EM TECHNOLOGY

PRACTICAL MANAGEMENT GUIDE

for

POULTRY & LIVESTOCK PRODUCTION

Manufactured by:

EM RESEARCH PHILIPPINES
3/F unit N, Westgate Tower, Investment Drive,
Madrigal Business Park, Alabang Muntinlupa City
Tel. # 807-2347 Telefax 842-7584
E-mail: emresearchphils@yahoo.com
Website: www.emro.co.jp

EM IN POULTRY & LIVESTOCK PRODUCTION

Introduction

To be competitive in today's market, the modern livestock producer must constantly innovate and look for new production techniques and tools. Our company**,** is involved in the promotion of **EM-1** (**Effective Microorganisms**) microbial inoculant to the Filipino raisers. EM Technology was developed in Okinawa, Japan in the 198's by **Dr. Teruo Higa** and spread to more than 50 countries around the world. EM Technology holds a great promise for the Filipino poultry and livestock producers. It is cost effective, easy to apply and produces wonderful results for odor control, animal performance and in areas of wastewater management, sanitation, and organic fertilizer production out of the manure.

Overview of usage

EM Technology offers the 3-point program for a very satisfactory result. The program includes :

1. EM-1 inclusion in the **drinking water**;
2. EM Bokashi B inclusion on **the animal feeds**; and,
3. EMAS sanitation **spray**.

Added features of EM Technology in animal production are, a). lagoon treatment with EMAS, b). the Trampling method, and c). manure treatment to convert to organic fertilizer.

Products available

EM Research Philippines, Inc. offers the following products for poultry and livestock producers:

1**. EM-1** liquid microbial inoculant **- BAI Registration # VRM 97-408-A**

2. EM Bokashi B solid microbial inoculant – **BAI Registration # 97-407**

Benefits derived from EM use in animal production

1. **Eliminates foul odor.** Odor compounds e.g. derivatives of ammonia, hydrogen sulfide, methyl mercaptan and methyl sulfide, etc are usually produced through the metabolic action of putrefying microorganisms. Introduction of EM can suppress the action of these microbes and achieves breakdown of organic matter without producing odorous compounds.

2. **Prevents disease development and epidemics.** Through the principle called "***competitive exclusion***", EM can limit the population of pathogenic microbes thus suppressing their pathogenic activities. Aside from that, EM improves the general health of the animals thus increasing the resistance to diseases.

3. **Treats waste to pass allowable discharge criteria.** The microbes in EM digest pollutants in the wastewater. Given enough time and engineering support, these microbes can bio-remediate farm wastewater.

4. **Improves growth rate.** With better feed utilization and improved animal well-being, there is a marked improvement in growth of the animals.

5. **Decreases mortality rate**. As a consequence of less disease outbreaks, mortality of animals in the farm decreases.

6. **Increases weaning rate and adult fertility**. With the general improvement in the environment and health, the breeders produce more viable sperms and eggs thus improving their fertility rates. EM offers resistance to gastro-intestinal disorders of very young animals thus improving survivability.

7. **Improves quality of produce like taste, texture and smell.** Since the animals are not receiving too much synthetic chemical inputs, the meat, milk or eggs produced are devoid of chemical residues that may pose harm to consumers health.

8. **Helps convert animal waste into organic fertilizer.** Animal manure when fermented with EM has high nutrient value and are pathogen-free.

EM in Broiler Production

As Drinking Water Additive

Add EM-1 on the daily drinking water of the flock at the following rates and schedules:

Day 1-14	0.5 ml per liter of drinking water or 2 ml per gallon of drinking water
Day 15 0nwards	0.25 ml per liter of drinking water or 1 ml per gallon of drinking water

CAUTION: DO NOT MIX WITH ANTIBIOTICS. WITHDRAW EM APPLICATION 3 DAYS BEFORE AND 3 DAYS AFTER EVERY ANTIBIOTIC ADMINISTRATION.

As Feed Additive

Add EM Bokashi B on the daily ration of the flock at the following rates and schedules:

Day 1-7	3% of the total feed requirement or 30 kilos per ton of feeds-
Day 8-14	2% of the total feed requirement or 20 kilos per ton of feeds
Day 15 onwards	1% of the total feed requirement or 10 kilos per ton of feeds

As Sanitation Spray

Dilute 1 liter of EM Activated Solution with 50 liters water. Spray at the rate of 0.5 liter per square meter, at the following schedules:

a. 3 to 7 days before loading, after the last chemical disinfection or fumigation, spray to ceilings, floors and walls of the housing.

b. Spray onto the manure weekly until harvest time.

CAUTION: EMAS SHOULD NOT TO BE SPRAYED OR MIXED WITH DISINFECTANTS AND/OR ANY CHEMICAL WITH KNOWN BACTERICIDAL OR FUNGICIDAL PROPERTIES.

EM in Egg Production

As Drinking Water Additive

Add EM-1 in the daily drinking water of the flock at the following dates and schedules:

Day 1-14	0.5 ml per liter of drinking water or 2 ml per gallon of drinking water
Day 15 onwards	0.25 ml per liter of drinking water or 1 ml per gallon of drinking water

CAUTION: DO NOT MIX WITH ANTIBIOTICS. WITHDRAW EM APPLICATIONS 3 DAYS BEFORE AND 3 DAYS AFTER EVERY ANTIBIOTIC ADMINISTRATION

As Feed Additive

Below is the application rate of Bokashi B in relation to age and production stage of layers:

Age in weeks/Production Stage	**Bokashi Inclusion in Feeds (% of Total Feed Consumption)**
0-18 Brooding to pre-lay	3
18-21 Onset of Laying	2
22-28 First egg to peak laying	1
29-35 Peak production	1
36-onwards	1-5 Challenge feeding

Challenge feeding - The inclusion of Bokashi B shall be gradually increased from 1% up to a maximum of 5% on a weekly basis, that is, 2% on the second week, 3% on the third week and so on. The increment shall be stopped as soon as the layers respond

As Sanitation Spray/Deodorizer

Dilute one liter EM Activated Solution with 50 liters water. Spray at the rate of 0.5 liters/m^2, at the following schedules:

a. Three to seven days before loading or after the last chemical disinfection or fumigation, spray to the ceilings, floors and walls of the housing.

b. Spray to the manure weekly until culling time.

CAUTION: NOT TO BE SPRAYED OR MIXED WITH DISINFECTANTS AND/OR ANY CHEMICAL WITH KNOWN BACTERICIDAL OR FUNGICIDAL PROPERTIES.

Waste Management

One of the most effective ways to control odor in a layer farm is to have an effective waste management program. Suppressing odor compounds will also decrease the stress due to toxic gases. Therefore, there is improvement in laying performance and general health of the flock.

For housing types that cannot permit a regular spraying, the use of EM Bokashi C to neutralize odor and reduce emission of toxic gases is highly recommended.

Use of fine organic materials, such as sawdust, rice hull, coarse or reject rice bran, coconut coir dust (peat) to reduce the wetness of the manure under the layer house is advisable. To do this, add one (1) part of charcoal for every ten (10) parts of organic materials and one (1) kilogram of EM Bokashi C. Mix very well and scatter evenly on the manure. Repeat this procedure every month or as often as necessary.

Collect all the litter under the house after culling. If the moisture is very high, add more organic materials. Put the manure in a fermentation bin or sacks and age until decomposition is completed. Signs of matured EM compost/organic fertilizer:

a. The original material is no longer recognizable.

b. There is neither a foul nor a fermented smell.

EM in Swine Production

As Drinking Water Additive

To induce faster development of the immune system of newborn pigs and to reduce pre-weaning mortality due to respiratory diseases and scouring, it is recommended to introduce EM technology at the youngest age possible.

If possible, give the sucklings EM drops at the rate of 3 ml per day until the sucklings learn to drink water.

As soon as the piglets are drinking water, they may receive EM through the daily drinking water. Add EM –1 into the drinking water at the rate of 0.5 ml per liter of drinking water for the first two (2) weeks. Succeeding application may be given at 0.25 ml per liter of drinking water.

As Feed Additive

Add EM Bokashi B on the daily ration of pigs at the following rates and schedules:

Breeders	1% of the total feed requirement for the first week and 0.5% of the total feed requirement from thereon
Market pigs	3% of the total feed requirement for first week 2% for the second week 1% for the third week 0.5% from thereon until market time

As Sanitation Spray and Deodorizer

Dilute one (1) liter EM-1 Activated Solution with 50 liters water and spray at the rate of 0.5 liters/m^2 weekly for the first month. As conditions improve, dilution rate can be lowered to 1 liter EMAS per 100 liters water.

As Wastewater and/or Lagoon Treatment

Seed EM-1 weekly at the rate of 1 liter per 1,000 liters of wastewater. The frequency of application may be reduced as the conditions improve. Seeding may be started 30 days after feeding and drinking applications. To enhance the activity of the microorganisms, submerge porous materials treated with EM in the lagoons or treatment tanks.

EM in Beef Cattle Production
(Feedlot Operation)

As Feed Additive

Add EM Bokashi B to feeds of fatteners and finishers at the rate of 30 grams per day**.**

As Sanitation Spray

Spray EMAS at the rate of 0.5 liter/m^2 diluted at 1 liter EMAS per 50 liters water for the first month and every 15 days thereon.

Wastewater or Lagoon Treatment

Seed EM-1 at the rate of 1 liter per 1,000 liters of wastewater. The frequency of application may be reduced as the conditions improve. Seeding may be started 30 days after feeding. To enhance the activity of the microorganisms, submerge pond materials treated with EM in the lagoons or treatment tanks.

Trampling Method/Manure Processing

a. Use any fine organic material, eg., sawdust, rice hull, coarse or reject rice bran., coconut coir dust (peat) as beddings on the pen floors.
b. Add one part charcoal for every 10 parts organic material and add one (1) kilogram of EM Bokashi C.
c. Mix very well and scatter evenly on the pen floor.
d. Repeat this procedure every month or as often as necessary.
e. Collect such beddings and manure as soon as it has accumulated so much on the barn floors.
f. Adjust moisture down to 30% by mixing with more organic materials.
g. Put in fermentation bins or in sacks until decomposition is completed.

Roughage Preparation

Mix thoroughly 1 liter EMAS, 1 liter molasses and 100 liters water then spray onto the chopped roughage 30 minutes before feeding.

Silage Preparation

a. Ingredients

   200 liters of chopped grasses (1-inch length) air-dried for 3 hours

   1 liter molasses

   1 liter EMAS

   200 kgs. spent grain

   plastic container

   plastic sheet

   rubber strips

b. Put the chopped grass into the plastic container. Be sure to remove air between particle spaces by stamping heavily and repeatedly as you pour the chopped grass into the container.
c. Spread the spent grain on top of the preparation.
d. Mix the molasses and EMAS. in one pail, stir very well and water onto the silage materials
e. Cover with plastic sheet. Tie tightly, using rubber strips, to prevent the entry of air (anaerobic condition).
f. Harvest after 35 days.

EM in Dairy Cattle Production

As Feed Additive

Add EM Bokashi B to cattle feed at the following rates:

Weanlings/growers	30 grams/day
Heifers	30 grams/day
Milking cows	30 grams/day
Dry cows	10-30 grams/day
Service bulls	10 grams/day
Junior bulls	10-30 grams/day

As Barn Sanitation Spray

a. Spread beddings (10 parts organic materials mixed with 1 part charcoal and 1 kilogram EM Bokashi C) on the barn floorings.
b. Spray EM Activated solution at the rate of 0.5 liters/m^2 diluted at 1:50 every 7 days for the first month and every 15 days thereon.

Wastewater or Lagoon Treatment
Seed EM-1 weekly at the rate of 1 liter per 1,000 liters of wastewater. The frequency of application may be reduced as the conditions improve. Seeding may be started 30 days after feeding. To enhance the activity of the microorganisms, submerge porous materials treated with EM in the lagoons or treatment tanks.

Roughage Preparation
Mix thoroughly 1 liter EMAS, 1 liter molasses and 100 liters water then spray onto chopped roughage 30 minutes before feeding.

Pasture Management
Broadcast 1,000 kilograms of EM Bokashi A on the pasture and spray immediately 1,000 liters of EM diluted solution (1:1,000) every 15 days. Practice pasture rotation.

Tick (*Boophilus microplus*) **Control**

Prepare 50% EM5 solution and spray thoroughly on the animals every 15 days. Reduce the concentration to 30% after the third month.

Quail Production

For newly hatched quail chicks

1. **As Water Additive :** Add EM-1 to the drinking water at the rate of 0.5 ml. per liter of water daily for the first 2 week. Refer to the table below.

Table 1. Amount of EM-1 to be added to varying amounts of drinking water for the first 2 weeks.

EM-1 (ml.)	Drinking water (liters)
0.5	1
5	10
10	20
15	30
20	40
25	50
30	60
35	70
40	80
45	90
50	100

From the third week onwards, add EM-1 to the daily drinking water of the flock at the rate of 0.25 ml. per liter of water. Refer to table below .

Table 2. Amount of EM-1 to be added to varying amounts of drinking water from the third week onwards.

EM-1 (ml.)	Drinking water (liters)
0.25	1
2.5	10
5	20
7.5	30
10	40
12.5	50
15	60
17.5	70
20	80
22.5	90
25	100

2. **As Feed Additive :** Add EM Bokashi-B onto the daily feeds of the flock at the following rates and schedules:

a. Pre-lay

Age in weeks	%i EM Bokashi-B
1-2	3
3	2
4-5	1
6 onwards	0.5

b. Layers

Age in weeks	%EM Bokashi-B
1-15	3
16-17	2
18-20	1
21 onwards	0.5

Reminder : *Always use fresh Bokashi everytime.*

3. **As Sanitation Spray :** Spray EM-1 at the rate of 2 ml. per liter of spray water every 7 days for the first month, and every 15 days for the second month onwards.

4. **Wastewater or Lagoon Treatment:** Seed EM-1 weekly at the rate of 1 liter per 1,000 liters of wastewater. Frequency of application may be reduced as the conditions improve. Seeding may be started 30 days after feeding and drinking applications. To enhance the activity of the microorganisms, submerge porous materials treated with EM in the lagoons or treatment tanks.

EM in Goat Raising

As Drinking Water Additive

To induce faster development of the immune system of newborn pigs and to reduce pre-weaning mortality due to respiratory diseases and scouring, it is recommended to introduce EM technology at the youngest age possible.

If possible, give the suckling EM drops at the rate of 3 ml per day until the suckling learn to drink water.

As soon as the piglets are drinking water, they may receive EM through the daily drinking water at the following rates and schedule:

Week	Dilution Rate	
Initial Month 1st week	1:2000	0.5 ml. per liter of drinking water
2nd week	1:2000	0.5 ml. per liter of drinking water
3rd week	1:4000	0.25 ml. per liter of drinking water
4th week	1:4000	0.25 ml. per liter of drinking water
2nd month onwards	1:4000	0.25 ml. per liter of drinking water

Note: For drinking water additive, it is recommended to use PURE EM•1

As Feed Additive

Add EM Bokashi B on the daily ration of pigs at the following rates and schedules:

Breeders	**1st week** - 1% of the total feed requirement (1/2 kg. per 50 kgs of feeds) **2nd week onwards** - 0.5% of the total feed requirement (¼ kg per 40 kgs of feeds)
Market pigs	**1st week** - 3% of the total feed requirement (1.5 kg per 50 kgs of feeds) **2nd week** - 2% of the total feed requirement (1 kg per 50 kgs of feeds) **3rd week onwards** - 1% of the total feed requirement (1/2 kg per 50 kgs of feeds)

Roughage Preparation

Mix thoroughly 1 liter EMAS, 1 liter molasses and 100 liters water then spray onto the chopped roughage 30 minutes before feeding.

The Principle of Competitive Exclusion

Competitive Exclusion (CE) was first published by Nurmi and his co-workers during the last quarter of the 1900's. The concept involved *per ora* introduction of cultured microbes into birds to suppress gastro-intestinal infections caused by Salmonella.

The Nurmi Concept involves the following points:

a). Newly hatched chicks may be infected even bya single cell of Salmonella;
b). Older birds are resistant to Salmonella because of the autochthonous microflora of the gut, particularly the caeca and colon, but possibly other portions of the gut;
c). Chicks hatched by sitting hens are probably populated rapidly by the autochthonous gut microflora of the adult;
d). Hatcheries have replaced sitting hens, and the mass production of chiks is carried on in such a sanitary environment that the autochthonous microflora is not introduced at the modern hatchery;
e). The rearing barns in which the newly hatched chicks are placed are usually sanitized and the floors covered with fresh litter between croppings. The autochthonous flora of adult birds is not readily available to the chicks to populate the gut of the newly hatched chicks.
f). The introduction of intestinal microflora of adult birds to newly hatched chicks makes them immediately resistant to $10^3 – 10^6$ .infectious doses of Salmonella;
g). The intestinal flora of the adult birds may be introduced as a suspension of fecal droppins, cecal material or anaerobic cultures; these are designated as "treatments". Treatments may be introduced directly into the crop, or by inclusion into the drinking water or feeds. Aerosols may also be useful means.

Procedures for making EM Bokashi B

FEED ADDITIVE

EM Bokashi B is a formulated feed additive fermented with EM-1. This Bokashi improves microflora in intestines. As the result, health of animals is improved and the foul smell of manure is suppressed.

Preparation

Materials:

1. Rice bran (D1)[1]	25 kilos
2. Molasses	1 liter
3. EMAS	1 liter
4. Water [3]	5 liters

[1] Corn germ, Soybean Meal, Wheat bran etc, can also be used as a material.
Molasses is optional

[2] The quantity of water is a guideline. The quantity of water that needs to be added will depend on the moisture content of the materials used. The ideal quantity of water required to moisten the material should be enough to make 30% moisture content

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Procedures:

- Mix rice bran
- Dissolve molasses in the water . It is easy to dissolve molasses in warm water.
- Add EMAS into the above prepared molasses solution.
- Pour the diluted EM solution onto the Bokashi materials and mix well. Please pour the EM diluted solution gradually and mix well while checking the moisture content. The moisture content should be about 30-40%. You can check it by squeezing a handful. Once squeezed, it should stick together and form a ball. However, with a slight push of a finger, it should crumble easily.
- Put the mixture into a plastic container or bag that does not permit air entry (e.g. a pail or polyethylene bag). Close the bag tightly to maintain an anaerobic condition
- Store the bag in a place away from direct sunlight.
- Allow to ferment for at least 12 days. If anaerobic conditions are not maintained, the temperature increases. Ideally, the temperature should be around 35-45 □C. Thus, please check temperature regularly using a normal thermometer. If the temperature rises beyond 50 □C, mix the Bokashi well to aerate it, and put into polyethylene bag (black vinyl) and close it to maintain anaerobic conditions.
- The Bokashi is ready for use when it gives a sweet fermented smell. If it produces a rotten smell, it is a failure.
- The Bokashi should be used soon after preparation. If storage is required, spread it on a concrete floor, dry well in the shade and then put into vinyl bag.