

WHAT IS ANIMAL WELFARE? – SUMMARY

DEFINING ANIMAL WELFARE

As animals are **sentient beings**, capable of experiencing positive and negative emotions, we have a duty to care for their welfare. The three orientations approach to animal welfare takes the view that good welfare implies good **mental and physical wellbeing**, and some degree of a natural life for the animal. In recent years, the mental wellbeing orientation has grown in importance as scientific methods to study mental states in animal have been developed. It is also increasingly understood that natural may not always imply good, but what is important for the animal is being able to engage in behaviours that are important for them, their **behavioural preferences**.



Fig. 1 Revised three orientations model

Animal welfare encompasses both the physical and mental wellbeing of an animal as well as their ability to engage in behaviours that are important to them.

ANIMAL WELFARE FRAMEWORKS

Animal welfare frameworks provide a practical definition of animal welfare by explicitly stating the conditions necessary to avoid poor welfare or provide good welfare. The **Five Freedoms** was the first such framework, formalised in 1979 by the UK Farm Animal Welfare Council and updated in 1993 to include the five provisions (Fig. 2). In 1994, the **Five Domains** framework was proposed, and has since been updated to incorporate the latest scientific knowledge (Fig. 2). The two frameworks highlight five areas that are relevant for animal welfare: the housing environment, aspects of feeding and nutrition, physical health, behaviour, and mental states of the animals.

These frameworks also differ. The Five Freedoms focus on preventing negative states (thus there is a need to add a sixth freedom to undergo positive experiences), while the Five Domains has been updated to explicitly include positive states. The Five Freedoms provide a snapshot of welfare in the moment and places equal emphasis on each freedom, while the Five Domains approach has a hierarchical structure whereby alterations in the first four “physical/functional” domains impact the fifth one – the mental state, which ultimately determines an animal’s welfare (Fig. 2).

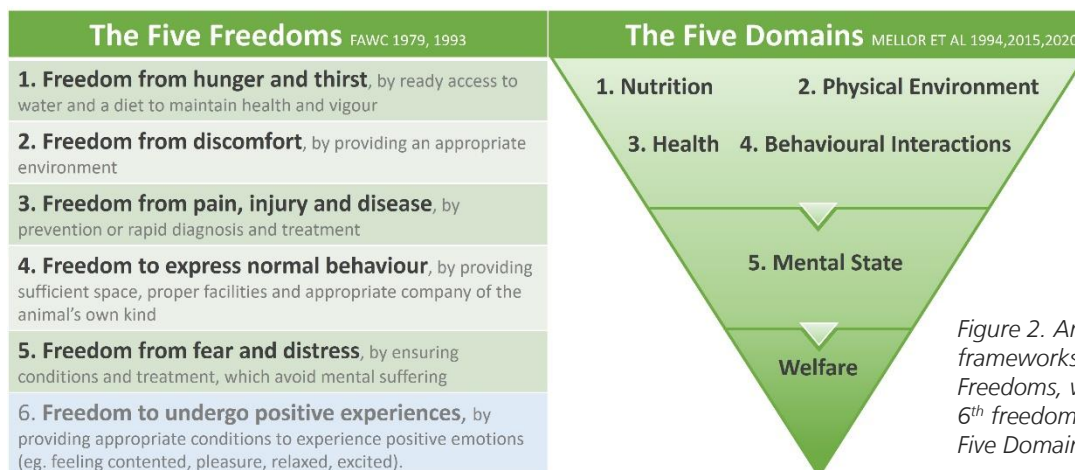


Figure 2. Animal welfare frameworks: The Five Freedoms, with suggested 6th freedom (left) and the Five Domains (right)

HOW TO ENSURE GOOD WELFARE

Ensuring good welfare depends on 1) providing the right inputs so that the system has the potential to provide what the animal wants and needs, and 2) measuring the actual welfare of the animals in that system. Standards can then be refined as the basis of a continuous improvement plan (Fig. 3).

Inputs – Welfare Potential: A farming system with a high welfare potential allows an animal to express their behavioural preferences, ensures their physical health and wellbeing, and promotes positive mental states while minimising negative experiences. The welfare potential of a production system is determined by the inputs into that system - the method of production is the principal determinant, with key housing features and the genetics of the animal being the primary defining factors. For example, caged systems which severely restrict the abilities of the animals to engage in important behaviours, or systems where animals have been selected for high productivity at the expense of their welfare, can never have a high welfare potential. The likely welfare experienced by an animal in the system is dependent on the welfare potential and the management of the system (Table 1).



Fig. 3 Ensuring good welfare: from defining inputs to measuring outcomes

Table 1. How the welfare potential of a production system determines the likely welfare experienced by the animal in that system

Welfare Potential of Production System	Standard of Management of System	Likely Welfare Experienced by Animal
High	High	High
	Medium	Medium
	Low	Low
Medium	High	Medium
	Medium	Medium
	Low	Low
Low	High	Low
	Medium	Low
	Low	Low

Outcomes – Measuring Welfare: Using animal-based welfare outcome measures can ensure the system achieves its welfare potential. Animal-based outcomes are measures made directly on the animal (or from farm records), and provide information on the animal’s behavioural, physical, and mental wellbeing. It is important that the measures cover all three facets of animal welfare, including mental wellbeing, particularly positive experiences. Tools such as Qualitative Behavioural Assessment can provide simple and rapid on-farm assessments of both positive and negative mental states.

ONE WELFARE

Placing animal welfare within the One Welfare framework promotes the selection of strategies with mutual benefits to animals, people, and planet, or at the very least to identify and apply appropriate mitigation strategies so that improvement in one area does not negatively affect the other.

WHAT IS ANIMAL WELFARE? – SCIENTIFIC REVIEW

ANIMAL SENTIENCE

The concern for animal welfare stems from the understanding that **animals are sentient beings**, capable of experiencing positive and negative emotions that can make them feel good or bad¹². Sentience implies some degree of awareness and cognitive abilities². As sentient beings, it is recognised that animals are capable of suffering and therefore we should care for their welfare. Animal sentience is recognised by law in the UK (Animal Welfare (Sentience) Act 2022), Europe (Lisbon Treaty, 2009), New Zealand, and parts of Canada and Australia.

DEFINING ANIMAL WELFARE

Animal welfare can be a difficult concept to understand because there is no universally agreed definition^{3,4}. Ethical concerns about the treatment of animals led to the establishment of animal welfare science as a discipline, and early definitions of welfare reflected three broad categories of concerns⁵ (Fig. 1): 1) the 'feelings' approach: welfare is a concern because animals can experience affective mental states such as emotions, 2) the 'biological functioning' approach: welfare is related to health and normal physiological functioning, and 3) the 'natural living' approach: welfare depends on the animal being able to perform natural behaviour.

The three orientations approach⁵ sees each of these aspects as important; thus, good welfare implies good mental and physical wellbeing, and the ability of the animal to engage in behaviours that are important to them.



Figure 1. Revised "three orientations model" where mental wellbeing is given greater prominence and natural living is replaced by behavioural preferences. Animal welfare involves all three orientations – mental wellbeing, physical wellbeing and the animal's ability to engage in their behavioural preferences.

While it is commonly accepted that all three orientations are important facets of welfare⁵, the relative importance of the different orientations has evolved over time. Historically, animal welfare science focused on biological functioning and the physical health of the animal, as it was considered the aspect which could be objectively measured.

With respect to 'natural living', it is increasingly acknowledged that natural does not necessarily imply good welfare. For example, in natural environments animals may experience fear of predation and are more exposed to the elements, all of which are conditions we try to minimise to ensure good welfare in farm animals. Understanding what is natural for an animal, however, is essential to be able

to provide for the animal's behavioural preferences, allowing them to choose to engage in behaviours that are important to them⁶. In order to design higher welfare farming systems with the animals needs in mind, it is important to understand their species behavioural repertoire as well as the environment to which they have adapted to over thousands of years.

The importance of the 'feelings' orientation has gained increasing prominence in the last decades. Sentience and the ability to suffer is the main reason for public concern about welfare⁷, and it is increasingly understood that both biological functioning and the ability to express behavioural preferences influence, and are influenced by, an animal's mental state. Thus, the mental state of the animal is increasingly being seen as the key determinant of welfare among the three orientations⁷.

Animal welfare encompasses both the physical and mental wellbeing of an animal as well as their ability to engage in behaviours that are important to them.

ANIMAL WELFARE FRAMEWORKS

To assess animal welfare, a more practical framework is needed so that key indicators related to the three dimensions of welfare (physical and mental wellbeing, ability to express their behavioural preferences), can be measured. There are two main frameworks which have been developed to that effect to date, the Five Freedoms and the Five Domains frameworks (Fig. 2).

The Five Freedoms: In response to the rise in public concern for farm animal welfare, following the publication of Ruth Harrison's book "Animal Machines" in 1964, the Bramble Report (1965) made a list of recommendations which led to The Five Freedoms (Fig. 2), formalised in 1979 by FAWC (UK Farm Animal Welfare Council, now Animal Welfare Committee). In 1993, The Five Freedoms were updated to include the five provisions (Fig. 2). The freedoms aimed to set out conditions necessary to avoid poor welfare, while the provisions offered the means by which this could be achieved⁸.

The Five Domains: The Five Domains framework was proposed in 1994, originally as a way to identify, but also to quantify the degree to which the welfare of animals used in research or teaching can be compromised^{4,9}. The Five Domains approach has a hierarchical structure whereby alterations in the first four "physical/functional" input domains (1. Nutrition, 2. Physical Environment, 3. Health, 4. Behavioural Interactions) impact the fifth domain (5. Mental State), which is therefore the "outcome" factor and ultimately determines an animal's welfare (Fig. 2). With the Five Domains framework, welfare is the subjective experience of the animal¹⁰. While the original Five Domains framework focused on negative states⁹, the model has undergone numerous updates since its conception based on current scientific thinking and new knowledge. For example, the range of negative states has been extended and positive states have been explicitly included^{10,11}.

The two frameworks (Five Freedoms and Five Domains) provide some outcomes by which welfare can be assessed, and both suggest inputs which can affect those outcomes. Both frameworks include the housing environment, aspects of feeding and nutrition, physical health, behaviour, and mental states as relevant for animal welfare. Where the two frameworks differ is on their scope, complexity, and how they prioritise the different aspects:

- While the Five Freedoms framework focuses on preventing negative states (thus the need to add a sixth freedom), the Five Domains has been updated to explicitly include positive states.
- The Five Freedoms framework has been so successful in part due to its simplicity¹¹ but it may miss welfare issues which arise due to the effect of conditions over time¹¹. The Five Domains

framework is more complex as it attempts to take into account the cumulative experience of the animal by assessing the likely impact of factors on the animal’s welfare according to their severity, intensity, and whether they require mitigation¹². This makes the Five Domains framework more comprehensive but more cumbersome to put into practice.

- The Five Freedoms describe five outcome measures, and the provisions are the inputs needed to achieve these. Each freedom is equally important. The Five Domains framework instead lists four input factors, while mental state is the outcome and reflects the welfare of the animal.

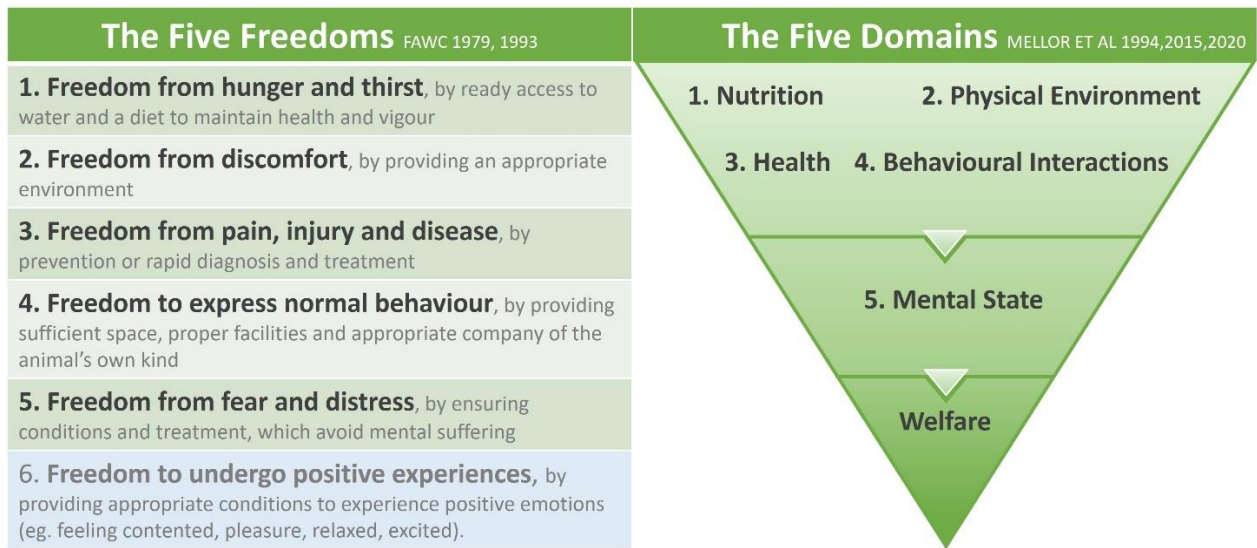


Figure 2. The Five Freedoms (and five provisions) framework with the inclusion of a possible sixth freedom (left) compared to the Five Domains framework (right).

HOW TO ENSURE GOOD WELFARE

Defining welfare is only the first step in ensuring that farm animals have a good quality of life. Ensuring good welfare depends on 1) providing the right inputs so that the system has the potential to provide what the animal wants and needs, and 2) measuring the actual welfare of the animals in that system. Standards can then be revised, if needed, to ensure the system achieve its welfare potential. This should form the basis of a continuous improvement plan (Fig. 3).



Figure 3. Ensuring good welfare: from defining inputs to measuring outcomes

Inputs - Welfare Potential

The welfare of animals on farm is inextricably linked to the welfare potential of the farming system they are reared in¹³. A system with a high welfare potential allows an animal to express their

behavioural preferences, ensures their good health and normal biological functioning, and promotes positive mental states while minimising negative experiences.

The welfare potential of the system is determined by the inputs into the system. The method of production is the principal determinant of the welfare potential of a system, with key housing features and the genetics of the animal being the primary defining factors. To have a high welfare potential, the housing environment must meet the animals needs and allow the animal to express their behavioural preferences (e.g. perching, dustbathing and foraging for poultry, rooting and nestbuilding for pigs). It must also provide a safe, comfortable, and healthy environment for the animal (e.g. appropriate/adequate shelter, clean and comfortable litter and bedding, designed to minimise injuries) and provide opportunities for the animal to experience positive states (e.g. through exploration and play possibilities, some degree of agency and control over daily routines, positive human-animal interactions). For example, housing systems with close confinement, such as cages for laying hens or farrowing crates for sows, severely restrict the ability of the animals to move and carry out important functional behaviours and therefore have a low welfare potential.

The genetics of the animals themselves is also a key determinant of the welfare potential of a system. The selection for increased productivity and efficiency is directly linked to many of the welfare issues inherent to intensive production systems. For example, commercial fast-growing broilers suffer from significant leg disorders, cardiovascular problems, and high mortalities¹⁴ - issues inextricably tied to the genetics of the animals used. Systems which use breeds selected for increased growth and performance at the expense of their welfare have a low welfare potential.

While management is also an important input into the system, it is not a determinant of the welfare potential of the system. For example, no amount of good management can make up for the restrictions on behavioural freedom in caged systems or for the welfare problems linked to the genetics of the animals. Good management, however, is crucial to ensure the system achieves its potential^{13,15}. Extensive outdoor systems which would have a high welfare potential, if poorly managed (e.g. lack of adequate shelter, safety from predation), are likely to result in poor welfare.

The likely welfare experienced by an animal in the system is dependent on both the welfare potential of the system and the standard of management (Table 1).

Table 1. How the welfare potential of a production system determines the likely welfare experienced by the animal in that system

Welfare Potential of Production System	Standard of Management of System	Likely Welfare Experienced by Animal
High	High	High
	Medium	Medium
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Outcomes - Measuring Welfare

While defining the inputs into the system can ensure that the system has a high welfare potential, we also need to understand if the animals in that system actually have good welfare. This can only be done by using animal-based outcome measures – observations and measures made directly from the animals themselves or from farm records¹⁶ that provide indicators of the behavioural, physical, and mental wellbeing of the animals. It is important that the measures used provide a comprehensive overview of all three facets of animal welfare.

So called ‘iceberg indicators’ are animal-based welfare outcome measures which can have multiple causes¹⁷. Recently EFSA have identified iceberg indicators for a variety of farm animal species^{18–20}, for example the presence of tail lesions is considered an iceberg indicator in pigs because they relate to the occurrence of many welfare consequences on farm (e.g. insufficient space allowance and/or enrichment, inadequate flooring)^{18,21}.

Animal-Based Welfare Outcome Assessment Protocols

Assessment protocols based on animal welfare frameworks (e.g. the Five Freedoms or Five Domains), can provide a detailed overview of animal welfare as well as indicating the causes of the welfare state measured²². For example, the five-year EU-Funded Welfare Quality® (WQ®) project began in 2004 with the aim of developing a standardised cross-species protocol for the overall assessment of animal welfare. The project built on the Five Freedoms and developed a list of 12 criteria, grouped under the four main principles of Good Feeding, Good Housing, Good Health, and Appropriate Behaviour^{23,24} (Table 2). The more recent European Animal Welfare Indicators (AWIN) project was grounded on the four WQ® principles and aimed to develop a protocol and provide a set of valid and practical animal-based outcome measures to assess animal welfare in species not covered by the WQ® project (WQ®: dairy cattle, beef cattle, veal calves, sows, fattening pigs, laying hens and broilers²⁵; AWIN: sheep, goats, horses, donkeys, and turkeys²⁶).

Table 2. Welfare Quality® principles and criteria for good welfare

Principles	Welfare Criteria
Good feeding	1. Absence of prolonged hunger 2. Absence of prolonged thirst
Good housing	3. Comfort around nesting 4. Thermal comfort 5. Ease of Movement
Good health	6. Absence of injuries 7. Absence of disease 8. Absence of pain induced by management procedures
Appropriate behaviour	9. Expression of social behaviours 10. Expression of other behaviours 11. Good human-animal relationship 12. Positive emotional state

Such extensive welfare assessment protocols can be time consuming to perform and require a certain level of training and expertise. A further potential limitation of welfare assessment protocols is how the scoring system is balanced across the different measures. If a large number of indicators are combined into a single outcome score, there is a risk that serious welfare issues can be missed²⁷. Furthermore, it is important that such protocols are not just a snapshot in time but reflect the cumulative experience of the animal over time.

Other approaches have tried to develop more practical welfare assessment protocols, relying on fewer measures such as the six-year AssureWel project (2010-2016)²⁸ which aimed to develop practical welfare outcome assessment protocols for farmed animals to be used in commercial inspection and certification schemes. Rather than following an overall framework, the AssureWel project focused on developing specific protocols for each species, based on the available scientific knowledge on welfare outcomes.

Cumulative Welfare Indicators

While many protocols provide a snapshot of the animal's welfare in time, other approaches attempt to look at the cumulative experience of the animal as a means of assessing the animal's overall quality of life. The Cumulative Pain framework²⁹ uses duration of time spent in negative affective states (termed 'Time in Pain') of different intensities to allow comparison between different conditions which may have different welfare consequences using a common metric. The Animal Welfare Assessment Grid³⁰ is an online software which aims to assess the cumulative lifetime experience of an animal across four parameters: physical (health), behavioural/psychological (mental wellbeing), environmental (physical and social environment), and procedural (response to husbandry events).

Emotion and Animal Welfare

Mental wellbeing is an important aspect of animal welfare which historically has often been neglected due to the difficulty in measuring subjective states in animals. In the last few decades, however, research into emotions of animals has increased and tools have been developed to assess mental wellbeing in animals.

Traditionally preference tests have been used to understand what an animal wants, and motivation tests can reveal how much an animal is willing to work to get what they want³¹. More recently, emotional states in animals have been investigated by studying how animals respond to ambiguity³²⁻³⁴. Pessimistic responses are said to reflect underlying negative mental states, while optimistic responses indicate underlying positive mental states.

Assessing an animal's body language and the way in which they interact with their environment can also give insight into their mental wellbeing. Using the Qualitative Behaviour Assessment (QBA) approach, human observers make judgements on how an animal feels by unconsciously integrating different aspects of the way the animal is behaving^{22,35}. Observers rate the animal on a list of terms such as stressed and agitated or happy and calm. These terms and ratings are then analysed for patterns and one or more dimensions are created based on the semantic similarities between the terms (e.g., Dimension 1: Stressed–Happy, Dimension 2: Agitated–Calm). The position of individual animals (or groups of animals) along these dimensions can then be compared (Fig. 4), for example, with animals in different conditions, or the same conditions at different points in time. Much research has shown that this method is reliable and reflects a variety of quantitative indicators often used in animal emotion research³⁶⁻³⁹. Additionally QBA is a relatively simple and rapid assessment method which can detect both positive and negative states²². QBA can be used to assess the animal's experience of their living conditions, but is not necessarily a cumulative measure of welfare – it is most effective in detecting the animals current experiences²². The ease of performance of QBA is further improved due to the development of a mobile app⁴⁰.

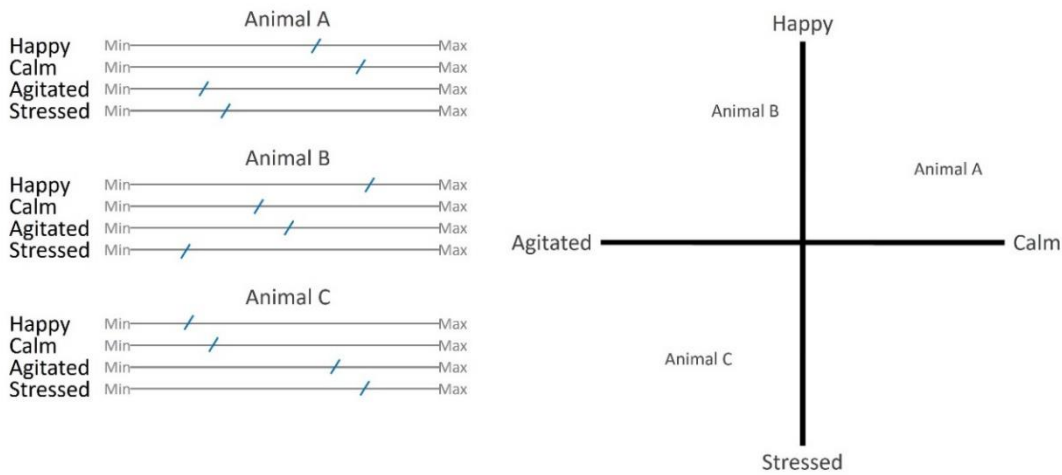


Figure 4. Overview of Qualitative behavioural Assessment adapted from Fleming et al. (2016)³⁹. The animals are scored on a list of terms (left) which are then used to generate dimensions based on the semantic meaning of the terms on which the animals can then be compared (right).

ONE WELFARE

The intrinsic link between animal welfare, human well-being, and environmental well-being, long recognised by Compassion in World Farming, has been formalised under the One Welfare framework^{41,42}. An extension of the One Health approach, which was established to create a global response to disease outbreaks, One Welfare “describes the interrelationships between animal welfare, human well-being and the physical and social environment”⁴². One Welfare aims to highlight the direct and indirect benefits of animal welfare improvements on human wellbeing and on the environment (Fig. 5). Improvements to animal welfare are often seen to conflict with productivity/economic and environmental goals. However, using a One Welfare approach can highlight where mutual benefits can be gained from improving animal welfare.

The One Welfare framework has five sections (Table 3)⁴². Farm animal welfare is linked to aspects of human wellbeing, food safety, food security, and sustainability, where changes in one are associated with changes in the other.

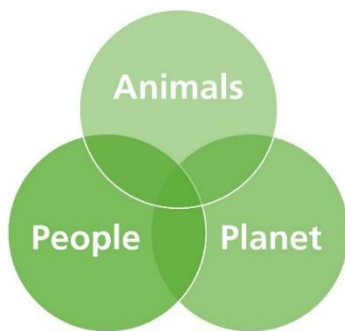


Figure 5. Overview of the One Welfare approach. The welfare of animals is inextricably linked to the welfare of people and the planet.

Table 3. The five sections of the One Welfare model.

Section 1: The connections between animal and human abuse and neglect.
Section 2: The social implications of improved animal welfare.
Section 3: Animal health and welfare, human well-being, food security and sustainability.
Section 4: Assisted interventions involving animals, humans and the environment.
Section 5: Sustainability: connections between biodiversity, the environment, animal welfare and human well-being.

There is pressure on farmers to increase production efficiency at the same time as improving animal welfare, food safety, while also reducing antimicrobial usage and environmental impact⁴³. Traditionally, improvements in animal welfare have been seen to be at odds with some of these other aims, particularly production and environmental impact. Taking a One Welfare approach instead, allows us to better integrate the benefits that improvements to animal welfare can bring, not only to the animals themselves but also financially for the producers, but also wider benefits to society and the environment. By seeing animal welfare in a wider context, approaches to improving animal welfare with wider benefits can be selected. There can be direct financial benefits to improvements in welfare through, for example, reduced mortality, improved health, improved product quality, improved resistance to disease/reduced need for medication⁴³. There are direct benefits to human health through the lowered risk of zoonoses and animal-borne infections⁴³ and the positive mental health benefits associated with improved worker conditions and job satisfaction on farm.

Regenerative agriculture is a way of farming which aims to restore soil health as the basis for “a holistic approach to farming that encourages continuous innovation and improvement of environmental, social, and economic measures”⁴⁴. Such an approach to agriculture has a high sustainability potential. A recent review of the scientific literature evaluating the links between regenerative agriculture and animal welfare found positive links between animal health and nutrition and regenerative agriculture, but that information on other aspects of animal welfare is lacking⁴⁵. Regenerative systems are extensive in their nature - they provide outdoor living to the animals as they are based on integrated livestock on the land - and therefore typically have a high welfare potential. The inclusion of additional animal welfare standards within regenerative farming practices, e.g. providing access to shade, water and shelter for grazing cattle, would ensure that regenerative systems have the highest possible welfare potential (Fig. 6).

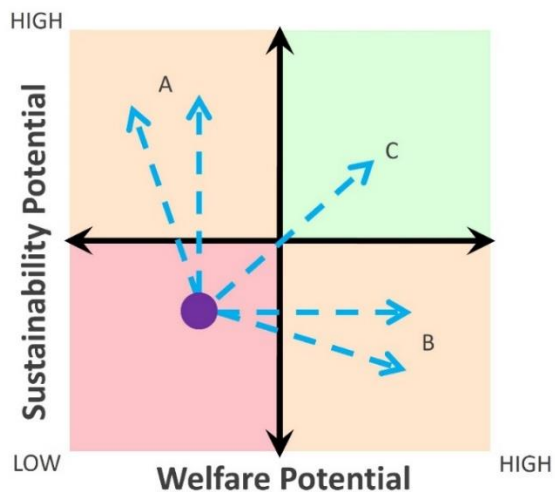


Figure 6. How a One Welfare approach helps select strategies with the widest benefits. Strategy A - Improving the environmental impact of the system (e.g. sustainable intensification) to the detriment of animal welfare. Strategy B - Improving animal welfare (e.g. moving to systems with higher welfare potential) to the detriment of environmental factors. Strategy C - move towards systems with both a high welfare potential and high sustainability potential such as regenerative systems.

CONCLUSIONS

Since farm animals are sentient beings, capable of suffering, we have a duty to care for their welfare. Although a difficult concept to define, welfare encompasses three facets – physical wellbeing, mental wellbeing, and the ability of the animals to engage in their behavioural preferences. All three facets are important for providing good welfare, but it has increasingly been acknowledged that the mental wellbeing orientation plays the greatest role in determining an animal’s welfare. Ensuring welfare involves providing the right inputs into the system and measuring relevant animal-based welfare

outcomes. Placing animal welfare within the One Welfare framework allows to select strategies with mutual benefits in several or all areas (animals, people, planet) or at the very least to identify and apply appropriate mitigation strategies so that improvement in one area does not negatively affect the other.

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