



FAO European Cooperative Research  
Network on Recycling of Agricultural, Municipal and Industrial Residues in Agriculture  
(Formerly Animal Waste Management)

**Report of the**

**Eleventh International Conference of the FAO ESCORENA  
Network on Recycling of Agricultural, Municipal  
and Industrial Residues in Agriculture**

**Sustainable Organic Waste Management for  
Environmental Protection and Food Safety**

held in Murcia (Spain)  
6 – 9 October 2004

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**Network on Recycling of Agricultural, Municipal**  
**and Industrial Residues in Agriculture**

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**Environmental Protection and Food Safety**

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**FOOD AND AGRICULTURE ORGANIZATION**  
**OF THE UNITED NATIONS**



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**Report of the eleventh international conference of the FAO ESCORENA  
Network on recycling of agricultural municipal  
and industrial residues in agriculture**

**held in Murcia, Spain, 6 – 9 October 2004**

## **Introduction**

1. The eleventh international workshop of the FAO Recycling of Municipal, Industrial and Agricultural Residues in Agriculture Network (formerly the Animal Waste Management Network), was held in Murcia, Spain, from 6 to 9 October 2004.
2. The conference was attended by 178 delegates from 26 countries [Austria (2), Bangladesh (1), Canada (4), Chili (1), Denmark (4), Estonia (1), Finland (2), France (16), Germany (5), Hungary (1), Ireland (4), Italy (11), Japan (2), Malaysia (1), Mexico (3), Netherlands (1), Portugal (6), Roumania (1), Russia (1), Slovak Republic (1), Spain (73), Sweden (8), Switzerland (4), United Kingdom (18), USA (5) and Vietnam (2)]. There were 112 males and 66 female participants. The list of participants is given in Appendix IV.
3. The theme for the conference was « Sustainable Organic Waste Management for Environmental Protection and Food Safety ». The conference programme is presented in Appendix I.

## **Opening of the Conference**

4. Dr. Maria Pilar BERNAL, the Conference Organizer explained on behalf of CSIC<sup>1</sup> and the University Miguel Hernandez how proud she was to host this meeting in Murcia. She acknowledges the support of the Organising Committee and particularly Raul MORAL (Conference Secretary) as well as the role of the Scientific Committee.
5. Dr. José MARTINEZ, the Co-ordinator of the Network welcomed the delegates, and expressed his gratitude to the organizers for making such a success with a wide and outstanding audience (**more than three fold increase in the number of delegates between 1994 and 2004**). Concurrently the scientific programme covers the major issues of the network including agronomic utilization of organic residues, atmospheric pollution and greenhouse gases emissions, hygiene and health issues and treatments and management strategies.  
José also acknowledged the sponsors of the meeting including Ministerio de Education y Ciencia, Comunidad Autonoma de la Region de Murcia, Consejo Superior de Investigacion Cientifica, Fundacion Seneca de Investigaciones Cientificas, Caja MAR, LECO, SELCO, CAM, ... and the Alquibla company for logistical organization.  
(Without this intensive sponsorship, the registration fees would have been twice as much as they were).
6. Dr. Montserrat SOLIVA presented a very authoritative plenary lecture on “Organic waste in Spain : a problem that should be a resource”. She emphasized the need

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<sup>1</sup> Consejo Superior de Investigaciones Cientificas.

to change the objective from a treatment-oriented perspective to a product-oriented perspective (for composting of MSW or other residues).

7. Mr. Raoul MILLE from International Headquarters at Cemagref in Antony pointed out the fact that waste management was surprisingly not a spot issue at the commission. He emphasized the need to raise RAMIRAN activities and network role to a new level of recognition. He also recommended that a **position paper** be prepared as a consensus output of this conference.

### **Scientific communications**

8. The theme of the conference was « Sustainable organic waste management for environmental protection and food safety » and the conference was divided into five sessions :
  - Nutrient and carbon cycling in sustainable plant-soil systems
  - Gaseous emissions and odours
  - Waste contaminants : lifecycle and entry into food chain
  - Organic waste treatments : safety implications
  - Waste management strategies
9. During these sessions, 46 technical papers were presented, including five invited keynote papers (Ed Stentiford, Sven Sommer, Stuart Williams, Sergio Piccinini, Bill Magette). In addition, 142 poster papers were displayed.
10. Summaries by each of the chairmen of the five sessions are presented in Appendix II.

### **Review and planning of network activities**

11. The last meeting of the network (the 10<sup>th</sup> workshop) took place in Strbské Pleso, Slovak Republic in May 2002. This workshop on the theme « Hygienic safety in organic waste management » was attended by 90 delegates from 21 countries.
12. Proceedings of all presentations and posters were jointly published by FAO and University of Veterinary Medicine. This book of Proceedings can be obtained from the organiser Prof. Jan Venglovsky at the University of Veterinary Medicine, or downloaded from the web site ([www.ramiran.net](http://www.ramiran.net)).
13. Further to the Proceedings a special issue of the journal BIORESOURCE TECHNOLOGY was published (J. Martinez and M.P. Bernal, eds) containing a selection of papers from Ramiran 2002.
14. Among other publications, the Glossary of terms on livestock manure management compiled and edited by Brian Pain and Harald Menzi was acknowledged as a very useful document.
15. The network continues to publish a newsletter which is edited by B.F. Pain from the UK. Issue number 3 will be prepared following the 11<sup>th</sup> Conference in Murcia.

16. In his brief review of projects, perspectives and further cooperation, José pointed out : (i) the planned agreement with LEAD (Livestock, Environment and Development Initiative) at the FAO in Rome which basically consists of utilising the expertise of the Ramiran delegates to produce a series of inventories, brief specific notes and reviews, on the role of livestock farming in relation to climate change, and in relation to the changes that are observed in management practices and in livestock production development, (ii) the suggestion jointly from the head of the service of multilateral scientific cooperation (INIA – MEYC), M. Pilar CASTRO-MARTINEZ and from Isabel ALVAREZ (FAO) to prepare a COST proposal to be submitted to the EU Commission, (iii) other potential specific involvements (ASIA-PRO-ECO tender).
17. The chairman of the working groups presented reports of their activities.  
The reports of the working groups are given in Appendix III.

### **Organisational matters**

18. It was agreed that publication in special issues of well recognized scientific journals was very successful in promoting network recognition. Two projects of special issues will be consider following this 11<sup>th</sup> Conference :
- One in **Bioresource Technology** on the topic “Biological management of organic residues”.
  - A second in **Biosystems Engineering** on the topic “Gaseous emissions and odours”.
  - In addition a join special issue between Ramiran and ISAH (International Society for Animal Hygiene, <http://www.isah-soc.org>) on the theme “Biosecurity of Livestock Effluents” is agreed with the journal **Livestock Production Science** (coordination Dr François MADEC, Chairman of the ISAH In between Congress in St Malo, 11-13 October 2004.
19. It was agreed to create an international RAMIRAN Association with WG Chairman as Board Members.
20. It was agreed that the next meeting would take place in 2006 in Denmark, at the suggestion of Dr. Sven SOMMER from Danish Institute of Agricultural Science.

### **Study tour**

21. A « study » tour was undertaken during the final day of the conference (Saturday). This allowed delegates to pay a visit to the Veterinary Farm of the University of Murcia and the Recycling of Organic Wastes Composting Plant (City of Murcia).

### **Closing of the conference**

22. Dr. José Martinez congratulated all of the participants for their high quality scientific contributions which had ensured the success of the meeting. He congratulated Dr. Maria Pilar Bernal and her staff at the CSIC and University Miguel Hernandez : Raul Moral, Rafael Clemente, M. Angeles Bustamante, Antonia Garcia, Concepcion Paredes, Maria Dolores Perez Murcia, Aurelia Perez-Espinosa, as well as the Alquibla Staff, Isabel Saura and Ana Alberca.

# Appendix I Final programme

## Ramiran 2004 11th International Conference of the FAO ESCORENA Network on Recycling of Agricultural, Municipal and Industrial Residues in Agriculture Sustainable Organic Waste Management for Environmental Protection and Food Safety

### Programme

Centro de Edafología y Biología Aplicada del Segura, Consejo Superior de  
Investigaciones Científicas  
Universidad Miguel Hernández de Elche  
6-9 October 2004, MURCIA (SPAIN)

### Wednesday, 6 October

9:00 Welcome, Registration, and Congress Document Collection

10:00 Opening Ceremony.

10.30 Plenary Lecture : Dr. M. Soliva (E). Organic waste in Spain: a problem that should be a resource

11:15 Coffee Break / Poster View

11:45 Introductory Lecture : Perspectives of RAMIRAN in the VI FP of EU

12:15 Scientific Session 1 : Nutrient and carbon cycling in sustainable plant-soil systems. Chairman : Dr. C. Cordovil (P) and K. Smith (UK).

12:15 Key Note : Dr. E. Stentiford (UK). The importance of agriculture in global waste

12:45 Oral Presentations :

Nitrogen and phosphorus excretion by UK dairy cows. J. Laws, K. Smith, B. Cottrill, R. Dewhurst

Evaluation of compost efficiency for soil carbon storage based on biochemical fractionation of their organic matter: validation using long term experiments. S. Houot, J.N. Rampon, M. Poitrenaud

Pig slurry application on alfalfa: what can we gain in terms of carbon cycle? E. Ceotto, P. Spallacci, R. Marchetti

Effect of multi-year surface-banding of dairy slurry on grass. S. Bittman, C.G. Kowalenko, D.E. Hunt, F. Bounaix, T. Forge

13.45 Lunch

16:00 Scientific Session 1 (cont.) : Oral presentations:

Effect of farmyard manure and urban composts on aggregate stability in a loamy soil. M. Annabi, S. Houot, Y. Le Bissonnais, J.N. Rampon, H. Gaillard, M. Poitrenaud

Short term evolution of pig slurry macronutrients (N, P, K) accumulated into an over amended lysimeter (SOLEPUR). P. Peu, J. Martinez, P. Hinsinger, M. Benedetti

Anaerobically digested source separated food waste as fertiliser in cereal production. H. Akerhielm, A.R. Stintzing

Short-term carbon and nitrogen mineralisation in soil amended with winery and distillery organic wastes. M.A. Bustamante, M.D. Pérez-Murcia, C. Paredes,

R. Moral, A. Pérez-Espinoza, J. Moreno-Caselles  
17:00 Coffee Break / Poster View  
17:30 Discussion Session 1 and Round Table  
Moderator : Dr. S. Houot (F) Reporter: Dr. R. Clemente (ES)

**Social Event :**

19:00 Welcome reception in Murcia Town Hall

**Thursday, 7 October**

9:00 Scientific Session 2 : Gaseous emissions and odours. Chairman: Dr. J. Malgeryd (S)

9:00 Key Note : Dr. S. Sommer (DK). New micro-meteorological techniques for measuring gas emission from stored solid manure

9:30 Oral Presentations :

Assessment of the ammonia abatement potential of different geographical regions and farm types based on a large-scale survey. B. Reidy, H. Menzi

Ammonia abatement: Effectiveness and costs in two German model farms. B. Eurich-Menden, H. Döhler

European agricultural gaseous emissions inventory researchers network (EAGER). H. Menzi, J. Webb, U. Dämmgen, T.H. Misselbrook, B. Reidy, N.J. Hutchings, H. Döhler, L. Rodhe, G.J. Monteny

Can the additive "Effective Micro-Organisms (EM)" reduce ammonia and greenhouse gas emissions from slurry stores? B. Amon, V. Kryvoruchko, T. Amon, G. Moitzi

Quantifying odour emission from composting. P. Hobbs, R. Noble, J. Williams, A. Dobrovin-Pennington

10:45 Coffee Break / Poster View

11:15 Oral Presentations :

Measurement and abatement of ammonia emissions from hard standings used by livestock. S.L. Gilhespy, V. Camp, A. Retter, T.H. Misselbrook, J. Webb

Ammonia emission from FYM heaps and cattle and swine slurry stores. P. Balsari, G. Airoidi, F. Gioelli

Integrated management practices to minimise losses and maximise crop nitrogen value of broiler litter. E. Sagoo, J.R. Williams, B.J. Chambers, L. Boyles, R. Matthews, D.R. Chadwick

Dynamic modelling of ammonia biofiltration from waste gases. G. Baquerizo, X. Gamisans, D. Gabriel, J. Lafuente

12:15 Discussion Session 2 and Round Table

Moderator : Dr. T. Misselbrook (UK). Reporter: Dr. H. Menzi (CH)

13:15 Scientific Session 3 : Waste contaminants: lifecycle and entry into the food chain. Chairman : Dr. P. Hunt (USA)

13:15 Key Note : Dr. S. Williams (UK). Health risks from pathogens in livestock manures

13:45 Lunch

16.00 Oral Presentations:

Measure of pathogen transfer in aerosols following land application of manure. P. Hobbs, D. Davies, J. Williams, H. Warren.

Concerted action AROMIS Assessment and reduction of heavy metal input into agroecosystems. H. Eckel, U. Roth, H. Döhler, U. Schultheiß

Hydrated lime and Velox reduce rapidly enteric micro-organisms of manure. H.



Heinonen-Tanski, S. Antola, K. Weppling  
Use of crude coffee grain for treatment of petroleum hydrocarbon-contaminated soil.  
G.A. Roldan-Martin, R. Rodríguez-Vázquez

17:00 Coffee Break / Poster View

17.30 Oral Presentations :

Hygienic aspects of biosolids reuse. J. Venglovsky, J. Martinez  
Comparison of humic acids from compost and peat as amendments of heavy metal  
polluted soils. R Clemente, M. P. Bernal  
Problems connected with the EU-animal by-product regulations in the field of  
environmental and animal hygiene. R. Böhm

18:15 Discussion Session 3 and Round Table

Moderator : Dr. R. Böhm (DE). Reporter: Dr. F. Nicholson (UK)

### **Social Event :**

20:30 Conference Dinner

## **Friday, 8 October**

9:00 Scientific Session 4 : Organic waste treatments: Safety implications.

Chairman: Dr. J. Martínez-Almela (E)

9.00 Key Note : Dr. S. Piccinini (I). State of the art of anaerobic digestion in Italy.

9:30 Oral Presentations :

Enhancement of the anaerobic digestion process of primary and secondary sludge  
by thermal and chemical pre-treatment. M. Climent, F. Gimeno, M.M.  
Baeza, A. Artola, M.A. Gordillo  
Anaerobic co-digestion of organic fraction of municipal solid wastes and industrial  
greases. A.I. Fernández, X. Font, A. Sánchez  
Study of biochemical and microbiological parameters during composting of pine and  
eucalyptus bark. A.C. Cunha-Queda, H. Ribeiro, A. Ramos, F. Cabral  
Development of environmentally superior technology to replace swine lagoons in the  
USA. M. Vanotti  
Full-scale combination of anaerobic digestion and concentration by evaporation at  
Garrigues County (Spain): evaluation after 2 years on operation. J. Palatsi,  
E. Campos-Pozuelo, M. Torres, S. Porrás, X. Flotats

10:45 Coffee Break / Poster View

11:15 Oral Presentations :

Investigation into the N-dynamics during composting under special consideration of  
denitrification. I.Körner, R. Stegmann  
Agricultural reuse of olive mill effluents after energy recovery. A. Natri, N.A.  
Ramieri, R. Abdayem, P. Gioacchini, C. Marzadori, C. Ciavatta  
Pretreatment of manure by separation as a method to improve gas production and  
economical performance of biogas plants. H. B. Møller  
Evolution of chemical and physicochemical properties of MSW compost during three  
long-term maturing treatments. R. Canet, R. Albiach, E. Ferrer, P. Flores, F.  
Pomares  
Methane production from maize, grassland and animal manures through anaerobic  
digestion. T. Amon, B. Amon, V. Kryvoruchko

12:30 Discussion Session 4 and Round Table

Moderator : Dr. X. Flotats (ES). Reporter: Dr. P. Balsari (I)

13:15 Scientific Session 5 : Waste management strategies. Chairman : Dr. O. Pahl  
(UK)

13:15 Key note : Dr. W. Magette (IR). Environmental management systems for organic

wastes management.

13:45 Lunch

16:00 Oral Presentations :

Assessing the reuse potential of organic waste products in urban and peri-urban agriculture. D. Forster, A. Montangero

Economic analysis of various animal waste treatments in selected provinces in Vietnam. T. Anh Hoa, T. Thi Dan, T. Duc Luan, P. Gerber, H. Menzi

Integrated evaluation of organic waste management options. G. Provolo, E. Riva  
Costs and regulations in pig production. R. Perez

17:00 Coffee Break / Poster View

17:30 Oral Presentations :

Review of food waste management in Scotland - a case study. R. Fernand, O. Pahl

Survey on manure management: a valuable tool to assess and optimise farm nutrient cycling and minimise emissions. H. Menzi, B. Reidy, K. Smith

Management manure and manure treatment plant: present and future. The farm school of Murcia University's veterinary science faculty. J. Martinez Almela, A. Muñoz Luna

18:15 Discussion Session 5 and Round Table

Moderator: Dr. G. Provolo (I). Reporter: Dr. J. Cegarra (ES)

19:00 Closing and Award for the most original poster contribution

### **Saturday 9 October STUDY TOUR**

8:30 Departure from Murcia

9:00 Technical Visits : Veterinary Farm of the University of Murcia, and the Recycling of Organic Wastes Composting Plant

11:00 Travel to San Pedro del Pinatar

12:00 Visit to Sea-Salt farm and the Nature Reserve "Salinas de San Pedro", where a colony of Flamingos can be seen

13:30 Typical Seafood Lunch

16:00 Boat Trip around Mar Menor

17:00 Arrival at La Manga, and return to Murcia

18:00 Arrival in Murcia

## **II.1. Chairman's summary of session 1 :**

### **Nutrient and carbon cycling in sustainable plant-soil systems** **C. M. de S.Cordovil<sup>1</sup> and K.A. Smith<sup>2</sup>**

<sup>1</sup>*Inst Sup Agronomia, Department of Environmental Chemistry, Lisboa, Portugal.*

<sup>2</sup>*ADAS Wolverhampton, Woodthorne, Wolverhampton, WV6 8TQ, UK.*

This first session got the conference off to an excellent start in this very important topic area. The importance of the session was reflected by the total of 54 papers, comprising 9 oral and 45 poster presentations. These papers included a number of presentations covering major nutrient recycling (from a range of waste types), a large number on MSW composts, carbon recycling and sequestration, soil physical fertility and soil structure, other non-agricultural residues, (e.g. meat and bone meal, sugar beet lime residues, sludge from fish farming, waste water from olive oil production), composted urban wastes as a growing medium, sometimes with overlap of topic area within individual presentations. The high quality of the oral presentations was reflected by the level, and number, of questions in the short discussion period following each of the papers.

The keynote address by Ed Stentiford on "The importance of agriculture in global waste" highlighted particularly the problems facing all of us in terms of the role of wastes in greenhouse gas emissions, posed a number of challenges and raised some thought provoking questions. Even the EU, rich in technology and resources, recently (2001), presents a disappointing scenario, with uncontrolled emissions from an average of > 30% of landfill sites, a statistic likely to degenerate further with the accession of 10 new States into the EU. The 4 billion people in the 'rest of the world', commanding relatively few resources, present a massive problem because of uncontrolled dumping of putrescible waste which result in significant emissions of CH<sub>4</sub>. Nevertheless this also presents a great opportunity for improvement in global emissions, demonstrated by small community projects, in southern American countries, in which some separation of wastes, followed by composting and beneficial recycling allows the generation of some income, improvements in health and significant savings in greenhouse gas emissions.

A wide range of issues were explored and a wealth of interesting information was presented within the 8 other platform presentations within this session. Despite the sometimes rather negative perception of composting as likely to increase gaseous and other emissions, it is clear that the process can make a significant contribution to sustainable agriculture by stabilising certain "waste" materials and enhancing the storage of soil C. During the discussion of the platform presentations, the importance of evaluating and demonstrating the economics (both costs and benefits, as appropriate) was emphasised.

J. Laws - A nutrient budget approach for estimating apparent N and P surplus on commercial farms and, hence, potentially N and P excretion in livestock (in this case dairy cows) provided data which was generally supportive of the N standards currently in use in the UK. However, the less well-established P standards appear likely to have been over-estimated and require re-evaluation. The robustness of the fertiliser data was questioned but the approach appears to offer a useful way of

evaluating these standards which are of great importance for the viability of livestock farming within the requirements of environmental regulations.

S. Houot – An index of biological stability (IBS) was used to compare the impacts of different urban composts on the soil organic carbon pool and the mineralisation and immobilization of organic C and the application of a French model was able to show the success of this IBS.

E. Ceotto – An interesting approach in which pig slurry was applied at high rates to alfalfa with apparent benefit for C sequestration and, surprisingly, utilisation of slurry N reduced risk of nitrate leaching.

S. Bittman - Field experiments conducted in Canada, on the application of pig slurries with surface-banding technique were able to show a significant yield benefit in comparison with surface broadcast application and very promising potential for reduction in ammonia losses.

M. Annabi – The paper concerned the impacts of urban composts on soil physical stability as well as soil organic C.

P. Peu – The presentation covered the residual phase of the “SOLEPUR” experiments which studied the soil treatment of very high rates of pig slurry application over 5 years. The residual phase of 6 years has shown an accumulation of P and K. However, despite the downward movement of soil P, no leaching of P was observed and while exchangeable K decreased, K concentrations in drainage water remained high.

H. Akerhielm – Source separated, anaerobically digested food waste was applied as a nutrient source in cereal production with results comparable to those of cattle slurry. They concluded that this residue could replace mineral fertilisers with a surplus of N and small deficit of P (which is a useful bonus compared with animal manures).

M.A. Bustamante – Various residues from wine production which are problematic for small producers who are unable to send to distilleries were successfully applied to 3 soil types as source of C and N. The beneficial impacts were greater for the sandy soil than to the clay or loamy soils. In general a reduction in N mineralisation occurs although there was an increase in soil biological parameters.

## **II.2. Chairman’s summary of session 2 :**

### **Gaseous emissions and odours Johan Malgeryd**

*JTI – Swedish Institute of Agricultural and Environmental Engineering*

The theme of session 2 was “Gaseous emissions and odours”. After a short introduction by the chairman, the keynote speaker Sven Sommer, Denmark, presented a review of new micro-meteorological techniques for measuring gas emissions from stored solid manure. The introductory lecture was followed by eight oral presentations covering the following themes:

- Ammonia emissions – assessment of the abatement potential in different geographical regions (B. Reidy, Switzerland), effectiveness and costs of different measures (B. Eurich-Menden, Germany), emissions from hard standings used by livestock (S. Gilhespy, U.K.), emissions from FYM and slurry stores (F. Gioelli, Italy) and management practices to minimise losses from broiler litter (E. Sagoo, U.K.).

- EAGER – European Agricultural Gaseous Emissions Inventory Network (H. Menzi, Switzerland).
- Manure additive “Effective microorganisms” (EM) and its effect on gaseous emissions (B. Amon, Austria).
- Methods for quantifying odour emissions from composting (P. Hobbs, U.K.).
- Modelling of ammonia bio-filtration from waste gases (G. Baguerizo, Spain).

In addition to the oral presentations, there were 23 posters covering different aspects of the problem. The themes of the posters can be divided into five categories:

- Measuring techniques.
- Emissions from animal houses, storage facilities, biological treatment plants, land application of animal manure and cut plant material on green manure leys.
- Abatement measures and management practices and their effects on the emissions.
- Modelling of emissions.
- Biofilters and their effectiveness.

### II.3. Chairman’s summary of session 3 :

#### **Waste Contaminants: Lifecycle and Entry into Food chain Patrick Hunt**

*USDA-ARS, 2611 W. Lucas St., Florence, S.C. 29501. USA*

Dr. Stuart Williams from Surrey, UK gave the Keynote address, **Health Risk from Pathogens in Livestock Manures**. The presentation was made with an emphasis on Dr. Williams’ specialty, Virology. He discussed various pathways of both natural-environmental and human-mediated pathogen transfer. He presented data and actual examples of aerosol transfer of Foot and Mouth disease. He noted that the transfer of aerosols across water presented some potentially serious problems associated with wind patterns. He emphasized the need for both early detection and quick control to mitigate the impact of Foot and Mouth disease occurrence. In regard to the control, he noted that heat sterilization units were now in place in the UK; the units had been tested and developed, but they were not available during the last outbreak. A wide range of questions and comments came from the audience – these included Asian flu, BSE, and post harvest surface sterilization of food products. The use of green chemistry oxidants to replace chlorine sterilization was mentioned as a means to reduce the harmful impacts associated with chlorine in waste management. There was also a discussion of the factors that contributed to the wide variation of infection levels among livestock in various countries and regions of the same country.

Phil Hobbs of the UK presented detailed information on pathogen transfer in aerosols during land application of manures. He discussed the influence of environmental factors and the use of K-12 as a pathogen indicator in these investigations.

Henning Eckel of Germany presented a format for comparing the benefits of implementing various EU Directives of manure management on the reduction of heavy metals into the agro-ecosystem.

Helvi Heinonen-Tanski of Finland presented data on the use of hydrated lime and Volex for rapid reduction of enteric microbes. Both compounds were effective in lab investigations.

Jan Venglovsky of the Slovak Republic presented data on the scope and breadth of potential pathogen contamination associated with the land application of manures.

Rafael Clemente of Spain presented data on humic acids from both compost and peat on the availability of heavy metal in calcareous and acid soils in the context of site reclamation. The humic acids were found to be more effective in the acid soils.

Reinhard Böhn presented data on the EU-animal By-product Regulations noting their strong and weak points. He noted that there were functional gaps in the regulations and the conditions necessary for effective handling of By-products. While authorization is important, process validation was critical for meaningful functionality.

#### **II.4. Chairman's summary of session 4 :**

##### **Organic waste treatments: safety implications. Jesús Martínez-Almela**

*Selco Mc. Advanced Engineering Services. Animal Residual Technologies. Pza. Tetuán, 16.  
E-12001 Castellón. Spain.*

Mavi Climent from Escola Universitària Politècnica del Medi Ambient. Barcelona, (Spain), presented the work entitled: "Enhancement of the anaerobic digestion process of primary and presented the work entitled secondary sludge by thermal and chemical pre-treatment", chemical treatment using NaOH has been applied to primary and secondary sludge from a municipal waste water treatment plant in order to improve the anaerobic digestion process by reducing the mean hydraulic retention time and increasing methane production. Thermal treatment has also been studied applied to secondary sludge. Contact time (ranking from 30 to 480 minutes) and NaOH concentration (0.05-0.3 mol/l) were the factors considered during the study of chemical treatment. Thermal treatment was applied to secondary sludge at different temperatures (110-134°C) and times (20-90 min) in an autoclave. The effectiveness of the two processes was evaluated by means of three parameters: the degree of disintegration using the chemical oxygen demand (%DD<sub>COD</sub>), the increment in soluble protein concentration (SCP, in percentage respect to the concentration in the original sludge) and the increment of the relationship between filterable volatile solids and the total volatile solids (FVS/TVS, in percentage). In conclusion, solubilization of organic matter from activated sludge can be achieved by both thermal and chemical treatment. This fact is expected to accelerate the hydrolytic step of activated sludge anaerobic digestion. Temperature and NaOH concentration are the factors that influence the effectiveness of the each treatment in most extend.

Anna-Isabel Fernández from Escola Universitària Politècnica del Medi Ambient (Universitat Autònoma de Barcelona) , Barcelona (Spain), presented the work entitled: "Anaerobic Co-digestion of Organic Fraction of Municipal Solid Wastes and Industrial Grease", the potential of mesophilic anaerobic digestion for the treatment of residual grease through co-digestion with the organic fraction of municipal solid wastes (OFMSW) has been evaluated. Co-digestion process was conducted in a metacrylate pilot plant (14 litres of effective volume) working in semi-continuous regime ('wet' process) in the mesophilic range (37°C). The hydraulic retention time was 18 days. During the start-up the reactor was fed with simulated OFMSW ( diluted

dry pet food). The TVS content in organic load was gradually increased with TVS coming from residual grease by a percentage of 7 % each residence time. Normal operation of the pilot plant was observed for grease content up to 28% in the organic load. No accumulation of LCFA or VFA was detected. The removal of total grease was about 90% throughout the experiment. In conclusion, anaerobic co-digestion of OFMSW and fat wastes appears to be a suitable technology to treat this wastes recovering energy in form of biogas.

Cristina Cunha-Queda from Departamento de Química Agrícola e Ambiental, Instituto Superior de Agronomia. Lisboa (Portugal), presented the work entitled: "Study of biochemical and microbiological parameters during composting of pine and eucalyptus bark", three composting experiments were carried out using: pine bark, eucalyptus bark and a mixture (50:50, v:v) of pine bark + eucalyptus bark. Sampling was performed at the beginning of the process (T1), at thermophilic phase (T2), at mesophilic phase (T3), at curing phase (T4) and at the ending of the composting process (T5). Results showed that in general the highest microbiological populations occurred during the thermophilic phase (>40°C) of composting process. Regarding the enzymatic activities (Table 1) results showed that the maximum values were also observed during the thermophilic phase as well as during the mesophilic phase (<40°C). The assessment of compost quality showed that composts obtained can be used successfully in the formulation of substrates to produce plants in containers, namely for the compost obtained from eucalyptus bark.

Matias Vanotti from USDA-ARS (USA), Presented the work entitled: "Development of Environmentally Superior Technology to Replace Swine Lagoons in the USA". A treatment system for liquid swine manure was developed to accomplish capture nutrients reduce emissions of ammonia and nuisance odours, and kill harmful pathogens. The system was evaluated at full-scale during 2003 as part of the Smithfield Foods-Premium Standard Farms/North Carolina Attorney General agreement to replace current lagoons with Environmentally Superior Technology. The full-scale demonstration facility was installed in Goshen Ridge, a 4,400-head finishing farm in Duplin County, NC. The system greatly increases the efficiency of liquid – solid separation by injection of polymer to increase solids flocculation. Nitrogen management to reduce ammonia emissions is accomplished by passing the liquid through a module where immobilized bacteria transform nitrogen. The system was successfully brought to steady-state operation with treatment performance that exceeded design expectations; it separated 97% of suspended solids, 99.9% of BOD, 98.9% of TKN and 94.8% of total P. Odorous compounds in the waste were reduced > 99% by treatment. In less than one year, the anaerobic lagoon that was replaced with the treatment system was converted into an aerobic pond with ammonia concentration lower than 15 ppm. The system has the potential for major positive impact as a functional advance in the treatment of animal waste.

J. Palatsi from Centre UdL-IRTA. Dep. of Environmental Engineering, Lleida (Spain), presented the work entitled: "Full-scale combination of anaerobic digestion and concentration by evaporation at Garrigues County (Spain): evaluation after 2 years on operation", the described centralised treatment plant is located at Garrigues County (Spain), able to treat 110.000 Mg/year of PS, and it serves 90 farmers. The technology applied is VALPUREN<sup>TM</sup> process, based on the combination of anaerobic digestion (AD) and evaporation. The biogas yield (m<sup>3</sup>biogas/kg volatile solids added) is highly correlated with the organic content of PS and with the COD/VS ratio, that is a function of PS age and of management practices at farm level. Organic loading variation along time, due to these factors, could provide a not stable anaerobic digestion process with accumulation of volatile fatty acids (VFA).

It is concluded that a stabilized AD improves biogas production and evaporation process. Management method at farm level is an issue of concern for a successful performance of a centralized treatment as this kind.

I. Körner from TU Hamburg-harburg; Department for Waste Management, Hamburg (Germany), presented the work entitled: "Investigations into the N-dynamics during composting under special consideration of denitrification", on the one hand compost N may be a valuable plant nutrient; on the other N emissions during composting may occur. Following groups regarding the N-lack could be postulated: I) no lack, in 20 % of the experiments; II) lack starts during 1<sup>st</sup> week, 37 %; III) lack start after 1<sup>st</sup> week, 43 %.. N<sub>2</sub> can be generated as a product from biological denitrification. NO<sub>3</sub><sup>-</sup> will be used as a substrate, which can be produced from NH<sub>4</sub><sup>+</sup> by nitrification. Nitrification and denitrification are generally considered to be relevant for mesophilic condition, but also thermophilic processes are known. Furthermore, a chemical denitrification may occur as well, which shall be more relevant for higher temperatures. The experiments showed, that also thermophilic denitrification can be important in a lot of cases, since in all experiments from group II, the N-lack did start during thermophilic phase. The process of biological denitrification is probably more important than the chemical one due to the impact of waste history which probably significantly influences the microbial population. The knowledge about denitrification processes helps to produce composts tailor-made for certain applications and to reduces unwanted N-losses and –emissions.

Claudio Ciavatta from Dipartimento di Scienze e Tecnologie Agroambientali, Università di Bologna (Italy), presented the work entitled: "Agricultural reuse of olive mill effluents after energy recovery", treatment and disposal of residues from olive-oil processing represents the main problem of the industry involved in the extraction of the olive oil due to the high volume annually produced. Recently, the introduction of the "two phases" method of olive-oil extraction has drastically reduced the amount of processing water produced and the olive mill pulp is the only waste generated. Aim of this research, within the BIOTROLL project started at the beginning of the 2003, was: 1) the physical and chemical characterization of the olive pulp arising from the biological treatment for the production of i) ethanol an ii) hydrogen, and iii) the subsequent anaerobic treatment of the effluent with production of methane, and 2) the agricultural reuse of the final effluents as fertilizer. Preliminary results showed that the first three effluents analyzed (olive pulp – OP, effluent from hydrogen – EH<sub>2</sub>, and from methane – ECH<sub>4</sub>) contain i) 28.4 (OP), 9.8 (op), 9.8 (EH<sub>2</sub>) and 4.6 (ECH<sub>4</sub>) of dry matter; ii) around 60 % (dry weight) of organic carbon; iii) an appreciable quantity of macro (especially organic N, K<sub>2</sub>O) and micronutrients and iv) a negligible amount of heavy metals. pH and electrical conductivity (EC) are in a normal range. These results confirm that the quality of the effluents after the biological treatments are compatible with their agriculture reuse, especially in Mediterranean areas.

Henrik B. Møller from Danish Institute of Agricultural Sciences,(Denmark), presented the work entitled: "Pretreatment of manure by separation as a method to improve gas production and economical performance of biogasplants", pre-treatment of manure by separation is a way to make fractions of the manure with higher gas potential in terms of volume. Different solid-liquid separation technologies like centrifugation, chemical precipitation and "in stable" separation of faeces/urine make production of solid manure fractions possible containing between 50-95% of the volatile solids in 10-25% of the total volume of manure. Theoretical methane potential and biodegradability of three types of fractions deriving from manure separation were tested. The economical and synergetic effects for biogas plants and farmers by integrating solid-liquid separation at farms connected to a co-digestion plant were analyzed for different scenarios. Pre-treatment of manure by separation is a way to



make fractions of the manure with higher gas potential in terms of volume since the water can be drained from the solids making fractions with a higher VS concentration, hence the volumetric methane productivity is higher in the physical fractions of manure compared to luted manure.

R. Canet from Instituto Valenciano de Investigaciones Agrarias (IVIA). Valencia (Spain), presented the work titled: "Evolution of chemical and physicochemical properties of MSW compost during three long-term maturing treatments", experiment was measured the evolution of different chemical and physicochemical properties of MSW compost ( pH, electrical conductivity, total, water-soluble, humified and humic carbon,  $E_4/E_6$  ratio of humic acids, and organic nitrogen) during one year of three different treatments: maturing (product kept at optimal moisture and aeration levels), stocking (product compressed and uncontrolled, simulating the usual handling at composting plants) and vermistabilizing (compost digested by *Eisenia foetida*). The results show a larger degradation of organic matter during maturing and vermistabilization, increasing density and nutrient concentration of the compost, together with stabilization of pH and salinity levels. Small differences were found as for humic substances concentration and  $E_4/E_6$  ratio.

T. Amon from Inst. of Agricultural, Environmental and Energy Engineering (ILUET), University of Agricultural Sciences (Austria), presented the work entitled: "Methane production from maize, grassland and animal manures through anaerobic digestion", biogas production from energy crops is a very promising option to generate renewable energy. Biogas plants require a targeted nutrient supply to make optimum use of energy crops. Currently, specific parameters on the anaerobic digestibility of energy crops are unavailable which restricts the exploitation of the promising potentials. The methane yield per hectare of energy crops can be estimated as well. Optimum varieties and harvesting times can be suggested. Methane production was investigated by incubation of the organic substrates in lab scale batch digesters. The new methane energy value system (MEVS) enables the calculation of the specific methane yield depending on the nutrient composition of maize, clover grass silages and animal manures. It helps to optimise biogas production by the following capabilities: estimation of the methane production of organic substrates from their nutrient composition; estimation of the nutrient requirement of micro-organisms that are responsible for anaerobic digestion; estimation of the power of agricultural biogas plants in dependency of amount and composition of organic substrates that are digested; recommendations on varieties and optimum harvesting time of energy crops; estimation of methane yield per hectare of energy crops, varieties and crop rotations.

## **II.5. Chairman's summary of session 5 :**

### **Waste management strategies Ole Pahl**

*Glasgow Caledonian University, Cowcaddens Road, Glasgow G4 0BA, U.K.*

This session dealt with generally more strategic and tactic aspects of waste management.

The session was opened by W Maggette's keynote speech on environmental management systems (EMS) in the meat production sector, using the ISO 14000 series as an example. The presentation highlighted the need for business analysis and thus the need to identify motivators for businesses that would lead them towards

the adoption of environmental management systems. It was reported that unfortunately there was a lack of demand for the implementation of such systems both on the side of the final consumer of meat products and the food processors and retailers. A price premium for “environmentally sound food”, it was argued, was unlikely to be achievable in the current climate. The presentation also highlighted that there were several breakages in the supply chain, as far as environmental obligations were concerned. This left the meat producers as solely responsible for environmental protection, without giving them the option to influence the price of the end product.

The topic of business analysis both from a motivation and process point was taken further by presentations on the regional integration of production, consumption and waste management with focus on :

- Spatial analysis of organics recycling in urban and peri-urban agriculture (Forster & Montangero)
- Economic benefits of various animal waste treatment systems (Hoa *et al.*)
- Evaluation of state intervention in the form of charges on waste water production.

These presentations showed that the implementation of any environmental management strategy would rely on the appropriateness of its measures for the main elements of the production chain and the local environment. It was reported that holistic assessment of management options was needed in order not to create disparity between different parts of the production chain, both in terms of financial implications and environmental effects. For example, the link between sanitation and reuse of waste waters in agriculture was not fully evaluated in developing countries, and rigid charging schemes in Mexico resulted in proportionally smaller financial implications for larger producers (polluters) than for small and medium size producers.

The central role of holistic or integrated evaluation of the various waste management options was demonstrated by Provolo & Riva, who showed that intervention at different parts of the production chain could result in significantly different overall effects on pollution reduction. They argued that a robust model, based on detailed data, would allow producers and advisers to better evaluate the combined effect of their practices and interventions, thus bringing a step closer the aim of employing the best available technique for a given situation. They highlighted the need to address each situation on its own and argued that a “one size fits all approach” would most likely have a lesser effect than their integrated evaluation. Menzi *et al.* reported on their work in the related collection of detailed manure management practices via surveys and statistical evaluation. The results of this survey helped them to better understand the practices on farms and thus would allow better evaluation of interactions between different waste management components and the potential benefits of related legislative action or incentives. They argued for a harmonised approach to data collection by surveys across Europe, and it is clear that such data would be of much benefit also for the expert model described by Provolo & Riva. The need for data collection via surveys, rather than expert opinion, was highlighted. Expert based data collected previously had shown considerable derivation from the actual data collected on farms.

The review of food waste management in Scotland was a good example of many of the strategic and tactic considerations highlighted in the presentations above: it showed that environmentally unacceptable practices were prominent in Scotland but that these were largely unnoticed by regulators and stakeholders alike. The main drivers for the parties engaged in such unsustainable practices were financial considerations and “ease of use”. Business analysis, holistic evaluation of

alternative management options and appropriate legislative action or incentives were clearly needed in this case.

The final presentation of the session (Martinez-Almela and Luna) on the manure management and treatment plant of Murcia University's veterinary farm, gave an example of integrated evaluation of the waste management challenges present at this site. This evaluation led to the development of a bespoke management/treatment system that had addressed environmental, financial and animal welfare concerns in a satisfactory way.

## **Appendix III Reports of the Working Groups**

### **III.1. Report of the Working Group on Heavy metals (Chairman : Dr Fiona Nicholson)**

Since 2000, the activities of the Working Group have been effectively covered under the auspices of the AROMIS Concerted Action. AROMIS is now complete and the report due to be published in the near future. Aromis identified a number of future research requirements in the area of heavy metals which can be summarised as follows :

- Harmonisation of manure sampling methods
- Reducing trace elements in livestock feeds (nutrition)
- Alternatives to the medicinal use of heavy metals (e.g ZnO used to control scour in weaner pigs, Cu/Zn based disinfectant hoofbaths for ruminants)
- Quantification and prevention of corrosion and abrasion of stable equipment
- Monitoring heavy metals in livestock feeds, manures and organic residues
- Creation of a European research and monitoring network
- Establish a heavy metal inventory for Europe
- Develop and promote heavy metal input reduction strategies

From these the research priorities were seen as a) reducing metals in livestock manures, b) developing farm gate balance models to test metal input reduction strategies and c) using the models to compare production systems (eg organic vs conventional) in terms of heavy metal balances.

The Working Group should consider how to implement these research priorities and whether RAMIRAN could act as a focus for a European monitoring network. In addition, RAMIRAN members could make a valuable contribution to the EC Thematic Strategy for Soil Protection (Working Group Contamination).

### **III.2. Report of the working group on Gaseous Emissions (Chairman : Tom Misselbrook)**

Accurate compilation of gaseous emission inventories at the national level continues to be a high priority as individual countries seek to improve their position for negotiating and seeking to comply with target ceilings agreed under the Gothenburg treaty, EU National Emissions Ceilings Directive and Kyoto protocol. In respect of ammonia emissions from agriculture, a network of researchers has been established with the aim of comparing and harmonising modelling approaches. The EAGER (European Agricultural Gaseous Emissions Researchers) network was initiated by Harald Menzi (Switzerland) and includes members from a number of European countries that have developed detailed inventories of ammonia emissions from agriculture. Further details of EAGER are given in the paper presented at the RAMIRAN 2004 conference by Menzi et al. A similar network may be appropriate for greenhouse gas emissions from agriculture, particularly if IPPC moves towards a more detailed methodology, where comparisons in the derivation and magnitude of emission factors will become important.

Following the RAMIRAN 2002 meeting, a projects database was established. RAMIRAN members were encouraged to enter details of research projects (with any relevance to RAMIRAN, not just gaseous emissions). After an initial period of activity, during which approximately 40 projects were registered, the database has rarely been updated. A major reason for this may have been poor advertisement and low visibility of the database web-site. However, a link to the site has now been included on the RAMIRAN web-site and all RAMIRAN members are again encouraged to keep the site up to date by entering details of new research projects as they begin. The site can be accessed at <http://www.igerlib.iger.bbsrc.ac.uk/ram/ramiran.html> or from the link on the RAMIRAN web-site ([www.ramiran.net](http://www.ramiran.net)). If kept up to date, the database will provide a useful resource both to RAMIRAN members and others when looking for research partners or details of particular research topics.

Opportunities for EU funding relevant to the Gaseous Emissions Working Group research area have been limited. Barbara Amon (Austria) convened a meeting at the RAMIRAN 2004 conference of parties interested in being part of a submission for a STREP project on biogas production. Other potential project bids were discussed but not pursued. It is important that informal collaborative links are maintained between partners, both to increase the value and relevance of individual partners' research and also to enable rapid response to EU tenders for research should they appear in relevant research areas.

It is probable that the Gaseous Emissions Working Group will be involved in a more formal link with the FAO, providing expertise and technical support on specific issues being addressed within the Livestock Environment and Development (LEAD) initiative. More details of this work will be provided at the next RAMIRAN meeting.

### **III.3. Report of the Working Group on Hygiene (Chairman : Reinhard Böhm)**

The report referred to the proposals of RAMIRAN members in the framework of the FP 6 programme of the EC in which none of the projects got any funding. The chair also reported that the MATRESA project has been successfully completed, with a book available from the Silsoe Institute (Colin Burton).

Ongoing activities and current problems requiring attention include :

- the standardisation of methods : Salmonella + E.coli in the framework of CEN TC 308
- the 'HORIZONTAL' project with different workshops on methods and strategies
- a requirement to solve the problems with EU regulation 1774/2002
- the problems of hygienic safety in biogas plants, especially relating to plant diseases and bioenergy crops.

#### Discussion

There was a brief discussion following the oral presentations. The major points raised were :

- Concern over the feasibility of having similar standard methods of CEN TC 308 to assess chemical and microbiological properties of different matrices.
- There was a proposal that members of RAMIRAN should participate in the upcoming Workshops of the HORIZONTAL project.
- Some specific issues relating to the AROMIS project were raised.

### **III.4. Report of the working group on Composting and Transformation of Organic Wastes (Chairman : Maria Pilar Bernal)**

The working group was established at the 9<sup>th</sup> RAMIRAN meeting in Italy in 2000. The initially identified activities of the WG were:

- Definition of compost: standardisation of methods and parameters to define maturity and quality, and to establish the characteristics of compost according to its use.
- Update technologies for composting and for anaerobic transformation of wastes.
- Transfer such technologies to industries in order to encourage producers to recycling their wastes.
- Collect data concerning the amount of wastes and the transformation methods used across Europe.

Data concerning the situation in the European Community, and particular in composting in Spain and UK, had already been reviewed. The situation of the different countries regarding the waste generation can be found in several documents of the European Environment Agency (EEA) and the Directorate General Environment of the European Commission. However, recently the European countries have set systems for recycling wastes at municipal, local and industrial sites, to cope with the latest European legislation on this matter. Therefore, the data related to the recycling of the different wastes need to be updated.

Through the EU project MATRESA, data concerning production of animal manures and slurries in Europe were collected and published in the book *Manure Management. Treatment Strategies for Sustainable Agriculture*. The book also describes the different technologies and treatments for recycling manures and slurries in agriculture. Technologies based on aerobic systems, including composting, anaerobic treatments and others, such as separation process, soil filters, thermal and chemical analysis, are well described.

The activities of this WG during 2003-2004 have been focussed on the organisation of the 11<sup>th</sup> International Conference of the Network, which was held in Murcia (Spain) from 6 to 9 October 2004, and organised by Dr. M<sup>a</sup> Pilar Bernal from CEBAS-CSIC as President of the Organising Committee, Dr. Raul Moral from the University Miguel Hernández (UMH) as Secretary of the Organising Committee, and the following collaborators as members of the Committee: Dr. C. Paredes (UMH), Dr. R. Clemente (CEBAS-CSIC), Dr. M.D. Pérez-Murcia (UMH), Mrs. A. García (CEBAS-CSIC), Dr. A. Pérez-Espinosa (UMH) and Ms. M.A. Bustamante (UMH). Of the 189 scientific communications presented, 44 were related directly with treatments of wastes, plus papers describing fertilising properties of transformed wastes, gaseous emissions during the processes and persistence of pollutants. This indicated the high scientific interest in composting and transformation of wastes that exists in all the countries. Some of the points raised during the conference, which it may be convenient to discuss further in this WG, were the need to assess the economic impact of the different technologies, for determining their feasibility, and, for composting, the need to search for potential markets for the final products in order to give extra value to the compost produced.

### III.5. Report of the working group on Management of Organic Wastes (Chairman : Giorgio Provolo)


<p>Working group on "Management of Organic Wastes" EU projects EoI – MORES</p> <p><i>Priority 5: Food Quality and Safety 3rd Thematic call Published July 2004 for funding in 2005</i></p> <p><b>5.4.6 Area: Safer and environmentally friendly production methods and technologies and healthier food stuffs</b></p> <p><b>Indicative topics for 2006</b></p> <p><b>T5.4.6.12 Management of waste from farms and fisheries (CA)</b></p>	<p>The objective is to coordinate research of relevance to policy issues by identifying <b>solutions to current critical issues in sustainable waste management and helping to reduce the environmental and nuisance value (particularly odour) of wastes from intensive farming</b> (including aquaculture and fisheries) systems.</p> <p>Results will be improvements in knowledge and technologies for the control of odour and pollution and for alternative waste handling systems. The project may also include alternative production systems and, in relevant cases, reduced levels of contaminants within feeds (for example within the aquaculture industry).</p>
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- Management option database (Ken Smith)
- Standard for EMS applicable to farms (W.L. Magette)
- Reduction of emissions: does a unique strategy fits all countries?
- Necessity of a greater multi-disciplinary approach
- Is legislation the driving force for the application of research results?

### III.6. Report of the working group on Other Wastes Generated on the Farm (Chairman : Paolo Balsari)

RAMIRAN 2004

**"OTHER WASTES GENERATED BY THE FARM"**




**ACTIVITY CARRIED OUT FROM 2000**

**Ramiran 2000:** Distribution, of a first version of the questionnaire concerning the amount and the typology of wastes produced into the farms and concerning the Normative in force in the different Countries

**2001:** participants were requested to draw up the questionnaire

first elaboration of data coming from Belgium provided by Josi Flaba (Ministère des Classes Moyennes et de l'Agriculture);

a second and more detailed version of the questionnaire was drafted and sent to working group participant



**ACTIVITY CARRIED OUT FROM 2000**

**Ramiran 2002:** Discussion of first results (material coming from Belgium, Great Britain, France)



**AMOUNT (kg/ha) OF OTHER WASTES YEARLY PRODUCED IN DIFFERENT COUNTRIES**

**CROP PROTECTION**


Country	Amount (kg/ha)
I	0.32
F	0.47
B	0.12

**CROP SEEDING**

Country	Amount (kg/ha)
I	0.3
B	0.25


**CROP FERTILISATION**

Country	Amount (kg/ha)
I	1.7
F	0.57
B	0.45



**TYPE OF OTHER WASTE DISPOSAL - PLASTIC**

Disposal Type	UK (%)	I (%)
BURNED	52	72
STORED	6	8
RECYCLED	13	15
OTHER	29	5




**AMOUNT (kg/ha) OF OTHER WASTES YEARLY PRODUCED IN DIFFERENT COUNTRIES**

**ANIMAL HEALTH TREATMENT**

Country	Amount (kg/ha)
F	0.58
I	0.73

**USED MOTOR OIL**


Country	Amount (kg/ha)
F	1.72
I	1.95



**ACTIVITY CARRIED OUT FROM 2000**

**from 2002:** no further material was received

**2003-2004:** First determination of waste waters amount due to sprayers cleaning



**OTHER LIQUID WASTE WITH HIGH IMPACT ON WATER POLLUTION THAT COULD BE CONSIDERED BY THE SURVEY**

**Waste water from pesticide application**







**WASTE WATER FROM PESTICIDE APPLICATION**

The problem:

up to 3% of the mixture sprayed is deposited on the external surface of the sprayer

an amount of mixture up to 4% of the tank capacity could still be present inside of the sprayer after pesticide application



local pollution due to pesticide mixtures  
contamination of surface water  
human exposure  
fitotoxicity (i.e. glifosate vs. gmo crops)

OEPA Pesticides WASTE MANAGEMENT GROUP

**PROPOSAL OF ACTION TO PROMOTE AND DEVELOP THE ACTIVITY OF THE WORKING GROUP "OTHER WASTES"**

- 1 - To find economical support to continue the activity
  - EU concerted action
  - private company of packaging and chemical products
  - national organisation
- 2 - to find the correct solution for the management of "other wastes"
- 3 - to improve data collection from "Other wastes" partners
- 4 - Production of FAO Ramiran guidelines

OEPA Pesticides WASTE MANAGEMENT GROUP

**NO MONEY = NO ACTIVITY!**

OEPA Pesticides WASTE MANAGEMENT GROUP

### III.7. Report of the working group on Information Technology (Chairman : Jan Venglovsky)

The 10th RAMIRAN Conference has decided to establish a new working group for information systems and chosen the new [www.ramiran.net](http://www.ramiran.net) domain as the main source of information for the whole network. Dr. Jan Venglovsky was nominated and unanimously elected chairman of this working group.

The agreed concept of the website has been implemented within a month to be presented on ISAH congress in Mexico City held 25th February 2003. Technically, the website is hosted on a Unix based machine running a web server and a database server that is directly connected with the web site. Interactive web services provide for an automated update of each member's information that can be then searched via internal search engine. Currently, there are no funds budgeted to support operations and maintenance of this website. Functions of this environment are maintained by Mr. Tomas Venglovsky who provides the hardware, software and high speed Internet access free of charge. The contents are updated by Dr. Jan Venglovsky, with some bits being available to the users to update themselves.

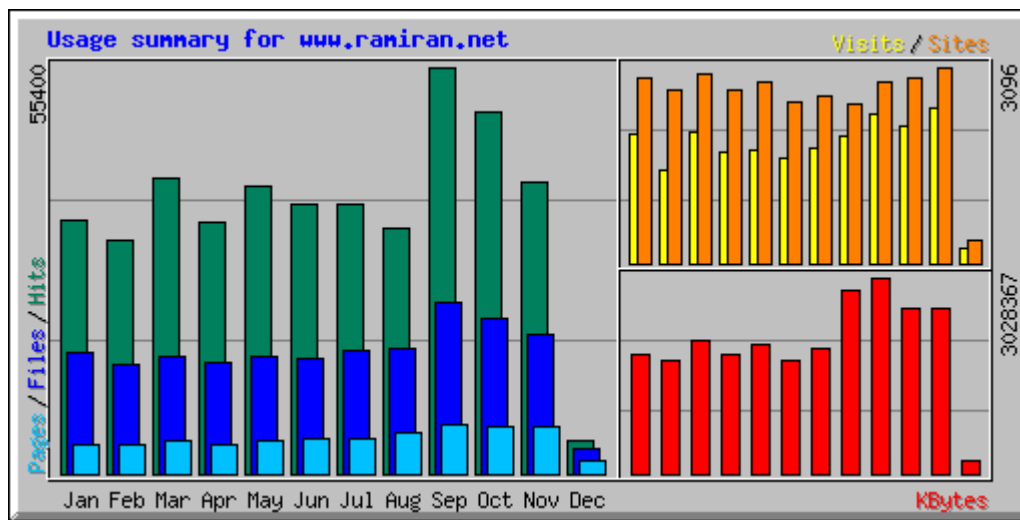
## Statistics

Access and traffic of the website are constantly logged and regularly monitored. Statistics are generated from access logs on hourly basis and are also available online on [www.ramiran.net/stats](http://www.ramiran.net/stats) with historical data since the website has been launched.

Over the past 12 months the website encountered over 435 thousand hits with almost 22 thousands unique visits, each month averaging to some 90 different countries. Following figure demonstrates the status as of Dec. 3<sup>th</sup> 2004.

Summary by Month										
Month	Daily Avg				Monthly Totals					
	Hits	Files	Pages	Visits	Sites	KBytes	Visits	Pages	Files	Hits
<a href="#">Dec 2004</a>	1357	946	526	74	359	194895	222	1578	2839	4072
<a href="#">Nov 2004</a>	1320	630	215	81	3096	2534160	2442	6469	18911	39603
<a href="#">Oct 2004</a>	1586	679	208	69	2927	2563306	2163	6472	21079	49185
<a href="#">Sep 2004</a>	1846	776	220	78	2868	3028367	2359	6612	23305	55400
<a href="#">Aug 2004</a>	1081	548	177	64	2497	2827917	1998	5499	16998	33523
<a href="#">Jul 2004</a>	1187	542	153	58	2624	1916827	1827	4753	16806	36819
<a href="#">Jun 2004</a>	1222	526	163	55	2528	1749906	1652	4911	15801	36680
<a href="#">May 2004</a>	1264	517	145	57	2846	2005816	1786	4495	16041	39203
<a href="#">Apr 2004</a>	1143	503	132	57	2739	1853609	1738	3971	15093	34290
<a href="#">Mar 2004</a>	1302	513	144	66	2989	2051233	2074	4483	15930	40372
<a href="#">Feb 2004</a>	1100	509	137	50	2726	1735025	1470	3973	14763	31906
<a href="#">Jan 2004</a>	1117	536	131	65	2913	1825313	2028	4089	16616	34656
<b>Totals</b>						<b>24286374</b>	<b>21759</b>	<b>57305</b>	<b>194182</b>	<b>435709</b>

Over 195 thousand files were transferred over the network amounting to 24 gigabytes of information being distributed among RAMIRAN members. The following figure graphically illustrates the above



There are enormous technical possibilities to enhance this valuable source of information. Your ideas and inputs are highly appreciated.

We would appreciate any proposals and suggestions concerning the design and contents of the website.

## Appendix IV List of participants

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