



Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

# D4.3. 30 Case Studies Review



DISARM has received funding from the European Union’s Horizon 2020 research and innovation programme under Grant Agreement No 817591

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## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Consortium

United Kingdom:



France:



Belgium:



Netherlands:



Greece:



Spain:



Latvia:

Romania:



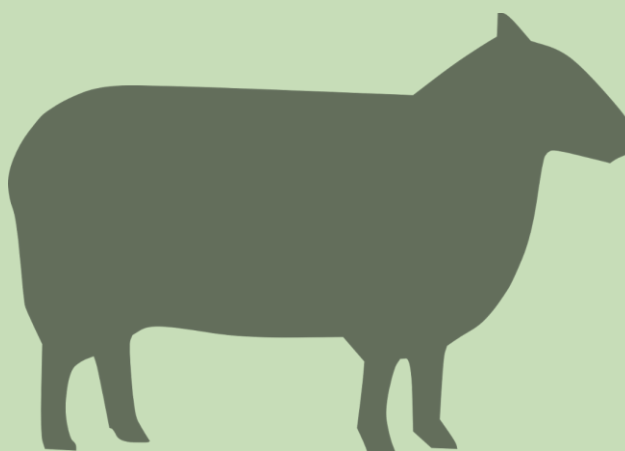
Denmark:





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

# Dairy Sheep Sector



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Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Flessas Farm, Korinthia, Greece

Flessas Bros, Antonis and Dimitris, exploit a dairy farm of 800 ewes of pure Chios breed located in Chiliomodi of Korinthia, Greece. Antonis holds a Bachelor in Chemical Engineering and Dimitris holds a Bachelor in social science. They follow a typical intensive livestock farming system, where the animals are kept indoors and fed forages and concentrate feeds. The lambing occurs all year round and lambs are reared artificially.



Multi-actor team working together!

Together with their herd vet DVM Mr. Karousos, Antonis and Dimitris have designed a farm health action plan focusing on improving animals health control prior to purchase, management of hospital pen, lambing and dairy, as well as water control for pathogens.



Biosecurity

Biosecurity practices were already at a good level considering the Biocheck Dairy. Based on Biocheck results, the low-scoring was appeared on Purchase and Reproduction due to the fact that they were through their 3rd year of existence (since 2017) as dairy farm, and they have imported new animals. In addition, they were low-scored in Lamb management due to lambs housing in the same building with the ewes. Hence, our first targets had been recorded in order to provide a powerful action plan. Their biosecurity practices had also included udder disinfection after milking and they had adopted the California Mastitis Test as measure to mitigate subclinical mastitis. In addition, the Veterinarian of the farm, DVM Mr. Karousos had provided plenty of corrective guidelines. Flessas Bros Self-assessment questionnaire was filled with great interest for future improvements and plans.

Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
69%	78%	-Sheep Purchase and Reproduction	60%	-Lamb management

Main Health Challenges

The main health challenges that should be addressed were the subclinical and clinical mastitis in ewes and lamb’s mortality in triplets.







## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Strategies adopted to reduce antibiotic resistance

#### Weaknesses identified – points for improvement

- Newly purchased animals are not tested for specific diseases when entering the farm
- No vehicle disinfectant is used before entry to farm
- No sign at the entrance of the farm indicating the importance placed on biosecurity
- Ewes aborted are not examined for the cause of abortion
- New born lambs are kept in the same space with ewes
- Rams' semen is not tested for sexually transmitted diseases

#### Actions to address the issues

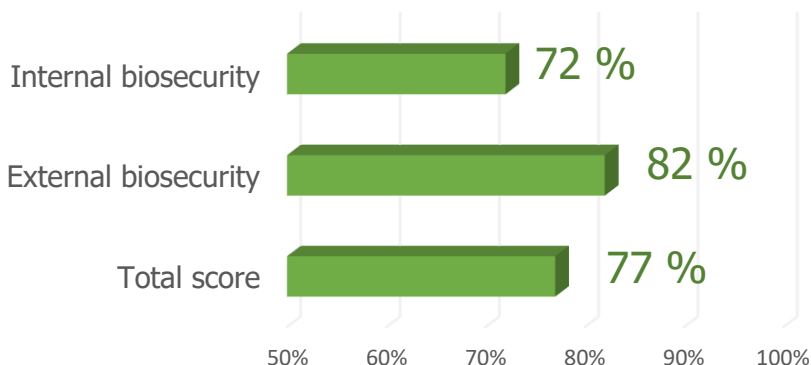
**Action 1:** Sign at entrance, visitors' book. The aim of this is to apply low-cost and irreversible protocols of potential infection tracking.

**Action 2:** Facilities to disinfect vehicles at the entrance. Both FHT and the owner of the Farm agreed that wheels (vehicles) disinfections is a priority in order to maximize the external biosecurity.

**Action 3:** Improved facilities for carcasses, fetal membranes, and tissues disposal of after a lambing / abortion

**Action 4:** Separation of newborn lambs from the ewes' house. The strict intensive farming system of this farm leading to certain difficulties. Based on FHT experience and Biocheck results, the fact that newborn lambs are housing together with the ewes appears to be a biosecurity caveat.

### Biosecurity assessment after best practices implementation



#### A testimonial video



### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

*"Decreased antimicrobials expenses (annually)."*

*"In the long-term, antimicrobial resistance could be suppressed and treatment may be more effective (less use of antimicrobials, fewer expenses)."*

*"Low antimicrobial' animal products could target a consumer group with 'one-health' concerns (added-value products, higher income than conventional systems)."*





Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Kalogeropoulos Bros Farm, Arcadia, Greece

Kalogeropoulos Bros exploit a dairy farm of 400 animals of various Greek breed located in Megalopolis of Arcadia, Greece. Theofanis holds a Bachelor in Animal Science and Theodore an integrated Master in Agricultural Science. They follow a typical modern semi-intensive livestock farming system, where the animals are kept in stable and fed forages and concentrate feeds, while, a few hours a day they graze in privately owned land near the stable.



Multi-actor team working together!

Together with their herd vet DVM Mr. Th. Sakelaridis, Theofanis and Theodore have designed a farm health action plan focusing on improving entrance and vehicles’ control and disinfection, management of hospital pen, and implementing a robust insects, rodents, birds control program.

Biosecurity

Biosecurity practices were already at a good level considering the Biocheck Dairy. Based on Biocheck results, biosecurity weaknesses was appeared on Purchase and Reproduction due to the fact that they rarely import new animals into the herd. In addition, they low-scored in Vermin control since they did not follow a specific protection pipeline. Additionally, there were space for improvement in Lambing and Lambs management biosecurity levels.

Their biosecurity practices have also included udder disinfection before and after milking as measure to mitigate subclinical mastitis. In addition, both their practical experience but also their academic background are essential to deal with the biosecurity risks. Kalogeropoulos Bros Self-assessment questionnaire was filled with great interest for future improvements and plans.

Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
72%	58%	-Sheep Purchase and Reproduction -Vermin control and other animals	86%	-Lambing management -Lamb management -Dairy management





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Main Health Challenges

The main health challenges that should be addressed are the subclinical and clinical mastitis in ewes.

### Strategies adopted to reduce antibiotic resistance

#### Weaknesses identified – points for improvement

- No vehicle disinfectant is used before entry to farm
- No sign at the entrance of the farm indicating the importance placed on biosecurity
- Ewes aborted are not examined for the cause of abortion
- No separation of sick animals (e.g. with mastitis) from the healthy ones
- No insects, rodents, birds control program

#### Actions to address the issues

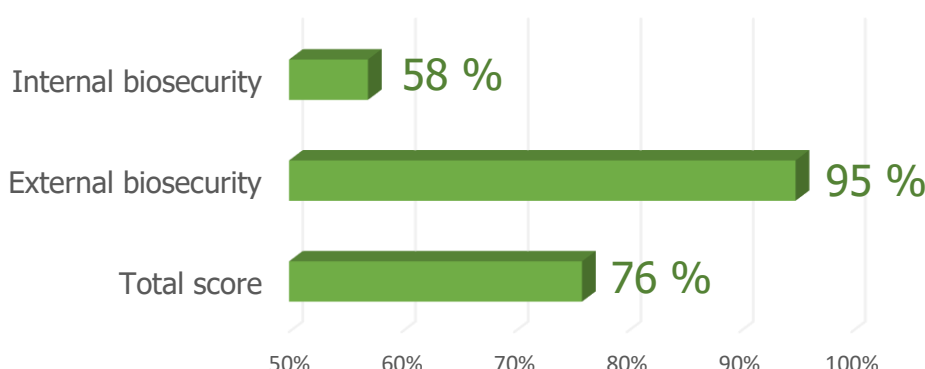
**Action 1:** Sign at entrance, visitors' book. The aim of this is to apply low-cost and irreversible protocols of potential infection tracking.

**Action 2:** Facilities to disinfect vehicles at the entrance. Both FHT and the owner of the Farm agreed that wheels (vehicles) disinfections is a priority in order to maximize the external biosecurity.

**Action 3:** Equipment and schedule for insects, rodents, and birds control

**Action 4:** Examination for subclinical mastitis using California Mastitis Test and separation of positive ewes into hospital pen individual boxes.

### Biosecurity assessment after best practices implementation



### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

*"Decreased antimicrobials expenses (annually)."*

*'Low antimicrobial' animal products could target a consumer group with "one-health" concerns (added-value products, higher income than conventional systems).*







Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Koronas Farm, Magnisias, Greece

Koronas Bros, Antonis and George, exploit a dairy farm over 1000 ewes of Skopelos Greek breed, located in Velestino of Magnisias, Greece. Both Antonis and George hold an Integrated Master in Agricultural Science from AUA. They follow a rather intensive livestock farming system, where the animals are kept indoor and fed forages and concentrate feeds, while also use meadows for grazing. Despite that their facilities are modern and well equipped, they urgent need to be organized in a more efficient way for animals’ management.



Multi-actor team working together!

Together with their herd vet, Antonis and George have designed a farm health action plan focusing on improving animals health and more specifically in early life in order to reduce antibiotic usage.



Biosecurity

Biosecurity practices were already at a good level considering the Biocheck Dairy. Based on Biocheck results, biosecurity weaknesses was appeared on Feed and Water where feed was difficult to frequently assess due to the large size of the herd. In addition, the low-scoring was the appeared to be caused by suboptimal lamb management, dairy management and adult management due to the fact that they do not apply any udder disinfection protocol during the milking, and they have high mortality rates in lambs, caused by diarrhea.

Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
60%	80%	-Feed and Water	40%	-Lambing management -Lamb management -Dairy management





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Main Health Challenges

The main health challenges that should be addressed are the subclinical and clinical mastitis in ewes.

### Strategies adopted to reduce antibiotic resistance

#### Weaknesses identified – points for improvement

- No udder disinfection before and/or after milking
- New bought rams' semen is not tested for sexually transmitted diseases
- No vehicle disinfectant is used before entry to farm
- No sign at the entrance of the farm indicating the importance placed on biosecurity
- Aborted ewes are not examined for the cause of abortion
- High antibiotics use due to high mastitis and lambs diarrhea cases

#### Actions to address the issues

**Action 1:** Sign at entrance, visitors' book. The aim of this is to apply low-cost and irreversible protocols of potential infection tracking.

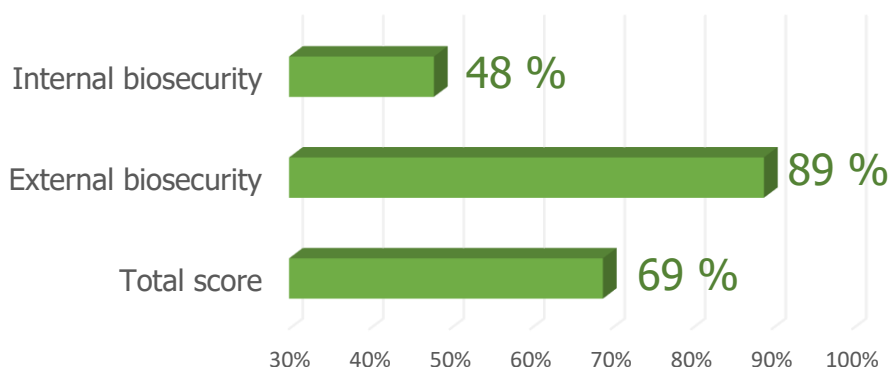
**Action 2:** Facilities to disinfect vehicles at the entrance. Both FHT and the owner of the Farm agreed that wheels (vehicles) disinfections is a priority in order to maximize the external biosecurity.

**Action 3:** Bacteria isolation causing mastitis and/or diarrhea by antibiograms

**Action 4:** Farm data recording

**Action 5:** Using an iodine dipping after milking.

### Biosecurity assessment after best practices implementation



### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

*"Decreased antimicrobials expenses (annually)."*

*'Low antimicrobial' animal products could target a consumer group with "one-health" concerns (added-value products, higher income than conventional systems).*





Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Tsirtsikos Farm, Argolida, Greece

Stamatis exploits a dairy farm of 300 crossbred animals, of various local Greek breeds, located in Kranidi of Argolida, Greece. Farm follows a more traditional semi-intensive livestock farming system, where the animals are grazing in local grassland and fed supplementary feed, whenever is needed indoor. The animals are well adapted to the local environment and grazing conditions.





**Multi-actor team working together!**

Together with his herd Veterinarian DVM N. Babas have designed a farm health action plan focusing on improving animals health and more specifically mastitis control.



Biosecurity

Biosecurity practices were already at a moderate level considering the Biocheck Dairy score of 76% in internal but only 42% in external biosecurity indices, achieving an overall score of 59%. Based on Biocheck results, the low-scoring was appeared on Lamb management, and Dairy management due to their traditional management exposed the animals to various pathogens such there is no udder disinfection protocol applied during the milking, nor a foot dipping after animals’ return from grassland. Hence, our first targets have been recorded in order to provide a powerful action plan in the upcoming meetings.

Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
59%	76%	-Transport and carcass removal	42%	-Lambing management -Lamb management -Dairy management





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Main Health Challenges

The main health challenges that should be addressed are the subclinical and clinical mastitis in ewes.

### Strategies adopted to reduce antibiotic resistance

#### Weaknesses identified – points for improvement

- No udder disinfection before and/or after milking
- No regular health status check of the farm by the vet
- No vehicle disinfectant is used before entry to farm
- No sign at the entrance of the farm indicating the importance placed on biosecurity
- Aborted ewes are not examined for the cause of abortion
- Ewes with mastitis are not separated from the healthy ones
- There is no use of a disinfection footbath

#### Actions to address the issues

**Action 1:** Sign at entrance, visitors' book. The aim of this is to apply low-cost and irreversible protocols of potential infection tracking.

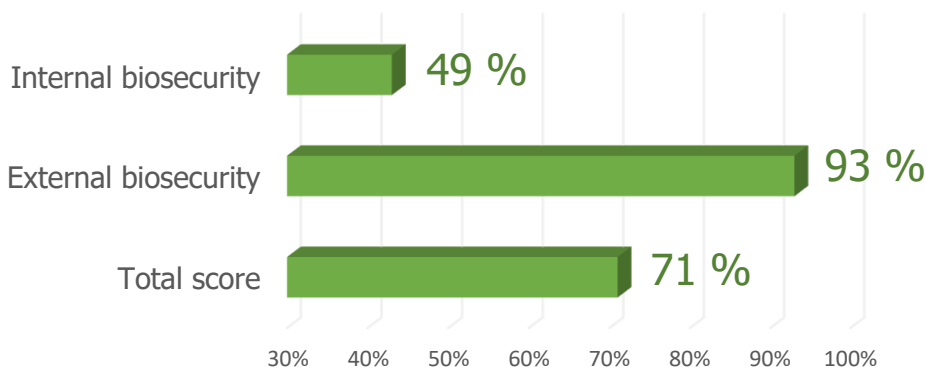
**Action 2:** Facilities to disinfect vehicles at the entrance and footbath in order to maximize the external biosecurity.

**Action 3:** Bacteria isolation causing mastitis by antibiograms and ewes' isolation

**Action 4:** Farm data recording and regular veterinarian visiting

**Action 5:** Using an iodine dipping after milking.

### Biosecurity assessment after best practices implementation



### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

***-May not affect it at all***

*"The financial assessment of prudent antimicrobial use in livestock is hard to assess."*







Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Fotinopoulos Farm, Messinia, Greece

Kostas exploits a dairy farm of 300 crossbred animals, of various local Greek breeds, located in Trifilia of Messinia, Greece. Kostas follows a more traditional semi-extensive livestock farming system, where the animals are kept in stable and fed forages and concentrate feeds, but also spend plenty of time outside on local grassland all year round. The animals are well adapted to the local environment and grazing conditions.



Multi-actor team working together!

Together with his herd Veterinarian DVM Maria Kolitsida have designed a farm health action plan focusing on improving animals health and more specifically mastitis control. The Veterinarian of the farm has given useful advise with guidelines to the farmer and appears to be very interested about the DISARM project.



Biosecurity

Biosecurity practices were already at a moderate level considering the Biocheck score of 90% in internal but only 31% in external biosecurity indices, achieving an overall score of 61%. Based on Biocheck results, the low-scoring was appeared on Lamb management, Dairy management and Adult management due to their traditional management with exposure of the animals to various pathogens. Hence, our first targets have been recorded in order to provide a powerful action plan in the upcoming meetings.

Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
61%	90%	-Vermin control and other animals	31%	-Lambing management -Lamb management -Dairy management -Adult management -Working organization and materials





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Main Health Challenges

The main health challenges that should be addressed are diarrhea in lambs, lamb mortality and antibiotic usage.

### Strategies adopted to reduce antibiotic resistance

#### Weaknesses identified – points for improvement

- No udder disinfection before and/or after milking
- There is no use of a disinfection footbath
- No vehicle disinfectant is used before entry to farm
- No sign at the entrance of the farm indicating the importance placed on biosecurity
- Aborted ewes are not examined for the cause of abortion
- High antibiotics use due to high mastitis and lambs diarrhea cases

#### Actions to address the issues

**Action 1:** Sign at entrance, visitors' book.

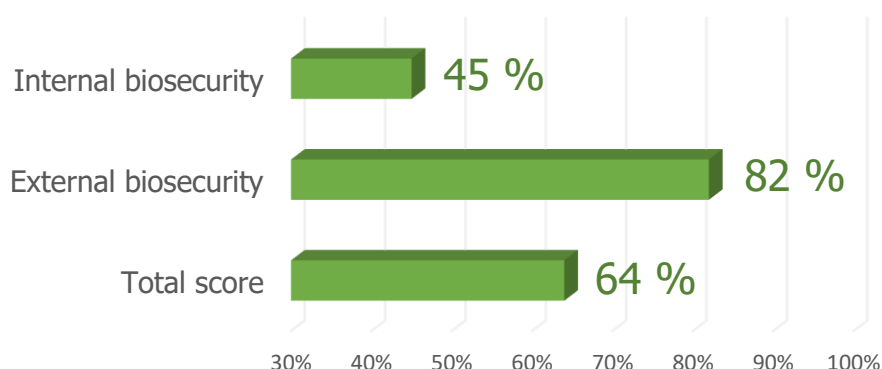
**Action 2:** Facilities to disinfect vehicles at the entrance. Both FHT and the owner of the Farm agreed that wheels (vehicles) disinfections is a priority in order to maximize the external biosecurity.

**Action 3:** Bacteria isolation causing mastitis and/or diarrhea by antibiograms

**Action 4:** Farm data recording and regular vet coaching

**Action 5:** Using an iodine dipping after milking.

### Biosecurity assessment after best practices implementation



### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

*"Decreased antimicrobials expenses (annually)."*





Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Grégory and Sophie Farm, Tarn, France

Grégory has been breeders for 21 years and own 370 high producing ewes, 8 rams and 130 ewe lambs. On this family farm in the Tarn, they are the 5th farmer generation. The sheepfold buildings for the adult and young ewes are old, but the milking parlor has recently been renovated. The ewes are fed with fodder during the winter and rotational grazing is applied for the other periods. Milking starts in mid-November. In addition to the sheep flock, the farm has a beef herd with of Blonde d'Aquitaine cattle with sale of breeding stock.



Multi-actor team working together!

The team consists of the farmers (husband and wife) together with their sheep-specialized veterinarian for 10 years from the small neighboring town veterinary practice and her milk advisor for 1 year from the milk record service from the Chamber of Agriculture (Maison de l'élevage). Together have designed a farm health action plan focusing on improving multitargeted animals health issues such as Abortions, Peripartum mortality, Parasitism (Tapeworms), Enterotoxemia, Mastitis, and Diarrhoea.



Biosecurity

Biosecurity practices were already at a moderate level considering the Biocheck Dairy score of 80% in internal but only 39% in external biosecurity indices, achieving an overall score of 60%. Based on Biocheck results, the low-scoring was appeared on Lamb management, Dairy management, Adult management and the overall management of herd health due to their traditional management with exposure of the animals to various pathogens.

Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
60%	80%	-Vermin control and other animals	39%	-Lambing management -Lamb management -Dairy management -Health





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Main Health Challenges

The main health challenges that should be addressed are Caseous abscesses, Abortions, Peripartum mortality, Parasitism (Tapeworms), Enterotoxemia, Mastitis, and Diarrhoea.

### Strategies adopted to reduce antibiotic resistance

#### Weaknesses identified – points for improvement

- High and risky production level
- Old and difficult to clean sheepfold
- Lambing preparation
- Lack of colostrum quality control

#### Actions to address the issues

**Action 1:** Calming caseous abscesses (ewe lambs), Treatments of outbreaks, auto-vaccine if increase; Improve hygiene of housing if possible; Check the feeding levels of Cu, Zn and Vit A.

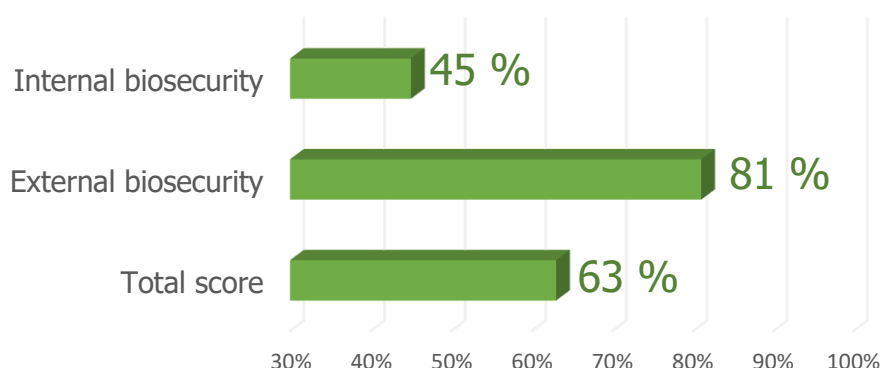
**Action 2:** Decrease abortions. Diagnosis (analysis) and Prevention (quick elimination of afterbirth); Check that feed values including for minerals are adapted to requirements. Reduce stress.

**Action 3:** Improve perinatal and milking mortality of lambs. Monitoring of lambing (supervision of lambing, management of individual pens, watering). Vigor of the lambs (analysis of colostrum, check feed values (energy, minerals) of pregnant ewes and mainly 2nd parity ewes.

**Action 4:** Parasitism; Prevention through faeces analysis

**Action 5:** Biosecurity; Prevention and registration

### Biosecurity assessment after best practices implementation



### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

*-May not affect it at all*

*"The financial assessment of prudent antimicrobial use in livestock is hard to assess."*







Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Emmanuel and Vanessa Farm,  
Aveyron, France

The farm is located in Aveyron. Emmanuel and Vanessa have 420 ewes, 130 ewe lambs, 6 rams, and 700 lambs. On the farm there are 3 family workers, with lambing at the end of the summer and another employee for the end of lambing. Milking starts at the end of September. Ewes are fed from home produced hay, cereals and silage and feed concentrates. The sheepfolds were too small and a third one has been built in 2020.



Multi-actor team working together!

The team consists of Emmanuel and Vanessa together with one of their herd veterinarians who has a 25 years history in sheep and cattle production and works for the same veterinary practice as the vet, and their milk advisor from UNOTEC who also advises other farmer of the DISARM projects' case studies.



Biosecurity

Biosecurity practices were already at a moderate level considering the Biocheck score of 81% in internal but only 34% in external biosecurity indices, achieving an overall score of 58%. Based on Biocheck results, the low-scoring was appeared on Lamb management, Dairy management, Adult management and the overall management of herd health due to their traditional management with exposure of the animals to various pathogens.

Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
58%	81%	-Vermin control and other animals	34%	-Lambing management -Lamb management -Dairy management -Health





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Main Health Challenges

The main health challenges that should be addressed are Abortions, Mastitis, Pneumonia for lambs, and Lameness.

### Strategies adopted to reduce antibiotic resistance

#### Weaknesses identified – points for improvement

- Lamb-ewe abortions
- Weaning of lamb-ewes
- Low fiber materials in young ewe diet
- Sheepfold ambiance,
- Low fertility,
- Few analysis and diagnosis if outbreaks,
- Lambing in August

#### Actions to address the issues

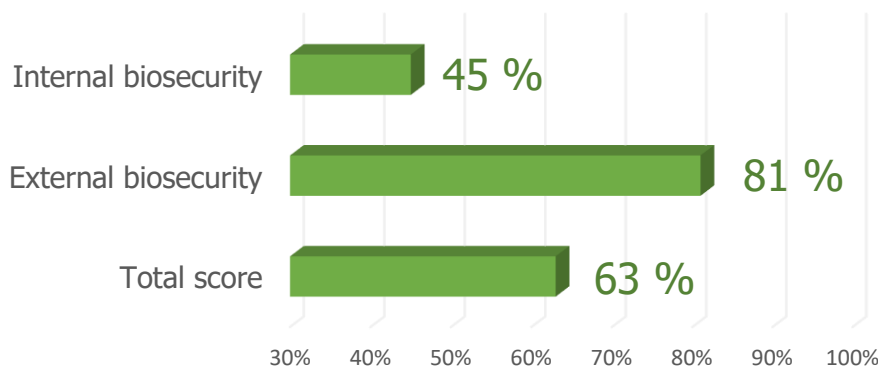
**Action 1:** Prevent weakness of some ewes.

Preparation of risk periods (preparation of IA phase, identification of most prolific ewes). Toxaemia analysis (B-OH and ruminal pH measures). Adaptation of nutrients supply (incorporation propylene-glycol and analysis of forages)

**Action 2:** Decrease abortions. Increasing diagnoses (PCR analysis). Water intake monitoring

**Action 3:** Improve Ewe-lamb's diarrhea and lambing management. Nutrition (Control results of home-mixed cereals, Better allotment, Introduction of fiber sources in the lamb diet); Salt and minerals (Number of mineral blocks to lick); Hygiene (Withdrawal of afterbirth); Ask a diagnosis of housing.

**Action 4:** Prevent mastitis. Monitoring and treatment, milking hygiene, pathogen analysis.



### Biosecurity assessment after best practices implementation

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Negative**

**-May not affect it at all**

*"The implementation of best practices to improve animal health on a farm-scale are more expensive than antimicrobial usage."*

*"The financial assessment of prudent antimicrobial use in livestock is hard to assess."*

*New diseases have appeared, and a low mortality is our main goal".*





Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Philippe Farm, Hérault, France

Philippe exploits a specialized dairy farm of 720 milking ewes from 1991, with a modern central sheepfold with the milking parlor of 36 units and a second sheepfold for ewe-lambs. Milking ewes are fed with a basis of hay and concentrates with introduction of rotational grazing at the end of lactation. After drying off, the sheepfold is empty and ewes are all day and night outdoor. On the farm there is a sheepfold for adults with an infirmary, and another sheepfold is located on the other side of the village for ewe lambs and rams. The lambing season takes place in December and milking starts in February.



Multi-actor team working together!

The team consists of the farmer together with his herd veterinarian for 10 years from the small neighboring town veterinary practice (food- and companion animals) and her milk advisor for 4 years from the milk record unit of the Roquefort cheese Council.



Biosecurity

Biosecurity practices were already at a moderate level considering the Biocheck score of 72% in internal but only 38% in external biosecurity indices, achieving an overall score of 54%. Based on Biocheck results, the low-scoring was appeared on Lamb management, Dairy management, Adult management and the overall management of herd health due to the large size of the herd which difficult the farm management.

Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
53%	72%	-Feed and Water -Transport and visitors control	45%	-Lambing management -Lamb management -Dairy management -Health







## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Main Health Challenges

The main health challenges that should be addressed are Early Abortions, Clinical and Subclinical Mastitis, Systematic treatment of lambs with oxytetracyclin, and Diarrhea of primiparous ewes.

### Strategies adopted to reduce antibiotic resistance

#### Weaknesses identified – points for improvement

- Farmer is alone to care about health.
- Few place to improve health,
- Management of visitors,
- Diarrhoea at weaning.

#### Actions to address the issues

**Action 1:** Prevent ewe's abortion outbreak crisis. Monitoring: search causes; Nutrition (vitamins and minerals supply); Maintaining the vaccination program (Chlamydia).

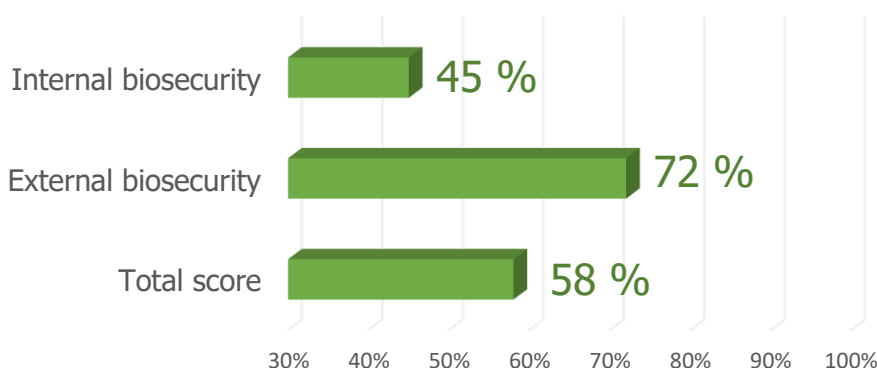
**Action 2:** Prevent E.coli event and keep low cell counts. Monitor and diagnose quickly mastitis (origin milking > litter)

**Action 3:** Decrease use of antibiotics at birth in 2 years; Salt intake of ewes at lambing, Limiting the entry routes of pathogens that cause arthritis: disinfection of navel and ear (at tagging).

**Action 4:** Avoid diarrhea in ewe lambs; Keep good hygiene practices

**Action 5:** Parasitism. Prevention through maintenance of rotational grazing

**Action 6:** Biosecurity. Maintaining and improving vigilance.



### Biosecurity assessment after best practices implementation

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

*-slight health improvement  
but few economic impact*

*"Despite the awareness of the need for a prudent use of antibiotics, their use is still necessary to stop abortions. Their use at lamb birth is also maintained. Veterinary costs remain stable while feed costs have increased."*





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

## Dairy Sheep Sector



### A Review

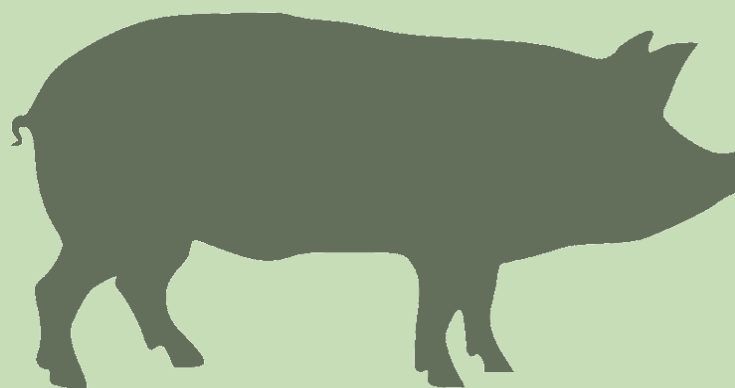
- ✓ The initial biosecurity score in Greek case studies were +7%.
- ✓ Farmers attitude towards antibiotics reductions were more positive in Greek case studies.
- ✓ The main Health Challenge were the mastitis and abortions in Greek and French case studies, respectively.
- ✓ Strategies adopted to reduce antibiotic resistance were more tailor-made in French case studies.
- ✓ The implementation of biosecurity measures improved significantly the internal biosecurity indices in both countries.





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

# Pig Sector



DISARM has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 817591

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Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Grard van Gerwe - van Gerwe b.v, The Netherlands

Grard is a young entrepreneur of 22 years old. In April 2020 he started his own closed pig farm. The farm is highly automated. Currently, he has 1400 fattening pigs and 940 breeding sows housed in his farm, but he is expanding to 1140 sows. On this farm almost 34 piglets per sow per year are weaned with a cycle index of 2,34. The farm strives to achieve optimal farm management to obtain good technical performance. He believes that farm management is the fundamental basis for good animal health. As a young, starting farmer Grard is eager to learn and is willing to get in contact with other young farmers who are dealing with similar challenges.



Multi-actor team working together!

Together with his veterinarian of De Varkenspraktijk and feed advisor of Vleuten-Steijn voeders, Grard is designing a farm health action plan focusing on improving farm management. Attention is drawn in particular to improving the structure of the farm, the efficiency and effectiveness of staff and the monitoring and improvement of animal health.



Biosecurity

The Biocheck® assessment of biosecurity resulted in Total score 55% / internal 52% / external 58%. It could mainly improve in feed, water and materials delivery, and in measures between compartments, walking routes and use of tools. The low-scoring was due to the fact they just started with the farm.

Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
55%	58%	-Feed, water and tool supply	52%	-Measures between compartments, walking lines and use of tools

Main Health Challenges

This farmer bought this farm at the beginning of project DISARM and he is changing it into a Specific Pathogen Free (SPF) farm, which includes many changes in farm structure, management and biosecurity practices.





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Strategies adopted to reduce antibiotic resistance

#### Challenges

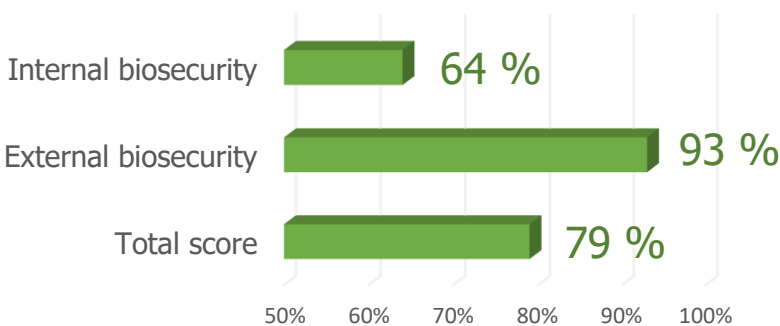
- Starting up a new pig farm site
- Maintaining high production rate with minimizing diseases
- There was a mismatch between the farm and the newly introduced animals with regard to health status. This must be solved with the use of medication. For now, the goal is to make the best possible product.
- Young piglets are fed with a cup system. Because there were many malfunctions in this feeding system, parts of the feeding installation have been switched off.
- This company is preparing to become an SPF company. A plan has already been made about how the hygienic walking lines should be and a farm map has been made.

#### Actions to address the issues:

**Action 1:** Transition to a SPF farm. Make a plan about how the hygienic walking lines should be, make a farm map and protocols. Depop-repopulation.

**Action 2:** Increase animal health by optimizing vaccination schedules based on blood samples. The various vaccination schedules are displayed at all departments.

**Action 3:** The elimination of malfunctions in the cup feeding system of the young piglets.



#### Biosecurity assessment after best practices implementation

#### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

*In the long-term, antimicrobial resistance could be suppressed and treatment may be more effective (reduced use of antimicrobials, less expenditure).*





Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Sander van Leeuwen, The Netherlands

Sander is living in Gelderland (east of the Netherlands) and has 1.000 sows. He runs a family business together with his father and 2 employees. The farm is run in a conventional way and achieves good results. From its history, the farm has grown in steps and got where it is today. Sustainability is reflected in high efficiency, resulting in among others a high production rate of 31,5 piglets/sow/year. In Project DISARM Sander is enthusiastic to meet other young (inter)national pig farmers.



Multi-actor team working together!



Together with his veterinarian and feed advisor, Sander is designing a farm health action plan focusing on 3 goals:  
Increase the farrowing rate to 90% within 5 months;  
Improve feed intake around weaning (>400 grams/day at weaning age).  
Decrease ear biting to a maximum of 1% in piglets around weaning having small marks of ear biting.

Biosecurity

The Biocheck® assessment of biosecurity resulted in a high score in feed, water and tool supply and visitors and personnel. To further improve the biosecurity, attention could be paid to the farrowing and nursing period and pest prevention.



Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
54%	67%	-Pest prevention	40%	-Piglets hygiene and health

Main Health Challenges

To maintain good animal health with high production rates.







## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Strategies adopted to reduce antibiotic resistance

This multi-actor team is carrying out three Plan-Do-Check-Act actions.

**Action 1:** Lowering the return rate of sows with 10% and increasing the farrowing rate to 90% within 5 months. The following actions were set:

- evaluate where the returns come from by making an analysis. Based on this analysis, identify points for attention. These points of attention will be discussed in the next multi-actor meeting.

**Action 2:** Improving feed intake around weaning.

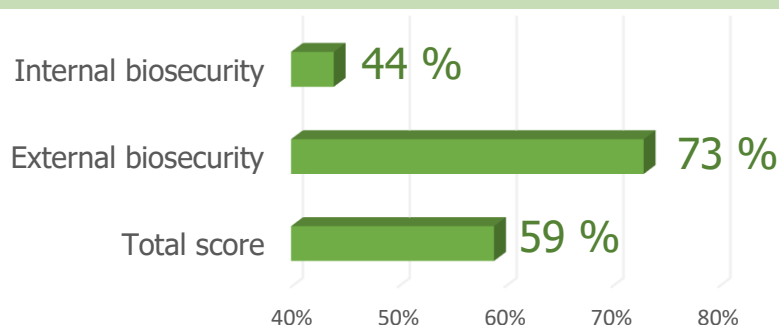
The total feed intake needs to be more than 400 grams/d at weaning (26 days). In addition, after weaning, the following needs to be achieved:

- temperature needs to be 29 degrees
- CO<sub>2</sub> concentration needs to be 3000 ppm maximum
- Feed intake at day 5 after weaning needs to be 900 grams
- % thin piglets at day 3 after weaning needs to be less than 3%

The team tries to achieve this by testing a new weaning diet. If the intended feed intake has not been achieved within 3 months, another weaning diet will be tried out. Important condition here is that the climate (temperature and CO<sub>2</sub>) is in control.

**Action 3:** Decreasing ear biting. At the last day in weaning pen, a maximum of 1% of the piglets may have small marks of ear biting. This will be done by eliminating a stress factor:

- the isolation will be improved by replacing the glass wool. In case this is not working enough, a test will be carried out with special anti-ear biting feed.



### Biosecurity assessment after best practices implementation

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

*Decreased antimicrobials expenses (annually).*

*In the long-term, antimicrobial resistance could be suppressed and treatment may be more effective (reduced use of antimicrobials, less expenditure).*

*'Low antimicrobial' animal products could target a consumer group with "one-health" concerns (added-value products, higher income than conventional systems).*







Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Niek Dieker, The Netherlands

This farm is located in North-Brabant. The farm houses 940 sows and 6,500 fattening pigs. It is a family business with a very high production due to the use of Danish genetics. At the same time this also results in a sensitive pig with high disease pressure. The farm is making plans to convert to SPF by means of depopulation - repopulation.



**Multi-actor team working together!**

Farmer together with his feed advisor, veterinarian and the Dutch FHT have design a MAFHT plan to deal with biosecurity risks.

Biosecurity



Biosecurity levels were already at a moderate level considering the Biocheck®. The initial Biocheck® assessment of biosecurity resulted in a Total score 68% / Internal 64% / External 72%. The main area of improvement is disease management, while the farm location impairs the external indices.

Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
68%	72%	-Farm location	64%	-Disease management

Main Health Challenges

Actinobacillus pleuropneumonia is the major problem at this farm





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Strategies adopted to reduce antibiotic resistance

#### Challenges

Lower APP disease pressure.

#### Actions to address the issues:

**Action 1:** Climate: under-pressure measurements will be taken, settings will be improved, and the software will be adjusted accordingly.

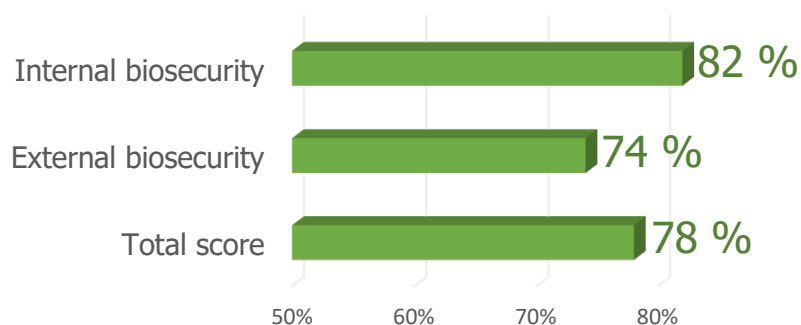
**Action 2:** Optimization of the vaccination schedule of the sows.

**Action 3:** The farmer is finding out if it is interesting to raise rearing gilts at another rental location to avoid APP contamination.

Climate is adapted in 5 departments.

In a few weeks, based on the experience in these 5 departments, the climate system will be renovated in the other departments as well; Vaccination schedule adapted. APP disease pressure improved after change of climate.

In addition, a workshop was organized for personnel, about biosecurity compliance.



### Biosecurity assessment after best practices implementation

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

*Decreased antimicrobials expenses (annually).*

*'Low antimicrobial' animal products could target a consumer group with "one-health" concerns (added-value products, higher income than conventional systems).*





Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Castellana of Innoporc, Spain

The farm belongs to a medium sized family business currently in the second generation run by 2 brothers and their father. One of the brothers is a veterinarian and the other an economist. The selected farm is a farm of 850 sows producing 20 kg piglets. The company has a strong character of development innovation and has carried out numerous actions to improve not only health but also production on the farms. It is located in the center of Spain.



Multi-actor team working together!

The owners’ background (economist and veterinarian Miguel) in combination with other veterinarian: Cesar Prisco, feed advisor and DISARM coach synthesize a powerful team against antibiotic resistance.



Biosecurity

The Biocheck results in the first audition (9/2/2021) were: external 77% and internal 73%. The farm has a good score based on Biocheck. The worst results are in pigs manure transport. The farm is located in a low density area and one of the most important improvements planned is to delimitate clean and dirty area during load/unload of pigs.



Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
73%	77%	-Pigs manure transport	69%	-Clean and dirty areas

Main Health Challenges

Reduce the consumption of antibiotics through health monitoring, reducing the pressure of pathogens present. On the other hand, protective measures will be increased to avoid reinfection and entry of new pathogens. In addition, if deemed appropriate, alternatives to antibiotics will be tested to address the problems present on each farm.





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Strategies adopted to reduce antibiotic resistance

Several working points have been identified and depending on the extent of implementation in the coming months, it will be possible to evaluate the assignment of objectives. At present, a series of actions are being developed with the aim of improving the health status and disease control on the farm.

The interventions that have been carried out are as follows:

#### Action 1: General aspects

- Implementation of a protocol for the protection of workers against Covid-19.
- Certification in the IAWS regulation (Interporc Animal Welfare Spain) on welfare and biosecurity certification.

#### Action 2: Biosecurity

- Reorganization of the gilt replacement, verification of health status on arrival and implementation of quarantine controls. Establishment of a protocol in case of failure to meet objectives.
- Internal farm movement protocol with application of hygienic measures between areas.

#### Action 3: Breeders

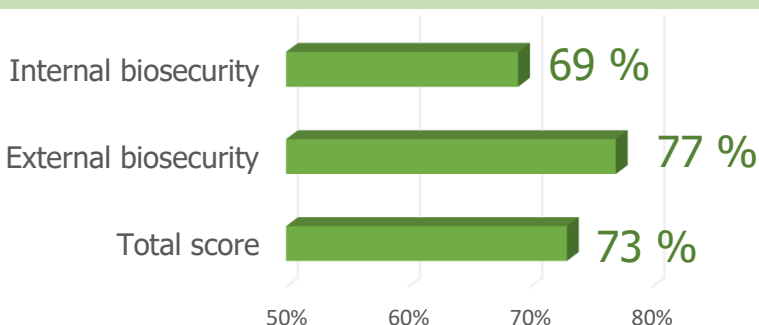
- Analysis of the effectiveness of the vaccination program. Serial serology to verify or adjust the current vaccination program.
- Establish a protocol for cleaning and washing grids between batches of breeders housed in groups.

#### Action 4: Weaning

- Zinc oxide elimination proposal: vaccination, probiotics, phytotherapy.
- Specific *Streptococcus suis* control work.
- Convenience assessment of specific plan for *H. parasuis*.
- Establish proper flow of workers by avoiding crossroads.

#### Action 5: Farm management

- Establishment of a computer program for the management and organization of the farm. The program will be created at company level with farm assignment



### Biosecurity assessment after best practices implementation

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

*Decreased antimicrobials expenses (annually).*

*'Low antimicrobial' animal products could target a consumer group with "one-health" concerns (added-value products, higher income than conventional systems).*







Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Agronsella of Los Alecos, Spain

The farm belongs to a small familiar integration company located in the northern part of Spain a low density area. It is the second generation of pig breeders. The census of the farm is 2.300 sows with 10.000 for nursery piglets. The final objective of this farm is being able to reach non-use of antibiotics in entering a specific certification program.



Multi-actor team working together!

Farmers with their veterinarian Maria Oficialdegui and feed advisor they have design a MAFHT plan to deal with biosecurity risks.



Biosecurity

The Biocheck results in the first audition were: external 85% and internal 80%. The farm has a very good score based on Biocheck. The worst result is in internal biosecurity during farrowing and suckling period. This farms is a two sites system with 200m between two sites and they have to improve changing and/or disinfecting boots, materials when workers move from one site to the other.



Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
82%	85%	-Material disinfection	80%	-Farrowing and suckling

Main Health Challenges

Controlling neonatal diarrhea the use of antibiotics will reduce and they also are testing natural treatments as an antibiotics alternative. They are using natural products to treat diarrhea.





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Strategies adopted to reduce antibiotic resistance

This farm is working with external consultancy in certification because the final goal is to get a farm for certification in antibiotic-free production.

The interventions that have been carried out are as follows:

**Action 1:** General aspects

- Implementation of a protocol for the protection of workers against Covid-19.

**Action 2:** Biosecurity

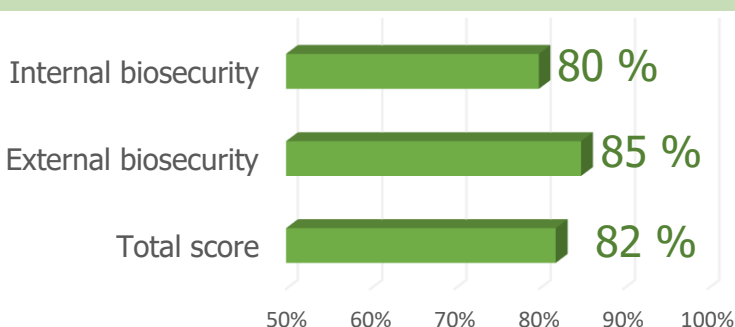
- Specific regional biosecurity control work with analysis and sharing of problems of all farms in the area. A pathogen monitoring protocol (mainly for PRRS) is established.
- Strengthening biosecurity measures.

**Action 3:** Reproduction

- It is proposed to introduce GP sows to avoid the entrance of animals and only buy semen from a controlled center.
- Establish a program of mycoplasma eradication at farm level.
- Registration and control of health status against: *Lawsonia intracellularis*, appendicitis and dysentery.

**Action 4:** Weaning

- Strategy to reduce the use of Zinc oxide
  - Specific temperature and ventilation control with daily adjustment.
  - Protocol for the inspection of animals and the authorization of an independent space for sick animals.
- Individual animal identification.
- Amoxicillin reduction strategy.
  - Testing with alternative therapy if necessary.



### Biosecurity assessment after best practices implementation

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

*Decreased antimicrobials expenses (annually).*





Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

A Large Family Business, Spain

The farm is owned by a medium-sized family integrator who is currently run by the second generation and has almost doubled in size over the last 10 years from 10.000 to 20.000 mothers. The integrator not only has a feed factory and farms, but also industrialization. The chosen farm is a non-integrated farm owned by the company with 2.400 sows. It is located in the northern half of Spain.



Multi-actor team working together!

Farmers with their veterinarian Eva Martín and feed advisor they have design a MAFHT plan to deal with biosecurity risks.



Biosecurity

The Biocheck results in the first audition (23/02/2021) were: external 74% and internal 72%. The farm has a good score based on Biocheck. Internal biosecurity in nursery is the worst result and materials delivery and management of replacement animals in external biosecurity.

Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
72%	74%	-Materials delivery -Management of replacement animals	70%	-Biosecurity in nursery

Main Health Challenges

PRRSV increases bacterial disease problems and so they are trying to eliminate the virus presence with vaccination and management. They are using several natural products to control neonatal diarrhea and *Streptococcus suis* in nursing piglets.







## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Strategies adopted to reduce antibiotic resistance

This case study is a large farm with problems in the recirculation of pathogens. One of the main problems found was in recurrent PRRS. Subpopulations of sows with different health status are being created on the farm, which due to contacts in group housing, increases the presence of the disease.

A specific control and stabilization plan for PRRS was decided:

**Action 1:** Evaluation of the status of the farm. Analysis to determine whether the farm is stable or unstable positive.

**Action 2:** Assessment of the risks of recirculation of the disease and proposal of measures to prevent its circulation.

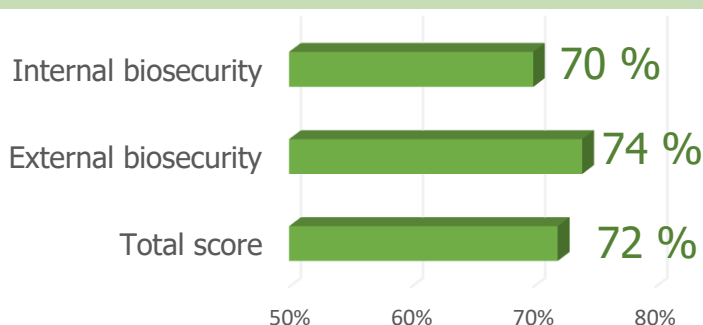
**Action 3:** Evaluation of the use of vaccination and application protocol.

**Action 4:** Establish a monitoring and evaluation protocol.

In order to reduce the presence of PRRS, a biosecurity reinforcement plan has been established to prevent the entry of new strains to the farm including transport logistics at company level and verification of regional disease pressure for surrounding farms.

**Action 5:** Health work is established and strengthened:

- Movements of personnel and animals.
- Personnel hygiene and cleaning, disinfection and emptying of rooms (most important in management).
- Climate control and ventilation monitoring.
- No replacement of reproductive sows for a period of time of 9 months.
- If necessary, partial depopulation is proposed at the weaning stage.
- Establish a correct procedure of euthanasia if there is not recovery option.



### Biosecurity assessment after best practices implementation

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

*-Positive*

*Decreased antimicrobials expenses (annually).*





Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Mendoza of Juan Jimenez, Spain

The farm belongs to a large integrator (top 5 in Spain). It is located in the south of Spain. Is a farrow to finish farm (reproductive sows + weaned piglets + fattening pigs). The census of the farm is 1.800 reproductive sows with 3.200 places for piglets, 3.600 places for pre-fattening and 15.000 for fattening. It's an old farm with more than 25 years. Sows are hyper prolific genetic. Farm is located in a low density area without any farms in several km.



Multi-actor team working together!

Farmers with their veterinarian Ignacio de Miguel and feed advisor they have design a MAFHT plan to deal with biosecurity risks.



Biosecurity

The Biocheck results in the first audition (23/02/2021) were: external 76% and internal 73% and total score 75%. The farm has a good very score based on Biocheck. The farm is a three sites systems located in a low density area. The way to load dead animals is shared with other farm vehicles and so they have to differentiate better between clean and dirty zone.



Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
75%	76%	-vehicles control	75%	-delimitate clean and dirty area

Main Health Challenges

The farm has three sites and internal biosecurity is essential to not cross pathogens from one site to the others. Farmers are working as two different farms with independent material, locker room, etc. Quarantine and correct vaccination plan is one of the main goals to avoid the introduction of new pathogens.





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Strategies adopted to reduce antibiotic resistance

This case study is a farrowing to finish (F-F) farm with high presence of pathogens. The farm is PRRS positive, with significant episodes of diarrhea at weaning controlled by Zinc oxide and if necessary, individual treatments with colistin. Furthermore, *S. suis* and *H. parasuis* are present at weaning as Swine Respiratory Complex at bait level despite vaccination. Lastly, mild incidence of ileitis in fattening is reported (seasonal).

As it is a F-F farm, work phases are established in the action plan in order to evolve. Phase 1 is currently being developed and is oriented towards general measures:

**Action 1:** Implementation of a protocol for the protection of workers against Covid-19.

**Action 2:** Differentiation of workers and areas. No movement between areas.

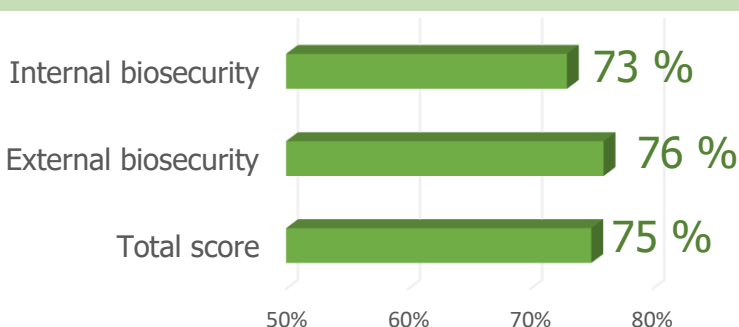
**Action 3:** Implementation of hygiene protocols within each area of the farm and in animal movements.

**Action 4:** Cleaning and management of utensils. Having specific material available for each area.

**Action 5:** Analysis of the farm environment: gas concentration and operation of automatic ventilation.

**Action 6:** Control of feed administration. Dry feed.

**Action 7:** A monitoring via serology of the diseases present on the farm will be undertaken in order to be able to move to phase 2 of the action plan depending on the evolution of phase 1.



### Biosecurity assessment after best practices implementation

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

*-Positive*

*Decreased antimicrobials expenses (annually).*





Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

La Punteta Roja of VC, Spain

The chosen farm belongs to a large integrator (top 5 in Spain). It is located in the north of Spain in one of the traditional production areas and has been built 13 years ago. It is a farm of 950 sows with piglet production without fattening unit. A father and his two sons are managing the farm with other two workers. A few years ago, they changed the Duroc genetics to a hyper prolific French genetic and currently they are adapting all the management because of the growing production. One of the main goals in this farm is to improve external biosecurity to not allow disease new entrances.



Multi-actor team working together!

Farmers with their veterinarian Quim Corbella and feed advisor they have design a MAFHT plan to deal with biosecurity risks.



Biosecurity



The Biocheck results in the first audition (30/11/2020) were: external 86% and internal 81%, the total score 84%. The farm has a good very score based on Biocheck. It could improve in feed, water and materials delivery ( for example cleaning and disinfecting new materials before using in the farm) and management in farrowing unit. The farm is a two sites system and the owner is focusing in avoid the disease transmission between the two sites with a clothes changing and boots disinfection in each site entrance.

Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
84%	86%	-Disease transmission between the two sites	81%	-Water and feed -Material delivery -Management in farrowing

Main Health Challenges

A few years ago, they changed the Duroc genetics to a hyper prolific French genetic and currently they are adapting all the management because of the growing production. One of the main goals in this farm is to improve external biosecurity to not allow disease new entrances. They are using auto-vaccines to control some bacterial disease and reduce antibiotic consumption.





Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Strategies adopted to reduce antibiotic resistance

This case study is a farrowing to nursery farm in a high density areas of pig farms.

The integration company which is the owner of the pigs is focusing the action plan in external biosecurity improvements:

**Action 1:** Establishing a differentiation between clean and dirty zone for workers and visits, vehicles.

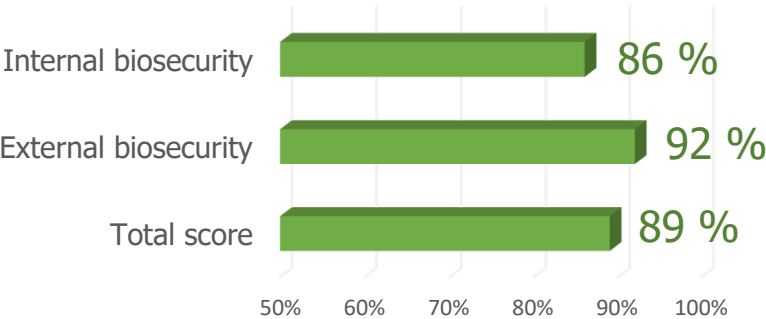
**Action 2:** Monitor with a high frequency water quality.

**Action 3:** Implement an automatic system to sanitize the water.

**Action 4:** Control and disinfection of materials before introducing to the farm.

**Action 5:** Establishment of a computer program for the management and organization of the farm. The program will be created at company level with farm assignment

Biosecurity assessment after best practices implementation



Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

*Decreased antimicrobials expenses (annually).*

*-Positive*







## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Pig Sector



### A Review

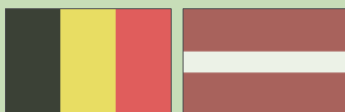
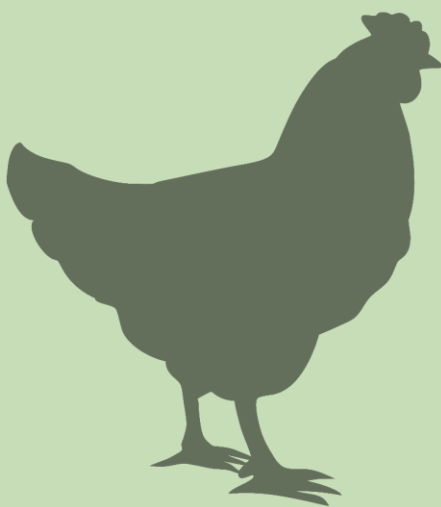
- ✓ The initial biosecurity score in Spanish case studies were +18,8%.
- ✓ Farmer attitudes towards antibiotics reductions were positive in both Spanish and Dutch case studies.
- ✓ The main Health Challenges in Spanish case studies were more focused in pathogens level, while Dutch challenge was the overall biosecurity improvement.
- ✓ Strategies adopted to reduce antibiotic resistance were more targeted in Dutch case studies, while in Spanish focused on general management manipulation.





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

# Poultry Sector



DISARM has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 817591

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Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Stefaan S. Farm, Belgium

The first Belgian farmer exploits a broiler farm with two houses of 3-year-old with a capacity of 85.500 birds. Compound feed is being bought from a supplier and being mixed with self-produced wheat gradually up to 30 % on the farm. He is also much involved in the local division of the Young Farmers organization “Groene Kring” for which he has been showcasing his farm on social media.



Multi-actor team working together!

To tackle coccidiosis the other FHT members proposed to apply a disinfection combining ammonium sulphate and calcium oxide. Upon adding water to this mixture, a layer of gypsum is formed between the flooring and the bedding and at the same time ammonia is formed which affects the cell wall of the oocysts. The execution of this action is pending.



Biosecurity

There is a lack of a clear physical separation between a dirty and clean route on the farms premises. The lay-out of the farmyard is central driveway to reach both the entrances to the technical rooms of the different compartments and to reach the large stable doors for chick delivery and collection of finished birds and with the feed silos between two consecutive compartments. Still, carcass disposal facilities are well equipped and strategically located at the farm gate to prevent having the rendering truck entering the farm premises. However, there is no general hygiene lock at the entrance of the farm. A general hygiene lock in addition to the hygiene locks between the compartments were shoeing and clothing is changed, would be a valuable contribution to external biosecurity measures. Another great risk factor is the cleanliness of transport crates for the birds coming from the slaughterhouse at thinning and at final clearance of the barns.

Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
68%	69%	-Physical separation of clean and dirty route on farm premises.	65%	-Installing a central farm hygiene lock in addition to the hygiene locks per compartment

Main Health Challenges

**Coccidiosis.** It challenges both technical performance as well being a risk factor for additional gut health problems that require antibiotic treatment. The farm experiences persistent and aggressive fast coccidiosis outbreaks with a deviant resistant *Eimera Acervulina*, from which the birds often don’t recover well.





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Strategies adopted to reduce antibiotic resistance

#### Action 1: Reduce and prevention of enterococcosis.

The concrete action taken were improving water quality for the day-old chicks. Additionally, an action point to reduce the stocking density by 2-3%. The planning of day-old chick supply has been changed accordingly.

**Action 2:** Optimization of ventilation settings Optimization of the ventilation settings has been done and is still ongoing to improve the respiratory health and further improve litter quality

**Action 3:** Improved prevention and control of coccidiosis Improved prevention and control of coccidiosis was another important area of improvement for the farm. This improvement action started with establishing the coccidiosis pressure on the farm with executing oocyst counts in two consecutive production cycles.

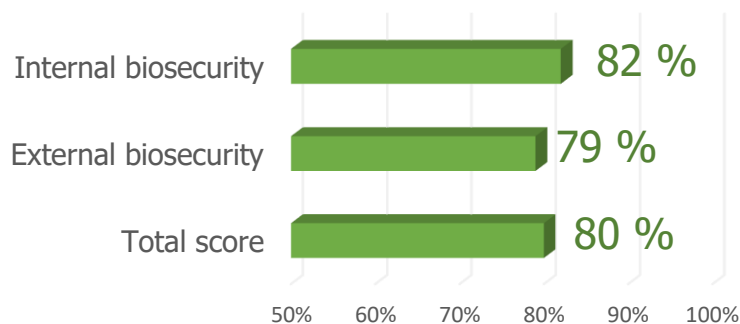
### Useful Tips

An additional measure that has been tried was supplementing the chickens in their drinking water with a supplement based on garlic and other phytoactive compounds. This however showed no instant significant results and tended to form flakes and cause clogging in the waterlines, hence it was only used in two production cycles.

The farmer immediately started with flushing with more and hot water when rinsing the stables during cleaning.

Lastly the coccidiostat in the feed has been changed from a product consisting of nicarbazin and narasin as the active molecules to a product combining nicarbazin and the ionophore monensin.

Additionally, a repetition of a chemical clean-up in one production cycle followed by vaccination against Eimeria in the consecutive cycle has been scheduled for the spring of next 2021.



### Biosecurity assessment after best practices implementation

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

*The treatment costs are always more advantageous than that of livestock losses/culls.*

*The implementation of best practices to improve animal health on a farm-scale are more expensive than antimicrobial usage.*





Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Wendy S. Farm, Belgium

This case study is being executed on the farm of our only female broiler farmer. She exploits a broiler farm of 85.000 broiler chicks. Feeding of the broilers is being done with complete compound feed. This farmer realizes the need for reducing the consumption of antibiotics for future-proof and sustainable production. Moreover, she wants to improve the collaboration with her advisors and improve the access to technical knowledge to elevate her farm to better performance.



Multi-actor team working together!

With the help of MAFHT, the farmer was encouraged to set up her own digital collaboration platform and invite their advisor from the hatchery to join the FHT to discuss options for managing day-old chick quality.



Biosecurity

This farms has a separate route for feed deliveries to the farm which is an important external biosecurity feature. Also the carcass disposal facilities are well equipped and strategically located at the farm gate to prevent having the rendering truck entering the farm premises. There is, however, no hygiene lock. The cleanliness of transport crates for the birds coming from the slaughterhouse at thinning and at final clearance of the barns remains a biosecurity risk. This is in general mostly beyond the control of the poultry farmers themselves and difficult to act upon directly at the time of collecting the chickens.



Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
66%	66%	-Stricter biosecurity measure for visitors and personnel	66%	-Improving cleaning and disinfection protocol

Main Health Challenges

The major health challenges are coccidiosis control issues with gut health in the chicks (*E.coli*).







## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Strategies adopted to reduce antibiotic resistance

Focusing on the quality of the day old chicks (by improving the communication with the hatchery) and improving their health standards before they reach the farm is a important strategy to reduce antimicrobial use.

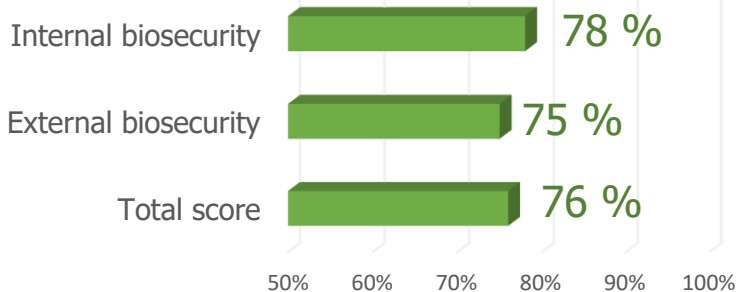
Thus, during the first meeting the following action points were defined:

**Action 1:** For better coccidiosis control: a chemical decox treatment would be executed in the next production cycle. After this treatment, the farmer and vet had to decide on doing a vaccination against the parasite or changing to a new in feed anticoccidial based on monensin and nicarbazin.

**Action 2:** For the improvement of the general water quality: the partner of the farmer would draft a design for automated flushing of the waterlines.

Furthermore, the farmer will start with acidifying the water to decrease the pH of the water to prevent microbial proliferation and promote gut health in the chickens.

The veterinarian will advise on the type acid to add and on the dosing protocol. Probably, protected esterified butyric acids mixtures will be used to ensure sufficient acidification in the intestines and not only the stomach.



### Biosecurity assessment after best practices implementation

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

- Decreased expenditure on antimicrobials (annually).
- In the long-term, antimicrobial resistance could be suppressed and treatment may be more effective (reduced use of antimicrobials, less expenditure).
- 'Low antimicrobial' animal products could target a consumer group with "one-health" concerns (added-value products, higher income than conventional systems).
- A beneficial and sustainable transition period, if the reduction/avoidance of antimicrobials in livestock will become obligatory within the EU





Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Putnu fabrika Ķekava, Latvia

The "Putnu fabrika Ķekava" company represents full cycle broiler farming model since 1967. The total area of the territory is 93ha, which include 30 parent stock houses and 64 broiler houses, incubator, slaughterhouse, fresh meat processing plant, marinated, ready-to-eat products processing plant and administration. Company on average rears 14,5 - 15 millions broilers per year, total amount of birds per cycle are around 1.800.000.



Each broiler house capacity is 25 000 - 35 000 birds per house, which allows to keep stocking density 35,13kg/m2 and reach the daily gain 58,7g, and FCR 1,52. Company vision: "Good food for better future" which leads us to thrive for excellence in every step of our business process.



Multi-actor team working together!

Strategic development plans and clear goals based on data analysis and estimated business results are set to ensure that all teams work together. The shareholders of the company, team of veterinarians, team of zootechnicians, nutritionists, farm workers, engineers, marketing specialists, personnel department, economists, lawyers etc. are united to reach the company targets.



Biosecurity

At the beginning of the project the Biocheck® assessment of biosecurity resulted in an overall score of 85% (External 85% and Internal 86%). The farm buildings were built long time ago, thereby some biosecurity points are difficult to fulfill recently, but we are constantly improving and investing in biosecurity every year. Until now: three heated disinfection barriers had been built - two barriers between broiler house areas, third - on exit of auxiliary road used for manure transportation. New fence between broiler houses was built to restrict movement of unauthorized persons and ensure strict control over vehicle traffic. As well it helps to improve current rodent control program. New process in warm seasons was implemented - washing of feed towers at the end of the production cycle.

Total score	External biosecurity	Main area of improvement	Internal biosecurity
85%	85%	-Renewal of road surface on which the birds are transported to the slaughter as well as transportation of poultry manure	86%

Main Health Challenges

Main health challenges are related with foot pad dermatitis, biosafety system improvements and raring cycles.  
"Covid-19 risk assessment to ensure continuity of production and workers' health."





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Strategies adopted to reduce antibiotic resistance

*For a perfect result, we use our 50 years of experience and apply processes and product control to every step of production. We have an advantage - the production itself is full-cycle – we have own breeder, parents flock, hatchery, separate broiler breeding farms, slaughterhouse and fresh meat processing plant, which means that every step we control and strictly comply with Food and Veterinary Service rules and European regulations.*

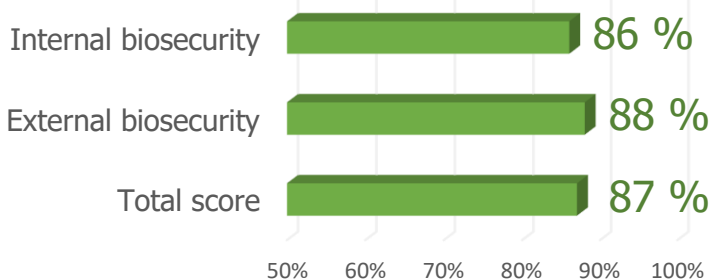
**Action 1:** With developed breeder poult immunological protection program, which include also autogenous vaccine, we succeed in reducing major part of bacterial and viral contamination in chicken houses. Breeder and broilers vaccination program effect based on serological immune response is monitored regularly both in own and outsourced laboratories. AV antibody titers (from broilers and breeders) is done on a regular base.

**Action 2:** As solution for foot pad dermatitis reduction we also did a series of experiments to find the best litter thickness, components and proportion between chosen solution - mix of shavings and peat. The microclimate of chicken houses is closely monitored - ventilation program, temperature and humidity. One of future projects is to reduce stocking density as well.

**Action 3:** Many biosecurity points have been improved and refined to reduce the burden of bacterial and viral infections - rodent control program, washing of feed towers at the end of the production cycle, double floor washing in broiler houses, water line disinfection, effective disinfectant, and prolongation exposure of housing disinfectants. The quality of disinfection and the quality of water are regularly determined in the laboratory.

*Strategy to reduce antibiotic resistance is multifactorial: broad spectrum of poultry disease monitoring on a regular base, flexibility in the operational review of biosafety requirements to improve biosecurity, the microclimate conditions in the chicken houses in accordance with the requirements for broilers in each age, appropriate vaccination program, finely developed recipes adjusted to each age group of the birds, disinfection of poultry houses etc.*

### Biosecurity assessment after best practices implementation



### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

- Decreased expenditure on antimicrobials (annually).
- In the long-term, antimicrobial resistance could be suppressed and treatment may be more effective (reduced use of antimicrobials, less expenditure).
- 'Low antimicrobial' animal products could target a consumer group with "one-health" concerns (added-value products, higher income than conventional systems).







## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Lielzeltiņi, Latvia

"Lielzeltiņi" company represents the incomplete cycle broiler farm. It also includes feed processing plant, which ensures well-balanced and nutritious food for our chicken, based on homeland wheat, corn, rapeseed or sunflower oil. The feed mill factory receives constant feedback from the poultry houses leading to a creation of individually tailored feed. Number of birds per cycle in "Lielzeltiņi" are around 800 000, total reared amount 6 - 6,5 million broilers per year.

Production performance: daily gain 62,48g, slaughter age 35,41 days, viability 95,53%, FCR 1,503. Company vision: "New era of sustainable agriculture and nourishing food. Our goal is to continuously improve using the latest scientific discoveries, so that the product meets the highest consumer requirements.



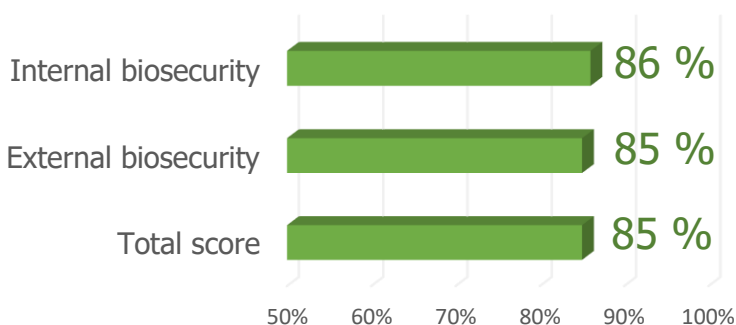
### Multi-actor team working together!

All structures of the company are involved to fulfil the set business targets. The shareholders of the company, team of veterinarians, team of zootechnicians, nutritionists, farm workers, engineers, marketing specialists, personnel department, economists, lawyers etc. are united to reach the company targets



### Biosecurity

At the beginning of the project the Biocheck® assessment for "Lielzeltiņi" resulted in an overall score of 85% (External 85% and Internal 86%). The owner of the farm invests in biosecurity improvements every year. Latest investments were done to renovate employee locker rooms, which ensure better work conditions. In 2021 reconstruction of the fence around the production area was completed as well. New procedures during the wild birds migration period was implemented - additional disinfection of vehicles.



### Biosecurity assessment during recruitment

### Main Health Challenges

Main health challenges are reducing the burden of bacterial and viral infections. Foot pad dermatitis also is a present problem. Compressed service period between cycles.







## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Strategies adopted to reduce antibiotic resistance

Strategy to reduce antibiotic resistance is multifactorial:

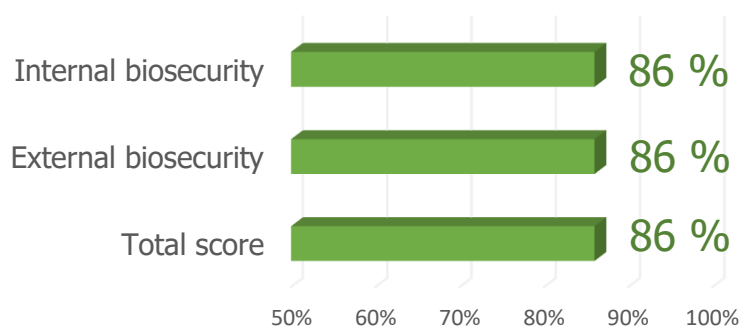
- ✓ improving biosecurity,
- ✓ the microclimatic conditions in the poultry house in accordance with the requirements for broilers in each age,
- ✓ a propriate vaccination program,
- ✓ finely developed recipes according to each age group of the birds,
- ✓ disinfection of poultry houses etc.

The owners of the farm invests in improving biosecurity every year. Many biosecurity points have been improved and refined to reduce the burden of bacterial and viral infections.

- ✓ Renovated and upgraded staff locker rooms in last year.
- ✓ Floor coverings in few poultry houses have been replaced.
- ✓ Reconstruction of the fence around the area was completed last year.
- ✓ Additional disinfection of vehicles during the migration of wild birds.

Without antibiotic treatments are raised following percentage of broilers:

in 2016: 84.8%,  
 in 2017: 85.3%,  
 in 2018: 98.5%,  
 in 2019: 100%,  
 in 2020: 100%,  
 in 2021: 100% of total broilers were raised without antibiotics



### Biosecurity assessment after best practices implementation

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

*-Decreased expenditure on antimicrobials (annually).*

*-In the long-term, antimicrobial resistance could be suppressed and treatment may be more effective (reduced use of antimicrobials, less expenditure).*

*-'Low antimicrobial' animal products could target a consumer group with "one-health" concerns (added-value products, higher income than conventional systems).*





Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

An Organic Poultry Farm, Latvia

The farm was founded in 2016 and its main activity is the breeding of organic meat birds. In 2017, a certificate of organic farming was received. Farm 3 is the first farm in the Baltics that breeds genetically organic poultry meat, providing a full breeding cycle. Currently, the farm is home to a flock of mother line (breeders), which lay an average of 350 hatching eggs a day, of which 1,300 broiler chickens are incubated once a month for meat production. The hen herd is based on the slow-growing Hubbard premium broiler line from France, which is specially adapted for organic breeding. The characteristics of the birds and the efficient use of food allow them to gain weight naturally, they reach their carcass weight (1.6 kg - 2.2 kg) in 81 days, ensuring high quality meat. Appropriate living conditions are provided for the welfare of birds - a maximum of four birds lives per 1 m2 and have free access to outdoor pastures.



Multi-actor team working together!

The Farm Health Team for farm 3 consists of two farm owners (husband and wife), the herd veterinarian, animal husbandry expert (from France) and a feed consultant from the feed and feed additives supplier (which is involved when needed).



Biosecurity

The Biocheck® assessment of biosecurity resulted in an overall score of 76% (External 76% and Internal 76%). The owners pay a lot of attention to biosecurity, but still there are points to improve: as installation of fence around farm, installation vehicles disinfection place and protocol, introducing disinfection control sampling.

Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
76%	76%	-Fence the farm, to build a separate road to the slaughterhouse. Install disinfection pits in drive roads	76%	-To do some checking's on cleaning and disinfection efficacy





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Main Health Challenges

During last years the main health associated problem is associated with coccidia around day 42. Coccidial diarrhea influences technical performance and can cause economical losses because of potential reduction of carcass weight and quality, a toltrazuril was used at day 42. The farm has a strict vaccination scheme for IB, Gumboro and NCD.

### Strategies adopted to reduce antibiotic resistance

The main goal for owners in collaboration with their farm veterinarian is to find solution for coccidiosis control and to reduce necessity of any medication usage. A farm health action plan will focus on:

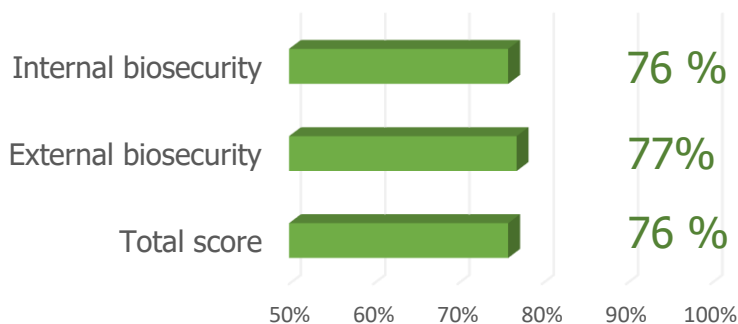
**Action 1:** Improvement of disinfection (disinfection with fire)

**Action 2:** Possible introduction of vaccination protocol against coccidiosis to prevent diarrhea syndrome around day 42.

**Action 3:** Also to improvement of external biosecurity.

- ✓ Proper external and as possible pedantic internal biosecurity measures.
- ✓ Strict vaccination protocol.

In last two years the incidence and mortality of coccidiosis is decreased. Overall mortality decreased from 5% in 2019 till 2% in 2020 and 2021.



### Biosecurity assessment after best practices implementation

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

*-Decreased expenditure on antimicrobials (annually).*

*-'Low antimicrobial' animal products could target a consumer group with "one-health" concerns (added-value products, higher income than conventional systems).*

*-With the decline in bird mortality, the steady production of high-quality products has stabilized. The market demand is high and the products can be sold at a sufficiently high price to manage with appropriate income.*







Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

A Small Organic Farm, Latvia

The farm was founded 7 years ago and its activity is the breeding of organic meat animals like broilers, ducks and beef cattle. Till year 2020, the owners raised broilers in an old wooden barn, but in 2021 a new premise appropriate to broilers needs was built. It is a small organic farm which works with conventional broiler cross as Ross 308. The farm increased broiler amount from approximately 200 broilers a month in 2020 till 500 broilers a month in 2021. Broilers reach their carcass weight (1.4 kg - 2.4 kg) in 81 days, ensuring high quality meat.



Multi-actor team working together!

The team consists of a farm owner and two veterinarians. Veterinary advices is asked when owner thinks it is necessary. Food Safety Authority inspectors are involved in discussing biosecurity and health issues of birds when needed.



Biosecurity

Poultry business was start as small back-yard farming, but with time the demand for their products did rise. Respectively numbers of broilers also did rise, but the premises were not suitable for more “commercial” farming. When broilers were kept in old premises where the applications of general biosecurity measures are difficult and some impossible, the External Biocheck result was 37 % , internal 41% and total 38%.



Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
38%	37%	-Anticipate the clean and dirty area on the new farm. Fence the farm. to build a separate road to new premise.	41%	-Create a biosecurity manual for the new broiler premises







## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Main Health Challenges

Main health challenges are related mostly to Coccidiosis and *E. Coli*, and gut health in general. Not every time when a bird dies the cause of death is identified. There is no vaccination protocol introduced because of small bird numbers and vaccine unavailability for small herds (economical issue). Also most broiler health problems were related to the non-compliance of the old barn with the qualitative manipulations of internal biosecurity (for example, hard to do proper disinfection because there were wooden constrictions).

### Strategies adopted to reduce antibiotic resistance

Farm health Action Plan was mostly focused on biosecurity improvements:

**Action 1:** Introducing rodent control program

**Action 2:** Introducing precise washing and disinfection protocols, at the end of the production cycle

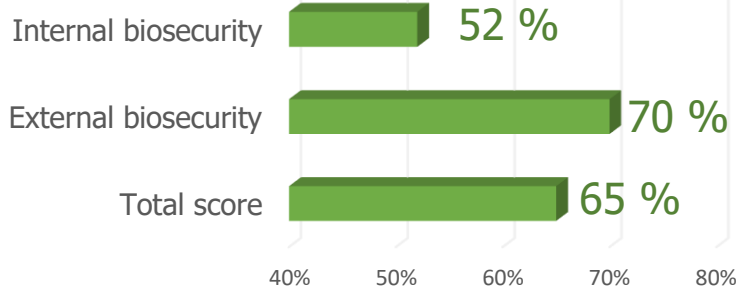
**Action 3:** Increase days off birds between cycles at least 3d

**Action 4:** Introducing of Higiene lock and clothes/boot change before enter the bird house

**Action 5:** Introducing microclimate control procedure.

*It was possible to improve the biosecurity measures because the owners did build a new bird house in place of wooden barn.*

There is no usage of antibiotics in this farm. Farmers focuses on biosecurity and low bird density. Ensuring an appropriate environment for broilers and implementing biosecurity measures significantly reduced overall bird mortality by up to 2%



### Biosecurity assessment after best practices implementation

After broilers breeding was moved to new premises the External Biocheck result increased till 70 %, Internal 52% and total till 65%.

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

*-In the long-term, antimicrobial resistance could be suppressed and treatment may be more effective (reduced use of antimicrobials, less expenditure).*

*-'Low antimicrobial' animal products could target a consumer group with "one-health" concerns (added-value products, higher income than conventional systems).*

*-Reduced mortality has improved economic performance*





Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

# A small conventional Poultry Farm, Latvia

The poultry for farm owners is not primary business. The main employment is connected to wood-processing. Secondly the owner delivers broiler chick (Ross 308) and other bird chicks from Poland and sells them to local small and back-yard farmers. Third, he keeps broilers (Ross 308) and turkey (BIG 6) and sells meat in the local market. The work with poultry started slowly 5 years ago. Now the number of birds does rise and he needs to renovate the bird farm to achieve basic poultry specific needs and biosecurity. The broilers are fed with conventional feed, but on average 60d cycle, the slaughter weight is 2,4 - 5,0 kg. Broiler chicks are kept in open type wooden brooders. As the bird stocking density is low (< 33 kg/m), qualitative feed is fed, microclimate issues are in process to be solved, the mortality rate does not bother the owner. These were 2,3 % in 2019 and 0,8% in 2020. But there is a lot to improve in keeping conditions so the farm renovation has started. The main aim is to renovate the isolated bird sections and build a hygiene lock.



## Multi-actor team working together!

The team consists of a farm owner, veterinarian and Food Safety Authority inspectors. Veterinary advices is asked when owner thinks it is necessary. Owner has good communication and experience exchange with Polish poultry collaboration partners.



## Biosecurity

The Biocheck results were as follow: external 61% and internal 52%. The main issues are connected to use of old building. There are separate room for broilers and turkeys. But there is need for general biosecurity plan implementation.

Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
58%	61%	-Stricter biosecurity measure for visitors and personnel.	52%	-Improving cleaning and disinfection protocol. Installing a central farm hygiene lock in addition to the hygiene locks per compartment





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Main Health Challenges

Unidentified mortality is the main issue. Total mortality for broilers in 2019 was 2,3%

### Strategies adopted to reduce antibiotic resistance

Farm health Action Plan was mostly focused on biosecurity measures:

**Action 1:** Introducing rodent control program.

**Action 2:** Reconstruction of wall and floor surfaces that there become effectively cleanable and washable, allowing for a proper disinfection.

**Action 3:** Precision of washing and disinfection protocols, at the end of the production cycle.

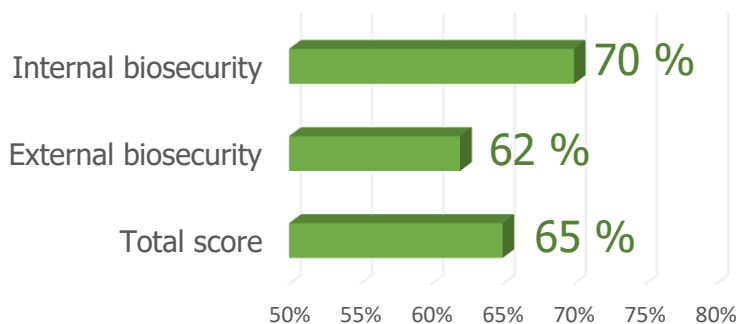
**Action 4:** Introducing of Higiene lock and clothes/boot change before entrance of the bird house.

**Action 5:** Communication about correct foot bath use.

**Action 6:** Communication about the better personnel flow between different bird age and breed groups.

There is no usage of antibiotics in this farm. Farmers focuses on biosecurity and low bird density.

The total mortality form 2,3 % in 2019 did decrease to 1,3 % in 2021. Live weight gain did rise from 50 g a day in 20219 to 60g a day in 2021. But the FCR from 2,4-2,9 in 2019 did rise to 2,9 - 3 in 2021.



### Biosecurity assessment after best practices implementation

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

*-The owner replied that he do not use antibiotic till now and he believes that with low bird density and good management the birds can be raised with no antibiotics.*





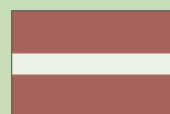
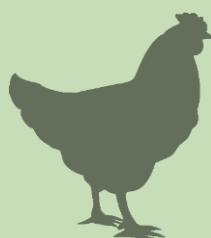
## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

## Poultry Sector



### A Review

- ✓ The initial biosecurity score was similar between Belgian and Latvian case studies. However, in Latvia there were higher fluctuations.
- ✓ Farmer attitudes towards antibiotics reductions were more positive compared to any other livestock sector. Besides, poultry farmers had a more clear point of view regarding their goals and the importance of reducing antimicrobial use.
- ✓ The main Health Challenge were related mostly to Coccidiosis and *E. Coli*.
- ✓ The reduction of antibiotics usage in Poultry sector during DISARM project was measurable.





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

# Dairy Cattle Sector



DISARM has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 817591

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Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Huddlestone Farms,  
SE England

This farm bred 458 milking cows with calving occur all-year-round. The milking cows are TMR fed with partial grazing. The cows produce 11 tons milk per year , high pregnancy rates, and have consistently bred for profit and longevity, resulting in the farm being the number 2 in UK for genetic merit . The farm focuses on having a good animal health, carrying out monthly foot trimming and purpose-built crush, plus good housing design for improved ventilation, and having a low incidence of disease generally. KPIs are monitored and graphed regularly and so trends are spotted quickly and remedial action identified. Well below average on antibiotic usage, it would be even lower but the policy of selling high merit young cows, has led to having an older herd with more potential health issues.



Multi-actor team working together!

Family farm run by father - son with brother vet and mum nutritionist. Team of loyal and committed farm staff (milkers, tractor drivers and feed people) mainly younger people that the farm focus on developing and helping boost their careers in farming.



Biosecurity

The farm has very few visitors but they do still have adequate boot dip on arrival. Not many dairy farms nearby due to where they are in country so no risky neighbors. They keep cows in all year round so no shared space between cows and vehicles. The vet has their own kit and clothes for on farm as they're a family member. The calves are looked after the father who does not work with the milking herd and they are in a separate shed, which reduces spread of disease. There are lots of farm workers who do move between groups of animals and use same equipment and there are no isolation facilities, so there is room for improvement.

Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
57%	68%	-Pressure wash vehicles; signs for visitors and sign in book; separate storage for carcasses.	46%	-Separate equipment, clothes and area for incoming/sick cows; more handwash; more use of fresh needles; better cleaning of calving area





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Main Health Challenges

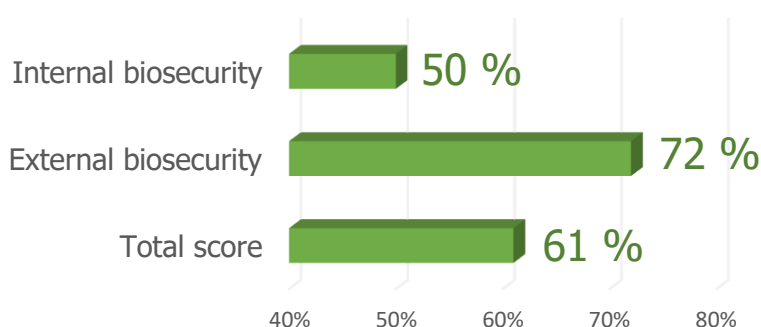
Mastitis and high cell counts since summer 2020, identified a water contamination issue early 2021, Low calcium levels in transition cow silage leading to RFM/MF, staffing compliance issues especially with foot trimming, calf scours outbreak Autumn 2021

### Strategies adopted to reduce antibiotic resistance

Farm health Action Plan was mostly focused on biosecurity measures:

- ✓ Signage at entrance, visitor book, report to farm office with phone numbers
- ✓ Facilities to disinfect/pressure wash vehicles entrance.
- ✓ Improve facilities for carcass disposal/storage. Steel storage container for small casualties.
- ✓ Joint-ill identify pathogen MG
- ✓ Investigate applicability of PRUEX KG/MG & other ways of replacing lime
- ✓ Cubicle changes widen, remove rail
- ✓ Blocking bruising and functional trimming already changed
- ✓ Find ways of treating LDA's
- ✓ Trial pro rumen rather synulox for ruminal digestive upsets MG
- ✓ Vaccination: fridge temp logger, priorities timings
- ✓ Get on top of mastitis and consequent increase in AMU, reduce MF/RFM cases back to where it was 2 years ago, Start the conversion of rotary parlor to robots

Continually looking to reduce use - prevention is better than cure, although they have had a recent lapse and used a HPCIA for a sick cow! Looking to update sheds and parlor to a robotic milking system - newer equipment and more space will reduce pressure on the high yielding cows so less likely to get ill.



### Biosecurity assessment after best practices implementation

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

- In the long-term, antimicrobial resistance could be suppressed and treatment may be more effective (reduced use of antimicrobials, less expenditure).
- 'Low antimicrobial' animal products could target a consumer group with "one-health" concerns (added-value products, higher income than conventional systems).
- A beneficial and sustainable transition period, if the reduction/avoidance of antimicrobials in livestock will become obligatory within the EU.
- Recent increases in mastitis and AMU has had a negative impact on economics, pinpointed to a water supply issue. Aiming to bring this down again.





Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Rhydcaernarfon Farm, South Wales, UK

Rhydcaernarfon is a family run farm with father, son and daughter all working on site. They started DISARM with a traditional AYR calving system with a herringbone parlor but have now installed robots. They produce milk for cheese and have Holstein Friesians. Their average SCC is 157, Butter fat 4.17%, and 3.34% Protein. Their calving interval is ~400d with calving to conception at ~117d. Their 100d in calf rate is 38% with 2.8 average services per cow. Robots have increased production and significantly reduced mastitis cases



Multi-actor team working together!

They are a family farm and as such use family labour. Owen and Delyth (brother sister) manage most of the day to day work and now have robotic milkers to free their time up. Their sister is the local vet and Delyth is their nutritionist. The MAFHT meeting in 2020 involved the whole team and resulted in their vet wanting more involvement in prevention of disease.



Biosecurity

They are surrounded by other farms and have no visitor protocols (signs, visitor book) but do have some foot dip. Vehicles are free to drive into the yard. They have struggled to keep wildlife like badgers away from their grazing cows and out of sheds. However, they do have a separate calf facility with separate equipment and clothes, which minimizes spread of infections.

Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
55%	64%	-Signs and sign in book for visitors; more boot dip; separate kit for regular visitors like vets; separate clothes/wellies for farmers when visiting abattoir	46%	-Better washing and cleaning of calving area; separation of incoming/sick stock; more handwash







## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Main Health Challenges

Calf pneumonia, Cryptosporidiosis (they have automatic calf feeders), mastitis and subclinical disease such as LDAs and ketosis.

### Strategies adopted to reduce antibiotic resistance

Farm health Action Plan was mostly focused on biosecurity measures:

#### Actions on Calves:

Pneumonia detection and prevention, consider drier bedding area, moving calf feeder around, assess immunity of calves from colostrum antibody transfer, Flying Herd.

#### Actions on Mastitis:

Use data to pick up cases sooner (conductivity, QMMS and Quarter Pro) and identifying cause so can prevent.

Ensuring cubicle beds are drier, consider sand.

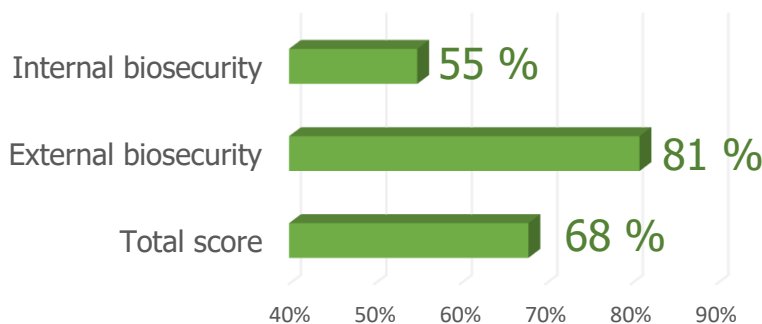
#### Actions on DATA:

Record, analyze and act on data for calf mortality and disease, mastitis rate, causes and prevention as well as incidence and cause of other diseases, such as ketosis and LDAs.

Reduce incidence and treatments

To assess causative bugs in pneumonia cases and select vaccine based on this, ensure family storing and giving vaccine correctly Ketosis/DA's etc.

They have managed to reduce their antibiotic use from 2018 when it was 23.7mg/PCU to 20.1mg/PCU in 2020. They have not used HPClAs for the last few years. They have targeted calf health as a way of reducing their usage - they vaccinate and have auto feeders to ensure calf growth rates are optimal. They clean out regularly to reduce build up of bacteria and parasites. They have recently installed robots to not only give them a better work life balance but pick up mastitis quicker with enhanced data and information.



### Biosecurity assessment after best practices implementation

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

*-In the long-term, antimicrobial resistance could be suppressed and treatment may be more effective (reduced use of antimicrobials, less expenditure).*

*-Decreased expenditure on antimicrobials (annually).*







Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Klink Økologi, Jutland, Denmark

Torben is the owner of an organic dairy herd with 246 cows and 200 heifers. Torben is the 3rd generation at the farm and he has more than 20 years of experience. The farm is located in the western part of Denmark: Jutland. The herd has been organic since 1998 and they deliver around 2 million kilogram of milk every year to the dairy company. Torben has two employees and during the project period they have gone from a milking parlor to Automated Milking System (AMS). The Vet is visiting the farm every fortnight for herd health management.



Multi-actor team working together!

Together with their herd vet and feed advisor, Torben have designed a farm health action plan focusing on improving animals health control prior to udder health, digital dermatitis, heifer managements and biosecurity.



Biosecurity

Biosecurity practices are already at a moderate to high level considering the Biocheck Dairy score of 77 % in external but only 41% in internal biosecurity, achieving an overall score of 59% which was above world average. Based on Biocheck results, the low-scoring was appeared on both Transport and carcass removal and Calving management. They have good procedures for visitors with an entry room with farm boots, signs and clothes. During grassing season most of the animals are outside and the farm has established a tunnel under the road which minimize external transport crossing internal roads. And they have established good protocols due to transport around the premises in order to keep feed and manure transportation separated.

Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
59%	77%	-Transport and carcass removal	41%	-Calving management





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Main Health Challenges

Main health challenges are related to udder health, especially chronic cases with *S. Aureus*, and hoof problems due to digital dermatitis.

### Strategies adopted to reduce antibiotic resistance

In collaboration with the veterinarian and the feed consultant the following farm health action plan was decided:

**Action 1:** Udder health – lowering the somatic cell count and keeping the antibiotic use low. Specific targeting cows with *Staphylococcus Aureus*.

There has been few cases with *Staph Aureus* but during the last 6 month the incidence of mastitis has gone up. They are looking into daily hygienic routines since there has been a higher incidence of *Uberis*. SSC is at the same level – see figure. Blue line is from the last 12 months

**Action 2:** Reducing the incident of digital dermatitis. All cow

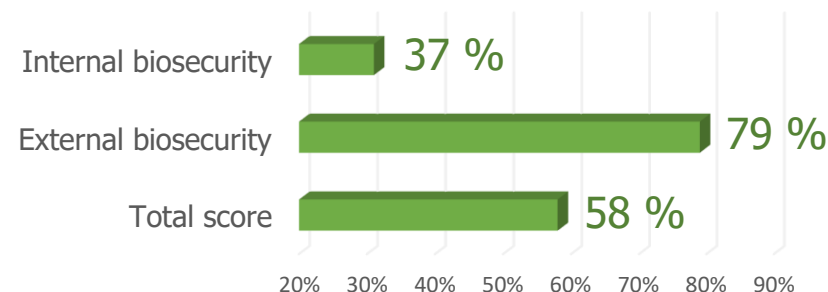
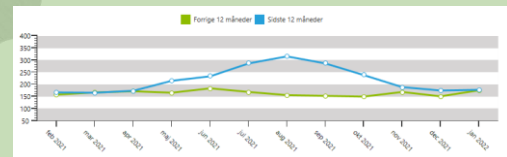
have a footbath once a week going from the robot after milking.

**Action 3:** Improve biosecurity

Whenever there is a delivery of veal calves the transport goes into the farm area. This procedure has changed and therefor the employee takes the bull calves to the vicinity of the farm, so vehicles does not enter the farm. Every day they try to do things better towards Biosecurity and have regular discussion upon the subject.

**Action 4:** Focus on heifers grows and age at first service

They made a point at the wall so whenever a heifer reach the measure they get served. The age at first calving has improved during the period going from 25.9 months to 25.6 months but the goal is 24 months. During the project period they have replaced the milking parlor with Automated Milking System AMS and also gone from calf reared in single hutches to suckling calves. The suckling calves goes with a nursing cow until the calves are 3-4 months old.



### Biosecurity assessment after best practices implementation

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

-In the long-term, antimicrobial resistance could be suppressed and treatment may be more effective (reduced use of antimicrobials, less expenditure).

-'Decreased expenditure on antimicrobials (annually).

-A beneficial and sustainable transition period, if the reduction/avoidance of antimicrobials in livestock will become obligatory within the EU.





Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Ellinglund, Jutland, Denmark

Gert has an organic dairy herd with 342 cows and 324 heifers. Gert took over the farm in 2006 from his father and the farm is family driven. Gert, his wife Anne and his parents all work at the farm. The farm is located in Jutland but in the middle near Silkeborg. The milking parlor is a Rotary with 28 places. The veterinarian comes around when it is needed but regular herd health visits take place twice a year.



Multi-actor team working together!

In many dairy farms udder health is a topic often adressed. At Ellinglund they do not treat many cases of mastitis but still there is a lot of focus on keeping somatic cell counts low and also focus on the young calves and their uptake of colostrum since they have perodes with more diarrhea.



Biosecurity



Biosecurity practices were at a low to moderate level considering the Biocheck Dairy score of 61 % in external but only 46% in internal biosecurity, achieving an overall score of 48%. Based on Biocheck results, the low-scoring was appeared on Purchase and Reproduction due to the fact that they have imported new animals. On the other hand, the assessment pointed out how well entry of people is handled at the farm. They also improved this point during the project period. All heifer calves born at the farm stay as suckling calves for 4-5 months, so the assessment upon calves does not fit into the Biocheck. Overall, the farm scored low in internal biosecurity.

Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
48%	61%	-Purchase and reproduction	34%	-Working organization and equipment







## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Main Health Challenges

Calf pneumonia, diarrhea, Cryptosporidiosis, high somatic cell count and milk fever.

### Strategies adopted to reduce antibiotic resistance

Farm health Action Plan has been decided as follows:

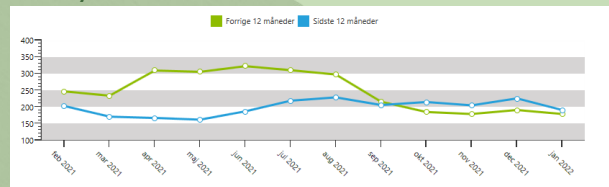
**Action 1:** Udder health – lowering SCC 200.000 and the goal is 100.000

Milking procedure – predip. Go through milking procedures and look at different ways to improve. Do hygienic score – is there an environmental issue? Use CMT after calving and also when a cow is high by monthly control and do milk sampling for bacteriological testing – treatment plan for positive results. PCR before drying of and teatsealer. Dry period – min more than 50 days.

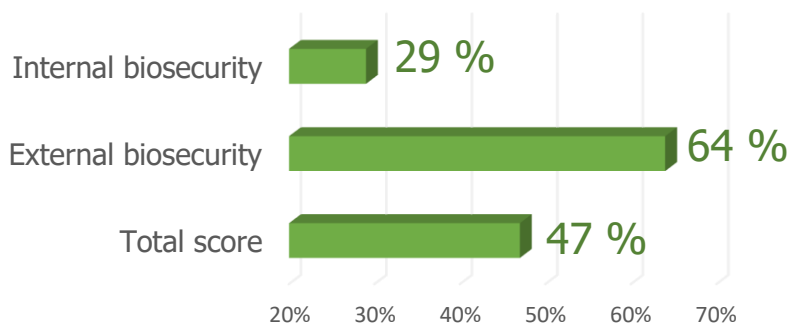
SCC has improved a lot since the begin of the project – from 298.000 to 190.000

**Action 2:** Quality of colostrum. Measure from every cow, Compare between different parity and also look at 2. milking If 2 milking is okay - use in times where there is a not enough colostrum

**Action 3:** Pneumonia/diarrhea – less draught



The calf mortality has improved during the last year. The incidence of pneumonia and diarrhea is low and the use of antibiotic has again been low the last 12 months.



### Biosecurity assessment after best practices implementation

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

*-Decreased expenditure on antimicrobials (annually).*

*'Low antimicrobial' animal products could target a consumer group with "one-health" concerns (added-value products, higher income than conventional systems).*







Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Bogdan MIHAI, Romania

Bogdan is a young farm manager and veterinarian with over 10 years of experience in dairy farming. In recent years he has been involved in increasing farm automation and easing the work of employees in the operation of dairy farms. Currently, the dairy farm has 27 adult cows, 6 heifers and 15 calves. He considers that maintaining animal health is very important and in this regard whenever he buys animals from another farm, he asks for proof of health status and he ensures that the state of health on the farm of origin is equal to or higher than on his own farm. He also ensures that all vehicles go through cleaning baths before entering the dairy cow farm, and external transport vehicles and carriers do not have access to areas where dairy cows are kept.



Multi-actor team working together!

Together with his livestock consultant feed advisor from the University of Agronomic Sciences and Veterinary Medicine of Bucharest, Bogdan is designing a farm health action plan focusing on identify factors that may promote the occurrence and spread of bacterial diseases, identify solutions for optimizing the management of animal husbandry, and identify solutions for optimizing the management of animal health.

Biosecurity



The Biocheck® assessment of biosecurity resulted in an overall score of 72% (External 76% and Internal 67%). The highest external biosecurity score was recorded in transport and carcass removal, while the highest internal biosecurity score was in adult cattle management. The low scoring aspects appeared to be related to purchase policies, reproduction, and calving management.



Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
72%	76%	-Transport and carcass removal	67%	-Reproduction, and calving management

Main Health Challenges

- Introduction of measures to reduce the number of cows with milk fever and to reduce the risk of injury to animals and the causing of injuries requiring antibiotic treatment.
- Cow health management during the transition period (antepartum and postpartum).





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Strategies adopted to reduce antibiotic resistance

Farm health Action Plan was mostly focused on biosecurity measures:

**Action 1:** Identify factors that may promote the occurrence and spread of bacterial diseases.

The actions of this objective aim at: Determining possible non-compliance with biosecurity measures when people and vehicles enter the cow farm; Milking monitoring; Colostrum quality assessment; Retrospective analysis of the diseases for which the therapeutic intervention with antibiotics was necessary.

**Action 2:** Identification of solutions for optimizing animal husbandry management.

The actions aim at identifying problems that may affect the management of animal husbandry. For optimizing the latter, it was proposed to conduct an analysis to identify solutions. The activities on dairy farms were classified into three categories: feed management, shelter hygiene management and milking management. It was envisaged to obtain them as soon as possible and to monitor them throughout the year. Within this objective, the answer to the following questions was considered:

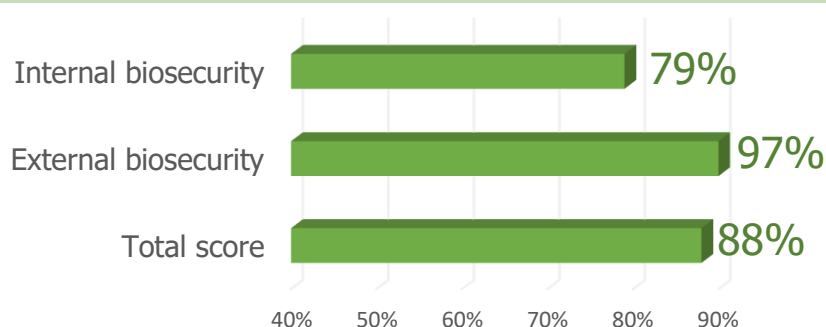
- ✓ To what extent can some identified technological deficiencies be factors favoring bacterial diseases?
- ✓ How often can these deficiencies be present?

Which people should be held accountable for remedying or preventing the occurrence of these deficiencies?

- ✓ Is it necessary to set a deadline for meeting these objectives or should they be applied continuously?
- ✓ What is the best way to monitor deficiencies in animal husbandry management?
- ✓ What target value is realistic and achievable and in what time frame?

**Action 3:** Identification of solutions for optimizing animal health management.

The actions of this objective aim at identifying problems that may affect the management of animal health. In order to reduce health problems on the farm, it was proposed to conduct an analysis to identify solutions for optimizing animal health management. The activities of health management in the dairy farm were classified into three categories: health management of cows in lactation, health management of cows in the dry period and health management of calf and heifer. The discussion of team was focused on identify deficiencies that may be favorable factors for bacterial diseases.



### Biosecurity assessment after best practices implementation

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

*-In the long-term, antimicrobial resistance could be suppressed and treatment may be more effective (reduced use of antimicrobials, less expenditure).*

*-"Low antimicrobial" animal products could target a consumer group with "one-health" concerns (added-value products, higher income than conventional systems).*





Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Viorel NĂSTASE, Romania

Viorel is a zootechnical engineer responsible for raising and welfare animals on a farm with 678 adult cows, 125 heifers, and over 200 calves. The farm has its own staff, including veterinarians and zootechnical engineers. The farm is in a continuous process of improving technical performance, and seeks to continuously implement the most effective methods of monitoring herd health. As a young engineer responsible for raising and welfare animals, Viorel is open to new smart farming technologies and is open to sharing the experience gained with other young specialists in the same field.



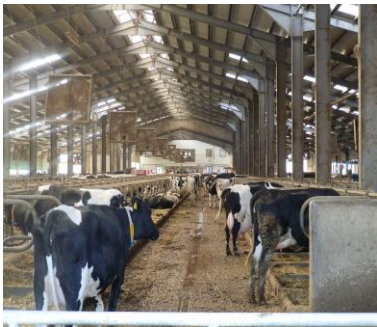
Multi-actor team working together!

Together with his farmer, veterinarian and livestock consultant, Viorel is designing a farm health action plan focusing on the following objectives: Identify issues that may affect calving and calf management and identify deficiencies in work organization and equipment that may affect internal biosecurity



Biosecurity

The total score of Biocheck® biosecurity assessment was 63% (External 72% and Internal 53%). A maximum score was recorded in the way of supplying feed and water. Also, the biosecurity assessment allowed the identification of future work directions for the improvement of internal biosecurity, mainly in the calving management, working organization and equipment.



Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
63%	72%	-Purchase and reproduction -Transport and carcass removal	53%	-Calving and Calf management. -Working organization and equipment

Main Health Challenges

- Introduction of new measures to reduce the bacterial infections in calves by:
- Analysis of the possible transmission of diseases through direct and indirect contact;
- Evaluation of the correct intake of maternal antibodies administered through colostrum in the first hours of life;
- Assessment of calf housing conditions;
- Assessment of the transition period in dairy cows.







## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Strategies adopted to reduce antibiotic resistance

Farm health Action Plan was mostly focused on biosecurity measures:

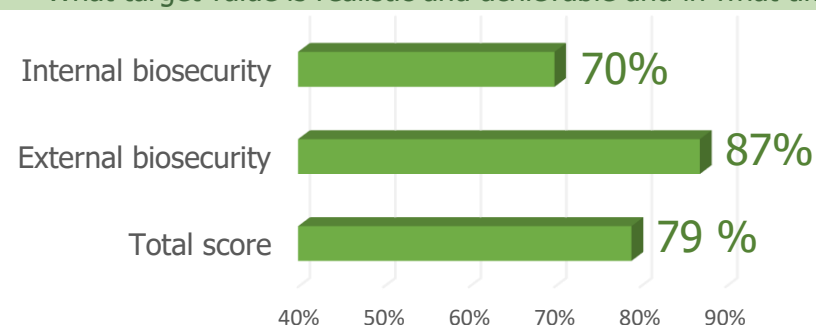
**Action 1:** Identify issues that may affect calving and calf management.

The actions of this objective are: analysis of the possible transmission of diseases through direct and indirect contact; evaluation of the intake of maternal antibodies administered through colostrum in the first hours of life; assessment of calf housing conditions; and assessment of the transition period in dairy cows. The following questions should be clarified:

- ✓ To what extent can some deficiencies in the management of calving be factors favoring some bacterial diseases?
- ✓ How often can these deficiencies be present?
- ✓ Which people should be held accountable for remedying or preventing the occurrence of these deficiencies?
- ✓ Is it necessary to set a deadline for meeting these objectives or should they be applied continuously?
- ✓ What target value is realistic and achievable and in what time frame?

**Action 2:** Identify deficiencies in work organization and equipment that may affect internal biosecurity. In order to reduce health problems on the farm, it was proposed to conduct an analysis to identify solutions for optimizing working organization and equipment deficiencies that may affect internal biosecurity. The DISARM facilitator proposed to the team that in future meetings the discussions should answer the following questions:

- ✓ To what extent can some identified deficiencies be factors favoring bacterial diseases? How often can these deficiencies be present?
- ✓ Which people should be held accountable for remedying or preventing the occurrence of these deficiencies?
- ✓ Is it necessary to set a deadline for meeting these objectives or should they be applied continuously?
- ✓ What is the best way to monitor deficiencies in animal husbandry management?
- ✓ What target value is realistic and achievable and in what time frame?



### Biosecurity assessment after best practices implementation

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

*-In the long-term, antimicrobial resistance could be suppressed and treatment may be more effective (reduced use of antimicrobials, less expenditure).*

*-'Decreased expenditure on antimicrobials (annually).*







Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

Stefan VRABIE, Romania

Stefan is a young entrepreneur who began to develop a dairy farm with his family. Although he is a starter and the farm has only 24 dairy cows and 10 heifers, he is an enthusiastic farmer who wants to grow and is open to developing a health team on his farm. He also recently graduated from the Faculty of Veterinary Medicine.



Multi-actor team working together!

Together with his family, Stefan is in a constant search for the development and improvement of the farm. He was one of the most receptive farmers to innovations on the farm's health plan, which correlated with his program to build new stables for dairy cows.



Biosecurity



The Biocheck® assessment of biosecurity resulted in a high score in purchase and reproduction (100%), transport and carcass removal (63%), and in feed and water (65%). To further improve the biosecurity, attention could be paid to the vermin control and calving management.



Total score	External biosecurity	Main area of improvement	Internal biosecurity	Main area of improvement
52%	72%	-Vermin control and other animals	32%	-Calving, Calf, and Dairy management -Working organization and equipment

Main Health Challenges

There was a history of udder diseases that required special medical attention, but during the last two years these problems were kept under control and did not require antibiotic therapy. In order to reduce the consumption of antibiotics on dairy farms, Stefan will work to identify factors that promote the emergence of bacterial diseases that require the use of antibiotics. The farm's health team proposes the introduction of measures to reduce bacterial infections and thus the consumption of antibiotics by improving internal biosecurity measures.





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Strategies adopted to reduce antibiotic resistance

Farm health Action Plan was mostly focused on biosecurity measures:

#### Action 1: Identify issues that may affect calving and calf management

The actions are: analysis of the possible transmission of diseases through direct and indirect contact; evaluation of the intake of maternal antibodies through colostrum; and assessment of calf housing conditions.

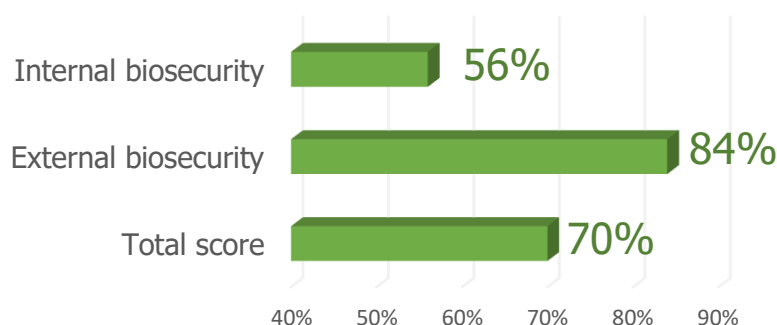
The facilitator proposed to the team that the following aspects were discussed at each meeting:

- ✓ To what extent can some deficiencies in the management of calving and calf be factors favouring some bacterial diseases?
- ✓ How often can these deficiencies be present?
- ✓ Which people should be held accountable for remedying or preventing the occurrence of these deficiencies?
- ✓ Is it necessary to set a deadline for meeting these objectives or should they be applied continuously?
- ✓ What target value is realistic and achievable and in what time frame?

#### Action 2: Identify deficiencies in work organization and equipment that may affect internal biosecurity

In order to reduce health problems on the farm, the farm health team proposed to conduct an analysis to identify solutions for optimizing labour management and equipment deficiencies that may affect internal biosecurity by answering to the following questions:

- ✓ To what extent can some identified deficiencies be factors favouring bacterial diseases and how often can these deficiencies be present?
- ✓ Which people should be held accountable for remedying or preventing the occurrence of these deficiencies?
- ✓ Is it necessary to set a deadline for meeting these objectives or should they be applied continuously?
- ✓ What is the best way to monitor deficiencies in animal husbandry management?



### Biosecurity assessment after best practices implementation

### Economic assessment

Does the prudent (decrease) use of antimicrobials to livestock result in a beneficial long-term financial balance?

**-Positive**

*-In the long-term, antimicrobial resistance could be suppressed and treatment may be more effective (reduced use of antimicrobials, less expenditure).*

*-"Low antimicrobial" animal products could target a consumer group with "one-health" concerns (added-value products, higher income than conventional systems).*





## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

## Dairy Cattle Sector



### Review

- ✓ The initial biosecurity score was higher in British and Romanian case studies compared to Danish.
- ✓ They were identified various Health Challenge, while those related to udder health and metabolic disorders were the most frequent.
- ✓ Case studies in Dairy Cattle Sector portrayed the highest diversity.



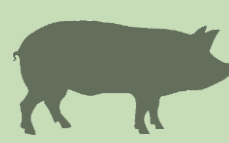


## Disseminating Innovative Solutions to Antibiotic Resistance Management: Farm Factsheet

### Overall Review



- ✓ Case studies involved in the DISARM project were able to strengthen their biosecurity measures.
- ✓ Although the biosecurity risks were diverse, the internal biosecurity was weakened in most cases.
- ✓ Farmer attitudes towards antibiotics reductions were quite positive in general.
- ✓ The farmers admit that there are specific action points to implement based on their main health challenge.
- ✓ Overall, there is a wide range of preventative biosecurity measures and set of strategies ready to reduce the dependence of antibiotics.



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