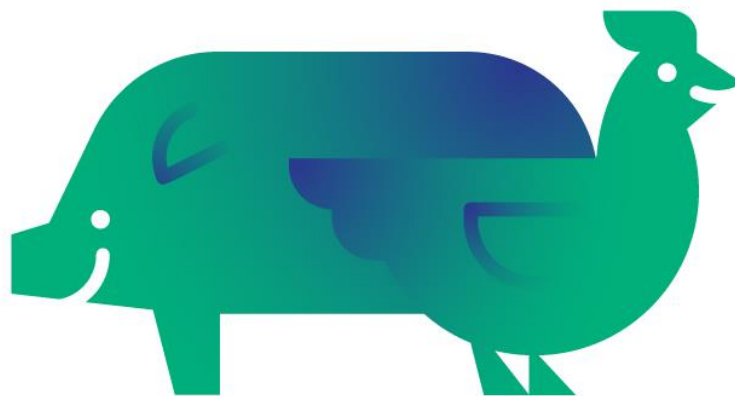


HealthyLivestock

D1.1 – A report on the key issues and guidelines related to the writing and use of a health plan on high welfare pig and broiler farms



HealthyLivestock

健康畜禽

**Tackling Antimicrobial Resistance
through improved livestock Health & Welfare**

Published on February 28, 2020

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Introduction

The overall objective of WP1 is to reduce the risk of pathogen introduction, exposure and spread on modern intensive broiler and pig farms in China and Europe through the development and application of tailor-made herd biosecurity protocols and health plans.

A structured and comprehensive method was developed to systematically assess disease risks related to housing and management in pig and broiler farms, based on existing knowledge and expertise, to monitor risk mitigation and to provide an innovative and transferable scheme to define a herd health plan including a biosecurity protocol and adapted to the specific risks present in a pig farm and a broiler farm. The final user-friendly version of the tool is delivered, for use in tasks T1.2 and WP5.

1. Methodology

This novel method incorporates both input and output parameters to assess risks of pathogen introduction, exposure and spread on modern intensive broiler and pig farms. Input parameters are categorised with respect to risk of introduction of a pathogen in a farm, risk of exposure of susceptible animals, and risk of diseases spread within the farm. Output parameters are biomarkers, i.e. animal based indicators to monitor results of risk mitigation and to give early detection of breaches in biosecurity or biocontainment.

Two BioSecurity risk Analysis Tools (BEATs) for broiler and pig farms have been developed to work on Microsoft Excel, including instructions to new users. Risks for major diseases of broilers and of sows, piglets and fattening pigs were listed from a systematic literature review including existing scoring systems for biosecurity. The biomarkers of interest consist of direct measurement of pathogen presence and spread (i.e. signs of respiratory and enteric diseases, serological or bacteriological parameters) and indirect measurement of animal exposure (i.e. immunological changes, mechanical damage and stress).

For each biomarker, target animals to sample with the purpose of risk monitoring were defined (sentinel animals, age groups, sample size in a herd). Then input and output parameters were grouped into objectives to be attained to reduce each risk.

The information is structured into a format which allows farmers and vets to systematically check which objectives are reached or are not reached, and to discuss how to reduce risks in a farm where it is necessary.

BEAT has been developed by WR for broiler farms, pretested by VTN in Cyprus and by WR on a Dutch broiler farm including their involved veterinarian. Furthermore, a format for the health plan has been developed in the Netherlands.

The development of BEAT for pig farms has been initiated by INRA and finalized by CRPA in strict collaboration with INRA; it has been pretested by CRPA in Italy in one of the 20 pig farms to be involved in WP1. The final format has been finalized by CRPA and agreement with INRA. These BEATs were presented and discussed between experts of disease causation (researchers), of disease control (field and official vet of the competent authority) and of farmers (responsible for the daily implementation of biosecurity) within two rounds of consultation in the Netherlands (WR) and in France (INRA), between researchers and field vets in France (INRA) and through a focus group, organized by CRPA in Reggio Emilia on December 13th, 2019. In an iterative process, the structured framework for risk analysis was improved, based on results of the Italian focus group and consultation of researcher and field vets in the Netherlands (WR), France (INRA), Greece and Cyprus (VTN).

2. Biosecurity Risk Analysis Tool

The development of this tool is based on two conceptual approaches that have been previously developed and used for biosafety risk analysis:

- the Biocheck.UGent, which is an elaborate of the University of Gent to check for the biosecurity status on farm, e.g. poultry farms <https://www.biocheck.ugent.be/index.php>
- the FAO 3zone-biosecurity model.

Biocheck.UGent considers a wide range of risks of entry and spread of pathogens in animal husbandry, differentiating between two main types: external biosecurity risks or pathogen entry risks in animal husbandry; internal biosecurity risks (pathogen spread between and in animal husbandry departments). In addition, it identifies their causes and scientifically based mitigation measures.

FAO 3zone-biosecurity model, identifies five different areas of the farm: the red zone (i.e. outside the farm perimeter), the orange zone (i.e. the professional zone in between the animal houses), the green zone (i.e. the animal houses) and the intersection lines between the red and the orange zone and between the orange and the green zones.

The combination of these conceptual approaches is expected to provide the assessor and the farmer with more detailed insight on farm facilities and management in each area, which is the basis for promoting a more careful risk analysis and more precise identification of mitigation measures. 'Based on the results of the risk assessment and on new insights in the design of risk zoning for broiler farms (as an elaboration of the FAO 3zone-biosecurity model), tailor-made health plans will be designed (proposed and discussed with each farmer-participant)'. In the development of the risk analysis tool, it is efficient to anticipate on the risk zoning in the health plans. The following picture gives an impression of the risk zoning, as worked out for a Dutch broiler farm.

'Coat rak': defining on-farm risk zones

[elaboration of FAO 3zone biosecurity model, 2015]

- Green zone with broiler houses and entree rooms: clean, strictly isolated, restricted access

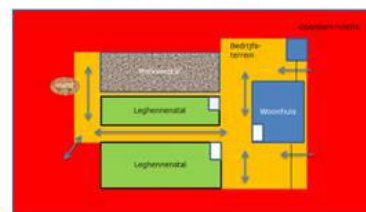
- Orange zone with paved surfaces and functional farm areas: with biosecurity measurements to reduce contamination with 'foreign' manure to medium/low risk

- Red zone with external areas (unpaved roads, ditches, pastures, ..): high risks, farmers little acting opportunities

By Google-Earth ...



... or schematic



For each zone and transition line, risk factors are listed, objectives indicated and a scoring system similar to the Biocheck.UGent scoring system has been developed (see the excel files attached to this deliverable). Based on the results of the risk analysis tool, tailor-made on-farm health plans are set up and proposed to the farmer and his field vet to strengthen biosecurity. The following steps are taken into account by constructing a health plan:

Biosecurity

- (Re)defining on-farm green-orange-red zones
- Determining hygienic measures per zone
- Determining hygienic measures when passing transition lines between zones
- Implementation of biosecurity protocols

Biomarkers

- Defining the biomarkers to monitor, and tailor-made objectives / targets for the chosen marker, as illustrated in the following chapter for broiler and pig farms.

For the purpose of Task T1.2 VTN has recruited and visited the 20 farms, whose size and location are listed as follows:

- Farm 1, size: 17.000 broilers, Central Greece
- Farm 2, size: 9.480 broilers, Central Greece
- Farm 3, size: 9.480 broilers, Central Greece
- Farm 4, size: 21.800 broilers, Central Greece
- Farm 5, size: 14.800 broilers, Central Greece
- Farm 6, size: 11.000 broilers, Central Greece
- Farm 7, size: 9.000 broilers, Central Greece
- Farm 8, size: 19.000 broilers, Central Greece
- Farm 9, size: 16.720 broilers, Central Greece
- Farm 10, size: 16.680 broilers, Central Greece
- Farm 11, size: 22.300 broilers, Central Greece
- Farm 12, size: 12.600 broilers, Central Greece
- Farm 13, size: 19.300 broilers, Central Greece
- Farm 14, size: 20.000 broilers, Nicosia province, Cyprus
- Farm 15, size: 23.000 broilers, Nicosia province, Cyprus
- Farm 16, size: 18.000 broilers, Nicosia province, Cyprus
- Farm 17, size: 18.000 broilers, Nicosia province, Cyprus
- Farm 18, size: 18.000 broilers, Nicosia province, Cyprus
- Farm 19, size: 14.500 broilers, Nicosia province, Cyprus
- Farm 20, size: 17.500 broilers, Nicosia province, Cyprus

One large broiler farm with 140.000 broilers has been recruited and visited by WR within the first 18-month period.

CRPA has recruited and visited the 20 Italian pig farms by the end of the first 18-month period; their type, size and location are listed as follows:

- Farm 1, type: weaning, size: 3.600 weaners, Pralboino (BS)
- Farm 2, type: weaning, size: 1.800 weaners, Pegognaga (MN)
- Farm 3, type: weaning, size: 1.800 weaners, Quistello (MN)
- Farm 4, type: weaning, size: 800 weaners, Gonzaga (MN)

- Farm 5, type: fattening, size: 4.500 fatteners, Pegognaga (MN)
- Farm 6, type: fattening, size: 1.700 fatteners, Moglia (MN)
- Farm 7, type: fattening, size: 2.500 fatteners, Pescarolo ed Uniti (MN)
- Farm 8, type: fattening, size: 1.900 fatteners, Montichiari (BS)
- Farm 9, type: fattening, size: 1.500 fatteners, Sant'Angelo Lodigiano (LO)
- Farm 10, type: fattening, size: 1.300 fatteners, Pavullo (MO)
- Farm 11, type: fattening, size: 1.000 fatteners, Pavullo (MO)
- Farm 12, type: fattening, size: 350 fatteners, Pavullo (MO)
- Farm 13, type: fattening, size: 350 fatteners, Pavullo (MO)
- Farm 14, type: fattening, size: 750 fatteners, Polinago (MO)
- Farm 15, type: fattening, size: 6.300 fatteners, Milzano (BS)
- Farm 16, type: fattening, size: 2.900 fatteners, Orzinuovi (BS)
- Farm 17, type: fattening, size: 3.500 fatteners, Novi di Modena (MO)
- Farm 18, type: breeding, size: 1.200 sows, Pralboino (BS)
- Farm 19, type: breeding, size: 800 sows, Pralboino (BS)
- Farm 20, type: breeding, size: 1.200 sows, Castelnuovo Rangone (MO)
- Farm 18, type: breeding, size: 1.400 sows, Formigine (MO)

No pig farm was recruited in France by INRA at the end of the first 18-month period

3. Protocol to monitor biosecurity risk mitigation in broiler farms

A protocol has been developed to pilot-test and evaluate health plans in broiler farms involved in WP1.

Data to be collected in Task T1.3 during the 12-month study period will be:

- Changes in health, welfare and productivity;
- Changes in the selected biomarkers (measured after visit 1 and after 12 months from visit 1);
- Changes in biosecurity practices and health risk management, according to the Health Plan output measures agreed with the farm managers;
- Changes in antimicrobial usage;
- Economic data: farm economic figures before and after the implementation of the health plans
- Antibiotic residue detection in meat, drinking water and manure;
- Farmers' opinion about the health and welfare plans, and opinion of their veterinarians.

A minimum of three visits per farm are planned:

- Visit 1: to collect historical data on farm economy and productivity, sampling for biomarkers and antibiotic residues, and implementation of health & welfare plans developed with the farmer and veterinary practitioner in Task T1.2.
- Visit 2: after 6 months to collect productivity data, sampling for biomarkers and check follow-up of compliance on health plans and adaptation if needed.
- Visit 3: after 12 months to collect economic and productivity data, sampling for biomarkers and antibiotic residues, and check follow-up of compliance on health plans and opinion of farmers and veterinarians.

A literature scan was performed using Web of Science and Scopus to review biomarkers that can be used in broilers to predict or indicate a disease. A biomarker, per definition, is a marker or indicator of a biological process or pathological states and it can provide information on a current status of future risk of disease of an individual (Pletcher et al., 2011; Moore et al., 2007). A biomarker should possess key characteristics and qualities, which will depend upon its intended use (Aronson, 2005; LaBaer, 2005). A biomarker should be accurate, sensitive and specific. The biomarker should be altered in the relevant disease and be able to discriminate between diseased and control populations. It should also be possible to quantify the biomarker reliably and reproducibly. For diagnostic purposes biomarkers should ideally be obtained from readily accessible body fluids in animals such as blood plasma, urine, sweat and saliva or other accessible materials such as hair and faeces (Moore et al., 2007). Disease non-specific biomarkers and animal-based measures have been considered too, to monitor animal health and welfare. Risks for major diseases of broilers (digestive, respiratory, feet disorders) have been listed from a systematic literature. The gross list of potential biomarkers was divided in non-specific biomarkers, and specific biomarkers for respectively digestive disorders, respiratory disorders and feet disorders.

Two biomarkers have been selected, taking into account their sensitivity and specificity and also their practicability, feasibility according to economic and human resources available for WP1:

1. Footpad lesions. Visual scoring at slaughterhouse according to the official method used across EU Member States in compliance with Council Directive 2007/43/EC (at least 100 birds; score 0, 1, 2). Where more than one slaughter day then 100 per slaughter day. At the end of the whole trial 4 flocks per farm would have been monitored and data collected. That is two flocks (production cycles) before health plan intervention and two after.
2. Campylobacter. One composite manure sample per farm taken just before first thinning (in order to avoid brought in infection with the bird catching gang). Manure sample are analysed according to ISO 10272-2:2017 (horizontal method for detection and enumeration of Campylobacter).

Farm antimicrobial use is calculated according to the DDDvet methodology (EMA, 2016) with reference to the 12-month study (one year) and compared to the year of production before the farm Visit 1.

A protocol to collect economic and productive data has been developed by CRPA in Task T5.2 attached to this deliverable (see Annexes);

A collection of 400 meat samples (in total) from 20 broiler farms in Greece and Cyprus is planned; 400 meat samples (in total) from 20 broiler farms in Netherlands. Specific procedures have been developed and described in the following paragraphs for collecting meat, drinking water and manure sample to be analysed by NVRI (meat and water) and INRA (manure) for antibiotic residue detection.

3.1 Instructions for meat and water collection in broiler and pig farms to send to Poland (NVRI)

1) Samples collection

- Collect the samples of muscles (200 g per one pooled sample from at least 5 birds) in a polypropylene or plastic tubes. The best indicator will be the breast muscles.
- Collect the samples of water (200 ml per one sample) in a polypropylene or plastic tubes.

2) Labeling of samples (the same like in manure collection)

Healthy Livestock
Country
ID code
YYYY-MM-DD

With the ID code as follows:

Farm	Visit	batch/flock	replicate
XXX	-1 or 2-	-1 or 2-	-1 or 2-

3) Stock the samples (meat and water) at -20 °C within the hour after collection and keep them frozen until shipment and transport

4) Samples should be sent in a cooled Styrofoam box (with a cooling pack inside to avoid thawing) to the following address:

Anna Gajda
National Veterinary Research Institute in Pulawy
Al. Partyzantow 57, 24-100 Pulawy – POLAND

3.2 Instructions for manure collection in broiler farms to ship to France (INRA)

1) Samples collection

- When:
 - a series of samples before the implementation of improvement plans (period 1) at the beginning of HL project
 - a series of samples after the implementation of improvement plans (period 2) at the last period of WP1

Within each period (1 and 2): one sample at the beginning (ex-ante) and one sample at the end (post-ante) of the growing cycle.

- Where:
 - the buildings: all poultry houses present in the farm
 - in the building: the zone where birds mostly defecate, for example under the drinking lines

Caution: the question of pooling or not the samples from the different buildings in the same farm.

It depends on the antibiotic treatments. If all the building have the same treatments at the same times, we can pool. If the episodes of treatments are different between the buildings, then we should not pool the samples.

Size:

About 40 g

Collect the manure in 40-60 mL polypropylene vials



2) Labeling of samples (the same like in meat and water collection)

With the ID code as follows:

Farm	Visit	batch/flock	replicate
XXX	-1 or 2-	-1 or 2-	-1 or 2-

So for example: the ID code 15-2-2-1 means the replicate 1 sampled at the second flock during the second visit in the farm #15 (to be replaced by your ID of this farm)

3. Storage

Stock the vials at -20°C within the hour after the collection and keep them frozen until shipment

4. Shipment

Send them packed inside a cooled styrofoam box* to the following address:

Marlène LACROIX
Ecole Nationale Vétérinaire de Toulouse
INTHERES UMR 1436 INRA/ENVT
23 chemin des Capelles, 31 076 Toulouse – France

* Styrofoam are supplied by the delivery company

NB: Shipment should be scheduled on Monday or Tuesday to be sure to receive samples before the weekend and avoid any risk of thawing.

3.3 Feed-back questionnaire on the design of a tailor-made health plan for broiler farms

A To be asked on both the preintervention and separately the postintervention meeting

1. How do you judge the health status of the most recent flock for this farm on a scale 1-5? 1 low, 5 high.
2. Do you consider biosecurity to be important on this farm? yes/no.
3. Where would you evaluate the biosecurity level on this farm currently scale 1-5? 1 low, 5 high.
4. Do you think there is room for improving the biosecurity level on this farm? yes/no. If yes what are the three main biosecurity features that you think this farm still needs to improve the most?
5. Have you experienced any biosecurity breach on this farm in the most flocks? yes/no. If yes please indicate which pathogen/disease you consider was the cause and due to what biosecurity breach/risk factor.
6. Is there presently any room for reducing the use of antimicrobials on this farm? yes/no. If yes what are the main strategies you would still like to put in place to further reduce the use of antimicrobials.
7. Did you ever assess and analyse systematically the biosecurity risk in this farm? yes/no. If yes which tool or kind of tool has been used for risk analysis how and who did perform the assessment?

8. To which extent do you think the regular meetings with farm vet/advisers and farm management team responsible for this farm about farm biosecurity are effective to improve flock health and reduce the use of antimicrobials on this farm on a scale 1-5? 1 low, 5 high.
9. How important is the role of the veterinarian for you as a farmer, in terms sharing knowledge and/or experiences about biosecurity, on a scale 1-5? 1 low, 5 high.

B Additional questions to be asked only at the end of the postintervention meeting

1. Did you find the recommendations coming out of the Biosecurity Health plan helpful in identifying targets for improvement? yes/no. If yes how overall helpful on scale 1-5? 1 low, 5 high.
2. How many of the recommendations have you already implemented?
3. How many of the recommendations do you plan to implement in the near future?
4. Of those you are not planning to implement in the near future what is the reason. (e.g. cost, impractical etc.)
5. Did you find the use of campylobacter as a biomarker useful? yes/no.
6. Did you find the use of footpad scoring as a biomarker useful? yes/no.
7. Will you be using in the future on a regular basis the questionnaire tool to monitor progress and identify further targets for improvement? Yes/no. If yes how often

4. Protocol to monitor risk mitigation in pig farms

A protocol to monitor risk mitigation in pig farm been developed with the same procedure as for broiler farms.

Data to be collected in Task T1.3 during the 12-month study period and number and type of farm visits (i.e. at least 3 visits) are the same. Of course, some data to be collected are slightly different. Biomarkers are totally different. Risk for major diseases of sows, piglets and fattening pigs (urinary and reproductive tract infections of sows, digestive, respiratory, and locomotor disorders) have been listed from a systematic literature review. The biomarkers of interest consist of direct measurement of pathogen presence and spread (i.e. serological or bacteriological parameters, evidence of past diseases in post-mortem inspection) and indirect measurement of animal exposure (e.g. animal based measures, markers of inflammation or oxidative status). For each biomarker, target animals to sample with the purpose of risk monitoring have been defined (sentinel animals, age groups, sample size in a herd).

A list of potential direct biomarkers was considered to select the ones to be used to monitor according to their sensitivity, specificity, feasibility, cost and expected efficacy to monitor pig diseases in the context of French and Italian pig farms.

1. Direct and indirect measurement of pathogen presence and spread
 - a. Enteric diseases
 - b. Respiratory and systemic diseases
2. Indirect measurement of animal exposure to disease entering and spreading, welfare and resilience
 - a. Animal based measures
 - b. Physiological parameters
 - c. Environmental parameters
 - d. Productive parameters

Ten biomarkers have been selected for the purpose of Task T1.2:

1. Cough, sneezing and laboured breathing scores for clinic evaluation of respiratory disease in sows and piglets, weaners and fatteners (Nathues et al., 2012);
2. PRRS analysis in serum and blood samples for PCR/serology test (Zimmerman et al., 2012) whenever the thresholds of respiratory scores are exceeded (i.e. in piglets, weaners and fatteners in case of evidence high scores for respiratory disease);
3. Faeces score for clinic evaluation of respiratory disease in sows and piglets, weaners and fatteners (Pedersen and Toft, 2010);
4. Colibacillosis (E. coli) in faeces samples for isolation genotype lab test whenever the thresholds of faeces scores are exceeded in weaners and in lactating sows + suckling piglets (Fairbrother and Carlston, 2012);
5. Skin and pluck lesions in fattening pigs at slaughter (Bottacini et al., 2018);
6. Haptoglobin analysis in serum and blood samples for ELISA test in weaners only due to the high cost of analysis). Haptoglobin is an acute phase protein fraction, may be considered an unspecific health status marker (Pomorska-Mól et al., 2013; Scollo et al., 2013);
7. Cortisol in the pig hair for immunoassay lab test (sows, weaners, fatteners). It is considered the main stress hormone. Released by non-inflammatory and

psychological stress response, by activating HPA axis and sympathetic-adrenal axis (Bergamin et al., 2019);

8. Dehydroepiandrosterone, DHEA, in the pig hair for immunoassay lab test; Steroid hormone used to evaluate allostatic load and resilience in pigs. DHEA plays a role in immune system activation; it has anti-inflammatory and antioxidant properties, and it is involved in lipid metabolism. Pigs affected by stress show an increase in the cortisol level to stimulate metabolism and energy production and a decrease in DHEA. (Bergamin et al., 2019)
9. Bacterial load in pen surfaces after cleaning and disinfection through the collection and analysis of environmental swabs (ALL OUT);
10. Mortality rates of all pig categories (i.e. sows, piglets, weaners fatteners).

Farm antimicrobial use is calculated according to the DDDvet methodology (EMA, 2016) for four pig categories (i.e. sows, piglets, weaners, and fatteners) with reference to the 12-month study (one year) and compared to the year of production before the farm Visit 1.

A protocol to collect economic and productive data has been developed by CRPA in Task T5.2 attached to this deliverable (see Annexes);

A collection of 400 meat samples (in total) from 20 pig farms (20 samples per farm) in Italy was planned originally, although this sampling will only be possible at slaughter from pigs of farms including fattening units; additional 400 meat samples (in total) are planned to be collected from 20 French pig farms that are mostly closed cycle farms, including fattening units. Specific procedures have been developed and described in the following paragraphs for collecting meat, drinking water and manure samples to be analysed by NVRI (meat and water) and INRA (manure) for antibiotic residue detection.

4.1 Clinical evaluation of respiratory disease

Number of rooms / animals to be examined:

	Number of rooms	Number of pigs	Respiratory
Gestation		> 50%	Sows
Farrowing/suckling		> 50%	Sows/piglets
Post-weaning (start)	2 rooms selected randomly with at least 100 pigs in total	> 50% in the room	Piglets
Post-weaning (end)	2 rooms selected randomly with at least 100 pigs in total	> 50% in the room	Piglets
Finishing (start)	1 or more rooms selected randomly with at least 100 pigs in total	> 50% in the room	Pigs
Finishing (end)	1 or more rooms selected randomly with at least 100 pigs in total	> 50% in the room	Pigs

How to assess the pigs:

- Enter the room
- Wait for 5 minutes; animals must be standing
- Record coughs occurring during 2 minutes (a cough attack corresponds to 1 cough)

- Repeat 3 times in total and calculate the mean value
- Record the total number of pigs observed
- Calculate the number of coughs / 100 pigs in 2 minutes

Thresholds: 3% for weaners and 5% for fatteners and sows

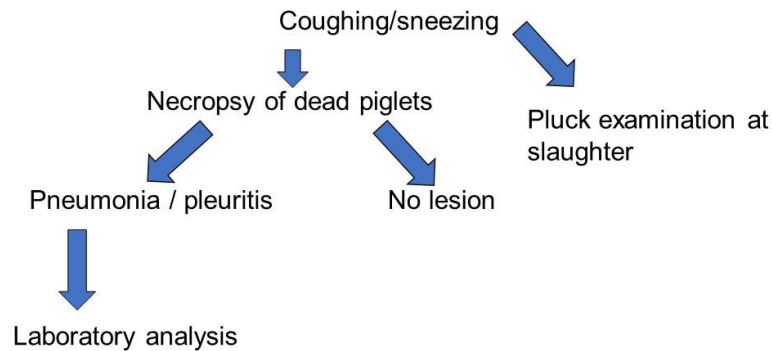
- Record sneezings occurring during 2 minutes
- Repeat 3 times in total and calculate the mean value
- Record the total number of pigs observed
- Calculate the number of sneezings / 100 pigs in 2 minutes
- Continue as the cough evaluation.

Thresholds: 3% for weaners; 5% for fatteners and sows

- Record the number of pigs with laboured breathing (pumping / planting) for 5 minutes

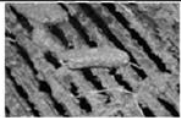

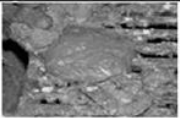
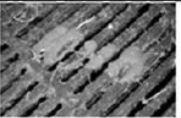
Threshold: 2 pigs observed

Hierarchical decision trees Respiratory diseases



4.2 Clinical evaluation of enteric diseases

Feces scoring per pen (Petersen grid)

Score	1 Firm and shaped	2 Soft and shaped	3 Loose	4 Watery
Picture				
Texture	Firm. Varies in hardness.	Varies in softness. Like peanut butter	Mush. Often shining surface	Varies from gruel to water.
Shape	Sausage	Varies from sausage shape to small piles	Tends to level with surface. Does not flow through or flows slowly through slatted floors.	Levels with surface. Flows through slatted floors.
In container	Preserves original shape.	Does not flow when container is rotated. Preserves original shape.	Inert when container is rotated. Merges and covers bottom of container in most cases.	Flows easy when container is rotated. Merges and covers bottom of container.

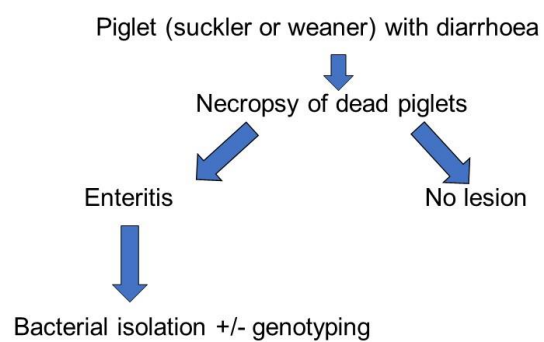
Number of rooms / animals to be examined:

	Number of pens		Pig category
Gestation			
Farrowing/suckling	> 50%		Suckling piglets
Post-weaning (start)	At least 15	Score the worst faeces in the pen	Weaners
Post-weaning (end)	At least 15	Score the worst faeces in the pen	Weaners
Finishing (start)	At least 15	Score the worst faeces in the pen	Pigs
Finishing (end)			

Threshold: At least 3 pens with score 4 (acute Threshold); average score greater than 1,5 (chronic)

Hierarchical decision trees

Enteric diseases



4.3 Instructions to assess skin and pluck lesions at slaughter

The aim is to develop an abattoir benchmarking system which provides feedback on the prevalence and severity of lesions of the skin (i.e. tail, ears) and of the pluck (lung, pleura, liver and pericardium) in batches of pigs to inform individual producers and their veterinarians of the occurrence of pathological conditions affecting their herds.

Abattoir post-mortem inspections offer a useful tool for the development and monitoring of animal health plans and a source of data for epidemiological investigation.

For each batch, about 100 pigs will be inspected at slaughter.

Skin lesions score

To score acute traumatic lesions (scratches), the carcass is divided into two parts: the “posterior” region, which included the hind legs and the tail, and the “anterior” region defined as the remaining area (starting from the loin up to the front limbs, the head and the ears). In order to easily scan the carcasses during their rapid passage on the dressing line, a 3 point scoring system for each of the two carcass regions is used: score 0, up to one scratch or bite; score 1, from two to five scratches or bites; score 2, more than five scratches or bites or any wound which penetrates the muscle (similarly to the Welfare Quality Protocol, which differs both for the perimeter of the regions and for the number of scratches per score)(Bottacini et al., 2018).

Pluck lesions score

Examination of the pluck is conducted by visual inspection and manual palpation of the organs, without any incision. Scores for every pluck organ are described in table below (Scollo et al., 2017).

Lesions	Scale	Description
Lungs		
Lung score (Madec score)	0-24	Pneumonic lesions (enzootic pneumonia-like, often due to <i>Mycoplasma Hyopneumoniae</i> : purple to grey rubbery consolidation, increased firmness, failure to collapse and marked edema) were scored according to Madec's grid (Madec and Derrien, 1981). Each lobe, except the accessory lobe, was scored from 0 to 4, to give a maximum possible total score of 24.
Absence of lesions	0-1	Lungs in which all the lobes, except the accessory one, received score 0.
Severe lesions	0-1	Lungs with a Madec score $\geq 5/24$.
Scars	0-1	Presence of recovered enzootic pneumonia-like lesions, with thickened interlobular purple to grey (depending from the age) connective tissue which appears as retracted tissue.
Abscesses	0-1	Presence of at least one abscess in the lungs.

Consolidations	0-1	Pneumonic lesions complicated by secondary bacterial pathogens (e. g. <i>Pasteurella</i> spp, <i>Bordetella</i> spp), more firm and heavy than enzootic pneumonia-like lesions. In the case of a cut surface, lesion was mottled by arborized clusters of gray-to-white exudate-distended alveoli, and mucopurulent exudate could be expressed from the airways (VanAlstine, 2012).
Lobular/chessboard pattern lesions	0-1	Presence of scattered multifocal spots of purple to grey discoloration indicative of probable co-existence of viruses (Porcine Reproductive and Respiratory Virus, Porcine Circovirus, Influenza Virus) and/or <i>Mycoplasma</i> spp. or foreign body (e. g. dust/particulate matter) (Leneveu et al., 2016).
Pleura		
Pleura score (SPES score)	0-4	SPES grid (Dottori et al., 2007). 0: Absence of pleural lesions; 1: Cranioventral pleuritis and/or pleural adherence between lobes or at ventral border of lobes; 2: Dorsocaudal unilateral focal pleuritis; 3: Bilateral pleuritis of type 2 or extended unilateral pleuritis (at least 1/3 of one diaphragmatic lobe); 4: Severely extended bilateral pleuritis (at least 1/3 of both diaphragmatic lobes). Most probable etiology: <i>Actinobacillus pleuropneumoniae</i> , <i>Haemophilus Parasuis</i> , <i>Pasteurella</i> spp, <i>Bordetella</i> spp., <i>Mycoplasma Hyorhinis</i> .
Severe lesions	0-1	Pleura with a SPES score ≥ 3 .
Sequestra	0-1	Presence of at least one sequestra in the lungs (acute: firm, rubbery and mottled dark red purple to lighter white areas with abundant fibrin, and hemorrhagic, necrotic parenchyma; or chronic: resolution of non-necrotic areas from acute infections results in remaining cavitated necrotic foci that are surrounded by scar tissue). Often associated with <i>Actinobacillus pleuropneumoniae</i> infection (Gottschalk, 2012).
<i>Actinobacillus pleuropneumoniae</i> index (APP index)	0-4	Frequency of pleuritis lesions with a SPES score ≥ 2 in a batch mean pleuritis lesion score of animals with SPES ≥ 2 . The APP index ranges from 0 (no animal in the batch showing dorsocaudal pleuritis) to 4 (all animals with severely extended bilateral dorsocaudal pleuritis) (Meriardi et al., 2012).
Liver		
Liver score	1-3	Scoring based on the number of milk spot lesions due to <i>Ascaris suum</i> presence and their migration. 1: no lesions or less than 4 lesions; 2: from 4 to 10 lesions; 3: more than 10 lesions.
Severe lesions	0-1	Livers with a score 3.
Total lesions	0-1	Livers with a score ≥ 2 .

4.5 Instruction for serum and blood sampling to analyse PRRS and Haptoglobine

PRRS:

Breeding farm: 1 pooled sample of serum from testicles of at least 40 castrated piglets affected by respiratory disease according to clinical examination (repetitions after 6 and 12 months = 3 repetitions)

Weaning farm: 2 pooled sample of blood at least 10 weaners piglets affected by respiratory disease according to clinical examination (repetitions after 6 and 12 months = 3 repetitions)

Fattening farm: 2 pooled sample of blood at least 10 fatteners affected by respiratory disease according to clinical examination (repetitions after 6 and 12 months = 3 repetitions)

Haptoglobin: 10 blood samples from 10 weaners randomly selected (repetition after 12 months = 2 repetitions)

4.6 Instructions for pig hair sampling

Collect 24 samples of pig hair (at least 100 mg/pig) from at least 24 randomly selected pigs:

- 24 sows (i.e. in breeding farms)
- 24 weaners (i.e. in weaning farms) at the end of the weaning phase
- 24 fatteners (in fattening and closed cycle farms) at the end of the fattening phase.

Take the pig hair by means of shearing machine or scissors. Take it from the back of the pig neck and place them in paper bags to be stored in the dark in a dry room at room temperature before sending them by courier service mail to the following address of the University of Udine, under the responsibility of professor Alberto Prandi, Department of Scienze agroalimentari, ambientali e animali. Label each paper bag with the ID code built as follows—:

Farm	Visit	replicate
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XXX	- 1 or 2 -	- from 1 up to 24 -
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4.7 Instructions for swab sampling and analysis of bacterial load in pig pens after cleaning and disinfection

On each farm, from 3 to 5 different sampling sites are tested in one representative, but randomly chosen pen, at the end of the “ALL OUT” cleaning and disinfection procedure, before the introduction of a novel batch of sows (i.e. in the farrowing sector) or weaners or growers:

- floor in the feeding area
- feeding tube (upside and inside) if dry or liquid feed is distributed automatically
- one nipple drinker from the same pen
- trough or manger (outside and inside)
- one manipulatable material (toys) if available.

For nipple drinkers, the inner nipple and the outer tube are swabbed in a circular motion. On planar surfaces, samples are taken by wiping the area horizontally and vertically. For every sampling point, an area of 25 cm² is tested. Swabs are premoistened with sterile physiological saline. All samples are to be stored in chilled insulated boxes (4 - 7°C) and transported to the laboratory and examined within 24 h.

4.8 Instructions for collection in pig farms of manure samples to ship to France (INRA)

1) Sampling protocol

When:

A series of samples before the implementation of improvement plans (period 1) and 12 months later, after the implementation of improvement plans (period 2) at the end of the production phase:

- at weaning (i.e. in breeding farms); at the end of the post-weaning phase (i.e. in weaning farms);
- at the end of the growing and the fattening phases (i.e. in fattening and farrow to finish farms)

Within each period (1 and 2): 4 pooled samples per farm for 2 consecutive batches (two pooled samples per batch) at the beginning (period 1) and 4 pooled samples per farm after the implementation of improvement plans (period 2).

Where:

The buildings: in pig houses or rooms where other biomarkers (cough scores, sneeze scores, laboured breathing scores, faeces score, etc.) are measured and/or sampled and analysed.

In the building: the zone where pigs mostly defecate; on the floor in solid floored pens, under the slats in fully or partially slatted floored pens. Sampling manure during pits emptying

operation is recommended whenever possible, for instance at the end of the production phase (i.e. farrowing, weaning, growing). The same sampling procedure must be used in period 1 and period 2 in the same pig house or room:

- a. in breeding farms without weaners, focus on two consecutive batches in visit 1 (the same in visit 3 after 12 months): two pooled samples in two farrowing rooms (one sample/room) with newly born piglets and two pooled samples in two farrowing rooms (one sample/room) with older piglets next to weaning.
- b. in breeding farms with weaners, focus on two consecutive batches in visit 1 (the same in visit 3 after 12 months) on farrowing and post-weaning phases: one pooled sample in one farrowing room with newly born piglets and one pooled sample in one farrowing room with older piglets next to weaning; one pooled sample in one post-weaning room with newly weaned piglets and one pooled sample in one post-weaning room with older piglets next to the end on the post-weaning phase.
- c. in weaning farms, focus on two consecutive batches in visit 1 (the same in visit 3 after 12 months) on post-weaning phases: 2 pooled samples from two rooms in the phase from 8 to 20 kg and 2 pooled samples from two rooms in the phase from 20 to 35 kg LW.
- d. in fattening farms with pigs from 25-35 KG up to 120-170 kg LW focus on two consecutive batches in visit 1 (the same in visit 3 after 12 months): two pooled samples at the end of the growing phase (one sample/room) with growers (from 25-25 kg to 50-80 kg LW) and two pooled samples at the end of the fattening phase (one sample/room or building) with older finishers next to slaughter.
- e. in farrow to finish farms (closed cycle) focus on two consecutive batches in visit 1 (the same in visit 3 after 12 months): one pooled sample in one post-weaning room with newly born piglets and one pooled sample in one post-weaning room with older piglets next to the end of the post-weaning; one pooled sample in one growing room or building with newly entered growers and one pooled sample in one fattening room or building with older fatteners next to slaughter.

Size:

About 40 g

Collect the manure in 40-60 mL polypropylene vials

2) Sample identification

Label each vial with the ID code built as follows :

Farm	Visit	batch/flock	replicate
XXX	- 1 or 2 -	- 1 or 2 -	- 1 or 2

For example: the ID code 15-2-2-1 means the replicate 1 sampled at the second batch during the visit 3 in the farm #15 (to be replaced by your ID of this farm)

3) Storage

Stock the vials at -20°C within the hour after the collection and keep them frozen until shipment

4) Shipment

Send them packed inside a cooled styrofoam box* to the following address:

Marlène LACROIX
Ecole Nationale Vétérinaire de Toulouse
INTHERES UMR 1436 INRA/ENV
23 chemin des Capelles, 31 076 Toulouse – France

* Styrofoam are supplied by the delivery company

NB: Shipment should be scheduled on Monday or Tuesday to be sure to receive samples before the weekend and avoid any risk of thawing.

4.9 Instructions for collection in pig farms of meat and water samples to ship to Poland (NVRI)

1) Samples collection

Collect 10 pooled meat samples from 2 consecutive pig batches after visit 1 (5 samples x 2 batches=10 pooled samples) and other 10 pooled samples 12 months later, after visit 3. The best indicator is the diaphragm pillar muscle. Each meat sample is composed of 5 muscles (200 g per one pooled sample) in a polypropylene or plastic tube. Homogenize the meat (grinding) if possible.

Collect pooled water samples (200 ml per one sample) in a polypropylene or plastic tube. Water samples should be taken the day before slaughter from the drinkers of the batches of slaughter pigs whose meat is to be sampled at slaughter the day after. The pooled water sample should be prepared by taking water from the drinkers from both pig batches on the farm and mixing to obtain 200 ml (e.g. 100 ml from the first batch, and another 100 ml from the second batch). However, when each of the pig batches on the farm has independent water supply systems, then the water sample should be taken from only one of the pig batch and accurately described from which it was taken (in this case, the samples from two independent water supply systems cannot be mixed, because the interpretation of the results will be very difficult).

Caution: meat and water samples are to be sampled in all fattening units (of farrow to finish or fattening farms). Not in breeding and weaning farms.

2) Labelling of samples (the same like for manure collection)

With the ID code as follows:

Farm	Visit	batch/flock	replicate
XXX	-1 or 2-	-1 or 2-	-1 or 2-

3) Storage

Stock the samples (meat and water) at -20 °C within the hour after collection and keep them frozen until shipment and transport

4) Shipment

Samples should be sent in a cooled Styrofoam box (with a cooling pack inside to avoid thawing) to the following address:

Anna Gajda

National Veterinary Research Institute in Pulawy

Al. Partyzantow 57, 24-100 Pulawy - POLAND

4.10 Feed-back questionnaire on the design of a tailor-made health plan for pig farms

A To be asked on both the preintervention and separately the postintervention meeting

1. How do you judge the health status of the current pig batches in this farm on a scale 1-5? 1 low, 5 high.
2. Do you consider biosecurity to be important on this farm?
3. Where would you evaluate the biosecurity level on this farm currently scale 1-5? 1 is low 5 is high
4. Do you think there is room for improving the biosecurity level on this farm? yes/no. If yes what are the three main biosecurity features that you think this farm still needs to improve the most?
5. Have you experienced any biosecurity breach on this farm in most batches? If yes please indicate which pathogen/disease you consider as the cause and due to what biosecurity breach/risk factor.
6. Is there presently any room for reducing the use of antimicrobials on this farm? If yes what are the main strategies you would still like to put in place to further reduce the use of antimicrobials.
7. Did you ever assess and analyse systematically the biosecurity risk in this farm? yes/no. If yes which tool or kind of tool has been used for risk analysis how and who did perform the assessment?
8. To which extent do you think the regular meetings with farm vet/advisers and farm management team responsible for this farm about farm biosecurity are effective to

improve herd health and reduce the use of antimicrobials on this farm on a scale 1-5?
1 low, 5 high.

9. How important is the role of the veterinarian for you as a farmer, in terms sharing knowledge and/or experiences about biosecurity on a scale 1-5? 1 low, 5 high.

B Additional questions to be asked only at the end of the postintervention meeting

1. Did you find the recommendations coming out of the Biosecurity Health plan helpful in identifying targets for improvement? yes/no. If yes how overall helpful on scale 1-5.
2. How many of the recommendations have you already implemented?
3. How many of the recommendations do you plan to implement in the near future?
4. Of those you are not planning to implement in the near future what is the reason. (e.g. cost, impractical etc.)
5. Did you find the use of respiratory scores (cough, sneeze, laboured breathing) as biomarkers useful? yes/no.
6. Did you find the use of faeces scoring as a biomarker useful? yes/no.
7. Did you find the use of pig hair analysis as a biomarker useful? yes/no.
8. Did you find the use of pluck and skin scores at slaughter as biomarkers useful? yes/no.
9. Will you be using in the future on a regular basis the questionnaire tool to monitor progress and identify further targets for improvement? Yes/no. If yes how

5. Literature

5.1 Literature scan biomarkers for broiler farms

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Annex 1 - HL Biosecurity Risk Analysis Tool for broiler farms

Risk analysis tool biosecurity Healthy Livestock WP1 Netherlands

Final version 27-6-2019 / MB-WUR

Introduction

This draft Risk Analysis Tool is based on literature review of risks for major Dutch broiler diseases, including existing scoring systems for biosecurity (with special attention to Dutch scoring systems and the Biocheck.Ugent). The format anticipates on the format of the health plans to be worked out, which will according to the WP1 work plan description be based on the (FAO) risk zoning (red-orange-green).

Farm characteristics

Name company/farmer:

Address, residence:

nr. broiler houses/nr. broilers per house:

Guideline to veterinarian and broiler farmer

Step 1 Define on-farm risk zones

Download a Google Earth map of the farm location and color the risk zones (red-orange-green)

Make a schematic drawing of the farm location and color the risk zones, and identify the buildings, stables, storage sites, pathways et cetera.

Example

'Coat rak': defining on-farm risk zones

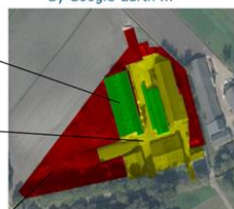
[elaboration of FAO 3zone biosecurity model, 2015]

■ Green zone with broiler houses and entree rooms: clean, strictly isolated, restricted access

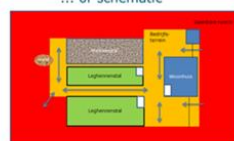
■ Orange zone with paved surfaces and functional farm areas: with biosecurity measurements to reduce contamination with 'foreign' manure to medium/low risk

■ Red zone with external areas (un-paved roads, ditches, pastures, ..): high risks, farmers little acting opportunities

By Google-Earth ...



... or schematic



Step 2 Go through the risk analysis tool

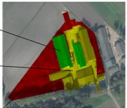
Answer the questions belonging to the different zones and transition lines between zones (see tabs). Each question can be answered by means of a scroll menu in the colored column. The tabs 'Transition O-G' and 'GREEN ZONE' should be filled out for each broiler house on the farm. The reddish colors in the column Farm Score are the points of attention.


Step 3 Interpretation


The answers entered by the scroll lists will be automatically scored in the Farm Score column. Veterinarian and farmer: please analyze together the generated scores and discuss: where are opportunities for improvements? In the Overall scores tab at the end of the document, an overview of the farm scores per theme and a graphical representation is provided. The point distribution system (fully compliance 1 up to no compliance 0) is derived from

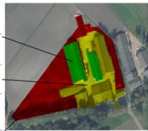
Step 4 Health plan

Make an action plan with SMART formulated preventative actions per zone and per transition line between zones for strengthening of on-farm biosecurity (What, How, Who, When)

Risk analysis tool biosecurity Healthy Livestock WP1 Netherlands							
Final version 26 -6 -2019 / MB-WUR							
RED ZONE [Location and surroundings of the functional farm areas]							
							
Risk factors	Objectives	Compliance	Additional remarks	Division of points	Farm score	Preventative options in case of non-compliance? (Should we leave this in?)	
		(scroll lists)					
R1	Poultry density in area	< ... / km2	no	1 - 0	0	R1	-
R2	Distance to nearest poultry farm	> 1 km	> 1 km	1 - 0.5 - 0	1	R2	-
R3	Shortest distance to public road with daily animal transports	> 250 m	> 250 m	1 - 0.5 - 0.3 - 0	1	R3	-
R4	Spread of poultry litter/manure on surrounding fields	never	often	1 - 0.3 - 0	0	R4	Arrangeable during downtime of broiler houses?^^
R5	Spread of other farm animal litter/manure on surrounding fields	never	sometimes	1 - 0.3 - 0	0,3	R5	Arrangeable during downtime of broiler houses?^^
R6	Mowing of premises	never	sometimes	1 - 0.5 - 0	0,5	R6	Arrangeable during downtime of broiler houses?^^
R7	Ploughing in surrounding fields	never	often	1 - 0.5 - 0	0	R7	-
R8	Water ponds present within radius of 1 km	no	no	1 - 0	1	R8	-
R9	Migratory birds route in the vicinity within radius of 1 km	no	yes	1 - 0	0	R9	-
R10	Pest animal pressure in surroundings	limited	limited	1 - 0.5 - 0	1	R10	Joint pest control with neighbouring farms possible?
				(higher score is less risk)	(max=10)	4,8	
Overall risk estimation RED ZONE (by veterinarian/farmer: low-medium-high)			medium	Important: farmers risks awareness, extra strict lines-of-defence necessary concerning pathogen entrance pathways to farm when located in high risk red area!			
Preventative provisions	Objectives	Compliance					
		(scroll lists)					
R11	Parking area visitors/farm employees in red zone	yes	yes	1 - 0	1	R11	
	Separation 'dirty' - 'clean' area^: location of dirty road in red zone. Accessible from the dirty road are:						
R12	* filling points of feed storage bins/silo's	yes	yes	1 - 0	1	R12	
R13	* collecting points of manure	yes	no	1 - 0	0	R13	
R14	* collecting points of cadavers	yes	no	1 - 0	0	R14	
				(max=4)	2		
OVERALL BIOSECURITY SCORE RED ZONE (higher score is less risk):				(max=14)	6,8		
Percentage of maximum score:					49%		
^Dirty road is relatively easily accessible for visitors, feed suppliers, cadaver and manure collection transports. [Clean road is part of the internal orange zone, and preserved for supply and collection of animals (in cleaned and disinfected lorries) and internal farm movements]							^^ Or arrangeable during favourable wind direction?

continued risk analysis tool biosecurity Healthy Livestock WP1 Netherlands								
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TRANSITION LINES between RED and ORANGE zone								
	Risk factors	Objectives/advices	Compliance	Additional remarks	Division of points	Farm score		
			(scroll lists)					
TA1	Access of personnel/visitors	Access of passenger cars in orange zone prohibited	never		1-0.5-0.3-0	0	TA1	
TA2		Limited number of farm visitors (only the strict necessary)	yes		1 - 0	1	TA2	
TA3		Poultry-free downtime of visitors of 48 hours	always		1 - 0.5 - 0	1	TA3	
TA4		Well located hygiene lock with dirty and clean area available	no		1 - 0	0	TA4	
TA5		Provision of hygiene lock with:						
		* company footwear	yes		1 - 0	1	TA5	
TA6		* company clothes/overalls	yes		1 - 0	1	TA6	
TA7		* hand hygiene facilities	yes		1 - 0	1	TA7	
TA8		* shower	no		1 - 0	0	TA8	
TA9		* adequate hygiene protocol for visitors/employees\farmer available	no		1 - 0	0	TA9	
TA10		Correct use of hygiene lock provisions by farm workers	sometimes		1-0.5-0.3-0	0,3	TA10	
TA11		Correct use of hygiene lock provisions by visitors	mostly		1-0.5-0.3-0	0,5	TA11	
TA12	Access of transport vehicles	Access exclusively for poultry transport vehicles	no		1 - 0	0	TA12	
TA13		Access limited to in-advance-thoroughly-cleaned-and-disinfected transport vehicles	always		1 - 0.5 - 0	1	TA13	
TA14		Cleaning and disinfection of tires before entering the orange zone (all transports)	sometimes		1 - 0.5 - 0	0,5	TA14	
TA15	Access of wild birds (and pest animals)	No open access via water ponds or the like to orange zone (farm yard)	no		1 - 0	0	TA15	
TA16		No open access via water ponds or the like to outdoor poultry areas	yes		1 - 0	1	TA16	
TA17		Facilities for driving wild birds away from farm yard/outdoor areas	no		1 - 0	0	TA17	
				(higher score is less risk)	(max=17)	8,3		
	Preventative provisions		Compliance					
			(scroll lists)					
TA18	Separation orange and red zone by fence/wire and entrance gate		yes		1 - 0	1	TA18	
TA19	Arrival sign		no		1 - 0	0	TA19	
TA20	Registration of visitors		yes		1 - 0	1	TA20	
					(max=3)	2		
OVERALL BIOSECURITY SCORE TRANSITION ZONE R-O:					(max=20)	10,3		
Percentage of maximum score:						52%		

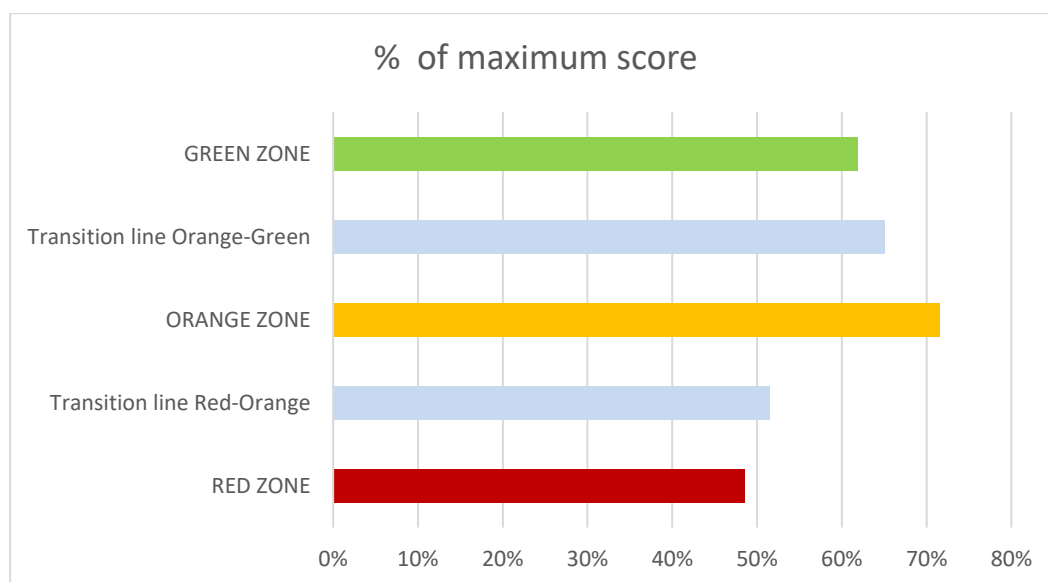
continued risk analysis tool biosecurity Healthy Livestock WP1 Netherlands						
Final version 26 -6 -2019 / MB-WUR						
<div> <div>ORANGE ZONE (Farm Yard)</div>  </div>						
	Risk factors	Objectives/advice	Compliance	Additional remarks	Division of points	Farm score
			(scroll lists)			
O1	Position of broiler houses relative to internal-external logistic lines	Internal poultry husbandry routes not crossed over by other (non-poultry related) transport routes (farm dairy cattle transport routes etc.)	yes		1 - 0	1 O1
O2		External transport routes not close to (air inlet of) broiler houses (> .. m)	yes		1 - 0	1 O2
					1 - 0	
O3	Cadaver storage	Cooled cadaver storage (... degrees C)	no		1 - 0	0 O3
O4		Cadavers not accessible for wild birds, rodents	yes		1 - 0	1 O4
					1 - 0	
O5	Manure storage	No manure storage in orange zone	no	[if yes, skip O6 and O7]	1 - 0	0 O5
O6		Storage present, but no manure from previous production rounds	no		0.3 - 0	0 O6
O7		Storage present, not accessible for wild birds, rodents, ..	yes		0.3 - 0	0,3 O7
O8	Feed storage	Regular cleaning of feed silos (... / ...)	yes		1 - 0	1 O8
O9		Storage not accessible for wild birds, rodents, ..	yes		1 - 0	1 O9
O10	Storage of bedding materials	Storage not accessible for wild birds, rodents, ..	yes		1 - 0	1 O10
O11	Other poultry species	Not present	no	[if yes, skip O12]	1 - 0	0 O11
O12		Only hobby-like present, not close to broiler houses, >.. m	yes		0.5 - 0	0,5 O12
O13	Other farm animal species	Not present	yes	[if yes, skip O14]	1 - 0	1 O13
O14		Only hobby-like present, not close to broiler houses, >.. m			0.5 - 0	0 O14
O15	Rodents/insects	Limited pest animal pressure	limited		1 - 0.5 - 0	1 O15
O16		Systematic, integrated pest control	yes		1 - 0	1 O16
O17		No hiding places near stables (plants, piles, dirt, ..)	little		1 - 0.5 - 0	0,5 O17
O18	Wild birds	No open water ponds on farm yard	no	[if yes, skip O19]	1 - 0	0 O18
O19		When open water ponds present: covered with nets	no		0.5 - 0	0 O19
O20		No trees/bushes near stables	little		1 - 0.5 - 0	0,5 O20
O21		Collection of roof runoff rainwater in gutters	yes		1 - 0	1 O21
O22	Contaminated farm yard surfaces	Cleanliness surfaces, not contaminated with feces, ..	high		1 - 0.5 - 0	1 O22
				(higher score is less risk)	(max=17)	12,8
	Preventative provisions	Objectives	Compliance			
			(scroll lists)			
O23	Cleaning and disinfection of farm yard	Broom cleaning of paved surfaces	frequent		1-0.5-0	1 O23
O24		Regular cleaning of paved surfaces (high pressure water sprayer) risk of airborne transmission?	sometimes		1-0.5-0	0,5 O24
O25		Regular disinfection of paved surfaces	never		1-0.5-0	0 O25
					(max=3)	1,5
				OVERALL BIOSECURITY SCORE ORANGE ZONE:	(max=20)	14,3
				Percentage of maximum score:		72%

continued risk analysis tool biosecurity Healthy Livestock WP1 Netherlands							
Final version 26 -6 -2019 / MB-WUR							
<div> <div>TRANSITION LINES between ORANGE and GREEN zone</div>  </div>							
Broiler house^ nr:							
	Risk factors	Objectives/advice	Compliance	Additional remarks	Division of points	Farm score	
			(scroll lists)				
TB1	Access of personnel/visitors	Entree room with dirty and clean area as hygiene lock available	yes		1 - 0	1	TB1
		Provision of entree room with:					
TB2		* broiler house specific footwear	yes		1 - 0	1	TB2
TB3		* broiler house specific clothes/overalls	yes		1 - 0	1	TB3
TB4		* hand hygiene facilities	yes		1 - 0	1	TB4
TB5		* shower	no		1 - 0	0	TB5
TB6		* adequate hygiene protocol for visitors/employees\farmer available	yes		1 - 0	1	TB6
TB7		Barn hygiene protocol for visitors and farmer/farm employees	yes		1 - 0	1	TB7
TB8		Correct use of entree room provisions by farm workers	mostly		1-0.5-0.3-0	0,5	TB8
TB9		Correct use of entree room provisions by visitors	sometimes		1-0.5-0.3-0	0,3	TB9
TB10	Access of materials	Cleaning materials before entering clean area of barn entrance room	sometimes		1-0.5-0.3-0	0,3	TB10
TB11		Disinfecting materials before entering clean area et cet.	never		1-0.5-0.3-0	0	TB11
TB12	Access of wild birds (and pest animals)	No open access via water ponds or the like to orange zone (farm yard)	yes		1 - 0	1	TB12
TB13		No open access via water ponds or the like to outdoor poultry areas	yes		1 - 0	1	TB13
TB14		Facilities for driving wild birds away from farm yard/outdoor areas	no		1 - 0	0	TB14
				(higher score is less risk)	(max=14)	9,1	
	Preventative provisions						
	..						
				OVERALL BIOSECURITY SCORE TRANSITION ZONE O-G:	(max=14)	9,1	
				Percentage of maximum score:		65%	
	^To be completed for each broiler house on the farm						

continued risk analysis tool biosecurity Healthy Livestock WP1 Netherlands									
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GREEN ZONE (broiler houses)		Broiler house ^A nr.:							
Risk factors	Objectives/advices	Compliance	Additional remarks	Division of points	Farm score				
G1	Introduction by purchased animals	No introduction of purchased chickens (only hatching eggs)	(scroll lists)	1 - 0	1	G1			
G2		Limited number of hatchery origins	yes	1-0.5-0	0,5	G2			
G3		Limited number of breeder flocks	2	1-0.5-0	0,5	G3			
G4		Health status of breeder flocks	high	1-0.5-0	1	G4			
G5	Introduction by bedding/enrichment materials	Bringing in (enrichment) materials (e.g. straw) before population	yes	1 - 0	1	G5			
G6	Introduction by contaminated feed	Concentrates are heat processed (pelleted/extruded)	yes	1 - 0	1	G6			
G7		Unprocessed feed (roughage a.o) has a quality guarantee (GMP)	no	1 - 0	0	G7			
G8	Introduction by drinking water	Regular examination of drinking water quality (every 12 months)	yes	1 - 0	1	G8			
G9		Regular flushing of water pipes (1/ week)	yes	1 - 0	1	G9			
G10		Regular cleaning and disinfection of waterpipes and reservoirs	once per round	1-0.5-0.3-0	0,5	G10			
G11		No use of surface water	yes	1 - 0	1	G11			
G12	Thinning	No thinning	no	[if yes, skip G13,G14,G15,G16]	1 - 0	0	G12		
G13		If thinning: clean/disinfected bird collection crates	yes	0.2 - 0	0,2	G13			
G14		If thinning: barn specific clothing and footwear for catching team	yes	0.2 - 0	0,2	G14			
G15		If thinning: hygiene protocol for catching team	no	0.2 - 0	0	G15			
G16		Correct compliance catching team with hygiene demands	sometimes	0.2-0.1-0	0,1	G16			
G17	Depopulation	Barn specific clothing and footwear for catching team	yes	0.2 - 0	0,2	G17			
G18		Hygiene protocol for catching team	yes	0.2 - 0	0,2	G18			
G19		Correct compliance catching team with hygiene demands	always	0.2-0.1-0	0,2	G19			
G20		Clean/disinfected bird collection crates	yes	0.3 - 0	0,3	G20			
G21	Spread of pathogens between consecutive flocks	Smooth surfaces broiler houses (no hiding/breeding places for insects)	some seams and cracks	1 - 0.5 - 0	0,5	G21			
G22		Cleaning between rounds	mostly	1-0.5-0.3-0	0,5	G22			
G23		Disinfection between rounds	sometimes	1-0.5-0.3-0	0,3	G23			
G24		Downtime period (vacancy period)	>= 3 days	1 - 0.5 - 0	0,5	G24			
G25	Spread between farm broiler houses	All in-all out (one age, max. 7 days difference, of birds on farm)	yes	1 - 0	1	G25			
G26		Broiler house specific farm employee(s)	no	1 - 0	0	G26			
G27		House specific equipment available (brooms, ...)	no	1 - 0	0	G27			
G28	Removal of dead birds from the house	Daily removal of dead birds	yes	1 - 0	1	G28			
G29		Cleaning of dead bird transport materials (e.g. buckets) after use	no	1 - 0	0	G29			
G30	Rodents/insects	Limited pest animal pressure	limited	1 - 0.5 - 0	1	G30			
G31		Systematic, integrated pest animal control in the broiler house	no	1 - 0	0	G31			
G32	Wild birds	Facilities for keeping wild birds out (e.g. mesh for fan openings)	yes	1 - 0	1	G32			
G33	Outdoor broiler areas	No uncovered outside areas present	no	[if yes, skip G34, G35]	1 - 0	0	G33		
G34		If present: facilities for keeping wild birds out	yes	0.4 - 0	0,4	G34			
G35		If present: changing footwear between outdoor bird areas	yes	0.2 - 0	0,2	G35			
				(higher score is less risk)	(max=26)	16,3			
Preventative provisions		Objective	Compliance						
			(scroll lists)						
G36	Cleaning and disinfection of entree room	Broom clean keeping of entree room during round	never	daily	1-0.5-0.3-0	0	G36		
G37		Cleaning between production rounds	yes	occasional	1 - 0	1	G37		
G38		Disinfection between production rounds	yes	never	1 - 0	1	G38		
G39	Cleaning and disinfection of broiler house	Cleaning between production rounds	always		1-0.5-0	1	G39		
G40		Disinfection between production rounds	sometimes		1-0.5-0	0,5	G40		
				(higher score is less risk)	(max=6)	3,5			
				OVERALL BIOSECURITY SCORE GREEN ZONE:	(max=32)	19,8			
				Percentage of maximum score:		62%			

^ATo be completed for each broiler house on the farm

Final version 26 -6 -2019 / MB-WUR		
	FARM SCORE	
Zones and transition lines	% of maximum score	(higher % is less risk)
RED ZONE	49%	
Transition line Red-Orange	52%	
ORANGE ZONE	72%	
Transition line Orange-Green	65%	
GREEN ZONE	62%	



Annex 2 - HL Biosecurity Risk Analysis Tool for pig farms

Biosecurity Risk Analysis Tool - Healthy Livestock WP1 Italy and France

Final version 26-02-2020 / PF

Introduction

This draft Risk Analysis Tool is based on literature review of risks for major Italian pig diseases, including existing scoring systems for biosecurity (with special attention to Dutch scoring systems and the Biocheck.UGent). The format anticipates on the format of the health plans to be worked out, which will according to the WP1 work plan description be based on the (FAO) risk zoning (red-orange-green).

Farm characteristics

Name company/farmer:

Address, residence:

nr. pig houses/nr. pig per house:

Guideline to veterinarian and pig farmer

Step 1 Define on-farm risk zones

Download a Google Earth map of the farm location and color the risk zones (red-orange-green)

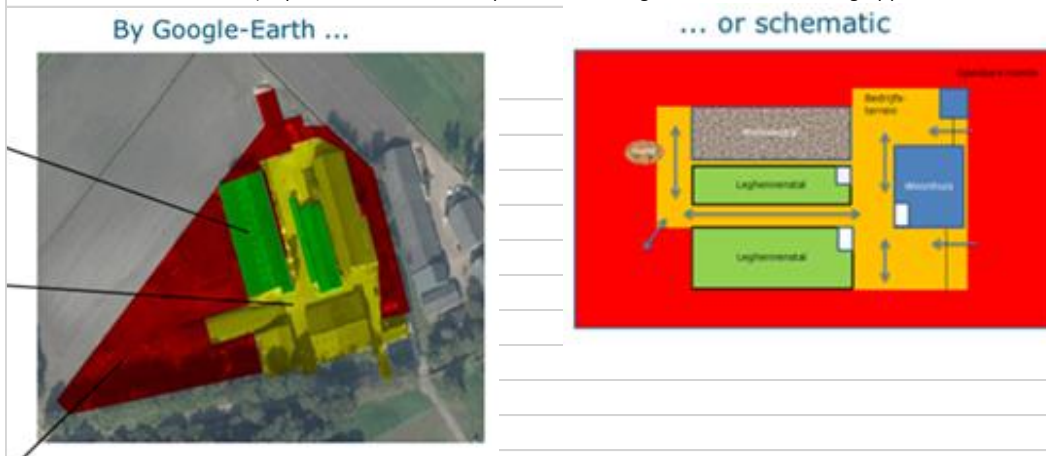
Make a schematic drawing of the farm location and color the risk zones, and identify the buildings, stables, storage sites, pathways et cetera.

Example

Green zone = pig houses and entree rooms: clean, strictly isolated, restricted access

Orange zone = paved surfaces and functional farm areas: biosecurity measures to reduce contamination with foreign manure to medium/low risk

Red zone = external areas (unpaved roads, ditches, pasture, etc.): high risks, farmers acting opportunities



Step 2 Go through the risk analysis tool

Answer the questions belonging to the different zones and transition lines between zones (see tabs) and score the risk. The tabs 'Transition O-G' and 'GREEN ZONE' should be filled out for each pig house on the farm

Step 3 Interpretation

In the tab "Overall scores", an overview of scores per theme is shown. Veterinarian and farmer: Analyze together the automatically generated scores and discuss: where are opportunities for improvements?

Step 4 Health plan

Make an action plan with SMART formulated preventative actions for strengthening of on-farm biosecurity

Biosecurity in the red zone (public)							
	Risk Factors	Objective	Conditions	Means in place to reach the objective	Score (1= high risk, 2=moderate risk, 3=low risk, 4=no risk or under control)	Major improvement needed	Is it critical in this farm (yes/no)
1	Neighbourhood activities	Awareness of at-risk situation due to neighbourhood	Pig density area (i.e. average pig density at municipality level > 300 pigs/km2 = score 1)		1		
2			Pig farms close to the farm (i.e. score 4>3000; 3000 m> score 3>1000 m; 1000 m> score 2> 500m; score 1 <500)		1		
3			Abattoir close to the farm (i.e. score 4>3000; 3000 m> score 3>1000 m; 1000 m> score 2> 500m; score 1 <500)		1		
4			Road with frequent pig transport close to the farm (i.e. score 4>3000; 3000 m> score 3>1000 m; 1000 m> score 2> 500m; score 1 <500)		1		
5			Wild boars spotted in the neighborhood within a radius of 10 km (i.e. score 1=yes; score 4=no)		1		
6	External vehicles	Maintain in the public zone vehicles and persons with no necessary access to the professional zone	Parking for staff and visitors in the public zone (i.e. score 4=yes; score 1=no)		1		
7			Separate access ways for rendering plant trucks (i.e. score 4=yes; score 1=no)		1		
8			Separate access for feed supply (i.e. score 4=yes; score 1=no)		1		
9			Separate access for manure elimination (i.e. score 4=yes; score 1=no)		1		
10	Dead animals	Reduce load of pathogens associated with elimination of dead animals	Storage of cadavers in the public zone (i.e. score 4=yes; score 1=no) ¹		NA		
11			Frequency of elimination of cadavers from the farm ¹		NA		
12			Cleaning and disinfection of the storage equipment after every cadaver collection (i.e. score 4=yes; score 1=no) ¹		NA		
				(higher score is less risk)	(max=48 for all points applicable. Otherwise max score is calculated in F18 = applicable points x 4)		
¹⁾	write NA in column F for non applicable conditions						
				OVERALL BIOSECURITY SCORE RED ZONE:	9		
				Maximum score	36		
				Percentage of maximum score:	25%		

Biosecurity in the transition between the red zone (public) and the orange zone (professional zone)							
	Risk Factors	Objective	Conditions	Means in place to reach the objective	Score (1= high risk, 2=moderate risk, 3=low risk, 4=no risk or under control)	Major improvement needed	Is it critical in this farm (yes/no)
1	contamination from truck and visitors	prevent contamination of the professional zone by trucks and visitors	arrival sign (i.e. score 4=yes; score 1=no)			1	
2			access exclusively for pig transport vehicles (i.e. score 4=yes; score 1=no)			1	
3			access limited to in-advance-thoroughly-cleaned-and-disinfected transport vehicles (i.e. score 4=yes; score 1=no)			1	
4			cleaning and disinfection of tires before entering the orange zone (all transports) (i.e. score 4=yes; score 1=no)			1	
5			truck platform equipped with fixed or manual equipment for wheels, lateral and undersides vehicles disinfection			1	
6			presence of a platform to house temporarily and load pigs for slaughter (i.e. score 4=yes; score 1=no)			1	
7			cleaning and disinfection of the platform after each delivery (i.e. score 4=yes; score 1=no) ¹			NA	
8	contamination by wildlife	prevent contamination of the professional zone by wildlife	delimitation of the professional zone to prevent access of wild animals (e.g. preimetretral fence against wild boars)			1	
9	contamination by staff in charge of elimination of dead animals	prevent contamination by staff in charge of elimination of dead animals in the public zone	specific clothes and shoes for staff to eliminate dead animals in the public zone (i.e. score 4=yes; score 1=no) ¹		NA		
10			cleaning and disinfection of the material used to transfer dead animals in the public zone (i.e. score 4=yes; score 1=no) ¹		NA		
11			cleaning and disinfection of the shoes after transfer of dead animals in the public zone (i.e. score 4=yes; score 1=no) ¹		NA		
12			hand washing after transfer of dead animals in the public zone (i.e. score 4=yes; score 1=no) ¹		NA		
13	staff and visitors	prevent introduction of diseases by staff and visitors entering the farm	well located hygiene lock with dirty and clean area available (i.e. score 4=yes; score 1=no)			1	
14			provision of the hygiene lock with company footwear or overshoes (i.e. score 4=yes; score 1=no)			1	
15			provision of the hygiene lock with company clothes/overalls (i.e. score 4=yes; score 1=no)			1	
16			provision of the hygiene lock with hand hygiene facilities (i.e. score 4=yes; score 1=no)			1	
17			provision of the hygiene lock with one or more showers (i.e. score 4=yes; score 1=no)			1	
18			provision of the hygiene lock with adequate hygiene SOP for visitors/employees\farmer available (i.e. score 4=yes; score 1=no)			1	
19			correct use of hygiene lock provisions by farm workers (i.e. score 4=yes; score 1=no)			1	
20			correct use of hygiene lock provisions by visitors (i.e. score 4=yes; score 1=no)			1	
21	unnecessary access	no unnecessary access to the professional zone	clear delimitation of the professional zone (i.e. score 4=yes; score 1=no)			1	
22			no access of the public to the orange zone (i.e. score 4=yes; score 1=no)			1	
23			no access of trucks eliminating dead animals (i.e. score 4=yes; score 1=no)			1	
24			availability of a visitors' register mentioning a period of at least 12 hours between two pig farm visits (i.e. score 4=yes; score 1=no)				
				(higher score is less risk)	(max=96 for all points applicable. Otherwise max score is calculated in F36 = applicable points x 4)		
1)	write NA in column F for non applicable conditions						
				OVERALL BIOSECURITY SCORE TRANSITION ZONE R-O:	18		
				Maximum score	72		
				Percentage of maximum score:	25%		

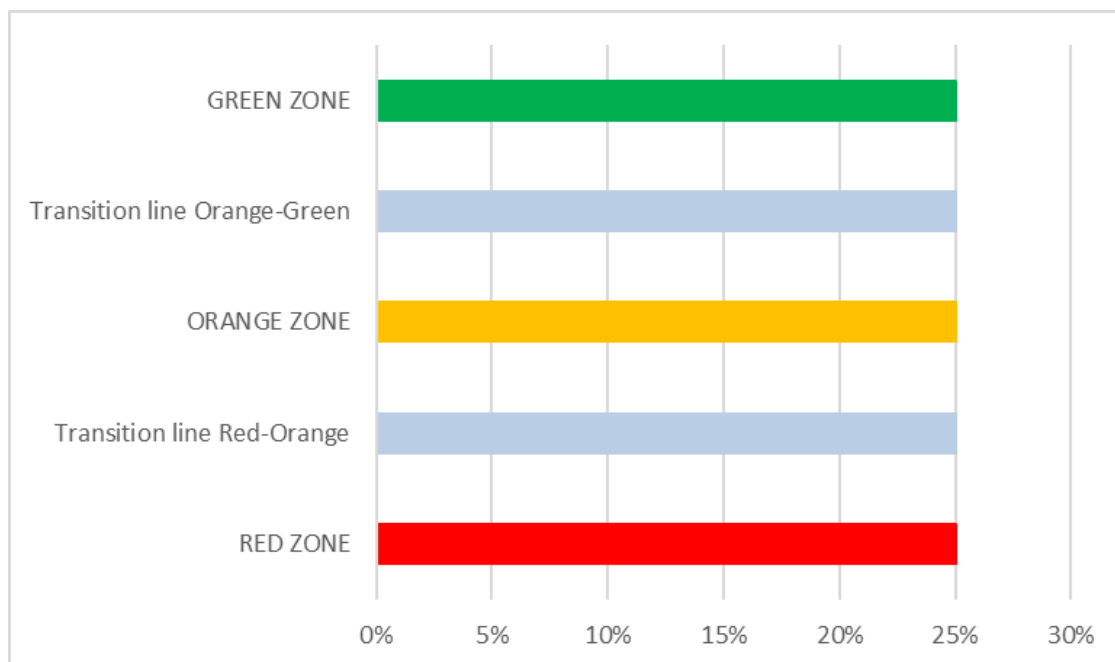
Biosecurity in the orange zone (professional)							
	Risk Factors	Objective	Conditions	Means in place to reach the objective	Score (1= high risk, 2=moderate risk, 3=low risk, 4=no risk or under control)	Major improvement needed	Is it critical in this farm (yes/no)
1	contamination by wildlife	prevent contamination of the professional zone by wildlife	protocols for control of rodents (i.e. score 4=protocol + registered treatments; score 1 no protocol, no register for treatments)			1	
2			protocols for control of insects (i.e. score 4=protocol + registered treatments; score 1 no protocol, no register for treatments)			1	
3	contamination by manure	prevent contamination by the manure	manure storage separated from the pig houses (i.e. score 4=yes; score 1=no)			1	
4			conditions of transfer and storage of manure (assess possible contamination slurry tanks and pig houses)			1	
5	pathogen persistence	prevent persistence of pathogens in the professional zone	staff staying there for rodents and parasites (i.e. score 4=yes; score 1=no)			1	
6			washable surface and flooring combined with high pressure water (i.e. score 4=yes; score 1=no)			1	
7	contamination by staff storing dead animals	prevent contamination by staff in charge of storing dead animals in the orange zone	specific gloves, clothes and shoes for staff to transfer and store dead animals in the orange zone (i.e. score 4=yes; score 1=no) ¹			1	
8			cleaning and disinfection of the material used to transfer dead animals in the orange zone (i.e. score 4=yes; score 1=no) ¹			1	
9			cleaning and disinfection of the shoes after transfer of dead animals in the orange zone (i.e. score 4=yes; score 1=no) ¹			1	
10			hand washing and disinfection after transfer of dead animals in the orange zone(i.e. score 4=yes; score 1=no) ¹			1	
11			Frequency of elimination of cadavers from the farm ¹			1	
12			Cleaning and disinfection of the storage equipment after every cadaver collection (i.e. score 4=yes; score 1=no) ¹			1	
				(higher score is less risk)	(max=48 for all points applicable. Otherwise max score is calculated in F36 = applicable points x 4)		
¹⁾	write NA in column F for non applicable constitions						
				OVERALL BIOSECURITY SCORE ORANGE ZONE:	12		
				Maximum score	48		
				Percentage of maximum score:	25%		

Biosecurity at the transition between the orange zone (professional zone) and the green zone (livestock zone)				Pig house ¹ nr:				
	Risk Factors	Objective	Conditions	Means in place to reach the objective	Score (1= high risk, 2=moderate risk, 3=low risk, 4=no risk or under control)	Major improvement needed	Is it critical in this farm (yes/no)	
1	pathogens from animals	prevent of pathogens by animals introduced into the herd	origin of animals (i.e. from Specific Pathogen Free farms=score 4, from the same farm=score 3, from more than one known farms=score 2, from more than one unknown farm=score 1)		1			
2			position of the quarantine in the farm (from other pig houses score 4>120 m; 120 m <score 3 <60 m; 60 m <score 2 <30 m; score 1 <30 m)		1			
3			conditions of quarantine (duration at least 30 d, daily observation, cleaning and disinfection after each batch)		1			
4	pathogens from other purchases	prevent introduction of pathogens by other purchases	facilities for delivery in the livestock zone (i.e score 4=room available to store temporarily and check materials; score 1=no room available)		1			
5			origin of purchased goods (to be listed and assessed)		1			
6	pathogens from shared equipment	prevent introduction of pathogens by shared equipment entering the farm	use of shared equipment between farms (i.e. score 4=no share; score 1=share)		1			
7			cleaning and disinfection of shared equipment before entry in the farm (e.g. ecograph). Is there a room, disinfectants and a SOP available for disinfection of shared equipment? (i.e. score 4=yes; score 1=no)		1			
8	pathogens from staff/visitors	prevent introduction of pathogens by staff/visitors	no contacts of staff with other pig farms (i.e. score 4=no contact; score 1=contact)		1			
9			entree room available, with clear dirty and clean areas, as hygiene lock at the entrance of the pig house for farrowing or weaning or quarantine (i.e. score 4=yes; score 1=no) ²	NA				
10			specific footwear available at the entrance of the pig house (i.e. score 4=yes; score 1=no)		1			
11			specific clothes/overalls available at the entrance of the pig house (i.e. score 4=yes; score 1=no)		1			
12			hand hygiene facilities available at the entrance of the pig house (i.e. score 4=yes; score 1=no)		1			
13			Barn hygiene protocol available for visitors / employees \ farmer (i.e. score 4=yes; score 1=no)		1			
14			Correct use of provisions at the entrance of the pig house by farm workers (i.e. score 4=yes; score 1=no)		1			
15			Correct use of entree room at the entrance of the pig house provisions by visitors (i.e. score 4=yes; score 1=no) ²		1			
16	unnecessary access		no unnecessary access to the livestock zone	persons (i.e. score 4=no persons; score 1=yes)		1		
17				animals (domestic animals) (i.e. score 4=no animals; score 1=yes)		1		
18		anti-bird nets (i.e. score 4=yes; score 1=no)			1			
19		insect screens available (i.e. score 4=yes; score 1=no)			1			
¹⁾ To be completed for each pig house on the farm				(higher score is less risk)	<i>(max=76 for all applicable conditions. Otherwise max score calculated in F36 = applicable points x 4)</i>			
²⁾ write NA in column F for non applicable constitions								
OVERALL BIOSECURITY SCORE TRENITION ZONE O-G:				18				
Maximum score				72				
Percentage of maximum score:				25%				

Biosecurity in the green zone (livestock zone)		Pig house ¹ nr:				
Risk factors	Objectives	Conditions	Means in place to reach the objective	Score (1=high risk, 2=moderate risk, 3=low risk, 4=no risk or under control; NA=not applicable)	Major improvement needed	Is it critical in this farm (yes/no)
1 animal contact between age groups	prevent transmission of pathogens between age groups by animal contacts	strict separation between housing for different age groups (i.e. score 4=yes; score 1=no)			1	
2		no mixing between batches in the farrowing, weaning and fattening sectors (i.e. score 4=yes; score 1=no) ²		NA		
3 animal contact with contaminated premises	prevent transmission of pathogens between age groups by premises	SOP available for "ALL OUT" cleaning, disinfection and duration of the empty period (i.e. score 4=yes; score 1=no)			1	
4		cleaning and disinfection of corridors and transfer zones after any animal transfer to prevent contamination of animals (not relevant for the insemination/pregnancy sector) (i.e. score 4=yes; score 1=no) ²			1	
5 animal contact with contaminated staff	prevent transmission of pathogens between age groups by staff	one-way organisation of work from the most susceptible to the most infectious animals (or separate sectors and staff) (i.e. score 4=yes; score 1=no)			1	
6		change of clothes/overalls and footwear/overshoes between sectors for different age groups (i.e. score 4=yes; score 1=no)			1	
7		change of gloves or hand washing and disinfection after handling diseased animals (i.e. score 4=yes; score 1=no)			1	
8		training of staff on the biosecurity SOPs (i.e. score 4=yes; score 1=no)			1	
9 animal contact with contaminated materials	prevent transmission of pathogens between animals by materials and intervention	suitable manipulable materials for environmental enrichment according to Recommendation (EU) 2016/336. Take note of the type of material (e.g. whole straw, chopped straw, hard wood, soft wood, rope of natural fibre, metal chain), quantity in kg/pig/day and frequency of distribution (i.e. score 4=suitable; score 1=no)			1	
10		materials, movable equipment and tools specific to the different age groups (i.e. score 4=yes; score 1=no)			1	
11		cleaning and disinfection of materials, movable equipment and tools shared between sectors (i.e. score 4=yes; score 1=no)			1	
12		cleaning and disinfection of tools for interventions on piglets after birth in the farrowing sector (i.e. score 4=yes; score 1=no) ²		NA		
13		dedicated injection needles for each age group of pigs or for every 10 heads individually housed (i.e. newly pregnant sows) (i.e. score 4=yes; score 1=no)			1	
14 high load of pathogens	reduce risk of exposure to high loads of pathogens	regular cleaning of housing at all stages other than all in all out (i.e. score 4=yes; score 1=no)			1	
15		animal density of suckling, weaning, growing and fattening pigs, adapted to the weight of the pigs (see the "scoring instructions" and take note of the type of pen floor inside the pig house : totally slatted floor, partially slatted floor, totally solid floor) ²		NA		
16		management of diseased animals to reduce contact with healthy animals (availability of hospital pens) (i.e. score 4=yes; score 1=no)			1	
17		shower and parasite treatments of sows before entering the farrowing room (i.e. score 4=yes; score 1=no) ²		NA		
18 heterogeneous herd immunity	reduce at-risk situations due to heterogeneous herd immunity	management of gilts before introduction into the herd (contamination period in quarantine) ²		NA		
20		constitution of batches of sows. Weekly farrowing or multikweek farrowing (e.g. 3, 4 or 5 or more weeks?) (i.e. score 4=yes; score 1=no) ²		NA		
21		constitution of pens of weaners and fattening pigs (i.e. score 4=litter mix; score 1=no litter mix) ²		NA		
22		vaccination plan (and comparison between consecutive batches in the medium end long term)			1	
23		check access of piglets to colostrum in the farrowing sector (i.e. score 4=yes; score 1=no) ²		NA		
24 contaminated feed or water or enrichment material	prevent contaminated feed or water or enrichment material	origin and regular quality checks of feed (i.e. score 4=yes; score 1=no)			1	
		regular quality checks of drinking water (i.e. score 4= at least yearly of water sampled at drinkers; score 3=at least yearly of water sampled at source)			1	
25		conservation of feed including access of rodents (inclusion of the pig house in the rodent control plan) (i.e. score 4=yes; score 1=no)			1	
26		cleaning of water supply equipments (how and how often) (i.e. score 4=yes; score 1=no)			1	
27		regular cleaning and disinfection of waterpipes and reservoirs (i.e. score 4=yes; score 1=no)			1	
28		concentrate feeds are salmonella free (i.e. score 4=yes; score 1=no)			1	
29		storing materials (e.g. enrichment material like straw, wood) on farm for at least 3 months before using (i.e. score 4=yes; score 1=no)			1	
30		no use of food waste (i.e. score 4=no use; score 1=yes)			1	
			(higher score is less risk)	(max=120 for all applicable conditions. Otherwise max score is calculated in F36 = applicable points x 4)		
¹⁾ To be completed for each pig house on the farm			OVERALL BIOSECURITY SCORE GREEN ZONE:	22		
²⁾ write NA in column F for non applicable conditions			Maximum score	88		
			Percentage of maximum score:	25%		

Overall farm scores on biosecurity regarding the zones and transition lines between the zones

Final version 26 - 2 -2020 / PF-CRPA					
	FARM SCORES				
Zones and transition lines	% of maximum s	(higher % is less risk)			
RED ZONE	25%				
Transition line Red-Orange	25%				
ORANGE ZONE	25%				
Transition line Orange-Green	25%				
GREEN ZONE	25%				



Annex 3 - HL Protocol for technical and economic data on broiler farms

 <p>HealthyLivestock 健康畜禽</p>	<p>PROTOCOL FOR TECHNICAL AND ECONOMIC DATA ON BROILER FARMS</p>	
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QUESTIONNAIRE

1 . Date of interview:

2. Number of questionnaire

3. Interviewer

4. Municipality Province

In how many buildings do you house your broilers? n.

(for the questions 5, 6, 8, 9 and 10 please use for each building a corresponding table)

5. MOVEMENT OF BROILERS PER PRODUCTION CYCLE**BUILDING 1**

	<i>Purchase of chicks</i>				<i>Sales</i>								
<i>No. of cycle</i>	<i>Date of entry in cycle</i>	<i>Number of chicks</i>	<i>Initial average weight</i>	<i>Purchase price (VAT included)</i>	<i>Date of sale</i>	<i>Number of broilers sold</i>	<i>Average weight at sale</i>	<i>Sales price (VAT included)</i>	<i>Days of sanitary vacuum</i>	<i>Mortality rate</i>	<i>Feed Conversion Rate</i>	<i>Water system¹⁾</i>	<i>Feeding system¹⁾</i>
	<i>Day/month</i>		<i>gr/head</i>	<i>€/chick</i>	<i>d/m</i>		<i>gr/head</i>	<i>€/kg l.w.</i>	<i>Days</i>	<i>%</i>	<i>kg feed/kg l.w</i>		
1													
2													
3													
4													
5													
6													
7													

1) 1 = Automatic 2 = Manual

6. FEEDING OF BROILERS prices in Euro/ton, VAT included**BUILDING 1**

No. of cycle	Starter ton total/cycle	Purchase price €/t	Grower Feed ton total/cycle	Purchase price €/t	Finisher 1 ton total/cycle	Purchase price €/t	Finisher 2 ton total/cycle	Purchase price €/t	Withdrawal Feed ton total/cycle	Purchase price €/t ton total/cycle	Purchase price €/t ton total/cycle	Purchase price €/t
1														
2														
3														
4														
5														
6														
7														

7. LABOUR FORCE DEDICATED TO THE BROILER FARM

A. FAMILY LABOUR

Members:	Hours per week	Time of each person per week dedicated to broiler farm (0 – 100%)
Farmer	_____	_____ %
Member 1	_____	_____ %
Member 2	_____	_____ %
_____	_____	_____ %
_____	_____	_____ %
B. Employee 1	_____	_____ %
Employee 2	_____	_____ %
Employee 3	_____	_____ %
Employee 4	_____	_____ %

8. BUILDINGS

Building	Type of flooring	Type of structure	Size			Year of construction or last renewal	Capacity in terms of number of broilers	Type of bedding	Amount of bedding per building
	Code *)	Code **)	Length (m)	Width (m)	Surface **)			Code ***)	tons
1									
2									
3									
4									
5									
6									
7									

*) 1 = on soil 2 = in concrete

**) 1 = brick walls; 2 = concrete 3 = metal

***) 1 = wood shavings; 2 = Sawdust 3 = Chopped straw 4 = Rice bran

9. EQUIPMENT – Building 1

Type	Number	Capacity	Diameter
		kg	Centimeters
Circular feeders			
Circular drinkers			
			Length Meters
Linear feeders			
Linear drinkers			

10. MANURE MANAGEMENT AND OTHER EXPENSES – Building 1


No. of cycle	Water content of manure	Sales of manure	Costs of removal of bedding	Purchase of bedding material	Energy costs(gas, electricity etc.)	Water costs	Loading and catching of broilers	Veterinary costs	Cost of antibiotics	Other medicins	Other variable costs
	%	Euro	Euro	Euro	Euro	Euro	Euro	Euro	Euro	Euro	Euro
1											
2											
3											
4											
5											
6											
7											

11. HEALTH MANAGEMENT PLAN


Measures undertaken and costs of the measures, please provide a detailed description of the proposed interventions

Annex 4 - HL Protocol for technical and economic data on pig farms


Tab 0

 <p>HealthyLivestock 健康畜禽</p>			
Question	choice answer / [unit]	definition / hints	indicate answer
Country	[text]		
Date	[date]		
HL Farm ID	[text]		
Type of farm	1) Breeding farm 2) Finisher farm 3) Breeding-to-finishing farm	(breeder farms: piglets are born on the farm and sold at weight between 20-40 kg)	
Breed(s) present on farm	[text]	(e.g. Landrace, Large White, Duroc*Landrace)	
From how many sources (farms) you do buy in pigs?	[number]		
Total utilised farm land	[ha]	(grasslands, pastures and arable land used for production of food, feed, bio-energy and fibres)	
<i>of which land rented</i>	[ha]	(rented farm land)	
<i>of which land in ownership</i>	[ha]	(own farm land)	


Tab 1

 HealthyLivestock 健康畜禽					
Buildings					
	Housed in building:	Capacity	€/pig place only if different than default *)	Year of construction	<u>or</u> complete renewal
	1) Sows and gilts 2) Weaners 3) Growing-finishers	Number of pig places		[year]	[year]
building 1					
building 2					
building 3					
building 4					
building 5					
building 6					
building 7					
building 8					
building 9					
building 10					
building 11					
building 12					
*) <u>Default investment values</u> per pig place will be delivered for sow, weaner and finisher buildings together with their definition					


Tab 2

 HealthyLivestock 健康畜禽						
question	choice answer	Sows (all together)	Suckling piglets	Weaner	growing-finishing pigs (all together)	Replacement gilt
Inventory						
Number of pigs on 01.01.2018	[number]					
Number of pigs on 31.12.2018	[number]					
mean weight 01.01.2018	[mean kg/pig]					
mean weight 31.12.2018	[mean kg/pig]					
Purchased: Number	[total number]					
Purchased: weight/ head	[mean kg]					
Purchased: Price/ kg live weight	[mean €]					
Purchased: Price/ kg slaughter weight	[mean €]					
Purchased: Price/ head	[mean €]					
Sales: Number of animals	[total number]					
Sales: weight/ head	[mean kg]					
Sales: Price/ kg live weight	[mean €]					
Sales: Price/ head	[mean €]					
Prices are	1) without VAT 2) with VAT					
Slaughter						
Total number of pigs slaughtered on farm / in own slaughter house						
Total number of pigs sold for slaughter	[total n pigs]					
Carcass weight	[mean kg]					
Carcass weight is	1) live 2) dead					
Dead carcass weight is	1) hot 2) cold					
Price/ kg slaughter weight	[mean € / kg]					
Performance						
Litters born	[total number]					
Litters/ sow/ year	[number]					
Piglets born alive: total	[total number]					
Piglets born dead: total	[total number]					
Piglets weaned: total	[total number]					
Piglets born alive: per litter	[mean per litter]					
Piglets born dead: per litter	[mean per litter]					
Piglets weaned: per litter	[mean per litter]					
average daily gain (ADG)	[g/day]					
feed conversion ratio (FCR)	[kg feed/ kg growth]					
Losses (animals that died, not including culled)	[number]					

Tab 3

 HealthyLivestock 健康畜禽		
Labour		
	total working hours per average week	% of total hours dedicated to pig production
Family labour n.1		
Family labour n.2		
Family labour n.3		
Family labour n.4		
Family labour n.5		
Employee n.1		
Employee n.2		
Employee n.3		
Employee n.4		
Employee n.5		
Employee n.6		
Employee n.7		
Employee n.8		


Tab 4

			
Overall feed consumed in 2019 which was bought			
	home-grown feed	tons feed consumed	€ per ton (mean)
milk powder [1 ton = 1,000 kg]			
pre-starter [1 ton = 1,000 kg]			
starter [1 ton = 1,000 kg]			
Maize			
Soy			
Barley			
Wheat			
Feed1 *)			
Feed2 *)			
Feed3 *)			
Feed4 *)			
Feed5 *)			
Feed6 *)			
Feed7 *)			
Feed8 *)			
premix 1			
premix 2			
premix 3			
premix 4			
Straw (total straw incl. bedding)			
*) please select out of a list of 30 predefined feedstuffs			


Tab 5.1

 HealthyLivestock 健康畜禽		
Feed amounts fed per pig in 2019		
	1) Sows and gilts	kg per pig per day
milk powder		
pre-starter		
starter		
Maize		
Soy		
Barley		
Wheat		
Feed1 *)		
Feed2		
Feed3		
Feed4		
Feed5		
Feed6		
Feed7		
Feed8		
premix 1		
premix 2		
premix 3		
premix 4		
Straw (total straw incl. bedding)		
*) Please use the same feedstuffs listed in Tab3		


Tab 5.2

 HealthyLivestock 健康畜禽				
Feed amounts fed per pig in 2019				
	2) Weaners	kg per pig per day	from kg live weight	to kg live weight
milk powder				
pre-starter				
starter				
Maize				
Soy				
Barley				
Wheat				
Feed1 *)				
Feed2				
Feed3				
Feed4				
Feed5				
Feed6				
Feed7				
Feed8				
premix 1				
premix 2				
premix 3				
premix 4				
Straw (total straw incl. bedding)				
*) Please use the same feedstuffs listed in Tab4				

Tab 5.3

				
Feed amounts fed per pig in 2019				
	3) Finishers	kg per pig per day	from kg live weight	to kg live weight
milk powder				
pre-starter				
starter				
Maize				
Soy				
Barley				
Wheat				
Feed1				
Feed2				
Feed3				
Feed4				
Feed5				
Feed6				
Feed7				
premix 1				
premix 2				
premix 3				
premix 4				
Straw (total straw incl. bedding)				
*) Please use the same feedstuffs listed in Tab4				

Tab 6

					
Labour, energy costs, vet&med and other costs paid to external entities 2019					
	Total costs (€)	% used for pig production	% used for sows + pigs up	% used for finishing	Total (=D+E)
	(enter data as available)	(allocate as ratio of the value of the pig output compared to total farm output)			
PAID LABOUR COSTS					
Salaries paid to employees					100%
Social contributions (to national pension service): employees					100%
Social contributions (to national pension service): family					100%
ENERGY					
Gasoline / diesel					100%
Methane gas, natural gas and other types of gas					100%
Electricity					100%
VET AND MED COSTS					
Veterinary and medicine costs					100%
of which purchase of antibiotics					
Artificial insemination					100%
OTHER COSTS					
Water					100%
Disinfectants					100%
Local taxes					100%
Insurances					100%
Rights for spreading manure or other costs for disposing of					100%
Lease costs of production rights (If rights have been)					100%
Bedding material					100%
Straw					100%
Other enrichment material					100%
Cleaning material					100%
Phone costs					100%
Fees for associations					100%
Overhead and administration					100%

Health Plan

[illegible]

