MANUAL OF THE GOOD BREEDER

Guidelines for the care and management of animal welfare in beef cattle farms

UNIVERSITY OF MILAN

FCSR

ACKNOWLEDGMENTS

Now more than ever, Breeders, Universities and the Food Industry stand in solidarity and alliance in a common effort to make Italian agriculture even more sustainable and suitable for the needs of the consumer.
In the beef sector, our country has been able to build a virtuous model capable of combining farm productivity with the environmental and social needs of a modern animal husbandry that aims at becoming an integral part of the territories in which it is carried out and which can preserve all the typical peculiarities of the Italian landscape.

In this context, the continuous improvement of the welfare conditions of beef cattle must constitute the first pillar in farm management; therefore, the knowledge of the specific needs of these animals as well as their attitudinal, ethological and genetic characteristics becomes absolutely necessary.
This manual therefore represents a contribution of knowledge in this zootechnical sector and. above all. a concrete tool to better manage and evaluate the welfare of beef cattle in farms.

We would like to thank: the Lombardy Region, which financed the research; Prof. Carlo Angelo Sgoifo Rossi and Dr Riccardo Compiani of the Department of Veterinary Sciences for Health, Animal Production and Food Safety of the University of Milan who, together with Dr Alessandro Gastaldo and Dr Marzia Borciani of the Fondazione C.R.P.A. Studi Ricerche di Reggio Emilia [Animal Production Research Centre of the Reggio Emilia Research Studies Foundation], have provided the working methods and scientific knowledge supporting this study; the farms that have become available for the experimental tests in the field; and very special thanks to INALCA for assuring their commitment to disseminate and promote this indispensable tool in all farms within its supply chain.

CONTENTS

1.0 INTRODUCTION

Beef production in Italy is mainly based on the breeding of young animals of fine breeds with a specific aptitude for meat production.
In Italy, the calving farms are mainly located in the southern Apennine grazing areas, especially Sicily and Sardinia, while the breeding facilities are located above all in the northern Po Valley regions that can produce high nutritional value fodder necessary to enhance the genetic potential of these cattle breeds. The south of Italy is, in fact, a territory that has always been dedicated to the production of grazing calves, although it is not yet able to fully satisfy domestic consumption. The main risk factors of this type of breeding in terms of animal welfare are connected to the phases of collection and transport of young cattle, as the conditions are not optimal for the natural immune defences of the calf. The first commitment of the breeder is therefore to identify the suitable well-being conditions to allow the cattle to better overcome this delicate transfer circumstance.
In terms of animal welfare, the general conditions in which the bovine lived in the days prior to transport are particularly important. In this phase, the animals are generally transferred from the calving farms to collection centres where, in addition to any health prophylaxis, the selection is carried out in homogeneous groups.
In this phase, therefore, animals of different origins are mixed and exposed to potentially pathogenic microorganisms against which they may not be adequately protected. In addition to the mixture of different territorial origins, the transport phase represents the main risk factor for the health of stalls as it a potential promoter of stress and related metabolic alterations. As a consequence of these risk factors, at the time of arrival in the fattening farm, the batches of young cattle could present, more or less severely, transport fever and gastrointestinal tract functional deficit. These issues require immediate action to counteract the negative effects which, if poorly managed, could develop into bovine respiratory disease (BRD).
BRD is in fact the main risk in terms of health and welfare in beef cattle breeding. A problem that, due to the various factors that will be subsequently exposed, must be managed and controlled effectively in order to limit this disease's incidence and severity, while also safeguarding the overall profitability of the livestock enterprise. **As an infectious disease sustained by viral and bacterial microorganisms, BRD is the main health problem tackled by veterinary therapies, including both vaccinations and antibiotic therapy.** Although this production system uses individual injection treatments instead of mass oral antimicrobial preparations, **the reduction and responsible use of antibiotics remains a priority to be achieved systematically**, in line with the indications of the world health institutions aimed at countering the phenomenon of antibiotic resistance and consumer expectations.
The above assumptions constituted the foundations of the **"INALCA Protocol - Protocol based on high standards of animal welfare in breeding cattle for fattening"**, a project that places animal welfare within breeding management, funded by the Lombardy Region pursuant to Provision 16.2 of the PSR [Rural Development Program] 2014-2020 and coordinated by Inalca - Industria Alimentare Carni S.p.A., in collaboration with the University of Milan - Departments of Veterinary Sciences for Health, Animal Production and Food Safety (VESPA) and Veterinary Medicine (DiMeVet) - and the Animal Production Research Centre of the Reggio Emilia Research Studies Foundation. The aim of the project is to develop an innovative system for the assessment of critical business points that affect animal welfare, as well as identifying areas for improvement aimed at reducing health problems and the associated consumption of antibiotics.

2.0 GUIDELINES

The development of guidelines to optimise operational practices and animal health in beef cattle breeding and thus reduce the consumption of antibiotics starts from the existing bibliographic analysis of the risk factors for the typical health problems of the beef production system. This goes clearly hand in hand with the evaluation of the current legislative framework and the scientific opinions of the **EFSA** (European Food Safety Authority), the main and foremost European authority whose investigations and insights detail the various aspects of animal welfare.
As regards the adult bovine, there is currently no specific standard at European level and, to protect and verify the level of beef cattle welfare, we only refer to the scarce specific indications provided by Legislative Decree no. 146 of 26 March 2001, "Implementation of Directive 98/58/EC regarding the protection of animals on breeding farms", or the provisions of the *ClassyFarm* system for the assessment of welfare and biosecurity in beef cattle breeding, also based on regulations in force and on the probable indications that will be regulated with reference to **EFSA** opinions and other scientific studies.

By integrating the above with the good practices and the experience gained by the research team, **more than 70 risk factors have been identified that could potentially influence the health of beef cattle and the related use of antimicrobials.** These risk factors have been identified within **5 breeding areas and, specifically, in relation to the arrival phase, health management, facilities and cattle management, nutrition and biosecurity.** All risk factors broken down as per area of interest are reported in *Table 1*.

TABLE 1 - Health risk factors for beef cattle.

1 ARRIVAL PHASE	Characteristics of feedlot animals, i.e. weight, age, gender (uncastrated male, castrated male, female), genetics and temperament (breeds, late or early cross-breeds). Health status upon arrival (animals already suffering from BRD, lame or with traumatic injuries, deteriorated, etc.).
	Information relating to the management in the breeding farm of origin, i.e. vaccinations, previous pathologies and therapies, the sanitary conditions of the breeding farm of origin regarding **infectious bovine rhinotracheitis (IBR)** and **bovine viral diarrhoea (BVD)** and management of the weaning phase.
	Information relating to transport, i.e. the duration of the travel and possible unforeseen events, the climatic conditions during the travel, the weight loss at unloading and the time spent in the collection centres/markets.
	Unloading at the breeding farm, i.e. the methodology for evaluating the lot during unloading at the farm, group formation, arrival season of the feedlot animals at the breeding farm and health control methods in the first 5-7 days after unloading at the breeding farm.
2 HEALTH	Aspects relating to prophylaxis, i.e. the choice of the vaccination protocol (standard, targeted, complete, partial), pesticide treatments, prophylactic methods (blocking the animals or "on the fly"), the timing of prophylactic treatments and preventive antibiotic treatment for groups in the days after arrival.
	Aspects relating to therapeutic approaches, i.e. the methods of choosing the active substances for antibiotic therapy during the breeding, the methods for implementing therapeutic treatments and the use of anti-inflammatories and painkillers.
3 FACILITIES AND MANAGEMENT	Adaptation phase, i.e. the availability of a specific adaptation/**quarantine area,** the duration of the adaptation/ quarantine period, the type of housing, the density and number of animals per box, the space in the manger, the type of drinking trough, the number of animals served by a single drinking trough, the type of separator gates (blind or slotted), the type of ventilation (natural or forced) and its efficiency, the type and efficiency of lighting, the feedlot bedding hygiene, cleaning and disinfection before introducing new feedlot animals and the duration of the sanitary vacuum
	Infirmary, i.e. the availability of a structure used only to isolate sick or injured animals, the type of housing, the type and number of drinking troughs, the type of ventilation and its efficiency, cleaning and disinfection before introducing new animals and the rapid isolation of sick or injured animals.
	Fattening phase, i.e. the density and number of animals per box, the type of housing, the space in the manger, the surface type of the manger, the characteristics of the rack, the type, number and functionality of the drinking trough, type of separator gates, the ventilation type and efficiency, the lighting type and efficiency, the hygiene of the bedding or the housing environment in the boxes
4 FEEDING	General aspects, i.e. the **type of feeding** (Unifeed or separate fodder and concentrates), feed availability (ad libitum or rationed), the implementation of at least 3 diets for the different breeding stages (base, fattening, finishing), the accuracy and precision in diet implementation (diet balanced by an expert professional, recording quantities and mixing times) and the quality and safety of the feed.
	Adaptation and transition phase, i.e. the availability of forage upon arrival, a specific diet for the adaptation phase, specific integration (**pre-biotics, pro-biotics, vitamins, minerals, immunostimulants**, etc.) in the diet for the adaptation, the feed transition for passing from the adaptation phase to the subsequent phases.
	Fattening phase, i.e. the nutritional level of the diet, the possibility of feed selection by the animals and a specific addition to the diet for the fattening phase.
5 BIO-SECURITY	Area concerning the influence on animal health of **suitable biosecurity measures**, such as control plans for flies or rodents and procedures for the access of visitors/strangers (logbook, signs, physical barriers, disposable shoes and gowns, clothing left on the farm, changing room area, etc.).

The level of importance to each individual factor regarded as an aspect or condition that can most influence the health of beef cattle was attributed after consulting the main stakeholders of the supply chain, such as the breeders and veterinary surgeons who daily manage the animals in the breeding farm. The consultation, carried out electronically using a questionnaire, made it possible to statistically analyse the opinion of a sample of about 200 stakeholders evenly distributed as per their qualification. The analysis of the data has shown that the breeders are particularly concerned about the health of the animals, the characteristics of the feedlots and the procedures immediately following the unloading of animals at the farm. Veterinarians, on the other hand, have prioritised health procedures in general (prophylaxis and therapy) and the facilities hosting and managing the delicate adaptation phase. Both professional figures agreed that information on the breeding farm of origin, transport, infirmary management and nutrition is of great significance.

The 38 most important indicators as per the surveyed sample were analysed in depth and included in a checklist so as to identify the good operational practices regarding the management of animals and facilities. To complete the checklist attached to this manual, measurements and checks must be carried out in order to establish the degree of danger within the specific breeding farm regarding each related risk factor.

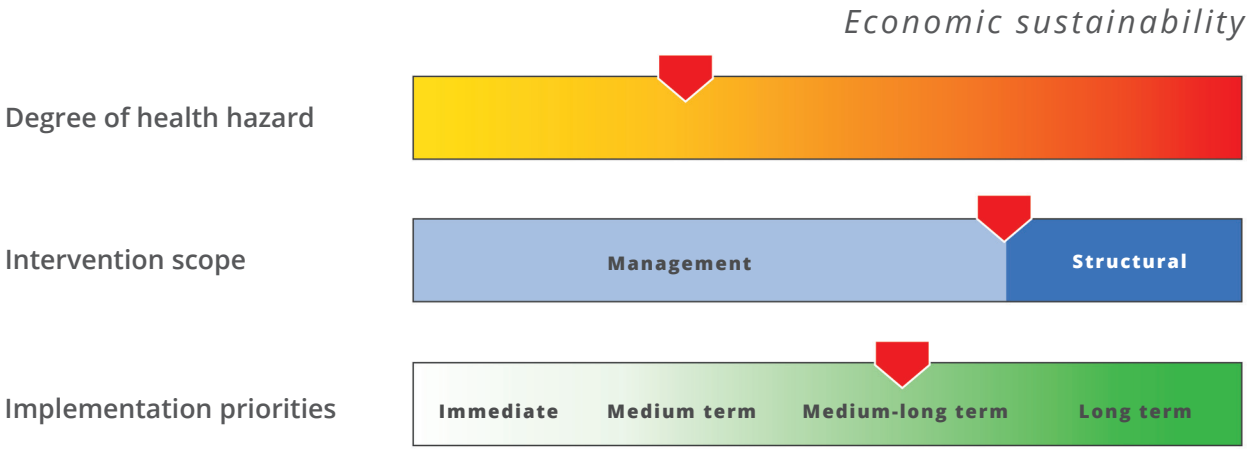
Once the checklist is filled out, the trained technician will carry out a report highlighting the critical points and areas for improvement of the breeding farm, and will also assess the cost associated with the proposed interventions to maximise the health of the animals and reduce the use of antimicrobials. Each risk factor included in the breeding farm assessment checklist will be detailed in the next chapter of this manual. Based on the associated danger, 5 thresholds are proposed for each aspect, situation or activity potentially capable of influencing the health of cattle on the breeding farm. The intuitive chromatic scale in *Figure 1* therefore facilitates consultation and study.

FIGURE 1 - Degree of danger of the possible conditions of each risk factor.

Each factor is described on the basis of the possible conditions characterising it, going from the most risky one, that is, capable of raising the incidence of health problems, to the optimal one which represents the best condition for breeding.

At the end of the discussion of each risk factor, the importance of the factor itself is graphically described in terms of the need for intervention, with high or low priority formulated according to its degree of economic sustainability *(Example in Figure 2)*.

FIGURE 2 - Example of graphic evaluation of the economic sustainability of the intervention on risk factors.



Below is the detailed description of each risk factor for the 5 AREAS OF INTEREST: **arrival phase, health, facilities and management, nutrition and biosecurity.**

3.1 ARRIVAL PHASE

The arrival phase represents the most critical moment of the entire production cycle of the fattening cattle. During this period, the risk of mortality and morbidity is extremely high. In fact, while young cattle are subjected to a series of inevitable stressful events such as transport, adaptation to new environments, new social interactions, contact with humans and different diets, they are also exposed to new and potentially harmful pathogens (*Sgoifo Rossi et al., 2013; Pinheiro et al., 2004, Assiè et al., 2009)*. Fortunately, the range of pathologies that a bovine may develop in the adaptation phase is not particularly wide, although the outcomes can, on the contrary, be highly damaging to the health and survival of the animals. The main health problem at this stage is bovine respiratory disease (**BRD**), a syndrome characterised by a very high contagiousness potential in farming conditions typical of the sector. In addition to representing an important health risk and a significant problem for the animal, stress and the high incidence of **BRD** in adaptation can generate a notable slowdown and decrease in the growth performance and body condition of the animals. This factor makes the adaptation phase even more critical. Considering that the foundations for the productivity of the entire cycle and for the maintenance of optimal health conditions during the entire productive life of the animal must be laid precisely from the first days of feedlot fattening, **this phase should contemplate all precautions and all good practices** aimed at limiting the stress and the incidence of pathological phenomena as much as possible. Facilities specifically dedicated to newly arrived cattle should be carefully designed, and equal attention should be paid to hygiene and management.

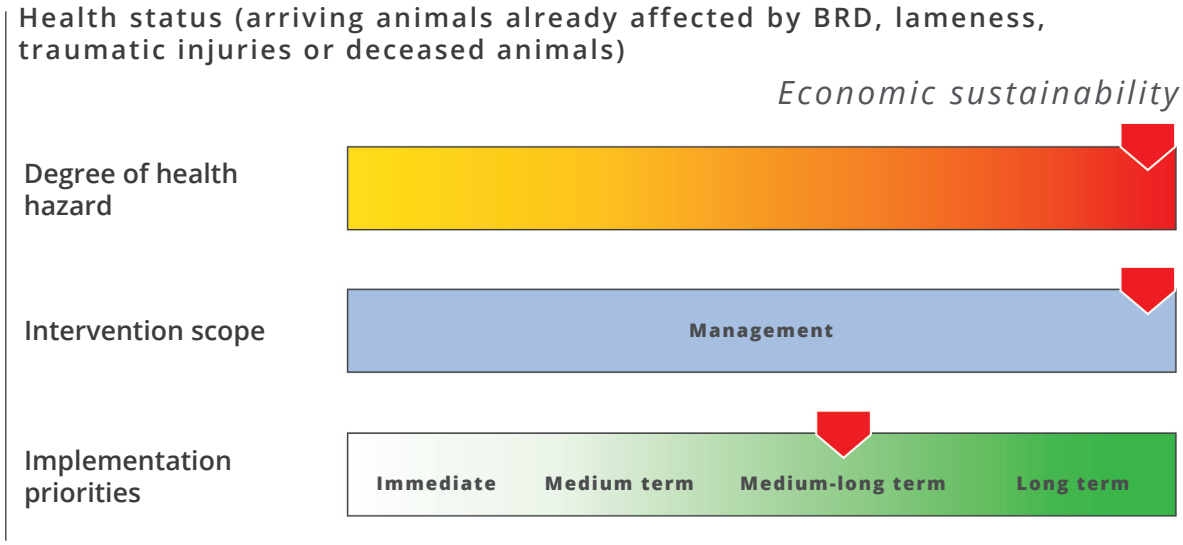
And last but not least, feeding is not to be overlooked. A correct nutritional management upon arrival and in the adaptation phase can help the rumen resume its full functionality.
In fact, a large number of factors that can potentially condition the health of animals are not always related to the facilities and management responsibility of the fattening breeder. The best guideline in terms of health treatments and lot management can be immediately determined by carefully evaluating the health conditions of the lot upon arrival, in conjunction with the knowledge about the breeding farm of origin (sanitary conditions, vaccination prophylaxis and treatments carried out) and the indications relating to transport (duration, season, time spent in collection centre).

3.1.1 CHARACTERISTICS OF THE FEEDLOT ANIMALS UPON ARRIVAL

The health status of the cattle upon arrival strongly depends on all the operations carried out in relation to the grouping and stay in the collection centres, transport, lot formation and unloading at the farm. Evaluating the health status at this stage is useful to obtain important information regarding the extent of stress to which the animals have been subjected, or how much the health of the animals has been compromised during transport, but also regarding the microbial circulation that has been established among the animals and the practices implemented in the breeding farms of origin and in the collection centres. Secondly, a careful and immediate assessment of the health status of the cattle upon arrival allows to establish the best health, managerial and nutritional strategies to be undertaken in the shortest possible time, aimed at fully resolving the problems present, and in order to maintain an adequate animal health and maximise production performance. **Among the characteristic problems of this phase, BRD is certainly the most impacting one due to the high morbidity rate (variable between 5 and 100% with an average of 20%)** *(Sgoifo Rossi et al., 2004)*. The situation of discomfort and stress generated by the operations connected to the transport, the feedlot formation, the unloading at the fattening farm and the adaptation to the new environment and management, contribute to increase said percentage *(Sgoifo Rossi et al., 2013 and 2014)*. The impact on production performance, not only in this phase but during the entire cycle, is also significant. Animals that suffered from BRD, especially in the early stages of breeding, even in successfully resolved cases, present lower growth rates during an relatively short production cycle. The negative effects of the lack of growth or even of the weight loss that characterise the period of illness and convalescence, can result in an increased reduction during the entire production cycle down to 200 grams per day (*Babcock et al., 2009; Bonfanti et al., 2013)*. The duration of the prolonged pathological state, and also the number of relapses, are directly proportional to the extent of the losses in terms of production performance. Acting promptly, therefore, makes it possible to significantly reduce the duration of the disease and to start treatment in its early stages, during which the probability of success is greater. Another health problem that can have a strong impact on the incidence and severity of health problems and on performance is lameness. The causes of lameness are actually multiple and generally concern the breeding phases following adaptation. However, some are still related to the adaptation phase and as a consequence of transport. Some examples may include changes in diet and housing environment – especially in terms of flooring – and increase in competitive behaviour, or trauma incurred during transfers. "Whatever the origin of the lameness, it is characterised by painful manifestations that can negatively affect all the main activities of a bovine, such as resting, movement, feed and water intake, or the expression of specific behavioural characteristics such as grooming or running away from dominant animals" *(ClassyFarm, Manual for the Assessment of Welfare and Biosecurity in Beef Cattle Breeding; verification item 35: Prevalence of lameness)*. **A situation is considered "normal" when the feedlot animals do not show evident impairments during the unloading phase at the fattening farm.** On the other hand, the situation that involves a greater future risk is the presence of several animals (about 10%) already suffering from BRD or lameness and/or deceased animals *(Table 2)*. A lower risk is instead associated with the reception of cattle that are visibly very healthy, reactive and without evident signs of post-transport fatigue.

Table 2 – CHARACTERISTICS OF THE FEEDLOT ANIMALS UPON ARRIVAL

Presence of several animals (~10%) with BRD or lameness and/or deceased animals	Minimal presence of animals with BRD or lameness and/or with traumatic injuries	No evidence of health impairment and non-deteriorated animals	Healthy lot	Very healthy appearance, reactive animals, absence of fatigue



3.1.2 MANAGEMENT IN BREEDING FARM OF ORIGIN

In addition to being particularly susceptible to various health problems as they are young with an underdeveloped immune system, as well as being moderately depressed by the stressful situations described, the feedlot cattle arrive in the fattening farms almost always without a case history. As per the Italian production reality, information about the health history and management prior to entry into fattening farms are most of the time inexistent or inaccurate and unreliable.

This makes the assessment of health risks even more complex, especially when it comes to BRD and the choice of the best prevention and treatment strategies against it. An animal that has not undergone any vaccination protocol, which has been weaned for a very short time, which has not undergone feed conditioning and which comes from a herd that is not free from **IBR** or **BVD** are certainly regarded as serious risk factors; however, all the above information, if transmitted, can allow the veterinary surgeon and the breeder to opt for specific actions in this regard.

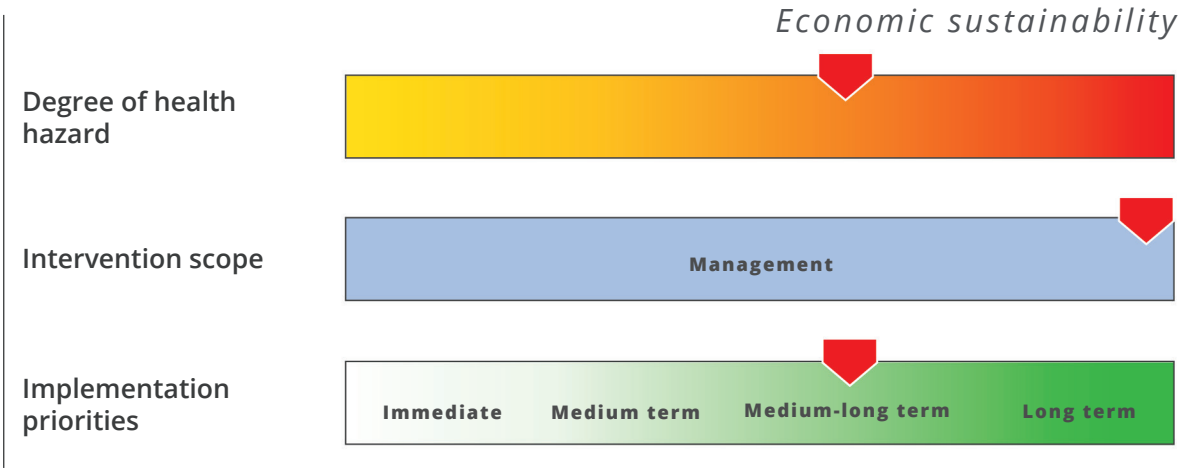
For this purpose, the acquisition and analysis of information regarding the management in the breeding farm of origin becomes of great importance in terms of vaccinations, therapies and case history of the diseases that occurred, in addition to the global sanitary conditions of the breeding farm of origin *(Sgoifo Rossi et al., 2013; Thomson, 2006)*.

3.1.2.1 Vaccinations

The absence of accompanying cattle lot information on the vaccinations administered poses a greater risk than having the certainty that no vaccination prophylaxis has been carried out. In relation to the type of vaccination protocol implemented in the breeding farm of origin, the risk tends to decrease *(Table 3)*.
A complete coverage against the main respiratory pathogens and against Clostridial diseases would represent the most protective condition of the cattle's health.

Table 3 – Vaccinations

No information	No vaccine prophylaxis	Prophylaxis for enterotoxaemia	Prophylaxis for enterotoxaemia and/or main respiratory viruses	Prophylaxis for enterotoxaemia and/or main respiratory viruses and bacteria

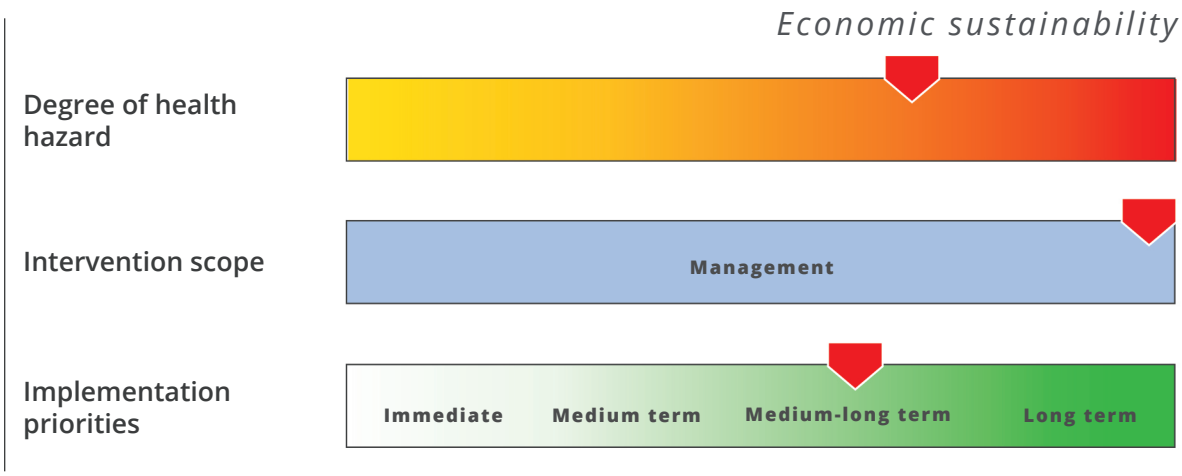


3.1.2.2 Pathologies and treatments

Therapeutic choices in fattening farms would be much more effective if we knew the possible pathologies previously suffered by each animal and the active ingredients used to treat these diseases. The total absence of related information is clearly a condition that increases the health risk for the feedlot cattle *(Table 4)*.

Table 4 – Pathologies and treatments.

No information	Vague information about the farm of origin	Case history of pathologies	Case history of the pathologies and active ingredients used	No health issues

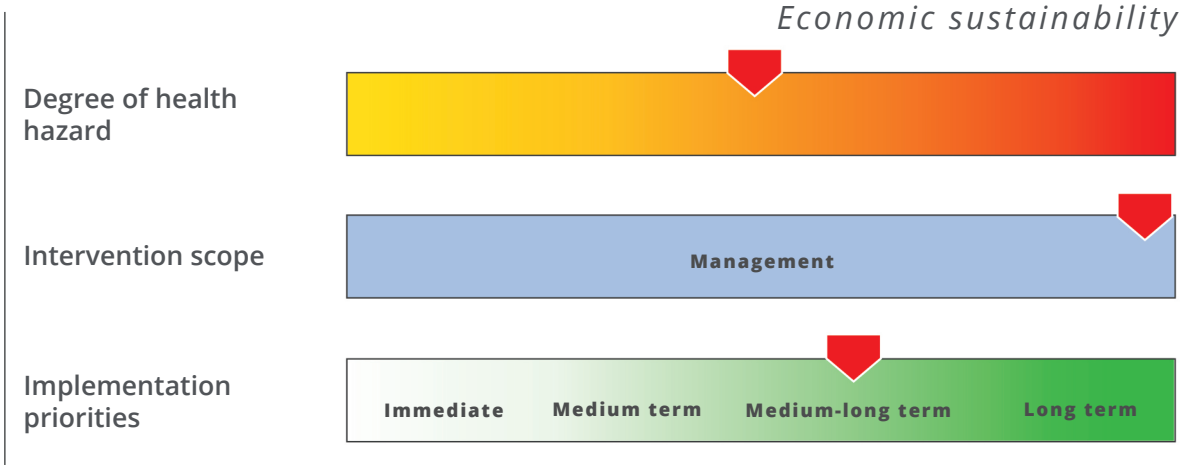


3.1.2.3 Sanitary conditions of the breeding farm of origin

As for the information relating to vaccination prophylaxis or to the treatments carried out in the breeding farms of origin, to also know the sanitary conditions of the suckler cow farms in relation to **IBR** and **BVD** would make management in fattening farms more effective by reducing the health risk of the lot *(Table 5)*. The certainty of receiving animals only from farms that are free from BVD, above all, guarantees the absence of persistently infected subjects within the re-stalled lots, i.e. responsible for the continuous spread in the environment of viruses capable of seriously compromising the immune defences of the animals with which they come into contact.

Table 5 – Sanitary conditions of the breeding farm of origin.

No information	Coming from a farm not free from IBR and BVD	Animal vaccinated for IBR and/or BVD	Coming from a farm free from BVD or IBR	Coming from a farm free from BVD and IBR



3.1.3 TRANSPORT

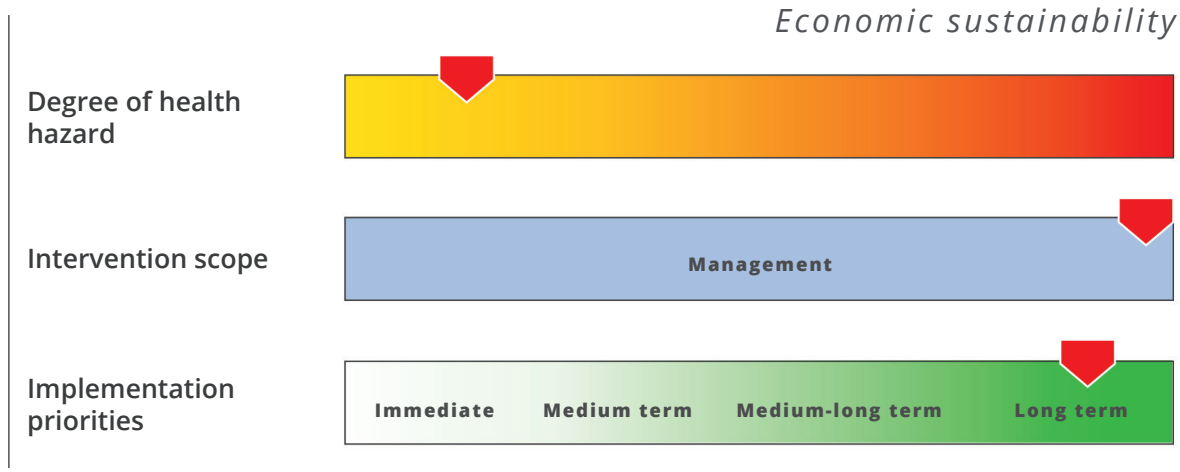
Obtaining information regarding the transport, in terms of duration, climatic conditions in which it took place and also regarding the length of stay in the collection centres, allow us to better evaluate various factors. First, it is better to establish the real impact that these operations have had on animal health. Secondly, by evaluating the risk posed to the animals, it is possible to establish the best management plans to be applied for each lot in terms of prophylaxis and health protocols, duration of the adaptation phase and also in terms of feed management.

3.1.3.1 *Travel duration and unforeseen events*

The current regulatory framework relating to animal transport reports the following:
"The travel time of animals of the species referred to in point 1.1 (*ed. Registered Equidae and domestic animals of the bovine, ovine, caprine or porcine species*) must not exceed 8 hours" *(REGULATION (EC) No. 1/2005 of the Council of 22 December 2004 on the protection of animals during transport and related operations, amending Directives 64/432/EEC and 93/119/EC and Regulation (EC) no. 1255/97. (OJEU L 5 of 5.1.200) Annex 1, Chapter V)*. The duration may be increased if certain additional provisions are respected, mainly regarding means of transport, such as thermal insulation of the roof and the presence of adequate bedding, for up to 14 hours. After that time, animals must be kept **"all other animals of the species referred to in 1.1 must, after fourteen hours of travel, have had a rest of at least one hour, notably enough to be watered and, if necessary, fed. After this rest period, the animals can resume the travel for another fourteen hours"** *(REGULATION (EC) No. 1/2005 of the Council of 22 December 2004 on the protection of animals during transport and related operations, amending Directives 64/432/EEC and 93/119/EC and Regulation (EC) no. 1255/97. (OJEU L 5 of 5.1.200) Annex 1, Chapter V).*
As the transport duration increases, there is a parallel increase in the level of stress related to it. Extending the duration of transport increases the lapse of feed and water restriction. In fact, even if water is always available on the means of transport, the registered consumption indicates that the animals during transport basically do not drink. **A 48-hour water and feed restriction can reduce the rumen fermentation capacity by up to 75% and after 5 days of full feeding the intake is still lower than the values recorded before the restriction.** In fact, in these situations the rumen undergoes a situation of alimentary instability which causes a reduction of volume, frequency and duration of ruminal contractions, less motility and turnover and also microflora alterations *(Fluharty et al., 1996; Loerch and Fluharty, 1999)*. The travel duration also negatively and heavily affects the immune function: in this case, there is an increase in the production of stress hormones, such as cortisol, which has an exhausting impact on the immune defences of animals. In fact, stress causes an increase in the production of epinephrine and norepinephrine, which leads to an increase in the secretion of glucocorticoids, hormonal factors capable of negatively influencing the immune response. It is believed that **a shorter transport time can safeguard the health condition of the cattle;** an acceptable travel time would last about 12 hours *(Table 6)*. The health risk for a lot whose transport lasts more than 48 hours, due to distance or unforeseen events, very negatively affects the health of the animals and makes the management of the arrival and adaptation phase more complex.

Table 6 – Travel duration and unforeseen events

> 48 hours and/or unforeseen events during transport	24 - 48 hours	12 - 24 hours	12 hours	< 8 hours



3.1.3.2 Season and climatic conditions during travel and adaptation

The arrival season and the climatic conditions are 2 conditioning for the risk of **BRD** partially correlated with each other *(Tables 7 and 8)*. Generally, the end of autumn and winter are periods in which the local defences of the airways of young cattle are less reactive to the action of **pathogens responsible for BRD** due to the cold temperatures and the high level of humidity *(Ackermann et al., 2010)*. An optimal scenario would be when the transport takes place **in situations of mild climate and in the absence of precipitation.** Climatic conditions are not always directly related to the placement season. If the transport takes place during a period of exceptionally intense rainfall **"out of season",** this is a factor to be taken into account in the risk assessment. The arrival season is not only an important factor for climatic issues, but also because it is connected with different types of feedlot animals. The animals coming from the pastures in the summer/autumn periods or instead from the stables in the winter are characterised by different nutritional management and by a variable potential exposure to pathogens.

Table 7 – Climatic conditions during transport

Hot humid climate or snow/precipitation	Intense cold climate	Hot dry climate	Moderate cold dry climate	Mild climate

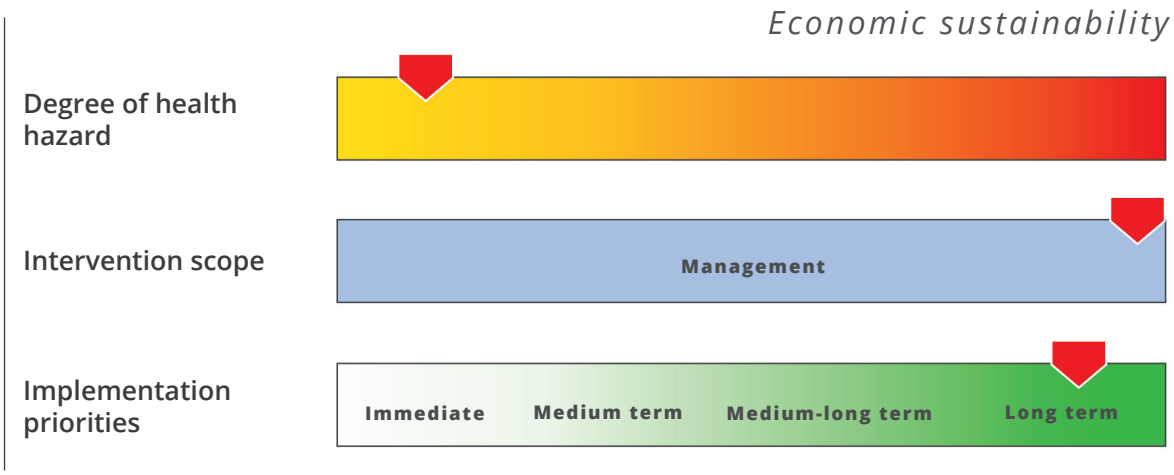
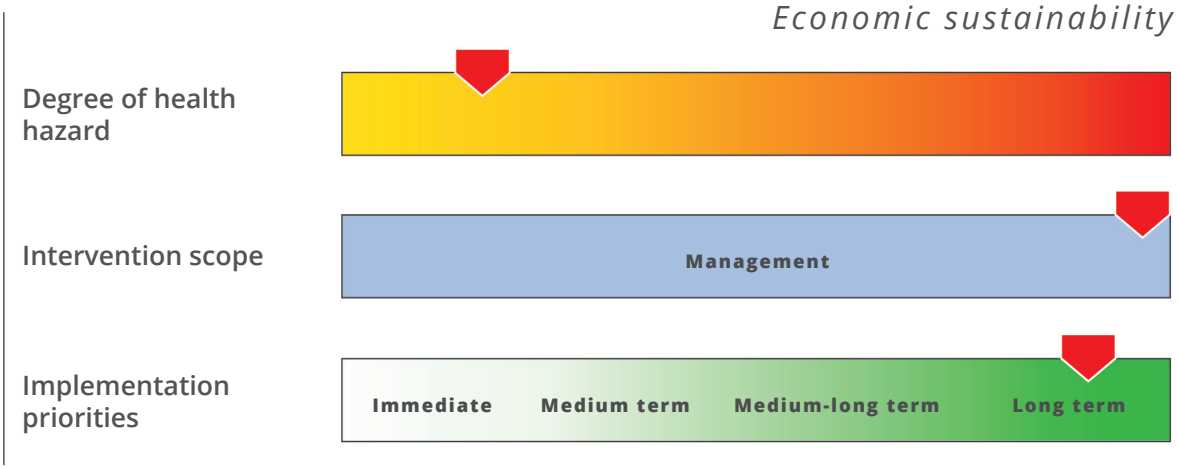


Table 8 – Arrival season

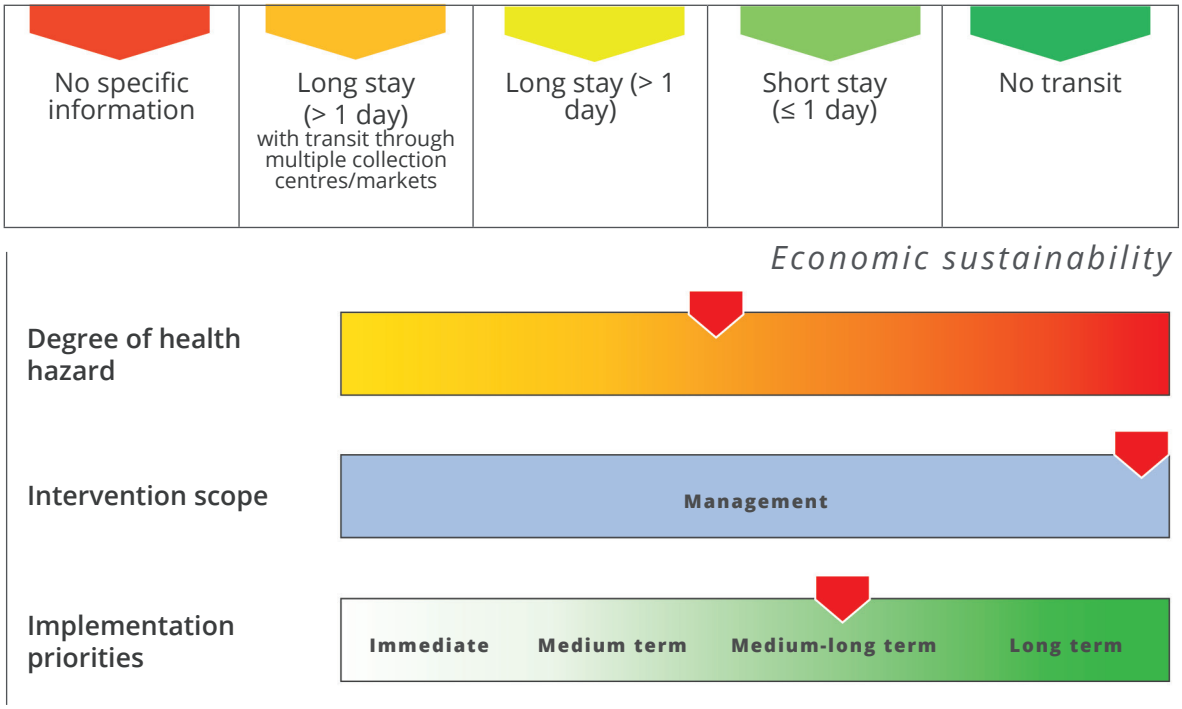
Winter	Late autumn	Spring	Early autumn	Summer



3.1.3.3 Stay in collection centres/markets

The transport time and the time spent in the collection centres represent a critical moment in terms of health. These are centres where the turnover and passage of animals is continuous, where animals coming from different realities and lots are mixed, with different pathogens. Furthermore, the animals arrive here after having already undergone a first stress, due to the grouping in the farms of origin and during the first transport.
Their immune defences may already be compromised. In addition to this, and apart from the remixing, formation of new groups and manipulations by the workers, they come into contact with multiple different pathogens at a time when their immune system is less reactive. For these reasons, although the collection centres must comply with the provisions set out by Regulation EC 1/2005 in terms of operational practices and animal health management, the stay in these places should be as short as possible or none at all, but still noted. Indeed, the absence of such information represents the worst condition and limits the management possibilities in fattening farms *(Table 9)*.

Table 9 – Stay in collection centres/markets



3.1.4 UNLOADING AT BREEDING FARM

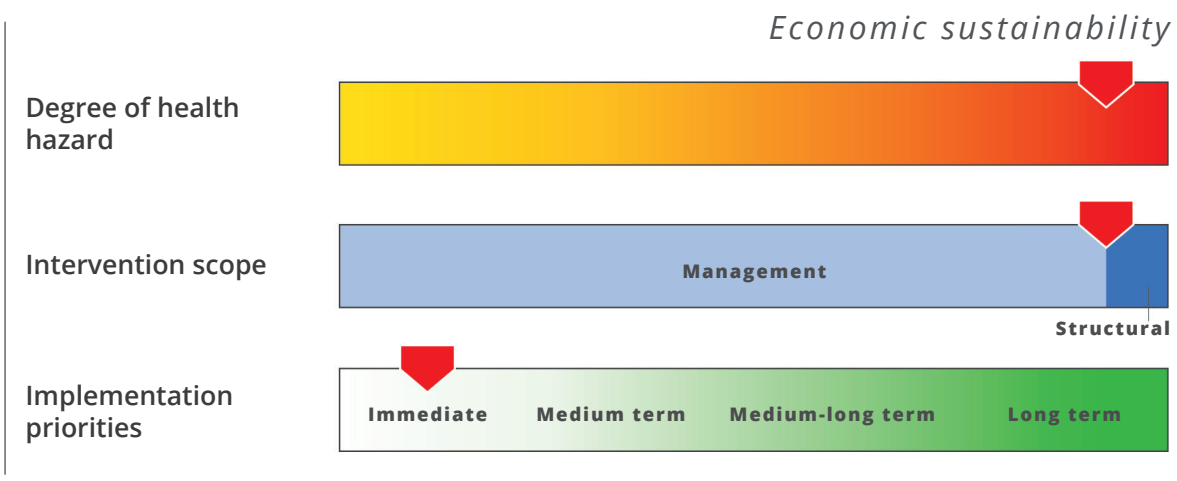
At the time of unloading, if all the operations are carried out correctly and if the breeding farm is equipped with facilities to facilitate the handling and inspection of the animals, the lot can be quickly checked to assess the physical and health condition of the animals. In this way, an initial assessment can be made of any specific management and health practices in relation to the conditions of the animals in the lot. Timeliness is essential in identifying sick animals and deciding on the therapies and prophylaxis.

3.1.4.1 Health control procedures in the first 5-7 days after unloading at breeding farm

In this regard, **the control of animals during the first 5-7 days after unloading must be as thorough as possible** in order to quickly and early identify all the animals that show clinical signs of pathology, even at an early stage. If early actions are taken, in fact, the chances of success and quick recovery of the animal are maximised to the advantage of both health status and productivity.
Therefore, it is a good idea to check the animals that have just arrived and are in the adaptation phase more frequently than animals in the fattening phase. Along with a greater control, monitoring the rectal temperature for a few days after arrival would also allow to identify those animals with not yet visible symptoms of respiratory disease (*oculo-nasal discharge, cough and dyspnoea*), but which still show a fever rise indicative of an ongoing pathology. These animals will then be monitored and treated early, ensuring a greater chance of treatment success *(Sgoifo Rossi et al., 2013)*.
Checking health status of the animals during the first days after arrival inside the boxes at least **twice a day** is believed to be the optimal condition for limiting the typical health problems of this phase *(Table 10)*.

Table 10 – Health control procedures in the first 5-7 days after unloading at breeding farm

Control ≤1 time a day and/or from outside the boxes	Control once a day from inside the boxes	Control 2 times a day	Control > 2 times a day	Inspection control ≥ 2 times a day and/or individual daily temperature measurement



3.2 HEALTH

A correct planning and implementation of conditioning and therapeutic health protocols, allows to greatly improve the health level of feedlot animals. The prevention of diseases and their effective resolution are the main objectives to be pursued.

3.2.1 PROPHYLAXIS

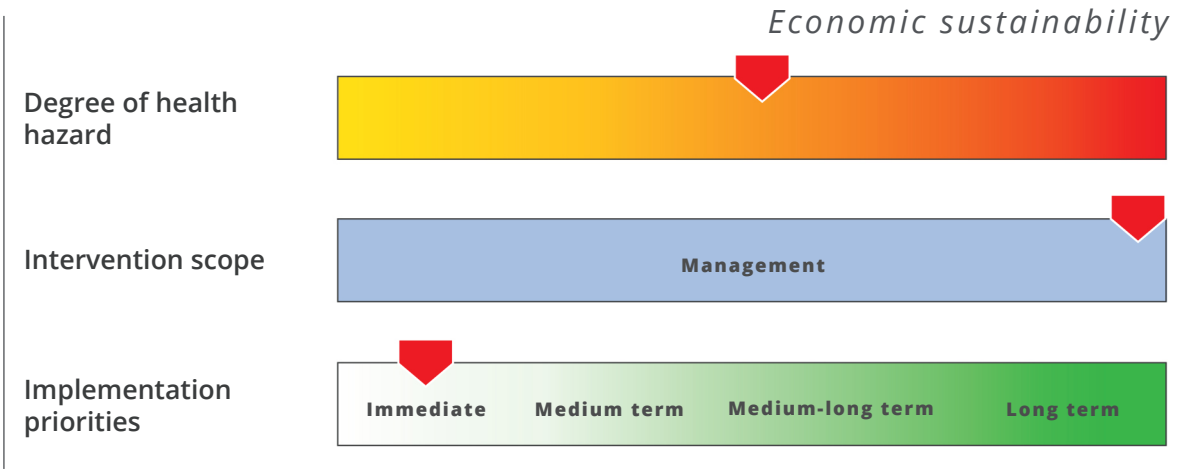
The conditioning procedures, i.e. vaccinations and antiparasitic treatments, play a key role in the prevention of the main pathologies typical of the adaptation phase. The choice of protocols, timing and administration routes must be made with extreme care, and preferably, assessed according to the conditions of the single lot.

3.2.1.1 Choice of vaccination protocol

It is therefore believed that the least risky condition is that in which a polyvalent and antibacterial antiviral protocol is implemented, based on the animals and the season and with relative reference. Always implementing a standard protocol turns out to be an acceptable practice as long as a complete coverage against viruses and bacteria is ensured. The best working method also involves frequent monitoring of circulating pathogens and their sensitivity to antimicrobials.

Table 11 – Choice of vaccination protocol

Incomplete protocol	Full standard protocol (virus)	Full standard protocol (virus + bacteria)	Full protocol (virus + bacteria) based on the risk of the lot	Full protocol (viruses + bacteria) based on the isolation of pathogens



3.2.1.2 Timing of prophylactic vaccination treatments

The timing of the prophylactic treatments should be weighted according to the conditions of the lot. Vaccinating directly upon arrival is considered to be potentially risky if the animals are in poor health conditions *(Table 12)*. On the other hand, to carry out these procedures with timing and methods depending on the health conditions of the animals is considered a risk-limiting factor *(Sgoifo Rossi et al., 2013)*. As a method, we intend to evaluate the benefits of intra-nasal vaccination in higher risk cases, in order to quickly promote the local immune reaction of the respiratory tract *(Plummer et al., 2004)*.

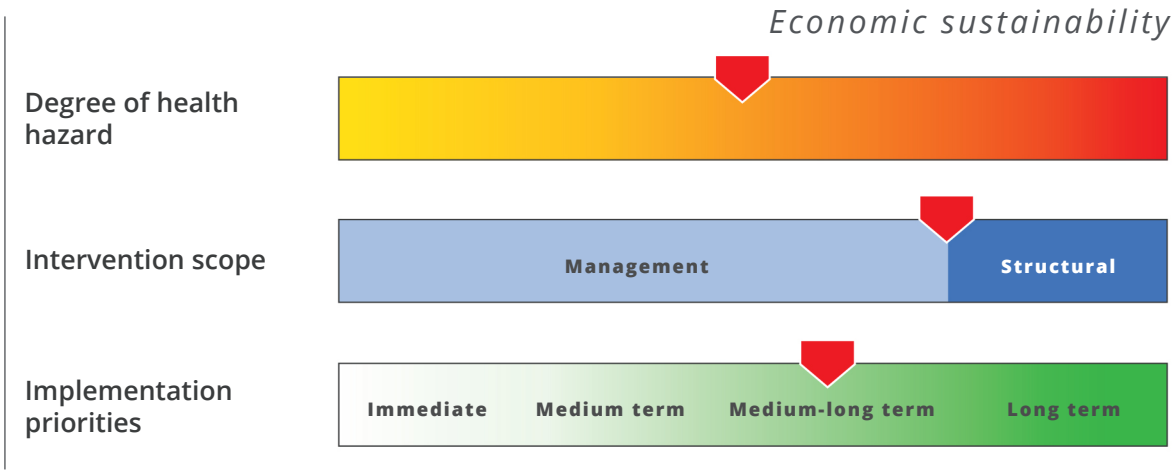
In relation to parasitic problems, a good practice would be to implement a protocol for endo and ectoparasites that is also targeted and based on objective data *(analysis)* characterising the breed, the origin, the weight, the season. Alongside the pharmacological treatment, back shearing is highly recommended, associated with periodic treatments against ectoparasites.

Table 12 – Timing for carrying out prophylactic treatments

At the time of unloading regardless of the condition of the animals	At the time of unloading	One or two days after unloading	With timing depending on the conditions of the animals*	With timing and methods** depending on the conditions of the animals

*postponing the vaccination in case of impaired health status.

**intra-nasal administration in addition to the classic parenteral route.



3.2.1.3 *Antibiotic treatment*

Currently, the "antibiotics" topic is extremely critical. In order to reduce and contrast the phenomenon of antibiotic resistance as per the European guidelines, it is necessary to significantly reduce the consumption of antibiotics in animal husbandry. However, as long as optimal animal health and farm productivity are pursued among the objectives of the breeding system, their use should not be demonised. If well used, preventive treatments are fundamental resources capable of raising production standards and health levels on the farm: the use of a correct metaphylactic protocol, where required, is able to strongly limit the impact of **BRD** and the main pathologies characteristic of beef cattle and especially of the arrival phase (*Galmozzi et al., 2009; Nickell et al., 2010; Fucci et al., 2012*). However, this is precisely the key point to consider, which makes it possible to combine the fight against antibiotic resistance with the farm needs: planning the protocol of preventive treatments for each individual lot, based on the health history of the animals, the health status upon arrival and the health risk to which they were exposed during the trip instead of always implementing the same routine protocol. Therefore, **the type of active ingredients chosen**, the timing of administration and the route of administration must be adapted each time. The routine treatment of all animals on arrival with a standard protocol, even without the signs of overt pathology, is considered a practice to be avoided.
However, the total absence of preventive treatments and the sole treatment of symptomatic cases are risky practices if carried out in the absence of other elements of clinical and epidemiological evaluation. Instead, a strong reduction in risk is achieved by associating the single treatment of each sick animal with a timely and specific protocol of metaphylaxis with long-lasting drugs, if the morbidity in the group reaches 10% (*Nickell et al., 2010*), always following the guidelines recently listed in the choice of the antimicrobial.

3.2.2 THERAPY

As explained in the previous chapter, the choice of the correct therapeutic approach, as well as the correct vaccine prophylaxis plan, also plays a key role in the success of the treatment and in the full recovery after the disease.

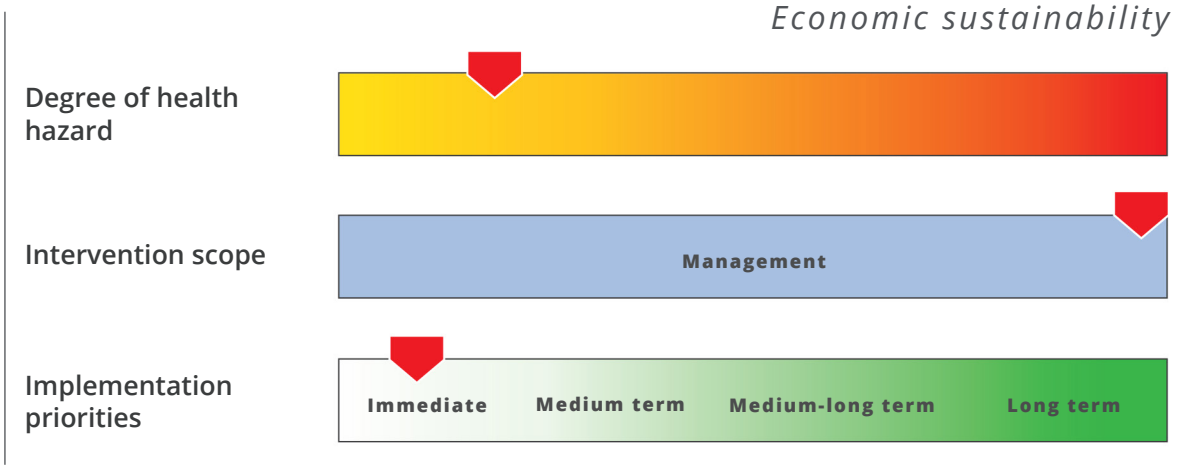
In this sense, the investigation of the reasons that lead to the choice of the active ingredients used in the farm will be regarded as particularly important.

3.2.2.1 Method for choosing the antibiotic active ingredients

As highlighted for health prophylaxis, the use of an active ingredient rather than another should be modulated on the specific case, on the basis of the detection of specific clinical signs by the veterinary surgeon or even on the basis of microbiological investigations concerning the type of pathogens involved and their sensitivity to antibiotics.
Choices based solely on the cheapness of the product, or on the duration of the suspension time and the number of administrations, often do not turn out to be successful: the cases of relapse increase and so do the cases of failure to fully recover, with evident negative effects on the health condition and also on performance.
Also, establishing standard protocols for each pathology and then using them for each individual case is not the optimal action plan, although it guarantees a certain chance of success.
Each case should be evaluated individually and, after a correct history, treated with the most specific active ingredient.
In this sense, the situation in which the choice of the active ingredient will be made on the basis of the results of microbiological investigations, aimed at evaluating the type of pathogens present and also their sensitivity to antibiotics, will be considered optimal in this protocol. The most protective situation for animal health is the choice of the active molecule on the basis of the veterinary surgeon's response or on the basis of epidemiological studies. The risk is, on average, higher if the choices are made based on practical aspects such as the number of administrations necessary or based on the suspension time *(Table 13)*.

Table 13 – Method for choosing the antibiotic active ingredients

Based on suspension times and/or cost	Based on the number of administrations (single or for several days)	According to standard protocols	Based on the veterinary surgeon's decisions or on epidemiological studies	Based on the isolation of pathogens and their sensitivity



3.2.2.2 Use of anti-inflammatory/painkiller

As part of the investigation regarding the type of therapy implemented, the use of painkillers and anti-inflammatories is also evaluated. The use of the anti-inflammatory in association with the antibiotic is in fact a procedure that enhances the therapeutic success and speeds up the recovery of the affected animal. Non-steroidal anti-inflammatories, in fact, have multiple mechanisms of action. The antipyretic effect, which is expressed by reducing the hyperthermia associated with the infection, promotes appetite and feed intake. Furthermore, as they act as painkillers, they constitute a therapy that is very much in line with the protection of animal welfare.

Lastly, recent scientific studies have shown that, in the event of an early detection of the fever associated with respiratory problems typical of beef cattle, the administration of the anti-inflammatory alone succeeded in healing a significant number of animals without requiring the administration of the antibiotic *(Thesing et al., 2016; Remnant et al., 2017)*.

3.3 FACILITIES AND MANAGEMENT

Livestock facilities and equipment, if unsuitable, represent a real risk to animal health. Therefore, an analysis of the adequacy of the premises and equipment with which the animals come into contact cannot be excluded from the evaluation criteria.
First, housing systems must allow reared cattle to correctly express their natural behavioural pattern. For example, **the number of animals present in each box must be such as to guarantee the correct freedom of movement for each animal and also the availability of adequate space for rest.**
The housing systems used also have a significant impact on the health status of the animals reared and on the effectiveness of the control and resolution strategies for any health problems implemented on the farm. In this sense, it is fundamental that there are specific supplementary structures for the management of both the most critical breeding phases, such as adaptation, and of the animals that require particular individual care.

For this reason, great attention must be paid to the evaluation of specific structures for the adaptation phase and for the sickbay.
Indeed, it is important that farms are equipped with them and that their structural characteristics are correct.
In addition, **the air quality and the ventilation intensity have a significant influence on the circulation of pathogens and on health status of the animals bred.**

Although the structural characteristics of a farm may seem more important in terms of effects on the health conditions of the animals, there are also some aspects related to the management of the structures themselves, such as **the level of hygiene and cleanliness, which are of considerable impact.**
This chapter examines in depth the main structural and managerial aspects considered critical for the health and **comfort of the animals,** which must be specially taken into account in order to continuously improve the breeding conditions.

3.3.1 GENERAL ASPECTS

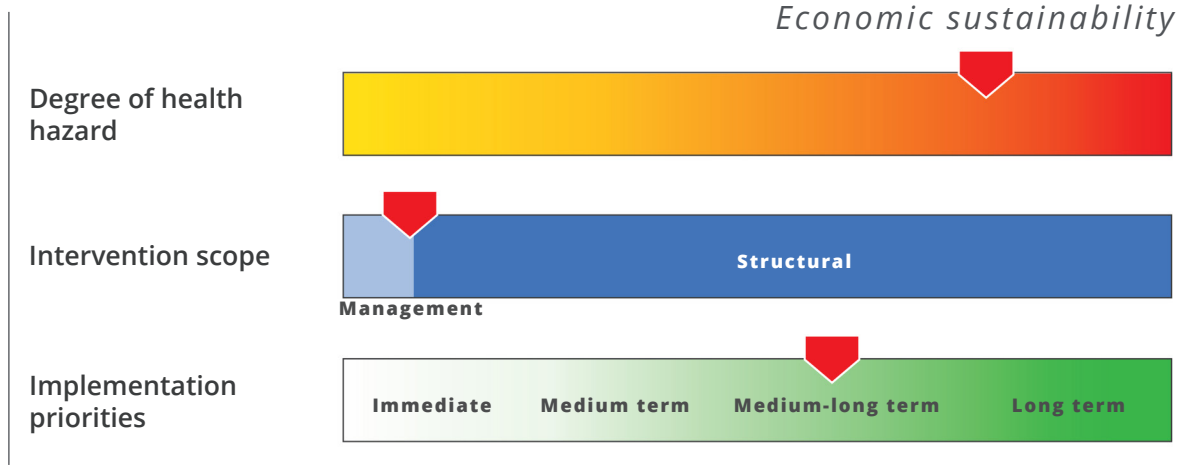
3.3.1.1 Number of animals per box

The breeding of beef cattle in small group boxes is the best solution: in this way, in fact, cattle, gregarious animals by nature, can weave social relationships and create their characteristic hierarchical social structure, developing different forms of communication: visual, tactile, and even olfactory (*EC Draft 8/09, Preamble, Biological characteristics of cattle, point c.*). "Bulls should be kept in groups, except when the herd is too small, or in case separation required due to disease, injury or competition" (*EC Draft 8/09 appendix B, point 5*).
Therefore, if breeding in multiple boxes is to be considered as an improvement, the management of the group can have considerable repercussions on the health of the animals. The groups must be as homogeneous as possible in terms of sex, age, weight and physical structure. In fact, the mixture of animals of different age, sex, weight and physical structure, as well as the continuous remixing of the groups, lead to an increase in competitive phenomena and social conflicts, as well as a to possible increase in the transmission of pathogens among animals of different ages which have different immune responses. "Older, more aggressive animals can cause continued severe

injury and stress to lower-ranking cattle. Young and small animals are more prone to diseases if kept with cattle of greater age and size. If raised with sexually mature bulls, young heifers can be chased and become pregnant" (*EFSA Journal 2012; 10(5):2669; 3.5.4. Grouping of Animals; Conclusion 1*). **"The groups should consist of animals of similar age, weight, and gender"** (*EFSA Journal 2012; 10(5):2669;* 3.5.4. *Grouping of Animals; Recommendation 1-2*). In addition to the characteristics of the animals, their number is also decisive. It is difficult to assess the optimal number of animals per box. "Little specific information is available on how large a group of animals can be. However, it seems that the size of a group should be limited to 40 animals. Above this limit, animals may have problems maintaining a stable social structure, exhibiting fighting behaviour more frequently" (*SCAHAW, 2001; Recommendation 18, Section D*). "The maximum number of animals per group should be 40 animals" (*CE Draft 8/09 appendix B, point 5*). In line with the *ClassyFarm* system, at national level, in the "Manual for the Assessment of Welfare and Biosecurity in Beef Cattle Breeding", each group should be **formed by less than 20 animals.**
It has been highlighted that, in larger groups, fighting behaviours and competition are more frequent. Indeed, it is more difficult for cattle to maintain a stable social structure. The choice of forming smaller groups will be positively evaluated, while larger groups will be penalised *(Table 14)*. Obviously, each evaluation will be carried out also taking into account the dimensions of the box, and, consequently, the space available for each animal.

Table 14 – Average number of animals per box

> 30 animals per group	20 to 30 animals per group	10 to 20 animals per group	5 to 10 animals per group	< 5 animals per group



3.3.1.2 Animal density inside the boxes

"A high density of animals can contribute to increasing the occurrence of injuries and have a negative effect on the growth rate, the feed processing index and some behaviours, such as movement, rest and water and feed intake" *(OIE 2017 - Terrestrial Animal Health Code - Version 7 - Chapter 7.9. - Animal Welfare and beef cattle production systems - Article 7.9.5 - point 2) Environment - part h).*

"Cattle, whether they are raised in extensive or intensive systems, should always be offered an adequate space for well-being and socialisation" *(OIE 2017 - Terrestrial Animal Health Code - Version 7 - Chapter 7.9. - Animal Welfare and beef cattle production systems - Article 7.9.5 - point 3) Management - part i).*

The density of the animals inside the box is an extremely important parameter in terms of the health and comfort of the animals on the farm. High densities are not only responsible for various alterations in some important natural behaviours, such as movement, rest times and the decubitus position, but also interfere with water and feed intake, leading to an overall decrease in production performance, as well as raising the susceptibility to health problems. Also, the spread of pathogens and the incidence of injuries and **competitive** behaviours increase with a bigger density of animals in the box. It is therefore essential, both with in order to maintain high standards of animal health and for the sake of corporate productivity, to keep the animal density reduced within the box.

The evaluation of the animal density inside the boxes is connected to the need of guaranteeing a correct space for each animal, which allows all the animals to lie down at the same time, to be able to move freely, to have access to the feeding area and to get up and rest normally. **"Animals should have adequate areas available to limit health problems and not be disturbed while lying down. Increasing the space available for decubitus has proven to improve animal**

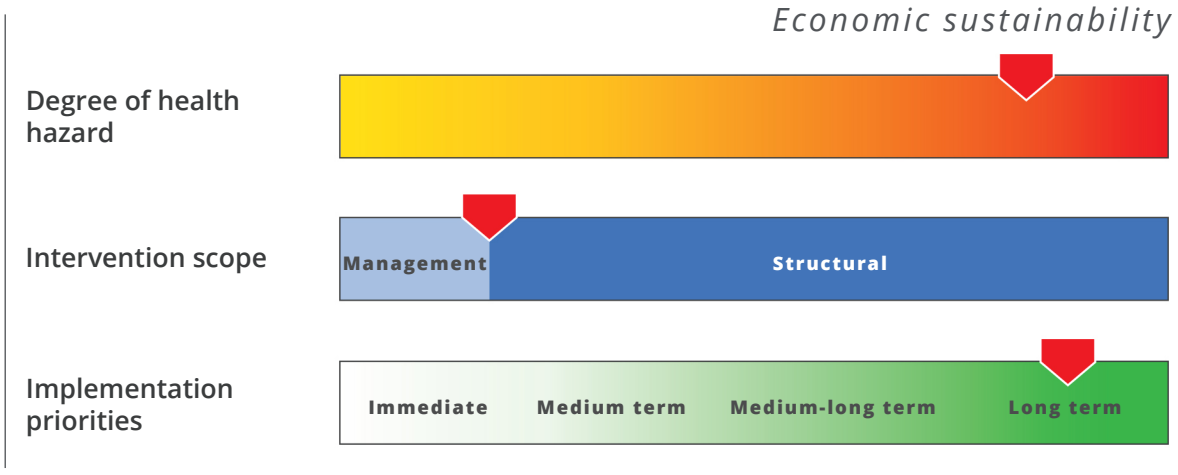
welfare. For animals weighing 500 kg, this improvement is evident when applied to high animal density situations (*1.5-3 m² per animal*), while there is not much information for cases of more than 4 m²/animal. The minimum space available should be 3m² for an animal up to 500 kg of live weight, mor or less 0.5 m² per every 100 kg of weight" *(SCAHAW, 2001; Recommendation 6; Section B Housing).*

"The space available for each animal housed in the group should be calculated based on the overall environment, the behavioural needs of the animals, age, sex, live weight, breed or physiological condition, taking into account the size of the group and whether there are animals with horns. This space should at least allow all cattle to lie down at the same time, rest and stand up normally, turn around and walk freely." *(EC draft 8/09 article 11, point 1).*

When **calculating** the **density of animals per box** the following factors must therefore be considered at the time of the evaluation: **the number and weight of the animals and the size of the box** *(Table 15)*. This calculation is based on that reported in the provisional document which is hypothesised to be the future animal welfare legislation for the adult bovine animal: **"For cattle for fatted animals kept in groups there should be at least 2.5 m² per animal of 400 kg and additional 0.5 m² every 100 kg of live weight, up to 800 kg"** *(CE Draft 8/09 appendix B, paragraph 7).* These numerical data take into account only the so-called **"free space".** "Free space" means the surface directly and freely usable by animals, where they can move and lie down freely. Therefore, any obstacles that make the space unusable are excluded from the calculation of the minimum area available for each animal.

Table 15 – Minimum housing areas based on live weight ***(expressed in m²)***

LEVEL	≤ 500 kg	500-599 kg	600-699 kg	≥ 700 kg
1	< 2.25	< 2.7	< 3.15	< 3.6
2	2.25	2.7	3.15	3.6
3	2.5	3	3.5	4
4	2..75	3.3	3.85	4.4
5	3	3.6	4.2	4.8



3.3.1.3 Space in manger

The availability of space in the manger and the ease of access to feed are two other structural aspects that can strongly influence the incidence and severity of health problems in a beef cattle farm.

"The equipment for the administration of feed and water must be designed, built and installed in such a way as to minimise the possibility of feed or water contamination and the negative consequences deriving from rivalry between animals" *(Legislative Decree 146/2001, annex, point 17).*

Many studies have shown that rivalries and competitive behaviours between animals increase considerably if the space in the manger is not proportionate to the number of animals present *(Moya et al. 2015, Gonzàles et al., 2008).* The dominant cattle, in these situations, maintain priority access to feed, to the detriment of the more submissive animals, with strong negative implications on susceptibility to health problems, but also in terms of growth and production performance.

Both excessive and insufficient intake, and above all an unbalanced diet resulting from waste from dominant subjects, can in fact cause metabolic pathologies, such as acidosis, which greatly affect the health and productivity of the farm.

The feeding equipment and areas must therefore be correctly sized in order to guarantee the easiest possible access for the animals and the possibility of ingesting the right amount of feed to meet their needs in a comfortable situation. **"In situations of intensive farming, the mangers must be sufficiently sized so that the cattle have adequate access to feed"** *(OIE 2017 - Terrestrial Animal Health Code - Version 7 - Chapter 7.9. - Animal Welfare and beef cattle production systems - Article 7.9.5 - point 3) Management - part i).*

The sizing of the manger must be according to the number of animals in the box in question and to the type of feeding and management of the feed phase implemented in the farm. In fact, if the feed is supplied ad libitum, in the form of Unifeed or through numerous daily administrations, an alternate access to the manger is acceptable. **"Simultaneous access to the manger for animals that receive an ad libitum ration is not necessary, but recommended"** *(SCAHAW, 2001; Recommendation 11; Section B Housing).* The feed is available for the entire duration of the day and maintains the same nutritional characteristics and homogeneity (*ClassyFarm, Manual for the Assessment of Welfare and Biosecurity in Beef Cattle Breeding; verification item 18: Number of places in the manger*). In this case, a number of places in the feeding trough equal to 70% of the animals present in the reference box shall suffice.

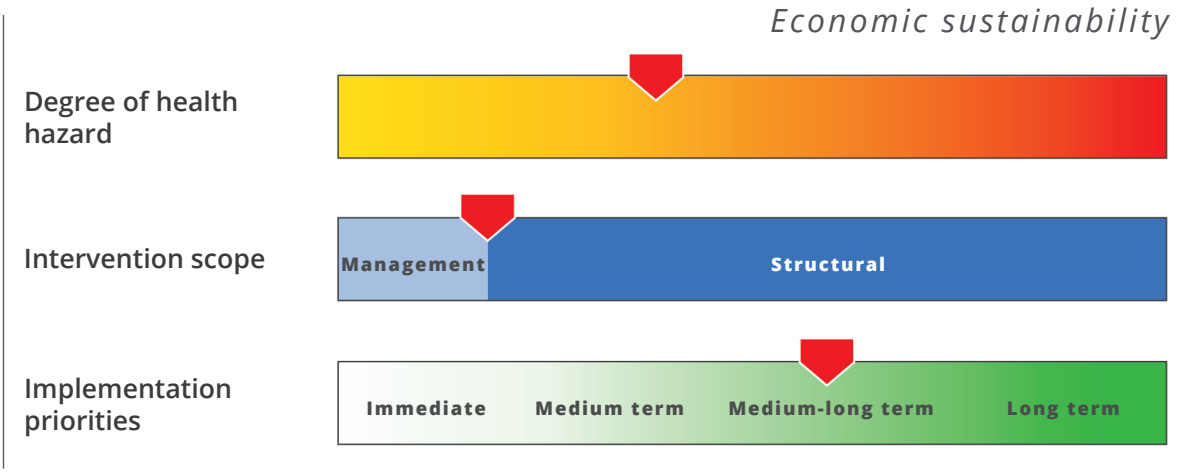
If, on the other hand, the administration is not ad libitum and therefore the ration is administered in a fractional way, all the animals must be able to feed at the same time: the number of places in the manger must therefore be equal to the number of animals in the box. **"If the feed is not provided ad libitum, the feeding area should allow all animals to feed at the same time"** *(EC Draft 8/09, article 9, point 5).* **"To minimise competition when ad libitum feeding is not implemented, each animal should have access to the manger at the same time"** *(SCAHAW, 2001; Recommendation 11; Section B Housing).*

In addition to the number of places in the manger, the front of the manger must also be taken into consideration, i.e. the space available for each animal to eat. **"The space in the manger for cattle in free housing for fattening is within the range of 0.6-0.7 m per animal"** *(SCAHAW, 2001; Conclusion # 22).*

Table 16 shows the dimensions of the space in the manger for each animal as the body weight increases.

Table 16 – Minimum housing areas based on live weight (expressed in m2)

LEVEL	< 200 kg	200-299 kg	400-599 kg	≥ 600 kg
1	< 31	< 47	< 51	< 55
2	31	47	51	55
3	32	48	52	56
4	40	60	65	70
5	44	66	71.5	77



3.3.1.4 Ventilation type and efficiency

Heat stress has a very strong impact on performance but also on the health of farmed animals. Therefore, systems should potentially be installed to reduce temperatures, maximise air circulation and disperse heat *(ClassyFarm, Manual for the Assessment of Welfare and Biosecurity in Beef Cattle Breeding; verification item 27: Temperature and humidity).*

"Adequate ventilation is crucial for cattle kept inside sheds, especially in hot weather and if the density is high" *(EFSA Journal 2012; 10(5):2669;3.4.1. Thermoregulation, and cold and heat stress; Conclusions 3).*

"Adequate ventilation is important for an effective heat dissipation in cattle and to prevent ammonia and gas build-up in housing facilities. Low air quality and ventilation are risk factors for respiratory problems and can cause pathologies" *(OIE 2014 - Terrestrial Animal Health Code - Version 7 - Chapter 7.9. "Animal welfare and beef cattle production systems" - point 2) Environment - part c) Air Quality).*

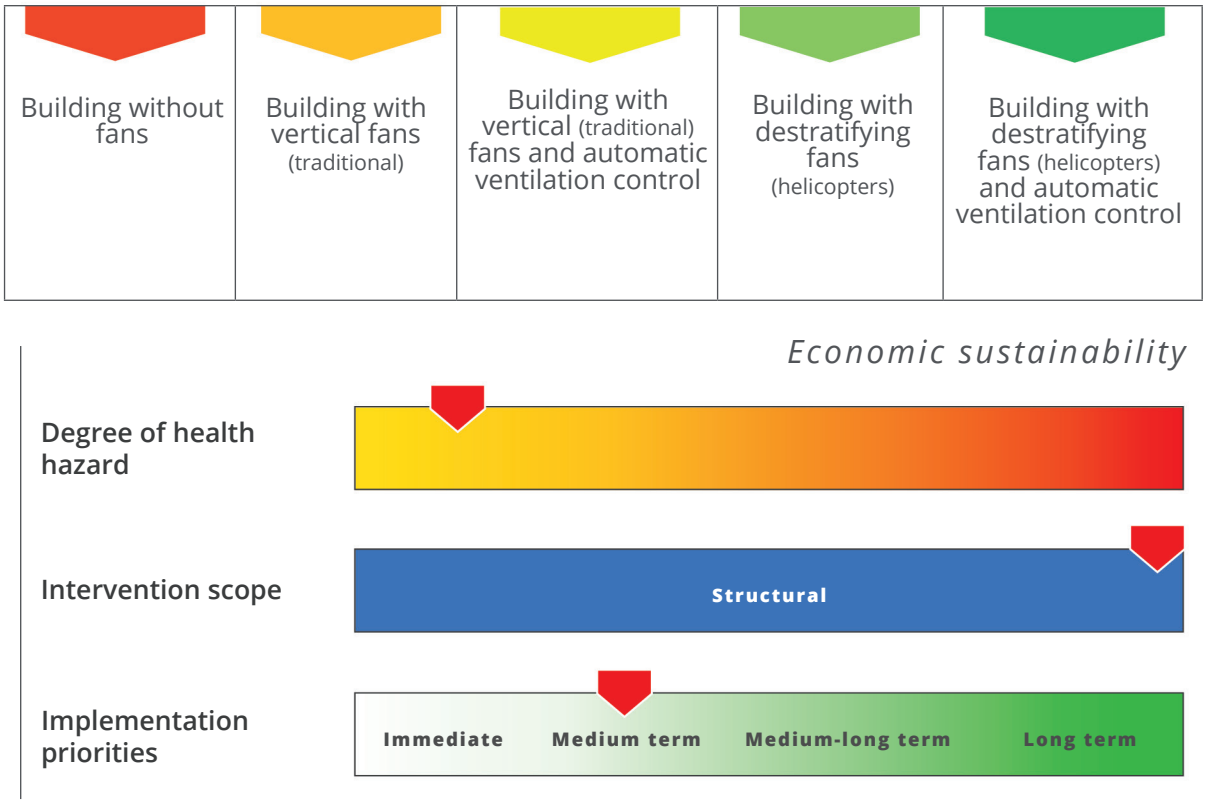
"The cattle are able to tolerate and adapt to a wide range of temperatures, but the optimal range is between 7 and 20 °C, with an optimum between 15 and 20 °C. If the temperatures exceed these values in any case, the animals find themselves in a situation of thermal stress, which leads them to initiate a whole series of physiological adaptation responses that have repercussions on production aspects (dry matter intake, growth) and also health (lowering of the immune defences). While cattle tolerate the cold well, they are particularly sensitive to heat, especially if fed with very energetic rations rich in concentrates" *(EFSA Journal 2012; 10(5):2669;3.4.1. Thermoregulation, and cold and heat stress; Conclusions 1).*

Fans are an excellent system for animal thermoregulation by air circulation. In addition to mitigating the negative effects of heat stress, ventilation is also functional to maintaining adequate air quality. In fact, it allows to dissipate harmful gases, which in higher concentrations are extremely harmful to animal welfare *(ClassyFarm, Manual for the Assessment of Welfare and Biosecurity in Beef Cattle Breeding; verification item 28: Presence of harmful gases) and by the European Council (EC Draft 8/09).*

"As an indication, cattle should not be permanently exposed to levels above these limits: ammonia, 20 ppm; carbon dioxide, 3,000 ppm; hydrogen sulphide, 0.5 ppm" *(EC Draft 8/09 article 13, point 2).*

The surveys on the farm will consider the different types of fans present, their functionality and efficiency, and whether or not the system is automated *(Table 17)*. Destratifiers, the most recent and effective technology, are considered the best way to increase the comfort of animals.

Table 17. Summer emergency ventilation



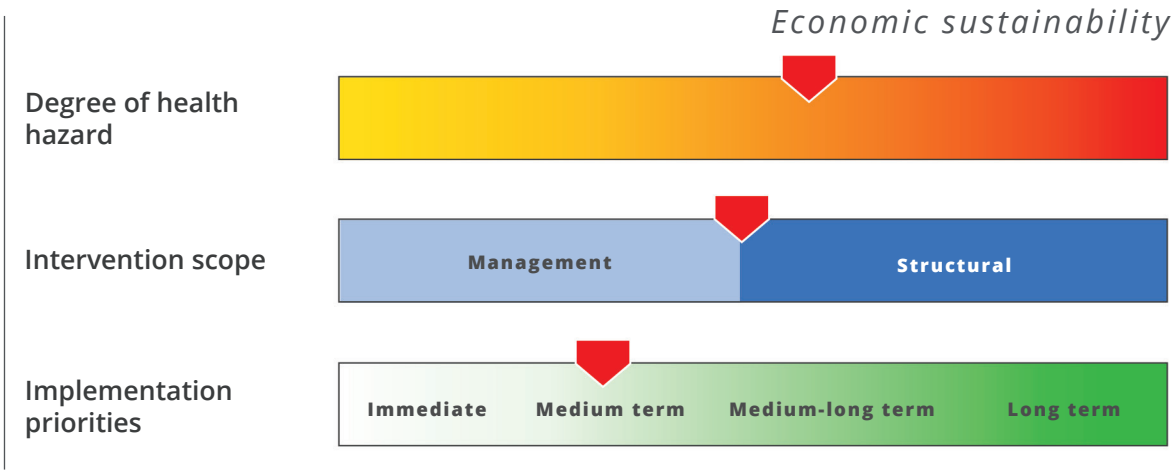
3.3.1.5 Hygiene of bedding or housing environment

Maintaining high standards of cleanliness of the housing facilities allows animals to stay clean and enjoy a comfortable, clean and dry resting area.
Maintaining high standards of cleanliness allows to restrict the possibility of contamination by pathogens that are normally found in poorly managed manure and bedding, thus limiting the incidence of pathological phenomena whose effects are extremely negative for the animal.

"Animals should be kept in a clean environment, which is as free as possible from contamination with manure" *(EC Draft 8/09 article 6, point 3).*
"The management of the bedding and the flooring of the box in intensive breeding farms can have a significant impact on the welfare of the animals. When there are areas in the box that are not comfortable for resting, such as due to an excessive accumulation of water and manure, these must not be so large and deep as to compromise animal welfare and must not extend to the entire usable housing area" *(OIE 2017 - Terrestrial Animal Health Code - Version 7 - Chapter 7.9. - Animal Welfare and beef cattle production systems - Article 7.9.5 - point 2) Environment, part f) Flooring, Bedding, resting surface and outdoor areas).*
Therefore, in addition to evaluating the adequacy of the type of flooring and the material used as bedding, if present, it is necessary to evaluate the cleanliness and correctness of the management.

"Those parts of the building that the cattle come into contact with must be thoroughly cleaned. While the facility is occupied by the cattle, the exposed surfaces and all equipment must be satisfactorily cleaned and any damage repaired" *(EC Draft 8/09 article 17).*

The bedding must be dry, clean and correctly managed with weekly refilling and replaced at the end of the fattening cycle. In fact, to provide the animals with high standards of comfort, cleanliness and ease of walking, the litter should be restored and topped up at least weekly. If the boxes are on a grid, this must be kept clean and as dry as possible. The boxes, walls and ceilings should be kept clean.



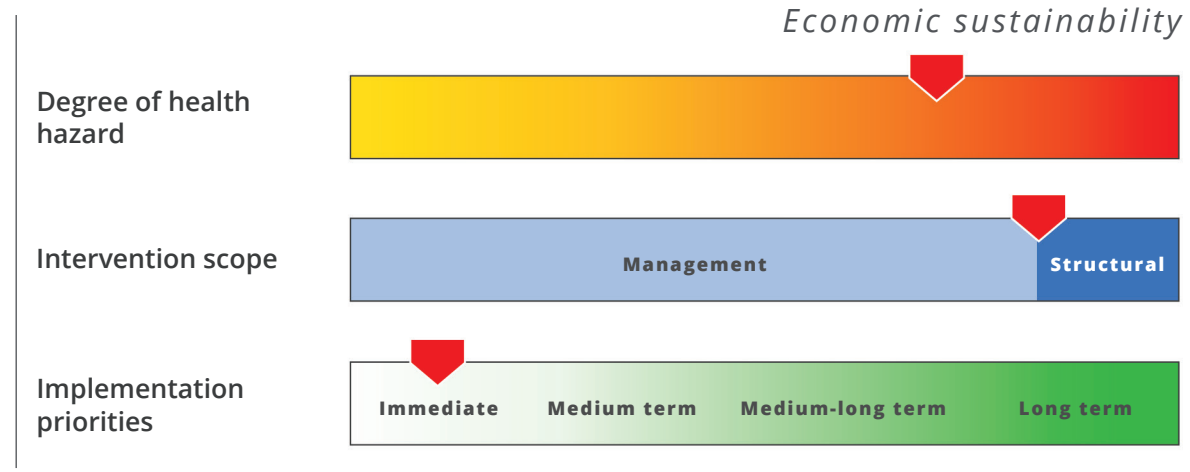
3.3.1.6 Cleaning and disinfection before introducing new animals

In addition to the correct management and cleaning of the housing and bedding during the fattening cycle, it is essential to take care of the cleaning and disinfection procedures of the boxes before introducing new animals. This prevents cross-contamination between two different batches and the permanence of potentially harmful pathogens in the environment. In this regard, at the end of each cycle, the boxes, walls, fences, drinking troughs, manger and ceilings must be washed and disinfected and the bedding, if present, must be completely replaced.

"Those parts of the building that cattle come into contact with must be properly cleaned and, where appropriate, disinfected every time the facility is emptied and before new animals are introduced" (*EC Draft 8/09 article 17*).
The removal of manure must be as thorough and complete as possible in order to eliminate any possible residue that may be a vehicle for pathogens. Correct removal also allows for a greater effectiveness of washing and disinfection procedures. In fact, if implemented on dirty environments, their potential is considerably reduced. In the worst cases, even the washing water can be a source of life for some pathogens present in the waste residues. The complete removal of manure/litter and the washing of the surfaces is sufficient for the sanitisation of the housing environments. Disinfection and the application of the sanitary vacuum are clearly considered as improving aspects. On the other hand, a potentially risky situation for animals is the absence of procedures for removing, washing and disinfecting the environments, or if the removal is not thorough and the disinfection takes place on dirty surfaces *(Table 18).*

Table 18 – Cleaning and disinfection before introducing new animals

No procedure	Only poor removal of manure and/ or disinfection of dirty environments	Manure removal and washing	Manure removal, washing and disinfection	Manure removal, washing, disinfection and sanitary vacuum



3.3.2 ADAPTATION PHASE

3.3.2.1 Specific area for adaptation/quarantine

"Farms that regularly receive animals from various sources should have isolation facilities and the quarantine period for incoming animals should last at least 14 days." *(EFSA Journal 2012; 10(5):2669; 3.5.7. Disease management issues; Recommendation 1).* The moments just after unloading at the fattening farm, and more generally the entire adaptation phase, as well reported in paragraph **"3.1 Arrival phase"** are extremely critical moments with the highest recoded rates of mortality and morbidity health risk *(Sgoifo Rossi et al., 2013).* In fact, while living a series of inevitable stressful events such as transport, adaptation to new environments, new social interactions, contact with humans and different diet, the young cattle are also exposed, right from the collection centres, to variable, numerous, more or less aggressive pathogens *(Panciera et al., 2010).*

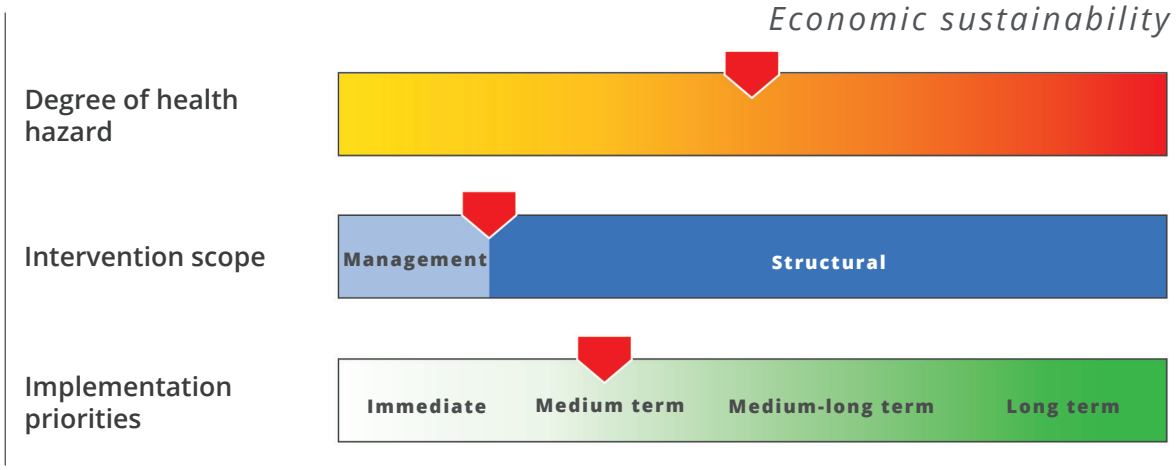
The management and also the presence of structures designed ad hoc for the animals just unloaded and for the adaptation phase are fundamental aspects in order to reduce health problems and optimise farm production performance. In fact, if the structures and management are not optimal, further stress could be generated in animals already in a delicate state, which can further compromise health and performance. Structures and management studied and adequate can instead strongly limit the negative effects of stress caused by the aforementioned events.

In addition to the availability and use of a specific and functional structure for handling and medical treatment, in order to limit health risks, mainly represented by **BRD**, it is necessary that the feedlot animals remain as long as possible in an isolated barn, intended only for the quarantine and adaptation phase. The drinking troughs in this structure should preferably be level and not pushed as in the latter case it is less likely that the animals mainly coming from the pasture are already accustomed to this watering system, thus aggravating the probable state of dehydration acquired during the transport. For the same reason, the grid flooring of the adaptation boxes is considered a risk factor compared to well-managed bedding *(Sgoifo Rossi et al., 2013; Pinheiro et al., 2004, Assiè et al., 2009).*

According to the bibliography, a as normal and suitable feature would be a housing structure for the animals in the adaptation phase that is specific but positioned near the fattening boxes and with empty walls *(open walls).* Blind walls are an improved condition since this structure allows a lower spread of pathogens. On the other hand, an optimal scenario would be an ad hoc quarantine structure, which is also isolated from the rest of the buildings and always used *(Table 19).*

Table 19 – Area of adaptation/quarantine

Absent and direct discharge in the fattening boxes	Specific, isolated, but not always used	Specific, but adjacent to the breeding boxes (open walls)	Specific, but adjacent to the breeding boxes (blind walls)	Specific, isolated, and always used



3.3.2.2 Duration of the adaptation/quarantine period

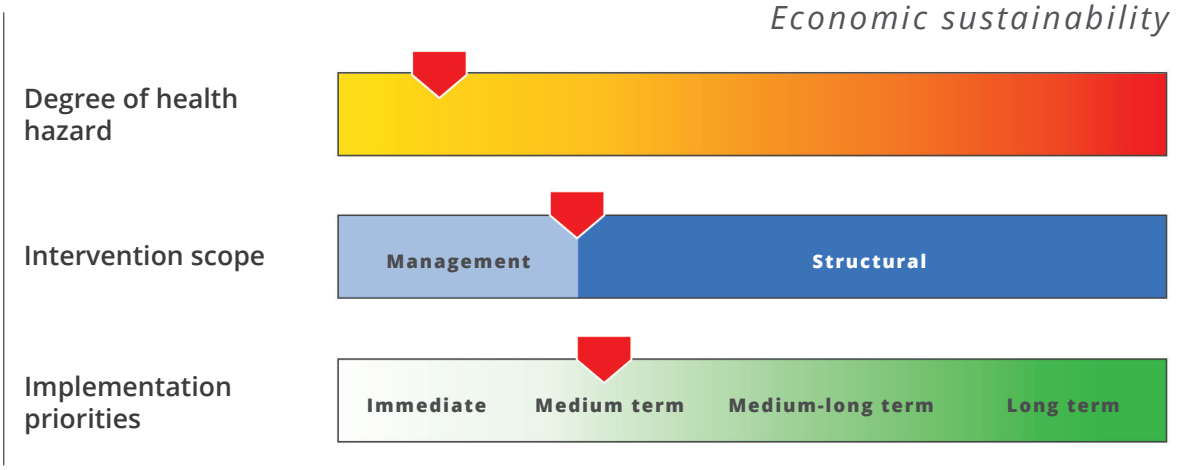
The duration of the adaptation/quarantine period is not actually the same for all cases and can be easily set a priori. The best managerial solution is in fact to adapt the duration of the adaptation phase to the health and growth conditions of the lot in question. In the case of lots that can be defined as **"healthy"**, in which there is no evidence of pathological phenomena in progress and in which the physical condition of the animals is good, presenting a correct adaptation also to the nutritional plans, shorter times can be adopted. On the other hand, in the case of lots showing signs of pathologies in progress, it is best to adjust the duration of this phase, based on the severity of the pathology.

"Farms that regularly receive animals from various sources should have isolation facilities and the quarantine period for incoming animals should last at least 14 days." *(EFSA Journal 2012; 10(5):2669; 3.5.7. Disease management issues; Recommendation 1).*

"All purchased animals, and those that have been in contact with animals from other stables, must be placed in quarantine for a period of between 21 and 30 days" *(ClassyFarm, Manual for the Assessment of Welfare and Biosecurity in beef cattle farms; verification item 51: Quarantine).*
As average indication, a 20-30 day quarantine is considered to be sufficient *(Table 20).*

Table 20. Duration of the adaptation/quarantine period

0 d	< 20 days	20 - 30 days	31 - 40 days	In relation to the health status of the lot



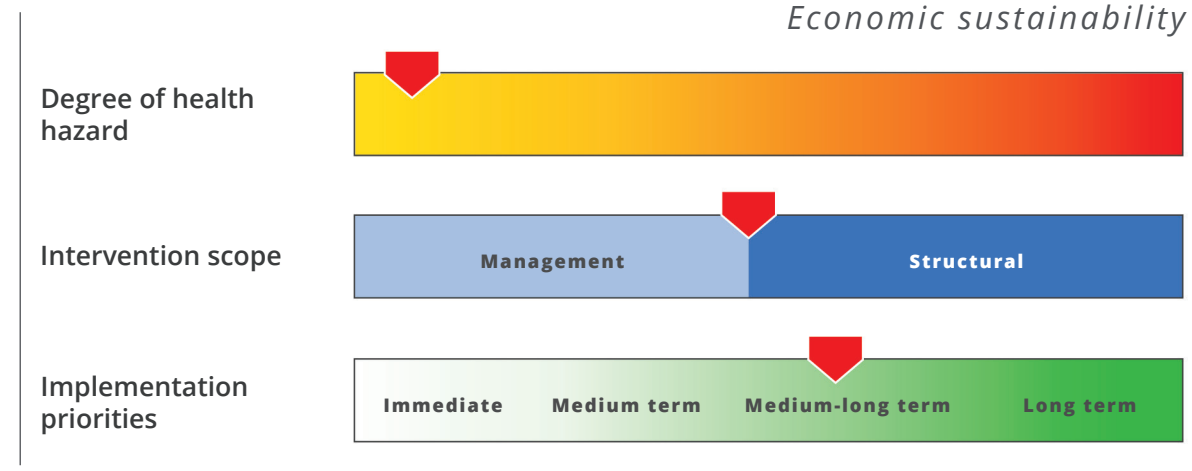
3.3.2.3 Duration of the sanitary vacuum before introducing new feedlot animals

The importance of cleaning and disinfecting housing environments has already been discussed in points **3.3.1.5** and **3.3.1.6.** In the adaptation phase, however, cleaning and disinfection play an even more important role: they allow to significantly reduce the load of pathogens present in the environment in a phase in which the animals are extremely delicate and already with their own load of lot-specific pathogens.
The implementation of correct environmental sanitisation plans, and above all the correct implementation of the sanitary vacuum, therefore allows to reduce the possibility of contagion between the different lots in this extremely delicate phase.

A sanitary vacuum lasting at least 5-15 days is considered sufficient for a correct and suitable environmental sanitisation *(Table 21).*

Table 21 – Duration of the sanitary vacuum before introducing new feedlot animals

Not carried out	For < 5 days	For 5 - 15 days	For 15 - 30 days	More than 30 days



3.3.2.4 Amount of bedding

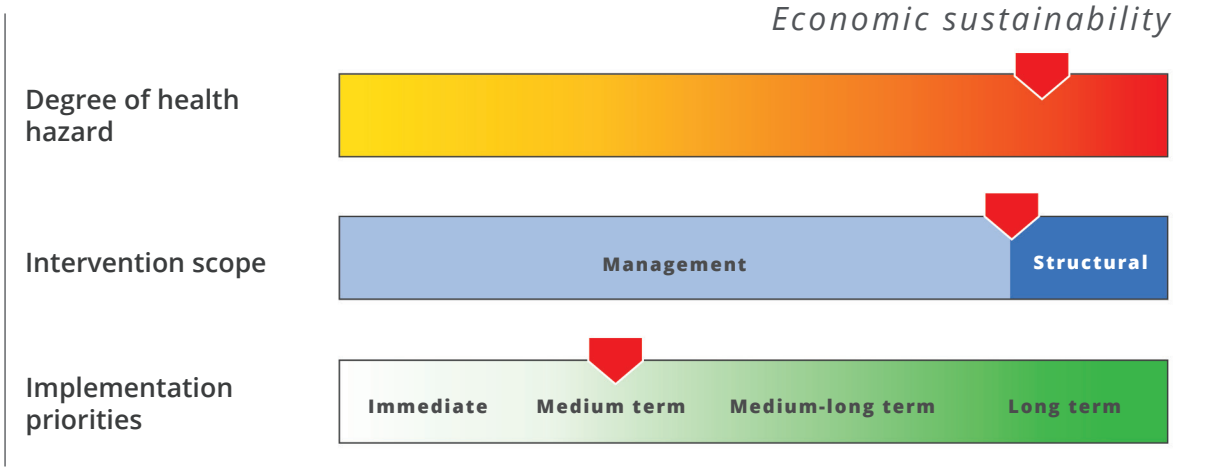
"Animals should be kept in a clean environment, which is as free as possible from contamination with manure" *(EC Draft 8/09 article 6, point 3).*

"The materials used for the bedding must always be sufficiently clean and dry. The bedding must be made of suitable materials (straw, corn stalks or rice husks) and must not generate excessive dust at the time of distribution. In order for the bedding management operations to be correct, in addition to providing a sufficient quantity of material, it is also necessary to ensure that the litter remains dry by means of air flow management that allows adequate ventilation inside the barn. In order to allow the animals to walk easily and have a good cleaning of the coat, the bedding should be treated (restoration and redistribution of the material) at least weekly, and totally replaced at least every 6 months, or in any case at the end of each production cycle before the introduction of a new lot of animals"
(ClassyFarm, Manual for the Assessment of Wellness and Biosafety in the bovine cow herd; verification item 12: Hygiene, care and management of housing and litter).

A daily added quantity of bedding of at least 0.75 kg/animal is considered correct and suitable *(Table 22).*

Table 22 – Quantity of bedding per animal

< 0.5 kg	0.5 - 0.74 kg	0.75 - 1.24 kg	1.25 - 1.5 kg	> 1.5 kg



3.3.3 SICKBAY

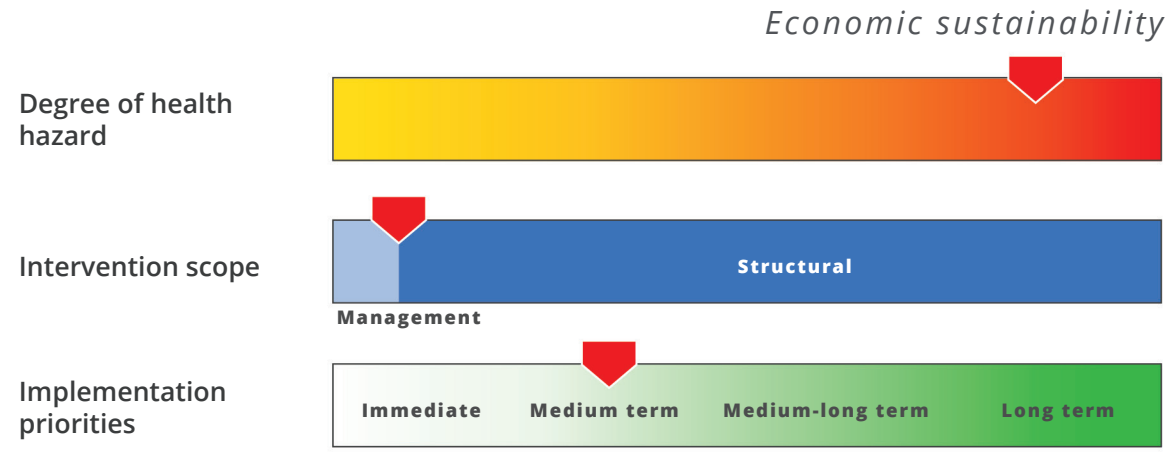
3.3.3.1 *Specific structure used only to isolate sick or injured animals*

An additional number of boxes must be set up on the breeding farm specifically for the housing of animals with health problems and/or traumatic injuries.
"Where necessary, sick or injured animals are to be isolated in special rooms equipped, where appropriate, with dry and comfortable bedding" *(Legislative Decree 146/2001, annex, point 4).*
"A sufficient number of separate boxes should be available to house sick animals" *(SCAHAW, 2001; Recommendation 8, Section B Housing).*

Those structures where the sickbay area is absent, undersized or even not well identified would be surely penalised. The optimal situation foresees a sickbay area that is isolated from the other breeding boxes. Structures would be deemed compliant if they have an area specifically used as an sickbay, located close to the other breeding boxes but whose partition walls are also empty *(open walls).* The presence of blind walls allows to improve the health safety of the hospitalisation area, as the possibility of pathogen circulation among the animals in the sickbay and the healthy ones is limited *(Table 23).*

Table 23 – Sickbay

Absent	Non-specific, breeding box	Specific but adjacent to the breeding boxes (open walls)	Specific but adjacent to the breeding boxes (blind walls)	Specific and isolated



3.3.3.2 Type of housing

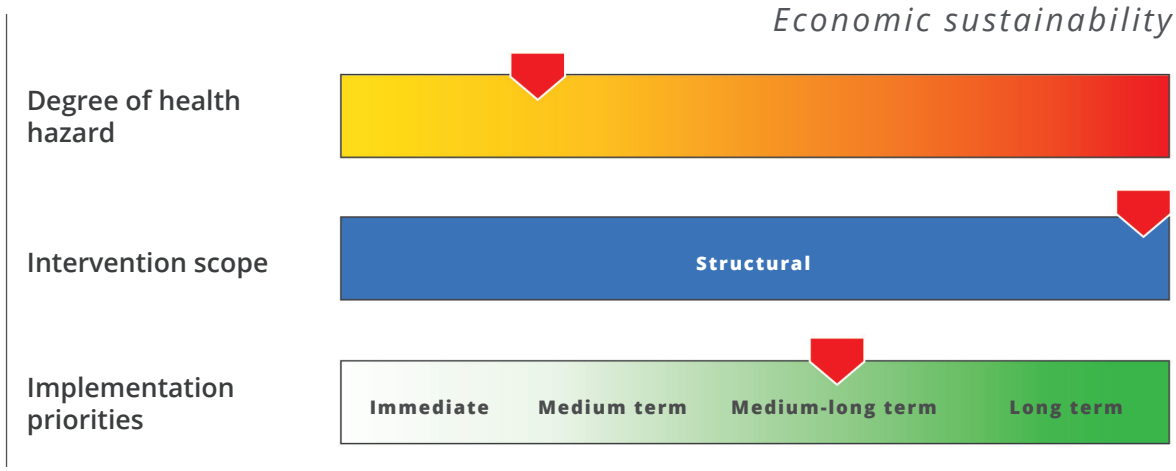
If the type of flooring and bedding and their management strongly affect the conditions of healthy animals, in the sickbay they play a fundamental role. Recovery from foot pathologies, trauma and injuries is in fact better and faster if the flooring in the sickbay is comfortable.

"Where necessary, sick or injured animals should be isolated in suitable accommodations with easy availability of fresh drinking water and feed, adequate climate and a dry and comfortable bedding, unless otherwise requested by the veterinary surgeon" *(EC Draft 8/09 article 6, point 2).* Moreover, **"When necessary, sick or injured cattle must be isolated in suitable structures, with a dry and comfortable bedding"** *(European Union Council 2008, annex 1, point 6).*
"... we positively consider situations in which the spaces are very abundant (e.g. more than 8-10 m2/animal), easy to inspect by the operator, possibly divided into several boxes, with well-managed permanent bedding, level drinking troughs, easy access to feed and with specific equipment for the immobilisation of the animal and for the administration of any therapies" *(ClassyFarm, Manual for the Assessment of Welfare and Biosecurity in Beef Cattle Breeding; verification item 26: Sickbay).*

Bedding is recognised as the optimal solution if well managed, clean and dry. In fact, it provides greater comfort for the animals both during movement and in the decubitus position, frequently assumed by sick or injured animals. The presence of an external paddock on the ground where the animal can resume motor activity is extremely positive. Cracked flooring can favour the incidence and severity of lameness, particularly if it is not the correct size and covered in rubber *(Table 24).*

Table 24 – Type of flooring in the sickbay

Fully cracked without rubber	Partially cracked without rubber	Fully/partially cracked with rubber	Permanent bedding without external paddock	Permanent bedding with external paddock (on the ground)



3.3.3.3 Rapid isolation of sick or injured animals

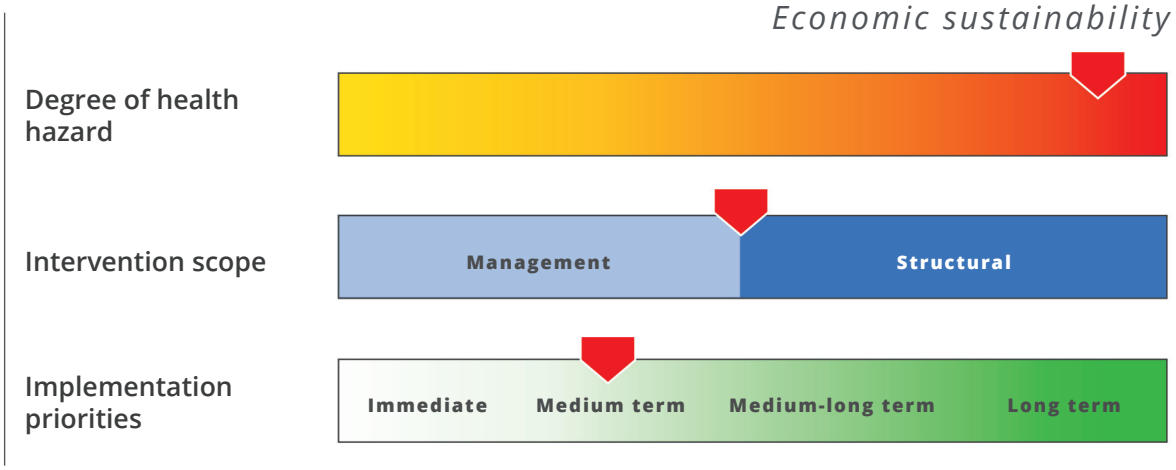
The timeliness with which the indicators and signs of disease are detected is a key to the chances of therapeutic success.

"If the cattle show signs of poor health or behavioural alterations, the staff in charge must, quickly and without delay, establish the causes and immediately activate the procedures necessary for the treatment and resolution of the problem. Animals that appear to be ill or injured must be treated appropriately, without any delay" *(EC Draft 8/09, article 6, points 1-2).*

The speed with which a sick animal is isolated in suitable premises is a factor capable of expediting the recovery of the animal and safeguarding the health of the herd if it is affected by a disease *(Table 25).*

Table 25 – Isolation times

No isolation	Insulation only in extreme conditions	Late, after two or more treatment failures of relapses	Immediately, after inadequate response to treatment of a relapse	Always and promptly upon evidencing that the animal suffers from staying in a group or has a contagious pathology



3.4 FEEDING

The management of the feeding time represents another important aspect of the production process that can strongly influence the incidence and severity of pathological phenomena and also the breeding production performance.
During the arrival phase, for example, a correct nutritional management is able to quickly re-establish the physiological conditions of normality, in highly stressed animals, elevating the immune function and, consequently, considerably reducing the incidence of respiratory diseases.
However, its effect is not limited to the arrival phase alone. During fattening, the correct nutritional management allows to prevent digestive dysmetabolism and the resulting diseases.
The formulation and balancing of the diet in terms of nutritional intake, fermentability, degradability, nutritional level, kinetics of use and also integration must be specifically studied according to the production phase and according to the specific characteristics of the animals in question.
A crucial role is also played by the management of the manger and the manufacture of the diet, with particular reference to the type of administration, the physical characteristics of the Unifeed, the accuracy in the preparation and distribution of the feed, its availability, the absence of selection by the animal thanks to a correct structure, cohesion and palatability of the feed.

Nutrition can be considered as a real tool for prevention and prophylaxis against health problems.

3.4.1 GENERAL ASPECTS

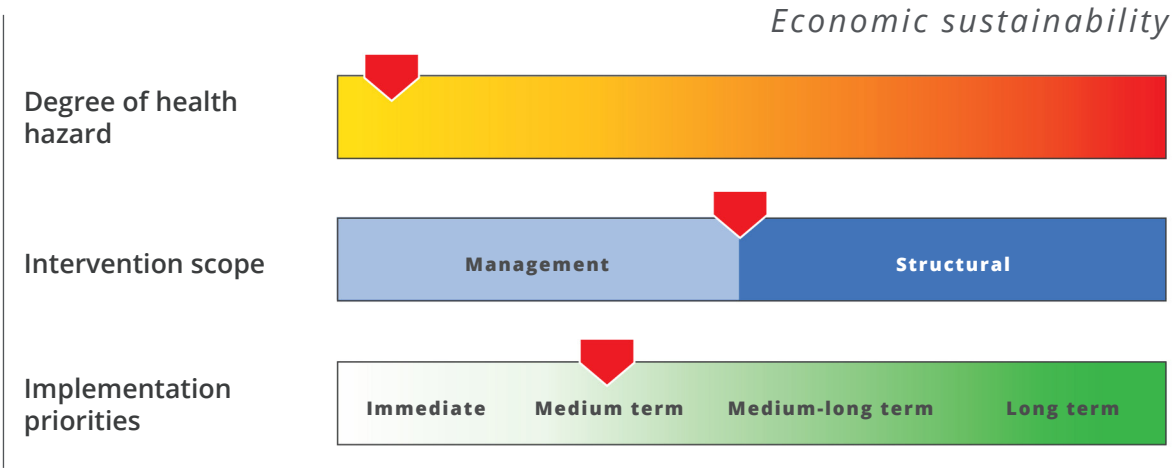
3.4.1.1 *Feeding type*

There are two main feed supply methods in beef cattle breeding: fractional feeding and via **Unifeed**. The supply of **Unifeed**, also known as a single dish, provides the animal with both the fibrous and the concentrated component together, so that it takes all the nutritional ingredients necessary to satisfy its needs at the same time. In the case of fractional feeding, the forages, which represent most of the fibrous component of the ration, are supplied separately from the concentrated component, i.e. the energy, protein and supplement fraction of the diet.

Supplying the ration through correctly formulated and prepared Unifeed undoubtedly has advantages in terms of animal health and production *(Table 26).*
In fact, the sorting chances of the bovine are limited, especially in those situations in which the manufacture is particularly careful and attentive to the homogeneity of the product. The animal thus takes on all the components necessary both for production needs and to keep **the rumen** fully functional. In the case of fractional feeding, on the other hand, the main risk is posed by the fact that the animal, in this case, can choose what to take based on its preference, which is usually the concentrated component. The intake of concentrates is therefore high, but not counterbalanced by a correct intake of peNDF *(Physically effective NDF)*, contributed by forages, functional to the maintenance of ruminal functionality. Therefore, there is a risk of an increase in the frequency of cases of sub-acute and acute acidosis, as well as of other metabolic disorders.

Table 26 – Feeding type

Separate forages and concentrates	Separated forages and concentrates but with concentrate fibre	Unifeed	Homogeneous Unifeed	Homogeneous, structured and non-selectable Unifeed



3.4.1.2 Feed availability

"All animals must have access to feed at intervals appropriate to their physiological needs" *(Legislative Decree 146/2001, annex point 15).* **"The feed should be supplied ad libitum to ensure that each animal is fed according to their needs during the 24 hours of the day"** *(ClassyFarm, Manual for the Assessment of Welfare and Biosecurity in Beef Cattle Breeding; verification item 8).*
These conditions guarantee the possibility of eating to all subjects, both dominant and not. If the supply takes place several times a day, the animal will be guaranteed to have access to feed of invariable quality in terms of composition, nutritional value and sanitary characteristics. The number of supplies should also be adjusted in relation to the climate: in the case of extreme heat, for example, it is good to increase the number of administrations, due to the rapid deterioration that the ration undergoes *(Table 27).*

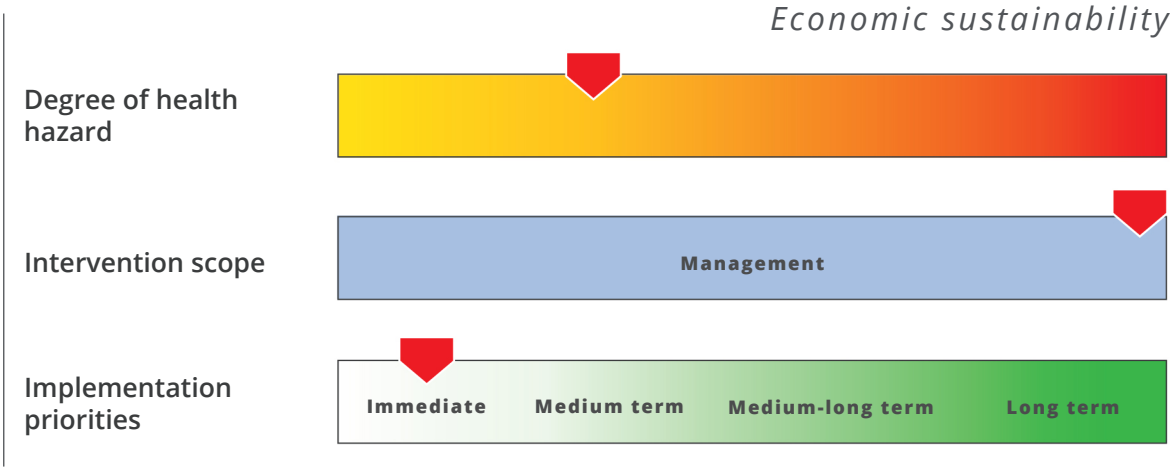
The same applies for particularly humid and rainy climates. The *ad libitum feeding*, in addition to allowing all animals to have the same access to feed without generating an increase in competitive behaviour, allows them to have feed available at any time.

This factor contributes **to the maintenance of constant rumen pH, essential for the prevention of metabolic disorders and for the maximisation of production performance.** On the other hand, supplying the feed in a rationed form, in addition to generating greater competition among the animals, also causes greater variability and fluctuation of the rumen pH during the day, favouring the incidence of acute and sub-acute ruminal acidosis phenomena.

Table 27 – Feed availability

Rationed* with 1 daily supply	Rationed* with more daily supplies	Ad libitum with a daily supply	Ad libitum with 2 daily supplies	Ad libitum with more daily supplies and in relation to the climate

*Rationed feeding in case of evident absence of feed in the feeding trough during the visit with anxious animals that lick the bottom of the same.



3.4.1.3 Accuracy and precision in diet implementation

"The animals must be provided with a healthy diet suitable for their age and species and in sufficient quantities to keep them in good health and to satisfy their nutritional needs" *(Legislative Decree 146/2001, annex, point 14).*
"The specific needs of animals should be met in order to ensure a good level of welfare, which also includes good health" *(SCAHAW, 2001, Recommendations, Section C, point 13).*
The diet should provide sufficient energy, nutrients and dietary fibber to meet nutritional requirements and respect the digestive and metabolic physiology of the beef cattle.
"In order to meet the needs of beef cattle, in relation to the physiological state, health and behaviour, the feed should meet four essential criteria":

1) Balanced and adequate supply of metabolisable energy (ME) and all other essential nutrients, as required for maintenance, activity, reproduction and growth;

2) Supply of feed with a consistent physical and chemical composition with stable reticulo-ruminal fermentation and healthy digestion in the gastro-intestinal tract;

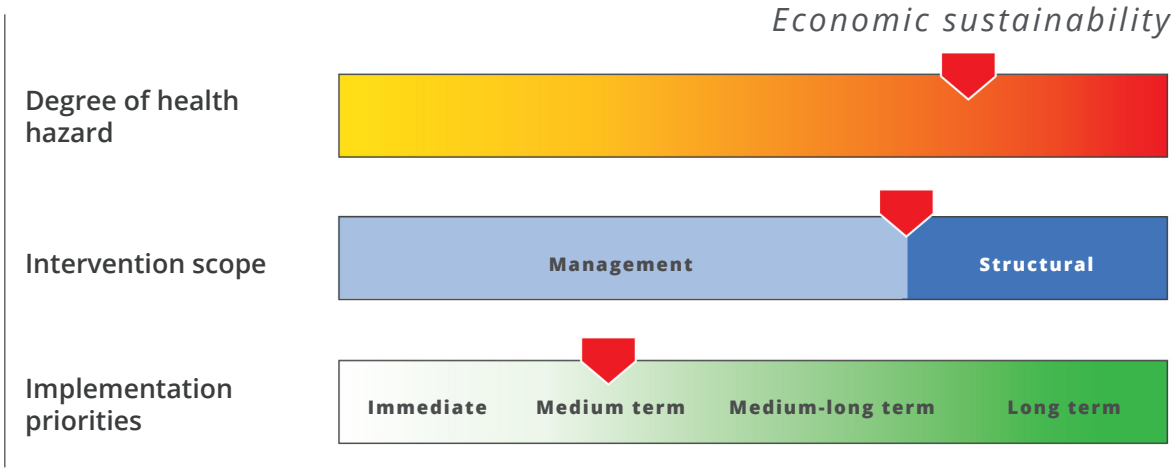
3) Supply of feed in a form that provides oral satisfaction (rumination) and does not predispose to the onset of stereotypical behaviours;

4) Supply of feed that does not cause any harm
(EFSA Journal 2012;10(5):2669, Section 3.5.3, Recommendation 1).

In order to satisfy the needs of beef cattle, it is essential that **the diet be adequate according to the animal's body development, age and weight.** To meet all these requirements, it is important that this ration is specifically prepared by an expert professional who calculates it on the basis of the real needs of the animal in question.
However, the theoretical formulation by an expert nutritionist alone is not enough: preparing the ration in the farm also play a crucial role. Errors in this phase, such as the loading of incorrect quantities of feed into the mixer wagon and incorrect mixing times, cause changes in the characteristics of the ration supplied and generate an increase in the inhomogeneity of the ration, which leads to a consequent increase in the selection activity by the bovine in the manger.
This phenomenon is inevitably followed by a decrease in rumen pH, which can cause dysmetabolism *(Baldi et al., 2014).* A well-manufactured Unifeed, on the other hand, limits the ability of the animal to select a single type of feed, reduces changes in rumen pH and the consequent risks of dysmetabolism, promotes greater feed intake and, reduces feed intake variations within the same day and from one day to the next by stimulating a greater number of meals *(De Vries et al., 2005; Krause and Oetzel, 2006; Dohme et al., 2008; DeVries et al., 2007).* **"Any sudden changes in the ration, in its quality and even in feeding procedures must be avoided"** *(EC Draft 8/09, article 12 point 3).*
A diet formulated by an expert professional is considered sufficient in the presence, however, of a system for registered at least the quantities of the single types of feed loaded into the mixer wagon. In addition to this registration, monitoring the mixing times and carrying out a periodic critical analysis of the results from this data collection is considered to be an extremely positive measure capable of preventing health problems *(Table 28).*

Table 28 – Accuracy and precision in diet implementation

Improvised and unregistered diet	Diet formulated by an experienced professional but without registration	Diet formulated by an experienced professional and registration of the quantities loaded	Presence of a system for recording the quantities loaded and mixing times	Periodic critical analysis of data (performed at least once a week)



3.4.1.4 Feed quality and safety

"The correct nutrition of the animals is also linked to the quality of the feed they consume, which must be of known origin and stored in suitable environments to avoid alterations and contamination with toxic-harmful substances" *(ClassyFarm, Manual for the Assessment of Welfare and Biosecurity in Beef Cattle Breeding; verification item 6).*

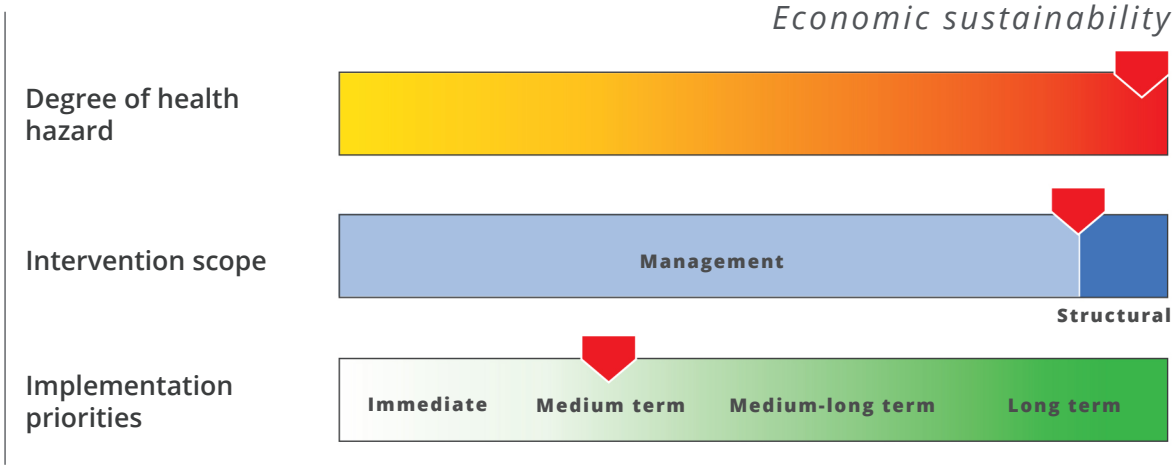
The quality and health safety of the feed and raw materials supplied to animals play an essential role in limiting and preventing health problems. Therefore, checks must be carried out periodically in order to evaluate the chemical composition of the feed, which must always be constant, as well as the hygienic-sanitary characteristics. Any harmful parameter, such as mycotoxins and other contaminants, must be kept within the legal limits, where present, or in any case scrutinised and minimised in general.

At least one occasional check regarding the chemical and sanitary characteristics of the ration is considered optimal. The optimal condition – and therefore the one that most protects the health of the animals – is reached when the control of the previous aspects is periodic, also in association with the analysis of the physical characteristics of the diet *(Table 29).*

Table 29 – Feed quality and safety

No control	Occasional control of the chemical characteristics	Occasional control of the chemical and sanitary characteristics (mycotoxins, other contaminants, etc.)	Periodic control of the chemical and sanitary characteristics (mycotoxins, other contaminants, etc.)	Periodic control of the chemical and sanitary characteristics and of the physical characteristics of the diet*

*control of the physical characteristics of the diet via sieving or spectrophotometry (e.g. NIR).




21

3.4.2 ADAPTATION PHASE

In addition to general nutritional aspects, the farm's nutritional management provides for specific compliance in relation to the production phase of the animals. In particular, during the first weeks of placement, particular attention must be paid to meeting the needs of young feedlot animals with specific objectives. As already described above, the peculiarities of the production system expose cattle to stressful factors which can also severely impair the digestive process.

The adaptation phase from a nutritional point of view therefore represents a crucial moment in the production system and the objective to be pursued is to promote the most rapid restoration of ruminal function in order to obtain a transition as rapid and complete as possible to the new conditions, in order to maximise growth performance and restrict the incidence of pathologies.

3.4.2.1 Forage availability upon arrival

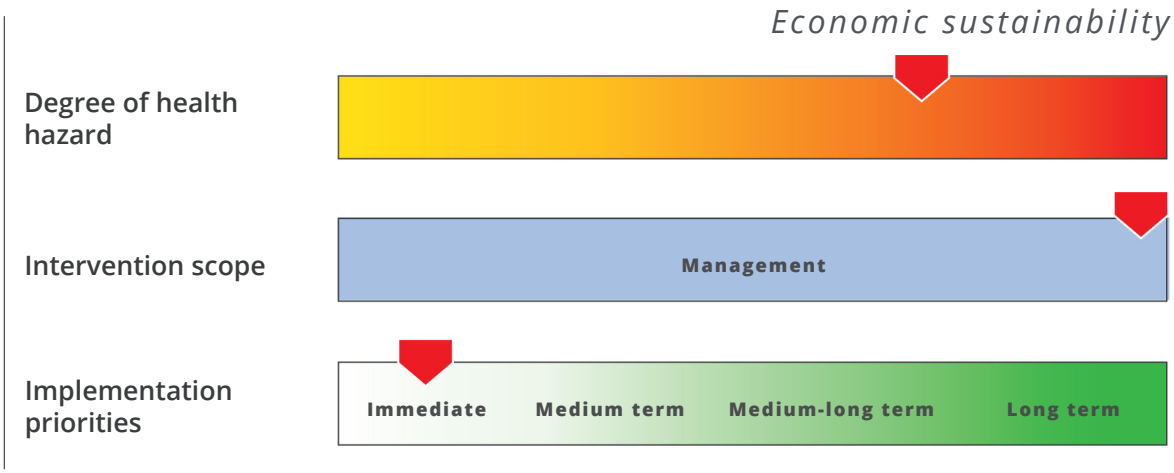
"A sufficient quantity of forage or other fibrous feed must be provided daily in accordance with the age and behavioural and physiological needs of the animals" *(EC Draft 8/09, article 12, point 1).*

"Animals should be given a sufficient amount of long fibre daily to ensure proper ruminal function and to meet the need for foraging behaviour" *(SCAHAW, 2001; Recommendation 14; Section C Feeding).*

For this purpose, feed characterised by high degradability of the fibrous fraction such as beet pulp, soy husks and bran, **but above all high quality hay**, not excessively lignified but with a good structure and supplied for the initial period in combination with the adaptation diet, are ideal to ensure a rapid restoration of ruminal function. In excellent working conditions, the hay should be supplied to the newly arrived animals in varying quantities and timing depending on the health conditions of the lot *(Table 30).*

Table 30 – Forage availability upon arrival

Not available	Hay only on 1st and 2nd day from arrival or as needed	Hay rationed over the first 7 days	Hay always available during the first 7 days	Hay available in relation to the health characteristics of the lot



3.4.2.2 Specific diet for adaptation phase

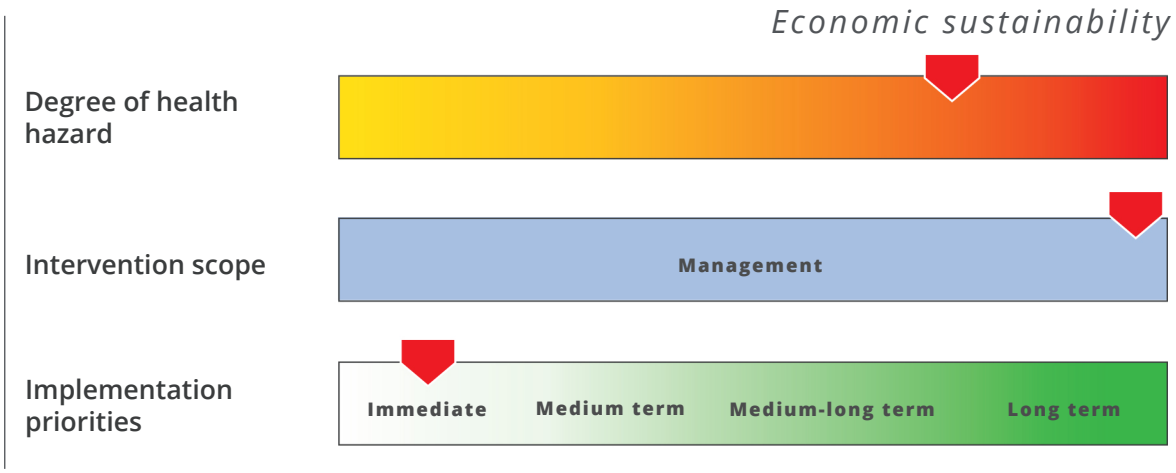
"The animals must be provided with a healthy diet suitable for their age and species and in sufficient quantities to keep them in good health and to satisfy their nutritional needs" *(Legislative Decree 146/2001, annex, point 14).* **"The specific needs of animals should be met in order to ensure a good level of welfare, which also includes good health"** *(SCAHAW, 2001, Recommendations, Section C, point 13).* Given the reasons mentioned above, it is therefore essential that the feeding plans for this phase are studied ad hoc on the basis of the actual and specific needs at this stage. The preparation of a Unifeed specifically formulated for the adaptation phase is considered ideal.
Administering the same diet used in subsequent stages but in a lower quantity to feedlot animals is not recommended, given the incorrect nutritional intake, which is excessive for this type of animal. In addition, the administration of these diets with the addition of a portion of forage is not optimal. In doing so, the addition of forage will in fact require a prolonged mixing in the Unifeed wagon, an event that involves an excessive reduction of the structure of the ration already present in the wagon. Also, adding an ingredient to a **"base"** diet has a dilution effect on all components of the diet, including the supplement, which will be taken by the newly arrived animals in insufficient quantities for the correct intake of minerals, vitamins, buffers, adsorbents and additives. Therefore, in case it is not possible to prepare a specific Unifeed for the newly arrived cattle, it is advisable to produce or purchase a suitably integrated and formulated adaptation feed, to be used with chopped straw and/or hay as forage.

In terms of the composition of the ration, considering the probable state of rumen hypo-functionality that on average characterises the newly arrived animals, the energy level, the protein level and the feed fermentability shall be kept at low values *(Duff et al., 2007).* At the same time, it is necessary to ensure a sufficient supply of **peNDF** *(Physically effective NDF)* in order to promote correct ruminal function. Supplementation must also be specific. In conditions of stress and ruminal hypo-function, there is an increase in the mineral and vitamin requirements following the lower synthesis of water-soluble vitamins and the increased renal excretion of trace elements and the reduction of intestinal absorption of minerals and vitamins, together with a greater need for micronutrients in order to promote a better immune response. In this context, we emphasise the need to provide a specifically formulated mineral and vitamin supplement for the inclusion of nutrients with immunostimulating action such as **calcio**, microelements for immunostimulating action such as **zinc, copper and** possibly selenium in organic form (characterised by higher bioavailability and the possibility of storage and mobilisation if necessary) and **vitamin E**.
Given the rumen hypo-functionality, **a specific supplementation with B vitamins** is also advisable. The addition of nutraceutical additives, including for example live yeasts and selected plant extracts, has proven to be a valid aid in restoring rumen function and promoting the immune system *(Chaucheyras-Durand et al., 2008).*

Table 31 – Specific diet for adaptation phase

Use of a non-specific rationed diet	Use of a non-specific ad libitum diet	Using a non-specific diet obtained by adding forage to other diets	Use of a specific diet suitable due to its chemical and physical characteristics*	Use of a specific diet suitable due to its chemical and physical characteristics and integrated with nutraceutical additives**

*Specific adaptation diet with CFU ≤ 0.88 kg/DM and PG < 13% DM.
**Examples of nutraceutical additives: prebiotics, probiotics, natural extracts, organic minerals, inactivating mycotoxins, hydro and fat-soluble vitamins.



3.4.3 FATTENING

The main problems encountered during the fattening phase are attributable to dysfunctions of the digestive function, such as acidosis and meteorism.

These are problems due to errors or deficiencies in the breeding management, which can be effectively and easily prevented. The nutritional aspects and the management of the feeding time are strongly involved in the aetiology of these problems: they can arise, in fact, in case of wrong balancing, formulation, preparation and supply of the ration during the fattening phase. The latter cause a significant reduction in feed intake and, consequently, in production performance. Due to a sudden change in diet, poor accuracy in the manufacture of the ration, in the Unifeed mixing or other inefficiencies in the management of the feeding time, the bovine can undergo a sudden and important drop in rumen pH. To compensate for this, the animal reduces its feed intake in the following days in order to rebalance the rumen pH. This condition, scientifically defined as **"off-feed"**, is therefore an effective system that reduces the risk of developing clinical acidosis. Dry matter intake can drop from 9.5 kg to 3.7 kg in just two days, and may take at least 6 days to return to normal values.

Acidosis predisposes the affected animal to significant health problems such as liver abscesses, polyencephalomalacia, meteorism, enterotoxemia and foot pathologies. Nutritional management in this phase therefore has a double function: to reduce health problems and to improve production performance.

3.4.3.1 Nutritional level of the fattening phase diet

The nutritional level and the balance of the ration are the two factors considered to have the greatest impact on the well-being of cattle in the fattening phase. **"Cattle should have access to a balanced ration that meets their physiological needs and is quantitatively and qualitatively adequate"** *(OIE 2014 - Terrestrial Animal Health Code - Version 7 - Chapter 7.9. "Animal welfare and beef cattle production", Section 2, part e) Nutrition).* Nutrient levels exceeding real needs, as well as rations whose components and supplies are poorly balanced or lacking certain fundamental nutritional ingredients, can represent a serious risk for animal health and can in fact favour acidosis.

"Rumen and metabolic acidosis is a major stressor for beef cattle. The appearance of acidosis is closely linked to the presence of diets based on a high proportion of concentrates combined with a low proportion of structured crude fibre" *(SCAHAW, 2001; Conclusion 65).*

"When the amount of concentrates increases in the diet, the related risk of digestive disorders also increases" *(OIE 2014 - Terrestrial Animal Health Code - Version 7 - Chapter 7.9. "Animal welfare and beef cattle production", Section 2, part e) Nutrition).* If, on the one hand, raising the nutritional levels of the diet and, consequently, the intake of concentrates, especially the starchy ones, can increase the production performance in terms of weight gain, on the other hand, this practice poses the risk of lowering the pH, generated by the supply of high quantities of carbohydrates, and is a predisposing factor for acidosis. This is especially true if the other components, with specific reference to the fibrous part, are not optimally balanced, in terms of quantities and nutritional and physical characteristics.

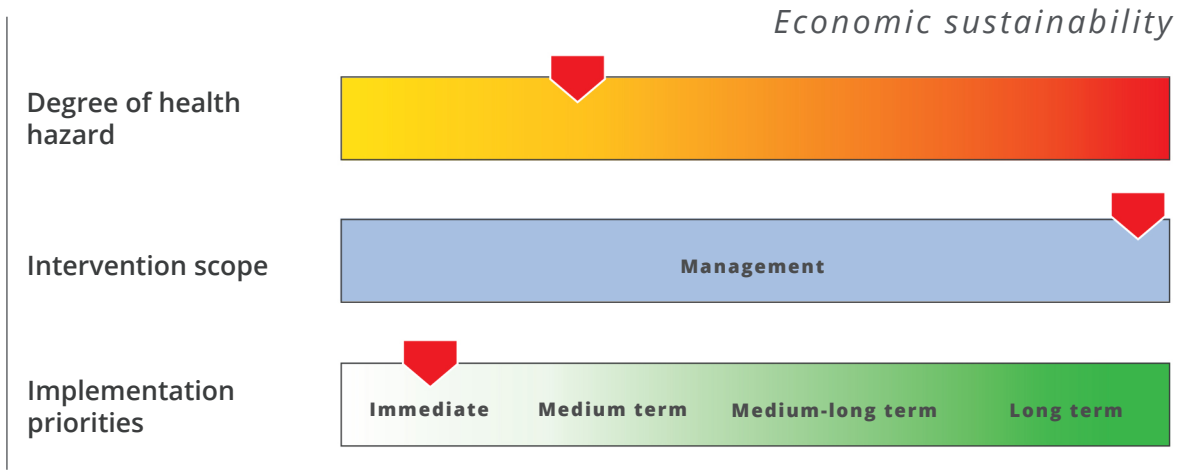
"Animals should be given a sufficient amount of long fibre daily to ensure proper ruminal function and to meet the need for foraging behaviour. This is especially important where the diet is based on concentrates or low fibre corn silage. The long fibre feed supplied must be at least 10%" *(SCAHAW, 2001; Recommendation 14; Section C Feeding).*

"Rations for finishing cattle should include at least 15% physically effective fibre to reduce the risk of rumen bloating, sub-acute acidosis (SARA) and its consequences. To control the risk of SARA, the food supplements to be used should stabilise the rumen pH through a natural buffer action, rather than exercising selective manipulation of the rumen microorganisms" *(EFSA Journal 2012; 10(5):2669; 3.5.3 Nutrition and Feeding; Recommendation 2).* The optimal approach for the nutritional management of the fattening phase is the administration of a ration with a high though balanced nutritional level, i.e. characterised by CFU > 1.00 and/or starch > 38% DM and/or NDF < 30% DM, and supplemented with sufficient buffers and additives capable of optimising ruminal function such as **prebiotics, probiotics, natural extracts** and mycotoxin inactivants *(Table 32).*

Table 32 – Nutritional level of the fattening phase diet

Exceeding*	Insufficient**	Balanced	Balanced with additives capable of optimising ruminal function***	High****, balanced and with additives capable of optimising ruminal function

*exceeding if > 1.08 CFU/kg DM and/or starch > 45% DM and/or NDF < 25% DM and/or insufficient buffers.
**insufficient if < 0.96 UFC/kg DM and/or starch < 35% DM and/or NDF < 35% DM.
***prebiotics, probiotics, natural extracts, inactivating mycotoxins.
****CFU > 1.00 and/or starch > 38% DM and/or NDF < 30% DM.



3.5 BIOSECURITY

The term "biosecurity" includes all the measures to be applied in order to prevent the introduction of new diseases and infections in a healthy population and limit their spread if present.

To be efficient, a biosecurity system must establish a precise set of actions on risk factors and management activities, including distinct actions and measures for prevention, prophylaxis, control and eradication.

A biosecurity system implemented in breeding is therefore represented by the set of management strategies, means and procedures aimed at preventing or limiting the introduction and spread of biological and chemical hazards that could cause pathological states in livestock or cause health problems for humans. The main purpose is certainly the prevention of diseases which, if ongoing, can worsen the health of farmed animals. In this way, at the same time, productivity and farm profitability are preserved. Finally, as a direct consequence, feed safety also increases and the risk to public health decreases.

Considering the typical characteristics of the production system, adopting biosecurity measures with the aim of 100% preventing the appearance of infectious diseases is extremely difficult. In fact, by breeding animals from different origins, the chance of pathogenic microorganisms entering the farm is impossible to avoid. Therefore, limiting the circulation of pathogens within the farm among the different production groups is fundamental and the territorial production system will be protected by limiting as much as possible any dissemination of these organisms outside the farm boundaries.

From a practical and operational point of view, a complete examination of all the diseases that can affect cattle breeding and of all the factors that can represent a health risk would require a large number of assessments. For this reason, similarly to what was proposed for the analysis of critical points in previous areas of beef cattle breeding, it was decided to extrapolate a series of observations that help the evaluator identify the major correlated risks as well as to better fulfil the regulatory requirements.

The aspects that are taken into consideration to complete the framework relating to biosecurity after reviewing the information on the management of feedlot animals in the farms of origin, the quarantine phase and the sanitisation procedures of the environments, will constitute the fight against pests and the regulation of accesses.

3.5.1.1 Rodents and insects

In fact, insects and rodents are responsible for both the spread and permanence of infections on farms, acting as biological and/or mechanical vectors (*Foil Lane D. and Gorham J. Richard, 2000; Daniels et al., 2003; ClassyFarm, Manual for the Assessment of Welfare and Biosecurity in Beef Cattle Breeding; verification item 43: General biosecurity procedures in the fight against rodents and insects).*

In addition to causing damage to feed, raw materials and livestock facilities, rodents can be vectors of various pathogens of interest concerning animal health and which can represent a health risk for beef production. Pathogens that may infect cattle by ingestion of infected food include: *Leptospira, Cryptosporidium, Mycobacterium avium subsp. paratuberculosis, Salmonella (Brockie RE, 1977; Daniels et al., 2003).* In light of all this, therefore, the control of rodents must take place through a defined, organic rat extermination plan detailed in a biosecurity manual that can be entrusted to a specialised company or managed internally.

Among insects, the most relevant organisms and whose management only provides benefits are flies, which can primarily be a direct cause of serious irritation and nervousness. In addition to causing high blood loss and depriving the host animal of multiple nutrients, some types of flies such as *Haematobia irritans, Stomoxys calcitrans, Tabanus sp. and Chrysops sp.,* generate a situation of continuous stress for the animal, which is detrimental to both animal health and productivity *(Taylor et al., 2012).* This stress is revealed through the appearance of various typical unnatural behaviours, such as continuously alternating the posture and the support of the weight on the limbs, stamping the feet, continuously shaking the head and tail and also, in some cases, skin spasms *(Dougherty et al. 1993, 1994; Mullens et al. 2006).* The time spent in decubitus also decreases, in case of heavy infestations by flies *(Vitela et al. 2006, 2007).*

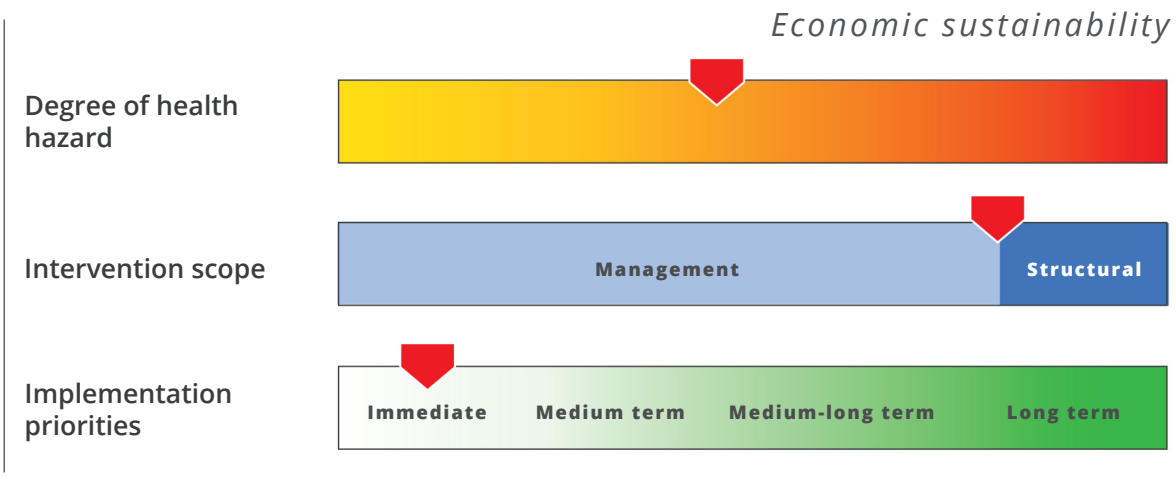
In the case of high levels of infestation, cattle tend to stay close to each other, which can lead to an increased risk of heat stress *(Wieman et al. 1992; Wellman 1973, Campbell et al. 1993).* In addition, they are also potential vectors of infectious diseases *(Byford et al., 1992).* To manage this issue, it would be advisable to schedule interventions (internally or through the intervention of an external company), more frequent in the summer-autumn period, aimed at controlling both adult forms and larvae. It is also useful to keep the rooms clean and dry, avoiding the accumulation of waste and dirt in areas that are difficult to access.
For both flies and rodents, the absence of specific documentation is unacceptable, the disinfestation carried out internally with internal documented protocol is improvable and the disinfestation carried out with specific documentation from a specialised company is optimal *(Table 33).*

3.5.1.2. Procedures for visitors and vehicles access

Finally, an significant way of introducing infectious agents into the farm is the entry of people and vehicles. **"The people and vehicles that, more or less habitually, enter the farm represent a possible vector of pathogens and a health risk factor"** *(ClassyFarm, Manual for the Assessment of Welfare and Biosecurity in Beef Cattle Breeding; Biosecurity Area, Management of the entry of strangers, Management of the entry of regular visitors).* Visitors can pose a major health risk on the breeding farm. People themselves, but especially their vehicles and clothing, can represent an important means of transmission for contagious diseases. It is therefore advisable to limit the visits of strangers to the farm to the minimum possible and, if necessary, to implement optimal biosecurity practices, such as disinfection and the use of specific or disposable clothing, aimed at restricting the risk (**DEFRA Guidance**, *2012 https://www.gov.uk/guidance/keeping-livestock-healthy-disease-controls-and-prevention).* Therefore, it becomes essential to avoid third party access, especially if they have contacts with other farms, through the display of clear prohibition signs and the installation of physical barriers, such as gates or bars. If the entrances are authorised, a register should be filled in order to document all visits to the farm. All good practices aimed at restricting health risks must also be implemented, such as disinfection of vehicles and wearing disposable clothing. The total absence of procedures is unacceptable; the implementation of partial procedures with the absence of written documentation is to be improved, and the implementation of well-defined procedures with the presence of written documentation is considered optimal *(Table 33).*

Table 33 - Biosecurity (rodents, flies and procedures for visitors and vehicles)

No specific documentation for rodents and flies and no procedures for visitors and vehicles	Partial specific documentation for rodents and flies and partial procedures for visitors and vehicles	Full internal documented protocol for rodents and flies and partial procedures for visitors and vehicles	Partial specific documentation for rodents or flies or partial well-defined procedures for visitors and vehicles with written documentation	Full specific documentation for rodents and flies and full well-defined procedures for visitors and vehicles with written documentation



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5.0 ANNEXES

5.0 ANNEXES – Checklist

FORM A – GENERAL ASPECTS

Company name: .....

Province.....

Total fattening cattle quantity: .....

Total stable stalls: .....

Total cattle slaughtered per year: .....

Prevailing breed: .....

Average mortality (dead animals/(slaughtered cattle + dead animals): .....%

Special emergency slaughter - SES (SES cases/(cattle slaughtered + SES cases): .....%

Respiratory events (1 therapeutic treatment): .....%

Chronic respiratory events (2 or more therapeutic treatments): .....%

Other health issues: .....

.....

1. ARRIVAL PHASE

a. Indicate the average health status at the arrival of the animals commonly housed (ITEM 4)

1.	2.	3.	4.	5.
Presence of several animals (~10%) with BRD or lameness and/or deceased animals	Minimal presence of animals with BRD or lameness and/or with traumatic injuries	No evidence of health impairment and non-deteriorated animals	Healthy lot	Very healthy appearance, reactive animals, absence of fatigue

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b. Available information on the vaccinations carried out in the breeding farm of origin with regard to the commonly housed animals (ITEM 5)

1.	2.	3.	4.	5.
No information	No vaccine prophylaxis	Prophylaxis for enterotoxaemia	Prophylaxis for enterotoxaemia and/or main respiratory viruses	Prophylaxis for enterotoxaemia and/or main respiratory viruses and bacteria

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c. Available information on the pathologies and any treatments performed in the breeding farm of origin with regard to animals commonly housed (ITEM 6)

1.	2.	3.	4.	5.
No information	Vague information about the farm of origin	Case history of pathologies	Case history of the pathologies and active ingredients used	No health issues

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d. Available information on the sanitary conditions (IBR - BVD) of the breeding farm of origin with regard to animals commonly housed (ITEM 7)

1.	2.	3.	4.	5.
No information	Coming from a farm not free from IBR and BVD	Animal vaccinated for IBR **and/or** BVD	Coming from a farm free from BVD and IBR	Coming from a farm free from BVD and IBR

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e. Indicate the average travel duration of animals commonly housed at the breeding farm (ITEM 9)

1.	2.	3.	4.	5.
> 48 hours and/or unforeseen events during transport	24 - 48 hours	12 - 24 hours	8 -12 hours	< 8 hours

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f. Available information on the stay in the collection centres/markets (date of departure from breeding farm of origin) of the animals commonly housed on the breeding farm (ITEM 12)

1.	2.	3.	4.	5.
No specific information	Long stay (> 1 day) with transit through multiple collection centres/markets	Long stay (> 1 day)	Short stay (≤ 1 day)	No transit

g. Health control procedures carried out in the first 5-7 days after unloading at breeding farm (ITEM 16)

1.	2.	3.	4.	5.
Control ≤1 time a day and/or from outside the boxes	Control once a day from inside the boxes	Control 2 times a day	Control > 2 times a day	Inspection control ≥ 2 times a day and/or individual daily temperature measurement

2. HEALTH

a. Indicate the vaccination protocol used upon arrival of the animals at the breeding farm (ITEM 17)

1.	2.	3.	4.	5.
Incomplete protocol	Full standard protocol (virus)	Full standard protocol (virus + bacteria)	Full protocol (virus + bacteria) based on the risk of the lot	Full protocol (viruses + bacteria) based on the isolation of pathogens

☐ **with recall**

☐ **without recall**

b. Indicate when prophylactic treatments are carried out upon arrival of the animals at the breeding farm (ITEM 20)

1.	2.	3.	4.	5.
At the time of unloading regardless of the condition of the animals	At the time of unloading	One or two days after unloading	With timing depending on the conditions of the animals*	With timing and methods** depending on the conditions of the animals

*postponing the vaccination in case of impaired health status
**intra-nasal administration in addition to the classic parenteral route

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c. Indicate whether mass preventive antibiotic treatment is carried out in the lots at risk in the days following their arrival at the breeding farm, and the active ingredient used (ITEM 21)

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d. Indicate the methods for choosing the active ingredients for antibiotic therapy at the breeding farm (ITEM 22)

1.	2.	3.	4.	5.
Based on suspension times and/or cost	Based on the number of administrations (single or for several days)	According to standard protocols	Based on the veterinary surgeon's decisions or on epidemiological studies	Based on the isolation of pathogens and their sensitivity

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e. Indicate if anti-inflammatories and/or painkillers are used on the farm (ITEM 24)

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3. FEEDING

a. Indicate the type of feeding at the farm (ITEM 58)

1.	2.	3.	4.	5.
Separate forages and concentrates	Separated forages and concentrates but with concentrate fibre	Unifeed	Homogeneous Unifeed	Homogeneous, structured and non-selectable Unifeed

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b. Indicate feed availability (ITEM 59)

1.	2.	3.	4.	5.
Rationed* with 1 daily supply	Rationed* with more daily supplies	Ad libitum with a daily supply	Ad libitum with 2 daily supplies	Ad libitum with more daily supplies and in relation to the climate

*Rationed feeding in case of evident absence of feed in the feeding trough during the visit with anxious animals that lick the bottom of the same

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c. Indicate the accuracy and precision in diet implementation (ITEM 61)

1.	2.	3.	4.	5.
Improvised and unregistered diet	Diet formulated by an experienced professional but without registration	Diet formulated by an experienced professional and registration of the quantities loaded	Presence of a system for recording the quantities loaded and mixing times	Periodic critical analysis of data (performed at least once a week)

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d. Indicate the quality and safety control on feed (ITEM 62)

1.	2.	3.	4.	5.
No control	Occasional control of the chemical characteristics	Occasional control of the chemical and sanitary characteristics (mycotoxins, other contaminants, etc.)	Periodic control of the chemical and sanitary characteristics (mycotoxins, other contaminants, etc.)	Periodic control of the chemical and sanitary characteristics and of the physical characteristics of the diet*

*control of the physical characteristics of the diet via sieving or spectrophotometry (e.g. NIR)

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e. Indicate the nutritional level of the diet for the fattening phase (ITEM 67)

1.	2.	3.	4.	5.
Exceeding*	Insufficient**	Balanced	Balanced with additives capable of optimising ruminal function***	High****, balanced and with additives capable of optimising ruminal function

*exceeding if > 1.08 CFU/kg DM and/or starch > 45% DM and/or NDF < 25% DM and/or insufficient buffers.
**insufficient if < 0.96 UFC/kg DM and/or starch < 35% DM and/or NDF < 35% DM.
***prebiotics, probiotics, natural extracts, inactivating mycotoxins
****CFU > 1.00 and/or starch > 38% DM and/or NDF < 30% DM.

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4. SICKBAY

a. Indicate if there is a specific structure used only to isolate sick or injured animals (ITEM 39)

1.	2.	3.	4.	5.
Absent	Non-specific, breeding box	Specific but adjacent to the breeding boxes (open walls)	Specific but adjacent to the breeding boxes (blind walls)	Specific and isolated

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b. Indicate the structure type of the sickbay (ITEM 40)

1.	2.	3.	4.	5.
Fully cracked	Partially cracked	Cracked with rubber	Permanent bedding without external paddock	Permanent bedding with external paddock (on the ground)

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c. Indicate the cleaning and disinfection procedures before introducing new feedlot animals (ITEM 44)

1.	2.	3.	4.	5.
No procedure	Only poor removal of manure and/or disinfection of dirty environments	Manure removal and washing	Manure removal, washing and disinfection	Manure removal, washing, disinfection and sanitary vacuum

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d. Indicate isolations methods for sick or injured animals (ITEM 45)

1.	2.	3.	4.	5.
No isolation	Insulation only in extreme conditions	Late, after two or more treatment failures of relapses	Immediately, after inadequate response to treatment of a relapse	Always and promptly upon evidencing that the animal suffers from staying in a group or has a contagious pathology

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5. BIOSECURITY

a. Indicate if there are control plans for flies certified pursuant to specific documentation in the farm:

☐ NO (no specific documentation)

☐ YES (internally with internal documented protocol)

☐ YES (with specific documentation from a specialised company)

b. Indicate if there are control plans for rodents certified pursuant to specific documentation in the farm:

☐ NO (no specific documentation)

☐ YES (internally with internal documented protocol)

☐ YES (with specific documentation from a specialised company)

c. Procedures for visitors/strangers access (logbook, signs, physical barriers, disposable shoes and gowns, clothing left in the farm, changing room area, etc.):

☐ total absence of procedures

☐ implementation of partial procedures (absence of written documentation)

☐ implementation of well-defined procedures (with written documentation)

Note: a, b, c are used to calculate ITEM 70

FORM B - ADAPTATION PHASE/QUARANTINE

Building no. .....

(form to be repeated for each building used for adaptation/quarantine)

a. Indicate if there is a specific adaptation/quarantine area (ITEM 25)

1.	2.	3.	4.	5.
Absent and direct discharge in the fattening boxes	Specific, isolated, but not always used	Specific, but adjacent to the breeding boxes (open walls)	Specific, but adjacent to the breeding boxes (blind walls)	Specific, isolated, and always used

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b. If applicable, indicate the duration of the adaptation/quarantine period (ITEM 26)

1.	2.	3.	4.	5.
0	< 20 days	20 - 30 days	31- 40 days	In relation to the health status of the lot

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c. Maximum number of animals housed ☐ **no.** .....

d. Final weight of the animals on exit ..... kg

e. Total housing area ☐ m2

Note: c, d, e are used to calculate ITEM 29

f. Average number of animals per box (ITEM 28) ☐ **no.** .....

g. feeding type: ☐ **Rationed** ☐ **Ad libitum**

h. Total length of the rack (in the absence of delimited places)

..... m

i. Number of places in the rack (in the presence of delimited places) .....

Note: c, d, g, h, i are used to calculate ITEM 30

I. Indicate the presence of an adequate summer emergency ventilation system (ITEM 34).

1.	2.	3.	4.	5.
Building without fans	Building with vertical fans (traditional)	Building with vertical (traditional) fans and automatic ventilation control	Building with destratifying fans (helicopters)	Building with destratifying fans (helicopters) and automatic ventilation control

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m. The housing has a resting area with bedding:

☐ Yes
☐ NO

no. Indicate the total quantity of bedding .....

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o. Indicate the frequency of distribution of the bedding: .....

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Note: m, n, o are used to calculate ITEM 36.

s. If there is an adaptation/quarantine area, indicate the cleaning and disinfection procedures before introducing new feedlot animals (ITEM 37)

1.	2.	3.	4.	5.
No procedure	Only poor removal of manure and/or disinfection of dirty environments	Manure removal and washing	Manure removal, washing and disinfection	Manure removal, washing, disinfection and sanitary vacuum

t. If there is a quarantine area, indicate the duration of the sanitary vacuum before introducing new feedlot animals (ITEM 38)

1.	2.	3.	4.	5.
Not carried out	For < 5 days	For 5 - 15 days	15 - 30 days	More than 30 days

u. Indicate the availability of forage upon arrival of the animals at the breeding farm (ITEM 63)

1.	2.	3.	4.	5.
Not available	Hay only on 1st and 2nd day from arrival or as needed	Hay rationed over the first 7 days	Hay always available during the first 7 days	Hay available in relation to the health characteristics of the lot

v. Indicate if there is a specific diet for the adaptation phase (ITEM 64)

1.	2.	3.	4.	5.
Use of a non-specific rationed diet	Use of a non-specific ad libitum diet	Using a non-specific diet obtained by adding forage to other diets	Use of a specific diet suitable due to its chemical and physical characteristics*	Use of a specific diet suitable due to its chemical and physical characteristics and integrated with nutraceutical additives**

*Specific adaptation diet with CFU ≤ 0.88 kg/DM and PG < 13% DM.
**Examples of nutraceutical additives: prebiotics, probiotics, natural extracts, organic minerals, inactivating mycotoxins, hydro and fat-soluble vitamins

FORM C - FATTENING PHASE
Building no. .....

(form to be repeated for each different building housing fattening animals)

a. Number of identical fattening buildings (excluding this one) .....

b. c. Maximum number of male animals housed .....

c. Final weight of male animals on exit ..... **kg**

d. Total housing area (males) **m2**

e. Average number of male animals per box (ITEM 46) .....

f. Total length of the rack (in the absence of delimited places).....

g. Number of places in the rack (in the presence of delimited places) .....

h. Maximum number of female animals housed .....

i. Final weight of female animals on exit ..... **kg**

l. Total housing area (females) **m2**

Note: b, c, d, h, i, l are used to calculate ITEM 48.

m. Average number of male animals per box (ITEM 46) .....

n. Total length of the rack (in the absence of delimited places) .....**m**

o. Number of places in the rack (in the presence of delimited places) .....

Note: b, c, f, g, h, i, n, o are used to calculate ITEM 49.

p. Indicate the presence of an adequate summer emergency ventilation system (ITEM 55)

1.	2.	3.	4.	5.
Building without fans	Building with vertical fans (traditional)	Building with vertical (traditional) fans and automatic ventilation control	Building with destratifying fans (helicopters)	Building with destratifying fans (helicopters) and automatic ventilation control

q. Indicate the cleaning and disinfection procedures before introducing new animals (ITEM 57)

1.	2.	3.	4.	5.
No procedure	Only poor removal of manure and/or disinfection of dirty environments	Manure removal and washing	Manure removal, washing and disinfection	Manure removal, washing, disinfection and sanitary vacuum

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