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## GRN019998 Best Practice Bio-Ecological Farming (BEFC) for Poultry

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## Introduction

This business case is based on our “Bio-Ecological Farming Concepts (BEFC)”.

The aim of BEFC is to achieve biological and ecological farming for any animal farms with our solutions in financially optimal way. This business case will discuss optimal sequence of partial solution implementation that shall generate the profits from very beginning. These profits can be used to continue introducing new solutions until the total solution is in the place.

The proposition is to start with low investment solution components, generate the profits and use them for high investment components. Dependent of the timelines and financial abilities of the investor, the concept can practically self finance the developments, it will just take longer time before the full concept is in place and full benefits/profits are achieved.

This approach is also reducing the investor risks as each component/technology is proving itself before going to the next step.

By providing us with the information in our “Biological Farming for Poultry Questionnaire” we will be in good position to calculate your benefits in terms of savings and profits in each step. In this way it shall be rather obvious what part of funding will be provided by implemented technologies in specific period and therefore easier to prepare planning and timing of the entire solution.

## BEFC (Bio-Ecological Farming Concepts) Concerns and Issues

The following are concerns and issues of any poultry farm:

**Food:** food: is considerable cost of farming. Poultry example: growth to approximately 2.4 kg will require approximately 4 kg of food. With costs of approximately € 1.60. 500,000 birds farm will have roughly € 800,000 cost for the food.

**Food transport:** food transport: dependent of quantity and distance to the supplier, the transportation costs could be visible in your food price. In above example approximately 800 tons of food, or equivalent of 40 containers/trucks, the costs can be estimated to € 40 for each km of transport (assuming € 1 per km for costs of transport).

**Food storage:** food storage is another hidden cost that needs to be considered.

**Energy:** energy used for hitting, lights, ventilation and other needs adds to your costs of farming. Multiply kWh used on the farm with the price per kWh, or gas volumes used with the price per cubic meter to see the farming energy costs (per kg of .meat produced).

**Air filters:** assuring reduction of noxious gasses emission to the environment is generating costs in terms of the equipment, maintenance costs and energy operational costs.

**Acid rain:** with inefficient and ineffective air management systems the environment surrounding (especially poultry) farms will be subject to acid rains causing acid forests and soil. This can over the time cause huge natural disasters.

**Farm sanitation:** assuring clean and healthy environment before introducing next nest/flock is pre requirement to reduce diseases, improve health of animals and humans on the farm, as well as delivering better quality meat. Costs to achieve good results could be time consuming and costly.

**Water management system:** without proper water management systems the water released from the farms will pollute underground waters, streams, ponds, lakes and/or soil (dependent where it is released). WWMS can be costly in terms of equipment, energy used, maintenance (especially filters replacement) cost and can cause disturbance in operations while maintaining the equipment.

**Growth time:** the goal is to have higher yield in shorter periods and hence increase number of production cycles, while maintaining animal health and quality of meat.

**Cannibalism:** especially with poultry the cannibalism is one of the large ethical concerns and cause of yield decrease.

**Human and animals health:** respiratory problems are common issue on animal farms for humans as well as animals. Improved health and reduced mortality is not only ethical concern of human and animal well-being, but is also generating higher yield. Achieving good result without excessive use of chemicals and pharmaceutical products is the goal you should be looking at.

**Manure storage:** each farm is producing considerable quantity of manure. It needs to be stored, but also the storage shall be environment friendly to avoid causing pollution. Costs to achieve that goal can be considerable.

**Manure transportation:** mostly with poultry, and pigs (less with cattle) the manure need to be processed before used as fertilizer or biomass for biogas plants. Transportation costs to the manure processing plants can considerably affect your overall costs.

**Manure treatment:** when talking about poultry and pig s manure the treatment (on site or remote) required can be costly.

## **BEFC (Bio-Ecological Farming Concepts) Solutions**

### ***Food Additive***

#### **BENEFITS**

- 8-30 % yield increase and faster growth (additional production cycles).
- Liquid or granular form.
- Full vitamin and mineral supplementation, only calcium and salt are required.
- Better immunity and overall health, growth without chemical and pharmaceutical growth agents.
- No respiratory problems for animals and humans (employees).
- Increased fertility.
- The manure is drier and easier to clean.
- Close to zero cannibalism.

#### **SAVINGS**

- Up to 8 - 30% food reduction due to the better food conversion.
- Costs for the manure treatment are close to zero due to the noxious gasses reduction in digestion system. The manure can directly be used /sold as nitrogen fertilizer without cauterizing growth plants.
- Reduced need for antibiotics.

- Less foddors to process/ dispose.

## ***Waste to Energy (Biogas) Systems***

### **BENEFITS**

- 100% biological solution.
- Boost methane production volumes by 30+ %.
- Reduced BOD and COD.
- Eliminates odors.
- Scalable: from 100KW plants to multi-MW.
- Dramatically reduces H<sub>2</sub>S hydrogen sulfide and NH<sub>3</sub> ammonia.
- Prevents equipment corrosion.
- Allows for higher ratios of difficult feedstock (chicken manure).
- Raises tolerance for toxins, antibiotics, high-sulfur feedstock and hostile pH levels.
- Protects microbes and allows for complete digestion efficiency – even in hostile AD environments.
- Overcomes microbial antagonism.
- Promotes end-product tolerance.
- Promotes STABILITY methane production Up to 20 times smaller footprint compared with competitors.
- Easy to implement.
- Small container units can be implemented in, or close to the farms to use manure directly.
- Minimal impact on landscape due to the small footprint and underground components.
- Possibility to deliver preprocessor for third party biogas plants (if you already have one) to increase third party plants efficiency up to 150%.

### **SAVINGS**

- Up to 3 times lower costs than competitive devices.
- Small footprint, largely underground chambers.
- Up to 200% more energy efficient than competitive products..
- High quality methane produced, converted to the electricity.
- Low emissions.
- Durability.
- Close to zero maintenance costs.
- Up to 3 times less residual waste, hence reduced transportation and disposal costs.
- Could be subsidized by government (dependent of local regulations) as environment friendly solution.

## ***WWMS – Waste Water Management System***

### **BENEFITS**

- 100% biological solution.
- Significant BOD, COD and SS reduction.
- Biological nutrient, nitrate, and phosphate reduction.
- Improved dehydration and decreased sludge volumes (20-40% less sludge dependent of organic content).
- Odor elimination via biological ion exchange.
- No chemicals.
- Reduced O<sub>2</sub> usage.

- Scalable: from 1-5 person unit up to desired size (hundreds of thousands population).
- Up to 20 times smaller footprint compared with competitors.
- Easy to implement.
- Underground implementation – minimal impact on landscape.
- Possibility to deliver preprocessor for third party WWMS to reduce retention time and enlarge daily capacity (in case you are running out of capacity).
- 50 years warranty.

### **SAVINGS**

- Reduced energy costs: no energy required, 100% biological process.
- No special filters required (only for non biological waste separation).
- Construction costs: up to 20 times smaller in size than competitors products due to the faster retention period.
- Lower sludge treatment costs
- Durability.
- Close to zero maintenance costs.
- Could be subsidized by government (dependent of local regulations) as environment friendly solution.

## ***Farm Sanitation***

### **BENEFITS**

Treating the farm by spraying the sealing, walls and floor after each production cycle will:

- Reducing pathogens and other harmful bacteria. Brown seaweed is more effective on pathogens than Reservatol.
- Dramatically reduce the odor.
- Reduced Noxious gases – ammonia (NH<sub>3</sub>), methane (CH<sub>4</sub>), hydrogen sulfide (H<sub>2</sub>S).
- Manure can spread immediately as available nitrogen fertilizer without cauterizing effect.
- Creating healthy environment for humans and next production cycle.
- No respiratory problems for humans or animals.

### **SAVINGS**

- Simple operation (manual or automatic spraying), hence low sanitation costs.
- Preventing costs due to the potential disease developments.
- Manure can be directly used or sold as fertilizer.

## ***Bio Filters***

### **BENEFITS**

- Biological solution for noxious gasses emission.
- Scalability: can be adjusted to practically any needs.
- Flexibility: can be adjusted to desire form and shape for specific purposes.
- Effectively reducing ammonia and sulfides emission.

### **SAVINGS**

- Less costly than competitive products.
- Less maintenance costs.
- Durability.

- Could be subsidized by government (dependent of local regulations) as environment friendly solution.

## Suggested Implementation Plan Stages

Project stages:

1. Food additive and farm sanitation: with our food additive you will
  - a. Reduce costs for food, food transport and storage.
  - b. Enlarge production by faster growth, close to zero mortality and close to zero cannibalism.
  - c. Improve quality of the meat.
  - d. Improve health of animals and employees (removing respiratory issues).
  - e. Reduce ammonia and sulfates emission for average of 40%, which should most likely bring below the environment protection norms for air pollution as well as residual waste (manure) pollution. Manure from the farm can be directly used as fertilizer and hence generate extra income with no manure treatment costs.
  - f. Reduce or totally remove acid rain issue.

With food additive usage you will achieve considerable savings that can be used to (co) finance the rest of the project.

2. Bio Filters: this is mostly cost stage, however the benefits are in close to zero air pollution from the farm and hence no air environmental issue. Residual waste and waste water pollution is solved in the next stage.
3. Biogas plant or WWTP (Waste Water Treatment Plant: biogas plant is combination of the WWTP and biogas production. All manure and waste water can be treated by the plant. The outcome is:
  - a. Up to 48 m<sup>3</sup> of up to 80% pure methane per m<sup>3</sup> of manure or equivalent energy transferred to the electricity;
  - b. Remaining is liquid fertilizer. If you don't opt for liquid fertilizer, the remaining will be over 99% clean gray water that can be released to the water systems or can be used for irrigation and 2-4% of environment friendly solid waste.

This will generate additional saving on the energy costs for the farm and likely profits on selling excess energy to the energy providers. CO<sub>2</sub> can be fully contained and sold to the CO<sub>2</sub> demanding industries. That means 0% CO<sub>2</sub> emission can be achieved by the plant!

## Suggested Implementation Plan Timelines and Finance

The following assumptions are based on the solutions delivered in Europe. For other regions the costs will be adequately higher with the logistics costs.

We will use sample of 500,000 bird farm which shall generate sufficient manure for our smallest (200KW) biogas plant. Farms with less than 500,000 birds will need to acquire manure or other biomass to generate approximately 30 m<sup>3</sup> of biomass per day, which is processing capacity of the plant. Our biogas plant can combine different sources of biomass like: manure, waste for meat processing industry, green mass (from the crop, grass, leaves, human feces, industrial mud, etc.).

### **Stage 1- Food Additive**

The easiest application is to use liquid additive that can be delivered to the water supply systems through the automated dosing devices. The financially optimal way is to order food additive in 1,000 l ABC containers.

The costs per 1,000 l are approximately 40,000 €. 1,000 l additive is sufficient for 2,5 millions liters of drinking water which in average will be sufficient for 300,000 – 350,000 birds. Hence, you will need between 1,400 and 1,700 liters of additive for 500,000 birds, or € 56,000 to € 68,000 for 500,000 birds.

Assuming food price of € 0.40 per kg, transport distance of 500 km and 7.34 liter of water per bird. The savings will be minimum 5 Eurocents per bird at 10% food reduction and 22 Eurocents per bird at 20% food reduction. For our further calculation we will take minimum of 10 eurocents savings per bird. That will generate minimum of € 100,000 each quarter.

Liquid food additive shelf lifetime is practically unlimited as long as you keep it in original packaging on temperatures below 30 degrees Celsius, does not get in contact with water and is not exposed to the direct sunlight. Once it is mixed with the water it needs to be used within 72 hours. However, due to the laws and regulations we needed to limit life time officially to 24 months.

Granular food additive lifetime is 24 months.

### **Stage 2 – Bio Filters**

Costs of bio filters are depending of your farm and we cannot make educated costs guess at this time.

### **Stage 3 Biogas Plant**

#### **The Project**

Our smallest biogas plant with 200KW capacity and processing capacity of 30 m<sup>3</sup> of manure per day costs for European markets can be estimated to 1.3 to 1.8 million Euros for European markets plus project management, account management and traveling costs estimate to 291,000 (on T&M – Time and Material basis) Euros for entire project. In our further calculations we will take the higher price to estimate the “worst case scenario”.

High level project timelines and finance:

Item/Month-costs	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
T&M	X	X													
Analyzing, Design		X	X	X											
Contract negotiations				X	X										
Manufacturing the plant						X	X	X	X	X	X	X	X		
Installing the plant											X	X	X	X	X

Testing and optimization = 3 to 4 months

Payments schedule in 1,000 of Euros:

Item/Month	1	2	3	4	5	6	7	8	9	10	11	12
T&M		8	52	19	16	16	16	16	21	23	20	20
The plant				180	540		540					



Cumulative	0	8	60	259	815	831	1387	1403	1424	1447	1467	1487
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Item/Month	13	14	15
T&M	45	23	26
The plant		510	
Cumulative	1532	2065	2091

If you start using additive for, say, 3 months before biogas plant project starts you will already generate some profits (savings) and that will continue during the project. Let's assume 35K savings per month and look on investment figures:

Item/Month	1	2	3	4	5	6	7	8	9	10	11	12
T&M		8	52	19	16	16	16	16	21	23	20	20
The plant				180	540		540					
Costs (cumulative)		8	60	259	815	831	1387	1403	1424	1447	1467	1487
Savings (cumulative)	135	170	205	240	275	310	345	380	415	450	485	520
Delta	135	162	145	19	540	521	1042	1023	1009	997	982	967

Item/Month	13	14	15
T&M	45	23	26
The plant		510	
Costs (cumulative)	1532	2065	2091
Savings (cumulative)	555	590	625
Delta	977	1475	1466

Now make direct comparison of the investments and add third line assuming 20% food saving and 22 Eurocents profits per bird, which shall generate minimum of 75K per month:

Item/Month	1	2	3	4	5	6	7	8	9	10	11	12
Costs		8	60	259	815	831	1387	1403	1424	1447	1467	1487
10% food savings delta	135	162	145	19	540	521	1042	1023	1009	997	982	967

20% food savings delta	300	367	390	266	215	156	637	578	524	472	417	362
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Item/Month	13	14	15
Costs	45	23	26
10% food savings delta		510	
20% food savings delta	332	790	741

You can easily observe that with 10% savings 35% of your biogas project is financed by the savings generated by food additive. With 20% of food savings 76% of your project is financed by the food additive savings.

### **Post Project**

Once the plant is installed and fully operational it will process up to 30 m<sup>3</sup> of manure and will generate up to 48 m<sup>3</sup> of methane with up to 80% purity. That means you will get (up to) 30 x 48 x 0.8 = 1,152 m<sup>3</sup> equivalent of gas from the regular pipelines. In the Netherlands 1 m<sup>3</sup> of gas costs for the customers (users) is approximately 60 Eurocents. Hence, the plants in Netherlands will generate (up to) 1,152 x 0.6 = 691 Euros worth of gas every day. Let us assume the plant will not perform optimal all of the time and take daily revenue down to 500 - 550 Euros. This will generate 180K – 200K worth of gas per year.

That means that it will take approximately 10 years to pay out the plant.

By generating between 35K – 75K Euros income from the food additive and assuming above investment calculations it will take about year and a half to break even if you achieve 10% food savings and about 4 months if you achieve 20% food savings.

### **In conclusion**

It is very much dependent of the animal food, your farm, feeding methods as well as from water used what results you will achieve. We trust above presented figures are good estimate.

Take in account we did not calculate all other savings you will have due to the benefits of each technology (please see benefits and savings above for each technology) which will considerably contribute to your savings.

The farming solution you will achieve will be biological and environment friendly and in many countries you will be able to get government subsidies for bio-ecological farming which, of course will reduce your investments and enlarge your profits.

With faster growth of the broilers (dependent of the breed) you will be able to achieve extra cycle approximately every 18 months. That means one cycle extra earnings every 18 months.

Last but not least, the animals and employees on the farm will have no respiratory problems, the animals will be healthier, more immune, and meat will be better quality (more muscular), which will further improve quality of your products.

With continuous usage of food additive alone you will be able to generate extra profits between 600K and over one million every year.

**Slavko Pecanac**

Greenacle Managing Director and Owner

