EM research in the Netherlands
(1997 - 1999)
by
Agriton and EMRO Nederland.
a Review

by

dr. ir. M.G.M. Bruggenwert

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Noordwolde, 22 - 7 - 1999

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I. Influence of EM on SOIL characteristics.

I.1. Influence of EM1 on the growth of micro-organisms in soil and sludg".

Aim:

To test the effect of EM1 on 10 micro-organisms isolated from soil and sludge and the air.

Method and materials:

The effect of:

- EM1 not diluted; pH 3.70;
- EM1 in water 1 : 100;
- EM1 not diluted; heated up to 90 °C;
- EM1 not diluted; pH 6.50

on 10 micro-organisms belonging to:
Azotobacter; Rhizobium, Pseudomonas, Bacillus, Streptomyces,Mycobacterium, Serratia, Escherichia; Saccharomyces and Penicillium.

Proper agar media are contaminated with these micro-organisms. EM1 is added to holes which are made in the agar.

Results:

Concerning EM1 not diluted, and EM1 not diluted heated up to 90 °C:

- Inhibition of the growth of all bacteria tested.
- Growth of fungi and yeasts is not inhibited.
Concerning EM1 in water 1: 100, and EM1 not diluted pH 6.50:

- No inhibition of the growth of all the micro-organisms tested.

**Conclusions:**

There is a pH effect. The low pH of EM1 not diluted causes negative effect on growth of the bacteria tested. Fungi and yeast can stand this low pH value.

EM1 heated up to 90 °C shows the same negative effect.

This negative effect disappears when EM1 is diluted (1: 100) and also when the pH is increased to 6.50: now the concentration of organic acids is low.

**Conclusion:**

EM1 diluted (1: 100 - 1000) can have no any negative effect on the microbial live in soils, in water or on plants.


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**I.2. "EM-technology on meadows: Effect on organic matter content of soil."**

**Aim:**

Some soil scientists in the Netherlands are afraid that EM1 can have a strong negative effect on the organic matter content of soils. The aim of this experiment is to see whether there is a reason for this fear.

**Methods and materials:**

Spring 1997: 32 field trials (100 m2 each) are installed at a pasture of the WUR, and soil samples are taken. Different amounts of fertilizers, manure and EM1 are added to these fields. Soil samples are taken again in spring 1998.

Soil Samples are analysed for:
- C total (Kurmis);
- CEC (Bascomb);
- N total and P total.

**Results:**

Table: Summary of the results of analyses of the soilsamples:
Difference between the mean values of the contents of C-, N-, and P as well as the CEC measured in spring 1998 and the values of the same parameters measured in spring 1997.

<table>
<thead>
<tr>
<th></th>
<th>EM0</th>
<th></th>
<th>EM+</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>C-content</td>
<td>+ 4.3 g/kg</td>
<td>+ 8.8 %</td>
<td>+ 5.0 g/kg</td>
<td>+ 10.0 %</td>
</tr>
<tr>
<td>CEC</td>
<td>-1.2 cmol/kg</td>
<td>- 2.7 %</td>
<td>-1.9 cmol/kg</td>
<td>- 5.1 %</td>
</tr>
</tbody>
</table>
Conclusion:

Under the prevailing experimental conditions this first orientation shows no significant negative effect of EM1 on CEC and total amount of C, N and P in the soil. So: no evidence for a strong decrease in soil organic matter.


I.3. "Development of organic matter content and pH-value in meadow soils on farm level".

Aim:

To follow the effect of the application of EM1 in combination with crushed sea shells and clayminerals (bentonite) on the organic matter content and pH of the soil.

Methods

On farm level, 16 parcels of Attema’s dairy farm are treated with EM1(4 L/ha/year), crushed sea shells (500 kg/ha, 3 years) and clay minerals (300 kg/ha, year) in combination with manure and fertilizers. This treatment started in 1995. Soil samples are taken and analysed in spring 1994 and in spring 1999 by the Institute for Plant and Soil Analyses: BLGG.

Results:

Table: Organic matter and pH as measured by BLGG.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>organic matter %</td>
<td>pH</td>
<td>organic matter %</td>
<td>pH</td>
</tr>
<tr>
<td>1</td>
<td>12.9</td>
<td>5.4</td>
<td>32.0 (+ 19.1)</td>
<td>5.7 (+ 0.3)</td>
</tr>
<tr>
<td>2</td>
<td>43.0</td>
<td>5.8</td>
<td>36.3 (- 6.7)</td>
<td>5.8 (+ 0.0)</td>
</tr>
<tr>
<td>3</td>
<td>23.1</td>
<td>5.4</td>
<td>33.6 (+ 10.5)</td>
<td>5.6 (+ 0.2)</td>
</tr>
<tr>
<td>4</td>
<td>6.1</td>
<td>5.6</td>
<td>12.0 (+ 5.9)</td>
<td>5.7 (+ 0.1)</td>
</tr>
<tr>
<td>5A</td>
<td>20.4</td>
<td>4.6</td>
<td>28.8 (+ 8.4)</td>
<td>5.3 (+ 0.7)</td>
</tr>
</tbody>
</table>

| N-content | -0.23 g/kg | - 5.0 % | -0.08 g/kg | - 1.7 % |
| P-content | -50 mg/kg  | - 4.5 % | - 12 mg/kg | - 0.8 % |
### Conclusion:

In 13 parcels there is a strong increase (often a remarkable increase) in organic matter content as measured by BLGG. The treatment of the soil has also a positive effect on the pH value.


### II. EM-technology in SOIL - PLANT systems

#### II.1. "Influence of EM on yield and uptake of NPK by grass: a pot experiment"

**Aim:**

To study the effect of EM1 applied in combination with several additions of fertilizers and cattle slurry under well defined conditions in a greenhouse.

**Methods and materials:**

Each pot is filled with 6 kg calcareous sea clay soil. Treatments are as follows:

- Fertilizer (NH\textsubscript{4}NO\textsubscript{3}) two treatments: 1) no fertilizers; 2) NH\textsubscript{4}4NO\textsubscript{3} 250 kg N/ha.
- Cattle slurry, three treatments: 1) no slurry; 2) 30 ton slurry/ha; 3) slurry treated according to the Agriton procedure (30 ton/ha), combined with initial addition to the soil of crushed sea shells (6 ton/ha) and clay minerals (6 ton/ha). Remark: Agriton treatment of slurry includes addition of sea shells and clay minerals to the cattle slurry at the farm.
- EM-technology, two treatments: 1) no EM1; 2) EM1 weekly sprayed (1L/ha) combined with initial addition to the soil of EM1 (1L/ha).
Different treatments: 6 with and 6 without EM1. Each treatment is repeated 3 times: 36 pots.
Moisture content is kept constant by daily addition of demineralized water.
Two cuts are earned. Fresh and dry weight as well as the content of N, P and K of the dry material are measured. Results are analyzed statistically with ANOVA and LSD ($a = 0.01$).

**Results:**

1. Effect of EM1 on the yield of the dry weight.
   - **First cut:** In all the six treatments the mean dry weight of grass in pots treated with EM1 is higher than the mean dry weight of grass in the similar pots without EM1.
     In three of these six treatments this effect was statistical significant.
     The effect of EM1 seems to be more effective at lower additions of nutrients.
     **Second cut:** the yield of the dry weight in pots treated with EM1 is in general lower than in pots without EM1. The effect of EM1 is non significant for all the six treatments.
     **First plus second cut:** Dry weight with EM1 is somewhat higher than without EM1. However the significant effect of EM1 as found in the first cut disappeared, because of the results of the second cut.

2. Effect of EM1 on the uptake of Nitrogen, Phosphate and Potassium.
   - Nitrogen: in pots with EM1 uptake in first cut somewhat higher than in pots without EM1.
   - The opposite holds for the second cut. For both cuts the effects were never significant.
   - Phosphate and potassium: In general no significant effect of EM1 was noticed. An exception was found in the first cut: treatments without manure show a significant positive effect.

**Conclusions:**

This experiment shows that also under certain Dutch (and West European) conditions EM1 can have a significant positive effect on the growth of grass.
Further research is necessary to improve knowledge concerning these conditions.


**II.2. "Influence of EM on quality and quantity of grass production: field trials".**

**Aim:**

To study with field trials in a meadow the effect of EM1 applied in combination with several additions of fertilizers and cattle slurry.

**Methods and materials:**

Field trials (36, 100 m2 each) are treated as follows:

- Fertilizer ($\text{NH}_4\text{NO}_3$) two treatments: 1) no fertilizers; 2) $\text{NH}_4\text{NO}_3$ usual amounts.
- Cattle slurry, three treatments: 1) no slurry; 2) cattle slurry: usual amounts; 3) cattle slurry treated according to the Agriton procedure: usual amounts.
- EM-technology, two treatments: 1) no EM1; 2) EM1 sprayed two times 1L/ha.

Different treatments: 6 with and 6 without EM1. Each treatment is repeated three times: 36 plots.

Two cuts are earned. Fresh and dry weight as well as the content of N, P and K of the dry material are measured.
**Results:**

No statistical evidence was found for a effect of EM1. Unfortunately the heterogeneity of grassland turns out to be too high.


**II.3. "Influence of EM on quality and quantity of grass production: on farm research".**

**Aim:**

In order to improve insight concerning the possibilities of EM-technology on meadows (on farm research), attention will be given to the influence of EM1 on quantity and quality of grass, in particular when nutrient supply will be decreased. Attention is also focused on the relation between yield and the way nutrients are supplied: fertilizer or cattle manure. Does EM1 increase the efficiency of nutrients present in manure?.

**Methods and materials:**

Farm 1: sandy soil. A parcel divided in three subparcels, about 0.6 ha each.
Farm 2: heavy river clay soil. A parcel is divided in four subparcels, about 0.5 ha each.
Related to the goal of this experiment, in 1997 as well as in 1998 the subparcels are treated with fertilizers, cattle slurry and EM1 in different ways.
First and second cut: yield of dry matter is determined and its quality is analysed.

**Results:**

Farm 1 and 2:

- N-fertilizer on one side, and N-cattle slurry in combination with EM1 on the other side show the same relation between production of dry matter and amount of nitrogen added
- Yield (dry matter) on subparcel treated with EM1 and usual amounts of cattle slurry and fertilizer is almost equal to the dry matter production of the subparcel treated with EM1, cattle slurry and a very small amount of fertilizer.
- The quality of the grass is almost the same for all the treatments.
- Yield of parcels which are treated in the same way can differ a lot.

**Conclusions:**

Under the prevailing conditions:

- Nitrogen added as cattle slurry in combination with EM1 shows the same efficiency as N-fertilizer: Efficiency N-cattle slurry + EM1 ≥ Efficiency N-fertilizer.
- In combination with applications of cattle slurry and EM1, the usual amount of fertilizers can strongly be decreased, keeping the yield almost on the usual level. This is important for farmer and environment: farmer works within environmental laws.
- The quality of grass is not influenced by addition of EM1 and the decrease in fertilizers
- A lot of unknown causes may influence the yield. Interpretation of results from "on farm research" must be done very carefully.
- Further research also under well defined conditions is important in order to improve insight of the
influence of environmental conditions (soil, plant, manure, tillage, etc.) and optimal application of EM-technology.


**Remark**: Experiment will be continued in 1999 on one farm. The other farm with sandy soil uses no fertilizers anymore, because of the positive effect of cattle slurry treated with EM1.

### II.4 "Influence of EM1 on chlorophyl-fluorescence".

**Aim:**
Experiences show that EM1 has a positive effect on the vitality of plants: use of sunlight energy should be increased. This experiment focuses the attention on the influence of EM1 on the photosynthetic activity of plants.

**Methods and materials:**
Photosynthetic activity is measured with the EARS Plant Photosynthesisimeter (PPM). Measurements are made on four locations: three with grass and one with maize. Eight parcels are involved, four with and four without EM1 treatment. In order to have statistical evidence, thirty measurements are made on each parcel. Measurements are made within one day.

**Results:**
Table: Mean PPM-values measured on the eight parcels.

<table>
<thead>
<tr>
<th>Location</th>
<th>Plant</th>
<th>PPM-value with EM1</th>
<th>PPM-value without EM1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>grass</td>
<td>78.6 ± 1.2</td>
<td>59.0 ± 1.2</td>
</tr>
<tr>
<td>2</td>
<td>grass</td>
<td>63.4 ± 0.6</td>
<td>59.0 ± 0.6</td>
</tr>
<tr>
<td>3</td>
<td>grass</td>
<td>71.4 ± 0.8</td>
<td>57.3 ± 1.3</td>
</tr>
<tr>
<td>4</td>
<td>maize</td>
<td>53.8 ± 0.8</td>
<td>36.2 ± 2.1</td>
</tr>
</tbody>
</table>

**Conclusions:**
- EM1 treated parcels show a statistical significant higher photosynthetic activity than the parcels without EM1.
- Visual observable differences (quality of sod, length of maize, etc) correspond with differences measured in PPM-values.
- During the growing season more measurements are necessary to see to what degree these differences are representative for the whole season.
- Besides the EM1 treatment other factors can have influenced the differences in PPM-values.
• N-fertilizers was added to all the parcels except those parcels treated with EM1 on location 1, 3 and 4.

1998. Dr. D. Ketel. Dept Agro-Biology, WUR.

II.5. "Application of EM1 in Horticulture".

Aim:

In 1999 Agriton initiates application of EM-technology in horticulture. In the Netherlands horticulture, which is very important from economical point of view, struggles a lot: on one side there is a fast increase in the occurrence of diseases and pests, while on the other side environmental laws limit the application of pesticides in an increasing degree. To what extent can EM-technology helps the market gardeners?.

Methods and materials:

About 15 market gardeners are involved in this experiment. EM1 and bokashi are added to the soil; EM1 is sprayed. These market gardeners strongly decrease the use of pesticides in their greenhouses.

Results:

The experiment is still going on. First results are interesting. Some examples:

• One market gardener couldn’t grow tulips anymore because of pythium. After application of bokashi and EM1 he could grow tulips again very well.
• Young plant cuttings root much better in potsoil which is treated with EM1.
• In certain greenhouses the impact of pests is almost zero when EM1 is sprayed weekly; usual spray of pesticides is not necessary. However in another greenhouse plants are still covered with pests in spite of the use of EM1.
• EM1 sprayed weekly improved the growth of young cuttings.
• Addition of bokashi to potsoil needs more attention. The potsoil used was not prepared in the proper way. Moreover attention must be given to the nutrient supply in relation to the need of the plants.

Conclusion:

Based on the first results most of the market gardeners who become acquainted with EM-technology are very enthusiast and will continue with this technology. Experiment will be continued.

1999. F.D. van den Ham (Agriton) et al. in cooperation with dr. C. Kempenaar Institute for Agr. Biology, WUR.

II.6. "Effect of EM present in soil and soil - plant systems".

Introduction:
According the Dutch legislation the government has to give permission to use EM-products in agriculture. Such a permission is based upon positive results of scientific experiments carried out by a known research institute; concerning additives to plant-soil systems the NMI (Nutrient Management Institute) is recommended. In order to get the permission, NMI carries out an experiment in summer 1999 on request of Agriton.

**Aim:**

Part 1 of the project:

- To determine the effect of EM1 on the microbial activity in soils.
- To determine the effect of EM1 on the amount of N, P and K in soils available for plants.

Part 2 of the project:

- To determine the effect of EM1 on the production of dry matter of maize.

**Methods and materials:**

Part 1.
Six soils which are representative for Dutch agricultural soils are treated with combinations of cattle slurry, bokashi and EM1. Soils are incubated in semipermeable sacks. CO$_2$-flux as well as the chemical available N, P and K are determined after incubation periods of 3 and 8 weeks.
Total experimental units is 144: (6 soils * 2 (cattle slurry yes/no) * 2 ( EM1 yes/no) * 2 ( time periods) * 3 (repetitions).

Part 2.
Pot experiment with maize: 10 maize seeds/pot. Each pot will be filled with about 7 kg sea clay soil and a certain combination of EM1, cattle surry and bokashi. Temperature (20 °C) and optimal moisture content will be kept constant. Three weeks after germination 6 plants are analysed for fresh weight and dry matter. Eight weeks after germination the remainder 4 plants are analysed in the same way.

**Results:**

Part 1:
First analyses of the results of the CO$_2$ production as well as the available N, P and K give no clear indication concerning an effect of EM1.

Part 2:
Results of this part2 of the project are not available yet.

**Conclusion:**

Conclusions will be drawn as soon the results of part 2 are available.


**II.7. "Influence of EM1 on growth and quality of sugar beets".**

**Aim:**
To determine the effect of EM1 and bokashi given in combination with chicken manure and different amounts of fertilizers on yield and quality of sugarbeets.

**Methods and materials:**

Experiment is carried out by the Institute for Rationalization of Sugar Industry, (IRS), Bergen op Zoom.

Field plots (about 50 m² each) on reclaimed peatland. Chicken manure is added to all the plots in spring. Further treatments:

1. controle;
2. 50 kg N-fertilizer/ha;
3. 100 " "
4. 150 " "
5. 200 " "
6. controle + EM1 (4 * spray with 10 L/ha) ;
7. 50 kg N-fertilizer/ha + EM1;
8. 150 kg N-fertilizer/ha + EM1;
9. 50 kg N-fertilizer/ha + EM1 + 500 kg/ha crushed sea shelves + 300 kg/ha clay minerals;
10. 50 kg N-fertilizer/ha + 100 kg/ha Bokashi

Total number of plots is 40. 10 treatments and 4 repetitions.

Soil samples (0-60 cm of treatments 1 and 6 ) will be analysed for N-mineral in May. Development of the plants will be evaluated monthly. In autumn quantity and quality of sugarbeets will be determined.

**Results:**

Will be available in autumn 1999.


**III EM-technology and ANIMAL HUSBANDRY.**

**III.1. "Influence of EM on resistance of piglets against diseases".**

**Aim:**

The aim of this study is to investigate whether the antibiotics in the diet can be replaced by EM.

**Methods and Materials:**

On farm research. 852 piglets were studied in a 2 * 2 arrangement of treatments:
1: Replacement of antibiotics (Avilamycin or Olaquindox a growth promoter) by EM1;
2. Increase crude fibre content of the diet.

The animals were housed in 4 units of 14 pens in daylight and 2 units of 20 pens mainly kept in dark.
Measurements are made concerning health and growth of the piglets.

**Results and conclusions:**

Unfortunately, effect of EM treatment was not evident. Reasons are:

- The EM treatment in this study was not optimal, the method of application and timing of the treatment have to be improved. EM bokashi should be blended with the diet, while EM1 should be mixed through the drinking water and EM should be sprayed on the walls of the pens.
- There was a large effect of other factors such as housing.

1997. Dr. P. Van Diepen et al. Dept. for Animal Husbandery, WUR in cooperation with Molenaars Fofbedrijf, Markelo, the Netherlands.

**III.2. "Influence of EM1 on grass and cattle: on farm research".**

**Aim:**

To study the effect of EM-technology on:

- quantity and quality of grass;
- quantity and quality of milk;
- growth rate of young stock;

**Materials and methods:**

On farm research at the experimental farm "de Ossekkapen" of the WUR. In 1997 the grassland is divided in two parts: 43 ha is sprayed with EM1 (4 times 1L/ha); 30 ha without EM1. All the parcels are treated as usual with cattle slurry and chemical fertilizers. Two herds of dairy cattle have been composed: one herd of 21 cows (EM-cows) was treated with EM (0.5 kg EM-bokashi per day; EM grass). The second herd didnâ€™t get any EM. Groups of young stock have been formed: 2 groups with EM and 2 groups without EM.

**Results:**

The results in 1997 are:

<table>
<thead>
<tr>
<th></th>
<th>+ EM</th>
<th>- EM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grass; dry matter (DM) yield (ton/ha)</td>
<td>7.0</td>
<td>6.8</td>
</tr>
</tbody>
</table>

Composition of silages:

<table>
<thead>
<tr>
<th></th>
<th>+ EM</th>
<th>- EM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude protein (%DM)</td>
<td>15.0</td>
<td>16.1</td>
</tr>
<tr>
<td>Net Energy for Lactation (NEL)</td>
<td>5.3</td>
<td>5.8</td>
</tr>
<tr>
<td>Crude fibre (%DM)</td>
<td>29.6</td>
<td>27.0</td>
</tr>
<tr>
<td>Sugar (%DM)</td>
<td>2.0</td>
<td>6.3</td>
</tr>
<tr>
<td>Ammonia fraction</td>
<td>10</td>
<td>7</td>
</tr>
</tbody>
</table>

Milk production: kg/cow/day

<table>
<thead>
<tr>
<th></th>
<th>june - december</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ EM</td>
<td>20.3</td>
</tr>
<tr>
<td>- EM</td>
<td>18.8</td>
</tr>
</tbody>
</table>
Growth of young stock: g/day

<table>
<thead>
<tr>
<th>Period</th>
<th>Yield</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>15/8 - 24/2</td>
<td>839</td>
<td>+14%</td>
</tr>
<tr>
<td>15/8 - 24/2</td>
<td>777</td>
<td>+3.5%</td>
</tr>
</tbody>
</table>

Conclusions:

- In general, the time period for the experiment is too short to see clear effects of EM.
- Yield of grass: no clear influence of EM on quantity and quality.
- Production of milk (quantity) tends to be influenced positively by EM. The same holds for the growth rate of young stock.


III.3. "Influence of EM on growth and condition of pigs".

Aim:

Growth and condition of piglets will be improved by addition of fermented materials. However, to ferment material on a large scale is not easy. It is expensive and difficult because poisoned material can be formed. In this study the attention is focused on the application of EM fermented plant extracts (EM-FPE): can EM-FPE diminish the present problems of the large scale fermentation? Moreover, a proper fermentation including the production of probiotic matter is important because the application of chemical antibiotics will be forbidden. Within the context of these problems, this study focuses the attention on the effect of addition of EM-FPE to the drinking water of piglets, their growth and condition.

Methods and materials:

In the first experiment EM-FPE will be added to drinking water of the piglets (1: 5000). Scale of the experiment: 400 piglets will be involved: 40 pens with 10 piglets each. 20 pens with EM-FPE and 20 without EM-FPE. Experiment is planned in autumn 1999 - spring 2000 by the National Centre for pigbreeding, Rosmalen, the Netherlands.

J. Scholten et al. Centre for Pigbreeding, Rosmalen, the Netherlands.

III.4 "Influence of EM1 on growth of pigs and on processing of manure".

Aim:

Part 1.
To study the effect of EM treatment on growth and condition of pigs. EM treatment involves addition to the feed, to the drinking water and spraying on the walls of the pigsties.

Part 2.
To study the application of EM1 in order to improve the processing of liquid manure.

Methods and materials.
Details concerning the experiment are in discussion.
Time period: is planned autumn 1999.

Experiment will be carried out in cooperation with Geurts Pig feeding farm, Helden, and Jansen Poultry Equipment, Barneveld, the Netherlands.

III.5. "Influence of EM1 on growth and quality of broilers".

Aim:
To study to what degree EM1 and Bokashi can influence:

- the growth of young chickens;
- the need for antibiotics, medicines, vaccinations and the addition of vitamins etc.

Materials and methods:
First pilot experiment is executed summer 1999:

- Henhouses (roof, walls, floor) were sprayed with diluted EM1.
- Bokashi is put on the floor and EM1 covered with wood scrubs.
- EM is mixed through the feed.
- Crushed sea shells are added to the feed.
- Usually vitamins and minerals are added to the drinking water and feed. In this experiment these products were not added to the drinking water.
- EM1 sprayed daily.
- Vaccinations as usual.

18,000 chickens per 740 m2.

Experiment performed at the farm of J. Dekker, Westerhaar-Vriezenveensewijk, The Netherlands.

Results:
Preliminary results of the pilot experiment:
According to the farmer and veterinary surgeon:

- Legs are stronger. This is very important because usually young chickens suffer a lot from weak legs. This gives difficulties to get feed and water.
- Chickens are healthier than usual: less diseases.

It is difficult to decide to what degree these phenomena are induced by EM treatment, since the experience with this group can only be compared with experiences of former groups. Therefore other factors can influence these results as well.

Conclusion:
Farmer is very positive concerning the possibilities of EM-products.
New experiments will be executed in summer 1999: EM1 will be blended through the feed and antibiotics will be reduced to zero.

1999, J. Dekker in cooperation with company "de Hoop" (feed factory) and Agriton.
IV Miscellaneous.

IV.1 "Micro-organisms present in EM1".

Aim:


Results:

Samples of EM1 contain about $10^7$ micro-organisms/ml.
Major part consists of Lactobacillus and Lactococcus (lactic acid bacteria): $5 - 10 \times 10^6$/ml.
Saccharomyces and Candida (yeasts): about $10^5$/ml.
Other micro-organisms in very low concentrations or not present.
Question mark concerning presence of photosynthetic bacteria.

1998. Dr. A. van Egeraat. Dept. Microbiology, WUR.

IV.2. "Discussions concerning the possibility to measure the quality of products treated with EM"

Aim:

Question is:
Would it be possible to measure the influence on the quality of products induced by the microbes (energy?..... forces?, .... change in structure of the material? ..... ) ?

Discussions concerning the application of:

- NMR with dr. De Waard, dept. ATO, WUR.
- Light-induced photon emission with dr. van Wijk. Dept. Molecular cell Biology, Utrecht State University, Utrecht, the Netherlands.
- Technics used by the National Institute for Applied Natural Research TNO, Zeist the Netherlands. Discussion with dr. Knol.

Conclusions:

- This type of research is very expensive.
- Results are uncertain.
- It will be difficult to introduce these new methods and to validate their results in practice.