Ireland*

L15 0168 Field assessment of the balance between greenhouse gases and ammonia emissions after cattle slurry application

Frédéric Bourdin[1,2], Gary Lanigan[1], Ruben Sakrabani[2], Mark Kibblewhite[2],
[1]Teagasc, Johnstown Castle, Wexford, Ireland, [2]Cranfield University, Cranfield, Bedfordshire, United Kingdom

---

L16 0175 Ammonia volatilization after application of biogas slurries in a coastal marsh region of Northern Germany

Robert Quakernack[1], Anna Techow[2], Antje Hermann[2], Friedhelm Taube[2], Henning Kage[1], Andreas Pacholski[1],
[1]Institute of Crop Science and Plant Breeding, Chair of Agronomy and Crop Science, CAU, Kiel, Schleswig-Holstein, Germany, [2]Institute of Crop Science and Plant Breeding, Chair of Grass and Forage Science/Organic Agriculture, CAU, Kiel, Schleswig-Holstein, Germany

---

L17 0214 Inventory of a soil heavy metal concentration in Galicia

Mosquera-Losada Rosa[1], Amador Alberto[2], Muñoz-Ferreiro Nieves[1], Santiago-Freijanes José Javier[1], Rigueiro-Rodríguez Antonio[1],
[1]University of Santiago de Compostela, Lugo, Spain, [2]Agroamb-Prodalt, Lugo, Spain

L18 0223 Effects of the fertilisation with sewage sludge on Cu concentration in soil and pasture in pastoral systems, forestry systems and silvopastoral systems developed under Pinus radiata D. Don

Mosquera-Losada Maria Rosa[1], Ferreiro-Domínguez Nuria[1], Rigueiro-Rodríguez Antonio[1],

[1]University of Santiago de Compostela, Lugo, Spain

L19 0246 C transformations during storage of farmyard manure

R. Moral[1], M.A. Bustamante[1], T.H. Misselbrook[2], D.R. Chadwick[2], V. Camp[2], N. Donovan[2],

[1]Miguel Hernandez University, Orihuela, Alicante, Spain, [2]North Wyke Research, Okehampton, Devon, United Kingdom

---

L20 0253 Assessment of different covering systems to reduce gaseous losses from slurry storage

Nadia Dorno, Elio Dinuccio, Paolo Balsari,

University of Turin, Grugliasco (TO), Italy

L21 0254 Ammonia volatilization after soil application of raw and dilute pig slurry

Elio Dinuccio, Nadia Dorno, Paolo Balsari,

DEIAFA - Università di Torino, Grugliasco (TO), Italy

L22 0257 Ammonia emission after the land application in orchard of raw and mechanical separated slurry

Fabrizio Gioelli[1], Enrico Paschetta[1], Elio Dinuccio[1], Paolo Balsari[1],

[1]Department of Agricultural, Forestry, Environmental Engineering and Land based Economics (DEIAFA) Torino University, Grugliasco (To), Italy

---

L23 0265 Assessment of water and soil pollution by nitrogen compounds from long term farm yard manure storage directly on the ground

Stefan Pietrzak,

Institute of Technology and Life Sciences, Falenty, Mazovia, Poland

---

L24 0314 Assessment of the CO2 emissions during acidification, storage and following soil application of the liquid fraction of pig slurry

David Fangueiro[1], Margarida Gusmão[1], Sonia Surgy[1], Joao Coutinho[2], Fernanda Cabral[1],

[1]UIQA Instituto Superior de Agronomia, TU Lisbon, Tapada da Ajuda, 1349-017 Lisboa, Portugal, [2]C. Química, Dep Biologia e Ambiente, UTAD, 5001-911 Vila Real, Portugal

6- Innovation and technology transfer

I1 0007 Organic Waste: Positive-List for highest Compost and Digestate Quality

Albrecht Siegenthaler[1], [1]*Swiss Federal Office for Agriculture, Berne, Switzerland*

I2 0040 EU Agro biogas Project

Amon Thomas[1], Herwig Mayr[1], Michael Eder[1], Phill Hobs[1], Sreenvias Rao Ravella[1], Ursula Roth[1], Anke Niebaum[1], Helmut Döhler[1], Peter Weiland[1], Elhussein Abdoun[1], Andreas Moser[1], Markus Lyson[1], Monika Heiermann[1], Matthias Plöchl[1], Jörn Budde[1], Alexander Schattauer[1], Theresa Suarez[1], Henrik Möller[1], Alastair Ward[1], Friedhelm Hillen[1], [1]*University of Natural Resources and Applied Life Sciences, Vienna, Austria,* [2]*North Wyke Research, Ceredigion, United Kingdom,* [3]*Association for Technology and Structures in Agriculture, Darmstadt, Germany,* [4]*Johann Heinrich von Thünen Institute;, Braunschweig, Germany,* [5]*RTD Services, Vienna, Austria,* [6]*Leibniz Institute of Agricultural Engineering,, Potsdam, Germany,* [7]*Aarhus University, Tjele, Denmark,* [8]*GE Jenbacher GmbH & Co OHG, Jenbach, Austria,* [9]*Institute for Renewable Energy, Warsaw, Poland,* [10]*Hugo Vogelsang Maschinenbau GmbH, Essen, Germany,* [11]*Engineering, Praha, Czech Republic,* [12]*Research Animal Science Group, Lelystad, Netherlands,* [13]*Plant Research International, Wageningen, Netherlands,* [14]*Universitá degli Studi di Torino, Grugliasco, Italy*

I3 0110 StoreEyes: a software application package for monitoring fluxes of livestock effluents at farm level

Fabrizio Mazzetto, Pasqualina Sacco, Aldo Calcante,
Department of Agricultural Engineering, Milan, Italy

I4 0111 The METAMORFOSI Project: monitoring and controlling zootechnical effluents in livestock farms

Fabrizio Mazzetto, Aldo Calcante, Pasqualina Sacco,
Department of Agricultural Engineering, Milan, Italy

I5 0151 Sugar beet production as a substrate for biogas plants in aspect of Polish sugar industry revitalization

K. Pilarski, J. Dach, N. Mioduszewska, Zhou Mo,
Poznan University of Life Sciences, Poznan, Poland

I6 0155 Industrial Hemp (CANNABIS SATIVA L.) as a Biomass Crop

Liena Poiša[1], Aleksandrs Adamovi?s[1], Zofija Jankauskiene[1], Elvyra Gruzdeviene[1], *[1]Institute of Agrobiotechnology, Latvia University of Agriculture, Jelgava, Latvia, [2]Upyte; Experimental Station of the Lithuanian Research Centre for Agriculture and Forestry, Upyte, Panevezys district, Lithuania*

I7 0167 Agrammon: An internet based model for the estimation of ammonia emissions

Thomas Kupper[1], Beat Achermann[2], Cyril Bonjour[3], Fritz Zauker[4], Harald Menzi[1],

[1]Swiss College of Agriculture (SHL), Zollikofen, Switzerland, [2]Swiss Federal Office for the Environment (FOEN), Bern, Switzerland, [3]Bonjour Engineering GmbH, Lostorf, Switzerland, [4]Oetiker+Partner AG, Olten, Switzerland

---

I8 0178 Changes in environmental perception and knowledge in stakeholders after waste management courses in Argentina

María Alejandra Herrero[1], Graciela María Sardi[1], Marcela Rebuelto[1], Susana Beatriz Gil[1], Myriam Celinda Flores[1],

[1]Facultad de Ciencias Veterinarias, Universidad de Buenos Aires, Ciudad de Buenos Aires, Argentina

---

I9 0202 Study of the homogeneity of Pig Slurry during storage and stirring by means of computational fluid dynamics (CFD)

Sonia Martinez, Rafael Granell, Enrique Molto, Ricardo Suay,

Instituto Valenciano de Investigaciones Agrarias, Moncada, Valencia, Spain

---

I10 0248 Nutrient management tools: The fertiliser manual and MANNER-NPK

John Williams[1], Brian Chambers[2], Fiona Nicholson[2], Ken Smith[3], Peter Dampney[1], David Chadwick[4],

[1]ADAS Boxworth, Cambridge, United Kingdom, [2]ADAS Gleadthorpe, Nottinghamshire, United Kingdom, [3]ADAS Wolverhampton, Wolverhampton, United Kingdom, [4]North Wyke Research, Okehampton, United Kingdom

---

I11 0294 Local pipeline transport for the environmentally and economic sustainable management of piggery slurry

Arturo Daudén[1], Marta Teresa[1], Christian Siegler[1], Eva Herrero[1], Colin Burton[2], Fabrice Guiziou[2],

[1]SODEMASA, Zaragoza, Spain, [2]CEMAGREF, Groupement de Rennes, France

7- Pre-processing of manure and organic waste for energy production

PP1 0025 Extreme thermophilic pre-treatment of manures for improved biogas production

Alastair Ward[1], Henrik Møller[1], Chitra Raju[1], [1]*Aarhus University DJF, Aarhus, Denmark*

PP2 0027 The effect of thermo-chemical pre-treatment on the ultimate biogas potential of straw

Chitra Sangaraju Raju, Alastair James Ward, Henrik Bjarne Møller,
Aarhus University, Foulum, Denmark

PP3 0030 Possibilities for sustainable agrarian feedstock production and utilization

Chrisitan Leonhartsberger[1], Alexander Bauer[1], Herwig Mayr[1], Thomas Amon[1],
[1]*University of Natural Resources and Applied Life Sciences, Vienna, Austria*

PP4 0060 Pretreatment: The key issue in vinasse valorization

Jose A. Siles[1], Hassan El Bari[2], Said Ibn Ahmed[2], Arturo F. Chica[1], M. Angeles Martín[1], [1]*University of Córdoba, Córdoba, Spain,* [2]*University Ibn Tofail, Kenitra, Morocco*

PP5 0078 Residual lard fat: A good alternative as biodiesel raw material

M. Carmen Gutiérrrez[1], Mónica Berrios[1], Arturo F. Chica[1], M. Ángeles Martín[1], Antonio Martín[1],
[1]*University of Córdoba, Córdoba/Andalucía, Spain*

PP6 0127 Effect of biomass hydrolysis on biogas production

Sreenivas Rao Ravella, Andy Retter, Phil Hobbs,
North Wyke Research, Okehampton, Devon, United Kingdom

PP7 0198 Evaluation of yielding abilities of Latvian flax varieties and future prospectives

Lubova Komlajeva[1], Aleksandr Adamovic[1], Veneranda Stramkale[2],
[1]*Latvia University of Agricultura, Jelgava, Latvia,* [2]*1Agricultural Science Center of Latgale, Vilani, Latvia*

PP8 0207 Comparision of three pretreatments for organic matter solubilization from OFMSW

MªÁngeles Romero Aguilar[1], Luis Isidoro Romero García[1], Carlos José Álvarez Gallego[1],
[1]*Universidad de Cádiz, Puerto Real, Spain*

PP9 0232 Use of microwave and thermo-chemical pretreatments for improvement of agricultural or agri-food wastes conversion into biogas

David Jackowiak[1,2], David Bassard[1,2], Maurice Nonus[2], André Pauss[2], Thierry Ribeiro[1],

[1]Institut Polytechnique Lasalle Beauvais, Beauvais, France, [2]Université de Technologie de Compiègne, Compiègne, France

PP10 0305 Anaerobic digestion experiments using Cynara cardunculus L. stalks

Ivo Oliveira[1], Santino di Berardino[1], Jorge Gominho[1], Elizabeth Duarte[1],

[1]Instituto Superior de Agronomia (ISA-UTL), Lisbon, Portugal, [2]Laboratório Nacional de Energia E Geologia, I.P., Lisbon, Portugal

PP11 0328 Evolution of dairy manure in a dungpit with regard to solid-liquid separation

Muñoz N. [1], Rico C [2], Gómez B.[1], Rico J. L. [1*].

[1] Department of Chemical Engineering and Inorganic Chemistry, University of Cantabria, Spain,[2] Department of Sciences and Techniques of Water & Environment, University of Cantabria, Spain

8- Technologies/systems for different manure and organic waste treatment options

T1 0042 Agronomic and environmental quality assessment of treated manures: 3. Carbon and nitrogen dynamics after treated manures application to the soil

Stefano Monaco, Dario Sacco, Simone Pelissetti, Laura Petruzzelli, Carlo Grignani,

Dip. Agronomia, Selvicoltura e Gestione del territorio - Università di Torino, Torino, Italy

T2 0044 Agronomic and environmetal quality assessment of treated manures:effects of solid/liquid separation on raw and digested slurries

Paolo Mantovi[1], Claudio Fabbri[1], Mariangela Soldano[1], Sergio Piccinini[1],

[1]Research Centre on Animal Production, Reggio Emilia, Italy

T3 0057 Physical, Chemical and Biological characterization of biofilters for the treatment of gas emissions in industrial plants

Manuel Dios, M. Carmen Gutiérrez, Ana B. Corredera, Fátima Vargas, Arturo F. Chica, *University of Córdoba, Córdoba, Spain*

T4 0062 Evaluation of the outcomes of a research on the use of microbial inoculation and the Eissenia foetida in the composting process for the treatment of household organic waste

Fabian Pacheco[1], Maria Sesma[1], Natxo Irigoien[1], Julio Muro[1], Itziar Domeño[1], Franchesco Storino[2], Beatriz Yaben[2], Sandra Blazquez[2], Alfonso Amorena[1],
[1]Universidad Publica de Navarra, Pamplona / Navarra, Spain, [2]Mancomunidad de la Comarca de Pamplona, Pamplona / Navarra, Spain

T5 0064 Flash Microbial Toxicity Test as Monitoring Parameter at Composting: Comparison of Ecotoxicity Leveles for Different Substrates

María José López, María del Carmen Vargas-García, Francisca Suárez-Estrella, Gema Guisado, Joaquín Moreno,
University of Almeria, Almeria, Spain

T6 0069 A pilot scale study to assess the effect of different rates of tannery effluent applied to constructed wetlands with Phragmites and Typha

José Pereira[1,2], Francisco Marques[1], Pedro Rodrigues[1], Daniela Teixeira[1], Adelaide Perdigão[1], António Pinto[1], Henrique Trindade[2],
[1]Escola Superior Agrária de Viseu, Instituto Politécnico de Viseu, Viseu, Portugal, [2]CITAB - Centre for the Research and Technology of Agro-Environment and Biological Sciences, Department of Agronomy, Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal

T7 0072 Rapid analysis of nutrients in solid manures from animal slurry separation by near infrared reflectance spectroscopy (NIRS)

Peter Sørensen[1], Lambert K Sørensen[2],
[1]Aarhus University, Faculty of Agricultural Sciences, Dept. Agroecology and Environment, 8830 Tjele, Denmark, [2]Eurofins-Steins Laboratory, 7500 Holstebro, Denmark

T8 0075 Production of Ligninolytic Enzymes by Dye-Decolorizing Microorganisms Isolated from a Composting Environment

Gema Guisado, María José López, María del Carmen Vargas-García, Francisca Suárez-Estrella, Joaquín Moreno,
University of Almería, Almería, Spain

T9 0083 Orange Peel: Organic waste or energetic resource?

M. Ángeles Martín[1], José A. Siles[1], Hassan El Bari[2], Arturo F. Chica[1], Antonio Martín[1]

[1]University of Córdoba, Córdoba/Andalucía, Spain, [2]Université Ibn Tofail., Kenitra, Morocco

---

T10 0105 Nitrogen recovery from biogas plant digestates via solid-liquid separation and stripping

Devina Fitrika Dewi Anasruron, Olaf Bade, Ina Körner,

TU Harburg Hamburg, Hamburg, Germany

T11 0114 Composting of brewery wastes with agricultural and forest residues

E. Brito[1], M.A. Bustamente[1,2], C. Paredes[1], J. Moreno-Caselles[1], M.D. Perez-Murcia[1], A. Perez-Espinosa[1], R. Moral[1],

[1]Miguel Hernandez University, Orihuela (Alicante), Spain, [2]Centro de Edafología y Biología Aplicada del Segura, CSIC, Murcia, Spain

---

T12 0147 Forced aeration composting system and dynamic composting system for the treatment of manure and slurry

Oscar del Hierro[1], Ania Escudero[1], Leire Ibarretxe[2], Noemi Aguirre[3], Lurdes Nafarrate[3], Jon Jausoro[4], Miriam Pinto[1],

[1]NEIKER-Tecnalia, Derio, Bizkaia, Spain, [2]ENEEK, Amorebieta-Etxano, Bizkaia, Spain, [3]SERGAL, Arkaute,Vitoria-Gasteiz, Spain, [4]UAGA, Vitoria-Gasteiz, Spain

---

T13 0153 Nitrogen reduction in the animal slurry through ammonia air stripping at high temperature

Giuseppe Moscatelli, Claudio Fabbri, Paolo Mantovi, Mariangela Soldano,

C.R.P.A. SpA, Reggio Emilia, Italy

T14 0163 Start up and operation of an aerobic reactor for swine effluent partial nitritation and simultaneous removal of COD

Marcelo Bortoli[1], Airton Kunz[2], Hugo Soares[1],

[1]EQA/UFSC, Florianopolis, Brazil, [2]Embrapa Swine and Poutry, Concordia, Brazil

---

T15 0173 Composting of green waste. The Experience of ALGAR, S.A.

Luis Miguel Nunes, Susana Oliveira,

ALGAR, S.A., Faro, Algarve, Portugal

T16 0176 Distillery stillage as one of the substrates increasing the efficiency of agricultural biogas plant

Krzysztof Pilarski, Mariusz Adamski, Agnieszka Wolna-Maruwka, Natalia Mioduszewska, Zhou Mo,
Poznan University of Life Sciences, Poznan, Poland

T17 0179 Composting of distillery stillage obtained as the waste during bioethanol production

Jacek Dach, Krzysztof Pilarski, Pawel Nizewski, Mariusz Adamski, Zhou Mo,
Poznan University of Life Sciences, Poznan, Poland

T18 0181 Evaluation of bulking agents influence in the emission of ammonia from swine manure Co-composting

Martha Mayumi Higarashi[1], Luana Goulart Sardá[2], Paulo Armando Victória Oliveira[1], *[1]Embrapa Swine and Poultry, Concórdia/SC, Brazil, [2]Universidade Federal de Santa Catarina, Florianópolis/SC, Brazil*

T19 0197 MSW facilities of combined biological treatment: anaerobic digestion plus composting

Marga López, Montserrat Soliva, F. Xavier Martínez, Montserrat Gallart, Oscar Huerta, *Universitat Politècnica de Catalunya, Barcelona, Spain*

T20 0199 Digestate treatment by means of a full scale membrane system: an innovative method for managing surplus nitrogen and for valorising farm effluents

Alessandro Chiumenti, Roberto Chiumenti, Da Borso Francesco,
University of Udine, Udine, Italy

T21 0215 Anaerobic treatment of dairy cattle effluents at tubular biodigestor

Elisabete Ferro Mendonça[2], Maria Hermínia Ferreira Tavares[1], Simone Damasceno Gomes[1],
[1]West University of State of Parana, Cascavel, Paraná, Brazil, [2]B&M Consultoria Agropecuária, Cascavel, Paraná, Brazil

T22 0216 Horizontal Biodigestor behavior at poultry litter treatment

Michael Steinhorst Alcântara, Simone Damasceno Gomes, Maria Hermínia Ferreira Tavares, Thaisa Pegoraro,
West University of State of Parana, Cascavel, Paraná, Brazil

T23 0218 Influency of ammonium nitrogen concentration and aeration time on poultry slaughterhouse wastewater nitrification process

Rosemeri Dallago, Simone Damasceno Gomes, Juliana Rodrigues Mees, Tatiane Martins de Assis, Sandra Moreira,
Unioeste, Cascavel, Paraná, Oeste, Brasil

T24 0229 Efficiency of mechanical separation of digested and not digested slurry

Elio Dinuccio, Enrico Paschetta, Fabrizio Gioelli, Paolo Balsari,
[1]*Università di Torino, Grugliasco (To), Italy*

T25 0239 Influence of turning and water addition on ammonia emission in co-composting of swine solid fraction manure

Eugenio Cavallo, Eliana Santoro,
IMAMOTER, Torino, Italy

T26 0243 Chemical changes in poultry manure during composting

Nada Sasakova[1], Jan Venglovsky[1], Ingrid Papajova[1], Miloslav Ondrasovic[1], Olga Ondrasovicova[1], Gabriela Gregova[1], Katarina Lakticova[1],
[1]*University of Veterinary Medicine in Kosice, Kosice, Slovakia*

T27 0269 Municipal solid wastes digested by biomethanization to use in agriculture

Soraya Zahedi[1], Luis Isidoro Romero[2], Diego Sales[1], Rosario Solera[1],
[1]*Department of Environmental Technologies. Faculty of Marine and Environmental Sciences (CASEM)., Cadiz, Spain,* [2]*Department of Chemical Engineering and Food Technology. Faculty of Science., Cadiz, Spain*

T28 0285 Monitoring of an anaerobic digestion plant in a cattle farm in Piedmont

Enrico Paschetta, Elio Dinuccio, Fabrizio Gioelli, Simona Menardo, Paolo Balsari, *DEIAFA-Università di Torino, Grugliasco (TO), Italy*

T29 0324 Anammox treatment of swine wastewater using immobilized technology

Magrí A.[1], Vanotti M.B.[2], Szogi A.A.[2]
[1]*GIRO Technological Centre, Barcelona, Spain,*
[2]*United States Department of Agriculture (USDA), Agricultural Research Service (ARS), Coastal Plains Research Center, South Carolina, USA*

T30 0325 Anaerobic digestion of solid slaughtwerhouse waste at laboratory scale

Lacalle A., Escudero A., Blanco F., Pinto M.
NEIKER-TECNALIA Basque Institute for Agricultural Research and Development, Derio, Spain

T31 0331 Development of pulse technology for production of fertilizers from an organic waste

Ramazashvili, K. Kiladze
Institute of agrarian radiology and ecology, Mtskheta, 3306 Georgia

9- Use of manures and organic wastes to improve soil quality and nutrient balances

U1 0010 Influence of the particle size and animal slurry type on the potential of nitrogen mineralization after soil incorporation

David Fangueiro, Margarida Gusmão, João Grilo, Ernesto Vasconcelos, Fernanda Cabral,
UIQA Instituto Superior de Agronomia, TU Lisbon, Tapada da Ajuda, 1349-017 Lisboa, Portugal

U2 0036 Changes to physical and chemical soil properties after MSW compost addition

Ana Isabel Roca Fernández,
Centro de Investigaciones Agrarias de Mabegondo, A Coruña, Spain

U3 0039 Analysis of the total composition and availability of soil elements after MSW compost application

Ana Isabel Roca Fernández,
Centro de Investigaciones Agrarias de Mabegondo, A Coruña, Spain

U4 0049 Carbon and nitrogen mineralisation in soil amended with digestates from anaerobic co-digestion processes.

Jose Antonio Alburquerque, Carlos de la Fuente, Lucía Carrasco, Juan Cegarra, María Pilar Bernal,
Centro de Edafología y Biología Aplicada del Segura, CSIC., Murcia, Spain

U5 0050 A 40-year record of Soil Organic Carbon (SOC) sequestration in an intensive cropping system in Hungary

Márton László,
RISSAC-HAS, Budapest, Hungary

U6 0065 Cation release dynamics in soils amended with municipal solid waste compost

Remigio Paradelo[1], Rosario Basanta[2], Marta Domínguez[3], María Teresa Barral[1], *[1]Departamento de Edafoloxía e Química Agrícola, Facultade de Farmacia, Universidade de Santiago de Compostela, Santiago de Compostela (A Coruña), Spain, [2]Instituto Superior de Agronomia, TULisbon, Lisboa, Portugal, [3]Fomento de Construcciones y Contratas SA, A Coruña, Spain*

U7 0089 Use of dry and wet digestates from biogas plants as fertilizer in plant production

Gabriela Bermejo, Frank Ellmer, Stefanie Krück,
Humbold Universität zu Berlin, Berlin, Germany

U8 0091 Nutrient availability in compost-based nursery substrates

Rafael López, Juan Carlos Ostos, Rosa López-Garrido, Francisco Cabrera,
IRNAS-CSIC, Sevilla, Spain

U9 0094 Effects of compost application on cress (Lepidium sativum) productivity in Iran

Bahram Tafaghodinia[1], Mohammad Kamalpour[2], Azadeh Reza[2],
[1]Iranian Research Organization for Science and Technology, Tehran, Iran, Islamic Republic of, [2]Young Researchers Club of Arak Azad University, Tehran, Iran, Islamic Republic of Iran

U10 0095 Comparison of field methods to assess net N mineralization in soils under different rates of cattle slurry application and a maize / annual ryegrass cropping system

José Pereira[1,3], João Coutinho[2], Nuno Moreira[3], Henrique Trindade[3],
[1]Escola Superior Agrária de Viseu, Instituto Politécnico de Viseu, Viseu, Portugal, [2]Chemistry Centre, Department of Soil Science, Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal, [3]CITAB - Centre for the Research and Technology of Agro-Environment and Biological Sciences, Department of Agronomy, Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal

U11 0100 Effects of applications of cattle manure on organic matter accumulation and nitrogen mineralization

Thierry Morvan[1], Alain Bouthier[2], Robert Trochard[3], Marie-Madeleine Cabaret[4], Jean Grall[5], Christelle Raison[7], Sabine Houot[8], Daniel Hanocq[6],
[1]INRA, Rennes, France, [2]ARVALIS, St Pierre d'Amilly, France, [3]ARVALIS, La Chapelle St Sauveur, France, [4]Chambre Agriculture, Plérin, France, [5]Chambre Agriculture, Rennes, France, [6]Chambre Agriculture, Quimperlé, France, [7]Institut de l'Elevage, Le Rheu, France, [8]INRA, Grignon, France

U12 0104 Value of Pig Slurry for agronomical use: an option in organic fertilization

Angel Faz[1], Melisa Gomez[1], Maria Dolores Estevez[1], Ana Belén Olivares[2], Vicente Climent[1],
[1]Technical University of Cartagena, Cartagena, Murcia, Spain, [2]Fecoam (Murcia Agrarian Cooperatives Federation), Murcia, Spain

U13 0106 Potential of using NIR to predict nitrogen fertiliser value of organic residues

Sofia Delin[1], Bo Stenberg[1], Anna Nyberg[1], Leif Brohede[2],
[1]SLU, Department of Soil and Environment, Skara, Sweden, [2]Eurofins Food & Agro Sweden AB, Lidköping, Sweden

U14 0115 Nutrient balance in Monterey pine stands treated with repeated applications of sewage sludge

Goio Egiarte[1], Marta Camps-Arbestain[2],
[1]Neiker-Tecnalia, Derio, Bizkaia, Spain, [2]Institute of Natural Resources, Massey, New Zealand

U15 0123 Consulting for the use of "waste fertilizers" on land - 20 years of experience in Austria!

Horst Mueller,
Mueller Abfallprojekte GmbH, Weibern, Upper Austria, Austria, Kompostgueteverband Oesterreich, Weibern, Upper Austria, Austria

U16 0132 Evaluation of nitrogen fertilizing value of anaerobic codigested sewage sludge by LONG-TERM AEROBIC INCUBATION

Maria Julià[1], Montserrat Pujolà[1], Gràcia Silvestre[2], August Bonmatí[2], Marithza Ramírez[1], Pedro Rubio[1,3], Josep Flores[1,3], Jordi Comas[1],
[1]Universitat Politècnica de Catalunya, Castelldefels, Barcelona, Spain, [2]Gestió Integral de Residus Orgànics, Centre Tecnològic, Mollet del Vallès, Barcelona, Spain, [3]Agbar, Barcelona, Barcelona, Spain

U17 0145 Effect of compost properties and temperature on C and N mineralization and soil biochemical properties

Maria Luz Cayuela[1], Tania Sinicco[2], Claudio Mondini[2],
[1]CEBAS-CSIC, Centro de Edafología y Biología Aplicada del Segura, Murcia, Spain, [2]Research Group of Gorizia, CRA - RPS, Gorizia, Italy

U18 0149 Nitrogen dynamics in a soil amended with raw and treated pig slurry in an almond orchard, Cartagena SE Spain

Sara G. Domínguez[1], Raúl Zornoza[1], Ángel Faz[1], *[1]Politechnical University of Cartagena, Cartagena, Murcia, Spain*

U19 0170 The effect of anaerobic digestion on fertilizing properties of pig slurry

Petri Kapuinen[1], Kristiina Regina[2],
[1]Agrifood Research Finland, Plant Production Research, Kaarina, Finland, [2]Agrifood Research Finland, Plant Production Research, Jokioinen, Finland

U20 0171 Nutrient Value of Digestate from Farm-Based Biogas Plants

Ken Smith[1], Bill Jeffrey[2], Phil Metcalfe[1], Alex Sinclair[3], John Williams[4],
[1]ADAS, Wolverhampton, United Kingdom, [2]SAC Evironmental, Edinburgh, United Kingdom, [3]SAC Environmental, Aberdeen, United Kingdom, [4]ADAS, Boxworth, France

U21 0180 Vermicomposting: an ecological way to recycle organic wastes resulting from horticulture

Manuela Costa[1], Fernando Miranda[1], Joana Gomes[1,2], Daniela Fernandes[1,2], Paulo Rio[1,3], Tiago Natal-da-Luz[1,3], José Paulo Sousa[1],
[1]DRAPN, Porto, Portugal, [2]FC-UP, Porto, Portugal, [3]IMAR-CMA, Coimbra, Portugal

U22 0183 Comparison of three different analysis methods to estimate N and P availability in organic soil amendments

Tapio Salo[1], Petri Kapuinen[1], Kari Ylivainio[1], Sari Luostarinen[2], Teija Paavola[1],
[1]MTT Agrifood Research Finland, Jokioinen, Finland, [2]MTT Agrifood Research, Mikkeli, Finland

U23 0189 Meat and bone meal as nitrogen and phosphorus supplier to ryegrass (Lollium multiflorum L. var Helen);II - Effects on soil N and P levels

Rui Fernandes, Cristina Sempiterno, Fátima Calouro,
INRB, Lisbon, Portugal

U24 0192 Meat and bone meal as nitrogen and phosphorus supplier to ryegrass (Lollium multiflorum L. var Helen)I - Dry matter yield, N and P uptake and Apparent N and P recovery

Cristina Sempiterno, Rui Fernandes, Fátima Calouro,
INRB, Lisbon, Portugal

U25 0195 Characterization of municipal solid waste composts produced in Spain

Oscar Huerta, Montserrat Soliva, F. Xavier Martínez, Montserrat Gallart, Marga López, *Universitat Politècnica de Catalunya, Barcelona, Spain*

U26 0201 Economic advantages of slurry pig used as organic amendment

Angel Faz[1], Melisa Gomez[1], Maria Dolores Estevez[1], Ana Belén Olivares[2], Vicente Climent[2],
[1]Technical University of Cartagena, Cartagena, Murcia, Spain, [2]Murcia Agronomical Cooperatives Federation (Fecoam), Murcia, Spain

U27 0203 Effects of dried pelletized broiler litter on soil fertility in sown meadows of Galicia (NW Spain)

María José Bande Castro[1,2], María Elvira López Mosquera[2], María Jesús Sainz Osés[2], *[1]Centro de Investigacións Agrarias de Mabegondo, A Coruña, Spain, [2]Universidade de Santiago de Compostela, Lugo, Spain*

U28 0206 Comparing effects of mineral fertilization and dairy sludge application on soil metal content in sown meadows

María José Bande Castro[1,2], María Jesús Sainz Osés[2], María Elvira López Mosquera[2], *[1]Centro de Investigacións Agrarias de Mabegondo, A Coruña, Spain, [2]Universidade de Santiago de Compostela, Lugo, Spain*

U29 0212 Liming and sewage sludge effects on Cu soil and on Ni understory development in reforested Pinus radiata D. Don plantations

Antonio Rigueiro-Rodríguez, Rocio Cuiña-Cotarelo, Rosa Mosquera-Losada,
University of Santiago de Compostela, Lugo, Spain

U30 0220 The effects of fertigation with swine wastewater on yield and seed quality of dry beans

Silvia Coelho, Victor Monteiro, Ana Paula Batistão, Silvio Cesar Sampaio,
UNIOESTE, Cascavel, Paraná, Brazil

U31 0224 Green/food compost: crop available nitrogen supply and soil fertility benefits

Alison Rollett, Anne Bhogal, Matthew Taylor, Brian Chambers,
ADAS Gleadthorpe, Meden Vale, Mansfield, Nottinghamshire, United Kingdom

U32 0238 Generated amount and composition of pig slurry and poultry manure: A field study

M. Rosa Teira-Esmatges[1], Daniel Babot[1], Jaume Boixadera[1,2], Patricia García-Ventosa[1], *[1]University od Lleida, Lleida, Catalonia, Spain, [2]Department d'Agricultura, Alimentació i Acció Rural de la Generalitat de Catalunya (Catalan government), Lleida, Catalonia, Spain*

U33 0245 Horticultural oils and soaps, eco-friendly bioactive compositions for organic farming

Sanda Velea[1], Florin Oancea[2], Mariana Popescu[1],
[1]National Research & Development Institute for Chemistry & Petrochemistry-ICECHIM, Bucharest, Romania, [2]Research & Development Institute for Plant Protection, Bucharest, Romania

U34 0249 Assessment of N mineralization and N leaching in soil using a new in-situ incubation method

João Sousa[1], Fernanda Cabral[1], João Coutinho[1], *[1]Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal, [2]Instituto Superior de Agronomia, Lisboa, Portugal*

U35 0252 Yield of forage maize from poultry litter and inorganic fertilizer applications

Seyfollah Fallah, Ardeshir Adeli,
Shahrekord University, Shahrekord, Iran, Islamic Republic of Iran

U36 0264 Effect of spent mushroom compost on P and K fertility in a vineyard soil of the La Rioja Region (Spain)

Clara Larrieta, Fernando Peregrina, Ignacio Martín, Jose Maria Martinez-Viduarre, Enrique García-Escudero,
Sección Viticultura y Enología, SIDTA. Instituto de Ciencias de la Vid y el Vino-ICVV, Logroño (La Rioja), Spain

U37 0267 Effects of co-composted sewage sludge amendment on Mediterranean agricultural soils. A soil microcosm experiment

Víctor Aranda[1], Antonio L. Pérez-Lomas[2], Jesús Párraga[2], Rafael Delgado[2], Gonzalo Almedros[3], Gabriel Delgado[2],
[1]Departamento de Geología, Universidad de Jaén, Jaén, Spain, [2]Departamento de Edafología y Química Agrícola, Universidad de Granada, Granada, Spain, [3]Departamento de Suelos, (CCMA-CSIC), Madrid, Spain

U38 0278 Fertilization with pig slurries in Mediterranean soils for crop production: liquid and conventional feedings comparation

Ángel Faz[1], Mª Ángeles Muñoz[1], Rosa María Rosales[1], Ibrahim Halil Yanarda?[1], Jorge Bretón[2], Asuman Büyükk?l?ç[1], Rafael Gallardo[1], Gerson Ramos[1],

[1]Technical University of Cartagena, Cartagena, Murcia, Spain, [2]Environmental Department, CEFU, SA, Alhama de Murcia, Murcia, Spain

---

U39 0280 Increasing soil fertility after application of composted olive mill pomace in organic olive oil groves

Beatriz Gómez Muñoz, Victoria Ochoa Esteban, Roberto García Ruiz,

University of Jaén, Jaén, Spain

U40 0282 Carbon and nitrogen mineralisation of raw and separated, digested animal manures

Andrea Manfredini, Marco Negri, Daniele Cavalli, Luca Bechini, Pietro Marino,

Deparment of Plant Production - Universita' degli Studi di Milano, Milano, Italy

---

U41 0284 Use of cereal and maize straw for bio-energy. An ecological contradiction

Franc Bavec, Matjaz Turinek, Manfred Jakop, Silva Grobelnik Mlakar, Simon Bavec, Martina Bavec,

University of Maribor, Faculty of Agriculture and Life Sciences, Maribor/Hoce, Slovenia

---

U42 0301 Carbon and nitrogen dynamics in soils under repeated manure applications: Preliminary Results

Daniele Cavalli, Pietro Marino, Stefano Occhi, Luca Bechini,

Deparment of Plant Production - Universita' degli Studi di Milano, Milano, Italy

---

U43 0313 Effect of organic fertilizers on yield and quality of greenhouse organic tomato

Isabel Mourão[1], Rui Pinto[1], Luis Miguel Brito[1], João Coutinho[2],

[1]Escola Superior Agrária de Ponte de Lima, Ponte de Lima, Portugal, [2]Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal

---

U44 0316 Environmental assessment of using meat meal as fertilizer – A Swedish Case Study

Johanna Spångberg, Per-Anders Hansson, Pernilla Tidåker, Håkan Jönsson,

Swedish University of Agriculture, Uppsala, Sweden

U45 0326 Long-Term effects of Two-Phase olive mill waste on biochemical properties of an olive grove soil

López-Piñeiro A[1]., Peña D[1]., Albarrán A[2]., Nunes J.M[3]., Cabrera D[1]

[1]Área de Edafología y Química Agrícola, Facultad de Ciencias, Universidad de Extremadura, Badajoz, Spain, [2]Área de Producción Vegetal, Escuela de Ingenierías Agrarias, Universidad de Extremadura, Badajoz, Spain ,[3]Escola Superior Agraria de Elvas, Elvas, Portugal

U46 0333 Does field application of poultry manure alter native plant species growth?

Mendes Pedro, Cordovil Cláudia

Instituto Superior de Agronomia, TU Lisbon, Tapada da Ajuda, 1349-017 Lisboa, Portugal

U47 0334 Poultry Manure: influence of root exudates on organic waste decomposition and microbial activity in soil

Tiago F. Alves, Cordovil Cláudia, Basanta Rosário

Instituto Superior de Agronomia, TULisbon, Lisboa, Portugal

10- Integrated manure and organic wastes management at the farm level

F1 0092 Operational results of three biogas plants in Italy

Sergio Piccinini, Claudio Fabbri, Mariangela Soldano,

Research Centre on Animal Production CRPA, Reggio Emilia, Italy

F2 0098 Nitrogen and phosphorus balances of two vegetable farms in Bulgaria – Balance NP software application

Vesselin Koutev[1], Lazar Kozelov[2], Ivan Yanchev[2], Stefaan De Neve[3], Karoline D'Haene[4], Lucien Carlier[4],

[1]Institute of Soil Science Nikola Poushkarov, Sofia, Bulgaria, [2]Institute of Animal Sciences, Kostinbrod, Bulgaria, [3]Ghent University, Ghent, Belgium, [4]ILVO, Merelbeke, Belgium

F3 0137 On-farm fertilizer production optimization

Alessandra Bonoli[1], Alice Dall'Ara[2], Billi Laura[3], Massi Paola[4], Poglayen Giovanni[5], *[1]Faculty of Engineering University of Bologna, Bologna, Italy, [2]ENEA, Faenza, Italy, [3]ARPA, Ravenna, Italy, [4]IZS, Forlì, Italy, [5]D Public Health & Animal Pathology, Bologna, Italy*

F4 0143 Seq-Cure: a LIFE project on the use of organic residues in energy crops fertilization

Elena Bortolazzo, Marco Ligabue, Paolo Mantovi, Mariangela Soldano,
Research Centre on Animal Production (C.R.P.A SpA), Reggio Emilia (RE), Italy

F5 0240 Evolution of physical and chemical parameters during co-composting of swine solid fraction manure using different turning strategies

Eugenio Cavallo, Eliana Santoro,
IMAMOTER, Torino, Italy

F6 0276 Manure management in cattle farms from transilvania (Romania)

Cristin Borda[1], Silvana Popescu[1], Iuliana Cristina Hegedus[2], Adrian Cîmpean[1],
[1]University of Agricultural Sciences and Veterinary Medicine, Faculty of Veterinary Medicine, Cluj-Napoca, Romania, [2]University of Agricultural Sciences and Veterinary Medicine, Faculty of Animal Husbandry and Biotechnology, Cluj-Napoca, Romania

F7 0310 High Uruguai river: Turning a problem into a solution

Sadi Baron,
Projeto Alto Uruguai, Chapecó SC, Brazil

F8 0315 Evaluation of the potential of an anaerobic Sequencing Batch Reactor for the treatment of dairy wastewaters

Ana Rodrigues, Ana Ferraz, Joaquim Alonso,
Escola Superior Agrária - Instituto Politécnico de Viana do Castelo, Ponte de Lima, Portugal

F9 0330 Unlining slurry ponds environmental risk assessment in Murcia province

Ana Belén Olivares
Fecoam (Murcia Agrarian Cooperatives Federation), Murcia, Spain

F10 0335 The importance of Waste Water Treatment Plant monitoring for treated wastewater reuse – Case Study of Coruche's WWTP

Sousa G, Duarte E, Fangueiro D,
UIQA, Instituto Superior de Agronomia, UTL, Lisboa, Portugal

11- Economical determinants and strategies for integrated sustainability across Europe

E1 0058 Evaluation of home composting of organic household waste in Pamplona´s region^

Maria Sesma[1], Natxo Irigoien[1], Julio Muro[1], Ivan Jauregui[1], Beatriz Yaben[2], Sandra Blazquez[2], Alfonso Amorena[2],
[1]Universidad Publica de Navarra, Pamplona / Navarra, Spain, [2]Mancomunidad de la Comarca de Pamplona, Pamplona / Navarra, Spain

E2 0135 Ferpode: a better agronomical use of Laying Hen Manure

Alessandra Bonoli[1], Alice Dall'Ara[2], Nora Rappoli[3], Nonni Sara[1],
[1]Faculty of Engineering University of Bologna, Bologna, Italy, [2]ENEA, Faenza, Italy, [3]AMEK, Ferrara, Italy

E3 0297 Accounting nutrients in animal manures

Jens Petersen[1], Leif Knudsen[2],
[1]Aarhus University, Faculty of Agricultural Sciences, Viborg, Denmark, [2]Danish Agricultural Advisory Service, Aarhus, Denmark

12- Manure and organic residues management approaches in non-European countries

NE1 0021 Agronomical valorization of bovine slaughterhouse waste by aerobic composting

Mamadou Amadou Seck, Mame Yacyne Gueye,
Université Cheikh Anta Diop, Dakar, Senegal

NE2 0028 Evolution of the Physico-Chemical properties of Tunisian agricultural wastes during composting process

Manel Kammoun Rigane[1], Jean-charles Michel[2], Khaled Medhioub[3],
[1]Faculté des Sciences de Sfax.Département de Géologie, BP 1171, Sfax 3000, Tunisie, Tunisia, [2]Agrocampus Ouest, UPSP EPHOR, 2 rue Le Nôtre, 49045, Angers, France, France, [3]IPEIS.UR: Etudes et Gestions des Environnements Côtiers et Urbains, BP 1172, Sfax 3000, Tunisie, Tunisia

NE3 0087 Composting of pig faeces from the Chinese GANQINGFEN system

Tao Jiang[1], Yuanqiu Zhao[1], Rui Guo[1], Frank Schuchardt[2], Guoxue Li[1],
[1]China Agricultural University, Beijing, China, [2]Johann Heinrich von Thuenen-Institute, Institute of Agricultural Technology and Biosystems Engineering, Braunschweig, Germany

NE4 0172 Study of the biogas generation in a swine production unit with CDM project in Brazil

Dayane Cristina da Rocha[1], Dilcemara Cristina Zenatti[2], Ricardo Nagamine Constanzi[2], Samuel Mellegari de Sousa[2], António Marcos Massao Hachisuca[3,2]

[1]Fundation Tecnology Park of ITAIPU, Foz do Iguaçu, Parana, Brazil, [2]State University of West of Paraná, Cascavel, Parana, Brazil, [3]Institute of Applied Technology and Innovation (ITAI), Foz do Iguaçu, Parana, Brazil

NE5 0184 Composition of Pig manures and wastewaters under the Gan Qing Fen system in China

Roxana Mendoza Huaitalla[1], Eva Gallmann[1], Kun Zheng[2], Xuejun Liu[2],

[1]University of Hohenheim, Stuttgart, Germany, [2]China Agricultural University, Beijing, China

NE6 0219 Vermicomposting of organic urban residues, characterization of the products and its contribution to amelioration of soil fertility

Robles, Celerino, Bende Gilberto,

Soillab. Ciidir-IPN-Oaxaca, STA. Cruz Xoxocotlan, Oaxaca, Mexico

NE7 0274 A changing strategy: From water recycling to methane burning. A Mexican experience

Rosario Perez-Espejo,

National Autonomous University of Mexico, Mexico D.F., Mexico

NE8 0283 Effluent from the anaerobic digestion of dairy cattle manure as biofertilizer in organic lettuce seedling production (LACTUCA SATIVA L.)

Analia Puerta, Mariana Garbi, Roberto Diaz, Monica Tysko,

Universidad Nacional de Lujan, Lujan, Argentina

NE9 0306 Agroindustrial wastes in the production of cedrela fissillis vell seedlings

Francisca Alcivania Melo Silva, Cristiano dos Santos, Reginaldo Barboza da Silva, *UNESP, Registro - São Paulo, Brazil*

13 – Environmental and sanitary safety aspects of manure and organic residues utilization

S1 0037 An Inventory of heavy metal inputs from organic and inorganic materials to agricultural soils in England and Wales

Fiona Nicholson, Alison Rollett, Brian Chambers,
ADAS, Mansfield, Nottinghamshire, United Kingdom

S2 0054 Nitrous Oxide emissions following soil biodisinfestation with animal manure on a greenhouse pepper crop

Haritz Arriaga[1], Sergio Menéndez[2], Maria Luisa Ibargoitia[1], Maialen Viguria[1], Mireia Núñez-Zofio[1], Santiago Larregla[1], Pilar Merino[1],
[1]Neiker-Tecnalia, Derio, The Basque Country, Spain, [2]University of The Basque Country, Bilbao, The Basque Country, Spain

S3 0059 Fate of pathogens in soils and plants in a long term field study amended with different composts and manure

Violaine Brochier[1], Monique Kallassy[2], Maelenn Poitrenaud[1], Houot Sabine[3],
[1]Veolia Environnement - Research and Development, F-78520 Limay, France, [2]Veolia Environnemental Services - Technical and Investments Division, Biological Treatments Coordination, F-92735 Nanterre, France, [3]INRA, UMR Environment and Arable Crops, F-78850 Thiverval-Grignon, France

S4 0063 Farmyard manure versus slurry: is it worthwhile to remove crop residues from the field to increase soil carbon stock elsewhere?

Enrico Ceotto[1], Lamberto Borrelli[2], Cesare Tomasoni[2],
[1]CRA-CIN, Bologna, Italy, [2]CRA-FLC, Lodi, Italy

S5 0070 Searching new bio-protective microbial agents from different types of composts

María del Carmen Vargas-García[1], Francisca Suárez-Estrella[1], María José López[1], Gema Guisado[1], Joaquin Moreno[1],
[1]Dpto. Biología Aplicada. Área de Microbiología. CITE II B. Universidad de Almería, Almería, Spain

S6 0129 The Microbiological features of composts produced from grey forest soil with down-feather crumb additives

Nadejda Verkhovtseva[1], Olga Seliverstova[1], Elena Protsenko[2], Natalia Kleeva[2],
[1]Moscow Lomonosov State University, Moscow, Russian Federation, [2]Kursk State University, Kursk, Russian Federation

S7 0134 Assessment of farm and manure management in Switzerland by means of representative stratified surveys

Thomas Kupper[1], Cyrill Bonjour[2], Daniel Bohnenblust[3], Beat Achermann[4], Harald Menzi[1], *[1]Swiss College of Agriculture, Zollikofen, Switzerland, [2]Bonjour Engineering GmbH, Lostorf, Switzerland, [3]Swiss Federal Statistical Office, Neuchatel, Switzerland, [4]Federal Office for the Environment, Berne, Switzerland*

S8 0186 Behavior of total nitrogen, phosphorus and potassium during runoff in soil under application of swine wastewater

Jonathan Dieter, Silvio Cesar Sampaio, Dinéia Tessaro, Natássia Jersak Cosmann,
State University of Western Paraná, Cascavel/Paraná, Brazil

S9 0188 Edaphic ants indicators of quality in soil submitted to the application of swine wastewater

Dinéia Tessaro, Silvio Cesar Sampaio, Jonathan Dieter,
State University of Western Paraná, Cascavel/Paraná, Brazil

S10 0191 Potential diffuse pollution from swine wastewater

Jonathan Dieter, Silvio Cesar Sampaio, Dinéia Tessaro, Leocir José Carneiro,
State University of Western Paraná, Cascavel/Paraná, Brazil

S11 0225 Heavy metal concentrations in livestock manures in England and Wales

Alison Rollett, Fiona Nicholson, Brian Chambers,
ADAS Gleadthorpe, Meden Vale, Mansfield, Nottinghamshire, United Kingdom

S12 0231 Sewage sludge application in agriculture: Pathogen reduction by temperature-phased anaerobic digestion

Víctor Riau[1], Mª Angeles De la Rubia[2], Montserrat Pérez[1],
[1]Universidad de Cádiz, Puerto Real, Cádiz, Spain, [2]Instituto de la Grasa (CSIC), Sevilla, Spain

S13 0241 Coliform populations and ESBLs in Escherichia Coli isolated from pig farm environment

Jan Venglovsky, Vladimir Kmet, Gabriela Gregova,
University of Veterinary Medicine in Kosice, Kosice, Slovakia, [2]2 Institute of Animal Physiology SAS, Kosice, Slovakia

S14 0242 Seasonal microbial variations and antibiotic resistance in bioaerosol production associated with waste water treatment plant

Gabriela Gregova, Jan Venglovsky, Vladimir Kmet, Evangelia N. Sossidou,
University of Veterinary Medicine ib Kosice, Kosice, Slovakia

S15 0244 Process of composting from the parasitological point of view

Ingrid Papajova, Peter Juris, Jan Venglovsky, Nada Sasakova, P Rudohradska, *Parasitological Institute SAS, Kosice, Slovakia*

S16 0266 speciation of metals in soils irrigated with surfactants: an approach for risk assessment

Maria del Carmen Hernández-Soriano[2], Aránzazu Peña[1], Maria Dolores Mingorance[1], *[1]Instituto Andaluz de Ciencias de la Tierra, UGR-CSIC, Granada, Spain, [2]Division of Soil and Water Management, KU Leuven, Heverlee, Belgium*

S17 0273 Aerobic thermophilic treatment of sewage sludge with and without food wastes

Anna-Maria Veijalainen, Helvi Heinonen-Tanski,
University of Eastern Finland, Department of Environmental Sciences, Kuopio, Finland

S18 0281 Vermicompost from wine and Olive-Oil wastes used to control release of herbicide residues in soils

Jean Manuel Castillo-Diaz, Rogelio Nogales, Esperanza Romero,
Estación Experimental del Zaidín, CSIC, Granada, Spain

S19 0286 Heavy metal dynamics in a calcareous soil after the addition of sewage sludge compost

Susana Peña, Milagros Navarro, Juana Isabel López-Fernández, Belén Alonso, Carlos Rad, Salvador González-Carcedo,
UBUCOMP. University of Burgos, Burgos, Castile, Spain

S20 0293 Field scale observations from slurry applications to grassland following a freeze thaw event of faecal indicator organisms in drainage water

Chris Hodgson, Nick Bulmer, Dave Chadwick,
North Wyke Research, Okehampton, Devon, United Kingdom

S21 0296 Development of a structured set of tools for evaluation and management of agricultural recycling of organic residues at local scale

Alexis de Junet[1], Philippe Cambier[1], Sabine Houot[1], Aurélia Michaud[1], Virginie Parnaudeau[2], Patrick Cazevieille[3], Emmanuel Doelsch[4], Hervé Saint-Macary[3], Sylvie Nazaret[5], Yacine N'dour[6], Dominique Masse[7], Tovonarivo Rafolisy[8], Clément Peltre[1], Jean-Luc Farinet[3],

[1]INRA-AgroParisTech Environnement & Grandes Cultures, Thiverval-Grignon, France, [2]INRA SAS, Rennes, France, [3]CIRAD, Montpellier, France, [4]CEREGE, Aix-en-Provence, France, [5]Université Claude Bernard, Ecologie Microbienne, Lyon, France, [6]LNRPV, Institut Sénégalais de Recherche Agricole, Dakar, Senegal, [7]IRD, Dakar, Senegal, [8]LRI, Université d'Antananarivo, Antananarivo, Madagascar

S22 0302 Vermicomposts from agroindustrial wastes and pesticides effects on soil microbial activity

Jean Manuel Castillo, Rogelio Nogales, Esperanza Romero,

Estacion experimental del Zaidin, Granada, Granada/andalucia, Spain

S23 0308 Induction of soil supressiviness against globodera by the addition of dewatered pig slurry

Yolanda Arribas, Carlos Rad, Domingo Javier López-Robles, Salvador González-Carcedo, *[1]UBUCOMP, University of Burgos, Burgos, Castile, Spain*

S24 0327 Influence of two-phase olive mill waste on the sorption, leaching and degradation of MCPA and S-metolachlor in A soil under intensive cropping

Peña D[1]., López-Piñeiro A[1]., Albarrán A[2]., Cabrera D.[1], Nunes J.M.[3]

[1]Área de Edafología y Química Agrícola, Facultad de Ciencias, Universidad de Extremadura, Badajoz, Spain, [2]Área de Producción Vegetal, Escuela de Ingenierías Agrarias, Universidad de Extremadura, Badajoz, Spain, [3]Escola Superior Agraria de Elvas, Elvas, Portugal

S25 0329 Behavior and fate of S-Metolachlor in two intensive crop soils amended with de-oiled olive mill waste

Albarrán, A.[1]; López-Piñeiro, A.[2]; Peña, D.[2]; Cabrera, D.[2]; Rato, J.M.[3]

[1]Área de Producción Vegetal, Escuela de Ingenierías Agrarias, Universidad de Extremadura, Badajoz Spain, [2]Área de Edafología y Química Agrícola, Facultad de Ciencias, Universidad de Extremadura , Badajoz, Spain, [3]Escola Superior Agraria de Elvas, Portugal

14- Use of manures and organic residues for the recovery of degraded and contaminated soils

C1 0001 Estimating the effect on nitrogen mineralization from organic residues applied to degraded soils

T. Teixeira, C.M.d.S Cordovil,
Instituto Superior de Agronomia, Lisboa, Portugal

C2 0003 Recovery of burned forest soil by organic residue application – Substrate induced respiration in soil

R. Pinto, C.M.d.S Cordovil, A. de Varennes,
Instituto Superior de Agronomia, TULisbon, LISBOA, Portugal

C3 0004 Shifts in the structure of a mine contaminated sandy soil (Pb, Zn, Cu, As) following different organic and inorganic treatments

C.M.d.S Cordovil[1], R. Basanta[1], A. de Varennes[1], E. Bååth[2], M. Díaz- Raviña[3],
[1]Instituto Superior de Agronomia, Lisboa, Portugal, [2]Department of Microbial Ecology, Ecology Building, Lund University, Lund, Sweden, [3]Departamento de Bioquímica del Suelo, Instituto de Investigaciones Agrobiológicas de Galicia (CSIC), Santiago de Compostela, Spain

C4 0074 Bioremediation of heavy metals with microbial isolates

María del Carmen Vargas García, Francisca Suárez Estrella, María José López, Gema Guisado, Joaquín Moreno,
University of Almeria, Almeria, Spain

C5 0079 Use of organic and inorganic amendments to enhance phytostabilization of trace element polluted soils

Francisco Cabrera, Paula Madejón, Pilar Burgos, Engracia Madejón,
Instituto de Recursos Naturales y Agrobiología de Sevilla (IRNAS), CSIC., Sevilla, Andalucía, Spain

C6 0084 Behaviour of oxyfluorfen in two soils amended with solid organic waste from olive oil production (ALPERUJO)

Miguel Real[1], MJesus Calderón[1], MCarmen Hermosin[1], Juan Cornejo[1],
[1]Instituto de Recursos Naturales y Agrobiologia de Sevilla.CSIC, SEVILLA, Spain

C7 0086 Effect of soil amendment with an organic residue on s-metolachlor fate

AnaIsabel Cañero, Lucia Cox, MCarmen Hermosin, Juan Cornejo,
Instituto de Recursos Naturales y Agrobiología de Sevilla.CSIC, SEVILLA, Spain

---

C8 0295 Evaluation of amendment application in the rehabilitation of sulfide mine tailings from São Domingos

Erika Santos[1,2], Maria Manuela Abreu[2], Felipe Macías[3], Amarilis de Varennes[4],
[1]Centro de Investigação em Ciências do Ambiente e Empresariais, Instituto Superior Dom Afonso III, Loulé, Portugal, [2]Unidade de Investigação de Química Ambiental, Instituto Superior de Agronomia da Universidade Técnica de Lisboa (TU Lisbon), Lisboa, Portugal, [3]Departamento de Edafología y Química Agrícola, Facultad de Biología, Universidad de Santiago de Compostela, Santiago de Compostela, Spain, [4]Centro de Engenharia de Biossistemas, Instituto Superior de Agronomia (TU Lisbon), Lisboa, Portugal

---

C9 0321 Use of organic residues in the recovery of organic matter pools, after forest fires

R.C Fernandes, C.M.d.S Cordovil, A. de Varennes,
Instituto Superior de Agronomia, Lisboa, Portugal

C10 0322 Microbial characterization of a mine soil subjected to different remediation technologies combining organic and inorganic treatments and plant cultivation^

A. de Varennes[1], R. Basanta[1], E. Bååth[2], M. Díaz-Raviña[3],
[1]Instituto Superior de Agronomia, TULisbon,, Lisbon, Portugal, [2]Department of Microbial Ecology, Ecology Building, Lund University, Lund, Sweden, [3]Departamento de Bioquímica del Suelo, Instituto de Investigaciones Agrobiológicas de Galicia (CSIC), Santiago de Compostela, Spain

---

C11 0336 The use of municipal solid waste compost as soil amendment: application to landscape integration projects"

Boaventura Afonso, Claudia M.d.S. Cordovil
Instituto Superior de Agronomia, Lisboa, Portugal

14. **ABSTRACTS ORAL PRESENTATIONS**

SESSION 1
LIVESTOCK PRODUCTION MANAGEMENT

0066 - Water footprint of pigs slaughtered in the Central-Southern states of Brazil

Julio Cesar Pascale Palhares

Embrapa Swine and Poultry, Concordia, Santa Catarina, Brazil

Pig production is constantly asked about the environmental impact that may cause in water resources. Several methodologies can be used to characterize this impact, Water Footprint is one of them. Brazil as one of the largest producers of pork in the world and having water in quantity and quality should evaluate the efficiency in the use of water by this production in order to outline actions. The aim of this study was to calculate the water footprint of pig slaughtered in 2008 in each Brazilian Central-Southern State. The choice for evaluating the states located in the Center-Southern is justified because 98.3% of pigs were killing in this region. Calculation of water footprint considered water consumed in the grain production (corn and soybean), drinking water and washing water. National mean of consumption of water by crops (corn and soybean) was 99.88%. Rio Grande do Sul was the state with the largest water footprint (2,702 km3), followed by Santa Catarina (2,401 km3), and Ontario (1,089 km3). Rio Grande do Sul had the third lowest productivity for corn and soybean productivity was the worst. This fact demonstrates the importance of improving the productivity of water to crops that are basic for pig diets. States with smallest footprints were Rio de Janeiro (0.00215 km 3), Distrito Federal (0.0354 km3), and Espirito Santo (0.0719 km3). The calculations performed in this study show that the improvement of water productivity in pig production depends on the improvement of water productivity of corn and soybeans. This does not preclude actions to reduce the consumption of drinking and washing water in farms. Conclusions are: low yields of corn and soybeans, increase water footprint, water consumed to produce corn is the highest amount in the footprint, calculations show that the water management in swine production cannot address only the farm, it should include agricultural supply chains dealing with it. Water footprint can be used in zoning programs to organize territories, because it shows water flows.

0165 - Effluent quality from Out-wintering Pads

Paulo Dumont[1], Ken Smith[2], Lizzie Sagoo[3], Dave Chadwick[1], Padriag French[4]

[1]North Wyke Research, Okehampton, Devon, EX20 2SB, United Kingdom, [2]ADAS Wolverhampton, Woodthorne, Wolverhampton, WV6 8TQ, United Kingdom, [3]ADAS Boxworth, Cambridge, CB23 4NN, United Kingdom, [4]Teagasc, Moorepark Dairy Production Research Centre, Fermoy, Co. Cork, Ireland

As a way of reducing costs of housing and pasture damage during the winter, there is increasing interest around the UK in the use of open enclosures with a free draining woodchip base, otherwise known as out-wintering pads (OWPs) for cattle. The performance of an OWP, both environmentally and with regard to animal production benefits, relies on the implementation of good management practices. Pad design, stocking density, rainfall and chip size are factors that affect drainage effluent quality. The objective of this study was to better understand how animal welfare and the environment are affected by three factors: chip size; feeding management; and area allowance. Four experimental OWPs were constructed at Rowden Farm, North Wyke Research, Devon, England. The factors under study were randomised across the pads, over 6-7 week periods, during 6 months (4 periods), based on a Graeco-Latin Square statistical design. Effluent flow from each of the pads was sampled in a flow-proportional way, using tipping buckets and analysed for total N, P, and solids; NH4-N and NO3-N. Beef cattle (Friesian-Charolais steers) were weighed at the beginning and end of each period and scored for Body Condition. Livestock performance was good across all chip sizes and area allowances. Production benefits were observed. No significant differences were observed between treatments, with effluent quality being closer to analyses typical of dirty water than of cattle slurry. Average effluent leachate concentrations (over the four periods) were 1095 mg/l total N; 807 mg/l NH4-N; 2.7 mg/l NO3-N; and 51 mg/l total P. These data suggest that the effluent drainage from OWPs must be contained and properly recycled to land, to avoid environmental pollution. Significant retention of liquids by the woodchip (rainfall/urine) was observed, suggesting that a significant reduction in the volume of effluent drainage from OWPs is possible. After the limit in water absorption is reached, the OWPs appeared to perform equally well for solids retention. Studies on the N Wyke research pads were complemented by studies on pad performance and effluent quality on three farms with OWPs, two used for beef cattle in England and Wales and one, for wintering dry dairy cows, in Ireland. First year monitoring results from all of these pads are presented.

0099 - Manure Production and Management on Commercial Farms

Giorgio Provolo[1], Elisabetta Riva[1], William L. Magette[2]

[1]Università degli Studi di Milano, Department of Agricultural Engineering, Milano, Italy,

[2]University College Dublin, School of Architecture, Landscape & Civil Engineering, Dublin, Ireland

The change towards intensification in recent decades by agriculture has reduced the use of manure as fertilizers, with a subsequent increase of pollution risk and agricultural cost. Many farms are facing the introduction of Best Available Technologies in order to reduce emissions and to decrease the nitrogen load. Therefore, farmers should use adequate methodology to assess the amount of manure produced, its nutrient content and management.

The aims of this research project were to: i) define a simplified methodology to record, manually or automatically, the main parameters of manure management; ii) develop a software tool to process recorded data into useful information for the farmer; and iii) validate the methodology and the software on commercial farms.

The methodology and software tool defined are based on a simplified mass and nutrient farm balance.

Three different farms (dairy cows, fattening pigs, farrow-to-finishing pigs) were monitored for 16 months to assess manure production and subsequent management, using both manual recordkeeping and automated sensors. The amount of manure in the storage was recorded by ultrasonic sensors while the spreading operation was monitored by GPS tracking devices. Manual measurements and manure sampling provided reference values on the farms against which to compare automated measurements.

The results of the research demonstrated that the devised methodology and software tool are effective in monitoring on-farm activity related to manure production and management. Most of the required data (number of animals, feed quantity and quality, etc.) are already available on the farm; others can be easily collected manually or automatically. The indirect evaluation of manure quantities obtained by calculations based on the recorded data gave results very close to the measured data (differences< 10%). Monitoring established that the three monitored farms produced 40% more manure (for dairy cows) and 10% and 30% less manure (for fattening and farrow-to-finishing pigs, respectively) than would have been estimated using the standard values proposed by regulations. The measured concentration of nutrients (nitrogen and phosphorous) produced agreed with the calculated values, but a high degree of uncertainty was introduced regarding the mass of nutrients due to the variability found in storages. All the three farms have reported a production of 5-10% more nitrogen than would be estimated using standard values.

From the results obtained it can be concluded that the devised monitoring system can be used effectively in commercial farms to assess the actual manure production and thereby improve manure and nutrient management.

0158 - Effect of adding fibre sources to pig diets on ammonia volatilisation and methane production from manure

Guillaume JARRET[1,2], José MARTINEZ[1,2], Jean-Yves DOURMAD[3]

[1]Cemagref, Environmental management and biological treatment of waste research unit, Rennes (35), France, [2]Université Européenne de Bretagne, Rennes (35), France, [3]INRA Agrocampus Ouest UMR 1079 SENAH, St Gilles (35), France

The aim of this study was to investigate the effect of the incorporation in pig diets of 20% of three raw materials rich in fibre (DDGS: dried distiller's grain with solubles, SBP: sugar beet pulp or ORS: oily rapeseed cake), on animal performance, nitrogen and carbon excretion and, ammonia volatilisation and methane production from effluents. These 3 diets were compared to two control diets with 17.5 or 14.0 % of crude protein (CP). The animals (20 castrated males) were housed individually in metabolism cages and fed one of the five diets (ie. 4 pigs per diet). Samples of each type of effluent (urine and faeces) were collected separately from each pig. For each diet, ammonia volatilisation was measured on samples of urines and slurry, during 16 days in a laboratory pilot scale system. The ultimate methane potential (B_0) of slurry was measured for each diet in the laboratory during 100 days. The addition of fibre sources to the diet had no marked effect on animal performance. It increased significantly ($P<0.001$), by about 100%, the amount of faeces excreted, whereas the amount of urine was not affected. For the high fibre diets there was a shift of N excretion from urine to faeces, resulting in a reduced ammoniacal N content of the slurry. Besides, VFA content was significantly higher ($P<0.001$) and pH was lower, by 0.3 to 1.4 pH unit, in faeces from the pigs receiving the high fibre diets. Ammonia emission from slurry was significantly lower, by 13%, for the low CP diet and by 19 to 33 % for the high fibre diets, compared to the control diet. The methane production of the slurry (B_0), after 100 days, was significantly higher ($P<0.001$) for the diet containing oily rapeseed cake, the control high protein diet and the diet with beet pulp. When expressed per pig and per day, the potential of methane production from slurry was 70 L for the slurry from the two control diets and 121, 91, and 130 L for the slurry from the diets containing DGGS, SBP or ORS, respectively. It appears form these results that the addition of fibre sources to pig diet is an efficient way to reduce ammonia volatilization but it may increase the production of methane.

0073 - Managing sulphur content of pig diet to control further sulphides production during pig slurry anaerobic storage.

Pascal Peu[1], Picard Sylvie[1], Dourmad Jean-Yves[2], Dabert Patrick[1]

[1]Cemagref, Rennes, France, [2]Inra, Saint-Gilles, France

The mixing of different raw materials during formulation strategies of pig feeding influences sulphurs food intake and further sulphur excretion by the animals. Increased amount of sulphur in manure can result in toxicity and odour problems during storage. The objective of this study was to determine the behaviour of different sulphur feed contents on pig excretion via faeces and urine, to evaluate the speciation of sulphur forms excreted and to determine further behaviour of sulphur in pig slurry during anaerobic storage.

The sulphurs content of 76 different raw materials usually used to formulate pig feeding diets was measured and classified. Total sulphurs content varied between 0.5 to 10 $gS.kg^{-1}$ of dry material. For most of these raw materials, total sulphur content was correlated with sulphur amino acid composition.

Then, two experiments were conducted with ?nishing castrated male pigs (n=10; n=20) randomized and individually housed in metabolic cages which allowed precise control for feed alimentation and excretion collection. Ten experimental diets based on wheat and on soybean meal were compared. They differed by the incorporation of different raw materials with different total S content (wheat malt, beets pulp or rapeseed meal). Trials were realised with 10 days dedicated for new feed adaptation followed by 10 days when urine and faeces were individually collected. At the end of the experimental procedure, feed, faeces and urine collected for each studied pig were analysed for total solids, volatile solids, total sulphur and sulphate.

Feed sulphur content varied between 1.6 and 4.1 $g.kg^{-1}$ of total solids. For all experiments, sulphur retention by animals was close to 25 % of the total ingested S whereas 75 % was excreted. Sulphurs were excreted as 100% sulphate speciation form in urine and 50% sulphate in faeces. With this dataset, sulphurs concentrations as sulphates in fresh pig slurries were determined and ranged between 0.5 and 1.7 $gS.kg^{-1}$ depending on the feed formulation. Behaviour of sulphate content of fresh pig slurry was studied with spiking raw pig slurry with different amounts of sulphate (0 to 2 $gS.kg^{-1}$) and volatile fatty acids (acetic, propionic and butyric acids). Kinetics of sulphate consumption and sulphide apparition were measured. In anaerobic storage condition, the sulphates added were consumed within 3 weeks to form solely sulphides, this reaction follows a first order kinetics.

These results show that sulphides content in stored pig slurry and its associated problems could be partially managed by sulphur diet control.

0013 - Effect of water scrubbing on ammonia emissions from a gestating sows building in the south of Europe.

Maite Aguilar[1], Alberto Abaigar[1], Pilar Merino[2], Fernando Estellés[3], Gema Montalvo[4], Carlos Piñeiro[5], Salvador Calvet[3]

[1]Instituto Técnico y de Gestión Ganadero (ITGG), Villava, Navarra, Spain, [2]Neiker Tecnalia, Derio, Pais Vasco, Spain, [3]Universidad Politécnica de Valencia, Valencia, Spain, [4]Tragsega, Madrid, Spain, [5]PigChamp Pro-Europa, Segovia, Spain

Background: Water scrubbers consist in introducing the exhaust air from livestock buildings into a trickle bed filter where certain pollutants, such as ammonia, dust and odors, are retained. Previous studies carried out in other European countries have shown a large variability (from 45 to 80%) on ammonia removal efficiencies.

Purpose: The objective of this research was to determine the ammonia removal efficiency of a water scrubber under Spanish production conditions in the Mediterranean region, where there is no information available.

Methods: The experience was conducted at a pig farm located in Navarra (Spain) where 800 gestating sows were housed. The building was equipped with two water scrubbers. The duration of the study was 68 days, from November 2008 to January 2009.

Air-ammonia concentration, before and after the scrubber, was measured continuously using an infra red photoacoustic gas analyzer. Several parameters of the washing liquid, such as pH, conductivity and ammonium content, were also analyzed weekly. Electricity and water consumption were also recorded.

The data were processed using summary statistics and analysis of variance by means of the program SPSS 8.0.

Results: An average ammonia removal efficiency of 70% was found for the water scrubber. Besides, a positive-significant relation ($p<0.001$) was shown between ammonia concentration in the inlet air and the removal efficiency. The average values of pH, conductivity and ammonium concentration in the washing liquid were 7.1, 32.4 mS/cm and 4.22 kg NH4/m^3, respectively. The fresh water and electricity consumption were 0.42 m^3 and 19 kWh per year and animal place, respectively. The wastewater production was 0.13 m^3 per year and animal place.

Discussion: Water scrubber significantly reduces ammonia concentration in the exhaust air in livestock houses in winter with an efficiency of 70%. This removal efficiency seems to be higher when the concentration gradient between the gas phase and the liquid phase increases. Further research is necessary to optimize the system performance.

SESSION 2
TREATMENT AND TECHNOLOGIES

0029 - **Possibilities to optimise feedstock mixtures for biogas production**

Thomas Amon, Alexander Bauer, Leonhartsberger Chrisitan, Mair Günter
University of Natural Resources and Applied Life Sciences, Vienna, Austria

A big advantage of biogas production is that a broad variety of organic substrates, in view on availability and economic concerns, can be used. In most of the biogas plants substrate mixtures from different energy crops, manures, organic wastes and residues from food-, feed- and bio-fuel industries are used. The economy of biogas plants depends mainly on feedstock prices and a continuous and stable fermentation process without any disturbances. The process stability as well as the velocity and rate of decomposition are affected by the chemical composition of the substrates and the full supply of the microbial community with essential- and trace elements. Well balanced feedstock mixtures are therefore a key for stable and optimised biogas yields.
Results from several laboratory investigations demonstrate the dependency of the feedstock´s nutrient composition on the specific methane yield. For example with maize the specific methane yield in the course of the vegetation is clearly showing a decline at later maturity stages due to strong bounded ligno-cellulosic complexes, which are hardly degradable by the microorganisms. Also in terms of ensiling the optimum dry matter content is therefore in the range of 28 to 35 %. For grassland it has been shown that the management intensity affects the composition of the plant community and subsequently the specific methane yield by a different chemical composition. Out of the chemical composition of different substrates and the investigated specific methane yields a regression model - the “methane energy value model” - was developed in order to estimate the biogas yield on the basis of the chemical composition. Such models can be also used to optimally adjust the components of feedstock mixtures to optimise their biogas yield. Investigations on feedstock mixtures out of sustainable crop rotation systems and well-balanced chemical composition have shown highest specific methane yields. Especially mixtures with a balanced proportion of protein-rich, energy-rich and fat-rich crops gave specific methane yields in the range of 360 to 380 IN CH4 kg VS-1. Investigations in the laboratory on the process parameters of feedstock mixtures also showed that unbalanced feedstock mixtures e.g. by using high amounts of glycerine can result in disturbances in the fermentation process. Such disturbances could be avoided by adding high amounts of pig or cattle slurry.
The demonstrated results clearly show that balanced feedstock mixtures have the potential for high and stable biogas yields.

0045 - The PROBIOGAS Project: an integrated approach of the anaerobic co-digestion of agricultural wastes for production of biogas and fertilisers

Maria Pilar Bernal, José Antonio Alburquerque, Carlos de la Fuente, Rafael Clemente, Fuensanta Caravaca, Elvira Díaz-Pereira, Antonio Roldán, Juan Cegarra
CEBAS-CSIC, Murcia, Spain

PROBIOGAS is a Spanish research project involving 28 partners from research institutions and universities to small and medium companies. The main objective is to develop sustainable systems for biogas production and use in the agroindustrial sector, and the demonstration of the viability and promotion of biogas in Spain.

The Project includes coordination of industrial research for improvement of the systems for biogas production, based on anaerobic co-digestion of agroindustrial by-products widely produced in Spain. A viability study of techno-economic and environmental character is included. Industrial research for improvement of the agronomical value of the digestates is being carried out for traditional and energy crops. The viability study is focused on the different uses of biogas for vehicles, combustible batteries, in natural gas systems and other further applications.

The Probiogas Project is integrated by subprojects of differing nature:

Two studies of technical viability prior to research activities:

Availability of by-products for biogas production, potential production and sustainability (subproject 1).

Use of agroindustrial biogas, viability analysis (subproject 4).

Two subprojects of industrial research:

Technical improvement of the anaerobic co-digestion from agroindustrial by-products (subproject 2).

Agronomical evaluation and use of the digestate (subproject 3).

Seven demonstration subprojects:

Co-digestion of animal manures with slaughterhouse wastes for biogas uses in combustible batteries;

Co-digestion of cow manures with citrus residues.

Production of biogas and fertiliser products from energy crops.

Use of biogas in vehicles

Production of organic fertilisers from co-digestion of animal manures and agroindustrial wastes.

Observation of the agroindustrial biogas

Control and automatisation of co-digestion plants for pig slurry and agroindustrial by-products.

One diffusion subproject: Technical office and diffusion.

The agronomic evaluation of the digestate is studied in subproject 3 under the coordination of CEBAS-CSIC. The main objective of subproject 3 is the recycling and use of the digestate as a normalised fertiliser product. This includes the following steps:

Establish the chemical composition and specific characteristics of the digestates produced by anaerobic co-digestion of animal manures and slurries with agroindustrial by-products.

Determine the agricultural value of the digestates and their usefulness as fertiliser products.

Develop new fertiliser products from digestates by conditioning and/or transformation by composting.

Define the requirements for traceability required in the production of fertilisers from digestates.

Contribute to the normalisation of digestates as recognised products in the fertiliser market.

0256 - **The (re)use of mechanical separated solid fraction of digested and not digested slurry in anaerobic digestion plants**

Paolo Balsari, Fabrizio Gioelli, Simona Menardo, Enrico Paschetta
DEIAFA, Università di Torino, Grugliasco (To), Italy

In many livestock farm and in several anaerobic digestion plants, slurry is mechanical separated in order to obtain a solid fraction with higher content of organic matter compounds and phosphorus (linked to organic matter) and a liquid fraction where potassium and inorganic nitrogen are concentrated. The use of slurry mechanical separators improves the agronomic use of manure: the liquid fraction - that can't be profitably transported at long distance - can be applied to lands close to the farm centre during crop irrigation after being mixed with water, by sprinkler irrigator or flood irrigation systems, whereas the solid one characterised by a lower humidity content and a higher amount on organic matter, can be sold to sother farms or transported to outside farm areas. A new utilisation of the separated solid fraction can be represented by its use as a feedstock for anaerobic digestion through the exploitation of its potential biogas yield. The aim of the present study was to assess the potential biogas yield of digested and undigested solid fractions. Five samples of solid fractions obtained from digestate and one from raw pig slurry were tested. The solid fractions were collected at four different farms where different mechanical separators were used: one stage rotating and screw press. Samples were anaerobic digested in 2,5 Litres batch reactor at 40°C for 60 days in a thermostatic room, according to VDI 4630 specifications. The specific methane yield of separated solid fractions ranged between 59,3 and 203,8LN/kgVS. Specific methane yield mainly depends on volatile solids, total nitrogen and protein content of the solid fraction. These parameters were significantly influenced by the separation efficiency of the mechanical separators used by the farms. Moreover the study highlighted that samples with the higher specific biogas yields are those collected at anaerobic digestion plants with short hydraulic retention time and higher specific loading rate.

SESSION 3
TREATMENT AND TECHNOLOGIES

0018 - Multi-stage treatment of swine manure

Beatriz Molinuevo Salces, Maria Cruz Garcia Gonzalez, Cristina Gonzalez Fernandez
Agricultural Technological Institute of Castilla and Leon, Valladolid/Castilla y Leon, Spain

Background: Swine manure is receiving an increasing attention in Europe due to the intensive and concentrated farming in located areas, and to the high organic and nutrient concentration of these wastewaters. Despite the most traditional treatment is the aerobic technology, the high organic load inherent to livestock effluents often hinders the economical viability due to the intensive oxygen supply necessary to achieve complete pollutant depletion. Thus anaerobic digestion is presented as an efficient and cost-effective treatment to diminish organic matter but not with regard to nutrients. In this context, microalgae based processes offer a solution not only for nutrients removal but for nutrients recovery.
Purpose: An in-depth study was carried out to fully understand the removal mechanisms and removal efficiencies of a multi-stage treatment of swine manure. The treatment was evaluated in terms of organic matter, nitrogen and phosphorus.
Methods: The multi-stage treatment included a first step of anaerobic digestion by which organic matter was reduced and a centrifugation step in order to decrease the solids content of the anaerobic effluent. The supernatant obtained was subsequently feed to a photobioreactor. The photobioreactor was an open pond operating at 8 days HRT where microalgae and activated sludge were inoculated. Influents and effluents concentrations in terms of organic matter, ammonium and phosphate were analyzed periodically. The biomass obtained at the end of the treatment was also analyzed in order to estimate the carbon, nitrogen and phosphorus assimilated.
Results and Discussion: The 40% of organic matter was reduced by anaerobic digestion. The methane productivity was 0.25 mL CH_4/g VS added. During centrifugation the removal of TS and total COD was approximately 65-70% and 75-80%, respectively. In the last stage of the treatment nutrients were depleted. Due to the microalgae limitation with regard to ammonium toxicity, inlet of the open pond reactor was diluted. Ammonium was removed completely and phosphate at 80%. The biomass withdrawn presented 45% of carbon, 7% of nitrogen and 1-2% of phosphorus per dry weight of biomass.
Conclusions: This study highlighted the great potential of combining anaerobic digestion and microalgae-activated sludge bacteria for degrading swine manure. Anaerobic digestion produced biogas which may be employed as energy. The final stage constitutes a cheap technology by which nutrients were efficiently removed from the medium. Furthermore, the biomass of this last stage is a value added product that may be employed as fertilizer, animal feeding, biodiesel or biogas.

0166 - Swine Manure Storage Time Influence on Chemical Flocculation And Solid-Liquid Separation Efficiency

Eduardo Bernardo[2], Airton Kunz[1,2], Ricardo Steinmetz[1]

[1]Embrapa Swine and Poultry, Concordia, Brazil, [2]UNC/Concordia, Concordia, Brazil

Swine manure has a large amount of suspended solids and its removal using conventional physical separation processes is very difficult. To promote better solid-liquid separation, additives acting as coagulant and flocculant must be added in the effluent. Furthermore, during storage, the enzymatic processes promote changes in the characteristics of the manure dissolving the solids. In this study, was evaluated the influence of storage time on swine manure solid-liquid separation (SLS) efficiency using natural flocculants. Samples of fresh manure were collected directly from the reception pits inside finishing houses in an experimental farm in Concordia, Santa Catarina State, Brazil. The samples total solids (TS) where adjusted, with water at 3% (w/v) and stored in aliquots of 2 L. The SLS tests were carried out with a jar test using cationic organic polyelectrolytes (tannin (extracted from black wattle and polyacrilamide). Samples were collected from the stored flasks after 0, 1, 3, 7, 14, 21 and 28 days. The COD removal efficiency decreased from 70% (day 0) to 45% (day 28). After 7 days of storage, settled solids without addiction of flocculant, increased from 640 to more than 900 mL L-1, showing fluffy flocks. These changes are also observed on flock microscopic characterization after separation process. It was found that the storage time interfere in the solid-liquid separation process, resulting in the decrease on separation efficiency and increase on the chemical flocculants consumption.

0161 - **"Anaerobic respirometry" as a tool for organic matter fractionation aiming at anaerobic co-digestion modelling**

Romain Girault[1], Fabrice Béline[1], Antoine-Georges Sadowski[2]

[1]Cemagref - UR GERE - 17, avenue de Cucillé - CS 64427 - Université Européenne de Bretagne, 35 044 RENNES Cedex, France, [2]ENGEES - SHU-IMFS - Université de Strasbourg, STRASBOURG, France

Modelling of anaerobic digestion is more and more used as a tool for process optimization or interpreting observed phenomena within research projects. The most used model is the "Anaerobic Digestion Model n°1"(ADM1) but some other models are also available. Whatever the model, one of the major key issue is the fractionation and characterisation of the influent. For substrates like activated sludge from wastewater treatment plants, detailed influent characterisation models have been developed. But, the other substrates more complex as slurries or those from co-digestion systems require a more detailed input characterisation.

Chemical analysis can be used to give the basic splits required into proteins, fats, and carbohydrates. However, this does not provide biodegradability. Moreover, this required a conversion of analysis results into COD fractions often used as unit in models which lead to difficulty in term of mass balance. The aim of this approach is to develop a method to define the influent of anaerobic digestion models. Named "anaerobic respirometry", this method is based on the interpretation of the results (in term of methane production kinetics) of batch experiments performed at low substrate to biomass ratios. Already used specifically for the characterisation of sludges from wastewater treatment plants (Yasui *et al.,* 2008), here this method was applied on more complex substrates (livestock effluents and common co-substrates).

In this work, eight similar mesophilic batch reactors (working volume : 1L) on which biogas and methane production rates are continuously measured were developed to perform "anaerobic respirometry" for substrate characterisation. After a study concerning the optimal conditions in term of substrate to biomass ratio and influence of the origin of biomass, substrates commonly used for anaerobic co-digestion were characterized including piggery slurry, wastes from slaughterhouse (fat, blood, sludges, ...), green wastes, ...

Three sludges were evaluated indicating a low influence of the origin of the sludge. Four substrate/biomass ratios were evaluated between 0.05 and 0.35 $gCOD_{biodegradable}/gVSS$ with an

optimum at 0.14 $gCOD_{biodegradable}$/gVSS. From these results, substrates were characterized allowing to determine a kinetic fractionation. A readily and a slowly biodegradable fractions were identified for most substrates with the help of a simplified version of ADM1.

These results could be useful for the modelling and optimization of anaerobic digestion processes and the developed methodology could allow to simulate anaerobic digestion of many substrates.

0304 - **Effects of antibiotic residues in fermentation substrates on biogas yield**

Alexander Bauer[1], Christian Leonhartsberger[1], Thomas Amon[1], Michael Klocke[2], Ingo Bergmann[2], Kerstin Mundt[2], Christoph Winkler[3]

[1]University of Natural Resources and Applied Life Sciences, Division of Agricultural Engineering, Vienna, Austria, [2]Leibniz Institute for Agricultural Engineering Potsdam-Bornim, Potsdam, Germany, [3]University of Natural Resources and Applied Life Sciences, Division of Livestock Sciences, Vienna, Austria

Within livestock husbandry veterinary drugs especially antibiotics are used to a great extent. These agents are excreted partly again from the animals and end up via the excrements in the environment. Animal manure, especially slurry is often used in biogas plants also due to its process stabilising properties. The effect of antibiotic residues in fermentation substrates on biogas production is so far not very well investigated. It could be assumed that antibiotics have a negative effect on the microbial community of the fermentation process. If the degradation and subsequently the specific biogas yield are reduced also economic risks of the biogas plant are arising.

In the course of this research project the effects of different concentrations of the antibiotics Chlortetrazyclin and Enrofloxacin on the biogas process have been investigated. Concentrations between 40 and 8,000 mg per dry matter pig slurry were analysed in continuous fermentation tests according to VDI 4630. Parameters like specific biogas- and methane yield, H_2- and H_2S-concentration were evaluated daily. Changes within the microbial composition have been examined after DNA-extraction according to the DNA-extraction protocol of Nettmann (2008). Copies of the 16S rDNA gene were determined with a quantitative realtime polymerase-chain reaction (Q-PCR) in the 5´-nuclease-assey. The results of the investigation have shown that a concentration of 200 mg kg^{-1} DM significantly decreased the specific biogas- and methane yield. The specific methane yield per m^3 fermenter volume was decreased in an extreme case from 0.11 Nm^3 (0-variant) to 0.05 Nm^3 at variants with concentrations of 8,000 mg kg^{-1} DM. A 25 % reduction of the specific methane yield was derived with concentrations of 200 mg kg-1 DM of both antibiotics. Microbial investigations have not shown any changes in the microbial community. Only with Chlortetracyclin at a concentration of 8,000 mg kg^{-1} DM the biodiversity varied slightly form the 0 variant. Here, no methanosarcinaceae have been detected. The amount of 16S rDNA copies for archaea was within all treated variants compared to the untreated slurry. This research has clearly demonstrated the influence of antibiotic residues in fermentation substrate on the biogas process. In further research projects it has to be investigated if the micro-organisms are creating resistances against the veterinary drugs.

SESSION 5
TREATMENT AND TECHNOLOGIES

0190 - Removal and Recovery of Ammonia from Liquid Swine Manure and Poultry Litter Using Gas Permeable Membranes

Matias Vanotti, Ariel Szogi, Michael Rothrock
USDA ARS, Florence, SC, United States

We investigated the use of gas-permeable membranes as components of new processes to capture and recover ammonia from liquid manures and other concentrated effluents as well as from the air in poultry houses. The basic process includes the passage of gaseous ammonia through a microporous hydrophobic membrane and capture and concentration with circulating diluted acid on the other side of the membrane and production of a concentrated ammonium salt. The membranes can be assembled in modules or manifolds and can be tubular or flat.

For liquid manure applications, the membrane manifolds are submerged in the liquid and the ammonia is removed from the liquid matrix in barn pits or storage tanks before it goes in the air. The concept was successfully tested using concentrated swine manure effluents (digested and un-digested liquid manure) containing 300 to 1500 mg/L NH4-N. After ten batches, the ammonia was recovered and concentrated in a clear solution containing 53,000 mg/L NH4-N. Soluble compounds such as soluble COD did not pass through.

For the removal of ammonia in air, the technology captured and recovered 96% of the ammonia lost from poultry litter. The recovery of ammonia could mimic the slow release during flock production or could be accelerated to a few days using hydrated lime amendments. The membrane manifolds can be placed close to the poultry litter surface (above or below), reducing the exposure of the birds to ammonia. Considering the ammonia is captured inside the houses, this technology help reduce ventilation and energy needs to lower ammonia levels in poultry houses.

The results obtained in this study show that the use of gas-permeable membrane technology could be an effective approach to recover ammonia from livestock wastewater and from the air in poultry litter and other livestock operations. The final products are (1) reduced environmental emissions from livestock facilities, (2) cleaner air inside the poultry and swine houses with benefits to bird/animal health, and (3) concentrated liquid nitrogen that can be re-used in agriculture as a valued fertilizer.

0120 - **Recycling of digestates from biogas production by composting**

M.A. Bustamante[1], A. Restrepo[1], J.A. Alburquerque[2], R. Moral[1], C. Paredes[1], M.D. Perez-Murcia[1], M.P. Bernal[2]

[1]Department of Agrochemistry and Environment, Miguel Hernandez University, EPS-Orihuela, Ctra Beniel Km 3.2, 03312-Orihuela (Alicante), Spain, [2]2Department of Soil and Water Conservation and Organic Waste Management, Centro de Edafología y Biología Aplicada del Segura, CSIC, PO Box 4195,30080 Murcia, Spain

Intensification of livestock production has led to a generation of great amounts of animal manures and slurries that can constitute a potential environmental risk, if their management is not optimised. Anaerobic digestion constitutes one of the main alternatives to manage these wastes and is based on the anaerobic conversion of organic matter, obtaining a biogas and a digested substrate named digestate. Although anaerobic digestate presents a high fertilising value, this material shows some characteristics, such as its phytotoxicity, which advice against its use as soil amendment in its basic form. Therefore, composting can constitute a suitable treatment to stabilise anaerobic digestate and thus, to improve its properties prior to its use as soil conditioner.

The objective of this work were twofold: i) to study the evolution of the composting process of the piles elaborated using the digestates obtained from the anaerobic digestion of pig slurry (PSD) and wastes from the agricultural activity (wheat straw (WS), vine shoot pruning (VP) and pepper plant pruning (PP)) and from the agro-food sector (exhausted grape marc (EGM)) and ii) to evaluate the characteristics of the end-products obtained. To carry out these objectives, five mixtures (P1, P2, P3, P4 and P5) were elaborated by the turning composting system, mixing in all of them the solid phase of PSD with WS (P1 and P2), with EGM (P3), with VP (P4) and with PP (P5). In addition, P2 was watered with the liquid phase of the anaerobic digestate of pig slurry (LPS); 0.22 L LPS per kg was added on the first day and the remaining volume, up to 0.45 L kg^{-1} was added gradually up to 27 days of composting and the rest of piles were watered with water, maintaining a moisture content not less than 40 %. When the bio-oxidative phase of composting was considered finished, composts were left to mature a month, approximately. Throughout the composting process, physico-chemical, chemical and biological parameters were studied.

In general, thermophilic temperature was reached in the first week of the composting process, showing piles P1, P2, P4 and P5 the highest temperature values. The highest organic matter degradation was observed in P1, which showed the greatest temperature values. At the end of the composting process, all composts displayed a C/N ratio < 20 and a total absence of phytotoxicity (GI > 50%), which revealed the stabilisation and humification of the organic matter in the mixtures studied.

0234 - Composting of anaerobic digestates for producing added-value materials in agriculture.

Mª Angeles Bustamante[1], Jose A. Alburquerque[2], Carlos de la Fuente[2], Adriana Restrepo[1], Raul Moral[1], Concepción Paredes[1], Juan Cegarra[2], Maria-Pilar Bernal[2]

[1]Miguel Hernandez University, Orihuela, Alicante, Spain, [2]CEBAS-CSIC, Murcia, Spain

Nowadays, anaerobic digestion is gaining interest to manage the wastes generated by livestock production. This treatment produces a source of renewable energy (biogas) and the potential use of the digested materials (digestate) as fertilisers. However, some characteristics of the digestate (phytotoxicity, viscosity, odour, etc.) make it difficult its direct application in agricultural soils. One option is to separate the digestate into a liquid and a solid fraction, the latter can be composted in order to obtain valuable and marketable end-products for agriculture.

The aim of this work was to study the co-composting process of the solid fraction of a digestate, obtained from the anaerobic digestion of cattle slurry, with vine shoot pruning (VP), as well as to evaluate the characteristics of the composts obtained. Three mixtures were prepared and composted in a pilot plant by the Rutgers static pile composting system. The proportions of the piles on a fresh weight basis were the following: P1 (100% digestate), P2 (90% digestate + 10% VP) and P3 (80% digestate + 20% VP). Additionally, in all the composting piles two additives were included: elemental sulphur in a concentration of 0.2% (fresh weight basis) in order to reduce pH of the mixtures, and almond shell powder in the proportion of 1% (fresh weight basis) to increase the C/N ratio. The moisture of the piles was kept at > 40 %, and the evolution of the temperature was monitored.

Throughout the composting process, physico-chemical, chemical and biological parameters were analysed in order to evaluate the effect of co-substrate, as a bulking agent, addition on composting progress as well as on compost quality. Clear differences, especially in both temperature evolution and organic matter degradation, were observed amongst piles that demonstrated the impact of the added co-substrate. All the composts had a good degree of stability, according to the C/N ratio < 12 or the germination index > 50%, which indicates absence of phytotoxicity.

0002 - Utilization of wasted sardine oil as co-substrate with pig manure for biogas production – A pilot experience of decentralized industrial organic waste management in a Portuguese pig farm

Ferreira, L.M.[1], Duarte, E. A[1], Figueiredo, D.[1]

[1] Dpt. Agricultural and Environmental Chemistry, Superior Institute of Agronomy, Technical University of Lisbon, lferreira@isa.utl.pt

Background: One important operation of the sardine canning process, consists of steam cooking. A mixture of oils and grease exuded from the flesh are collected from the cooking wastewater, and designated here as wasted sardine oil (WSO).
WSO, according to the Regulation (CE) nº. 1774/2002, of 3rd October, is classified as an animal sub product of category 3 and it can be processed in a biogas plant.
In the same region where the canning plant is located, there are several full scale farm biogas plants where could be interesting to introduce other substrates to co-digest with pig slurry (PS), in order to raise biogas production.
Purpose: The main goal of this work was to demonstrate in a commercial pig farm with a biogas plant and in real conditions, the possibilities to co-digest WSO and PS at farm level. Since it was the first time that in Portugal such an experience was done, the production of technical information to the veterinary authorities was a secondary goal.
Methods: Characterization of WSO indicated a very high COD content and lab trials were performed to test the biogas potential and feedstock compositions with PS.
A biogas mobile pilot plant, equipped with a 2 m3 CSTR digester was set up in the pig farm and operated in real conditions during 4 months. Dynamic mesophilic (35º - 37º C) continuous pilot trials with a HRT=16 days, were performed with pig slurry (PS) (OLR = 1,6 – 2,3 Kg CQO/m3.d-1) and with mixtures of WSO:PS with a volumetric composition (% v/v) of 2:98 (OLR = 2,8 – 3,0 Kg CQO/m3.d-1) to 5:95 (OLR = 4,8 – 5,1 Kg CQO/m3.d-1). The main operational parameters (methane, carbon dioxide, H2S and COD fractions of the digestate, nitrogen and phosphorous) has also been investigated.
Results: Biomass adapted very fast to metabolise the WSO and biogas productivity (m3 biogas/ m3 digester.d-1) was raised from 0,56 (0:100) to 1,91 (5:95) through the use of different compositions of WSO:PS. The methane and digestate quality were not significantly different after the co-digestion process. Process stability was monitored measuring the pH and T-VFA/BA ratio. Both indicators, suggests that the co-digestion process was robust.
Discussion: The results showed that WSO could be easily co-digested in farm scale biogas plants. In the particular case of this canning plant, a regional waste management solution could be envisaged and the awareness of the competent authorities about this technical alternative was improved.

0038 - Physicochemical changes and nutrient dynamics during composting of the solid fraction of dairy cattle slurry

Luís Miguel Brito[1], Ana Luisa Amaro[1], Isabel Mourão[1], João Coutinho[2]

[1]Escola Superior Agrária de Ponte de Lima - IPVC, Refóios, Ponte de Lima, Portugal,

[2]Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal

Solid-liquid separation of livestock slurry is an effective slurry treatment method for producing nutrient-rich organic solids and potentially reducing the nutrient contents and organic matter (OM) in the liquid phase. There is value in separating the cattle slurry solid fraction (SF) for use as a soil conditioning agent and this is particularly important in Southern European climates where soils are depleted in OM. Composting may be an effective management option to improve the suitability and acceptability of SF for use on agricultural land and composted SF can be managed in the same way as traditional farmyard manure with application at any time of the year provided ground conditions allow, unlike slurry spreading which is subject to closed periods. This work aims to find methods to improve the composting process of SF, without pile turning or additional bulking agent, based on the effects of pile size and the rate of SF solid-liquid separation.

SF was collected from two dairy farms and dewatered using a screw press. The press was supplied with slurry at a rate of 4 m^3 h^{-1} at Farm 1 (SF1) and 1 m^3 h^{-1} at Farm 2 (SF2) and the SF was composted in tall (1.7 m) and short (1.2 m) static piles to evaluate the physical-chemical characteristics and nutrient dynamics of SF during composting. SF1 showed long-lasting thermophilic phase compared to SF2. Highest maximum temperature (62-64 ºC) was achieved in tall piles compared to short piles (52 ºC). Therefore, tall piles enhanced compost sanitation. Final OM losses were within the range of 520-660 g kg^{-1} and nutrient content gradually increased throughout the composting period (168 days) due to the net loss of OM. Linear regression between nutrient and OM contents showed highly significant correlation coefficients ($P < 0.001$), which decreased by the following order: N, Ca, P and K. The low temperature and C/N ratio, and the small content of NH_4^+ combined with increased concentrations of NO_3^- indicated that final SF composts were stabilized. The high concentration of OM (772-856 g kg^{-1}) and total N (24-40 g kg^{-1}), P (4-7 g kg^{-1}), K (11-15 g kg^{-1}) and Ca (13-21 g kg^{-1}) in the dry matter of final composts, together with a low electrical conductivity (0.6-1.4 dS m^{-1}), suggested that SF composts would be effective as soil amendments.

SESSION 4
LOSSES ON APPLICATION

0160 - Injection of animal slurry to winter cereals - effects on emissions of odour, ammonia, and crop yield

Martin N Hansen[1], Tavs Nyord[2], Torkild Birkmose[3]

[1]Agrotech, Institute for Agri Technology and Food Innovation, Aarhus N, Denmark, [2]University of Aarhus, Faculty of Agricultural Sciences, Foulum, Denmark, [3]Danish Agricultural Advisory Service (DAAS), Aarhus N, Denmark

Background: While injection of slurry is increasingly used to mitigate odour and ammonia emissions from land applied slurry, injection of slurry to winter cereals rarely takes place. The reason for this is expected to be the potential crop damage caused by the injection, but the actual knowledge is limited regarding how injection in winter cereals affects crop yield and emissions of ammonia and odour.

Purpose: To quantify how injection of slurry to winter cereals affects crop yield and emissions of ammonia and odour.

Methods: Pig slurry was applied to winter wheat by commercial technologies to experimental plots at a rate of 30 m3 ha-1 in the spring of 2008 and 2009. The application was performed by a shallow disk injector (disk injector), a trailing shoe injector (trailing shoe) and a trailing hose applicator (trailing hose). The odour concentration in air sampled in static odour chambers situated above the applied slurry were quantified twenty minutes after application by dynamic dilution olfactometric analyses, the emission of ammonia from the applied slurry was continuously measured by the IHF technique until five days after the application, while the impact of injection on crop yield was quantified by measurements of harvested yield of grain and protein. All measurements except ammonia were triplicated.

Results and discussion: Trailing shoe injection did not allow an efficient injection of the applied slurry and was not found to abate the odour concentration of air sampled above the applied slurry, while the more efficient injection performed by disk injection was found to reduce the odour concentration between 15 and 60 % compared to slurry applied by trailing hoses. The effect of injection on crop yield varied between years and used technology. Compared to slurry applied by trailing hoses, trailing shoe injection increased crop yield by 0.3 tonnes of grain in 2008, while it reduced grain yield by 0.3 tonnes ha-1 in 2009. Disk injection was found to increase grain yield by 0.3 tonnes ha-1 in 2009, while it had no impact on grain yield in 2008. Injection of slurry was found to affect the emission of ammonia; however, the total emission of ammonia following slurry application has not yet been worked out.

0237 - **Modelling ammonia emissions after field application of biogas slurries**

Andreas Pacholski, Dirk Gericke, Ni Kang, Quakernack Robert, Kage Henning

Christian-Albrechts-University at Kiel, Institute of Crop Science and Plant Breeding, Agronomy and Crop Science, Kiel, Germany

In Germany, the production of biogas from energy cropping systems has been in the focus of the national bio-energy strategy for the reduction of greenhouse gas emissions since the year 20004. Their greenhouse gas saving benefit can be strongly decreased by other adverse environmental effects induced by biogas systems as greenhouse gas and ammonia emissions. Ammonia emissions which are unavoidable as biogas slurries have to be re-transferred to the field as N-fertilizers, contribute indirectly to greenhouse gas emissions. In addition ammonia emissions are the main source of eutrophicating and acidifying compounds deposited on natural and semi-natural ecosystems. There is thus an urgent need to quantify NH3 emissions from biogas production systems. For scenario and regionalisation simulations, model approaches for NH3 emissions after field applications of biogas slurries are of particular interest. Model development was carried out on the basis of intensive ammonia loss field measurements carried out in the years 2007-2009 in biogas cropping systems grown in Northern Germany. Altogether 18 experimental campaigns including the simultaneous measurement of several animal and biogas slurries were carried out in multiple plot field experiments using different N-fertilization levels. For the determination of NH3 emissions micrometeorological as well as plot based measurement approaches were used and subsequently cross- checked. Several new dynamic and empirical model approaches were tested which can be applied for the calculation of NH3 losses after field application of biogas and animal slurries to energy crops. In addition to the well known principles for calculation of ammonia losses based on temperature, pH and soil water relationships new algorithms were implemented to account for the effects of slurry incorporation, crop type, canopy structure and precipitation on NH3 emissions. Model results showed a good agreement with measured data with respect to both simulated ammonia loss dynamics as well absolute final losses. As compared to validation data the models show a quantitative accuracy of cumulated NH3 losses in between 1 - 2 kg N ha-1 which is in the range of the measurement accuracy of commonly used measurement methods.

0270 - European Agricultural Gaseous Emissions Inventories Researchers Network - gaseous emission factors for solid manure management.

J Webb, Sven Sommer, karin Groenestein, Thomas Kupper

AEA, Didcot, United Kingdom

Livestock excreta and manures are significant sources of ammonia (NH_3), methane (CH_4) and nitrous oxide (N_2O) emissions. Consequently limits for the emission of these gases have been agreed. The EAGER (European Agricultural Gaseous Emissions Inventories Researchers Network) network examined models used for national agricultural NH_3 emission inventories in Europe and found that the models gave very different outcomes for solid manure management systems. In consequence it was decided to establish a knowledge base of emissions from solid manures for these models and also to define research gaps.

We examined datasets available to the EAGER group including data published nationally and in internal research reports. The data provided, and data from reviewed articles, were amalgamated so that they could be subject to statistical analysis providing new information focussing on developing emission factors, emission algorithms and also new understanding of emission patterns from solid manure, including N_2O and CH_4.

The greater aerobicity of litter-based manures is likely to increase emissions of NH_3 from buildings housing livestock, countering the mitigating impact of increasing the C:N ratio, and further increase emissions of N_2O and CH_4. The balance of the effects on emissions will vary according to litter type and amount and the management of manure within buildings. Differences in animal behaviour will also contribute to differences in emissions from livestock buildings.

During storage temperature is decreased by storing at greater densities, due to reduced aeration of the manure heap. Greater densities are achieved with manures with smaller proportions of litter or by compaction of the manure. Greater amounts of litter, will increase the likelihood of aerobic decomposition and hence increase emissions. These factors, together with variations in the amounts of time manures are stored, will lead to further variation in emissions from the manure during storage and to the characteristics of manures prior to spreading.

Following spreading on land rapid incorporation was more effective for reducing NH_3 emissions than incorporation after longer intervals. The reduction achieved using a plough was greater than from other machines. Abatement from other potential mitigation measures such as addition of straw in buildings, storage before application and measures during storage such as compaction and covering or wetting of the manure after application were less clear. Storage before application tended to produce less NH_3 emissions following application. The data suggest that incorporation of solid manure does not increase emissions of N_2O.

0255 - Understanding the efficacy of zeolite as a binding agent to mitigate ammonia volatilisation from pig manure and slurry

Ruben Sakrabani

Cranfield University, Bedford, United Kingdom

Nitrogen excreted in animal faeces is typically bound up in organic compounds which are slowly volatilised into ammonia (NH_3). However nitrogen in the urine is in the form of urea which can rapidly hydrolyse to form ammonium carbonate. The decomposition of ammonium carbonate frees up ammonium ions that can volatilise as gaseous NH_3. Hydrolysis of urea is facilitated by the enzyme urease, which is abundant in soils and plant roots as well as in animal faeces

The aim of the proposed work is to determine efficacy of zeolite as a binding agent to mitigate NH_3 volatilisation from pig manure and slurry. Zeolites are clay like minerals from sedimentary deposits. The hypothesis is ammonium ions available as results of urea and organic nitrogen hydrolysis in manure will be adsorbed by zeolite and thus reducing the volatilisation of NH_3. In addition there is an added benefit of using zeolite as a binder as it also adsorbs Cu and Zn (originating from feed) which are present in pig manure and slurry.

The experiment was carried out in a laboratory. The experiment is designed to pass a constant flow of water-saturated air over the top of a soil sample which has been mixed with manure and slurry. Ammonia volatilising from the soil sample is carried into a flask (acid trap) containing an excess of sulphate ions. Measuring the ammonium sulphate formed shows how much ammonia has volatilised from the soil surface.

The pig manure, slurry and soil samples were analysed for pH, dry matter content, carbon, nitrogen, Cu and Zn concentrations. The urease activity of manure was also determined in the laboratory. The soil samples collected were free draining sandy soils.

We carried out a mass balance by considering the nitrogen concentration in the soil, manure and slurry, amount loss as NH_3 and amount adsorbed to zeolite. The results show that zeolite is efficient (in some cases efficiency of more than 70%) in minimising volatilisation of NH_3 from manure and slurry. However the pH and urease activity have a significant influence on the volatilisation of NH_3. Cu and Zn are also adsorbed by zeolite. , These promising results could provide an initial solution to the current problem on NH_3 loss in the livestock sector. The paper will consider all these findings and discusses the economical aspects of using zeolite for this purpose.

TASK GROUP MEETING SESSION

0177 - Anaerobic Digestion and Digestate Utilization in Europe

Ina Körner, Barbara Amon, Olaf Bade, Paolo Balsari, Thierry Bioteau, Patrick Dabert, Jacek Dach, Anna Deipser, Thomas Kupper, Luis Jorge Martinez Ferreira, Henrik Moller, Paolo Mantovi, Anna Schnürer, Mariangela Soldano, Alstair Ward, Claudio Fabbri

Hamburg University of Technology, HAmburg, Germany

In 2008 the RAMIRAN task group on "Anaerobic digestion (AD) and utilization of digestate" was established. It includes voluntary members from several European Countries that proposed to collect data about AD of waste and other biomass in Europe. The purpose was to produce a picture of AD development and utilisation in Europe.
A questionnaire was elaborated containing statistical inquiries of present AD facilities regarding substrates; regarding: biogas production, processing and utilization; digestate production, utilization, treatment or disposal; the legal framework and other driving forces of AD development. The questionnaire was then transferred to an internet available form using the on-line survey designer tool: http://www.surveymonkey.com. Its principal practicability for the different regional situations was verified by the group members before the final distribution for data collection. The data input was carried out by the group members based on their own surveys or on nationally available survey literature. The on-line tool and set-up of the questionnaire allows a direct comparison of the data from different countries and is easy to actualize.
This questionnaire is a complement of the one performed in the EU project Agrobiogas (www.agrobiogas.eu), which was related to specific European plants. In contrast data of the RAMIRAN questionnaire cover entire countries. Data were/will be collected for at least the following countries till the RAMIRAN conference: Austria, Denmark, France, Germany, Great Britain, Italy, Poland, Portugal, Sweden, Switzerland. The data collection is going on and will be finalized by the end of January 2010. For the RAMIRAN conference the data will be summarized and evaluated regarding the similarities, differences, problems and benefits. At this stage of elaboration it can be stated that the intentions regarding the introduction, the substrates, the procedures and the driving forces for the establishment of this technology are very different from one country to another. The increasing amounts and diversity in substrates and processes results in various digestates. The whereabouts and characteristics of the digestates will become an important topic in the future.
Since the on-line questionnaire is of easy access an update of data should be carried out at regular intervals as long as the developments on anaerobic digestion in the member's home countries are going on. The questionnaires results and the international networking will help in learning from each other and in the integration of AD into regional systems in the most suitable and beneficial way.

0332 – Agrobiofilm Project. Development of Enhanced of Biodegradable films for horticulture and viticulture

Costa-Rodrigues, C.[1], Martins, M.[2], Oliveira, M.[2,3], Lima, A.[2], Duarte, E.[2], Monteiro, A.[2]

[1]*Silvex, Quinta da Brasileira, Lote 10, 2130-999, Benavente, Portugal*

[2]*Instituto Superior de Agronomia, Tapada da Ajuda, 1349-017, Lisboa, Portugal*

[3]*Escola Superior Agrária de Santarém, Quinta do Galinheiro, S. Pedro 2001-904, Santarém, Portugal*

Keywords: Agrobiofilm project, Biodegradable mulch films, Starch-based polymers

The current practise and use of plastics in horticulture and viticulture is associated with several sustainability drawbacks and negative environmental impacts. Plastics must be removed at the end of each cropping cycle, and, noncompliant disposal of plastics is well documented and widespread. Recent technological advances give biodegradable materials made of starch-based polymers a significant potential for improved environmental sustainability and cost efficiency for end-users. The major value of such materials is that film residues can simply be ploughed into the soil before regular soil preparation for the next crop. The purpose of AGROBIOFILM is to overcome scientific and technical barriers, associated with broad scale introduction of biodegradable mulch film in viticulture and horticulture. Based on small scale tests and field test data, yield/costs analysis will be performed allowing a comparison between different types of biofilms, against a conventional production methodology for the crops in question. These results in a dataset of resource use (fertiliser, pesticides, water, film, traction energy) and output at different growing practice, as well as, a definition of the conditions in which these results are expected to be achieved. This research will lead to the development of novel products, as well as, performance validations of customized product specifications and a study on the implementation conditions which, together with an environmental liability study, will demonstrate the benefits of biodegradable mulch films.

According to the activity tasks, field trials began in April 12, with the installation of a vineyard in France. Later, in April 28 and May 6, the experimental field tests for melon and bell-pepper were settled in Portugal. By late July, the first results of the short cycle crops will be obtained for later data treatment, integrating all the monitored variables. In September/October it is predicted to start the strawberry crop evaluation both in Portugal and Spain.

SESSION 6
LOSSES IN STORAGE (Session 6)

0194 - Greenhouse gas emissions from stored slurry with and without different covers

Lena Rodhe, Johnny Ascue, Åke Nordberg

JTI - Swedish Institute of Agricultural and Environmental Engineering, Uppsala, Sweden

Introduction: Total greenhouse gas (GHG) emissions from stored manure corresponded to 13% of overall GHG emissions from Swedish agriculture in 2006 according to calculations using standard values for a cool climate.

Material and Methods: - In the present study storage conditions was identified for cattle slurry in different regions of Sweden and methodology was developed for measuring GHGs from slurry stored under similar conditions to full-scale storage. A pilot-scale plant with nine containers was constructed and placed outdoors at JTI in Uppsala, where the conditions were similar to a full-scale storage as regards slurry temperature, climate and filling/emptying routines.

The annual GHG emissions were determined (methane and nitrous oxide) from stored cattle slurry, with and without covers to reduce ammonia emissions. The covers were natural crust, straw cover or plastic sheet cover and the treatments were organized in a randomized block design with three replicates. The closed chamber methodology and equipment developed for measuring GHG emissions were implemented for one year in order to see the annual GHG emissions.

Results: The mean annual temperature in stored slurry was 9.7°C in south-west Sweden (57°1.3´N), 5.6°C in the most northerly agricultural region of the country (62°57.6´N) and an intermediate 8.1°C in Uppland (60°0.9´N).

During the year-long pilot-scale study, methane gas emissions occurred from all types of storage, whereas nitrous oxide emissions were very small or scarcely detectable. During the winter period (Oct-April), methane emissions were 3.6 CH_4-C per kg VS from uncovered storage and the average storage duration was 3.5 months. During summer (May-Sept) the corresponding emissions were 6.5 g CH_4-C per kg VS for an average storage duration of 2.5 months. Plastic-covered stored slurry emitted significantly lower methane emissions than uncovered or straw-covered slurry in the period Feb-Oct. During winter there were no significant differences between the slurry treatments. Mean annual methane emissions (g CH_4-C per kg VS) from slurry were 4.8 for uncovered, 4.4 for straw-covered and 3.2 for plastic-covered. This corresponds to an annual MCF factor of 2.7%, 2.5% and 1.8%, respectively. Using assumptions made in this report, the methane emissions from the uncovered slurry corresponded to 9.3 kg CH_4-C per cow and year.

Conclusions: Under Swedish conditions, an annual methane conversion factor (MCF) of 3 % is more relevant than the IPCC default value of 10%.

0228 - A floating covering system able to reduce ammonia and GHG emission from the storage of digested slurry

Paolo Balsari, Elio Dinuccio, Fabrizio Gioelli

Università di Torino, Grugliasco (To), Italy

In recent years anaerobic digestion (A.D.) of feedstock and animal manures has widely spread in Europe and several installations have recently been constructed. A.D. plants require tanks for the storage of digested slurry with a proper storage capacity in order to enable farmers to fulfil national requirements and to allow the correct agronomic utilisation of digestate. At present, storage tanks are mostly uncovered. Due to a still significant presence of undigested organic matter and a quite high ammonia nitrogen concentration in the digestate, biogas and ammonia losses from the storage tank are likely to be expected. With the aim to quantify such emissions, and to find solutions able to prevent them, within the EU-Agro-Biogas project a set of trials were carried out on a digestate storage tank of a 1MWel. anaerobic digestion plant. Ammonia emission were measured by means of a set of three floating wind tunnels by Schmidt and Bicudo (2003). Biogas losses were measured by means of an ad hoc pilot scale system (6,25 m^2). According to the pilot scale trials results, an average daily production of 450Nm^3 of biogas was measured, corresponding to an emission of about 50kg CO_2eq. per m^3 of digestate loaded daily into the tank and to more than 200kgCO_2eq, per MWel. produced. Ammonia emission were approximately 3.9gN-NH_3 per square meter of storage per day (~38gN-NH_3 per m^3 of digestate loaded into the tank per day). This latter figures suggested the possibility to recover a large amount of residual biogas from the storage of digestate and to significantly abate GHG and ammonia emission by covering the whole tank surface, thus a floating coverage system was designed and constructed in collaboration with Ecomembrane® Firm. The coverage components are: a perypheric floating frame made up of 48 polypropylene and stainless steel modules; a central floating unit made of nine polypropylene blocks; a PVC two sides coated polyester fiber membrane covering the whole surface of the tank (~1000m^2). The residual biogas recovered by the floating cover accounted for the 27% of the total GHG emission of the A.D. plant. Furthermore, by the recovered biogas (250-500Nm^3 per day) it is possible to increase the daily biogas yield of about 2-4% (0.5-1MWhel). According to the project results, in anaerobic digestion plants the storage of digestate plays an important role under the environmental point of view. The coverage of storage tanks is therefore strongly recommended.

0300 - Nitrogen losses in young beef cattle housing and during their manure storage estimated thanks to nitrogen balance, diet and manure management.

Michaël Mathot[1], Virginie Decruyenaere[2], Richard Lambert[1], Didier Stilmant[2]
[1]Université catholique de Louvain, BAPA, CEMI, Louvain-la-Neuve, Belgium, [2]Centre Wallon de Recherches Agronomiques/Section Systèmes Agricoles, Libramont, Belgium

Fate of nitrogen in cattle housing and during manure storage is of major concern in agriculture. Indeed, this element is essential for agricultural productions as nutrient for plants or as food for animals. However, losses out of the farming systems can be harmful for the environment (acidification, eutrophisation, climate change). Therefore farm production systems have to be optimised to minimise losses of this element. During 4 winters, we tested the impact diets and manure management on nitrogen losses in young beef deep litter houses and during the storage of their manure. During 7 periods of 42 to 125 days, we raised young Belgian blue white cattle in two experimental full deep litter stalls. We compared effects of two main factors for their influence on N losses. The first one was the diet and the second the amount of straw for bedding. Furthermore, the deep litter was either kept below the animals during all the period or removed and stocked outside the buildings. Nitrogen balance of the whole system (housing and manure storage) was calculated. we weighted and analysed all the products (feed, animal gain, liquid and solid manure) considering the end of the experiment at spring, before application of manure to agricultural lands. Multiple linear regression with straw supply, duration of deep litter storage outside the barn and nitrogen content of the diets was used to estimate nitrogen balance of the whole system. We observed that nitrogen losses (i.e. gaseous nitrogen losses) increased significantly ($p<0.05$) with nitrogen supply in the diet and duration of storage of the manure outside the stall. The global multiple linear relation was very highly significant ($p<0.001$) and allows to explain more than 80% of the variability observed in the nitrogen balance. These results suggest that N nutrition of cattle has a major impact on global N balance and that manure management changes should be considered to reduce N losses from farm buildings.

SESSION 7
SANITARY AND ENVIRONMENTAL ASPECTS

0125 - Decision support tool for the integration of public health in manure management

Jakob Ottoson

Swedish University of Agricultural Sciences, Uppsala, Sweden

Background: Sustainable development must take into account economic, social and environmental aspects ; however, one important but often neglected aspect is health and hygiene. Best management practices (BMPs) are those that best attain all of the abovementioned aspects. One helpful tool in order to integrate hygiene in BMPs is quantitative microbial risk assessment (QMRA) for the calculation of health-based targets to provide decision support from a public health point of view. This paper outlines QMRA for manure management.

Purpose: Provide decision support for integrating microbiological hazards in best manure management practices.

Methods: Risk assessment is a four-step analysis including: hazard identification, exposure assessment, hazard characterisation and risk characterisation. The end-point of QMRA is the numerical values of the probability of exposure, infection, illness or death. From a decision support point of view, a more relevant target is that the disease rate from recycled manure should not exceed a minimal background level; in food safety normally termed appropriate level of protection or acceptable risk.

Results: Based on the endemic level of disease and manure usage (i.e. probability of exposure) the treatment performance targets (TPTs) for different pathogens are calculated as a decision support for the prediction of right treatment, taking into account variability and uncertainty. TPTs vary with exposure and organism.

Discussion: Calculating TPTs can be done in an early phase of the planning process to give an indication of the pathogen reduction in manure needed in order not to cause adverse health effects. Is intensive treatment at higher temperatures needed, or is storage sufficient? Inclusion of the following information to figure 1 is suggested as a means to include public health in manure BMPs . QMRA can be used to calculate TPTs whereas epidemiological studies or the national reporting system can be used to measure the outcome in the feedback loop.

0090 - **Survival of E. coli within Farmyard Manure heaps**

Chris Hodgson[1], Nick Bulmer[1], Dave Chadwick[1], Lizzie Sagoo[2], John Williams[2], Brian Chambers[3]

[1]North Wyke Research, Okehampton, Devon, United Kingdom, [2]ADAS UK Ltd, Boxworth, Cambridge, United Kingdom, [3]ADAS UK Ltd, Gleadthorpe, Nottingham, United Kingdom

Background: Diffuse pollution from agriculture can be a significant source of E. coli loads to bathing and shellfish waters. Revisions to the EC Bathing Water Directive in 2005 have made compliance with water quality standards more demanding, increasing the likelihood of non-compliance. In the UK, farmyard manure (FYM) from cattle and pig housing, which contains dung and urine mixed with bedding material (usually straw), can be stored in uncovered temporary field heaps for up to 12 months before land application. The leachate produced during storage can contain high concentrations of microbial pathogens and nutrients and poses a significant risk of surface water contamination.

Purpose: To determine the survival of E. coli within cattle and pig FYM heaps and quantify E. coli concentrations in leachate during FYM storage.

Methods: Pig and cattle FYM heaps (3 replicates, each c.4 tonnes) were constructed at North Wyke Research (Devon, England) and ADAS Gleadthorpe (Nottinghamshire, England) in hydrologically isolated individual concrete bunkers, with sumps capable of collecting the leachate from each heap. There were two pig FYM and two cattle FYM storage studies at each site, and heaps were stored for up to 6 months. Heap temperature was measured continuously using temperature probes connected to a data logger. Samples of leachate and FYM were taken during storage and analysed for E. coli.

Results and Discussion: In all storage studies, leachate was generated soon after heap construction and usually within 48 hours. Temperatures within the heaps peaked within the first week after construction, at greater than 50ºC, with temperatures of over 70ºC measured. The composting process in the FYM heaps decreased E. coli concentrations within both the FYM heaps and leachates. E. coli concentrations in the FYM decreased from between 6.6 and 8.3 $\log_{10}$ colony forming units - CFU/100ml to between 3.2 and 5.5 $\log_{10}$ CFU/100ml within the first month of storage. E. coli concentrations in the leachates decreased from between 6.1 and 8.2 $\log_{10}$ CFU/100ml to between 2.6 and 4.9 $\log_{10}$ CFU/100ml within the first month of storage.

0020 - The effectiveness and energy demand for thermal sanitization of piggery slurry using heat exchangers

Charles Cunault, Colin H Burton, Anne-Marie Pourcher

Cemagref, GERE, Rennes, France

Pig rearing, is responsible for the production of 300 million tonnes of slurry annually with intensive production in certain regions leading to nutrient excess. Many of the environmental problems that affect these zones have been long recognised but concern now lies equally with sanitary aspects. These relate especially to the land spreading of manure and the possible link between the faecal contamination of soil and groundwater and the prevalence of disease and illness. Pathogens are today increasingly the main barrier to recycling manures. Furthermore, within the context of a growing demand of water quality for domestic and industrial use, it is becoming necessary (a) to find reliable methods for sanitisation that are economically acceptable, (b) to establish effective and enforceable regulations and (c) to establish procedures to manage the implied hygienic risks. Within these terms, the work presented here is set out to establish the effectiveness of continuous thermal sanitation based on the use of heat exchangers.

As a means to assess the efficiency of sanitation of trials carried out, plate counts are done before and after treatment for total bacteria, total spore forming bacteria, enterococcus and coliforms (all found in the slurry), plus the inoculation by the viral phage MS2. Initially, it seems that most of the vegetative bacteria and virus can survive no more than a few minutes at 65ºC. However, temperatures over 95ºC are needed to target the reduction of spores. If the objective required is only a 4 log10 reduction of the classic indicators (coliforms and enterococcus), a treatment of less that that specified in regulations (70ºC for 1 hour) should be sufficient.

The efficiency of heat recovery and the consumption of energy is followed with the objective of minimising energy costs whilst meeting the set sanitization target. It is recognized that the application of heat to the treated material within the exchanger will consequently lead to surface fouling that will reduce this efficiency. A study of deposits is being done by temperature monitoring with the physio-chemical nature of the deposited layer being determined by means of its composition (protein, mineral and biomass) and form (electron microscopy). As a result o this, treatment strategies are identified and the related financial cost of the options estimated based on the assumption of a system linked to a biogas unit using livestock slurry. Overall costs of below one €/m3 of treated slurry are expected suggesting acceptable economics.

0034 - **Investigation of copper and zinc speciation in pig slurry by a multitechnique approach**

Samuel Legros[1], Emmanuel Doelsch[1,2], Perrine Chaurand[2], Jerome Rose[2], Armand Masion[2], Daniel Borschneck[2], Olivier Proux[3], Jean-Louis Hazemann[4], Valérie Briois[5], Jean-Henry Ferrasse[6], Hervé Saint Macary[1], Jean-Yves Bottero[2]

[1]CIRAD, UPR Recyclage et risque, Montpellier, France, [2]CEREGE, CNRS, Université Aix Marseille, IRD, CdF, Europôle Méditerranéen de l'Arbois, Aix-en-Provence, France, [3]CNRS, OSUG, St Martin d'Hères, France, [4]CNRS, Institut Néel, Grenoble, France, [5]Synchrotron SOLEIL, Gif-sur-Yvette, France, [6]MSNM-GP UMR 6181 CNRS Université Paul Cézanne, Aix-en-Provence, France

Copper (Cu) and Zinc (Zn) occurs in high quantity in pig slurry since they are used as essential micronutrients at high concentrations in animal feeds despite the low Cu and Zn assimilation by pigs. Cu and Zn accumulation was therefore measured in soil surface layers that had been amended with pig slurry, while also determining the phytotoxicity as well as the extent of groundwater quality degradation. Better prediction of the mobility and bioavailability of Cu and Zn from pig slurry spreading can be achieved by determining the speciation of this element in addition to its total concentration.

The aim of this study was to present a multitechnique approach to investigate Cu and Zn speciation in pig slurry. Size fractionation was first carried out to account for the complexity of pig slurry. Then X-ray diffraction (XRD), scanning electron microscopy, coupled with energy dispersive spectrometer (SEM-EDS), Micro X-ray fluorescence spectroscopy (μXRF) and extended X-ray absorption fine structure (EXAFS) or X-ray absorption near-edge structure spectroscopy (XANES) analyses were combined to assess Cu and Zn speciation.

The present study demonstrated that only 0.2% of total Cu or Zn present in pig slurry was bound to particles with a size less than 0.45 μm, while 75% of total Cu and Zn was bound to particles in the 0.45–20 μm size range. μXRF highlighted the colocalisation of Cu and sulfur (S). In addition, geochemical modelling demonstrated that physical chemical conditions within pig slurry lagoon are compatible with the precipitation of chalcocite (Cu2S). Finally, XANES shows that Cu speciation in raw pig slurry and size fractions is described by Cu2S and that its oxidation state is Cu(I). These Cu speciation in pig slurry may be the main reason for the observed Cu accumulation at the the soil surface. Zn speciation revealed three patterns 49% Zn bound to organic matter, 37% amorphous Zn hydroxide, and 14% sphalerite. The detected presence of sphalerite, or Zn sulphide, was unexpected and is reported for the first time. These three Zn forms seemed to be soluble in neutral or weakly acid soil systems, so the long-term impact of pig slurry spreading could lead to Zn leaching.

0146 - Influence of temperature and moisture on nitrous oxide and carbon dioxide emissions during initial decomposition of N-rich animal residues in soil

Tania Sinicco[1], Maria Luz Cayuela[2], Claudio Mondini[1]

[1]Research Group of Gorizia, CRA - RPS, Gorizia, Italy, [2]Department of Soil Quality, Wageningen University, Wageningen, Netherlands

The recycling of organic residues as soil amendments is particularly promoted in sustainable agricultural systems. However, effective application of organic wastes in agriculture should not only refer to the balanced supply of nutritive elements, but also to the minimization of negative environmental impact. Particularly important in this respect is the emission of N_2O, but for many animal by-products little is known about their effects on the greenhouse gas (GHG) balance of the soil.

The aim of this work was to investigate the effects of residue properties, soil moisture and incubation temperature on N_2O and CO_2 emissions during short term incubation of soil amended with animal by-products. A degraded agricultural soil (1.0% TOC, 0.1% N_{TOT}) was amended (0.5% w/w) with two N-rich animal residues (blood meal, 49.3% TOC, 15.6% N_{TOT}, 3.2 TOC/N_{TOT}, and horn and hoof meal, 51.3% TOC, 17.0% N_{TOT}, 3.0 TOC/N_{TOT}) and incubated in the laboratory for 30 days at 3 different soil water content (20, 30, 40% of water holding capacity, WHC) and temperature (10, 20, 30 °C). During incubation the CO_2 and N_2O evolution of the amended soils were measured every 4 hours by means of an automatic chromatographic system.

Despite their similar C and N content, the two animal residues led to remarkably different N_2O and CO_2 evolution patterns.

Nitrous oxide emissions were detected in amended soil incubated at 20 and 30 °C, but not at 10 °C. Cumulative N_2O emissions varied from 0.04 to 1.5% of the N added with the residues and was between four and ten-fold higher for horn and hoof meal than for blood meal. Increase in temperature and in soil water content always led to significant increases in N_2O emissions.

Cumulative CO_2 emissions were also clearly affected by the properties of the organic residue (horn and hoof meal > blood meal), soil moisture (40 > 30 > 20% WHC) and temperature of incubation (30 > 20 > 10 °C), but the influence was not as remarkable as for N_2O emissions.

This study clearly demonstrates that the properties of the residues and the environmental conditions can significantly modify the dynamics and total amount of GHG emissions. Moreover, our results suggest that laboratory experiments are an effective tool to obtain in a short time useful information for the optimization of field scale trials for reliable quantification and monitoring of the overall GHG balance of the soil.

SESSION 8
SANITARY AND ENVIRONMENTAL ASPECTS

0222 - Inactivation of avian flu and model virus in animal by-product composts

Josefine Elving[1,2], Eva Emmoth[2,3], Björn Vinnerås[1,4], Jakob Ryd Ottoson[1,2]

[1]Department of Chemistry, Environment and Feed Hygiene, National Veterinary Institute (SVA), Uppsala, Sweden, [2]Department of Biomedical Sciences and Veterinary Public Health, Swedish University of Agricultural Sciences, Uppsala, Sweden, [3]Department of Virology, Immunobiology and Parasitology, National Veterinary Institute (SVA), Uppsala, Sweden, [4]Department of Energy and Technology, Swedish University of Agricultural Sciences, Uppsala, Sweden

Animal by-products such as hatchery waste and manure can contain pathogens. In case of epizootic outbreaks, e.g. avian flu, a safe sanitation method adoptable to any size is required. During the thermophilic phase of aerobic composting temperatures high enough to inactivate most pathogens can be reached (Epstein 1997). Avian influenza virus (AIV) has been shown to be inactivated during composting (Guan et al. 2009). However, in order to establish guidelines for sanitation treatments in case of an epizootic outbreak further investigation is needed. A simple method for evaluating treatment efficiency is to monitor the, in manure naturally occurring, bacteriophages as model organisms.

The aim of the present study is to investigate the inactivation rate (as decimal reduction, D-value) of the highly pathogenic AIV strain H7N1 during composting. This strain has been shown to be relatively heat stable in comparison to other AIV strains (not published data). In addition, the inactivation of the indicator organism bacteriophage MS2 (ATCC 15597-B1) during composting will be determined regarding its suitability as model organism.

Initial studies of bacteriophage MS2 was performed in a compost mixture with a dry matter content of 55% consisting of non-hatched eggs, chicken manure and straw heated to 50°C. Results show bacteriophage MS2 to have a D-value of more than 40 h at 50°C. If compared to inactivation of AIV at similar temperatures, having D-values of <0.3-0.9h, bacteriophage MS2 seems to be significantly more heat stable (Guan et al. 2009). Further investigations will be carried out in laboratory-scale composting vessels (Dewar flasks 1.5 l) with a compost mixture inoculated with avian influenza strain H7N1 and bacteriophage MS2, correlating the temperature development with the inactivation of the two organisms.

Epstein, E. (1997) The Science of Composting. Laricaster, PA: Technomic Publishing Co.

Guan, J. et al. (2009) Survival of Avian Influenza and Newcastle Disease Viruses in Compost and at Ambient Temperatures Based on Virus Isolation and Real-Time Reverse Transcriptase PCR. Avian Diseases 53, 26-33.

0139 - Evolution of ammonia emissions in Switzerland between 1990 and 2007

Harald Menzi[1], Thomas Kupper[1], Cyrill Bonjour[2], Fritz Zaucker[3], Aurelia Nyfeler[2], Beat Achermann[4]

[1]Swiss College of Agriculture, Zollikofen, Switzerland, [2]Bonjour Engineering GmbH, Lostorf, Switzerland, [3]Oetiker+Partner AG, Olten, Switzerland, [4]Federal Office for the Environment, Berne, Switzerland

The ammonia emissions for Switzerland were calculated within the framework of the Convention on Long-range Transboundary Air Pollution for 1990, 1995, 2002 and 2007. The emission inventory is based on detailed representative stratified surveys on farm and manure management conducted for 2002 and 2007, respectively. The ammonia emissions were calculated for each farm of the sample (1950 and 3133 farms for 2002 and 2007, respectively) by means of the new emission model Agrammon (www.agrammon.ch). The resulting mean emission factors of 25 livestock categories for each of the 32 farm classes were extrapolated using the total number of livestock in Switzerland. The emission inventory was completed by the emissions from crop production, grassland, non-agricultural and natural sources. For 1990 and 1995, data from the literature and expert judgments were used as a basis for the inventory. In 2007, NH3 emissions of 48.0 kt N were calculated for agriculture contributing 94% of the total Swiss ammonia emissions (51.3 kt N). Of the agricultural emissions, livestock production and manure management accounted for 89%. The percentage emitted by the livestock categories was as follows: cattle: 70%, pigs: 13%, poultry and other livestock: 3% each. Emissions from crop production and grassland contributed 11% to the agricultural emissions. The emissions produced by spreading of slurry or solid manure and by housings were 47% and 34% of the total emissions from livestock, respectively. Storage of slurry or solid manure and pasture contributed 16% and 3%, respectively, to the emission from livestock. About 2.8 kt N corresponding to 5 % of the total anthropogenic emissions from Switzerland originated from non-agricultural sources (i.e. industry, traffic, private households, waste management). Between 1990 and 2007, the total anthropogenic ammonia emissions decreased by 14% and the agricultural emissions by 15%. The reduction for cattle was 12% and for pigs 22%. In 2007, the emissions from poultry, horses and other equids and for small ruminants exceeded the level of 1990 by 14%, 21% and 9%, respectively. The emissions from pastures and from housings increased by 77% and 44%, respectively, between 1990 and 2007. Ammonia volatilization from storage and spreading of slurry/solid manure declined by 16% and 33%, respectively. Emissions from point sources (i.e. housings, storage) accounted for 38% in 1990 and for 50% in 2007 of the total amount of ammonia released by livestock production. The agricultural ammonia emissions were in line with the number of livestock and farm and manure management.

0082 - Identification of livestock faecal contamination in surface waters: application of chemical and microbiological tools for Microbial Source Tracking

Anne-Marie Pourcher[1,2], Romain Marti[1,2], Michèle Gourmelon[3], Sophie Mieszkin[3], Marie Paule Caprais[3], Emilie Jardé[4], Morgane Derrien[4], Anne Jaffrezic[5]

[1]Cemagref, UR Gere, Rennes, France, [2]Université Européenne de Bretagne, Bretagne, France, [3]Ifremer, EMP, Laboratoire de Microbiologie, Plouzané, France, [4]UMR 6118 CNRS-Université Rennes 1, Rennes, France, [5]CNRS Géosciences Rennes, Rennes, France

Cattle and pig manure contain pathogenic micro-organisms which can be transferred to soil through land spreading and thence to surface water. Such faecal pollution may pose risks to human health. However, the bacteria currently monitored to assess faecal pollution (E. coli, faecal coliforms and enterococci) do not distinguish between faecal pollution of water from animal and human origin. The aim of this study was to develop chemical and microbiological tools and to compare their suitability to identify farm livestock sources of faecal contamination found in the environment.

Four types of markers have been tested: (i) sitostanol/coprostanol and cholestanol/cholesterol steroids ratios, (ii) tryptophan / fulvic-like fluorescence ratio, (iii) F-specific RNA bacteriophages (genotypes I and IV) and (iv) bacterial markers belonging to the Bacteroidales (Rum-2-Bac and Pig-2-Bac) and to the species Lactobacillus amylovorus.

We have searched for the presence of such markers in one river that was receiving effluent from a wastewater treatment plant, a second receiving effluent from a slaughterhouse and a third located in a cow pasture. We have also searched for such indicators in runoff waters collected after rainfall simulations on an agricultural plot previously landspread with either cattle or pig manure. The level of faecal contamination was estimated by the enumeration of E. coli. Sterol and stanol were characterized and quantified using a GC-MS method. Fluorescence properties of the samples were undertaken using fluorescence excitation-matrix spectroscopy. Bacteroidales and L. amylovorus were quantified using real-time PCR. F-specific RNA bacteriophages were enumerated following the ISO method. The distribution of the genotypes of F-specific RNA bacteriophages was examined by RT PCR.

The results showed that none of the markers of contamination from animal manure were detected in the river contaminated by the urban effluent. Sitostanol/coprostanol and cholestanol/cholesterol steroids ratios and tryptophan/ fulvic-like fluorescence differentiated pig and cattle faecal contamination. Bacteriophages of genotypes I and IV, Bacteroidales Pig-2-Bac and L. amylovorus have been quantified in waters contaminated by pig manure whereas Bacteroidales Rum-2-Bac were present in water contaminated by cattle manure. The suitability of the proposed markers is demonstrated by their transfer via runoff to surface waters and their detection in contaminated water by animal faeces.

0227- Fate of Steroid Hormones and Multiple Endocrine Activities in Agricultural Waste Treatment Facilities

Sarah Combalbert[1], Virginie Bellet[2], Patrick Balaguer[2], Nicolas Bernet[1], Guillermina Hernandez-Raquet[1]

[1]INRA, UR50 Laboratoire de Biotechnologie de l'Environnement, Narbonne, France, [2]INSERM U896 - UM1 - Signalisation Hormonale, Environnement et Cancer, Montpellier, France

Steroid hormones are endocrine disruptors excreted in urine and faeces. These compounds display high estrogenic activities at concentrations of ng/L and may cause negative effects on living organisms. After human excretions, animal wastes are recognised as a main source of steroids hormones to the environment. France, the fourth producer of pig's meat, is face to a release of 21 Mtons of swine liquid manure charged to steroid in high quantities. Through the agricultural manure spreading practices like source of nitrogen, hormones enter to the soil and, by leaching or run-off, they may contaminate ground and surface water. Recently, swine farms have installed biological treatment facilities to reduce the impact of nitrates from swine wastes. However, these treatment facilities have not been assessed for their capacity to eliminate steroid hormones. Hence, the aim of this study was to determine the fate of estrogens in two different types of swine waste treatment facilities using respectively aerobic and anaerobic processes. The studied compounds belong to estrogens, progestagens and androgens families, in both free and conjugated forms. Hormones concentrations were monitored by GC-MS during six months, in different farms applying different treatment processes. Simultaneously, the estrogenic activity (ER), androgenic (AR), progestative (PR), pregnane-X- (PXR), dioxine-like (AhR), and peroxisome proliferator (PPAR gamma) endocrine activities were determined by in-vitro bioassays using MELN, PALM, HELN- PR, -PXR, -PPAR gamma and HahLP cell lines. In effluents form anaerobic systems, the concentration of steroid hormones was in the range of 2 200 ng/L to 8 000 ng/L which explain most of the ER activity measured (about 1000 ngE2-Eq/L). AhR activity of about 8 µg dioxine-Eq/L was also detected; however the compound inducing this activity remains to be identified. No AR, PR, PXR nor PPAR activities were detected. Hence, ER and AhR activities measured in anaerobic treated manure may be released to agricultural soils. The aerobic treatment by activated sludge appeared to be an efficient method to reduce steroid concentration in manure, allowing 95 to 99% of hormones removal. After swine lagooning, a residual hormone concentration of 1 to 6 ng/L and an estrogenic activity of about 3 ng/L were measured. It would therefore be highly recommended to implement aerobic treatment for swine wastes to achieve an environmental sustainable solution for endocrine disrupters removal.

SESSION 9
INNOVATION

0026 - Using near infrared spectroscopy to predict acetic and propionic acids in biogas processes utilizing different feedstocks

Alastair Ward, Chitra Raju, Henrik Møller
Aarhus University DJF, Aarhus, Denmark

Near infrared reflectance spectroscopy has been shown to be a useful method of measuring key process parameters in anaerobic digesters. In particular, the use of an optical fibre reflectance probe allows the spectrometer to be located some distance from the process and thus is not affected by adverse conditions such as vibration or slurry spillage. The method is non-invasive and requires no sample preparation yet there has been increasing concern that a prediction model calibrated on a digester utilizing one type of feedstock will not be effective on a digester utilizing a different feedstock.

The following work has involved the collection of VFA data measured in the laboratory by gas chromatograph to construct partial least squares models for prediction of acetic and propionic acids in three different reactors. Experiment 1, a reactor digesting a pig manure and maize silage mix, experiment 2 a reactor digesting chicken manure and experiment 3 a reactor digesting cattle manure. The three sets of data were collected differently as the measurement method progressed towards a full on-line system during the experiment. Experiment 1 used 30 m^3 reactors and 1 litre samples measured at-line, experiment 2 used the reflectance probe fitted directly to a 130 litre reactor and experiment 3 used the probe fitted to the outlet pipe of a 30 m^3 reactor.

Calibrations for each feedstock were initially validated on the source data using leave-one-out cross validation techniques. This produced good quality models for experiments 1 and 2 with R^2 up to 0.971 and residual prediction deviation (RPD) up to 5.87, although the full on-line method used in experiment 3 was not successful. Each of the models were then used with spectra obtained from the other two feedstocks in two different ways; first by using the original cross validated models to predict the VFA and second by using the different feedstock data as a test set to validate the models. It was found that it was not possible to predict VFA directly in a feedstock which was different to that in which the model was created. However, using the combined data from the experiments to build generic models was considered a success with R^2 values of up to 0.941 and RPD up to 4.1.

0122 - Implications of benchmarking biogas plants to improve performance

Phil Hobbs[1], Sreenivas Rao Ravella[1], Alastair Ward[2], Alexander Schattauer[3], Andy Retter[1], Jon Williams[1], Michael Eder[4], Thomas Amon[4]

[1]North Wyke Research, Okehampton, Devon UK, United Kingdom, [2]University of Aarhus, Tjele, Denmark, [3]Leibniz-Institute for Agricultural Engineering, Potsdam, Germany, [4]BOKU, Wien, Austria

To assess and improve the production from European biogas plants a specific targeted research or innovation project (Project no. 513949) entitled 'European Biogas Initiative to improve the yield of agricultural biogas plants' involved collating data from 13 biogas plants across Europe. Data was collected by four means from the biogas plants; as periodic data, weak-point analysis from the plant operators; a questionnaire and a schematic of each plant. The information revealed that although the biogas plants were performing relatively well, with an average specific biogas yield of 0.44 m^3.methane.kg^{-1} VS and an average methane productivity of 1.25 $m^3.m^3,d^{-1}$ there was considerable capacity to improve the performance of each of the biogas plants by a range of different means.

Economic comparison of these biogas plants across Europe was difficult. However, about 90% of the revenue was realised from electricity sold. The average specific capital expenditure for the 13 biogas plants was about 4,400 € per installed electric capacity (kW) or at 5% discount rate and 15 years economic life, 5.3 €-Cent per kWh of electricity. The average costs of feedstock was 5.6 €-Cent per kWh electricity produced. Also the average cost was 67 €-Cent per Nm^3 of methane produced. The average total costs were 19.5 €-Cent per kWh electricity produced which was slightly above the price paid in most of the countries involved.

Development of improved means of both introducing and treating the feedstock was important for improved biogas yields. The type and mixture of feedstock also influenced the biogas yield and optimisation of the inputs would be of benefit.

There was up to 3 times the methane output per kg VS from different biogas plants. Some biogas plants had a variability of the specific methane yield as low as 7% others could be considered unstable with values over 100% of their mean values.

Feedstocks were considered responsible for this variability, however such a range suggests that process monitoring and control would provide more stable biogas production and improved biogas yields. Monitoring fermentation parameters was limited to pH and volume of the various vessels for all biogas plants. Sensors did include means of measuring VFAs (36% of the total) and conductivity (18%) and redox potential (9%) for the 13 biogas plants.

0164 - The ES-WAMAR project : a large scale demonstration of environmentally friendly management of swine manure in Aragon, Spain

Arturo DAUDEN[1], Marta Teresa Fernandez[1], Christian Siegler[1], Eva Herrero[1], Colin Burton[2,3], Fabrice Guiziou[2,3], José Martinez[2,3]

[1]SODEMASA, Area Nuevas Tecnologias, ZARAGOZA, Spain, [2]Cemagref, Environmental Management and Biological Treatment of Waste Research Unit, RENNES (35), France, [3]Université Européenne de Bretagne, RENNES (35), France

With the increasing body of EU and national legislation, the acceptable management of livestock effluent is becoming more demanding requiring basic knowledge in chemistry and the related environmental issues. For the individual farmer, it is no longer reasonable to expect the skills to make correct decisions and thus respond to the requirements dealing with (i) avoiding nitrogen losses to water courses and aquifers, (ii) avoiding soil pollution through the accumulation of nutrients (including phosphorus and heavy metals) and (iii) minimizing gaseous emissions either as ammonia (leading to acidification and eutrophication) or those contributing to global warming (methane and nitrous oxide emissions).

This European Commission LIFE project was launched in 2007 in Aragón, a region of Spain with a major and growing pig production. The project was established following an environmental assessment of the local situation which is represented by selected communes of three geographic zones : (a) sufficient local land for recycling of all manure produced, (b) insufficient local land but land available in neighbouring communes for spreading, (c) insufficient land both locally and in neighbouring areas. The main strategy was to focus on centralised (group) solutions involving farmers which are implemented through the creation of dedicated swine manure management enterprises (SMME).

The first scenario involved a centralised information system based on sending available manure to available crop land respecting crop needs. The second scenario is again an improved redistribution of manure but over a wider area. Often hilly areas are implied with pig farms on the upland and arable agriculture in the valleys, so it uses centralised storage and a dedicate slurry transfer and collection systems using pipelines where possible to reduce costs. Within the third scenario, the slurry production is not manageable within the surrounding farms so a centralised treatment system to reduce the nutrient load is necessary.

The aim of this paper is to describe the initial situation at these three study sites, to explain the reasons of proposing the specialised SMME and summarise progress of the project in terms of implementing the various planned actions. The analysis will crucially include the first results in terms of assessing the overall efficiency of the 3 approaches in terms of improved water, soil and air quality.

0174 - **Assessing regional potentials of waste and energy crop biomass of agrifood systems – Towards an adequate method**

Miia Kuisma[1], Eeva Lehtonen[2], Esa Aro-Heinilä[3], Jussi Tuomisto[4], Helena Kahiluoto[1]

[1]MTT Agrifood Research Finland, Plant Production Research, Mikkeli, Finland, [2]MTT Agrifood Research Finland, Services Unit, Jokioinen, Finland, [3]MTT Agrifood Research Finland, Economic Research, Helsinki, Finland, [4]MTT Agrifood Research Finland, Economic Research, Seinäjoki, Finland

Material flows of the agrifood system form a substantial part of the material flows of the modern societies, representing un-efficiently utilised resource at the present. Within the agrifood system, the major part of waste biomass and by-products are formed in agriculture. Their utilisation for energy is negligible, and recycling of nutrients is inadequate. Processing the agrifood biomasses allows not only the utilisation of the energy, but the enhancement of nutrient recycling for crop cultivation, to replace energy-intensive manufacturing of mineral fertilisers. Besides, the transportation and application possibilities are enhanced e.g. through possibility to differentiate nutrients. The available and achievable biomass potential depends on the supply and location of biomass in a region, present use and opportunity costs, usability of processing technologies, and the markets. In this study we review previous agrifood biomass potential assessments in the sense of regional achievable potentials. Typically location of both agrifood primary and waste biomass is scattered and transportation costs are significant determinants when technical and economical potentials are estimated. Assessments of energy potentials of global and regional biomass supplies, and also future scenarios, have been made and they have been recently analysed. However, assessments have not comprehensively covered agrifood waste potentials. In fact, often dedicated energy crops have been in the focus of these studies. Nutrient and carbon potentials of biomass have even more seldom been estimated. Assessments have mostly relied on statistical data, while primary surveys are scarcer. The scale of the assessed systems has often been an administrative region or geographical area, allowing no specific location for processing plants to be taken into account. Exceptions are GIS based assessments, but they have usually been addressed to arable energy crops and short rotation forests. For practical planning of biomass utilisation these assessments have seldom proved data accurate enough and still they are too time-consuming to be separately performed for each individual demand. We conclude that there is a need for adequate method for comprehensive regional assessments of agrifood primary and waste biomass potential. Due to the heterogeneity of the sources of this biomass, the method should include multiple approaches including GIS data and applications, and rely on sufficient data of energy and nutrient contents of the biomass. In this study we present a conceptual model for a stepwise assessment method for agrifood wastes and energy crops.

SESSION 10
INNOVATION

0055 - **Batch dry anaerobic co-digestion of sheep manure and potato waste**

Daniel Blanco[1,2], Álvaro Lobato[1], Camino Fernández[1], Adrián Escapa[1], Xiomar Gómez[1]

[1]University of León, León, Spain, [2]Bioenergia y Desarrollo Tecnológico, León, Spain

The management of farm waste is a problem of increasing concern due to its environmental impacts. The energy valorisation of manures is an interesting solution for the farmers, who can biologically treat the waste, obtaining a stabilized product valuable in agriculture, and revenue by producing electricity with CHP units and by feeding in it in the grid. On the other hand, potato peel is a by-product from the agribusiness that may be used as animal food. If it cannot be consumed (due to the difficulties for its conservation) the surplus becomes a waste that has to be managed. The anaerobic digestion has been traditionally performed in continuous and wet processes. With dry digestion, no additional water nor waste water take part in the process and, moreover, the digestate is a solid product more easily managed for fertilization and reclamation purposes. This work studies the feasibility of this kind of digestion using sheep manure and potato peel as co-substrates, laying down their drawbacks as single substrates and establishing the most convenient mixture.

The batch dry anaerobic digestion consists of a process in which most of the substrate remains in solid state and static conditions and the liquid fraction is periodically recirculated. Three tests at laboratory scale (3 l reactors) were carried out: digestion of sheep manure (M) and co-digestion of sheep manure and potato peel with a ratio 3:1 (MP1) and 1:1 (MP2) in dry basis. They lasted 94 days.

All the tests gave similar results in terms of methane yield (326 $l \cdot kgVS^{-1}$) although the potato peel was supposed to impoverish it according to previous biodegradability test. The trends in the ORL and the reactor methane yield were also similar in the three systems (92 $kgVS \cdot m^{-3} \cdot d^{-3}$ and 300 $lCH_4 \cdot m^3 \cdot d^{-1}$). The kinetics of methane production however differed: while test M and MP2 showed long lag times of 40 days, the intermediate case, MP1, had a shorter start up (20 days). The long lag times may be explained by a inhibited steady state caused by the interaction of VFAs, free ammonia and pH in the test M, and by a VFAs accumulation in the test MP2. These tests show the way for a process design in which the duration can be shortened, allowing to obtain a biological performance comparable to a conventional anaerobic digestion.

0200 - Production of value-added chars and activated carbons from animal manure

Isabel Lima, K. Thomas Klasson

USDA-ARS, New Orleans, LA, United States

Water quality and public health impacts of animal manure produced at large concentrated animal facilities prompted the need for viable solutions for their conversion and reuse. Our laboratory at the Southern Regional Research Center, SRRC, as part of the Agricultural Research Service, ARS of the U.S. Department of Agriculture, has shown that it is feasible to convert animal manure, particularly poultry litter into chars and granular activated carbons used for heavy metals remediation. Pyrolytic products or chars are low porosity, lower surface area materials that are intermediate products in the development of activated carbons. Toxic metals contamination of various water sources is a significant problem in many parts of the United States. Neither chars nor activated carbons, which can be produced from a number of precursor materials including coal, wood and agricultural plant wastes, have been examined for remediation of this problem. Chars are produced by pyrolyzing a pelletized sample of animal manure (sourced from poultry, dairy cow and swine) under inert atmosphere. Char yields ranged between 30 to 48% and were highest for dairy manure and lowest for swine manure-based chars with poultry chars in the middle. High porosity activated carbons were produced by steam activating chars resulting in surface areas as high as 550 m^2/g. Our laboratory has been characterizing these chars and activated carbons for their physical properties and most importantly their ability to adsorb metal ions. Adsorption for metal ions far exceeded that of the reference chars, made from coal, wood or coconut shells, with negligent to no adsorption observed, under the same conditions. In looking to different markets and uses for these manure based chars and carbons, our laboratory has been recently testing their use in remediating ammonia from poultry houses, removing organics such as trihalomethanes from drinking water, and removing mercury from air with promising results. The conversion of readily available and renewable animal manures into chars and activated carbons for environmental remediation might be an alternative to a serious disposal problem and at the same time create new markets for animal manures and new opportunities for animal farmers.

0140 - **Plant Fibre Reinforced Polymer Composites in Papua New Guinea**

Steve Korokan Ales, KED Sumanasiri

Papua New Guinea University of Technology, Lae, Papua New Guinea

In the localities of Papua New Guinea (PNG) there are various agricultural by-products such as wood chips (saw dust) from timber processing industries, coir from coconut husks from copra industries, and sugar cane fibres (bagasse) from sugar industries etc. Other agro plant fibres such as pineapple, sisal, banana, and corn have been considered as wastes in PNG. These large volumes of by-products and wastes have not been significantly used in any productive ways as from our observations. This phenomenon has led us to utilize these by-products and wastes to produce natural fibre reinforced polymer composites.

Research activities are currently being carried out particularly on how these by-products and wastes can be utilized to make useful value added products in the form of polymer composites to suit the needs in the local industries and domestic uses in PNG. Products such as hard boards, panel boards, particle boards, insulations can be produced with this technique. In this way environmental damage can be reduced to some extent by minimizing felling trees for timber and at the same time reducing the green house effect.

The main objectives of this research are creating employment and improve economy for the people living in the rural areas; introduce waste products as useful commercial items (commodities) and promote agriculture and growing plants as multi-purpose agro plants. Some areas of interest of applications are building and construction industries, packaging, laundry and household uses.

Production techniques such as extrusion, hand lay-up moulding and hot pressing are being used in this work and important mechanical properties such as tensile strength, stiffness, and flexural modulus are determined for natural (plant) fibre reinforced polyester composites.

SESSION 11
APPLICATION

0213 - **A Hierarchy for Land Application of Organic Wastes**

Mebrate Taffese Tanto, William L Magette
School of Architecture, Landscape, and Civil Engineering, University College Dublin, Dublin, Ireland

The Landfill Directive (99/31/EC) seeks to alter the way wastes are managed in the EU by inter alia forbidding the use of landfills as a repository for a variety of organic wastes. As long as these wastes are generated, other management options must be used to assure compliance with the EU's waste management hierarchy. An obvious management option for organic wastes is their application to land.

While the use of land for the application of organic wastes is conceptually valid, a number of constraints determine the extent to which this management option is actually viable. These constraints include technical, economic and legal requirements, as well as attitudes among many stakeholders within the agricultural / food supply and consumption chain.

To assess whether the land application of organic wastes is a viable option for the Republic of Ireland, this research made a holistic analysis of the constraints identified above. These analyses included assessing the quantities of agricultural, municipal and industrial organic wastes generated; the distribution and quantities of various land uses; and the existing legal framework for environmental protection. The research also included a socioeconomic survey of attitudes towards land application of wastes held by three key stakeholders: landowners (farmers), supermarket chains, and consumers. A decision-support system was created to aid the optimal distribution of wastes on land using water quality as the ultimate constraint.

An improved estimate of organic waste generation was completed and compared to official data for land use, to show that while Ireland has enough land to safely utilise projected quantities of organic wastes arising, agricultural land alone is insufficient for this purpose and should be reserved for application of agricultural wastes. Localised shortages of land were also predicted. While there was widespread acceptance and support by both farmers and consumers for the "recycling" of some organic wastes on land, there was also a reluctance indentified among consumers to accept the application of some organic wastes on food producing land. These attitudes were reflected in the attitudes of some supermarket chains. The attitudes of consumers comprise a constraint on the land application of organic wastes that is not often reported in policy reviews. However, the decision support system showed that such constraints can be integrated with technical and legal requirements to guide the rational allocation of organic wastes to land on a hierarchical basis.

0268 - **Nitrogen use efficiency in smallholder production systems: a case study from central Mexico**

Joel Velasco-Velasco, Rob Parkinson, Victor Kuri
University of Plymouth, Plymouth, United Kingdom

Smallholdings (<5 ha) represent 73% of the total area devoted to agricultural production in Mexico. Many are of low productivity, and little quantitative data has been published on the environmental performance at farm scale in terms of nitrogen use and management. Nitrogen (N) is the most important nutrient for increasing crop yields. While the benefits from the use of N in terms of productivity are self-evident, low efficiency of utilization can lead to environmental problems. The environmental performance (N losses and the change of soil N pool) of smallholdings could be improved by decreasing N losses. In this research, conducted in the Texcoco region in central Mexico, N flows in the core components (soil-cropping and livestock sub-systems) were quantified. Further, typical manure management practices were evaluated in order to provide information on the impact of management practices on N flows at farm scale. A reconnaissance survey of 15 small-scale farms was conducted and key N management practices were defined. Subsequently a predictive framework for N flows was developed following farm-scale methodologies as a tool to facilitate the quantification of N inputs, outputs and internal transfers.

The reconnaissance survey characterised the typical smallholder farm in the Texcoco region. Seven smallholders had farms ranging in size from 0.5 - 2.0 ha, seven from 2.5 – 8.0 ha and one had a 20 ha farm. Dairy cows are the most dominant livestock type. They are normally held in corrals, with variable stocking density ranging from 1 - 10 LU ha^{-1}. Pigs are the second most common type of livestock in terms of the number of LU ha^{-1}. Manure management practices included the application of both old and fresh manure to agricultural land. Some farmers employed composting and vermicomposting methods. The predominant cultivated crops in this region are corn maize followed by forage maize, forage oat, alfalfa and vegetables. Nitrogen losses at farm scale ranged from 70 - 528 kg N ha^{-1} a^{-1}, and N losses decreased as follows: stocking density > livestock type > manure management > crop sequence. A stocking rate of more than 3 LU ha^{-1} increased N loss at smallholder farm scale. Nitrogen accumulation showed a positive response with legume crops, while N depletion was observed during forage crop sequences. The change of soil N pool ranged from -38 to 124 kg N ha^{-1} a^{-1} in the 15 small-scale farms in the Texcoco region.

0298 - Phosphorus fertilization of maize seedlings using placement of direct injected animal slurry

Jens Petersen[1], Henning Høgh Jensen[2], Gitte H. Rubæk[1]

[1]Aarhus University, Faculty of Agricultural Sciences, Viborg, Denmark, [2]Aarhus University, National Environmental Research Institute, Rosklide, Denmark

Background: The third Action plan for the aquatic environment passed by the Danish parliament in 2004, stipulates a 50% reduction of the P-surplus in 2015 and further restrictions are expected introducing the Water Framework Directive. Maize is typically fertilized with animal manure in amounts, which fully covers the P requirements. On top of that, mineral P fertilizer is placed close to the seeds at sowing to overcome potential P deficiency in the early growth stages. Together with frequently cultivation of maize, this practice cause unintended accumulation of P in the soil.
Purpose: Examine the possibilities for replacing mineral P fertilization by placement of animal manures as P source for maize seedlings.
Methods: In spring 2008, 108 miniplots (1 m row of maize, 10 plants) were sown at Jyndevad experimental station (54° 54´N 9° 08´E) in a coarse sand soil with low P status. Compared with mineral P references, two types of animal slurry labelled with ^{15}N were placed 5 cm next to the seed row at the time of sowing. Three replicates of each treatment were harvest weekly at six dates from 7th May to 12th June. Dry matter yield were analysed for N, ^{15}N, P, K, S, Ca, Mg, B, Na, Mn, Fe, Cu, Zn, Cd and Al

Results: The concentrations of $^{15}N$and K in plants were increased 2-4 weeks after emergence synchronous to a decrease in the Ca and Mg concentration irrespective of slurry type. Placement of mineral P fertilizer affected the plant P concentration 2-4 weeks after emergence. In contrast, animal slurry P did not affect the plant P concentration, which was comparable with the mineral reference without P. Placement of a reduced rate of mineral P fertilizer within the seed row increased the plant P concentration 1-3 weeks after emergence, but also cause a 2-4 days delayed germination and a tendency to reduced plant density.

Discussion: The roots of maize were able to take up N and K from the applied animal slurry, but the P uptake seems unaffected. This illustrates that specific, yet undefined, barriers, may restrict P uptake in maize seedlings from the slurry applied at sowing. Our result therefore raise highly relevant research questions related to identification and eliminaton of the barriers, which limits P availability in animal manure applied at sowing. Processing of animal manures may provide opportunities to overcome these barriers.

0319 - Bioenergy residues and biochar as soil amendments: climate-relevant C and N dynamics during decomposition in soils.

MariLuz Cayuela[1] , Peter Kuikman[1], Oene Oenema[1] , Rob Bakker[1], Jan Willem van Groenigen[1,2]

[1]Alterra Wageningen UR, Wageningen, Netherlands, [2]Wageningen University, Wageningen, Netherlands

An expanding bioenergy sector in a biobased economy will affect land use and the environmental consequences of that are not clear yet. Probably the increased bioenergy production will lead to higher input of its by-products to the soil as either amendments or as fertilizers. How will these novel by-products of bioenergy production and biorefinery influence microbial transformation processes in soil, and thereby its greenhouse gas balance and organic matter stocks?

In this study we highlight the importance of considering the by-products of bioenergy production on net greenhouse gas balance calculations. Biofuel by-products vary enormously in chemical composition and, when used directly as soil-amendments, they lead to very different climate relevant dynamics. Whereas some may lead to elevated N_2 O emissions and contribute little to soil organic matter, others may increase soil organic matter stocks with little N_2 O emission.

We assessed the climate change impact and compared the greenhouse gas dynamics after application of different bioenergy by-products into an agricultural soil in a laboratory incubation. By-products were selected from different bioenergy sectors: anaerobic digestion (manure digestates), first generation biofuel residues (rapeseed meal, distilled dried grains with solubles), second generation biofuel residues (non-fermentables from hydrolysis of different lignocellulosic materials) and pyrolysis (biochars).

Redundancy analysis (RDA) revealed a strong and significant correlation between greenhouse gas emissions and residue characteristics. Total concentration of N in the residue seems to be the most critical factor, highly correlated with both CO_2 and N_2 O emissions. In an ordination diagram samples from different bioenergy chains clearly grouped and showed different behaviour with respect to N_2 O and CO_2 emissions. The biochars were the residues with the lowest C and N losses and highest C sequestration potential. Digestates exhibited lower than average emissions, followed by second-generation biofuels . First generation biofuel by-products produced the most adverse impact (high emissions, low C sequestration) and all of them showed higher than average emission values.

We conclude that - at least in the short term - the effects of biofuel residues on the combined greenhouse gas balance of the soil ranges from beneficial (biochar) via mixed (digestates, second generation biofuels) to manifestly adverse (first generation biofuels). These effects are relevant and need to be taken into account in life cycle analyses in the future in order to provide a truly integrated assessment of the environmental and climate impact of biofuels and bioenergy.

0258 - **Use of hydrophilic polymers from disposable diapers to restore metal-contaminated soils**

Amarilis de Varennes

Technical University of Lisbon, Lisbon, Portugal

Phytostabilization of severely metal-contaminated soils is a mandatory step in the restoration of these degraded ecosystems. Hydrophilic insoluble polymers, used in disposal in diapers and other hygienic products, are not recycled and represent a considerable proportion of the solid waste in landfills. These polymers contain carboxyl groups that are capable of forming bonds with metallic cations, thereby decreasing their bioavailability in soils. The use of polyacrylate polymers as soil amendments has been investigated in the Technical University of Lisbon in the past 15 years. Plant growth and mineral composition, extractable levels of soil metals, and soil enzymatic activities were used to monitor the improvement in soil quality following the application of this amendment. The polymer seems to create microcosms throughout contaminated soils, rich in water and nutrients, and with small concentrations of toxic elements, where roots and microorganisms proliferate.

SESSION 12
APPLICATION

0033 - Long term application of dairy slurry reduces Cd concentration in sunflower (*Helianthus anuus* L.)

Shabtai Bittman[1], Derek Hunt[1], Aiguo Liu[1], Grant Kowalenko[1], Cynthia Grant[2]

[1]Agriculture and Agri-Food Canada, Agassiz, BC, Canada, [2]Agriculture and Agri-Food Canada, Brandon, MB, Canada

Excess Cd intake may lead to long-term human health risks so farming practices that reduce Cd concentrations in foods may be desirable. Some food crops such as sunflower, flax and certain wheat varieties accumulate Cd in their edible parts so that crops grown on uncontaminated soils may contain concentrations exceeding allowable levels. Agronomic tools are needed to reduce accumulation of Cd in food crops.

In this greenhouse experiment, we compared Cd concentrations in sunflower (5 leaf-pair and mature seed) grown on a silt loam soil taken from a replicated field trial growing tall fescue. The historical field treatments were 13 years with either no nutrient application (control), applications of mineral fertilizers (including triple super phosphate) at recommended rates, or applications of dairy manure at approximately equal to or double the recommended N rates. The greenhouse trial treatments included additions of urea (60 and 120 kg N ha^{-1}) and Zn EDTA (5 kg Zn ha^{-1}). Seed from the historical mineral fertilizers had higher ($P<0.05$) Cd concentrations (1.2 mg kg^{-1}) than seed from the historical unfertilized controls (1.0 mg kg^{-1}). Long term application of the lower rate manure reduced Cd concentrations to 0.7 mg kg^{-1} while application at the higher rate reduced Cd concentrations to about 0.4-0.5 mg kg^{-1}. Zinc fertilization decreased seed Cd concentrations to about 0.5 mg kg^{-1} in the historically unfertilized crop and to 0.6 mg kg^{-1} on the chemically fertilized soils. Only when Zn was added to the historical manure treatments were Cd levels in the sunflower seed reduced to commercially acceptable levels of about 0.2 mg kg^{-1}. Similar effects of treatments on Cd concentration were noted in the tissue of sunflower plants at the 5 leaf-pair stage. Increasing N application rate did not affect Cd concentrations in the juvenile plants or the mature seed. This study shows that crops can accumulate excessive concentrations of Cd on apparently uncontaminated land that has received no nutrients for at least 13 years (and moderate rates of fertilizer and manure for many years before the trial). Long term manure application can effectively reduce Cd concentrations and manured fields may be most suitable for growing crops that are natural Cd accumulators. Perhaps dairy slurry can help reduce Cd uptake on naturally high Cd soils or after application of biosolids or Cd-contaminated P fertilizer.

0226 - Assessment of the nutrient content in farm manures and biosolids via Near Infrared Reflectance Spectroscopy (NIRS)

Ken Smith[1], Colin Barrow[2], Ali Gahkani[2], Lizzie Sagoo[1], Stephen Shelley[3]

[1]ADAS UK Ltd., Wolverhampton, United Kingdom, [2]Bruker Optics Ltd., Coventry, United Kingdom, [3]Eurofins Laboratories Ltd, Wolverhampton, United Kingdom

Current methods of laboratory analysis for organic materials are slow, relatively expensive and, for solid and semi-solid materials, can give inconsistent results. Consequently, they are rarely analysed. The resulting uncertainty means that farmers and growers are unaware of the nutrient content of organic materials and, therefore, generally fail to adequately allow for the nutrients supplied following the application of manures to land. Growers therefore tend to apply unnecessarily high rates of inorganic fertilisers, as "insurance" for optimal yields, in addition to the often substantial nutrient supply from the organic materials. However, interest in manures as nutrient sources reached unprecedented levels in 2008-09, as a result of substantially increased fertiliser prices. Whilst prices peaked in late 2008 and have fallen progressively since that time, interest appears to have remained high and farmers are more receptive to the use of practical aids for improved recycling of manures.

Near infrared reflectance spectroscopy (NIRS) has greatly improved precision and reliability in the analysis of forages and is now used routinely for the analysis of grain. More recently, NIRS has shown considerable potential for estimating the nutrient content of manures and slurries from multiple, rapid, scanning of fresh samples. The initial focus of this research was on the development of robust calibration models, for estimation of dry matter, total N, NH_4-N, SO_3, P_2O_5, K_2O, MgO and pH; covering a range of manure types, including cattle and pig slurries and farmyard manures, and a range of treated biosolids. This process requires very large numbers of manure samples in order to cover the range of likely analyses, sample and NIR spectral variability. In 2008-2009, a total of almost 2300 samples were collected, from throughout the UK and Ireland, with the active participation of industry partners. These manures were all scanned and, from the NIR spectral database, Principal Component Analysis (PCA) was used to select a proportion of samples for chemical analysis following a robust sample homogenisation procedure developed within earlier research. Some of these manure samples were also selected for N mineralisation and N recovery studies using ryegrass sown in pots. In addition to the conventional analysis capability, the research aims to develop a calibration model for the estimation of N release from the organic component of manure N.

It is hoped that the scanning capability and transportability offered by the new instrumentation will allow a rapid, reliable and reduced-cost analytical procedure for organic manures.

0109 - **Optimisation of the RothC model pools to simulate C dynamics after exogenous organic matters application in soils**

Clément Peltre[1], Bent Tolstrup Christensen[2], Sophie Dragon[3], Christian Icard[3], Thomas Kätterer[4], Sabine Houot[1]

[1]INRA, Environment and Arable Crops, Thiverval-Grignon, France, [2]Department of Agroecology and Environment, Faculty of Agricultural Sciences, Aarhus University, Tjele, Denmark, [3]SERAIL, Station d'Expérimentation et d'Information Rhône-Alpes Légumes, Brindas, France, [4]Department of Soil Sciences, SLU, Uppsala, Sweden

The use of exogenous organic matters (EOM) in croplands can contribute to increase soil organic matter content and improve soil fertility through the recycling of their organic fraction. To evaluate the long-term potential C sequestration in croplands after EOM applications, multi-compartment C dynamic models such as RothC (Jenkinson and Rayner, 1977) or CENTURY (Parton et al., 1987) are useful tools. These models need to be parameterized to account for the diversity of EOM types. In the RothC model, organic C from EOM is split into the labile pool (DPM, turnover time of 1.2 month), the resistant pool (RPM, turnover time of 3.3 years) and possibly the humified pool (HUM, turnover time of 50 years). Then at each time-step of the model, a fraction of each pool (RPM, DPM and HUM) is decomposed and either mineralized into CO_2 or transferred into the humified (HUM) and the microbial biomass pools (BIO). The objectives of the study were (i) to determine the distribution of EOM into the RothC entry pools (DPM_{EOM}, RPM_{EOM}, HUM_{EOM}) using mid to long terms field data, with the hypothesis that the decay rate constants of the pools are similar for all kind of EOM and (ii) to assess the possibility to estimate the pools previously determined using field data with widely available laboratory biochemical characterizations and indicators of EOM behaviour in soil. The data necessary to run the RothC model and to fit the DPM_{EOM}, RPM_{EOM} and HUM_{EOM} pools were collected from mid to long-term field experiments where various EOMs are regularly applied: the Qualiagro experiment near Paris, France (started in 1998, 4 EOMs, Houot et al., 2002), the SERAIL experimental station experiment near Lyon, France (started in 1995, 5 EOMs, Berry et al., 2008), the Ultuna field experiment, Sweden (started in 1956; 5 EOMs, Gerzabek et al., 1997) and two experiments in Askov, Denmark (started in 1894 and 1956, 1 and 4 EOMs, Christensen & Johnston, 1997). Preliminary results obtained with the data of the Qualiagro experiment showed high correlations between the entry pools of RothC determined with field data and an indicator of residual organic C in soil (IROC, Lashermes et al., 2009) or with the lignin fraction of EOMs The validation of these indicators with the other long term experiments will be presented.

0128 - **Effects of co-digestate on the soil properties and crop responses**

Seunggil Hong, JoungDu Shin, Soon-Ik Kwon, Seung-Yong Oh, Yeon-A Jang, Woo-Kyun Park
NAAS, RDA, Suwon, Korea, Republic of

Livestock manures have a potential to be a valuable resource with an efficient treatment. In Korea, 42 million tons of livestock manure were generated in 2008 and 84 % of them were used for compost and liquid fertilizer production. Recently recycling of livestock manure for biogas production through anaerobic digestion is increasing, but its utilization in agriculture is still uncertified. In this study, we applied co-digestate to the paddy rice cultivation based on N supplement. Co-digestate was fertilizer fermented with pig manure and food waste combined 70:30 in its volumetric basis. For the assessing the safety of co-digestate, we monitored the contents of co-digestate for seasonal variation, result in no potential harm to the soil and plant by heavy metals. The properties of soil after harvest showed that the content of nitrogen was over-consumed more than that of applied and exchangeable calcium and magnesium were accumulated in the soil. Compared to the soil applied with chemical fertilizer, soils applied with co-digestate were accumulated with copper and zinc which were added to feed for fattening. And the yield of paddy rice grown in the soil amended with co-digestate and chemical fertilizer was not different at the 95% significance level by DMRT. With these results, we concluded that co-digestate could be used as a alternative fertilizer for chemical fertilizer. More study in needed for the long-term effects of co-digestate application on the soil and water environment.

SESSION 13
GLOBAL STRATEGIES FOR SUSTAINABILITY

0047 - Potential role of slurry treatment for the underpinning of EU Nitrates Directive derogations

Jaap Schröder

Wageningen University and Research Centre, Wageningen, Netherlands

Intensive livestock farms are generally not self-sufficient in terms of their feed production. Consequently they import feeds including the nutrients (N, P) that these feeds inevitably contain. This often results in local N and P surpluses because home-grown crops require less than the N and P available in the manure. To reduce the environmental pressure, these types of farms should either extensify or export their excess manure. The permitted manure rates stipulated in the current Dutch Action Programme, 40 kg P and 250 kg N per ha for most dairy farms and 35 kg P and 170 kg manure-N per ha on other farms, have strongly reduced the room for manure application and increased the need to export manure from livestock farms. Hence, intensive livestock farms are confronted with costs to export manure and to purchase additional mineral fertilizer N to compensate for this export. This stimulates further measures to reduce the excretion of N and P per unit milk or meat and to increase the amount of available N per unit applied manure P. Slurry separation is one of the methods that can increase the amount of N per unit manure P. Separation results in a solid and a liquid fraction. The solid fraction, rich in P, is less bulky and can be exported at lower costs to arable farmers. The widened N (largely ammonia-N) to P ratio of the remaining liquid fraction matches better with the requirements of forage crops. Mineral fertilizer N could thus be partly or largely substituted with liquid fraction, depending on the quality of the separation process. Recent experiments have also shown that anaerobic digestion of slurry contributes little to long-term NFRV's and the consequential room for the use of manure. The overall impact of slurry treatment on permissible rates within environmental requirements will be illustrated with simulation studies. We conclude that the rate of 170 kg manure-N per ha as stipulated by the EU Nitrates Directive is unnecessarily stringent for many dairy farms. In case of untreated pig slurry, however, 170 kg manure-N per ha is linked to an amount of P that is larger than what is taken off in harvested crops. We conclude that there is a need to differentiate permitted rates to a much stronger extent unless one does not mind that regulations are too mild in one situation and unnecessarily strict in another situation.

0061 - Manure fertilization on dedicated energy crops: productivity and energy implications

Mario Di Candilo, Enrico Ceotto

CRA-CIN, Bologna, Italy

Background: Dedicated energy crops, if managed properly, can provide sustainable supply of renewable energy. In particular, manure application might improve their energy budget by displacing the use of the energy-demanding industrial fertilizers.

Purpose: To assess whether cattle manure can be suitably used for fertilization of bioenergy crops.

Methods: A field experiment was undertaken in 2008 in Anzola dell'Emilia (Bologna), Low Po Valley, Northern Italy on a loam-silty soil. The investigated plant species were: the herbaceous perennial giant reed (Arundo donax L.); the herbaceous annual fiber sorghum (Sorghum bicolor L.); the woody perennial hybrid poplar (Populus x canadensis hybrid), cultivated as short rotation coppice (SRC), with biennial harvest interval. Fertilization treatments were: two rates of liquid cattle manure, named as M1 and M2, corresponding to10 and 20 mm; one rate of industrial fertilizers, named as IF, corresponding to 120 kg of N + 120 kg P_2O_5 ha^{-1} $year^{-1}$; and one unfertilized control, named as CONTROL. The nutrient content of the applied cattle slurry was 3 kg N and 0.68 kg P_2O_5 per ton. The experimental design was a split-plot with three replications, with fertilization treatments in the sub-plots. Giant reed and sorghum were harvested on both years 2008 and 2009, while for SRC of poplar the cumulated productivity for the years 2008 and 2009 will be available during the winter.

Results: Our preliminary results indicate that: i) manure application on giant reed tended to increase biomass yields, stem to leaf ratio, plant height and diameter, compared to both industrial fertilizers and unfertilized control; ii) manure application on fiber sorghum tended to increase both biomass yield and stem diameter.

Discussion: Recently, Wien et al. (2008) estimated that a diluted slurry can be transported for manure could be transported 12.3 km before the energy cost per kg of available N is equivalent to the energy cost of urea N. This estimate takes also into account the full energy cost, including the energy needed to keep the slurry in agitation. However, these authors referred to highly diluted slurry with about 1.5 kg N ton^{-1} the hauling distance can be doubled for slurry containing 3 kg N ton^{-1}. Therefore, our findings suggest that the availability of manure at reasonable distances provide opportunities for improving the energy budget of dedicated energy crops. However, in order to avoid competition for land, the energy crops should be cultivated on land unsuited to forage and grain crops production.

0317 - Assessment of dairy wastewater management practices in the northwest region of Portugal

Ana Cristina Rodrigues, Joana Saldanha, João Mamede, Joaquim Alonso

Escola Superior Agrária - Instituto Politécnico de Viana do Castelo, 4990 - 706 Ponte de Lima, Portugal

Background: In recent decades, a very intensive dairy farming system has been developed in the northwest region of Portugal. Intensive dairy production is responsible for the generation of important quantities of manure. It is recognised that one of the most appropriate manure management options is its application to the soil leading to the recovery and recycling of nutrients and energy. Nevertheless, the application to soil of organic residues can have important effects on the environment. The high fraction of available carbon, often found in manures, can greatly stimulate soil microbial activity, which may result in carbon losses and nitrate (NO_3 ^-) leaching, as well as in gaseous emissions.

Manure surplus in dairy farms can be reduced by separation of the solid fraction from slurry, which can be composted and exported to other farms with a high demand for organic amendments. Nevertheless, the dairy slurry liquid fraction needs to be treated before discharge into receiving bodies in order to reduce the still high organic matter and nitrogen levels. Therefore, it is important to develop and implement integrated measures with the purpose of protecting the soil quality and fertility, as well as to prevent water pollution.

Purpose: The goal of the present study was to contribute for the development and implementation of an integrated strategy for dairy wastewaters management.

Methods: The present study comprised the analysis of 1860 dairy farms located in the northwest region of Portugal, previously characterized regarding the production and the environmental systems (Alonso et al., 2008). Emphasis was put on the collection systems, the storage capacity, the treatment and valorization processes, including manure application to soil.

Results and discussion: The results obtained from the analysis of 1860 dairy farms located in the northwest region of Portugal revealed different wastewater management options and, consequently, different environmental pressures, according to the features of the dairy farm and its territorial integration. The results also showed that the the wastewater storage capacity of the dairy farms ranged between 1 and 17980 m^3 . However, 7% of the dairy farms did not have any wastewater storage capacity. In 61% of the dairy farms, the wastewater storage systems were located inside the stable. Only 3,5% of the dairy farms were able to perform the separation of the solid fraction from slurry and 0,4% had ponds for wastewater treatment.

0071 - Biophysical modelling approach for beef cattle manure management and nutrients flow evaluation in Malaysian cattle feedlot

Tuan Poy Tee, Anna Renly

Department of Animal Science, Faculty of Agriculture, Universiti Putra Malaysia, UPM Serdang, Selangor, Malaysia

Biophysical Model that estimates nutrients (e.g. nitrogen (N)) flow has been widely used for livestock manure management. It tracks the fate and pathway of nutrients through animal ration in feeding operation and identifies the nutrient N transformations process in the animal production system until field application. This type of model approach may be attempted for a single component or source of N losses (e.g. animal house, lagoon, compost, ammonia emission, leaching) (Muck et al., 1984; Burton and Beauchamp, 1986; Groot Koerkamp et al., 1998); or for entire animal production systems (N flows in farm-gate balances) integrated with cropping systems at farm level (Beauchamp, 1983; Oudendag and Luesink, 1998; Chambers et al., 1999; Hutching et al., 2001; Menzi et al., 2002). Though many of these nutrient balance models have been developed, most of them are for temperate regimes in accordance with their animal farming system and conditions. However, it is clear that the different housing systems, manure handling methods (storage), the biophysical processes of nutrients loss (e.g. temperature and pH effects) affect the magnitude of nutrients loss. Therefore, the models studies from temperate countries may not be entirely adequate for Malaysian humid tropic conditions. Currently, no model exists that describes the whole nutrients cycle chain linking the fate pathway flows from animal production phase (e.g. cattle feedlot) to waste handling phase (e.g. composting). As well as no study on the insight of nutrient N flow processes and designs such models for livestock manure management system prevalent in Malaysian conditions. In view of that, biophysical models, namely the Beef Cattle Production and Manure Excretion (BCPME) Model will be developed. These models focus on nutrients cycling at the whole farm-gate from source (e.g. cattle feedlot production) to waste handling phase (composting phase) for investigating nutrients flow associated losses and efficiency, and thus for assessing the impact of animal manure on the surrounding environment. BCPME model estimated that about 36% N loss in housing and production stage and 28% in composting stage. Whereas P and K loss about 19 % and 5 %, respectively, in housing and production stage but no loss found in composting stage.

The project research was supported by Fundamental Research Grant Scheme (Code: 05-10-07-372FR)

0112 - Compost is a product in Austria - 8 years experience by the Austrian Compost Quality Association

Horst Mueller[1]

[1]Kompostgueteverband Österreich, Weibern, Upper Austria, Austria, [2]Mueller Abfallprojekte GmbH, Weibern, Upper Austria, Austria

Background: In the year 2001, after 5 years of intensive discussions and negotiations of governmental, non governmental and private institutions the Austrian compost - ordinance was established. Compost, produced from defined input materials, which fulfils the quality requirements of the compost - ordinance is a product which can be sold on the market under the condition, that the quality-class, content of main-/trace-elements and user recommendations are visible for the consumers.

Purpose: The compost-ordinance was the first and not the final step to the end of waste solution in Austria. Since 2001 a lot of Austrian standards and technical reports have been revised. An important example for the need of ongoing adaption of the regulation is the implementation of the animal by-product regulation and its requirements by the definition of "good practice of composting" by a directive from the Federal Ministry of Agriculture, Forestry, Environment and Water Management.

Results: A common European solution with intensive efforts for proper conditions to use compost on soils in all member states have to be the target.

Discussion: Nevertheless compost is a product the conditions for the use of compost have to be proper. One negative example to hinder the use of compost is the Austrian fertilizer-ordinance. There the fertilizers and components, which can be brought to the market under this regulation, are defined. The regulation is from 1994 and allows as mixing component for pot plant substrates and soil improvers only compost from green areas. Hitherto it's impossible to use quality-compost when one of the input materials is source separate collected bio waste. A solution for this problem was found by establishing standards for "earths" instead of "substrates" for pot plants, etc. and to define the use of these earths in the federal waste management plan as utilization.

One existing problem is the ban of compost for fertilizing sugar beat in Austria and another fact to question are the stringent limits for heavy metals for organic farming in Europe. It´s not understandable to define compost as valuable resource for organic, main-nutrients, trace-elements, etc. and to set quality requirements which cannot be fulfilled in many cases even by using clean input materials. An opposite example is the use of phosphorous-fertilzer for organic farming. The limit for Cadmium in these fertilizers is 90 mg/kg P2O5 and much higher than the allowed content in class A compost.

0320 – Increase and Regulation of Biogas Production

Kurt Hjort-Gregersen, M.sc.

Institute of Food and Ressource Economics, University of Copenhagen

The back-ground of the project is the present Danish situation, in which the recent government plan, "Green Growth" stipulates 50% manure production should by 2020 be utilised for energy production, mainly biogas. And in which business as usual is no longer an option, as waste resources for such enlargement with plants are not available. Recent research indicated that less dependence on organic waste supplies can be achieved by supplies of fibre fraction from pre-separated manure. There is no doubt about the question that this technology has to be integrated in the centralised biogas plant concept before a significant enlargement with plants can take place. In addition considerable seasonal variation in heat demand in Denmark offer a considerable economic potential for biogas plants if production can be regulated according to these varations. Therefore it is the objective of the project to demonstrate in practice on existing traditional centralised biogas plants how biogas production can be increased and regulated by supplying solid fractions from manure and storable plant material according to variations in energy demands throughout daily hours (experimental) and the year as a whole (full scale demonstration), and its economic potential.

The use for pre-separeated manure fibres and storable plant material is demonstrated at 4 existing traditional centralised biogas plants. The full scale demonstration efforts are backed by lab and pilot scale trials at Aarhus University´s R&D plant in Foulum in order to clarify the limits for regulation of production and gaining experience about organic load, retention times e.g. which is important information for the full scale demonstration.

Gained experience from the demonstration activities is analysed and economically perspectivated by Institute of Food and Resource Economics, University of Copenhagen. An update on economic potential of centralised biogas plants including this new technology is elaborated and disseminated, in order to complete the effect of the demonstration activities.

The technology which is demonstrated in this project is crucial to the scheduled enlargement with new plants. A comprehensive demonstration and efficient dissemination of gained experience will contribute to an acceleration of the ambitious enlargement of plants stipulated in "Green Growth"

The paper will present preliminary assessments of the economic potential, focusing mainly on the use of fibre fractions from pre separated liquid animal manure.

SESSION 14
NON EUROPEAN COUNTRIES

0211 - **Slurry management in dairy grazing farms in south american countries**

Francisco Salazar[1], Alejandra Herrero[2], Veronica Charlon[3], Alejandro La Manna[4]

[1]National Institute for Agricultural Research, Remehue Research Centre, Osorno, Los Lagos, Chile, [2]Facultad de Ciencias Veterinarias, Universidad de Buenos Aires, Ciudad de Buenos Aires, Provincia Buenos Aires, Argentina, [3]Instituto Nacional de Tecnología Agropecuaria. INTA, Estacion Experimental Rafaela, Rafaela, Santa Fe, Argentina, [4]Instituto Nacional de Investigación Agropecuaria, INIA La Estanzuela, Colonia, Uruguay

Milk production is important in South American countries where it is based mainly on pasture systems. Dairy slurry management has become an important issue in these production systems because of the large volumes produced and the environmental effects. The aims of this work were to analyse the management of slurry on dairy fams in countries of South America (Argentina, Chile and Uruguay) and to identify potential options to reduce the risk of pollution and issues where research and advice is required. The analysis of dairy slurry was based on literature published literature in each country together with expert judgement of researchers working in this area. Most of the dairy production is based on grazing, where the slurry analysis showed very low dry matter contents (1.1% to 2.7%) which could be explained by short or no housing periods, and an important contribution of water from cleaning , mainly on yards (21.6 to 32.9 l cow^{-1} day^{-1}), and rainfall entering the slurry stores. Dairy slurry generally applied to soil untreated, with only few farms using a physical treatment for separation, and some farm in Uruguay are producing methane by slurry biodigestion. Dairy slurry is applied mainly to grassland and crops (e.g. corn and sorghum) all year around, with no legislation to control rate or time of application in these countries. Most dairy slurry is applied by surface broadcasting systems, either high-pressure irrigation system (e.g. irrigation gun), tank spreader or a combination of both. These methods have the disadvantage of causing air pollution by gas or odours. Dairy slurry is stored in earth-banked lagoons or lagoons lined with concrete, high density polystyrene or PVC. The information collected has helped to identify problems in slurry management in South American dairy farms and areas where research and technology transfer will be necessary to avoid pollution and to improve the use of manure nutrients. There are many aspects that should be improved on dairy farms, such as reducing slurry production, storage, rate and time of application and the use of more efficient equipment in order to reduce pollution and to increase the recycling of nutrients in these production systems.

0247 - **Zero waste process for palm oil mills by composting and biological drying**

Frank Schuchardt[1], Heinz Stichnothe[1], Klaus Wulfert[2]

[1]Johann Heinrich von Thuenen-Institute; Institute of Agricultural Technology and Biosystems Engineering, Braunschweig, Germany, [2]UTEC Consultant, Bremen, Germany

The by-products in a palm oil mill are waste water (POME, Palm Oil Mill Effluent), waste (EFB, Empty Fruit Bunches), mesocarp fibre and palm kernel shells. Whereas mesocarp fibre and kernel shells are used as energy source in the oil mill itself, POME and EFB are waste for most of oil mills. POME (COD_{tot} 50,000 mg L^{-1}) is stored in ponds and EFB are disposed in dumps or used as mulch in plantation. The ponds and dumps emit a huge amount of biogas with methane as a strong green house gas. The methane emission from a POME pond of an average size oil mill is about 1.5 million m³ in one year. One of the keys for a sustainable palm oil production is the treatment and utilisation of POME and EFB.

A patented process (Indonesian patent P-00200400378; ID 0019277) was developed to avoid methane emissions and to utilize the nutrients from POME and EFB. It is an open windrow composting process of chopped EFB with simultaneous drying ("biological drying") of the total POME (2 to 4 m³ waste water per ton of EFB). All nutrients from POME and EFB are united in the final product, compost or mulch. The POME can be used as fresh waste water or after anaerobic fermentation in a biogas reactor (with fixed bed).

The process is profitable with a pay back time of less than 2 years; it is also accepted and realized for CDM. In about 40 palm oil mills in Indonesia and Malaysia the process is realized in practice (or in planning or under construction). A green house gas balance shows the positive CO_2eq effect of the process.

0251 - **Recycling of organic residues from agricultural and municipal origin in China**

Marco Roelcke[1], Rolf Nieder[1], Heiner Goldbach[2], Joachim Clemens[2], Peter Heck[3], Katrin Müller-Hansen[3], Hongyan Lu[3], Xuejun Liu[4], Tiening Cui[5], Fusuo Zhang[4]

[1]Technische Universität Braunschweig, Braunschweig, Germany, [2]University of Bonn, Bonn, Germany, [3]University of Applied Sciences Trier, Environmental Campus Birkenfeld, Germany, [4]China Agricultural University, Beijing, China, [5]Beijing University of Technology, Beijing, China

Background: This Sino-German collaborative research and technology transfer project takes advantage of different interdisciplinary research groups and the involvement of German small and medium-sized enterprises to develop integrated strategies and solutions for the recycling of organic residues in China.

Purpose: The project aims at reducing pollution, abating greenhouse gas emissions, improving nutrient cycling, generating renewable energy and increasing regional added value in the Chinese countryside.

Methods: In one comprehensive and integrated approach planning, technical improvement of animal production techniques, feed optimization, manure storage and treatment for minimizing emissions, as well as hygienization, designation of organic fertilizers for specific usage, carrying capacity of cropland, economic factors, administrative issues and environmental regulations are taken into account and realized in a case study.

In a second parallel approach five research sites in four different Chinese provinces and municipalities have been selected to develop economically viable and ecologically sound recycling projects through regional material flow management, stakeholders' involvement, innovative financial schemes and technology transfer.

Expected results: Starting from the technical situation of selected model farms and pilot plants, an improvement of the regional situation, as well as intensive animal husbandry in peri-urban areas of large Chinese cities is envisaged. First-hand accounts from China will be delivered and first research results will be shown. Experiences from the first year have shown that all solutions have to be site-specific, and that there are no standard concepts for aerobic or anaerobic treatment of organic wastes.

The project is co-sponsored by German Federal Ministry of Education and Research (BMBF FKZ: 0330847A-H) and Chinese Ministry of Science and Technology (MOST: 2009DFA32710). Project duration is from Sept. 1, 2008 to Aug. 31, 2011 as first phase.

Website : www.organicresidues.de

0279 - Medium size agricultural biogas plants management at ambient temperature: Process control and fluxes

Jianbin Guo[1], Xiaoping Li[1], Pan Xu[1], Renjie Dong[2], Joachim Clemens[3]

[1]College of Water Conservancy and Civil Engineering, China Agricultural University, Beijing, China, [2]College of Engineering, China Agricultural University, Beijing, China, [3]Institute of Crop Science and Resource Conservation, University of Bonn, Bonn, Germany

Biogas production is seen as a tool within the Clean Develop Mechanism (CDM) to reduce the emission of greenhouse gases, for example in China. Many biogas plants run at the lower range of mesophilic conditions because of lacking insulation. In these plants, the minimum temperature is around 20°C-25°C during winter. In summer, the temperature in the plant depends on ambient temperature. The performance of a representative agricultural biogas plant operated at ambient temperature was evaluated by mass balance and routine chemical analysis. The fluxes into and out of the biogas plant (organic dry matter (ODM) in, ODM out, biogas out, CH_4 and CO_2 concentration) were analyzed for seven weeks, starting in early spring. Substrates fed were manure from fattening, sows, piglets and pig slurry. The estimated performance showed that the biogas plant ran on a very low organic loading rate of 0.2-0.5 kg ODM $m^{-3}d^{-1}$ with a hydraulic retention time (HRT) of 35 days. The temperature increased from 23.4 to 26.5°C during the measuring period. Depending on the base for the mass balance -either input data or output data- the biogas and methane yields were 550-610 L kg^{-1} ODM and 340-370 L CH_4 kg^{-1} ODM, respectively. Around 66%-73% of the ODM fed were converted to biogas. The estimated methane production of onsite plant was higher as compared to the calculated biogas production derived from ODM input/output data from the plant and biogas production from batch tests of the single substrates at 37°C (16% less) and 20°C (26% less). Reasons may be (i) the difficulties of a precise determination of mass fluxes on the farm, (ii) sediment in the biogas plant that contributed to the biogas production on the farm and (iii) the stimulation of biogas production by a mixed substrate. Especially for CDM activities the mass balance on a biogas plant is still a challenge, because on the mass balance the financial benefits of the biogas plant are calculated.

0271 - **Bioenergy in family farming: a new sustainable perspective for the rural sector**

Kleber Vanolli[1], Cicero Bley Jr[1], Glaucio Roloff[2]

[1]ITAIPU Binacional, Foz do Iguasu/Parana, Brazil, [2]UNILA, Foz do Iguasu/Parana, Brazil

In the region that drains into the ITAIPU reservoir in Western Parana State, Brazil, about 80% of the farms are 30 ha or less in size. Most farms produce soybeans and corn which are then used as feed to pigs, dairy cattle and poultry in an integrated production cycle. As a consequence, the animal operations concentrate residual biomass, which has become a major environmental liability at the regional level. However, if its potential energy is used, it can become a new revenue source, increasing sustainability of the system and mitigating the cost of the associated environmental services. Anaerobic biodigestion of the residual biomass is considered a viable alternative to reverse this by producing biogas and an effluent with lower pollution potential usable as a biofertilizer, with the methane capture making this activity eligible as a Clean Development Mechanism (CDM). All these can augment farmer income, even though current technology restricts access to larger farms only. To overcome this important limitation for the region, small neighboring farms can be brought together to form a consortium or cooperative of biogas producers in which individual biodigestors feed into a gas pipeline that leads to a common small thermoelectrical power plant. This paper discusses the economical feasibility of such an arrangement of 41 small farms holding about 3500 pigs and 1200 dairy cows, located in the Ajuricaba Watershed, municipality of Marechal Cândido Rondon, Western Parana State, Brasil. Expected revenues include electricity sold to the grid at non-subsidized rates, biofertilizer net avoided costs and net CDM credits. These revenues coupled to investment and operational costs were used in investment analysis methods to estimate cash flow over time and thus determine investment cost recovery times. Incremental value analysis was used to assess project acceptance and return rates were calculated to determine investment returns. The three revenue sources have similar relative importance on the expected income, roughly one third each, and hence are all essential revenue components. Only when accounting for these three sources the straight investment payback of 5.9 years is obtained whereas the discounted payback is 9.7 years, judged to be reasonable. The investment return rate of 13.8%, with a net rate of 1.8%, can be considered attractive. Hence such a consortium arrangement for the production and use of biogas is considered as economically feasible.

0032 - Evaluation of tunisian Composts properties. Exogenous organic matter used As soil Amendment

Manel Kammoune[1], Khaled Medhioub[2]

[1]Faculté des Sciences de Sfax, BP 1171, Sfax. Département de géologie., Sfax, BP 1171, Sfax 3000, Tunisia, [2]IPEIS, UR: Etudes et Gestions des Environnements côtiers et Urbains, Sfax, BP 1172, Sfax 3000, Tunisie, Tunisia

In the southern region of Tunisia, soils are characterizes by sandy to sandy-loamy texture and a low organic matter contents (0.5-1%). The agricultural areas are mainly amended with manure and mostly by chemical fertilizer. This practice ameliorates only harvesting and cause degradation and decline in soil properties and proves soil erosion. The using of organic amendments and fertilizer as composts is practice for restoring nutrients, C and Soil organic matter contents (SOM).

The aims of this study were to investigate physic-chemical properties of six different organic amendments and to evaluate their effects comparing to farm manure on sandy-loamy soil properties and productivity during short-term application. Indeed, soil treatments were obtained from agricultural wastes composts (Almond Shell: AS, Sesame Bark: SB, Olive Cake: OC, Olive Mill Wastewater Sludge: OMWS and poultry manure: PM) and mixtures of compost-manure (70:30% weight bases). Results of characterization of amendments should that pH values using the standard EN Pr 13037:1999 were alkaline (8.2-8.8), the nitrogen contents using the Kjeldhal method were greatest in olive wastes and PM based composts, Carbon/Nitrogen ratio (C/N) and the Organic Matter (OM) contents determining using the loss-on-ignition at 450°C over six hours, range of 14.1 to 29.7 and 19.3 to 64.5 % respectively. Exogenous organic matters as well as manure were applied to a sandy-loamy reconstituted soil at the ratio of 14 kg/m^2 in metallic basins for controlling experimental conducted under 34°10'N, 10°46'E conditions. Ten tomato plants were placed on each substrate. During plants growing irrigation was assessed by drip system without application of chemical fertilizer.

Characterization of soil samples pH, EC, SOM, during the cultivation period samples were determined in a 1:1(w/v) water soil extracts and were calculated by loss on ignition at 550°C until constant weight respectively.

The physical properties mainly texture and unsaturated hydraulic conductivity of treated soils were measured using the Levesque and Dinel (1977) and ASTM 2434 methods respectively.

Results showed variations in physic-chemical and physical properties during the cultivation phases. Differences are mainly related to the nature of used exogenous organic treatment.

For evaluation the fertilizing power of amendments, soils productivity was determined by comparing quantitative and qualitative tomatoes fruits obtained from each amended plot with manure treated soils.

15. **SUGGESTIONS AND COMMENTS**

In case you wish to make any comment to the organizers, you can tear out the page and deliver it to the secretariat of the conference.

Dear participant,

The organizing commission of the 14th International Ramiran Conference is aware that there may be some failures during this event. We put at your disposal this form to fill in with any complaint, so that it can be solved as soon as possible.

We also appreciate your comments and suggestions about this conference organization.

Name: _____

Afilliation: _____

Country: _____

Telephone: _____

Email: _____

Comment / suggestion / complaint:

_____

_____

_____

_____

_____

_____

Mark:

☐ missing documentation ☐ missing certificate of attendance ☐ other _____

☐ missing invoice / receipt ☐ mistake in paper edition ☐ suggestion

Sponsors:
The 14th International Ramiran Conference was organized by the
Instituto Superior de Agronomia of the Universidade Técnica de Lisboa, and supported by:

Caixa Geral de Depositos
FCT
UTL
Fundação Calouste Gulbenkian
Lisboa
LUSO
silvex
TERRAFERTIL
Gestão e Valorização de Resíduos
Adega Cooperativa de Portalegre
inapa
SAGRES
Fundação Eugénio de Almeida
Delta
citrama
PT
Instituto dos Vinhos do Douro e do Porto, I. P.
sumol+compal
unicer
Círculo de Leitores
carbono zero

Media Partners:

frutas legumes flores
A REVISTA DOS PROFISSIONAIS
suinicultura
ambiente online