

The Value of Animal Welfare

**Towards socially accepted
and economically viable animal husbandry**

An LNV/NWO research programme

Hans Hopster and Hans Komen, Lelystad/Wageningen, April 2007

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1 Introduction

The recently concluded NWO-LNV *Limits to welfare and animal production*¹ priority programme has greatly improved our understanding of the mechanisms that determine how production animals handle stress and whether they can adapt to the conditions prevailing in animal husbandry practices and to changes in these conditions. Over twenty successfully completed PhD-projects and various post-doc studies have helped to improve cooperation between universities and research institutes, while also contributing to enhancing the integration of fundamental, strategic and applied research.

During the programme, gradually more emphasis was laid, not primarily on the lack of biological knowledge but upon its applied value in improving the welfare of animals in practice. This approach however requires other fields of interest to be incorporated. The problem rather is that animal welfare clashes with production methods because the economic interests of producers and consumers clash with the views of the general public (i.e. society) on how animals should be treated. Producers throughout the production chain maintain their market positions by producing within society's confines, by controlling costs, by differentiating their products and by improving quality. Welfare is only a minor consideration for the general public and consumers, and one that does not contribute to increased efficiency or higher sales. Neither producers *nor* consumers are generally willing to pay the additional costs of better animal welfare. Nevertheless, society, both at home and abroad, is increasingly calling for better animal welfare, and this prompted the evaluation committee to emphasise the need for a new, dedicated research programme.

This memorandum describes the new programme. A programme that requires an integrated, interdisciplinary approach because of the range of scientific, socio-economic and societal issues involved. A programme, moreover, that will involve all the parties responsible for animal welfare. This should help ensure that the findings and recommendations are genuinely appropriate and can be applied in practice.

1 NWO, August 2005

2 Towards socially accepted and economically viable animal husbandry

The animal production sector has come under growing pressure in recent years, with increasing competition from Southeast Asia and Latin America, consumers' focus on low prices, the retail price war, cost-conscious producers and European agricultural policy reforms making it increasingly hard to earn a living. The public, on the other hand, is calling for improved animal welfare. At the same time the government is seeking to regulate less and leave more to the market as part of the deregulation process and the drive towards a more manageable legal system. And this applies to animal welfare, too. Legislation, both at a national and European level, sets minimum standards. The production chain will be forced by the market (i.e. consumer/retailer behaviour) to meet additional demands for animal welfare. As a result, the responsible parties will probably devise a range of regulations and control measures, quality assurance protocols and covenants with guarantees at various levels, both nationally and internationally. A uniform yardstick for measuring animal welfare is crucial in this respect for all parties involved in or with the chain.

There is a widely felt need for clear standards and definitions specifying what animal welfare actually means, and particularly how it can be measured. Only once animal welfare is a transparent concept that can be verified by means of clear criteria and reliable tools and classified at verifiable levels, will animal welfare become a parameter that the market can handle.

The existing lack of standard definitions and criteria is all the more of a problem because of the current legal requirements not always being well substantiated. Differences in characteristics between various animal species and different forms of management and business organisation obviously also influence how well an animal feels. Guarantees for animal welfare should preferably, therefore, be based on reliable indicators that can be monitored in the animals themselves in a way that fits in with farm management practices.

This would have two major advantages. Firstly, we can directly monitor the effects on the animals' welfare of any improvements or any other changes in operational management, irrespective of whether these involve housing conditions, management or any other aspect of farm management. Secondly, this approach would tie in with the objective of making operators more responsible and allowing them greater scope to devise solutions appropriate to their own specific operational situations.

3 Animal welfare and animal robustness

After a long period of increasing standardisation and rationalisation, the greater awareness of sustainability and animal welfare in society and politics marks a change in thinking. Various different production systems have become established, including organic systems and various forms of free-range and extensive breeding and husbandry systems. At the same time, a move is being seen from individual to group accommodation. Free-range and organic husbandry are becoming increasingly popular, especially in Western Europe, where they are seen as practical ways of ensuring sustainable production and business operations that are considered socially acceptable. At the same time, we are seeing a further increase in the scale of operations, driven by the need for greater efficiency and lower costs.

The diversification of husbandry systems exposes the animals to a greater variety of living conditions and environments, while at the same time reducing the opportunities to give vulnerable animals the individual care they need. There are also fewer breeds available that are suitable for more extensive systems such as organic farming. The modern hybrid breeds are the results of decades of careful selection for production in optimised husbandry, feeding and care conditions. Market parties are emphatic in their wish not to lose the qualities of these animals. What is needed, therefore, are animals that are mentally and physically strong enough to function well in all sorts of production systems and also able to adapt easily to changing husbandry conditions. *It is not just a matter of having animals that, for production purposes, are optimally adapted to large-scale, minimum-care forms of factory farming.*

Robustness

We have grouped these qualities together under the common denominator of *robustness*. In this programme we will use the following definition of robustness:

“The combination of characteristics that enables an animal to cope with the disruptions that normally occur in socially accepted and economically cost-effective husbandry systems, such as will be applied in the Netherlands in the coming decade”.

Robustness is thus seen as a combination of the characteristics that keep an animal mentally and physically healthy. Robustness focuses on animal characteristics; animal welfare is the result of animal characteristics and environmental conditions that can be measured in the physical and emotional state of the animals.

The state of welfare, in the sense of the quality of life experienced by an animal, depends on the animal's characteristics, on the conditions in which it is raised and kept and on the care it receives. In this way, robustness and husbandry systems are important, interacting factors that determine an animal's welfare. Animal welfare clearly cannot be directly measured or expressed in a single parameter. A set of parameters can, however, be used, providing transparent definitions are agreed.

The best way to measure animal welfare is to make an estimate on the basis of certain criteria and standards. This is only possible, however, once all stakeholders have reached agreement on the relative significance of the parameters, and on the validity and reliability of the measuring method. Cultural, societal and socio-economic forces clearly play an important part in any such agreement. The debate on animal welfare, and especially on robustness, is therefore not exclusive to the domain of the natural sciences, but should also receive input from behavioural and social scientists and from consumers and producers. In this way, the opportunities to bring animal welfare into line with what society considers acceptable can be explored.

The government has an important communicative role, even if formal responsibilities lie elsewhere. It can affect the standards applied in society by identifying products generated by less desirable systems. This does mean,

however, the government making a value judgement on the different forms of animal husbandry. A tricky problem, which relies heavily on a transparent government vision and strategy, proper definitions, reliable standards and a practicable rating system. The issue is so complex that it requires an integrated research approach; an approach where knowledge is gathered on views held by society, both on animal handling and on measuring animal welfare, and then used in studies of normative consumer behaviour and the effectiveness of marketing tools.

4 Research programme and focus areas

An integrated and interdisciplinary research programme has to provide answers to the questions arising as a result of the imbalance between efficient production and animal welfare. The programme needs to involve stakeholders such as breeders' organisations, livestock farmers, animal-health organisations, societal organisations, retailers, ethicists, animal scientists and market and consumer experts. The questions are very wide-ranging, and cover both the exact and social sciences. The questions concern the ethical and biological limits to the adaptability of animals and the consequences for animal welfare, while other issues that have to be addressed include ways of measuring animal welfare and the relationship with trends in society and consumer behaviour.

In this respect, the programme clearly follows on from the findings of the *Limits to animal welfare and production* programme, but essentially goes further by explicitly involving stakeholders in the research strategy. Not just producers, but also customers (both retailers and consumers) will be asked how we can improve animal welfare. An important issue is how innovative marketing concepts, direct approaches to consumers and activities by various groups in society can be used to reposition animal welfare, which has become marginalised, in the market. The focus areas and the relationships between them, which are shown in figure 1 below, will be discussed separately.

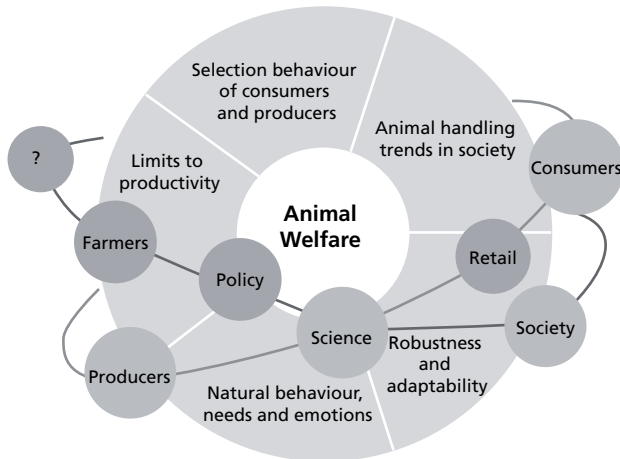


Figure 1: At the centre: the five integrated focus areas affecting animal welfare. Around the circle: various stakeholders and target groups.

4.1 Societal trends in how we treat our animals

There is a fundamental dilemma in any wish to promote a more sustainable and more animal-friendly production system by breeding for robustness: do we take the animal as it is, or are we allowed to adapt the animal to a particular objective through breeding programmes? And, in the latter case, how do we assess the acceptability of specific adaptations?

As a society, we impose certain direct obligations on ourselves and on livestock holders (to safeguard the animals' welfare and avoid distress and hunger), but also some indirect obligations (respectful treatment, role model, improving housing conditions). How should we view, in that respect, the breeding of a robust animal with a high degree of tolerance for stress and disease if this could result in the animal being kept in less optimal conditions without suffering any ill effects? Finding sensible answers to these and related questions requires research on an ethical, practical and advisory level.

Ethical research

Are we allowed to adapt animals by breeding or should we take them as they are? The answer to this question also depends on the fundamental question of why we consider animals the proper objects of moral care. Only by making a fundamental ethical analysis of our responsibilities towards animals and the grounds on which these responsibilities are based, can we gain a proper understanding of the various views on this subject.

It is important in this respect to take the differences between various ethical theories and approaches seriously. We cannot expect consistent answers and so are forced to keep on thinking about how society should handle fundamentally different views on this subject. We can distinguish the minimum requirements that should be defined by the government (in other words, things that 'should simply be organised') from other, additional, requirements that do not require public-sector involvement. In other words, things that are a private responsibility and can be left to market forces.

A fundamental question in this respect is whether animal welfare is a public (i.e. collective) responsibility, and whether, in that case, the market is a proper and fair mechanism for dealing with that responsibility. Research shows that consumers believe that the government and industry, especially the supermarkets, should regulate animal welfare. This is part of what is referred to as the 'double standards of consumers and citizens'. In other words, citizens may attach great importance to animal rights, but, as consumers, they invariably opt for the lowest price. This raises the questions of whether firstly the notion of responsible consumption can exist in a modern free-market society and secondly what this means in terms of the division of responsibilities between governments, producers and retailers, and consuming citizens.

From insight to impact

Theoretically based insight is an important tool on the road to sustainable and animal-friendly production systems. But insight alone will not change society to any great extent. We therefore need research into the question of how to design and support effective studying and learning, without lapsing into a manipulative process. This kind of research has both ethical

and empirical aspects, including, for instance, the possibility of devising experimental dialogues for the parties in the production chain in order to identify and study the key factors involved in establishing shared values and comprehensive solutions. Such learning processes can be evaluated, from an ethical point of view, for aspects such as fairness and the ideal of a dialogue between equals. To achieve real change, however, we need feedback based on empirical data from everyday practice that reflect the various values that the participants in the chain wish to maintain and the allocation of the respective responsibilities.

The ethical limits of the opportunities to influence consumers' buying behaviour and the desirability of doing so are good examples of this. The boundary between providing information and marketing does not necessarily align with the dividing line between the public and private sectors. The question remains to what extent manipulation of behaviour is acceptable, and by whom.

Research into regulation and advice

The ethical and societal discussion will not be starting from scratch because several initiatives designed to achieve more sustainable and animal-friendly production have already been taken. Some of these initiatives have been successful, while others have failed because of practical or fundamental problems. This is why we need research into 'best practices' and the factors determining what *best* actually means. Interdisciplinary research, such as a combination of a technical assessment of an entire life-cycle analysis and advice by Technology Assessment forecasting, can provide an integrated contribution that reflects both ethical and societal considerations. Involving ethical analysis in the further interdisciplinary development and analysis of the factors determining the success of transition management and chain reversal (i.e. from supply-driven to demand-driven) may also play a significant role in promoting more sustainable agriculture.

4.2 Limits to productivity

Selection with the aim of enhancing the genetic capacity for production is increasingly at the expense of the animal's reproductive capacity, health and natural behaviour. Breeding organisations urgently need a greater understanding of these aspects and selection methods that produce more balanced results and more robust animals. Little is yet known, however, about the relationship between production, reproduction, general resistance and natural behaviour. The proposed programme covers three focus areas:

1. genetic backgrounds of the relationships between characteristics;
2. quantification of genetic differences affecting health and natural behaviour;
3. development of new methods to select for robust animals.

Genetic backgrounds of relationships between characteristics

If we want to limit the detrimental effects of selection for maximum productivity on other biological characteristics, such as behaviour and reproductive capacity, we need a detailed understanding of the relationships between these characteristics at a genetic level. We also need to understand the mechanisms that can explain the effects of choices made when selecting for these characteristics. We also know little about the way in which husbandry conditions affect the relationships. Trade-offs and threshold values play an important role in the relationship between health and natural behaviour on the one hand and productivity on the other. All sorts of health and behavioural aspects are regulated and mediated at various levels in the body, ranging from a central level (i.e. in the brain) to local or peripheral levels (i.e. at the level of a specific organ or organ system). We know too little about the way these regulatory mechanisms change under the influence of selection.

Quantifying genetically determined differences in health and behaviour

The state of an animal's health and natural behaviour depends partly on its genetic predisposition and partly on the conditions in which it is kept and the things it experiences. As robust animals stand out because of their good scores in precisely these three aspects, we need to quantify the relevant genetic differences among and between animal breeds properly.

Behaviour and health are also affected by other factors. Behaviour, for instance, is influenced by the characteristics of other animals in the same group. Both behaviour and health also depend on underlying sensitivities or predispositions, which affect an animal in many more respects than just behaviour and health. Research should, therefore, focus on the question of which characteristics are most appropriate for quantifying genetic differences in health and behaviour. Research is also needed into how the influence of other group members is best taken into account in selection decisions. This could involve modelling studies, possibly supported by experimental animal studies.

Developing selection methods for robust animals

The objective of selection is invariably to improve a population's characteristics. Better insights into genetic relationships between characteristics and genetically determined differences in robustness should make it possible to devise more reliable and effective selection methods, without harming animal welfare. It is not easy, however, to acquire such insights. To measure the productivity of each animal, the animals should be housed separately. Such conditions are, however, undesirable from an animal welfare perspective. The characteristics relating to health and behaviour can also be measured better in animals housed in groups. One of the results the programme intends to achieve is the development of new selection methods that take account of interaction with group members.

In summary, research into the limits of productivity should help to answer the following four questions:

1. Is it possible to predict changes in genetic relationships between characteristics so as to prevent selection from having undesirable consequences on health and welfare?
2. How could information on biological backgrounds of relationships between characteristics (trade-offs and genome data) be used to prevent undesirable consequences?
3. How can the multifactorial nature of robustness be properly taken into account when determining genetic variation within and between populations?
4. How can concepts of group selection be developed effectively and used to improve the health and welfare of farm animals?

4.3 Robustness and adaptability

For a concept like robustness to be practical, the meaning of the word needs to be clearly and objectively defined. Robustness concerns the ability of animals to adapt in the short or longer term to variations in conditions in such a way that the normal balance between biological processes in the animal is restored. This means we can regard an animal as robust if it is able to adapt physically and mentally to different conditions, without any effect on its welfare and while remaining equally productive.

Adaptability and trade-offs

Animals react to environmental stress in many different ways. Depending on the situation they may display various physiological, behavioural or stress reactions and adjust their temperature or feed uptake. These regulatory systems are not stand-alone systems, but affect each other. Some systems become more active in response to the occurrence of a certain stress factor, while others are suppressed to accommodate the new conditions. The balance between suppressing and reinforcing the regulatory systems is what we call a trade-off.

Trade-offs have serious consequences. It is well known that the reproductive capacity of farm animals is often greatly reduced in periods of high production. There are also indications that a strong selection for productivity makes farm animals react less effectively to environmental stimuli in periods of maximum production. Which processes take precedence over others and what trade-offs occur vary from one species to the other and, within a species, from one individual to the other, depending on the production stage of the animal. Little is yet known about how these processes are regulated. Research into the effects of genetic predisposition and the effect that experiences in the period before, around and shortly after birth have on an animal's adaptability at a later age will make a key contribution in this respect. So, too, will research into the extent to which housing and management aspects can help or hamper animals' ability to adapt.

Development of robustness parameters

One of the important results the programme is seeking to achieve is a limited set of specific and easily measurable parameters that demonstrate an animal's robustness, i.e. its adaptability. The acquired knowledge should serve as input for the Societal trends in how we treat our animals research theme, which will involve an ethical discussion of the limits to productivity against the background of genetic predisposition and the acceptability of influencing adaptability. Knowledge gained in this theme could also be used as input for the *Selection behaviour of consumers and producers* research theme, which involves establishing measurable criteria for assessing animal welfare. The environmental factors and animal characteristics considered to be representative, and the range to be used for the extent of variation, are not just scientific questions, but also depend on the explicit choices made by the stakeholders.

Eventually, the research into robustness and adaptability should help to answer the following four questions:

1. How are 'trade offs' in animals regulated and what do individual differences in this respect mean for the welfare and health of animals?
2. What effect do genetic predisposition and experiences in the period before, around and shortly after birth have on adaptability at a later age?
3. To what extent can the ability of animals to adapt to specific housing conditions be actively affected by housing and management factors?
4. What specific set of easily measurable parameters can be used to give a representative indication of animals' adaptability?

4.4 Natural behaviour, needs and emotions

Animal welfare also covers the issue of how animals *feel* and *experience* their surroundings. Many attempts have been made to measure these phenomena, based on the assumption that the animal brain is evolutionarily identical to the human one in the relevant aspects. Even though these approaches yielded valuable knowledge, they did not result in really satisfactory and generally accepted scientific criteria for this

aspect of animal welfare. This gap is all the more pressing as society will have to support such an approach if it is to be translated into policy and practice. The underpinning of criteria for welfare and housing should ideally be confirmed by a comparative evaluation and integration of earlier approaches. Dissimilar data, such as physiological, ethological and cognitive components, associated with the feelings of an animal and able to be approximated scientifically should be integrated with more subjective components.

Dynamics in needs and emotions

In the animal production chain, animals at different life stages are generally kept strictly separate, but the relationship between early development and adult life has been given little attention in animal welfare research to date. We do not yet know the extent to which a balanced emotional development requires better attuning to conditions in the various stages of life. Little is yet known on how negative (i.e. stressful) events and, conversely, positive, rewarding experiences affect and reinforce or suppress adaptability, including the potential application of this interaction in practice. What we do know is that the dynamic interaction between stress and reward takes place in various specific systems in the brain. We also know that the moments at which the set points and sensitivities of these systems are determined are before birth and in early infancy, but that later experiences also affect an animal's sensitivity.

Needs and natural behaviour

Natural behaviour results from the interaction between motivational systems associated with water, food, company, reproduction, temperature and so on. The motivation for animals to exhibit a particular behaviour at a certain moment also depends, however, on the extent to which many other needs are met. Many of these needs and behaviours are already present, albeit in a rudimentary form, at birth. As needs are met from birth onwards, the desired satisfaction levels increase over time, thus changing the relevant set points. Moreover, programmed ontogenetic processes in the course of maturing to adulthood mean some needs are replaced by other needs and behaviours. Play behaviour, for instance, gives way to sexual and agonistic behaviour, while chewing behaviour replaces sucking.

Some types of behaviour are so important that the entire behavioural pattern is disrupted if they cannot be performed. These needs seem to be controlled by the same brain systems that are involved in stress and reward. The opportunity to perform these types of behaviour could act as a buffer against stressful events, and animals will not feel well if they lack that opportunity. They may develop pathological behaviour as a form of compensation; defective behaviour resulting in a similarly rewarding effect.

The question as to what extent animals' needs to show natural behaviour should be satisfied has an obvious socio-ethical dimension, as well as a biological one. Behavioural experts can indicate what the natural needs of animals are and which husbandry systems prevent them from satisfying these needs. However, the extent to which we are prepared to satisfy an animal's needs will reflect a careful balance between the animal's needs and our own interests.

In this respect, we want to create the opportunity for innovative research into the biological functions of behaviour in order to reach conclusions about the importance of certain types of behaviour for animals and the development of their needs to perform that behaviour. The intention is to work with ethicists and life and social scientists to devise a socio-ethical evaluation framework for determining priority behaviour in farm animals. Lastly, there will be scope for research into ways of charting the subjective components of animals' emotional state, starting from shared empirical knowledge, logical deduction and knowledge of the normal behaviour of species. The newly acquired insights will provide information for the *Societal trends in how we treat our animals* research theme, which involves an ethical discussion on the acceptability of the behavioural concessions we require from animals.

Eventually, the research into natural behaviour, needs and emotions should help to answer the following five questions:

1. How do we recognise the emotional state of an animal as the resultant of the animal's needs and stimuli in the environment?
2. How are set points established for the way in which an animal experiences discrepancies between its needs and stimuli in the environment, and how are these affected by genetic, epigenetic and cognitive mechanisms?
3. To what extent are these set points and their ontogenetic determinants neglected in current breeding and husbandry practices, and how can we correct any detrimental effects?
4. What is the role of natural behaviour in the way an animal perceives its environment, and what behavioural characteristics contribute positively to this perception?
5. How can we quantify the subjective components of animals' emotional state on the basis of shared empirical knowledge, logical deduction and knowledge of the normal behaviour of the species?

4.5 Selection behaviour of consumers and producers

The conditions in which production animals are kept, and especially the welfare of these animals, can be considered as a characteristic of the animal products generated. In that sense, animal welfare can add value to the products. This value should, however, be **reflected in the price** paid by the consumer. As the Netherlands is an exporting country, three out of every four consumers actually live abroad, although most of them are within Europe. The EU action plan for animal welfare is also seeking to achieve higher standards of welfare. Applying such a retail pricing policy to consumers will mean, for instance:

- An increased perception among consumers of what they are doing when they consume animal products produced in conditions that are more animal-friendly;
- A possible price increase that will partly offset the higher costs to producers of producing such products.

There are, therefore, two essential issues that play a dominant role in the question of how animal welfare can be improved:

- **Consumer demand** (the market, national and European) for animal products with a higher animal welfare value and robustness, where welfare is 'objective' and visible;
- **Producer demand** for production conditions that are friendly to animal welfare, and the impact of this on the entire production chain in terms of segmentation, production methods, costs and so on.

The two issues cannot be considered separately. A potential increase in revenues that results from changes in consumer appreciation and demand directly affects the economics of the entire chain (including producer demand), while topics such as the way the market and chain are structured, branding and marketing and the international context also have a major influence.

Embedding in the programme

Successful goal-oriented research into the selection behaviour of consumers and producers, (primary producers and other links in the chain) requires animal welfare to be measured 'objectively' and quantitatively. In this way, alternative decisions can be effectively formulated for consumers and producers, and thus form a basis for research into their selection behaviour. The applicable criteria will be developed in other parts of the programme and used in the research theme discussed here. There are also various research questions that will require research by various disciplines.

Role of the consumer

Consumers play a key role in selecting products (in retail, foodservice outlets and so on) that have a higher or lower added value with regard to animal welfare and robustness. The retail sector usually has the greatest influence on the **product range on offer**, but consumer preference also plays a major role in determining the latter. Branding greatly affects the buying process, especially with respect to the presenting of the production conditions (e.g. animal welfare) in a way that enables consumers to make an informed choice and in the warranties that can be given on products on the basis of certification systems.

The following general research questions into the selection behaviour of consumers and producers can be defined:

1. What are the most important factors in determining whether or not a consumer buys products with added animal-welfare value and to what extent do these factors correspond with the transparency of the goods on offer (if, for instance, criteria are set for animal welfare)?
2. What is the relationship between citizens' ethical standards and consumers' priorities in valuing product characteristics such as animal welfare, price and food safety? How stable are these priorities and what factors affect that stability?
3. To what extent does a lack of transparency or differentiation in the market prevent consumers from reflecting their preferences (latent or otherwise) in their actual buying behaviour? Can this discrepancy be reduced by branding and education?

Market organisations and institutions

Retailers and brand manufacturers play an important role in determining the range of products on offer to consumers, and thus in generating market demand. The composition of the assortment on offer derives from these companies' marketing strategies, in which their vision of socially responsible activities is an important issue. Branding is extremely important in demonstrating the various options that can be selected. In this respect the following general research questions on market organisation and institutions can be defined:

1. What do products with added animal-welfare value contribute to the psychological image of a chain-store retailer (CSR) and the financial performance of the store?
2. How can animal welfare be marketed as a profitable proposition to consumers?
3. Within which chains can brands scoring high on animal welfare be positioned?

Primary producers and production chains

Launching new products that take greater account of animal welfare or implementing new concepts for existing products has consequences for all links in the chain. These concepts involve numerous risks (image, sales, costs, auditing, etc.), which all need to be carefully weighed up. Primary producers increasingly operate within a specialised production chain. However, they also bear a major responsibility themselves with respect to the choices that affect their operational management and business set-up. It is ultimately the producer who decides the extent to which new ideas and concepts will actually be implemented in practical housing and production systems. Studying the behaviour that influences this selection in respect of animal welfare is, therefore, an important aspect of this theme, with the key issue being to identify the critical factors affecting the selection behaviour of livestock farmers, preferably within a specific business context. Understanding these factors may help to remove many of the barriers to improving animal welfare and robustness.

The following general research questions into primary producers and production chains can be defined:

1. How much scope is there to improve animal welfare among primary producers and production chains within the existing and future financial, economic and institutional frameworks?
2. To what extent can segmentation in the matter of animal welfare be an option within a chain, and what would be the consequences for the chain organisation and the auditing of the participants in the chain?
3. How should improvements in animal welfare be embedded in other important product characteristics such as the environment and food safety?
4. How sustainable or vulnerable (from a financial and economical perspective) will production chains and primary producers be if they implement improvements in animal welfare, what are the critical risk factors and how can these best be managed?

International context

Societal support does not only involve acceptance by the general public (i.e. citizens) of animal welfare and the creation of added value for consumers. It also involves various groups of players, such as local and national governments, societal organisations, consumers and producers. An exporting country such as the Netherlands cannot ignore the international arena, where animal products are traded. Societal acceptance of animal welfare takes place at various levels: local, national, European and world-wide. The latter two levels are very important in view of the Netherlands' strong position as an exporting nation. In that sense it will be interesting to examine the role that international institutions such as the EU, WTO, FAO and OIE could play in creating societal support for animal welfare. It is also important to investigate the opportunities for international producer organisations and voluntary codes of behaviour to help promote societal support for animal welfare.

5 Programme structure

In this programme, proposals may be submitted that focus on one of the two following types of animal husbandry:

1. Farms ('type 1') characterised by a high degree of rationalisation, such as in factory farming, where much attention is already given to health care as a prerequisite for optimising the operating result, animal health and food safety. These farms generally pay only limited attention to the behavioural component of animal welfare as implementing various welfare-enhancing measures would involve extra costs.
2. The growing number of farms ('type 2') that are moving to a greater or a lesser extent towards more animal-friendly/sustainable production methods. These farms are often characterised by less intensive forms of animal husbandry and by product speciality. For this category, improving the behavioural component of animal welfare is often the key element in the transition process (e.g. animal-friendly designs), but the practical implementation of the new production methods can create problems in relation to animal health, food safety or operating results.

In addition to the above two types of animal husbandry, proposals may address either short-term or long-term issues. Research proposals may have a clear short-term perspective if they focus on finding solutions for specific welfare problems currently existing in factory farming (e.g. feather pecking, docking pigs' tails and locomotion problems in dairy cows). On the other hand, we also need species-transgressing solutions with a longer-term focus on the transition to more animal-friendly and socially accepted types of animal husbandry. Policy and marketing efforts are needed, both in the long-term and short-term proposals, to promote and support socially desirable changes in the animal production sector.

Within the programme we are aiming for a balance between fundamental and applied research. There is a clear need for knowledge developed in cooperation with customers in industry and society.

5.1 Key fields

The problems involved in socially accepted and economically viable animal husbandry have been outlined in the previous sections, with discussion of the most pressing questions in the various focus areas. When formulating the call for proposals for the first round, it was decided, however, to select a limited number of fields. We have consequently decided to focus the first call on the following three key fields:

1. Interdisciplinary research aimed at enhancing animal welfare in intensive forms of animal husbandry and thus improving the societal and socio-economic position of these sectors. This involves knowledge that will help to identify solutions to welfare problems, such as locomotion problems in dairy cattle and broiler chicks, diet composition in relation to natural behaviour in veal calves and horses, the 'off-flavour' problem of fattening pigs, aggression among fish held in recirculation systems and feather pecking and cannibalism among laying hens.
2. Increasing the understanding of the emotional component of natural behaviour and/or the adaptability of animals in order to develop methods or parameters that can be used to provide a more scientific basis for assessing the emotional state of animals. This could include research into the validity of the homology postulate when interpreting the adaptation reactions of production animals in terms of feelings and emotions and into parameters for the emotional component of animal welfare.
3. Knowledge development with stakeholder participation, aimed at structural changes needed to achieve sustainable forms of animal husbandry, based primarily on the needs of animals. This type of interdisciplinary research will focus on participating in the design and implementation of new systems, on embedding them and on removing impediments to implementation. When we say systems, we are initially thinking of operating systems, chain procedures, market organisation and governance. The research will be based on and reflect theories designed to support transition processes according with sustainable development (such as system innovation, transition management, social learning and constructive technology assessment).

The programme will start with a call for pre-proposals that are in line with the three key fields. A programme committee will be set up to devise a format for the call and a rapid procedure for implementing it. This will eventually result in a limited number of projects being selected, and the relevant applicants will be invited to prepare a more detailed full proposal. The pre-proposals will be selected by an assessment panel consisting of international scientists and people from the fields of policymaking and day-to-day practice. This committee will assess the policy relevance and consider the merits of specific project proposals complementing each other.

The scientific quality and feasibility of the detailed project proposals will be assessed by international reviewers (3 for each project) in accordance with the usual system of hearing both sides of the argument. Applicants will be invited to present their proposals to the assessment panel. Based on the judgements of the reviewers, the hearing of the applicant and the presentation of proposals, the assessment panel will use its specific knowledge of scientific, societal and practical insights into animal welfare and robustness to formulate a recommendation that will be submitted to a Steering Committee for approval. This Steering Committee, which still has to be formed, will consist of representatives of the Dutch Ministry of Agriculture, Nature and Food Quality and the Netherlands Organisation for Scientific Research (NWO) - Earth and Life Sciences (ALW).

The proposals will be assessed on the basis of the following criteria:

1. *Relevance to the objective of the programme*, as formulated in the three key fields;
2. *Scientific quality*: This includes both the scientists' track record and the research proposal's scientific quality. It is important, therefore, for applicants to present a scientifically strong CV and to have demonstrated to be success in international collaboration. We also want to see approaches that are potentially innovative and likely to be successful in helping to answer the questions in the three key fields;
3. *Applicability of research results*: The research results should be able to be translated into information that can be applied in practice. The applicants should thus have demonstrable experience and impact in the field of converting scientific findings into practical applications;
4. *Active participation of industry* (producers, retailers and other players in the animal production chain) and NGOs, preferably demonstrated in the form of co-funding as a guarantee of involvement from

the applicant's side. A willingness by industry to provide facilities, laboratory animals, data sources and labour can, in this context, constitute a contribution;

5. *The interdisciplinary extent and added value of cooperating groups (national or international):* A proposal should combine at least two disciplines (see sections 4.1 to 4.5). In the case of existing cooperative ventures, the results that have been achieved are important, as evidenced in the form, for instance, of joint papers. In the case of new cooperative ventures, it is important for the expertise contributed to be complementary.

Who can apply:

Applications for funding are open to scientists working at Dutch universities, the Netherlands Organisation for Scientific Research (NWO) or institutes of the Royal Netherlands Academy of Arts and Sciences (KNAW) and the former Agricultural Research Agency (DLO), providing the latter are cooperating with a university in the proposal for which funding is applied and the researchers are free to publish in international scientific journals.

5.2 Implementation and indicative budget

To get the best result out of this programme, a budget of €8 million should be available over a six-year period. We propose putting out the programme in two rounds of approximately equal size. The Dutch Ministry of Agriculture, Nature and Food Quality (LNV) (2/3) and the Netherlands Organisation for Scientific Research (NWO) (1/3) have made a total budget of €3.6 million available for the first round (2008-2011). To launch the second round, additional funding will have to be found sometime between 2008 and 2011. This second round should build on the results of the first round and specifically target reinforcement of innovative forms of animal husbandry, as well as initiate basic research with a clear long-term perspective. In order for the second round to benefit from the research results generated in the first round, this round should start no later than mid-2009.

PhD student and postdoc positions can be applied for on the basis of the standard remuneration agreed in the covenant between NWO and the Association of Universities in the Netherlands (VSNU). As of 1 July 2007,

these have been set at €182,500 for a PhD-student (over 4 years) and for a postdoc at €180,000 (over 3 years), including a fixed bench fee. For support staff, the applicable rate is €42,000 per year. In view of the desired interdisciplinary collaboration both within and between institutions and the desired focus and mass, several positions can be applied for in each project proposal, subject to a maximum of 3 PhD-student and/or postdoc positions. Consumables and analysis expenses can be funded up to an annual maximum of €45,000 per application.

Five per cent of the budget should be set aside for communications and disseminating knowledge to the education sector, societal groups, scientists and stakeholders. The same percentage of the total programme budget should be set aside to cover management and administration costs.

5.3 Indicative timeframe

1. Formulating of programme description and budget by LNV and NWO
autumn 2007
2. Formation of programme committee, steering committee and assessment panel
January 2008
3. Start of call for proposals
spring 2008
4. Decisions on granting and start of projects
autumn 2008

Appendix A: Programme preparation committee

This programme description was prepared under the auspices of The value of *Animal Welfare* programme preparation committee.

This committee consists of the following people:

Dr Hans Hopster (chairman)	Animal Sciences Group of Wageningen University (ASG – WUR), Animal Production Systems Group/ Associate Professor of Animal Welfare, Van Hall Larenstein, Wageningen University
Professor Jos Verheijden	Faculty of Veterinary Sciences, Utrecht University (UU)
Professor Johan van Arendonk	Animal Sciences Group, Wageningen University (ASG – WUR), Animal Breeding and Genomics Group
Professor Siem Korver	Faculty of Economics and Business Administration, Tilburg University (UvT) / Vion Food Group
Professor Tjard de Cock Buning	Faculty of Earth and Life Sciences, VU University Amsterdam
Dr Sietse de Boer	Behavioural physiology, Groningen University (RUG)
Professor Ruud Huirne	Animal Sciences Group, Wageningen University (ASG – WUR)
Dr Marijke de Jong	Dutch Society for the Protection of Animals
Dr Leo den Hartog	R&D, Nutreco / Animal Sciences Group, Wageningen University (ASG – WUR), Animal Nutrition Group
Mr Jan Van Rijsingen	Dutch Association of Fish Farmers
Mrs Mona van Spijk	Dutch Federation of Agriculture and Horticulture (LTO) – North
Dr Ed van Klink	Dutch Ministry of Agriculture, Nature and Food Quality (LNV) – Department of Knowledge

Mrs Celia Steegmann	Dutch Ministry of Agriculture, Nature and Food Quality (LNV) – Department of Agriculture
Dr Annemieke van der Kooij	Netherlands Organisation of Scientific Research – Earth and Life Sciences Council (NWO - ALW)

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