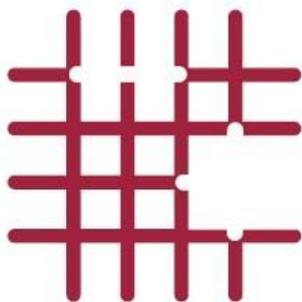


# Humane livestock farming



COUNCIL ON  
ANIMAL AFFAIRS



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## Procedure

This advisory report from the Council on Animal Affairs (*Raad voor de Dierenaangelegenheden*, RDA) was drawn up by a working group of Council members consisting of Prof. G.M. van Dijk (chair), Dr G.B.C. Backus, G.P. van den Berg, Prof. L.A. den Hartog, A.L. ten Have-Mellema, Prof. B. Kemp, Prof. T.B. Rodenburg, J. Staman LLM DVM and Dr J.W.G.M. Swinkels.

The working group was assisted by deputy secretaries R. Pothoven MSc and Dr T.J. Bergstra and secretary M.H.W. Schakenraad MSc of the RDA team.

The group held 11 meetings for the purpose of preparing the report.

The draft advisory report was submitted to the entire Council and to the RDA Junior Network for assessment. Accordingly, this advisory report is a product of the Council as a whole.

# 1. Introduction

## 1.1 Background and reason

'The State of the Animal in the Netherlands' (published by the RDA in 2019a), while reflecting a widespread positive assessment of the way animals are kept in the Netherlands and of associated developments, also expresses concern in society about the living conditions of animals in livestock farming. This has to do with the high productivity requirements, the short lives of animals, limited living space, the climate in the stables and the limited opportunities for the animals to perform their natural behaviour. These concerns are also reflected in a public survey commissioned by the RDA<sup>1</sup> (Kantar, 2018), which shows that the way animals are being kept is widely felt to be an important issue and one that many have strong opinions about.

In the past, the Council has repeatedly focused on particular aspects of livestock farming. While concerns about animal welfare (including animal health)<sup>2</sup> are nothing new, they are a growing focus of attention of the Council, as also reflected in the number of its publications devoted to this issue. Here are some examples of RDA Advisory Reports on the subject:

- 'Animal welfare in circular agriculture' (RDA, 2020) concluded that a high level of animal welfare (and not just animal health) should serve as the basis for all types of agriculture, including circular agriculture. Specific attention to animal welfare is necessary because the circular agriculture concept does not automatically recognise animal welfare as being part of our societal values.
- In 2019 another advisory report, 'Digitisation of the livestock farming sector' (RDA, 2019b), highlighted the fact that the use of new digital technology in livestock farming entailed both threats and opportunities in terms of animal welfare.
- In 2016 the RDA produced an 'Assessment Framework for Production Animals' (RDA, 2016a), which addresses the question of which animal species should be permitted for use as production animals. To answer that question, the RDA designed a step-by-step approach that also considers, for example, the impact of a particular livestock farming system on the welfare and health of the animals involved.
- In the advisory report entitled 'Getting a grip on intervention' (RDA, 2013), the RDA developed an assessment tool for decisions on whether or not to perform (or permit) interventions in animals that would affect their welfare or integrity.

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<sup>1</sup> With 2,010 Dutch respondents between 18 and 69 years of age, representative for the Dutch public (weighted for gender, age, level of education, ethnicity, region, degree of urbanisation and household size).

<sup>2</sup> In this advisory report, every reference to animal welfare is understood to include animal health.

- 2010 saw the publication of the advisory report 'Responsible Animal Keeping' (RDA, 2010), in which the Council argues that while it is permissible to keep animals, this should be subject to restrictions and conditions. The document also discusses the respective responsibilities of the government, livestock farmers and other parties when it comes to keeping animals and animal welfare.
- In 2006, in its advisory report entitled 'Natural behaviour of laying hens and broilers' (RDA, 2006) the RDA recommended that poultry farming systems should introduce better opportunities for laying hens and broilers to perform their natural behaviour.

'The State of the Animal in the Netherlands' (RDA, 2019a) concludes that the welfare of farm animals has improved considerably over the past 25 years. For example, veal calves are now housed in groups, and roughage has become a fixed component of their diet. Dairy cows have been given much more space to move in open housing systems. Sows are now kept in groups, have more space per animal and more tools and toys to prevent boredom. The standard practice of castrating male pigs has been abandoned. Laying hens may no longer be kept in battery cages, and the practice of beak-trimming has been banned. Due in part to the health and welfare requirements that it must meet as a major export country, the Netherlands now has one of the healthiest animal populations in Europe.

However, despite these developments livestock farming continues to struggle with persistent and new welfare issues. Examples include physical interventions such as tail-docking, problems caused by cramped housing, boredom due to lack of stimuli, morbidity and mortality of young animals, long-distance transports and issues associated with social behaviour. Making the necessary improvements to the current livestock farming system will prove a difficult task. A range of developments are under way to further improve the welfare of farm animals. These include quality labels for more animal-friendly food products (such as the 'Better Life' label) and embedding animal welfare as a criterion in quality systems. The livestock farming sector is also being asked to transition towards circular agriculture.

Solutions intended to improve conditions for the animals are usually conceived and designed from within the existing systems. Most of the time, the focus is on preventing disease, pain and suffering (negative welfare: the absence of discomfort). However, the mere prevention of negative welfare does not mean that positive welfare is achieved. For positive welfare in livestock farming, animal husbandry systems need to be developed from the perspective of the animals concerned. Conventional livestock farming however was developed first and foremost from the perspective of affordable food supply, rather than animal welfare. Likewise, the desired transition towards circular agriculture is still focused

on closing nutrient cycles and on environmental effects, rather than on animal welfare. Even so, new systems have been introduced that do reflect the positive animal welfare approach. Examples include Rondeel and Kipster (for laying hens), Dartelstal and Familievarken (for free-range pigs) and the Kwatrijnstal (for dairy cows). However, these systems are not particularly common yet and their spread appears to stagnate. The socio-economic context of livestock farming plays a crucial role in this regard.

## ***1.2 Questions and reading guide***

In her letter to Parliament on Sustainable Livestock Farming (dated 4 September 2019), the Minister of Agriculture, Nature and Food Quality (LNV) explained how she intends to shape the transition towards circular agriculture (LNV, 2019). Within this context, by letter dated 5 February 2021 (see Appendix 1 for the full text) the Minister asked the Council to draw up an advisory report that discusses the needs of animals that must be fulfilled for the animals to experience positive welfare in livestock farming. The Minister asked the Council the following question:

*'What are the preconditions to be fulfilled in future livestock farming to ensure a positive welfare experience for the animals involved?'*

And the following sub-questions:

- 1. 'What are the phrases "humane" and "positive welfare" understood to mean?'*
- 2. 'What are the physiological (including animal health-related) and ethological needs of farm animals to be satisfied to ensure positive animal welfare?'*
- 3. 'What measurable parameters could be used to determine whether those needs are met? What is already available and what will need to be developed?'*
- 4. 'How will future animal husbandry systems help to facilitate those needs?'*

The Minister's questions are about future forms of livestock farming and are formulated within the context of the transition towards circular agriculture and sustainable livestock farming. In this advisory report, the Council uses the term 'humane livestock farming' to denote future livestock farming systems that enable animals to experience positive welfare.

The report examines the requirements imposed on humane livestock farming from the animal's perspective, and explores the perspectives for action in Dutch policy to realise humane livestock farming within the given socio-economic context.

Chapter 2 describes the guiding principles for humane livestock farming from the animal's perspective that enable the animals concerned to experience positive welfare (answers to the main question and sub-questions 1, 2 and 3).

Chapter 3 explains how our 'view of animals' guides and determines the development of livestock farming, and how the guiding principles should be interpreted in the development of new farming systems (answer to sub-question 4).

Based on two different livestock farming systems which, given the socio-economic context, might develop into the dominant approaches of the future, Chapter 4 describes a number of critical development milestones for ensuring those systems are 'humane'. This chapter also outlines several perspectives for policy action to realise humane livestock farming in the Netherlands.

Finally, in Chapter 5 we present our conclusions and recommendations.

## 2. Guiding principles to ensure humane livestock farming

Principles constitute a substantive point of departure from which to approach a particular issue. While their status is not carved in stone, principles do tend to be stable. Principles are more than mere rules of thumb used to speed up decision-making: they are fundamental starting points. Even so, they should not be deemed to be entirely beyond discussion. Sometimes principles come into conflict with each other, for example when the principle of being good to an animal clashes with the principle of avoiding environmental damage. In addition, principles need to be fleshed out in concrete terms, which offers some room to include other considerations in the process, for example regarding time and place.

This is why the RDA does not see humane livestock farming as a fixed concept, strictly defined by the Council itself. In this advisory report we use principles to outline the playing field for the development towards humane livestock farming. As such, the report offers possible directions rather than definitions or a prescribed route.

This serves as the background for a description in this chapter of the guiding principles that livestock farming should fulfil to be truly humane, and of the consequences of the choice for humane livestock farming.

### 2.1 *The intrinsic value of animals in livestock farming*

In the Netherlands, the intrinsic value of animals was recognised several decades ago as the point of departure for policy and regulation regarding the way we deal with animals. Indeed, the intrinsic value of animals was already mentioned in the Experiments on Animals Act from 1977 and the Flora and Fauna Act from 2002, and has been included, since 2013, in Section 1.3, subsection 2 of the Animals Act:

*'Recognition of intrinsic value as referred to in Subsection 1 is understood to mean recognition of the value that animals possess in their own right as sentient beings. In drawing up rules under or pursuant to this Act, and in taking decisions on the basis of these rules, due consideration shall be given to the impact of these rules or decisions on the intrinsic value of the animal, notwithstanding other legitimate interests. In all cases, any violation of the integrity or well-being of animals, beyond what is reasonably necessary, shall be avoided and the care reasonably required by the animals guaranteed.'*

Humane livestock farming, therefore, is first and foremost a system of livestock farming that recognises the intrinsic value of animals and translates this into the prevention, where possible, of any violation of the integrity and welfare of animals.

### *The integrity and specific nature of the animal*

In addition to its link with the absence of structural or substantial violation of animal welfare, including animal health - a concept to be discussed in further detail from an animal science perspective in the following sections - the recognition of the animal's intrinsic value is also connected to the concept of animal 'integrity'. The concept of integrity is often used in combination with the term 'specific nature'. When essential species-specific characteristics have disappeared, the integrity of the animal has been violated. There are several ways in which this can happen. One example is an intervention to physically change parts of the body or their function. Think of practices such as castration, or eliminating an animal's need to root in the soil through selective breeding programmes or genetic modification. Other examples are tail-docking in pigs and trimming the beaks of laying hens - practices which cause temporary pain and discomfort, but serve to avoid further damage through harmful behaviour (tail-biting and feather-picking) if the causes of such behaviour are not removed. However, integrity also concerns an animal's capacity to survive independently in an environment suited to its needs (Rutgers & Heeger, 1999), and is also violated, therefore, when we make the animal more dependent on our care (however good that care may be). In this advisory report we have restricted ourselves to considering integrity in terms of the physical wholeness and intactness of the animal.

Humane livestock farming respects the integrity of the animal. In other words, it strives to achieve farming practices without physical interventions such as beak-trimming, tail-docking and disbudding. It also means that limits are imposed on modifications to animals through breeding programmes, and that any such modifications should not compromise the animal's integrity. However, breeding programmes with a focus on functional characteristics such as social behaviour, health, lifespan, behaviour in groups and robustness can of course contribute to humane livestock farming. In addition, humane livestock farming recognises the animal's intrinsic interests, which offers opportunities to ensure a good quality of life for the animal. This is elaborated in the sections below.

## ***2.2 What do the phrases 'humane' and 'positive welfare' mean?***

We use the 'Denkkader Dierenwelzijn' (Conceptual Framework Animal Welfare) from 2018 as the basis for our concept of humane livestock farming that affords positive welfare experiences for the animals concerned. From the 1960s, animal welfare was approached predominantly from the perspective of preventing welfare problems (pain, fear, stress,

disease) and satisfying basic needs (good feeding, good housing and good health). New scientific insights have helped shift the attention to the animal's experience of its condition and an emphasis on positive experiences such as enjoyment, contentment, affection and euphoria.

By asking 'What does the animal want?', we are forcing ourselves to consider animal welfare from the perspective of the animal's own perception and experience as much as possible. In this light, the 'Five Domains Model' of David J. Mellor (2016) offers a relevant approach. In this model, the five freedoms (Farm Animal Welfare Council, 1993) serve as a basis for considering the effects on the animal's experience if one or more of those freedoms are respected or ignored. This approach removes some of the emphasis on satisfying basic needs, in favour of the emphasis on a 'life worth living' for the animal (Figure 1).

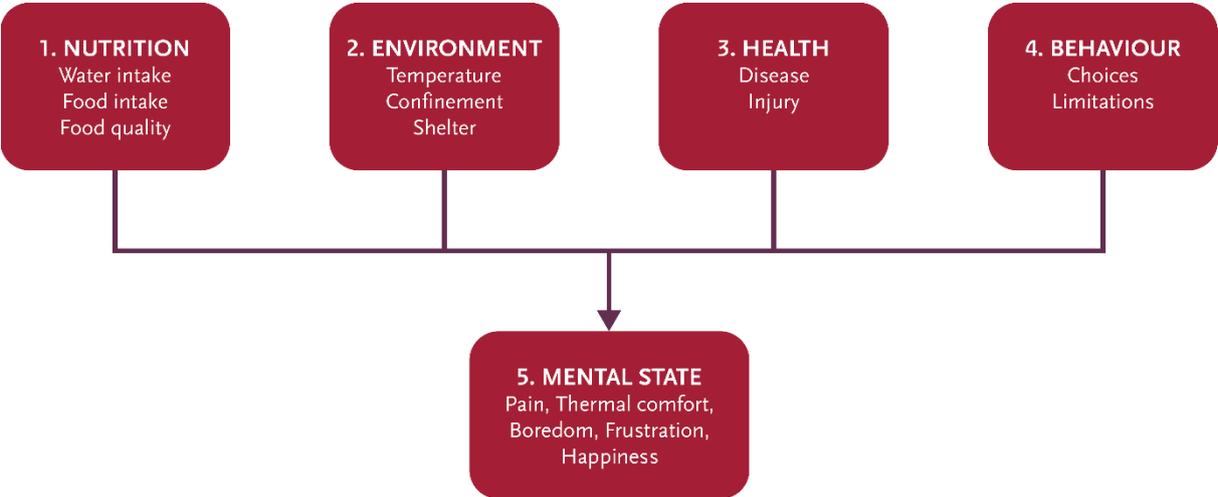


Figure 1. The Five Domains Model, with changes in nutrition, environment, health and behaviour resulting in changes in the animal's mental state (Mellor, 2016).

In this model, the animal's behavioural options (Domain 4) form the link between satisfying basic needs (Domains 1 to 3) and the animal's mental state (Domain 5), or the way in which the animal experiences its own situation. To better illustrate this relationship, Figure 2 offers an adapted version of Mellor's Five Domains Model.

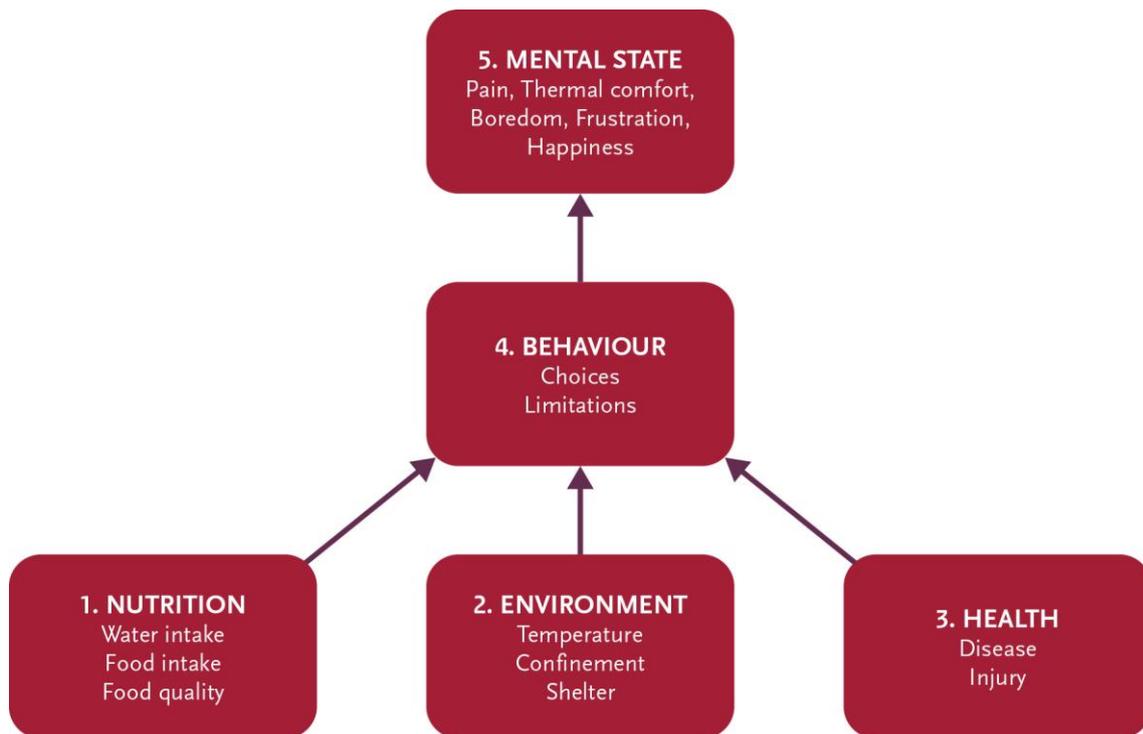


Figure 2. Adapted version of the Five Domains Model (adapted from Mellor, 2016).

Mellor distinguishes between domains that are directly associated with survival (nutrition, physical environment and health) and the domain of natural or normal behaviour. This also illustrates that while a confined environment, such as a chicken cage, may perfectly ensure the animal's survival, it fails to provide positive welfare due to excessive limitations on the chicken's natural behaviour. In this case, several of the animal's behavioural needs (such as nesting, foraging and pecking, resting on a perch) remain unfulfilled.

To determine which natural behaviours must be recognised as meaningful for the positive experiences of captive animals it is required that the animal has the possibility to follow its intrinsic preferences, to choose among options and to control the environment. Behaviour that supports such positive experiences under these conditions is considered the most meaningful for farm animals.

Another attractive feature of the model is the relationship between the negative and positive effects on each of the four domains on the one hand, and the effects on the animal's mental state on the other. This is illustrated in Figure 3 (although perhaps Mellor's terms do reflect a rather anthropomorphic approach). In the end, animal welfare essentially depends on the capacity of the animal to engage effectively with its environment so as to achieve a state that the animal itself experiences as positive. This also offers opportunities for further thought on suitable parameters that can be used to judge how an animal feels and to assess whether it can indeed be deemed to lead a life worth living (see section 2.4).

Physical/Functional Domains					
Survival-Related Factors			Situation-Related Factors		
1. Nutrition	2. Environment		3. Health	4. Behaviour	
Negative	Positive	Negative	Negative	Negative	Positive
Restricted water & food; poor food quality	Enough water & food; balanced and varied diet	Uncomfortable or unpleasant physical features of environment	Physical environment comfortable or pleasant	Disease, injury and/or functional impairment	Healthy, fit and/or uninjured
<b>Affective Experience Domains</b>					
5. Mental State					
Negative Experiences			Positive Experiences		
Thirst	Breathlessness	Anger, frustration	Drinking pleasures	Vigour of good health & fitness	
Hunger	Pain	Boredom, helplessness	Taste pleasures	Maternally rewarded	
Malnutrition malaise	Debility, weakness	Loneliness, depression	Chewing pleasures	Excited playfulness	
Chilling/overheating	Nausea, sickness	Anxiety, fearfulness	Satiety	Goal-directed engagement	
Hearing discomfort	Dizziness	Panic, exhaustion	Physical comforts	Calmness, in control	
<b>Welfare Status</b>					

Figure 3. Elaboration of the Five Domains Model in terms of the effects of positive and negative factors within each of the five domains on negative and positive feelings in animals (Mellor, 2016).

### ***2.3 What needs of farm animals must be satisfied for positive welfare?***

Generally speaking, the physiological and ethological needs as formulated for animal-oriented design (see also section 3.2) are fairly similar for the various types of farm animals (mammals and birds) and can also be classified effectively in Mellor's five domains. While of course some needs are specific to individual species, even those may be part of the same cross-species category. For example, the sniffing and rooting of pigs and the scratching and pecking of chickens are all expressions of exploratory behaviour. Both pigs and chickens show very strong exploratory behaviours. Their wild ancestors spent most of their time exploring and foraging. This strong urge to explore has survived in domesticated pigs and chickens, even when they do not need to look for food and simply find it in front of them. So these behaviours are intrinsically rewarding for the animal concerned, even if they are not required to find food. If the animals are unable to sufficiently engage with soil, humus or some other substrate material, they risk developing abnormal behaviours aimed at their other captive companions, such as tail-biting in pigs and feather-picking in hens. Important behavioural needs can be identified for most farm animals. Examples are exploring, foraging, social behaviours and grooming. Long-term suppression of such behaviours will result in abnormal behaviour, and once they become possible again the animals will show a particularly strong compensatory rebound. Think of cows running and frolicking in the fields when first allowed outside after a long winter. Specific behaviours also require specific environments. For example, chickens can only scratch and peck for food if there is soil and humus available, pigs need mud to take a bath and cows can only graze outside. Incidentally, this also raises the question of whether all animals actually feel the need to go outside. When given the chance, dairy cows do prefer spending much of the time outside, especially at night. There are also indications that cows that are allowed to graze outside possibly feel better than cows kept permanently indoors (Crump et al., 2021). Moreover, various studies suggest that this could also apply to other animal species.

Comparing outdoor grazing or outdoor housing with indoor housing is a complex exercise, given the multitude of factors involved. These include positive aspects such as extra space, a different substrate for the animals to stand and walk on with potential positive effects on their claws and legs, as well as negative aspects such as increased exposure to the weather and to pathogens (e.g. worm infections and avian influenza in poultry caused by migratory birds), which in turn require solutions such as shelter, worming and vaccination.

The main thing, as these examples show, is that animals should be given a choice and hence that they need a varied environment. The key considerations to bear in mind, therefore, are the behavioural needs of the species concerned and the associated demands on their environment.

Below is the list of the principal needs of a pig (selected from a list of over 50 needs), from the report entitled 'What does a pig want?' (Project Team for Animal-Oriented Design for pigs, 2009). These needs are comparable to the positive experiences mentioned in Domain 5 arising from Domains 1 to 4 (Figure 3). These categories are equally applicable to other farm animals, although the specific needs may differ.

- Rest
- Nutrition and drink
- Defecating and urinating
- Grooming
- Exploration
- Social behaviour
- Thermoregulation
- Security
- Health
- Movement
- Reproduction
- Sexual behaviour
- Nest-building behaviour
- Maternal behaviour

In today's farm animals, these needs cannot be linked directly to their wild ancestors. In the course of their domestication process, farm animals have changed. The past 70 years in particular have seen huge changes with strong selection for high productivity and efficiency. Even so, studies like those of Schutz et al. (2001) and Lindquist et al. (2002) show that even domesticated laying hens still have some 'wild genes' in them. If you give red junglefowl (the wild progenitor of modern chickens) and white leghorns a choice between easily available feed and feed hidden among wood shavings, the junglefowl are more likely to opt for the hidden feed. However, the white leghorns still display a strong urge to scratch and peck and are also interested in the hidden feed. Similar studies have been done on pigs, for example in Edinburgh Pig Park (Scotland). When domesticated pigs are set free in a natural environment, a whole range of natural behaviours re-emerge (Wood-Gush et al., 1990). For example, sows will build a nest when they are about to farrow (Sterksel, 2012) and show their natural maternal behaviour. This indicates that while the strength of certain behavioural needs may have changed, those needs and the behavioural repertoire of modern farm animals are probably still very similar to those of their wild ancestors.

An animal's behavioural options are influenced by its physical environment (housing) but also, to a considerable extent, by its social environment. The social environment and group dynamics play an important role both in positive and negative social interactions. Both the genetic make-up of animals in a group and the environment in which the group is kept are key factors in the social development of individual animals and of the group as a whole. Changes in group composition can lead to negative effects on welfare, such as fights to

establish a hierarchy when pigs that do not know each other are put together in a group. A stable social group can serve as an important basis for positive welfare experiences, and animals within a group can help each other deal with stressors (social support).

In summary, the scientific data suggest that for an animal to experience positive welfare it needs to have sufficient opportunities to perform essential natural behaviours and meet its needs, such as resting, foraging, drinking, defecating and urinating, grooming, social behaviour, thermoregulation, safety, health, movement, reproduction, sexual behaviour, nest-building behaviour and maternal behaviour. For certain types of behaviour the intrinsic urge is so strong that the lack of an opportunity to express it amounts to a negative experience for the animal concerned (for example, when chickens and pigs are deprived of the possibility to scratch or root in the soil, respectively, they may resort to feather-picking and tail-biting). At the same time, measures will have to be taken to prevent opportunities for social behaviour from causing new welfare problems (often among other animals). We need to explore the possibilities for husbandry systems that also allow for these types of behaviour.

In addition, it must be emphasised that while it is important to give animals sufficient opportunity to perform essential natural behaviours, this does not necessarily have to be done in a natural environment. The positive experiences arising from natural behaviours do not necessarily require an authentically natural environment such as the one their wild ancestors lived in. For example, while our chickens' ancestors found shelter in trees, domesticated chickens seem perfectly content with a perch.

## 2.4 *What measurable parameters are available for positive welfare?*

In order to determine the extent to which animals' needs for positive welfare are being fulfilled ('A life worth living'), we need to measure welfare using animal-related parameters (see also Figure 3). Possible indicators of animal welfare mentioned in the Conceptual Framework Animal Welfare (RDA, 2018) are the following:

- Positive social behaviours such as play, all forms of grooming, resting and eating (or foraging) in each other's company, exploration;
- Abnormal behaviours such as stereotypical behaviour, excessive aggression, apathy and causing harm to themselves and other animals;
- Mental state: posture (of body parts), emotions, cognitive bias<sup>3</sup>;
- Physical injuries: conditions and injuries such as stomach ulcers, lung conditions, leg injuries, tail injuries, lameness and premature death;
- Physiological indicators, with a focus on relative differences between hormone levels and dynamics in measured values.

Stress and pain are not negative by definition. For example, they can serve as biological incentives for the animal to groom itself, withdraw or adapt to a particular change. However, stress and pain should not be too frequent or prolonged. The combination of an animal's stress-sensitivity and the pressure it is under determines in part the extent it can bear further strain. For example, unfavourable farming conditions can cause an animal to be overburdened ('allostatic load' (Korte et al., 2007)) and compromise its ability to adapt. When pigs are deprived of the possibility to explore and forage, they show more abnormal behaviour (such as bar-biting and tail, ear, and flank-biting) and impaired resistance to disease. On the other hand, a completely stress-free life is both impossible and undesirable, because it will lead to apathy and boredom. Indeed, stress can be a functional, positive state (e.g. excitement about a pleasant experience, such as the ability to mate or run out into the open, can result in increased stress-hormone levels in the blood, and animals can experience a great sense of satisfaction after having overcome a threatening or otherwise negative situation).

In a European context, the Welfare Quality project of the EU strongly contributed to the intention to assess animal welfare using animal-related assessment parameters. So far, animal welfare assessments have largely focused on and measured the animal's environment: How much space does the animal have? How many drinking nipples are

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<sup>3</sup> Cognitive bias: studies in which animals are taught, for instance, that a red signal announces a reward and a yellow signal does not. Researchers then register the extent to which an animal expects a reward when the signal is orange. The assumption is that animals in a positive mental state will interpret orange as red, which is a positive signal, and expect a reward, while animals in a negative mental state will tend to interpret orange as yellow, which is a negative signal, and in consequence do not expect a reward.

available?, etc. What has been mostly lacking thus far is a consideration of the effects of this on the animal and its mental state (see Figures 1 and 2; Mellor, 2016). Within the Welfare Quality project (<http://www.welfarequality.net/en-us/home/>), every effort is being made to find animal-related welfare indicators, organised within four domains based on the Five Freedoms:

- 1) Good feeding
- 2) Good housing
- 3) Good health
- 4) Natural Behaviour (including Positive Emotions)

This approach has proved to be quite fruitful and has generated a great deal of alignment and agreement on welfare assessment within the EU. However, reliably measuring an animal's mental state in real-life circumstances has remained a challenge. In many cases, moreover, measurements took place during one-off farm visits, which gives further reason to doubt whether this is the best way to obtain a reliable picture of the animals' state of welfare and of how they experience their environment. It has also become clear that any welfare benchmark should be fairly simple and straightforward and that the measurement itself should take little time if it is to be useful in practice.

Currently, several projects are exploring the possibilities for developing a simplified instrument that would enable a vet, other farm advisers or the cattle farmer himself or herself to measure an animal's welfare in a relatively uncomplicated way. The use of such simple tools does however make it even more difficult to make any statements about how the animal itself experiences its environment. Moreover, as the focus tends to be on physical measurements such as feeding condition or injuries, and less on behaviour, not all the welfare domains are included in the assessment in a balanced manner. A chicken with damaged feathers is easy to detect, but a chicken in a positive mental state is far more difficult to recognise. As regard the second category, the assessment tends to be based on observed behaviour. A chicken in a negative mental state (frightened, stressed or ill) is unlikely to perform behaviours such as scratching or dust bathing. So if chickens do show those behaviours, that is basically a good sign and potentially an indicator of positive welfare. Another option is to incorporate physiological indicators that tell us something about an animal's experiences throughout its life. For example, we know that an animal that experiences chronic stress has relatively high cortisol or corticosterone levels in its fur or feathers, but also shows changes in the neurotransmitters dopamine and serotonin, which play a prominent role in animals' reward systems. These data could then be used to validate observed behaviours or the outcomes of a welfare benchmark or mobile welfare assessment application.

One possible advantage of simple tools is that they make it easier to repeat measurements at the same farm. This will reveal developments over time and, for example, show the effect of adaptations to housing or management systems. Livestock farmers can also use such tools to benchmark their data with those of other farms and identify areas for further improvement.

In terms of animal welfare monitoring, artificial intelligence systems using sensors and image recognition technology have aroused high expectations. Stables are being fitted with ever more and better sensors to monitor the indoor climate, and with cameras to observe the animals' behaviour over time. If used effectively, such systems can provide the farmer with extra pairs of eyes and ears. Image recognition technology enables automatic recognition of specific behaviours, allowing both positive and negative behavioural patterns to be detected and monitored over time. Combined with the sensor data, this makes it possible to establish optimal climate settings for the stable based on the behaviour of the animals in them. The information can then also be used to examine increases or decreases in specific behaviours and, as such, contribute to welfare monitoring. In addition, when negative behaviours are observed such a system could be used to initiate adaptations in the management or housing systems (e.g., providing the animals with extra enrichment components as soon as the number of negative social interactions increases). This provides lessons learned for the next round and may help to prevent the behavioural change altogether. In addition, sensors allow welfare measurements of individual animals that are kept in a group. This is necessary to ensure high levels of welfare for each individual animal in such a group.

A great deal of effort is currently being invested in exploring the benefits of and developing animal-related parameters. The possible strategies outlined above, combined with the use of sensor-based and other systems, offer considerable potential for the further development of parameters that enable the measurement and monitoring of positive animal welfare.

## 2.5 Six guiding principles to ensure humane livestock farming

Based on the above, the Council has formulated six guiding principles to arrive at a humane type of livestock farming that offers the animal a positive welfare experience.

Humane livestock farming provides an environment for animals that guarantees the following six guiding principles:

1) **Recognition of the animal's intrinsic value and integrity**

*Respect for the animal's inherent value as a sentient being that can experience pain and pleasure. This means no interventions (beak-trimming, tail-docking, disbudding etc.), restrictions on modifications to the animal through breeding programmes, and awareness of the animal's own interests.*

2) **Good feeding**

*Sufficient water and feed of good quality.*

3) **Good housing**

*A comfortable and safe environment with good climate conditions (temperature, fresh air, biorhythm).*

4) **Good health**

*Ensure good health and prevent pain (including pain resulting from injuries caused by conspecifics).*

5) **Natural behaviour**

*Sufficient opportunities to perform natural behaviours and satisfy needs: resting, eating and drinking, defecating and urinating, grooming, exploring, social behaviour, thermoregulation, safety, health, movement, reproduction, sexual behaviour, nest-building behaviour and maternal behaviour.*

6) **Positive mental state**

*Enabling the animal to respond to the changed social and physical environment and achieve a state that it experiences predominantly as positive ('A life worth living'). Such a state will result if all the other guiding principles are fulfilled (see Figure 4).*

The first principle, recognition of the animal's intrinsic value and integrity, is the fundamental point of departure. More than anything else, a humane system should be based on the animal's intrinsic value. The minimum requirement, consequently, is to protect the animal's integrity and satisfy the conditions for positive welfare (Figure 4). The conditions for positive welfare are based on scientific research on animals kept in livestock farming. These six guiding principles also apply, mutatus mutandis, to other captive animals, but those are beyond the scope of this advisory document.

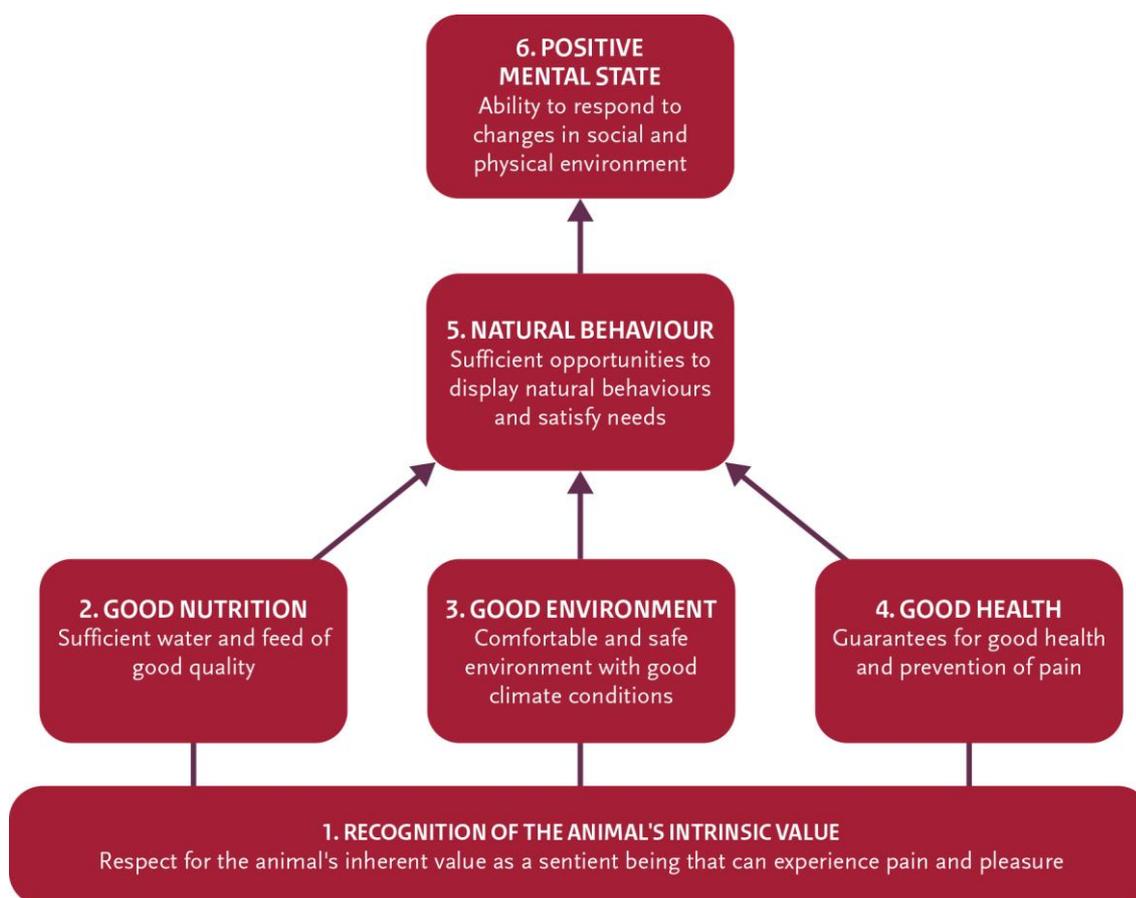


Figure 4. The six guiding principles to ensure humane livestock farming

### Keeping up with international developments

In the summer of 2021, the EU's Directorate-General for Health and Food Safety (DG SANTE) launched a proposal to move from the Five Freedoms to the Five Provisions (which correspond with the domains) as the basis for European animal welfare regulations. The Five Provisions approach (Mellor and Beausoleil, 2020) expressly acknowledges the role of positive experiences (as described in Chapter 2). According to the UK Animal Welfare Council, the Five Freedoms approach, which is based on avoidance of suffering and discomfort and fulfilment of basic needs, strengthens the negative image of livestock farming and animal production. Explicit inclusion of positive experiences in the assessment of animal welfare is more consistent with current views and is future-oriented - and for those reasons, is the preferred approach.

## 3. From principles to humane livestock farming

As pointed out in Chapter 2, principles constitute a substantive point of departure from which to approach a particular issue. The issue we are concerned with here is how a livestock farming system of the future could accommodate the needs of animals as defined using the six guiding principles. The interpretation and concrete implementation of those guiding principles can generate a great deal of debate and potentially uncomfortable questions and dilemmas, due in part to the fact that scientific knowledge about the needs of animals is far from complete (especially as regards species-specific needs, many of which have not yet been studied given the many different species used as farm animals). Another reason is that the interpretation of those principles is influenced in part by ethical considerations and our moral relationships with animals. In this chapter we will attempt to provide some guidance in this debate.

### 3.1 *Interpreting the guiding principles*

In 2019, in its publication 'The State of the Animal in the Netherlands' (RDA, 2019a) the RDA described the transformation that is taking place in the Netherlands in the relationship between humans and animals, which the role of humans shifting from that of ruler of animals to steward to partner of animals. This applies to all categories of animals, including farm animals. There is a normative debate going on in society on questions such as the following:

- What are the purposes or objectives of humans with regard to animals?
- What do people believe that animals want?
- What do humans consider to be acceptable in how they approach animals? and
- What are humans prepared to grant an animal?

How can we make sure that the things the animals themselves want, as described in scientific studies, become the guiding principles for the future development of livestock farming? And how can we make sure that those principles are not based, at least in part, on well-intended but incorrect human perceptions?

The two studies described below (Studies 1 and 2) illustrate how widely people's perceptions of livestock farming can diverge.

### Study 1

Bergstra et al. (2013) discuss the ethical values underlying the construction of an attitude with respect to livestock farming. One ethical value that plays a role here is the one that concerns 'naturalness'. This study shows the variation in how this phrase is interpreted in relation to pigs. Citizens and organic farmers attached importance to all aspects (the possibility for the animals to go outdoors, social contact, the freedom to move, root and take a mud bath, good substrate material and unlimited access to food and water). Conventional pig farmers and vets however did not consider 'the possibility to go outdoors' and 'to root and take a mud bath', both of which are natural behaviours, to be important with regard to naturalness. The different interpretations of such a phrase, therefore, can cause mutual incomprehension between the various stakeholder groups.

No relationship was found between ethical values and attitude towards pig farming. Hence, a person's understanding of 'naturalness' cannot be used to determine what their attitude towards pig farming is. Despite the lack of a direct relationship between ethical values and attitude, shared ethical values can help to identify the values that are important (in this case, to pig farming).

### Study 2

Van Asselt et al. (2015) asked citizens, poultry farmers and vets which poultry farming systems they thought were the best. Most respondents among the citizens (73%) preferred a system with a free-range outdoor section, while most poultry farmers (71%) and vets (93%) preferred the opposite: a system without such an outdoor section. The citizens attached more importance to the 'natural needs of laying hens' and 'environmental friendliness' than did poultry farmers and vets, and attached less importance to 'animal health', 'farm income' and 'many eggs per chicken' than did poultry farmers and vets. All three groups attached importance to 'food safety' and 'public health'.

Based on these results, the researchers called for a multi-stakeholder design method for new livestock farming systems that incorporates both technical and economic wishes and stakeholders' norms.

These two studies reflect the diversity in people's views of livestock farming. In the Conceptual Framework for Animal Welfare (RDA, 2018), this is illustrated in the form of a continuum between two extremes:

- The **anthropocentric outlook**, with humans at the centre of attention and every aspect being viewed in terms of its practical use or relation to humans. One example of this is the focus on the socio-economic importance of animal production (practical use: labour, income, export). The conventional pig and poultry farmers and vets mentioned in the two studies are inclined towards the anthropocentric approach.
- The **biocentric outlook**, with the ecosystem taking centre stage and humans being regarded as partners of nature. One example is the tendency to take the interests and welfare of the individual animal as the point of departure. The general public and

organic pig farmers mentioned in the two studies are inclined towards the biocentric approach.

The space between the two extremes (the anthropocentric outlook and the biocentric outlook) offers room for many intermediate positions. How we interpret the practical consequences in terms of our obligations towards animals is strongly determined by our position on this scale. In society at large, many people are moving on the scale towards the biocentric outlook. Increasing importance is attached to the integrity and inherent value of animals, and to the notion that an animal should feel well and that, consequently, its intrinsic needs should be fulfilled. This also means that merely preventing negative welfare is no longer considered to be sufficient, and that it will become necessary to enable positive welfare experiences. The six guiding principles for humane livestock farming offer guidance on how this can be achieved.

### ***Precautionary principle***

One generally applicable consideration for situations in which there is a lack of relevant knowledge arises from the precautionary principle: as long as studies suggest but do not prove that animals in a particular situation experience or have to deal with pain and discomfort, we should take a precautionary approach and be careful not to create such situations. In such a case, further research is required; in the meantime, we must act with restraint given the uncertainties involved (we know that there are things we do not know). The precautionary principle may only be invoked if there is a potential risk and may not be used to justify arbitrary decisions (EU, 2000).

## ***3.2 From guiding principles to the livestock farming system of the future***

Animal-oriented design (see the box below) is an existing method for designing new livestock farming systems. It incorporates both the needs of the animals and the wishes of the farmer and society at large. While the method itself is not new, what is certainly new is the unconditional primacy of the six guiding principles - including, and in particular, the principle of the positive mental state resulting from the other principles. The power of animal-oriented design is that it affords an animal the space it needs to be that animal. Like human beings, animals need an environment that is predictable and that they can control, and they need the possibility in that environment to opt for what they experience as the best choice. When you offer animals a shed where they can shelter, they will use it in bad weather to stay dry and warm. In this way, you give animals the opportunity to adapt when circumstances change. A complex environment enables the animal to fully exploit its adaptive potential and to use its environment in a way that best meets the

animal's specific wishes and needs at any particular moment. Such a complex environment also accommodates individual needs. Sensor-based monitoring of individual chickens in an aviary system shows that some are 'wallflowers' that spend most of their time in the upper reaches of the aviary and only come down to eat, drink or lay an egg, while others are 'wild explorers' that move around the system throughout the day and spend much of their time scratching (Rufener et al., 2018). The environment should offer variation and space so as to accommodate the needs of both types of chicken. If a shed has different functional areas, preferably at different levels within the system, each chicken will have a suitable space to meet its behavioural needs and enjoy a good quality of life.

By enabling animals to use their capacity to adapt to changing circumstances, we also increase their ability to look after themselves without external assistance. In this way, both the individual animal and the group will become more self-reliant and better able to deal with fluctuations in, for example, climate, feed quality and disease. In the Conceptual Framework Animal Welfare from 2018, the RDA gave the example of pigs in an enriched environment, which not only showed reduced tail-biting behaviour but also recovered more quickly from infections compared with pigs in a bare environment (van Dixhoorn et al., 2016)<sup>4</sup>. This goes to show that an approach based on animal-oriented design also offers opportunities in terms of enhancing the animals' resilience and robustness.

The animal-oriented design method makes it possible to design new livestock farming systems which not only satisfy the six guiding principles of humane livestock farming but also accommodate wishes and interests from other domains (such as society, the farmer or the environment). Note however that a humane design alone will not be sufficient, but should be complemented with proper care for the animals and effective business management.

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<sup>4</sup> This effect was recently confirmed in the SmartResilience project of J.E. Bolhuis et al. (WLR, not yet published).

### **Animal-oriented design**

Over the past 15 to 20 years, a great deal of experience has been gained with (reflective, integrated) animal-oriented design. Animal-oriented design begins with 'ignoring' existing systems and starting afresh with the design of a housing system that recognises the needs of the animal as the 'schedule of requirements' for the design project. This design approach was developed into the Reflexive Interactive Design method (Bos, 2010). One example is the 'Houden van Hennen' project, which was completed in 2005. This project involved the production of several different designs that accommodate the chickens' needs as much as possible while also taking into account the most important needs of the farmer and of society in general. Eventually this resulted in the development of Rondeel, a stable system that addresses the chickens' strong urge to scratch by offering them a large covered outdoor range. This system earned the highest (three-star) Better Life label from the Dutch Society for the Protection of Animals - an accolade previously only granted to organic farms. Since the development of Rondeel, several other innovative stable concepts have seen the light, such as the Windstreek stable for broiler hens, the Kwatrijn system for dairy cattle, the Dartelstal and Familievarken systems for pigs and the Kipster system for laying hens. All these new concepts have proved to accelerate innovation throughout the livestock farming sector.

## 4. Foresight Study on Humane Livestock Farming

### Socio-economic context and perspectives for action

Efforts to improve animal welfare in livestock farming have been going on for years. This advisory report is intended to add momentum to the development and implementation of humane livestock farming systems that focus on the animal and are based on the six guiding principles. No prescriptive models are available for what these systems exactly look like. While the six guiding principles do offer guidance in this respect, they leave room for multiple forms of humane livestock farming systems. In this regard, the socio-economic context and the business choices of the farmer are crucial. With due regard for the potential developments within that socio-economic context and those business choices, this chapter explores the possible dominant livestock farming systems and related development tasks to which this may lead. Based on that exploratory exercise, we will identify possible perspectives for action for the government and other stakeholders to add new momentum to the development towards humane livestock farming and stimulate existing market initiatives.

#### *4.1 What is the prior history of this development?*

After the Second World War, Dutch agriculture and horticulture developed into one of the most productive food production systems in the world. Supported by an intricate research, education and information network the Dutch agricultural sector modernised rapidly, driven by specialisation and economies of scale. Within a few decades this strongly boosted the production of affordable food. At the same time however, it became clear that this development came at cost: increasing pressure on the country's natural and social capital, causing biodiversity loss, damage to vulnerable nature, soil and water, to the landscape and to farmers' incomes. Concerns about the negative effects of livestock farming on animal welfare feature with increasing prominence in the social debate.

#### *4.2 What future developments are awaiting us?*

We expect that the nitrogen issue and climate change - and the measures to deal with them - will prove to be the most decisive issues for livestock farming in the decades to come. Indeed, a future without such measures is inconceivable. The dominant factor in dealing with these issues is the environmental space in the Netherlands, which determines the spatial scope for production in livestock farming. Alongside social acceptance, it is the environmental space that largely determines what is and is not possible, and where.

Livestock farms are facing the challenge of balancing demands imposed by the market and society on the one hand, and the available environmental space and economic mechanisms on the other. From the livestock farmer's perspective, key terms in the development of their business are flexibility, control over the production process, critical mass, connection with the market, relationship with local residents and hedging risks.

Below we will describe two future types of livestock farming in the Netherlands which, given the socio-economic context, could emerge as the main models. Note that this does not necessarily mean they are also humane models. We have deliberately decided to restrict this description to the main features and points of departure, as we are aware that in practice a variety of intermediate forms of livestock farming will exist that combine different elements from both models. Our choice for these two livestock farming models is based in part on scenario studies conducted elsewhere, such as the 'Agrifood Brabant in 2050' study (BrabantAdvies, 2019). In that study, four scenarios are described extensively, two involving an international orientation and two a local orientation in agriculture and horticulture. In accordance with that scenario study, we believe it is reasonable to assume that in future both orientations will exist side by side and will be reflected mainly in the following two livestock farming models, with a variety of intermediate forms in between:

1. A type of livestock farming in which quality and safety take centre stage, with a focus on standardised production at large-scale facilities within integrated marketing chains, directed at a largely international sales market. In this model, consumer confidence is based on quality assurance systems using labels and certificates.
2. A type of livestock farming in which nature-inclusive farming practices and biodiversity take centre stage, with a focus on local production within marketing chains at a short distance from the consumer. A model in which the farmer has a face, and assurance is based on a relationship of trust with the consumer.

See the two text boxes for the main features and points of departure of each of these two models. Both strive for product differentiation and more added value, allowing the livestock farmer to invest profits from his revenue model in measures to benefit animal welfare and thus to retain his 'license to operate'. The chain is transparent about this, and all stakeholders can see the results of this approach for humans and animals.

Both models also address global issues concerning the climate and the available environmental space in the Netherlands. In addition, in the Netherlands the entrepreneurs in both systems operate in a social environment that expects them to continue improving the welfare of their animals. The central idea is that the designs for these livestock farming

systems should incorporate the six guiding principles for humane livestock farming as well as other sustainability aspects.

### **Main features and points of departure of livestock farming model 1 - Integrated marketing chain**

In this livestock farming model, the emphasis is on standardised production at relatively large-scale facilities within integrated marketing chains focused on consumers in the Netherlands and elsewhere.

- In most cases, the consumers do not know which livestock farmer the products originate from. The anonymous relationship between the producer and consumer reduces the urge and incentives to guarantee high quality. Quality assurance is based on institutional trust and is visible to consumers in the form of labels and certificates.
- Sensors enable non-stop monitoring to ensure an optimum living environment for the animals and to provide management support for the farmer. Sensor technology enables automated recognition of specific animal behaviours and alerts the farmer when necessary.
- Not just the volume but also the quality (including humane farming aspects) of the product serve as crucial unique selling points. Product differentiation and higher added value are important. This also offers better marketing opportunities in international markets.
- In addition to optimised reuse of raw materials, source-directed measures and zero emission systems are used to reduce the production and emission of substances such as ammonia, nitrogen, greenhouse gases and fine particles.
- The nutrient cycle covers the whole of Europe; many residual flows from the human food industry are used in the production of animal feed.
- Livestock farms keep relatively large numbers of animals, with good opportunities to limit the risk of importing infectious animal diseases. However, if an infectious disease or stable fire does occur, the consequences are severe.
- Animals continue to be transported, but across smaller distances.
- The people who care for the animals are mostly paid workers. This offers the potential benefit of specialisation in care tasks, and the potential drawback of a greater distance between carer and animal.

### **Main features and points of departure of livestock farming model 2 - Short marketing chain**

The emphasis is on local production within marketing chains at a short distance from consumers, with a focus on broadened livestock farming for food production and on blue and green services, possibly combined with care farm tasks, recreation or other objectives. In this way, food producers provide a broad and diverse range of products and livestock farming systems. Specific types of 'community supported agriculture' (involving collaboration between citizens and local farms) also occur.

- Consumers know which livestock farmer the products originate from. The direct feedback loop to the producer reduces the scope for a non-committal mentality in production. This means that quality assurance can be based on a relationship of trust (the livestock farmer now has a face). For example, using social media a farmer can communicate directly with consumers about the welfare of his animals, events at the farm and the products in his range.
- Farmers can use apps to monitor animal welfare and compare their performance in this regard with that of other farmers.
- Optimum reuse of raw materials combined with a move toward extensive agriculture and regional spread are key elements to reduce production and emissions of ammonia, nitrogen, greenhouse gases and fine particles while enhancing nature-inclusive practices and biodiversity.
- This system also accommodates the most far-reaching form of circular agriculture. In this system, the nutrient cycle is small (confined to Western Europe, at most). Measures to ensure high-quality feedstuffs and good health demand attention.
- Livestock farms keep relatively small numbers of animals, but often with outdoor range facilities and hence fewer opportunities to limit the risk of importing infectious animal diseases. Once an infectious disease does occur, however, the consequences are less severe. In animal breeding, the robustness and resilience of animals are important selection criteria.
- The livestock farms are closed systems and do not supply animals. Transport distances are kept as short as possible.
- The people who care for the animals are the livestock farmer himself, family members and possibly one or two paid workers, with the potential benefit of reducing the need to monitor the commitment of those who look after the animals. Given the broader functions assigned to livestock farming, there will however be requirements on the broad employability of labour.

### ***4.3 Critical milestones for humane livestock farming***

There are huge differences in terms of the extent to which today's livestock farms are organised according to the six guiding principles. Some farms have almost completed the transition, while others will have to be transformed entirely to comply with the guiding principles. Truly humane livestock farming systems of the future, as outlined in section 4.2, and all the possible intermediary forms call for innovation and continued development of our existing systems.

In this regard, we can distinguish between:

1. livestock farming systems that are already humane, and those as yet to be developed;
2. existing systems that meet the requirements or need (minor) renovation; and
3. existing systems where the investment required for renovation to a humane system is huge (or unaffordable).

Humane livestock farming will not come about of its own accord. On the contrary, it calls for considerable effort and cooperation from a multitude of parties. In this section we will discuss some aspects that we regard as critical milestones in the process.

Humane livestock farming has not yet been incorporated as an integrated objective in current spatial planning, environmental and nature legislation. For example, renovation will result in more space requirements if the numbers of animals remain the same. And even for farmers who decide to reduce their livestock in a renovation project, and effectively move to a more extensive type of farming, the zoning status of the land concerned can cause problems. For most existing stables and plots of land, the provision of more space and possibly a free-range area is a bottleneck within the existing licensing system. In addition, not enough sites are available for the new construction of integrated sustainable stables. In stable renovation projects, aspects such as the shell of the building, the size of the building block and financing issues involve constraints that make it almost impossible, under the present regime, to realise an integrated and sustainable stable system for humane livestock farming. This calls for targeted amendments to spatial planning, environmental and nature legislation, as well as for adaptations to the financing system and the farmer's revenue model.

The livestock farming model oriented towards the international market (see section 4.2) comprises multiple links in supply, production, processing and sales (integrated chain). As long as competition for market share in these chains is based on price rather than on sustainability and/or more added value for consumers, the risk is that the costs are passed on, via the farmers, to the animals. In that case, the external costs would not be incorporated into the price paid by consumers. This explains the need for market concepts that allow for the additional costs of innovation to be compensated by the market and that

keep pace with similar developments in neighbouring countries, which constitute the primary sales markets for Dutch farmers. One other critical milestone in this model for humane livestock farming is the fact that the animals are kept on large farms with multiple employees. In such a situation, good working conditions, selection, education, training and guidance for employees are crucial for their intrinsic motivation to ensure the best possible care for the animals. The importance of this is increasingly recognised in current practice.

In a livestock farming model oriented towards local markets (see section 4.2), the greatest risk for animal welfare is the outbreak of infectious diseases. Since production conditions in this model are less strictly controlled, there is a higher risk that diseases are imported and transferred. Also in this model, attention for optimal care for the animals is crucial. Besides looking after his animals, the farmer has to devote his attention to sales and also, in many cases, to additional activities such as blue and green services, care farm services and recreation. This necessarily broader focus involves the risk of animal care issues being overlooked.

One further aspect to consider in the development of any humane livestock farming system is the potential conflict between the various demands imposed on welfare and health: while certain measures can help to improve animal welfare, they can also lead to new health problems. Examples include the increased risk of piglets in a litter being crushed by the sow, and the increased risk of injuries among non-disbudded cows. Solutions such as mud ponds or swimming ponds can increase the risk of disease or hygiene-related conditions. In such cases, it may be hard to find a simple solution. The risk of such conflicts calls for careful consideration, without losing sight of the need to ensure positive welfare for the animal.

In summary, the Council expects that both livestock farming models and all intermediate forms offer possibilities for farmers to incorporate the guiding principles. There is room for improvement in terms of the progress being made towards each of those guiding principles. This calls for a proactive attitude among public authorities and other stakeholders, especially in the livestock farming model oriented towards the international market, with its integrated marketing chains, as the trade-off between 'environment' and 'animal' in these contexts is more likely to be to the animal's disadvantage (also see the text box on 'Preventing trade-offs'). This applies all the more when, in stable renovation projects, 'environment' already faces constraints in terms of stable dimensions, building block size and proximity to residential areas and nature. Livestock farming models oriented towards local markets are already more likely to use humane livestock farming principles as a basis for an animal-oriented design. These models also expressly include those principles in the

marketing concept, allowing the additional costs to be factored into the price paid by consumers. This calls for a proactive commitment of public authorities and other stakeholders to facilitate the transition towards more nature-inclusive forms of livestock farming in licensing procedures and stable renovation projects.

### **Preventing trade-offs**

The nitrogen problem and climate change, and the efforts made to deal with these issues, look set to remain the most decisive themes for decades to come. The dominant factor in dealing with these themes is the environmental space in the Netherlands, which determines the spatial scope for production in livestock farming. In the effort to make the sector more sustainable, there is a need for an integrated approach, combining economic, ecological and social considerations, so as to prevent optimisation efforts being focused on separate issues. We should avoid win-lose situations in which a measure to help solve one issue comes at the expense of another issue. The challenge is to develop and implement measures that do not compromise other sustainability aspects (win-no regrets situations) or, even better, measures with benefits for several or all sustainability aspects (win-win situations).

Examples of previous win-lose situations:

- the requirements imposed on manure storage and utilisation in the 1990s, resulting in stables with liquid manure stored under floor grills. This caused manure and urine to be mixed, resulting in higher ammonia concentrations in the stable, with unfavourable effects on the indoor environment for both the animals and those looking after them.
- the far-reaching reduction requirements for ammonia emissions from stables. For emission reductions of over 60% in dairy farming and over 80% in pig farming, the existing emission reduction measures will always favour an air scrubber over the use of straw as a bedding material or a manure scraping system (the latter two systems both offer more opportunities to take the animals' interests into account).

A greater focus on the integrated development of stable systems will make it easier to place the principles of humane livestock farming centre stage in actual implementation.

## 5. Conclusions and Recommendations

The government is promoting the transition to circular agriculture and sustainable livestock farming because current farming practices are unsustainable and threaten to exceed the burden that the planet can bear. Animals have a clear position within circular agriculture, and the government aspires to both assure and improve animal welfare and health levels. For this reason, the Ministry of Agriculture, Nature and Food Quality asked the RDA to produce an advisory document that discusses the needs of animals in livestock farming that need to be fulfilled for the animals to experience positive welfare. In this context, the RDA has drawn the following conclusions, and has also formulated a number of recommendations for follow-up action.

### 5.1 Conclusions

In Chapter 2 of this advisory report, we answered the Minister of Agriculture, Nature and Food Quality's main question and the first three sub-questions on the preconditions for the livestock farming systems of the future that allow animals to experience positive welfare.

In section 2.2 we explained what the terms 'humane' and 'positive welfare' can be understood to mean (**sub-question 1**). Animal welfare essentially depends on the capacity of the animal to engage effectively with its environment so as to achieve a state that the animal itself experiences as positive. In this context, the animal's behavioural options form the link between its basic needs and its mental state. Whether this is (or can be) sufficient is determined by the extent to which the conditions regarding good feeding, good housing, good health and natural behaviour are fulfilled. We illustrated this using the Five Domains Model.

In section 2.3 we examined the needs of farm animals that must be satisfied for them to experience positive welfare (**sub-question 2**). These needs are fulfilment of the animal's basic needs (good feeding, good housing, good health) and sufficient opportunity for it to perform essential natural behaviours. The behavioural needs of the specific animal species and the associated requirements on housing must govern the provision of a varied environment with multiple options. For positive experiences arising from natural behaviours to occur, a natural environment is not always a necessary condition.

In section 2.4 we made a best effort to identify the measurable parameters for positive welfare that are available (**sub-question 3**). A great deal of effort is currently being invested, in studies and in practice, in exploring the benefits of and developing such

parameters. While the number of systems currently available, such as sensor-based systems, remains limited there are high expectations of technologies such as image recognition and artificial intelligence for animal welfare monitoring. Even though real-time measurement of welfare is not possible, a great deal of scientific data is already available that allows us to estimate animal welfare based on measurements of the animal concerned and environmental factors.

After discussing these three sub-questions and in response to the Minister's **main question**, in section 2.5 we formulated the six guiding principles for humane livestock farming:

Humane livestock farming provides an environment for animals that guarantees fulfilment of the following six guiding principles:

1) **Recognition of the animal's intrinsic value and integrity**

*Respect for the animal's inherent value as a sentient being that can experience pain and pleasure. This means no interventions (beak-trimming, tail-docking, disbudding etc.), restrictions on modifications to the animal through breeding programmes, and awareness of the animal's own interests.*

2) **Good feeding**

*Sufficient water and feed of good quality.*

3) **Good housing**

*A comfortable and safe environment with good climate conditions (temperature, fresh air, biorhythm).*

4) **Good health**

*Ensure good health and prevent pain (including pain resulting from injuries caused by conspecifics).*

5) **Natural behaviour**

*Sufficient opportunities to perform natural behaviours and satisfy needs: resting, eating and drinking, defecating and urinating, grooming, exploring, social behaviour, thermoregulation, safety, health, movement, reproduction, sexual behaviour, nest-building behaviour and maternal behaviour.*

6) **Positive mental state**

*Enabling the animal to respond to the changed social and physical environment and achieve a state that it experiences predominantly as positive ('A life worth living'). Such a state will result if all the other guiding principles are met (see Figure 4).*

Livestock farming systems designed in accordance with these six guiding principles are humane livestock farming systems that enable the animals concerned to experience

positive welfare. If we, i.e. the government and society at large, decide in favour of humane livestock farming, these principles should serve as our points of departure.

In Chapter 3 we aimed to provide insight into the ways in which future livestock farming systems might facilitate these six principles (**sub-question 4**). We advocated the animal-oriented design method for building new livestock farming systems and possibly also for adapting existing systems.

In Chapter 4 we argued that humane livestock farming calls for a substantial development effort and should not be expected to occur of its own accord. Some farms have already made considerable headway in implementing the six guiding principles, while others still need to make a huge step forward. The system depends on the collective efforts of businesses, citizens, civil-society organisations and public authorities, and the path towards it includes several perspectives for action and critical development milestones. Without an extra effort, the pursuit of humane livestock farming threatens to be overlooked in the government's actions for other urgent themes, such as climate change and nitrogen pollution, and in the battle for market share among sales organisations competing essentially on price.

The development of humane livestock farming affects all parties within or associated with the farming sector. Humane livestock farming is inextricably bound up with necessary adaptations in the livestock farming sector in view of nitrogen pollution and climate change, as well as with the current market, in which farmers are unable to invest in humane livestock farming without an effective revenue model. This calls for a different policy and a different type of market that tie up with developments taking place at the European level. In terms of governance, a convincing and integrated approach is required. This will require considerable effort. The first and most important step for the government to take is to make a convincing choice, in conjunction with all stakeholders (including livestock farmers, market parties and civil-society organisations), for humane livestock farming. Once that decision has been made, the path towards its implementation needs to be fleshed out, for which we have formulated several recommendations in section 5.2. This calls for a strong coordinating effort by the government.

**In summary:**

- 1) Livestock farming is all about keeping animals. Humane livestock farming systems fulfil the six principles of humane livestock farming, minimising the negative and maximising the positive aspects for each individual principle. These principles emerge from a

perspective in which the animal takes centre stage and provide assurance for the welfare of animals in livestock farming systems.

- 2) Humane livestock farming forms part of the transition promoted by the government towards sustainable livestock farming. Crucially, this requires a central and coordinated approach that addresses positive animal welfare and reduction of the environmental burden (nitrogen, greenhouse gases, biodiversity loss) in a parallel and integrated fashion, while strengthening farmers' economic position where necessary.
- 3) It is up to the government to highlight the urgency of this transition, to take the initiative and coordinate all efforts - in consultation with livestock farmers, market parties, civil-society organisations and other stakeholders - while also setting out appropriate timelines in connection with this advisory report.

## ***5.2 Recommendations***

Humane livestock farming will not come about of its own accord. This is why the Council has formulated the following recommendations, which require the government to take up a prominent role:

1. As a government, decide to opt for humane livestock farming. Take the initiative and assume a coordinating role to accelerate the development towards humane livestock farming based on the six guiding principles. Connect this development to the transition promoted by the government to circular agriculture and sustainable livestock farming. The promotion of sustainable practices and farmers' revenue models form part of this transition.
2. Integrate humane livestock farming as a priority of equal weight in an overall approach that also addresses other policy issues such as climate change and nitrogen pollution.
3. Incorporate the development of good revenue models for livestock farmers (and the entire chain) in the development of humane livestock farming.
4. As the national government, stand by the choice for humane livestock farming and address the issue accordingly, and proactively, at the EU level (tie in with and implement European developments in this field) and at the level of provincial and municipal bodies and water boards for the purpose of placing humane livestock farming on the agenda and realising it. Connect to instruments used in other policy areas and adapt them where necessary.
5. Provide momentum for the further and faster development of humane livestock farming based on the guiding principles described in this advisory report.

Distinguish between: a) livestock farming systems that are already humane, and those as yet to be developed, b) systems that will have to be renovated or require minor adaptations, and c) systems for which fulfilment of the six guiding principles would require a prohibitive investment. In the renovation of existing stables, provide space

(both financially and in terms of policy) to accommodate the transition to a humane form of livestock farming by replacing the one-sided effort to reduce the environmental burden by an integrated approach to promote positive animal welfare as well as reduce the environmental burden; in view of the urgent need to reduce the environmental burden, accelerate the practical availability of the required integrated systems.

6. Ensure that an independent progress monitoring system is in place.

In addition to the RDA's main recommendations outlined above, given the required further and faster development of humane livestock farming and the critical development milestones identified, the Council believed it expedient to also formulate a number of more practical recommendations to support that development. These are presented separately in the box below, 'Elements of the approach'.

### **Elements of the approach**

- Livestock farmers need unambiguous government policies, and a promising perspective. This calls for consistency in the policy message over many years.
- Start the development of humane livestock farming, in cooperation with livestock farming chains, retailers, food service organisations and civil-society organisations such as the Dutch Society for the Protection of Animals and Natuur en Milieu, by drawing up a covenant (or as part of an agriculture agreement, as recently recommended by the Social and Economic Council of the Netherlands SER (2021)) on the irreversible realisation of humane livestock farming based on the six guiding principles.
- Appoint a national authority (a 'Delta commissioner') who guides and supervises the development towards humane livestock farming, supported by an official body and sufficient legislative measures.
- Use the six guiding principles to design humane and integrated sustainable livestock farming systems which, in addition to fulfilling those six principles, also satisfy all sustainability requirements imposed on livestock farms.
- Draw up an action plan to clearly set out which livestock farming systems qualify as new, which existing systems could be renovated to satisfy the six guiding principles with minor modifications and for which systems the investment would be prohibitive. The action plan should also identify the steps that livestock farmers can make in the short term and how the government can support them in this. In addition, the action plan could explain how, in the longer term, the guiding principles for humane livestock farming are to be integrated with other societal objectives, for example those related to the environment and climate change.
- Develop qualification systems for recognising stable systems or stable system elements as 'compliant with the guiding principles of humane livestock farming'. Banks should demand the use of such a system as a condition for funding.
- Establish a knowledge centre for information about the transition to integrated sustainable and humane livestock farming.
- Provide investment grants for sustainable livestock farming systems and/or for innovative components in existing stables. Make eligibility for existing and new grant schemes conditional on a concrete plan for how the grant is to contribute to humane livestock farming and reduce the environmental burden.
- Make sure there is an unambiguous link between objectives on the one hand, and existing or newly developed instruments on the other. Make sure to include competition issues from the start and to benefit from the opportunities this provides for extra agreements on sustainability.
- Enable livestock farmers to take animal-oriented design courses and include the topic as a module in agricultural training programmes.
- Select (specific elements of) stable systems that meet the guiding principles to hold up as examples for the sector. One important condition is accessibility for farmers, consultants and stable designers: they should be willing to study the action plan before starting a stable renovation project themselves.
- Make sure that consultants are sufficiently knowledgeable about what it takes to introduce humane livestock farming practices at a farm.

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# Appendix 1 – The Minister's question

11-2-2021



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**Ons kenmerk**  
DGA-DAD / 21011088

Datum **05 FEB 2021**  
Betreft Verzoek zienswijze randvoorwaarden voor positief welzijn in de  
veehouderij

Geachte heer Schakenraad,

De landbouw is een onmisbare activiteit in onze samenleving, ze staat immers garant voor het voeden van een steeds groter wordende wereldbevolking. Maar de huidige wijze van landbouw is niet vol te houden en loopt aan tegen de grenzen van draagkracht van onze planeet. Daarom heb ik ingezet op een transitie naar kringlooplandbouw. Dit betekent dat reststromen zoveel als mogelijk opnieuw als grondstof worden ingezet en verliezen van nutriënten zoveel als mogelijk worden voorkomen. Het dier heeft een duidelijk plaats binnen kringlooplandbouw. Dieren zijn in staat om reststromen en laagwaardige plantaardige materialen om te zetten in hoogwaardige dierlijke eiwitten en vetten voor humane consumptie. Daarbij leveren ze meststoffen, die weer gebruikt kunnen worden voor de teelt van gewassen.

Binnen de transitie naar kringlooplandbouw heeft het ministerie van Landbouw, Natuur en Voedselkwaliteit (LNV) de ambitie het niveau van dierenwelzijn en -gezondheid te borgen én te verbeteren. Blijvend uitgangspunt daarbij is dat aanpassingen aan het dier verdwijnen en dat houderij-systemen worden vormgegeven rond de behoefte van het dier. Het is daarbij van belang deze behoeftes te kennen en te kunnen vertalen in praktische randvoorwaarden waaraan de veehouderij van de toekomst moet voldoen. De verbetering van het niveau van diergezondheid en dierwelzijn is daarmee ook te monitoren en te borgen.

De RDA heeft in mei van afgelopen jaar een eerste zienswijze uitgebracht over dierenwelzijn in de kringlooplandbouw. De conclusies en aanbevelingen onderschrijf ik. Met name de aanbeveling om concrete randvoorwaarden uit te werken en deze te gebruiken om met de stakeholders stappen te zetten richting een kringlooplandbouw, waarin de verbetering van dierenwelzijn en -gezondheid wordt geborgd.

De positie van het dier in de veehouderij van de toekomst moet concreet worden uitgewerkt, zodat voor iedereen duidelijk is hoe deze positie eruit ziet. Middels deze brief verzoek ik de RDA daarom om een zienswijze op te stellen die ingaat de behoeftes van het dier om een positief welzijn te ervaren in de veehouderij. De centrale vraag die u hierbij stel is:

Pagina 1 van 2

**Directoraat-generaal Agro**  
Directie Dierlijke Agroketens en  
Dierenwelzijn

**Ons kenmerk**  
DGA-DAD / 21011088

*"Wat zijn randvoorwaarden voor de veehouderij van de toekomst, waarin het dier een positieve staat van welzijn ervaart?"*

Vervolgens zou ik graag zien dat de zienswijze ingaat op de volgende deelvragen:

1. Wat kan worden verstaan onder 'dierwaardig' en 'positief welzijn'?
2. Wat zijn de fysiologische (incl. diergezondheid) en ethologische behoeftes van productiedieren, die voorwaardelijk zijn voor een positief welzijn?
3. Welke meetbare parameters zijn bruikbaar om te bepalen of aan deze behoeftes wordt voldaan?
  - Wat is beschikbaar en wat moet ontwikkeld worden?
4. Hoe faciliteert een houderij-systeem van de toekomst deze behoeftes?

Inmiddels is de RDA al gestart met dit onderwerp en hebt u aangegeven de zienswijze op eigen initiatief aan te vullen. Ik ga ervan uit dat u deze zienswijze, of in elk geval het gevraagde deel, spoedig kunt opleveren.

Met vriendelijke groet,

  
Carola Schouten  
Minister van Landbouw, Natuur en Voedselkwaliteit

## Composition of the Council on Animal Affairs

The Council on Animal Affairs is an independent council of experts, which advises the Minister of Agriculture, Nature and Food Quality on request and on its own initiative on multidisciplinary issues in the field of animal welfare and health. The Council consists of scientific experts and professional practitioners, who serve on the Council in a personal capacity, independently and without any outside influence.

The draft advisory report was submitted to the entire Council for assessment. As such, the report is a product of the Council as a whole. As of 1 October 2021, the Council had the following members:

Prof. J.J.M. van Alphen	Prof. B. Kemp
Dr G.B.C. Backus	A. Kemps
J.P. van den Berg	Dr L.J.A. Lipman
W.T.A.A.G.M. van den Bergh	Dr F.L.B. Meijboom
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The Council Secretary is M.H.W. Schakenraad MSc.

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