

University of Hohenheim

Faculty of Agricultural Sciences

Institute of Animal Production in the Tropics and Subtropics
Animal Breeding and Husbandry
Prof. Dr. Anne Valle Zárate



Animal welfare approaches and the concept of naturalness in organic dairy calf management

Master Thesis
by
Theofano-Elissavet Vetouli

Stuttgart
March 2008

First supervisor: PD Dr. Brigitte Kaufmann

Second supervisor: Prof. Dr. Christian F. Gall

External supervisor: Dr. Vonne Lund, National Veterinary Institute, Oslo, Norway

ACKNOWLEDGEMENTS

I would like to thank all the people who helped in the completion of this master thesis. First and foremost I would like to thank my dear supervisors for the great collaboration, exemplary supervision and arrangement of all the financials for my field trip to Norway and Sweden :

Dr Brigitte Kaufmann for accepting me as a student despite her big load of work, for encouraging me in my choice, for taking care of all the official procedures while I have been away in Prague, for her direct, accurate and always discrete comments, for being understanding and supportive, facilitating any distance obstacles, and for the general well-organised and punctual supervision.

Dr Vonne Lund for the big inspiration she offered me (even if she did not realise it) and guidance in the world of animal welfare, giving me her valuable knowledge and for organising everything for the trip in Norway and Sweden, translating, driving, trusting me and giving me this great opportunity to visit the two countries, learn a lot about dairy farming in practice and meet so interesting people.

I would like to thank the farmers for giving me their valuable time, welcoming me in their homes and answering my long questions and also the researchers Dr Lena Lidfors and Dr Jenny Loberg for participating in the interviews.

I would also like to thank everyone at the Bioforsk institute in Tingvoll, Norway for welcoming me and being so warm and friendly. Especially I want to express my gratitude to:

Britt Henriksen, the 'big mama', for taking good care of me while I was at Tingvoll, for driving, translating, picking me, arranging that I had all I needed and also participating in the interviews

Steffen Adler, such a noble person, for the generous hospitality and my first ski lesson

Heidi Paulsen, for helping me with the interviews, translating, driving, introducing me to the Norwegian deer and being a friend!

I would also like to thank Dr Marek Spinka for the fast ethology lesson and for arranging contacts for me in the Institute of Animal Science in Prague.

And David for all the rest! ☆

Table of contents

1	Introduction	7
1.1	Historical background of the animal welfare concept	7
1.2	Development of animal welfare legislation	9
1.3	Thesis approach and research aim	11
2	Literature review	13
2.1	Definition and concepts of animal welfare	13
2.1.1	Biological functioning	15
2.1.2	Subjective experience /Affective states	20
2.1.3	Natural living	23
2.1.4	Other approaches	26
2.1.5	Values and Science	28
2.2	Animal ethics (an overview of some theories)	29
2.2.1	Ethical positions regarding moral significance	30
2.3	Animal welfare and organic livestock farming	36
2.3.1	The organic philosophy	36
2.3.2	Animal welfare in the organic philosophy	39
2.4	Organic dairy calf husbandry	45
2.4.1	Different calf rearing systems in organic and conventional farming	45
2.4.2	IFOAM and EU Regulations regarding organic dairy calf rearing	47
2.4.3	Overview of welfare situation in organic dairy calves	54
2.5	The concept of “naturalness” in dairy calf husbandry	57
2.5.1	Animal domestication and tameness	57
2.5.2	Human-animal relationship and its effects on welfare	62
2.5.3	Naturalness and rearing of organic calves	66
3	Case Study: How can the concept of Naturalness be best implemented in Rearing of organic dairy calves	70
3.1	Material and Methods	70
3.2	Results	74
3.2.1	Farmers’ interview	74
3.2.2	Researchers’ interview	83
3.2.3	Welfare evaluation	88
4	Discussion	91
5	Conclusions	102
6	Summary	104
7	References	105
8	List of appendices	118

List of Tables

Table 1: The Five Freedoms	8
Table 2: Definitions of Natural Behaviour from the scientific literature	41
Table 3: Minimum housing surface areas for bovine species according to the EU Regulation (Annex VIII)	51
Table 4: Extent of organic agriculture in Norway and Sweden in 2007	71
Table 5: The organic farms	74
Table 6: The non-organic farms	75
Table 7: The different rearing systems	75
Table 8: The organic farmers	77
Table 9: The non-organic farmers	77
Table 10: Farmers' approaches to animal welfare: aspects	78
Table 11: Farmers' approaches to welfare: restrictions	79
Table 12: Farmers' approaches to welfare: affective states	80
Table 13: Naturalness and calf welfare-the farmers' view	80
Table 14: Can a calf have a natural life in a production system?-the farmers' view	82
Table 15: Are mutilations compromising naturalness?	82
Table 16: The researchers	83
Table 17: What are the characteristics of a dairy farm that enable natural behaviour?	83
Table 18: Characteristics of a calf rearing system	84
Table 19: The dairy farmer and animal welfare	84
Table 20: Strengths and weaknesses of organic farming in relation to animal welfare	85
Table 21: Researchers' approaches to welfare: aspects and restrictions	86
Table 22: Researchers' approaches to welfare: affective states	86
Table 23: Naturalness and calf welfare-the researchers' view	87
Table 24: Can a calf have a natural life in a production system?-the researchers' view	87
Table 25: Are mutilations compromising a) naturalness, b) welfare?	88
Table 26: Ethical justifications for animal welfare provision	88

List of Figures

Figure 1: Three understandings of animal welfare	15
Figure 2: Conceptual model illustrating welfare aspects of the life of an animal, as the result between interactions of the animal's behavioural adaptations and environmental challenges	44
Figure 3: The effect of handling on the human-animal interaction	65
Figure 4: Researchers' welfare evaluation	89
Figure 5: Organic farmers' welfare evaluation	90
Figure 6: Non-organic farmers' welfare evaluation	90

1 INTRODUCTION

1.1 Historical background of the animal welfare concept

The debate on the issues of ethical treatment of animals dates back at least to ancient Greece, when it was debated whether humans are unique creatures, clearly distinguished from all other beings or just one species among all others (Fraser, 2001b). Aristotle (384-322 BC) supported the view that moral status requires reasoning and argued that animals cannot be regarded as beings of reason. The views of Aristotle have been used and referred to by Christian academics such as Thomas Aquinas (1225-1274) who also shared the opinion that animals have no moral status and no sentience. By the time of the Renaissance, based on the writings of Leonardo da Vinci (1452-1519), Erasmus (1466-1536), Thomas More (1478-1535), Montaigne (1533-1592), Shakespeare (1564-1616) and others, there has been a fair deal of evidence that animal sentience was accepted as part of secular knowledge (Preece, 1999 in (Duncan, 2006).

In the 17th century Descartes (1596-1650) expressed the view that animals are 'automata', like machines, which lack emotions, cannot think or feel pain. His views were later widely criticised and almost universally rejected (Ibrahim, 2007b). Philosopher Emmanuel Kant (1724-1804) also argued that animals lack moral status because they lack reason. During the age of Enlightenment, the philosopher David Hume (1711-1776) considered sentience to be relevant for moral consideration, and Jeremy Bentham (1748-1832), the English social reformer, argued for the moral significance of animals (Bentham, 1907). In the 19th century animal sentience was seemingly accepted to a quite broad extent. With the evolutionary thinking of people like Charles Darwin (1809-1882) and George Romanes (1848-1894), who expressed the view that feelings are adaptations to pressures of natural selection (Duncan, 2006), people started to regard other animal species as sharing not only a common anatomy with human species, but also common ancestry (Fraser, 2001b).

The industrialisation of agriculture in the western world brought about after World War II came as a call for more food to replace hunger and malnutrition and to improve the broken physical infrastructures (Hodges, 2003). At the same time it stimulated a rise in the use of animals in research with high numbers of toxicity tests, and until the 1960s animal experimentation was projected as a scientific necessity rather than an ethical issue (Rollin, 2006).

In 1965, the British society reacted to the emerging intensification of animal agriculture when Ruth Harrison exposed industrial animal farming practices in her book *Animal Machines*, published in the United Kingdom in 1964. The increased sensitivity of the British population led the British government to establish the commission of the Brambell Committee, a group of scientists under the leadership of Sir Rogers Brambell, who declared that any agricultural system failing to meet the needs and natures of animals was morally unacceptable and gave recommendations concerning how animals should be kept and handled (Rollin, 2004). The Committee's report led to the Agriculture Act in 1968 and to the formation of the Farm Animal Welfare Council (FAWC), whose reports and concept of "The Five Freedoms" (see Table 1) have been internationally adopted (Matheny and Leahy, 2007)

Table 1: The Five Freedoms

<ul style="list-style-type: none">• Freedom from hunger and thirst• Freedom from thermal and physical discomfort• Freedom from pain, injury and disease• Freedom from fear and distress• Freedom to express normal behaviour
--

(Farm Animal Welfare Council, 1993)

In 1975 Peter Singer published his book *Animal Liberation* where he argued that all animals are equal in their interest to experience pleasure and avoid suffering.

The book gave an overview of the factory farming practices and illustrated the concept of speciesism, triggering the formation of the animal liberation movement (Singer, 1990). A big impact on the public and scientific consideration of animal welfare came after the publication of Dawkins' book *Animal suffering* in the 1980s, where she put forth the position that animals experience positive and negative emotions and animal welfare is connected to the attribution of mental states to the animals (Dawkins, 1980). An advancement of this position to the view that feelings are seen as the only component of welfare was later on defended by Ian Duncan (1996). Since 1984 the most far-reaching view regarding the moral standing of animals has been developed by Tom Regan who established the concept of *animal rights* and argued for the consideration of animals not as human property but as individuals with moral rights that call for respectful treatment and for the abolition of all kinds of animal manipulation (Regan, 1988).

1.2 Development of animal welfare legislation

In the third century BC an early act of animal compassion was the ban of royal hunt and of religious animal sacrifices in north India, by King Asoka. 1800 years later, other acts of compassion were revealed when court cases defended animals, in England and Wales, with the earliest case in 1592 concerning cruelty to swans. However, regulations on animal protection in European countries started to appear in the 19th century. The first attempts to establish an animal-protecting law appeared in England and Wales in 1800, but the first law to treat animals humanely was passed in 1822, to prevent 'the cruel and improper treatment of cattle' (Knierim and Jackson, 1997). In spite of their differences in content, all of the regulations in the different European states were based on the principle that cruelty to animals, caused intentionally or through lack of care, is morally wrong and should be punished. Since the 1970s it has been increasingly recognised that many activities relating to animal welfare were of supra-national nature (e.g. transport of animals for trade purposes) and the Council of Europe (CoE) started the process of establishing guidelines and recommendations

(Caporale et al., 2005). A body of norms and regulations concerning the breeding, transport, slaughter and protection of companion animals, wild animals, farmed animals and laboratory animals has been formed. The current basis of EU animal welfare policy has been formed since 1997 with the Treaty of Amsterdam, which amended the Treaty of Rome¹. In the Treaty of Amsterdam, the Protocol on Protection and Welfare of Animals was introduced as an annex, and it recognised animals as *sentient beings*. The European Institutions were forced to fully consider the welfare requirements of animals when implementing Community legislation in animal transport, agriculture, internal market and research (Horgan and Gavinelli, 2006). Key policies concerning the protection of animals are included in the following European Union (EU) Directives and European Conventions, which have been synthesised (Bayvel, 2005b; Caporale et al., 2005) in chronological order:

1968: CoE Convention for the Protection of Animals during International Transport, additional protocols to this Convention were passed in 1979 and 2003

1974: EU Directive on animal welfare (stunning before slaughter)

1976: CoE Convention for the Protection of Animals kept for Farming Purposes

1979: CoE Convention for the Protection of Animals for Slaughter

1986: CoE Convention for the Protection of Vertebrate Animals used for Experimental and other Scientific Purposes

1987: CoE Convention for the Protection of Pet Animals

1991: EU Directive concerning the protection of animals during transport

1991: EU Directive laying down minimum standards for the protection of calves

1991: EU Directive laying down minimum standards for the protection of pigs

1998: EU Directive concerning the protection of animals kept for farming purposes

1999: EU Directive laying down minimum standards for the protection of laying hens.

¹ In 1957, when the Treaty of Rome was conducted, animals were considered agricultural products and were identified as 'goods'.

1.3 Thesis approach and research aim

In the new, industrialised form of animal agriculture, animals are raised in factory farms under poor welfare conditions, harmful for the environment, producing low quality food in a socially unjust way (Fraser, 2001a). Organic agriculture, which focuses on production of healthy and nutritious food in an economically, socially and environmentally responsible way, is interestingly continuously increasing worldwide (IFOAM, 2007b). Organic livestock production takes animal welfare issues into special consideration, and tries to promote a life quality for the animals that will manifest respect for their natural needs. The organic animal production methods employ special guidelines for the appropriate handling of animals, including aquaculture management practices (IFOAM, 2005). Parallel to the rapid development of the organic world, animal welfare science has also been constantly developing, for example, in the last 20 to 30 years 13 full time university chairs have been established around the world (Bayvel, 2005a).

The concept of animal welfare has been approached in variable ways though throughout the scientific and philosophical world and there seems to be no consensus about what a quality of life is for animals in agricultural systems. Among the different views, the approach of naturalness to animal welfare features feasibility perspectives that are challenging ethologically and ethically.

The present thesis is essentially a literature study that aims to compile and compare the different animal welfare approaches found across the literature and to investigate current views and discussions on the animal welfare concept. Given the prevailing differences in the welfare approaches, this study also examines how the different approaches to animal welfare reflect different underlying values and ethical considerations. The organic approach to animal welfare (i.e. the concept of naturalness) is explored in more detail, aiming to a better understanding of how and to what extent naturalness is and can be implemented within an organic livestock farm. This literature study is complemented by some empirical research in form of a case study. The narrower focus of the study is on the organic approach to animal welfare and exemplarily explores the implications of this approach for the rearing of organic dairy calves.

In order to learn about the practical situation on the farms and about the views of farmers regarding welfare in organic calf rearing, a case study has been conducted. It assesses how far the organic approach to animal welfare is implemented in some calf rearing systems in Norway and Sweden.

2 LITERATURE REVIEW

2.1 Definition and concepts of animal welfare

There have been many attempts to define non-human animal welfare and across the literature plenty of them can be found. Although “animal welfare” is a commonly used term, there is no consensus about its definition and this fact further implicates different understandings of what a good quality of life is for a non-human animal (Lund, 2002). In a wide interpretation of the term, Appleby (1997), page xi) is giving the definition of animal welfare as “the state of well-being brought about by meeting the physical, environmental, nutritional, behavioural and social needs of an animal”. In a broad sense, animal welfare refers to the life quality of an animal and has several aspects like health, pleasure, longevity and harmony with the environment.

There are a few definitions that persist in contemporary scientific literature, in legislation, as well as in several animal welfare organisations, such as the ‘five freedoms’ definition of welfare. The differences between the definitions come as a result of different cultural, political and scientific backgrounds of the stakeholders and their respective interests. For example a legislator who wants to regulate minimum welfare standards would give a different definition than a scientist who wants to make welfare assessments and measurements. Similarly, public interest and concern raise a separate definition relating to activism, current knowledge and socially acceptable (or unacceptable) animal manipulation (Swanson, 1995). The major animal welfare definitions are dealt with in the following sections.

A big issue among the scientific and philosophical literature, concerning the definition of non-human animal welfare, is whether welfare is an objective state which therefore consists of measurable parameters, or not (Bracke et al., 1999). The objective-position claims that welfare can be measured in a scientific and direct way from the coping ability of the individual towards the environment it lives in. In other words, the effort which is required on behalf of the individual to reach satisfactory living conditions is a measurable welfare indicator. According

to Broom (1991) welfare is a measurable concept that involves the ability of an individual to cope with its environment and can vary between poor and good. Certain situations can result in poor welfare and certain indicators can measure to what extent the poor welfare reaches (i.e. stress levels). Moreover it is claimed that “the welfare of an individual can be precisely assessed at any particular time” (Fraser and Broom, 1997). On the other hand, according to the subjective-position, welfare is a concept that cannot be measured because of its dual nature: a science-laden component and a value-laden component, which implies that there is no objective truth regarding what welfare is (Tannenbaum, 1991).

Welfare, as a dictionary term, is composed by the word “well” and the verb “to fare” (= to go, to proceed) and therefore it is considered a synonym to “well-being”(Oxford University Press, 1989). In this (terminological) sense, welfare cannot be poor just like well-being cannot be anything else but well (or not existent). As a result of this semantic considerations, Seamer (1998) defines welfare as the state of well-being of an individual which continuously persists or increases as long as its psychological and physiological needs are satisfied and any unfavourable factors are limited or eliminated. Fraser (1998) has suggested that “welfare” should be used to describe the long-term good condition of an individual and “well-being” for its short-term state.

In order to better understand what we mean by animal welfare, we need to examine in more detail the main concepts behind different welfare approaches separately. Most welfare definitions have been identified (Duncan and Fraser, 1997) as belonging to one of the following categories: (i) the biological functioning approach which sets the good health and productivity of a non human animal as the most important welfare factor, (ii) the feelings-based approach, which has as a core value the subjectivity of experiences and emotions, and (iii) the natural living approach, which claims that the individual’s ‘natural needs’ are most relevant to its welfare.

In spite of the differences in principle, the three approaches to welfare seem to correspond often. Lund (2002) has suggested that the three different understandings of welfare partly overlap as shown in Figure 1.

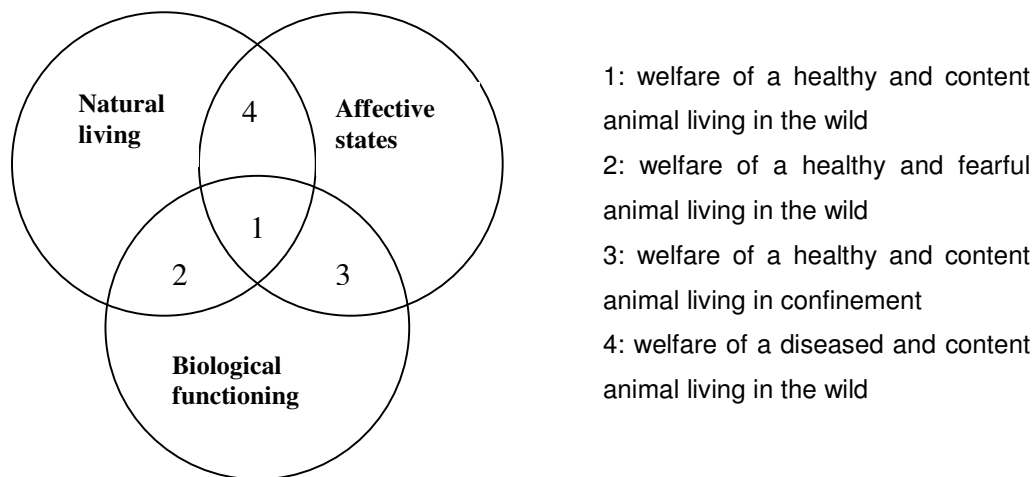


Figure 1: Three understandings of animal welfare

Each circle represents one of the three different approaches to animal welfare: the natural living approach, the biological functioning approach and the subjective feelings approach. The numbers in the circles represent conditional overlapping among the approaches (adapted from (Lund, 2002).

2.1.1 Biological functioning

The idea behind the biological functioning approach is that welfare is promoted when the animal succeeds in coping with its environment (Broom, 1986). The coping success involves absence of (large) physiological stress response and fulfilment of the animal's biological needs (Duncan, 2005). According to this definition, welfare is generally indicated by healthy biological functions, high reproductive capacity, longevity and biological fitness. The coping concept was developed and changed by Broom over the years. As mentioned above, he supports the objectivity of the welfare state, focusing on strictly biological

functioning factors, though later he also pointed out the importance of feelings² in his approach (Bracke et al., 1999)

When an animal is facing adverse conditions in the environment in which it lives, it will try to overcome them. This biological-functioning position supports that the effort which will be laid by the individual against any negative conditions is expressed by physiological and behavioural modifications. The physiological changes take place because of improper circumstances that have to be faced, such as physical discomfort or movement limitations. In such cases the animal's physiology responds with stress symptoms that include amongst others alteration of brain processes, high adrenal activity, disturbance of the immune system and increased heart rate. Behavioural changes also occur as a result of an adaptation effort towards a potentially harmful factor in the animal's environment. The physiological and behavioural reactions of the individual aim to re-gain biological functionality.

In more detail, Broom (1991) has listed a number of environmental disturbances that require the animal's response. Fear responses can be initiated by the threat of possible dangers like predation or injury and can cause behavioural aversion and physiological changes. Such changes involve high brain activity and initiation of the adrenal cortex. Pain perception, as a part of the individual's state that can initiate adrenal activity, is similarly another detrimental factor of 'poor welfare', which can be detected by behavioural observation and by recording of pain fibres of the nervous system. A number of other disturbances originate from the animal's inability to have control over its environment. Insufficient stimulation drives the individual to develop behavioural abnormalities. Likewise, absence of specific stimuli for a species can be of great importance for its development and survival. Over-stimulation is frequently also detrimental if an animal is forced to experience unpredictable situations with unfamiliar excessive input. Other

² 'The mechanisms for trying to cope include behaviour, physiological systems, immunological systems, a range of feelings such as pain, fear and various forms of pleasure etc'. Page 63. (Broom, 2002)

uncontrollable conditions involve movement restrictions and frustration over being hindered to act in a specific way.

Welfare assessment

All the above mentioned conditions can cause a number of physiological and behavioural symptoms which, successful or not, are directly detectable and can therefore provide valuable information about the individual's state. The welfare assessment in this case is possible by measuring the extend of the coping efforts as well as the levels of stress that the individual has experienced. Failure to cope with adverse environmental conditions is also proof of 'poor welfare'.

There are several indicators which can be used for welfare measurement when welfare is defined in terms of biological functioning. Measures of body damage such as wounds, broken bones or injuries are used to reveal poor welfare. Disease incidence and disease susceptibility can indicate that an animal has been kept under poor management or housing conditions. An impaired immune system can result from the fact that the adrenal cortex of the individual has been highly active over a long time span. High adrenal activity is generally associated with high coping efforts and high levels of adrenal products show that the individual is facing difficulties in its environment (Broom, 1991). Adrenal products and enzymes as well as other hormone secretion, blood pressure and heart rate are key elements in welfare measurement and they are described as stress indicators (Keeling and Jensen, 2002). Stress is the effect that negative environmental conditions (threatening stimuli or 'stressors') have on an individual (Fraser and Broom, 1997). Stressors involve primarily the recognition of a threat by the organism, then the response to the threat and ultimately the consequences of the stress response, which account for the impaired welfare. The stress response is basically expressed by changes in the biological functions of the organism, which develop a pre-pathological state of defence and eventually, if the stressor persists, a pathology. Pre-pathological states, such as immune system suppression or extreme aggression are the main threat to welfare as they can result in pathological states where the individual is not in the

position to practice normal biological functions (reproduction, health maintenance) (Moberg, 1987). Biological fitness is usually assessed by determining the number of female offspring per female breeding. Inadequate reproductive success can be a consequence of poor welfare and is attributed to insufficient reproductive behaviour, which can result in failure to conceive, failure to come into oestrus, abortion or premature offspring death (Fraser and Broom, 1997). Lifetime reproductive success can provide a lot of information about the welfare of the individual along with life expectancy (Broom, 1991). Short life expectancy indicates that the animal might have been experiencing stress and therefore poor welfare conditions during parts of its life, even if it's been highly productive (Hurnik and Lehman, 1988). Highly productive animals often experience health problems and diseases that are associated to the high production rates, like for example mastitis or lameness in dairy cows (Broom, 1991; Marie, 2006; Stricklin, 2003). But a highly productive animal with a good longevity and high reproductive success stands for satisfying welfare conditions. Stereotypies³ are usually regarded as another poor-welfare indicator. Although stereotypic behaviour appears to be a useless movement sequence with energy costs for the individual, it is assumed that it contributes to cope with an extremely restricting situation. To illustrate the purpose that stereotypies serve at, Broom (1988) gives examples of calves and sows with impaired health when stereotypic behaviour was absent. On the other hand, Mason and Latham (2004) list a number of studies which show that stereotypies are not necessarily linked to poor welfare. In specific, they show how in cases which are thought to be welfare-promoting (provision of a stimulating factor in the animal's environment, increase of cage size or decrease in corticosteroids level) stereotypies fail to decrease and how poor welfare conditions may not initiate stereotypic behaviour. Although a lot of times stereotypies are negatively co-related to other welfare parameters, systems that increase stereotypic behaviour are indeed likely to

³ A stereotypy, as defined by Broom (1988) is a repetitive and invariable movement, for no apparent reason that appears too frequent to be considered as part of a normal function system of the animal. A commonly occurring stereotypy is bar biting in sows.

reveal bad conditions for the animal, but other indicators have also to be taken into account.

Self-narcotising (e.g. utilization of naturally occurring analgesic substances such as endogenous opioids) and apathy are similar welfare indicators associated with brain chemistry, that show one more way in which an animal is attempting to overcome unbearable circumstances (Broom, 1991).

The fulfilment of the animals' biological needs is another argument of the biological functioning advocates. To serve the purpose of welfare assessment, there has been suggested a classification of the biological needs of the animals in three distinct categories. These categories outline an order of biological requirements starting with the most important: The first category includes the so-called *life-sustaining needs*, namely the needs that have to be satisfied in order to prevent sudden or direct death. Examples of life-sustaining needs are the need for adequate oxygen, food, water and fresh air supply, protection from extreme temperatures and avoidance of toxic substances. The second category includes needs that help the animal keep a satisfactory health level, like coverage of all nutritional requirements, and are called *health-sustaining needs*. Finally, the third category includes the *comfort-sustaining needs*, which if not satisfied will cause discomfort, frustration, abnormal behaviour or even reduced reproduction (Hurnik, 1988; Hurnik and Lehman, 1988). In a similar way, another classification of the animals' biological needs has been suggested, proposing a hierarchy of *physiologic needs*, *safety needs* and *behavioural needs* (Curtis, 1987). To illustrate what this classification means in practice, the following example is used: dehorning an animal can be a stressful procedure that causes a lot of discomfort and frustration, thus compromising welfare from the point of view of a comfort sustaining need. But in the presence of horns, animals can injure one another causing in this way a health sustaining need to be unsatisfied. Since the biological functioning point of view considers body damage to be more important for animal welfare, dehorning has to be carried out in spite of the short-time discomfort it may cause, for the sake of the long-time health and injury prevention it will serve.

2.1.2 Subjective experience /Affective states

Other definitions of animal welfare can be considered as belonging to a second approach towards animal welfare, the subjective experience or affective states approach. This position is defining the welfare of an animal as the state in which the animal is *feeling* well. The subjectivity approach is emphasizing the significance of the animals' emotional experiences, as most important for welfare status.

This approach emerged in the early 1980's, when Dawkins argued that animals experience negative and positive emotions and that mental suffering can still occur in physically healthy animals. In her book *Animal suffering: the science of animal welfare* (1980) she is analysing how these emotions can cause a whole scale of affective states from joy and happiness to extreme suffering. She underlined the significance of not only avoiding suffering, but also of providing positive feelings in accomplishing animal welfare (Dawkins, 1980). This view was furthermore developed to support that what the animals feel should be the only reliable indication of animal welfare (Duncan, 1993). Duncan has pointed out the argument that since (as generally accepted) welfare can only be applied sensibly to sentient animals, and sentient means capable of feeling, then the animals' feelings should be the only welfare variable (Duncan, 1996).

Feelings, as experienced by humans are assumed to be in correspondence to animals' mental experiences, so that, for example, obstruction from highly motivated behaviour is interpreted as frustration (Desire et al., 2002). Additionally, animals may even experience other states of suffering, that are not experienced by humans (Duncan, 1993). Among advocates of the subjectivity approach, it has been argued that negative feelings, like fear or fright serve as reflex mechanisms (or refer to processes that have evolved from these mechanisms (Paul et al., 2005)), at least in mammals and some higher invertebrates, as more flexible ways of reacting to danger/harm (Duncan, 2005). This means practically that the animal will try to escape from possible threats by following its feelings. With this perspective, negative feelings demonstrate that

the individual is experiencing a damaging situation or is threatened by a damaging factor.

Respectively, positive feelings demonstrate that an animal is experiencing well-being. In this way, the importance of feelings should not be misconceived or underestimated but respected as vital survival components. The positive feelings reflect a state in which the cognitive needs of the individual are met so that the animal is in a mentally good condition. If mental health entails physical health, an animal in bad physical condition may also be in a bad mental condition. Otherwise, if the individual does not feel ill, although it is, welfare is not compromised. Since, as generally accepted, welfare applies to sentient animals and sentient means capable of feeling, it is concluded that welfare is exclusively depending on the satisfaction of the individual's cognitive needs (Duncan and Petherick, 1991). Nevertheless, whether animals are conscious requires scientific evidence, which is though still debated among scientists since the cognitive components of emotions have not yet been thoroughly explored as a source of information about animal emotions (Paul et al., 2005). Forkman (2002) claims that it is not possible to demonstrate that animals are conscious of what is happening around them, while Dawkins (2006) states that there is plenty of evidence of the cognitive abilities of many animal species.

Pain, as an explicit evidence of suffering, is one major welfare-reducing factor. Other states of suffering are for example frustration, deprivation, hunger, fear and boredom. Hence, in order to assess welfare it is important to know whether an animal is experiencing pain, frustration or any negative feeling, how strong this feeling is and how long it lasts (Duncan, 2005). Unlike the biological functioning position, here the welfare measurement must be carried out rather indirectly. It is impossible to know exactly how much pain an animal feels, given that emotions are not directly measurable variables but subjective states available only for the animal to experience. However, although measuring subjective states poses problems, some methods of welfare assessment have been developed.

Welfare assessment

In order to assess the psychological experiences of animals, non verbal or behavioural methods are used to estimate what animals like, or dislike, what they learn to be good for them, what they recognise as familiar, or how much value they attribute to a welfare factor (Watanabe, 2007). In preference tests the animal is given the opportunity to choose between different components of its environment. These tests are based on the assumption that the animal will make a choice that serves best its welfare interests (Keeling and Jensen, 2002). The problem arising here is the validity of such tests because the choice an animal makes is always of relative importance to the choice it didn't make, and it could also be influenced by the individual's former experiences. This could be mitigated by providing a wide range of choices and by comparing the preference tests with motivational tests as well. However, difficulties persist because there is an apparent conflict between the long time and the short time welfare interests of an individual (Duncan, 1978). Additionally, there is also the problematic fact that animals can be 'fooled' by a human. For instance, a tasteless food could be one enriched with valuable vitamins, or a tasty food could be one containing addictive drugs, like alcohol. Very important component of a preference test is also to examine the preference strength of the choice an animal is making (how much more choice A is preferred compared to choice B). Obstruction testing is another method used in welfare assessment, which is monitoring the effort that the animal will make to overcome an obstacle, in order to reach a preferable choice (the higher the effort, the higher the desire for a choice). In a similar test, Jensen et al. (2004) have suggested the elasticity of demand functions as a measure of motivational strength. This method, inspired by the economic theory, suggests that the elasticity of a need can be revealed by the effort laid to satisfy this need when facing increased difficulties in doing so. Food for instance, consists of an almost inelastic need, because the more we increase difficulty in accessing it, the higher the effort that the animal will make to obtain it. By comparing between the elasticity of demand of different behaviours, we can assess their relative significance and quantify behavioural priorities. Pain symptom lists are one more tool that can be used in welfare assessment, as well as behaviour observation in

cases where an animal suspected for feeling pain is i) treated and ii) not treated with painkillers (Molony and Kent, 1997). Beyond choosing something to reach a positive state, tests have also been developed to examine how animals choose something to avoid a negative state. Another way to see what animals want is to limit the time they have available for realising certain activities and then observe the relative importance of each activity for the individual. This is done by decreasing the time available for performing these activities and assuming that in limited time periods the most important activities will last longer or will have priority over the less important ones. In addition to all the above mentioned, physiological evidence of stress response can be used for welfare assessment as confirmative information of the preference results (Duncan, 2005).

2.1.3 Natural living

The natural-living approach considers welfare to be firmly connected to the realisation of the animal's nature. Each species has specific "natural" needs that ought to be respected and should live a life in accordance with its own nature. The fulfilment of the animal's nature presupposes adequate environmental stimulation so that the animal is able to express its whole behavioural spectrum. In order to suggest what would promote animal welfare as determined by the natural-living approach, it is necessary to understand each species' nature. Rollin proposed that each species has its own 'inherent, genetically encoded nature' that is subjecting it to specific behavioural performances. He used the word 'telos' (ancient Greek for completion or purpose) to describe the physical and psychological nature of an individual (Rollin, 1993). The nature of an animal has also been addressed as its genetically encoded behaviour- specific for every species- that has been 'built' as a result of evolutionary processes. Through evolution and natural selection, animals (at least higher) have developed adaptations that rule the performance of behaviour by defining not only species specific behaviour, but also under which conditions certain species specific behaviours are expressed (Fraser et al., 1997). Evolution has promoted

characteristic features for each species that qualify it for better survival possibilities. This means that through constant adaptation in its natural habitat, each species has evolved its physical, mental and behavioural characteristics towards the best possible surviving and reproductive potential (Lund and Röcklinsberg, 2001; Waiblinger et al., 2004).

The problem arising here is to know the essential natural needs for domesticated species. The nature of each animal species developed over thousands of generations and while the animals were living in 'wild' conditions. It is also in the 'wild' where these features served a function and where the animals could freely express them. The wild ancestors of contemporary domesticated species developed specific characters in the specific environments they lived. They were naturally selected for fitness to withstand aversive conditions and developed traits to help them be flexible and adaptive in constantly changing situations (Jensen, 2002b). Domesticated animals have been subjected to breeding and provided with very different living conditions than their ancestors. In addition, functions of several natural features have been taken over by humans, such as shelter or food provision. However, no behavioural pattern has disappeared from farm animals, and the motivational structures of each species still persist (Jensen, 2002a). To be in the position to understand the natural needs of a species, scientists rely on behavioural studies of wild or feral animals and compare them with domesticated animals.

Algers and Lund (2007) have argued that natural behaviour is not necessarily the behaviour performed 'in nature'. According to their view, natural behaviour is the behaviour initiated by a stimulus which by being performed seeks to result in a functional outcome which will then reduce the motivation to perform the behaviour. In this sense, some behaviours may be found in recession if their motivational levels are kept low; for instance, some behaviours can be avoided or repressed by appropriate environmental manipulation. The practical suggestions of this view are connected to the fact that some 'natural behaviours' are not always perceived as good for the animals' welfare (Algers and Lund, 2007) and that some environments which encourage expression of natural behaviour can as

well induce suffering for the animals (Fraser et al., 1997). Even so, in the context of the organic interpretation of animal welfare, natural living is considered to be good in itself and a precondition for accomplishing welfare (Lund, 2006). Kiley-Worthington (1989) has furthermore argued that an ethologically sound environment is one which decreases or eliminates prolonged suffering. It is hence essential to understand, when designing an ethologically proper environment for an animal, what prolonged suffering consists of and what the species' behavioural needs are. Advocating this view, Spinka (2006) has identified positive examples in the relation between natural behaviour and welfare: behaving naturally is also associated with positive emotional experiences and may bring long-term benefits to the animals that would not be accomplished otherwise.

Environmental challenge is considered as integral part of behavioural development and welfare, according to the natural living approach. An environment resembling the animal's habitat, as much as possible, is a prerequisite for natural behaviour and subsequently for welfare. Natural behaviour takes place not simply by permitting the animal to express whatever it wants, but also by providing adequate environmental challenge. A stimulating environment is one which offers possibilities for the animal to make decisions, to make choices or to get expectations. Animals tend to actively interact with their environment, investigate and explore it, in ways that create innovation and enable challenge. This interaction also serves as a way to get information about their surroundings and many times animals get challenged by their own activities. Such stimuli are reduced, if not completely missing, in controlled living conditions with high predictability, such as farming systems. Nevertheless, a certain degree of predictability is necessary so that the animal can have some control over particular situations and future events of its environment (Wemelsfelder and Birke, 1997). The more natural the environment, the more natural the expressed behaviour will be. When the animal has the possibility to express its entire spectrum of natural behaviour then it confirms a natural environment and experiences welfare. The production environment must have components that

promote species-specific behaviour and this does not refer only to housing systems; it should for instance also include appropriate feeding for physiological health (Lund, 2006).

2.1.4 Other approaches

The notion of the Five Freedoms is another approach that has been used to define animal welfare. The Five Freedoms have been listed by the Farm Animal Welfare Council as five principles that have to be respected in order to accomplish welfare and they are also employed by many animal welfare organizations (BSAS, 2007; UFAW, 2007). The Five Freedoms are also expressed in legislation in Europe, North America, and Australasia, as well as in the guiding principles of the World Organization for Animal Health *Office International des Epizooties* (OIE) (Matheny and Leahy, 2007).

According to this approach, the following freedoms have to take place under all circumstances, so that welfare is ensured:

- Freedom from hunger and thirst
- Freedom from thermal and physical discomfort
- Freedom from pain, injury and disease
- Freedom from fear and distress
- Freedom to express normal behaviour

(Farm Animal Welfare Council, 1993)

The first three Freedoms refer to the good biological functioning of the animal. The fourth Freedom involves all the emotional-subjective aspects of welfare, while the fifth Freedom links welfare to natural behaviour. As we can see, the five freedoms approach incorporates all the elements of the scientific and philosophical discussion as components of an animal's welfare.

Dawkins (2004) has made yet another approach to welfare and welfare assessment. She argues that good animal welfare consists of two components: if the animal is healthy and if it has what it wants. Animal health, as freedom from injury, disease and deformity is the foundation of animal welfare, alongside with

mental well-being. Mental well-being in this case is defined as a state in which the animal has what it wants (likes or prefers) and does not have to endure what it doesn't like. She has suggested that instead of using a variety of behavioural, physiological and biochemical indicators that have to be integrated for welfare assessment, we can base our measurement of welfare only on the behavioural responses of the animal to the two questions: *is the animal healthy?*, and *does the animal have what it wants?* Use of behaviour is a non-invasive tool for welfare assessment which in this case includes vocalisations, preferences and choice measurements.

Sztybel (1998) has identified several different views of animal welfare and he has classified them as following:

Animal exploiters' animal welfare, which is the 'good care' of animals that the people who use animal for commercial or recreational reasons take and a view which may validate factory farming conditions

Commonsense animal welfare, which is the public's general vague opinion that welfare has to do with avoiding cruelty to animals and being kind to them

Humane animal welfare, more disciplined than the common sense view of welfare concerning animal cruelty, which does not reject all animal-exploitive industries and practices (e.g. as professed by humane societies and organizations)

Animal liberationist animal welfare, such as Peter Singer's view which claims welfare to be accomplished when animals are free (or liberated) but accepts certain forms of animal use, such as vivisection [also ***utilitarian's animal welfare*** see:(Sztybel, 2006)]

New welfarist's animal welfare, a term used by Gary Francione⁴ to describe people who support reforms in animal welfare legislation while claiming to be animals rightists

Animal rights animal welfare, which does not distinguish between the two and considers welfare to be realised with the abolition of animal exploitation (use of animals for food, leather, fur, vivisection, entertainment, zoos).

As it becomes evident, it is not easy to stick to one definition throughout different backgrounds, interests and time frames. The dynamic rather than static nature of the term can be attributed to the fact that there is no clear consensus about how humans value animals (Arkow, 1998) and what is the nature and extend of our moral duties toward them (Hemsworth, 2007). Moreover, science is called to answer ethically raised concerns, such as the concern for the welfare of animals, when it is still debated where a line can be drawn between scientific justifications and moral considerations (Sandøe and Simonsen, 1992). Thus, an important question we should try to answer is why there are different perceptions of animal welfare and why the concept of animal welfare is not a universal one.

2.1.5 Values and Science

The different animal welfare perceptions practically originate from the different values that formulate concerns about how animals ought to be treated (Fraser et al., 1997). It is these ethical concerns that led primarily to the development of animal welfare in a scientific context, reflecting in this way the ethical principles of the society (Duncan and Fraser, 1997). This is the reason why scientists should not face welfare purely as a technical term, ignoring that it also requires ethical considerations. The major values which are 'inextricably connected' to animal welfare concerns have to be clearly demonstrated so that such misunderstandings are eliminated (Tannenbaum, 1991).

The relevant ethical concerns of welfare have to be first of all recognised by the scientists and secondly not misinterpreted by personal ideologies, as scientists have their own ethical ideologies and may therefore not define welfare in accordance with other widely held positions and concerns. When trying to apply these ethical concerns on a technical base, scientists have implemented several empirical methods. In a scientific context, the theoretical problem has to be transformed into precise action by using a certain methodology. Accuracy in measurement and development of reliable indicators are the tasks that science is

⁴ (Francione, 2007)

called to carry out, reflecting at the same time the source of the problem- the relative value that society attributes to proper animal treatment. But the interpretation of the ethical concerns has to be carried out appropriately in order to truly reflect the underlying values (Fraser et al., 1997). The problematic 'technicalisation' of a moral-borne notion requires clear definition that can be used to link it with other technical terms or to measure it with existing scientific methods (Stafleu et al., 1996). The 'problematic' nature of this process is due to the fact that values are philosophy-addressed issues that empirical science tends to exclude from its territory, given that scientific research aims to be as objective and rational as possible (Verhoog et al., 2004). Broom (1988) has advocated the idea that welfare assessment can be carried out in a scientific way, without any moral considerations and that any ethical decisions about the moral acceptability of the given welfare situation can be made afterwards. On the other hand has been widely argued (Fraser, 1999; Rollin, 1990; Sandøe and Simonsen, 1992; Tannenbaum, 1991) that science does not provide objective facts upon which society will apply its ethical values. They have supported that animal welfare science, similarly to all scientific disciplines, is not value-free, but inseparably bound to valuational notions, including ethical ones. Scientists should be aware of their moral responsibility when conducting scientific research, instead of leaving it to 'society' since scientific research is taking place because of social values and under the conditions and rules that social values and ethics set. Furthermore, social values are the ones to decide in the first place what 'counts' as *scientific facts*, meaning *what* scientists will study and *how* they will study it (Rollin, 1993).

2.2 Animal ethics (an overview of some theories)

Each one of the animal welfare definitions as approached by the three different views (functionality, subjectivity and naturalness), reflects how science based arguments are connected to ethical guidelines. Every animal welfare approach is an interpretation of an ethical position regarding moral obligations humans have towards animals.

But do humans have any moral duties at all towards animals? Do animals have moral standing? What qualifies animals as participants in the moral community?

Morality is the application of certain ethical rules we impose to ourselves and to others in a social context (Narveson and Wellman, 1970). The moral status of animals has changed through the history of the human-animal relationship. In ancient times, the Stoics and the Epicureans excluded animals from moral consideration (Verhoog et al., 2004) and until recently in the Western society, animals have been regarded as inferior to humans (Taylor, 1999). In contemporary society, growing concern on animal welfare and ethical issues, particularly with the development of biotechnology (Marie, 2006) has lightened up the debate of the moral status of animals. Philosophers have argued about what makes an entity qualify for moral concern in its own right if at all and, if so what the human duties are towards animals (Sandøe et al., 1997). Among the arguments used to deny animals moral consideration in their own right are that animals lack an immortal soul, lack reason or language, are evolutionarily inferior or are unable to make contracts. These arguments have been rejected by other philosophers for being wrong or lacking the 'necessary degree of moral relevance that would justify not considering animals morally' (Rollin, 1990).

In the following we will examine briefly some ethical theories concerning how we ought to treat animals and their ethical justifications. These justification theories are ethical positions that manifest the human-nature and human-animal relationship and the moral rules that govern them. The ethical considerations will focus on the question *how we ought to treat animals* and on the nature of human duties to non-human animals.

2.2.1 Ethical positions regarding moral significance

There are four main categories for ethical positions towards the relationships of humans with animals and with nature. The different ethical frameworks argue whether humans, sentient beings, living organisms or whole ecosystems have an own intrinsic value and have direct moral significance.

Anthropocentrism (from Greek άνθρωπος, anthropos= human)

It is the ethical view that only all humans have direct moral status (Lund and Röcklinsberg, 2001). This means that other living beings, like animals, are not qualified for moral considerations in their own right, and that they can be used for any purpose of human interest. Animal mistreatment consequently, is morally acceptable if it serves human ends and our moral responsibilities are valid only towards other human beings. From an anthropocentric point of view, animal welfare is an obligation only if a maximum output for human use can be obtained (Verhoog et al., 2004).

Sentientism

Sentientism or zoocentrism is the view that only all sentient beings have direct moral status (Lund and Röcklinsberg, 2001). This theory supports that humans have moral obligations towards sentient animals; therefore, causing suffering to such animals is considered as morally indefensible and humans have the responsibility to control or prevent it. Humans ought to treat animals in a way that does not offend their sentience and respect their moral status (Verhoog et al., 2004).

Biocentrism

The biocentric theory supports the view that all living beings have direct moral status. It is not only humans or other sentient animals that require our moral obligations, but all living entities. Humans have the obligation not simply to avoid the suffering of animals, but respect them in their nature and integrity (Verhoog et al., 2004).

Ecocentrism

Unlike biocentrism, ecocentrism expands its ethical framework from individual organisms to whole natural systems. According to this view, not just sentient beings or living entities are morally important, but all species and whole ecosystems have an intrinsic value and direct moral status. From an ecocentric point of view a distinction has been made between individual entities and species, where the second are more significant morally than the first (Verhoog et al., 2004). It has been argued that ecocentric ethics fits, at least to the extent

where individuality is morally subordinate, to the organic farming philosophy which has environmental concerns and the ideal of sustainable agroecosystems (Lund, 2002; Lund et al., 2004).

Some ethical theories concerning how we ought to treat animals

Utilitarianism

In short, the utilitarian ethical guideline says that what ought to be done is what causes as much good as possible and as little harm as possible (Narveson and Wellman, 1970). The morality of our actions is defined by the consequences caused; the maximum of good consequences and/ or the minimum of undesirable consequences have to be obtained in the utilitarian framework (Croney and Millman, 2007).

Utilitarianism is usually considered to originate from the nineteenth century, when Jeremy Bentham and John Stuart Mill defended that ethical practice is one which brings the greatest good over evil (Hurnik and Lehman, 1988). Bentham argued that sentience should be the decisive factor of whether an entity should be morally considered or not, and argued about the moral significance of animals⁵. One of the prominent utilitarians of our time, Peter Singer introduced the idea of animal liberation (in his homonymous book, first published in 1975) arguing that certain animals are sentient and defending that sentience should decide whether an individual should be morally considered. The principles of consequence thus apply to sentient animals in the case of ethical animal treatment. Singer considers animal sentience, at least for mammals and birds, as a given fact, and as such, it should not be offended. Causing animal suffering is an action with harmful consequences for the subject, whose interests are being compromised.

⁵ ‘But a full-grown horse or dog is beyond comparison a more rational, as well as a more conversable animal, than an infant of a day, or a week, or even a month, old. But suppose the case were otherwise, what would it avail? The question is not, Can they *reason?* nor, Can they *talk?* but, Can they *suffer?*’ (Bentham, 1907).

The interests of an animal are to experience as much pleasure and as little suffering as possible and this should apply equally to all sentient beings, human and non human (Singer, 1990).

However, conclusions drawn out of this theory can be very challenging since there is no action which is considered ethically absolute correct or wrong. While emphasising the importance of consequences, any action can be permissible as long as it is outweighed by good results. This means practically that an animal could be subjected to pain as long as this pain would result in more pleasure in a universal context (Sandøe et al., 1997). For example, animal vivisection is a painful procedure that most likely will also result in death for the animal. But if out of this procedure a useful medicine can be created that saves the lives of thousands of sick children, it can be morally accepted. This presupposes that the pain and suffering it has caused to the animal was less than the good it has provided in the total context.

Furthermore the utilitarian view as expressed by Singer claims that the painless killing of a sentient, but not self-conscious entity (which therefore has no expectations regarding its future) is ethically accepted, as long as it is replaced with another individual which is at least as happy as the one it replaces. In practice, this means that it is not ethically wrong for instance to kill an animal for food, given that its life so far was pleasant and that it will be replaced by another animal with also a pleasant life. The ethical view is confirmed here by claiming that the total amount of happiness has not changed or improved and therefore such a killing is not just morally acceptable but it should take place.

Therefore animal suffering has to be either avoided or outweighed by the good consequences it will bring.

Our focus here is not whether this view draws a line between humans and animals, but what suggestion it makes in practice about our treatment to animals and how it can be implemented for animal welfare.

Duty ethics

The duty or deontological ethics approach originates from the eighteenth century philosopher Immanuel Kant (1724-1804) who claimed that an act can be ethically either right or wrong (and not circumstantially permissible). In spite of the fact that Kant himself did not accept animal sentience but considered animals to be irrational beings (Duncan, 2006; Fraser, 2001b; Ibrahim, 2007a), he set the ethical base for the animal rights view which was later established by Tom Regan (Croney and Millman, 2007; Szybel, 2006).

The animal rights view claims that all animals (human and non human) possess moral rights and an inherent value. These rights are universal and equal for all the individuals that bear them. This qualifies them to the principle of respectful treatment, being morally treated as a result of respect to their inherent value and their moral rights⁶. The principle of respect has a direct effect on our ethical treatment of animals (as moral agents to moral patients⁷): no animal should be harmed in defence of a human's interests, since every individual's basic rights, either moral agent or moral patient, are equal (Regan, 1988). This does not conclude that the moral value of humans and animals is the same, but the way humans treat animals must be judged by the same moral criteria as for the way humans treat each other (Rollin, 1990).

Unlike utilitarian ethics, duty ethics is not case sensitive. Subsequently, it is generally unethical to violate an individual's rights and, as a consequence, to sacrifice one's interests for the interests of another (human versus animal interests). This clearly illustrates what our treatment of animals ought to be like; animals are not meant to be used by humans in any way that would compromise their interests and disrespect their inherent value. They should not be used for food or experimentation, entertainment or sport. Ultimately, the animal rights view

⁶ The *respect principle*, as cited by Regan (1988, pp 248): *We are to treat individuals who have inherent value in ways that respect their inherent value.*

⁷ Regan distinguishes between moral agents and moral patients as follows: moral agents are individuals that can be held morally accountable for their actions and refer to normal adult humans, while moral patients are individuals that cannot be held morally responsible for their actions and here refer to animals as conscious, sentient, cognitive enabled individuals (Regan, 1988).

challenges ownership of animals as someone's 'legal property' and aims to the 'dissolution of the animal industry as we know it' (Regan, 1988).

Virtue ethics

Virtue ethics is another theoretical approach to ethics, which is based on moral characters (virtues) of the active agent. Virtues are features of one's character and refer to traits such as courage, justice, generosity, kindness, temperance, honesty and patience. Virtue ethicists often follow Aristotle's *Nicomachean Ethics*. According to Aristotle's work, a virtue is basically the repeated good habit (ethos), which makes the person that practices it virtuous. The ethical virtue of a person is not intuitive, but it is shaped with the repetition of such behaviour. The ethical perception of a human is giving shape to his activities, as the word ethos implies (in greek: habit, manner) and this actual expression results from his free choice of both actions and emotions (Aristotle). Therefore, a fully virtuous person will act in the way that she or he ought to act which is at the same time the way that he desires to act (Hursthouse, 2001). It is the practice of such virtuous activity (to act in accordance with one's virtues – practical reasoning engaged in decision making) that brings felicity (*eudemonia*) to the virtuous person (Lemos, 2007).

When applying this theory in relation to our treatment of animals, it is revealed that the ethical considerations concern only us –humans– as moral agents. This is the reason why this ethical approach to animal issues is also called 'agent-centered' view (Sandøe et al., 1997). Ethical treatment of animals in this sense is treatment according to one's virtues. And this is a problem that poses limitations for animal issues to be ethically implemented in the virtue theory, since any ethical application entails individual interpretation according to one's virtues (Szybel, 2006)

2.3 Animal welfare and organic livestock farming

2.3.1 The organic philosophy

Organic agriculture is described as an agricultural practice that is using methods respectful to the environment through all stages of the production process until a product reaches the ultimate consumer (FAO, 2002). According to the Codex Alimentarius Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods :

'Organic agriculture is a holistic production management system which promotes and enhances agroecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, cultural, biological and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system.' (CAC / GL 32, 1999)

Organic agriculture is based on agroecological principles and focuses on soil fertility and plant health, not with the use of external input, but with a 'closed system' approach (Ikerd, 2006). Considering the agro-ecosystem as a living entity and using natural systems as a model, organic practice employs biological protection of the plant and soil, crop diversity in space and time and nutrient recycling. In the organic practice, livestock is considered as an integral part of the farm. Farm animals are essential for providing manure and allowing a balanced crop rotation. They help return nutrients to the ground without the use of chemical fertilisers, while they also play an important economic role for the farmer, by providing a regular income (Lampkin, 2002). In organic agricultural systems the farm is seen as an organism that functions as a result of balance between its components, while being responsive and adaptive to its own environment (Woodward, 2002).

Coming as a result of long time efforts against agricultural intensification, organic farming finds its roots in the early 20's and 30's of the 20th century in Europe

(Vaarst et al., 2004). Since the foundation of biodynamic agriculture in 1924 from Rudolf Steiner, the ideal of the farm as a 'self-contained evolving organism' first emerged (FAO, 2002). This systemic approach was further developed in the 50's and 60's with the 'organic-biological' movement, to meet a greater acceptance only after the Green Revolution; with the major environmental impacts from the wide use of agro-chemicals and mechanisation becoming more evident, public concern raised in favour of organic farming. After the recent food scandals like the BSE outbreaks, consumer awareness seems to lead towards an increased demand for organic food and animal welfare issues are also given significant concern (Vaarst et al., 2004).

In 1972 the International Federation of Organic Agriculture Movements (IFOAM) - the world umbrella association of organic farming was founded. IFOAM defines standards for organic farming, which serve as basic principles for most national regulations, making in this way an important contribution to the harmonisation of international organic standards. The vision of IFOAM is a sustainable agricultural practice on a global level, as reflected in the IFOAM principles of organic agriculture (IFOAM, 2007a):

The principle of health states that organic farming should maintain and improve the health of the soil, plants, animals, humans and planet as a whole. Health represents the integrity of living systems and entails mental, physical, social and ecological well-being. Organic farming aims to the production of high quality nutritious food within immune, resilient and regenerating ecosystems.

The principle of ecology states that organic agriculture should be practiced based on living ecological systems and cycles, adopt them, work compatibly with them and help maintain them. Organic management should make use of renewable resources and conserve genetic, agricultural and natural biodiversity.

The principle of fairness states that organic agriculture should build on relationships that guarantee fairness with regard to the common environment and life opportunities. Fairness has to apply to all participants in the organic food chain and makes reference also to animals, who must be provided with a life in accordance to their physiology, natural behaviour and well-being.

The principle of care states that organic agriculture should be practiced with precaution and responsibility towards the protection of health and well-being of current and future generations and the environment. Organic management must be safe and use resources efficiently, while acknowledging indigenous knowledge and traditional farming practices.

Beyond these four ethical principles, IFOAM has also described general principles that apply to the entire production, processing and handling, labeling and distribution system of organic goods and also refer to food safety, resource use efficiency, environmental management, social justice and animal welfare, including aquaculture and apiculture (see Appendix I).

The Danish Research Centre for Organic Farming (DARCOF) has synopsized the organic farming objectives in three basic ethical principles:

The precautionary principle, which focuses on the nature-man interaction. This principle projects the respect that man should have for nature and his moral duty to protect it from possible harms. Based on the basic assumption that man is an integral part of nature and cannot fully comprehend possible consequences his actions may have on it, agricultural practice should make use of natural systems rather than trying to control them.

The cyclical principle, which underlines the importance of using renewable forms of resources, promoting closed nutrient flows and minimizing overexploitation and pollution.

The nearness principle which aims at the establishment of a humane 'organic system' on a local level that encourages transparency, safety, protection of cultural values and communication between all the 'actors' of the organic food chain (DARCOF, 2000).

The values behind the organic concept reveal a wider aim towards an ecologically responsible system that spreads beyond the farm, to social structures and economic viability of all members of the organic chain. The concept of organic agriculture is implementing a systemic approach of agricultural practice with the primary goal of optimum health and productivity of soil, plants, animals and people (FAO, 2002; Ikerd, 2006). This reflects the

holistic view of the organic philosophy, which aims towards agricultural progress and development, taking into consideration ecological, economic and social aspects, with the further aim for sustainability.

This holistic approach to agriculture underlines the interaction between man and nature as fundamental, and farm animals are as well an element of this interaction as part of nature. At the same time, this holistic view considers humans and farm animals together as part of the agro-ecosystem, and this has great importance for the welfare status of the animals in organic systems (Alroe et al., 2001).

2.3.2 Animal welfare in the organic philosophy

Naturalness in the organic context

In the organic philosophy, the concept of 'naturalness' is of major importance. Organic is claimed to be produced in a 'natural' way and the consumers' perception of organic production is also related to the 'naturalness' of production. But what naturalness really means is not so easy to state. Definitions of **what is natural** may vary considerably. It has been argued that there are two different senses of natural; in one sense, naturalness should refer to the property of anything which is subject to the laws of natural sciences. The second understanding sets as 'natural' anything independent from human interference (Verhoog et al., 2003).

In the organic context, the concept of naturalness is inseparable from viewing the farm as an organism in its wholeness, as a system that functions by making optimal use of natural physical and biological processes. Respect for nature is emphasized and its protection is considered as man's moral responsibility. Organic agricultural practice aims to work with natural processes, incorporate and use them and not try to control them (principle of ecology). In the organic farming's holistic view, working with natural cycles and living systems in a harmonious balance for plants and animals is also substantial (see Appendix I). Verhoog et al. (2003) have distinguished different interpretations of the concept of nature within the organic philosophy. The three identified **approaches to**

'naturalness' are : i) the organismic approach that views as natural what is related to the realm of living nature (as opposed to dead nature, i.e. chemical substances) and consists of autonomous life processes (*no-chemicals* approach to naturalness), ii) the ecosystem approach where natural refers to the self-organised and self-regulatory properties of agro-ecosystems (*agro-ecological* approach to naturalness), and iii) the natural entity approach, where natural refers to the characteristics of every living system (plants, animals, humans and ecosystems) possessing its own intrinsic value as a part of nature (*integrity* approach to naturalness). In the organic farming philosophy all three aspects of naturalness are incorporated as necessary for optimal system management and further development (Verhoog et al., 2003). Relevant to these systemic principles is the organic principal aim to provide living conditions that allow animals to express the basic aspects of their innate behavior (see Appendix I). Animals under human care in organic farming are living individuals, components of the agro-ecosystem and also a part of nature, that qualify to respect. This respect is expressed by providing a quality of life to the animals that meets their 'natural needs' (Vaarst et al., 2001). This consists of the link to the animal welfare concept which is understood, in organic farming, as the provision of a 'natural life'.

In this wider concept of welfare, positive feelings are to be taken into account as well, as a part of expressing natural behaviour. In this position organic livestock welfare has to be ensured by a rich natural life with greater behavioural opportunities, such as playing and socializing. On the other hand, a high degree of natural living is possible to cause a certain degree of biological disfunctioning and health damage (illness, parasite infections etc), or increased negative feelings and suffering (combative behaviour) (Alroe et al., 2001).

Defining natural behaviour

The fact that natural living conditions for the animals are required by the principal aims of organic farming (see Appendix I), shows that animal welfare is not solely interpreted in terms of biological functioning and satisfaction of physiological and

behavioural needs. Leading a natural life in the organic production system concerns expression of natural behaviour, natural reproduction and growth (Alroe et al., 2001). In specific, the organic definition of naturalness, with regard to animal husbandry, lies on the expression of species-specific behaviour within a natural (including key features and stimuli) environment (Waiblinger et al., 2004). The first reference to the concept of natural behaviour was in 1988 in the Swedish Animal Welfare Act (Swedish Statute 1988:534), Section 4: *Animals shall be accommodated and handled in an environment that is appropriate for animals and in such a way as to promote their health and permit natural behaviour.*

Trying to specify what is natural behaviour, other definitions have also been suggested. They are presented in the Table below (Table 1).

Table 2: Definitions of Natural Behaviour from the scientific literature

Definition	Author	Year
The behaviour that tends to be performed by the animal under natural conditions because it is enjoyable for the animal and promotes biological functioning	Bracke & Hopster	(2006)
The species-specific behaviour and the underlying evolved control mechanisms	Waiblinger et al.	2004
The evolved sets of control systems to allow the animal to register and react to internal and external stimuli in order to optimize survival and reproduction	Lund & Röcklinsberg	2001
The motivated behaviour that gives a functional feedback to the animal when performed	Algers	(1992)
All the behaviours in the animal's repertoire	Kiley-Worthington	1989

The different aspects covered by the several definitions could be summarized as follows:

Natural behaviour is

- intrinsically motivated
- a species-specific characteristic

- performed under natural circumstances (in natural habitat)
- performed because it is pleasurable to the animal.

As it is shown in the definitions above, central aspects of an animal's natural behaviour are the environment and the animal's needs, or the internal and external stimuli (Waiblinger et al., 2004). The internal stimuli refer to the animal's genetic, species-specific or innate nature, that has been brought about by the long-lasting evolutionary process, and has built the basic outline for the species' behaviour (Alroe et al., 2001). The external stimuli refer to all the environmental conditions, challenges and individual experiences, which affect the way, time and reason of a performed behaviour (Waiblinger et al., 2004). This interpretation of natural behaviour, as a combined outcome of the animal's nature and 'nurture' (or internal and external stimuli, or needs and environmental circumstances) seems to follow the genetic relationship where: genotype and environment result in phenotype, which in this case would be the expression of (natural) behaviour. The dynamic relation between the components of natural behaviour of an animal enables them to show flexibility- the environment influences the expression of a genetically imprinted character to a better survival potential while the innate nature helps the individual to adjust in different environments- and is the reason why animals, and in particular domestic animals, show high adaptability and behavioural variation (Waiblinger et al., 2004).

Natural behaviour in animal husbandry systems

If under animal husbandry conditions, the natural behaviour is disregarded, then welfare problems appear. The welfare of an animal, in terms of coping, depends on its **adaptability in the specific husbandry system**. The adaptive capacity of an animal is determined genetically on a species-specific level, and with regard to environmental conditions on an individual level. When the animal shows inability to cope in the given environment, two things could be taking place: i) the animal has a need or motivation to perform a behaviour that cannot be expressed or satisfied or that cannot serve the function that it is meant to, because of a restricting environment that is lacking key features, ii) the

environment is subjecting the animal to conditions, for which the animal does not possess any adaptive characters, because it is not likely that such conditions would be encountered in the animal's 'original' habitat (Fraser et al., 1997) (Figure 2).

In the first case, the motivation to perform a behaviour has been interpreted as an adaptation that no longer serves a function for health or survival and has therefore no direct necessity or simply, as an adaptation unsuited to the challenges that the animal is facing in the specific environment (Alroe et al., 2001). Examples of such behavioural needs are the calf's desire to suck or the furrowing sow's desire to build a nest. It has been argued that such behaviour persists although not necessary anymore for health or survival- because, for instance, the calf is fed with milk by a bucket. However, there could be more possible functions of sucking than milk intake, such as pleasure and other affective states, that are ignored when the calf is prohibited to use its natural means of accomplishing it (Fraser et al., 1997). The calf is experiencing unsatisfied motivation to suck because it has been put under restricting conditions (separated from its mother). In the second case, the environmental conditions that the animals encounter are the livestock husbandry housing and management systems that may often be somehow inappropriate for the animal's adaptations and pose threats to its health and safety since their potential risks are not detected by the animal, such as avoidance of contaminants.

The following figure shows the different welfare situations to which the animal can be subjected, depending on the balance between its possessed adaptations and environmental challenges. When the animal is prevented from performing a behaviour that it is highly motivated to perform (part A in Figure 2), it possibly experiences suffering and may also develop physical health problems (Waiblinger et al., 2004). On the other hand, when the animal is put in conditions that are not similar to its natural habitat, there could appear situations that require a kind of adaptive behaviour, which is missing (part B in Figure 2), setting in danger the animal's biological functionality. For example, high ammonia concentration in housing systems with poor ventilation, can cause serious

respiratory damage to the farmed livestock that lacks a respective self-defending adaptation (Alroe et al., 2001). The part where the adaptations and the challenges correspond and interact (part C in Figure 2), is the case when welfare can be potentially accomplished. For example, thermoregulatory systems of the animal correspond to incidents of cold or hot temperatures, up to a certain extent (where both the animal's system and the prevailing conditions are part of C) (Fraser et al., 1997) .

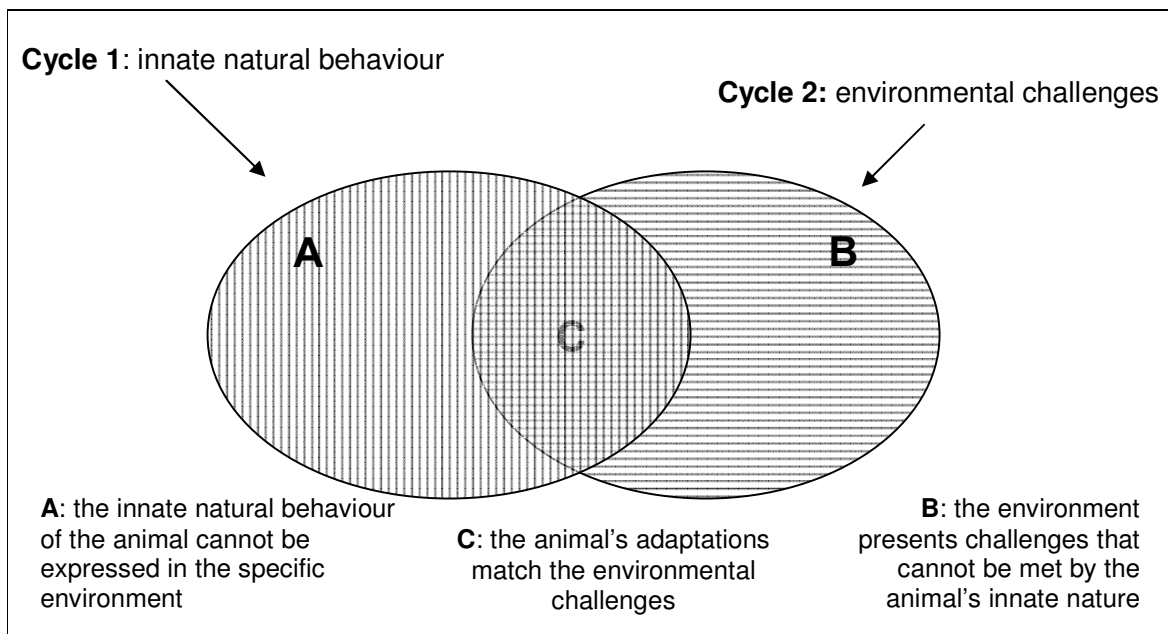


Figure 2: Conceptual model illustrating welfare aspects of the life of an animal, as the result between interactions of the animal's behavioural adaptations and environmental challenges

The interaction between behavioural adaptations and environmental challenges that the animal faces in the specific conditions it's been kept: (A) when the environment does not correspond to the animal's need to perform a behaviour, (B) when the animal's innate nature is not 'qualified' to meet the challenges of the environment and (C) when the animal's adaptations correspond to the challenges it encounters under the specific circumstances (adapted from Fraser et al (1997), page 200).

Therefore, the larger the common 'area' of the animals' natural behaviour and the environmental challenges it is facing, the higher the degree of welfare that is accomplished. What can be concluded is that to accomplish such a 'matching', the living conditions of the animal have to be as 'natural' as possible. Natural behaviour has to be given the opportunity to be expressed, and the environment has to feature similarities to the natural habitat of the animal (including feed), where such behaviour was evolved and adapted in (Lund, 2006).

2.4 Organic dairy calf husbandry

2.4.1 Different calf rearing systems in organic and conventional farming

Several types of rearing systems and practices can be observed in organic and conventional cattle farms. They are differentiated based on the following characteristics: the kind of feed (milk) provided to calves, the method of feeding, and the type of calf housing.

Feeding system

The feed

Calves, apart from cereal pellets and roughage (straw, hay) for rumen development, will be primarily provided with milk of the following kinds.

Colostrum: is the first secretion produced by the mammary gland of cows after calving. Adequate colostrum provision is of major importance for calf welfare, as it contains large amounts of immunoglobulins, protecting the neonatal from infections and supplies high amounts of minerals and vitamins as well as fat, which is important for maintenance of body temperature of the new born. Failure of calves to receive sufficient colostrum quantity is potentially a cause for subsequent mortality (USDA, 2002).

Whole milk: the shift to milk from colostrums has to be gradual, in order to avoid digestive disorders. Whole milk is very seldom used due to economic reasons,

although the composition of whole milk is well matched to the digestive capabilities of the young calf, which makes milk an excellent feed for them.

Milk replacers: are widely used and they are usually based on dried skim milk and dry whey and have been supplemented with carbohydrates and fat (e.g. homogenized tallow or lard). A variety of milk-replacer formulations are available commercially and different powders may have various nutritional content. Furthermore acidified milk replacers have been produced in order to allow for mixing and storing of large quantities at one time required for ad libitum feeding. (Crawford, 2006).

The feeding method

The different calf feeding systems can be distinguished according to

a) natural or artificial feeding

Suckling: natural suckling systems feature calves staying with their mother and/or nurse cows, who they can suckle. Depending on the duration of the suckling period, we can distinguish between

- long term suckling, covering the first 6-12 weeks of the calf's life and
- short-term suckling, which lasts approximately from few hours after birth to 3-5 days (Krohn, 2001).

Long term suckling systems are commonly observed in beef calf rearing under extensive or semi-extensive conditions (Friend and Dellmeier, 1988).

Artificial: Artificial feeding systems include bucket feeding and teat feeding methods. The bucket system has the disadvantage of not offering any suckling opportunity for the calf's natural suckling need, which can be satisfied, at least to some extent, with teat buckets, teat bottles or automatic feeders with teats. Providing access to milk through a teat reduces non-nutritive suckling and increases secretion of hormones important in the digestion process, while allowing the calf to express its natural sucking needs (von Keyserlingk and Weary, 2006).

b) access to feed

Restricted: Restricted feeding systems involve feeding the calves once or twice a day. In this system (individual feeding) the calves can be supervised at each feeding so they can be easily checked visually for any kind of necessary individual care.

Ad libitum: This system allows calves unrestricted access to feed. With free access to milk (or milk replacer) calves tend to drink more and show higher growth rates (weight gain). Ad lib systems can be either natural suckling systems (with the mother or with foster cows) or automatic feeding systems.

Housing system

Calves can be managed under different conditions, varying from complete to minimal environmental manipulation. They may be housed in groups of various sizes or individually in pens, and provided with ranging space allowance per individual. Veal calves are often housed in crates which is an illustrative example of extreme confinement since they are prohibited from performing most of their natural behaviours, suffering from 'chronic deprivation of sufficient freedom of movement to perform the fundamental fixed action patterns of kinesis/locomotion' (Friend and Dellmeier, 1988). Various types of individual housing include: individual hutches, individual pens and calf stalls where the calves are tied. Grouped housing types include super-hutches/group hutches, group pens and housing without building (outdoor rearing) (Anon., 2008).

2.4.2 IFOAM and EU Regulations regarding organic dairy calf rearing

The regulations set on a European level about animal welfare in the production of calves are contained in the Council Directive 91/629/EEC laying down minimum standards for the protection of calves. As last amended in 2003, the Council Directive principally prohibits the use of confined individual pens after the age of eight weeks and regulates appropriate feeding, stocking densities and health treatments (Council Directive 91/629/EEC). In the organic legislation though, such features are more strictly regulated.

Although the first regulation on organic farming (Council Regulation (EEC) No. 2092/91) was conducted in 1991 and first implemented in 1992, it was only in 1999 that the regulation was supplemented to include organic livestock production rules (Council Regulation (EC) No. 1804/1999).

The guidelines on organic livestock farming first came into force in August 2000 and were regulating housing conditions, health management, veterinary treatment, animal nutrition, animal breeding and animal care. The requirements of these guidelines have to be fulfilled, otherwise no animal product can be labelled as organic within the EU.

The guidelines have been formulated by the IFOAM and the IFOAM has also set certain standards that the members have to comply with, in order to obtain or preserve their organic label. IFOAM basic standards have been used for the development of the EEC Regulation for organic production (Sundrum, 2001). The EU council has set rules on production, labelling and inspection of the organic livestock systems of the most important animal species. Production rules refer to general principles of livestock production, origin of the animals, conversion, feed, husbandry management practices, disease prevention, veterinary treatment, housing, transport and manure management.

In the IFOAM Norms for Organic Production and Processing (2005 version), the livestock management basic standards are presented along with the principles that bring them into being and the respective recommendations. The IFOAM basic standards about animal husbandry are briefly presented here and followed by an outline of the rules in organic livestock production of the EU Regulation. Emphasis has been given to welfare related rules, with a focus on dairy calf rearing.

IFOAM Basic Standards on animal husbandry (II, Section 5)

Animal management: Management and housing facilities should provide for sufficient free movement of the animal (stand naturally, lie down easily, turn around, groom), rest (adequate natural bedding), protection from sunlight, extreme temperatures, rain, mud and wind and predators and offer to the animals

the opportunity for expression of their normal behavioural patterns, with access to open air pasture areas. The animals should be able to satisfy their needs in fresh air, water, feed and daylight and should not be isolated. Landless animal husbandry is prohibited and the housing system should be constructed and equipped of materials that do not significantly harm human or animal health.

Length of conversion period: In dairy production, the conversion period for the existing animals on the farm is 90 days.

Animal sources/ origin: Calves have to be raised organically. Conventionally raised dairy calves may be brought to organic farms when organic animals are not available, only up to 4 weeks old, having received colostrums and being fed mainly full milk.

Breeds and breeding: Embryo transfer techniques and cloning are not allowed and breeding should be based on breeds that reproduce successfully without human interference. However artificial insemination is allowed.

Mutilations: Mutilations are not allowed with the exceptions of castration and dehorning.

Animal nutrition: Animal feed has to be organic. Some exceptions are allowed up to the level of 10% dry matter per ruminant annually and at least 50% of the feed must come from the farm or the farm wider region. Animals should have daily access to roughage.

Calves shall be provided maternal milk or organic milk from other cows, and shall be weaned only after a minimum time that takes into account their natural behaviour. Non organic milk may be provided when organic is not available. Milk replacers or other substitutes -free of antibiotics, synthetic additives or slaughter products- can be used in emergencies.

Veterinary medicine: Health and well being of the animals must be ensured by all practical preventive measures in animal husbandry practices and if preventive measures fail to keep an animal healthy, then medical treatment that will relieve the animal from unnecessary pain is required, even if the animal will lose its organic status. Chemical allopathic drugs, antibiotics and vaccinations are allowed only under restricted conditions.

Transport and slaughter: Transport and slaughter conditions must minimise adverse stressful situations for the animals without the use of synthetic tranquilizers or stimulants. Animals must be handled calmly and gently and the use of electric prods and similar instruments is not allowed. Maximum travelling distance to slaughterhouses is eight hours, but exceptions are allowed. (IFOAM, 2005)

EU Regulation (Annex I, B)

In principle, the reproduction of the organic herd should be carried out naturally without human intervention, but artificial insemination is also allowed. Other forms or artificial or assisted reproduction are not allowed. The selection of breed must be conducted in such way that vitality, adaptability to the local conditions and disease resistance are favoured. These features are dominant in indigenous breeds and strains, which therefore should be preferred.

The feeding of the animals has to aim to ensure quality production instead of quantity production. The animals have to be fed with organically grown feedstuff, which should be produced on the farm unit, or at least on other organic farms. Calves have to be fed with natural milk (preferably maternal) for at least three months. In the diet of an adult animal, at least 60% of the dry matter in daily rations has to consist of roughage, fresh or dried fodder, or silage. For dairy cows in early lactation the percentage can fall to 50% for a maximum period of three months.

Disease prevention is of vital importance in organic livestock farming and the measures taken include: selection of disease resistant breeds, husbandry practices appropriate for each species, high quality feed and exercise, appropriate stocking densities and housing in hygienic conditions. If, nevertheless, the animal gets sick or injured, immediate medical veterinary treatment is compulsory. If chemically synthesised allopathic veterinary medical products and antibiotics are the only solution in combating illness and injury, and treatment is necessary to avoid suffering and distress to the animal, then their use is allowed under the supervision of a veterinarian.

Housing facilities must provide enough space for animals to cover their behavioural needs concerning freedom of movement and comfort and easy access to feed and water. Animal tethering is not allowed. The housing building must offer appropriate temperature, air humidity, dust level, air circulation and gas concentration, so that housing conditions are not harmful to animals. In areas with appropriate climate, housing equipment is not necessary. Indoors, the stocking density must be appropriate for the breed and age of the animals, taking into account their behavioural needs, depending on group size and sex. In particular, stocking density must ensure enough space for the animals to stand naturally, lie down easily, turn around, take all natural positions, groom themselves and perform all natural movements. The minimum surface areas have been identified as shown in Table 2.

Table 3: Minimum housing surface areas for bovine species according to the EU Regulation (Annex VIII)

	Indoors area		Outdoors area (exercise area; pasturage not included)
		m ² / animal	m ² / animal
Breeding or fattening bovine	up to 100 kg of live weight	1.5	1.1
	up to 200 kg of live weight	2.5	1.9
	up to 350 kg of live weight	4	3
	over 350 kg of live weight	5 (minimum of 1 m ² /100kg)	3.7 (minimum of 0.75 m ² /100kg)
Dairy cows		6	4.5

(Council Regulation 1804/1999)

Flour must be smooth and not slippery, at least solid up to 50%. Resting area must be sufficient, clean, comfortable, dry and not slatted, include ample dry bedding and natural litter material.

All animals must have access to pasturage or open air area. Use of such areas can be subjected to limitations because of bad weather and ground conditions or the animals' physiological condition. If pasturage is accessible during the grazing period and if the winter housing system allows freedom of movement, then

access to open air areas is not obligatory. Calves after 1 week of age must be kept in groups and not in individual boxes.

Dehorning of calves is an operation that should not be carried out systematically in organic livestock farming but is permitted for welfare, hygiene or safety reasons. Physical castration is also permitted.

During transport and until slaughter, animals must be handled with caution and in a way that is minimising stress. Use of electrical stimulation or allopathic tranquilisers before or during transport is prohibited (Council Regulation 2092/91).

On July 20, 2007 the new organic regulation was published (Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labelling of organic products and repealing Regulation (EEC) No 2092/91), which will come into force on January 1, 2009. According to the new livestock production rules (Article 14) the stockperson must have the necessary basic knowledge and skills as regards the health and the welfare needs of the animals and livestock management and housing must ensure that 'the developmental, physiological and ethological needs of animals are met' (Council Regulation 834/2007, 2007). Concerning health in organic livestock, the IFOAM EU Group has commented on the new implementing rules in a draft position paper about veterinary treatments. It is suggested among others that *veterinary treatment* should be defined more precisely and that treatments for parasites should not be included in the restrictions for number of treatments. Since parasites have been reported as one of the most important health and welfare compromising factors, any restriction in the number of treatments under organic practice could lead to suffering of not properly treated sick animals (Leroux et al., 2007).

Organic livestock farming differs from conventional in many aspects. The main points where the organic and conventional calf rearing systems differ can be synthesised in the following groups: housing, feeding and medical treatment/health management.

In general, in conventional farms, animals have a smaller housing and locomotion area available and different floor characteristics than in organic. In organic farms loose housing and free range conditions are key features. In an organic livestock farm outdoor access is obligatory, in an area that must be at least as big as 75% of the indoors area. Straw bedding and dry litter are also prescribed for all animals (Sundrum, 2001). In conventional systems, dairy calves rarely nurse their dams. The common practice is immediate separation after birth and then the calves are fed colostrum for 1-3 days and then milk replacer for up to two months. The milk they are fed is unsuited for sale colostrum, or milk supplements are used (Field and Taylor, 2007). In organic systems, separation of the calf from the mother does not occur immediately, and the common practice is suckling for at least a minimum period of few days after birth. Housing of calves in organic herds has to be in groups after one week of age, while in conventional herds calves are usually housed in individual calf pens up to 8 weeks of age. Dimensions of the individual calf pens are recommended (in conventional systems): 60-80 cm wide and 1-1.25 m long, for calves staying in the pen only 2 weeks, and 75-100cm x 150-180 cm for calves kept in pens 4-8 weeks (Kapila, 2003). For young calves in organic farms, the respective space is 1.5 m² indoors per calf in group housed stalls, plus 1.1 m² outdoors (see chapter 2.4.2). Calves older than 3 months of age must have outdoor access 150 days in the summer, while conventionally raised calves and heifers do not have such obligatory regulation.

As we can see, in the organic practice the underlying principal aims form different conditions for the rearing of the animals in a dairy herd.

Animal health and welfare is promoted by measures that respect the animals' nature and behaviour, such as choice of the appropriate breeds, feedstuff, feeding techniques and stable social conditions. These measures are presented through the IFOAM Basic Standards and the European regulation on organic livestock production.

2.4.3 Overview of welfare situation in organic dairy calves

Since health is considered to be integral part of welfare and health indicators are relatively easy to monitor, most studies seem to focus on health issues to refer to the general welfare conditions of the organic animals. In an organic dairy farm the **main health problems** encountered are practically the same as in a conventional dairy farm; mastitis, fertility disorders and hoof problems, to mention the most common ones (Kijlstra and Eijck, 2006). Mastitis has been often claimed to be the most frequent health problem in organic dairy farms, possibly because the risk for mastitis is also quite high in suckling systems. Nevertheless, many studies show that its incidence is similar to, or even less than in conventional dairy herds (Hovi et al., 2003; Lund and Algers, 2003; Valle et al., 2007). Other reports conclude that because of contradictions between research results, no statements should be made yet about disease incidence (Sundrum, 2001; von Borell and Sorensen, 2004).

Diarrhoea, which is a common health problem in conventional dairy calves and a frequent cause of calf mortality, has been found to be less frequent in organic dairy farms with suckled rearing (Wagenaar and Langhout, 2007a). Higher calf growth in organic farms has also been attributed to suckling systems (Grondahl et al., 2000; Langhout, 2006).

At the same time when use of allopathic medicines is restricted, outdoor rearing and environmental exposure of animals under organic management increases the risk of contact with pathogens. And since in organic farming preventive medical treatment is forbidden, the animals face a greater risk of health damage.

Parasite infections have indeed been reported as a problem, such as high infection levels of lung worms in organic calves (Hoglund et al., 2001). There are indications that animals under organic management have a stronger **immune system response** against harmful agents. Housing conditions that offer straw bedding or more space to the animals could be a potentially lower stress factor compared to conventional conditions, contributing to a better immune response. Weaning age may also affect the immune response of a calf (Grondahl et al., 2000; Kijlstra and Eijck, 2006).

Suckled systems offer a way of increasing natural living conditions within dairy farming practice and are also confirmed as potentially beneficial for both the calf and the cow, as they offer more **freedom of expression** and demonstration of **natural behaviour** (Maxwell et al., 2006). In fact, natural suckling behaviour is accompanied by cow-calf bonding and gives to the cow the opportunity to show or develop her mothering abilities- features important for the natural living approach to animal welfare. Suckling systems also favour **social contact** between calves while allowing more space for **exercise** or **playing** (Krohn, 2001). Kijstra and Eijck (2006) report higher levels of **physical activity** for calves that have been left with their dam during the colostrums period, compared to isolated calves. Additionally, **calf weight** at weaning age of three months has been found higher for calves fed on maternal milk. Nevertheless, a study conducted in the Netherlands reveals that at present only 40 out of 450 organic dairy farmers apply some kind of suckling in their rearing systems. Low numbers of suckling systems can be attributed to much lower levels of marketable milk as well as to high **stress levels after the weaning process**, especially in single suckling systems (Wagenaar and Langhout, 2007b). Suckling has also to be avoided if paratuberculosis infections are present, as young calves are highly susceptible to becoming infected (Kijlstra and Eijck, 2006).

Sundrum (2001) argues that although there is no consensus among scientists about animal welfare assessment, the already high level of minimal organic standards on **housing** conditions sets a precondition for improved animal welfare. For instance, the organic guidelines for locomotion area (regulated minimum in organic farms), for floor characteristics (bedding and litter material) and husbandry practices (prohibition of tethering, grouped calf housing) are indicative of increased health and welfare for calves and cows under organic management. Still, *minimal* housing requirements do not guarantee *high* welfare status, which is significantly influenced by the caretaker-animal relationship too. A negative human-animal relationship for example, increases fear of humans and causes higher stress levels to the fearful animal (Hemsworth et al., 1993), which can then be held responsible for a suppressed immune systems (Moberg, 1987).

On the other hand, concerns have been expressed (Hammarberg, 2001) that because of the organic limitations on the use of antibiotics and allopathic chemical medical treatment, animals may not be adequately protected from diseases and this may be a compromise in animal suffering and prolonged distress, and the general welfare condition of the animals (IFOAM EU Group, 2007).

2.5 The concept of “naturalness” in dairy calf husbandry

2.5.1 Animal domestication and tameness

Domestication is an evolutionary and experiential process during which characteristic traits of ‘wild’ animals are modified to the domesticated populations. Adaptation of the animals to the captive environment of domestication is accomplished through the genetic change that artificial or natural selection brings, in combination with environmental stimulation and lifetime experiences (Price, 1984). Modified traits in the domesticated animals refer to morphology, physiology and behaviour. Natural behaviour has been subjected to changes in domestic animals, but there is no behavioural pattern which has vanished or emerged. Domestication differs from taming, in that domestication refers to a process where reproduction, shelter, protection against predators and feeding of animals are directed by humans (Mignon-Grasteau et al., 2005). Tameness, as opposed to fear or aggression in the presence of humans, possibly has been developed as a result of selection of easy-handling individuals (dairy cows) during domestication (Rushen et al., 1999).

It has been argued that domestication of contemporary farm animals has been a process favouring the interests of both humans and animals. Hemsworth (2007) suggests that animal domestication in its premature form has been an ‘unconscious process’ initiated by humans, during which (semi-)tame wild animals were progressively brought under human control. The domesticating animals have been benefited by the human presence and care in terms of provision of food, shelter and protection against predators. Such benefits of course have been used by humans to develop dominance over the animals, changing the initial course of their relationship from symbiotic to possessive (Lund et al., 2004; Lund and Olsson, 2006).

In order to study how domestication has changed specific traits in animals, domestic populations are compared to their ‘wild’ relatives. This can be very complicated though, since wild representatives are difficult to find for a lot of species. In these cases, comparisons within domesticated species are carried

out where breeds show differences in the intensity of their relationship to humans. Variability in flight distance for example can be a useful indicator, but differences may also occur as a result of variability in the management intensity of each system we study. The relation to humans and the degree of tameness was one of the first traits to be modified during domestication, to favour tamer animals with less fear of humans. Feeding behaviour is also modified in domesticated species; wild animals need to be potent in identifying quality differences in their food, while domesticated animals are, at least to some degree, provided with their feed by their caretaker. Similarly, domesticated animals have been the ones showing less anti-predator abilities, since humans have taken the responsibility to protect their livestock. Reproductive behaviour has also been changed in domesticated animals, which show less reproductive competitiveness under natural conditions, compared to their wild counterparts (Mignon-Grasteau et al., 2005).

Jensen (2006) has synthesised the domestication changes, in the concept of the 'domesticated phenotype' as: *external morphological changes* (e.g. altered body size and growth pattern), *internal morphological changes* (e.g. decreased brain size), *physiological changes* (e.g. changes in endocrine responses), *developmental changes* (e.g. earlier sexual maturity) and *behavioural changes* (e.g. increased sociability, reduced fear).

2.5.1.1 Domestication of cattle

Contemporary cattle breeds descend from the aurochs *Bos primigenius*. Domestication of cattle is dated approximately 9000 years ago (Hall, 2002). Cattle have been used for dairy, beef and as draught animals, while having a central role in the agricultural production system; as ruminants, cattle can utilise high-fibre feed that humans cannot consume. Since the 17th century breeds started to be specialised for different production uses, and artificial selection for specific traits has contributed to a large variety of breeds. In dairy systems, it is the components of maternal behaviour, such as nourishment for her calf, which

have been used and selected for milk production. In this way, milk production during the first 6 months after calving, which was initially possible only if cow and calf were in constant contact, could be extended beyond calf-rearing, due to selection and cross-breeding (Baars et al., 2004). Strong maternal bonds though have been avoided as a breeding trait in intensive systems, where the cow and calf are separated shortly after birth. In organic livestock systems on the other hand, such behaviour is to some extent allowed to be expressed. Maternal behaviour of the cow includes licking, nursing and protection from potential predators, while at the same time providing for the calf's health and rapid growth through nourishment (von Keyserlingk and Weary, 2007). Differences between breeds show that a higher degree of maternal behaviour can be expressed, like for instance in Salers cows compared to Friesian cows. Such behaviour is shown by the cow through longer time periods of suckling and licking her calf and lower degree of acceptance to be suckled by an alien calf (Mignon-Grasteau et al., 2005). In general, beef cattle seem to be more capable of expressing maternal behaviour, compared to dairy breeds, possibly because of higher motivation or because in dairy breeds anatomical differences in the udder, make it more difficult for calves to find the teat thus causing a latency in suckling up to 6 hours after calving (von Keyserlingk and Weary, 2007). In dairy cattle breeds in the tropics the maternal behaviour is also still very prominent.

2.5.1.2 The cow-calf relationship from calving until weaning

Shortly before the time of calving, the cow usually detaches herself from the herd to a nesting place. Nest-building behaviour has been observed, but with apparently no large investment of effort. The nesting sites reported, are preferably dry, protected shelters. Most cows calve in recumbence and have to stand up after calving, to accomplish physical contact with the calf and suckling (von Keyserlingk and Weary, 2007).

During the first hours after calving the cow is usually licking her young, showing the highest intensity the first hour after birth. Such 'care-giving' behaviour, which

is occupying approximately 50% of the dam's time, is stimulating blood circulation and calf activity, urging the calf to stand up and nurse (Field and Taylor, 2007) and possibly stimulating also breathing, urination and defecation. Licking of the calf is associated with suckling and seems to be more intensive in experienced mothers. Licking activity lasts throughout lactation and is a generally frequent sign of socialisation even among adult cows. Failure of a cow to lick her calf can lead to calf rejection and occurs mainly within primiparous cows. Calf rejection represents failure to establish the natural bond between mother and offspring. This could be attributed to inability of the mother to recognise the odour of her calf and even to licking of alien calves (von Keyserlingk and Weary, 2007). In high stocking densities, the risk of coming in contact with other calves increases the possibility of breaking down the maternal bond and, additionally, may decrease the intake of colostrum by the new born calf. This comes as a result of the calf's suckling a cow other than its mother, or because a cow is nursing a calf other than her own (Illmann and Spinka, 1993).

In the hours after birth the cow exhibits specific maternal behaviour which is generally indicated by the ingestion of (part of) the placenta (placentophagia) and licking of the amniotic fluids. Any fetal discharges on the calf and the space around it are cleaned by the mother, obviously because of reasons of hygiene and protection against predators (that can be attracted by the smell). Additionally, licking of amniotic fluids probably offers analgesic possibilities to the cow, facilitating in this way the expression of maternal care after a painful calving.

The first few hours after birth quiet grunting vocalisations are common and are usually accompanied by licking. Vocalisations between mother and offspring are used possibly as a sign for recognition of each other (von Keyserlingk and Weary, 2007). The calf, in an expression of 'care-soliciting' behaviour often bawls. Such cries for help occur when the calf is being threatened, stressed or even hungry, and are directed to its mother. Although these vocal sounds help recognising each other, it seems that the calf's odour is the most effective element of identification between a cow and her young. Calves usually nurse with their back end toward the dam's head, which allows the dam to smell the calf and

decide to accept it or no (Field and Taylor, 2007). In the first half to one hour after birth, the calf manages to stand up and exhibits teat seeking behaviour. Suckling apparently denotes most characteristically the maternal behaviour of a cow (von Keyserlingk and Weary, 2007). Suckling can be initiated by either the cow or the calf, as one will call and the other one will respond to the call. Newborn calves suckle their mother approximately 5 to 8 times per day, for 10 -15 minutes per bout. As the calf grows the number of suckling bouts reduces to 3-5 (Hall, 2002). At the beginning the cow is feeding her calf and then returns to the main herd. Such behaviour could be attributed to a strategy that cows have evolved in order to protect their young from possible threats, and is interpreted as 'hiding' the calf in the tall grass instead of keeping it at her feet. Nevertheless, after the first few days the calf will follow its mother back to the herd (Webster, 1994). In a similar way, protective behaviour is as well manifested when cows become aggressive, shortly after parturition (Field and Taylor, 2007). The distance between the cow and the calf seems to increase after the first hours following the birth. The dam has to move around to obtain feed and naturally the calf would be left behind in the bushes or the tall grass. The time periods that dam and young spend distanced from each other increase as the calf is growing, obviously as a result of the offspring's gradual independence. As the calf grows and becomes more autonomous socially and nutritionally, the process of weaning begins. Weaning takes place progressively and is a procedure initiated by the cow who slowly withdraws maternal care (nursing and milk output) in the course of a number of months (von Keyserlingk and Weary, 2007). The reduction of milk output encourages the calf to search out for forage and hence stimulates the development of the rumen (Field and Taylor, 2007). Although Webster (1994) mentions that natural weaning is taking place at the age of 6 to 8 months, Reinhardt and Reinhardt (1981) report that observed weaning time by the mother was found to be 8.8 months for female and 11.3 months for male calves in semiwild zebu dairy cattle.

2.5.2 Human-animal relationship and its effects on welfare

Forming a human-animal bond

As prey species for several other animals, farm animals are sensitive in detecting danger and avoiding possible predators. In doing so, fear plays a very important role by motivating the animals to escape from any possible threat. Being natural preys for human beings as well, farm animals regard humans too as their predators and will primarily react with fear to their presence, evoked by the humans' relative size or by their tendency for rapid, unpredictable movements (Rushen et al., 1999). Although domesticated species have been selected against fear of humans (Mignon-Grasteau et al., 2005), exposure to humans can still be the most fearsome event that animals may experience, unless they have been previously familiarised with people on a neutral or positive basis.

The human-animal relationship can be defined as the extend to which an animal and a human are related to or distanced from each other (Waiblinger et al., 2006). This relatedness or distance reveals the reciprocal perception between the two parties and is expressed in their behavioural interaction. The human-animal interactions can involve optical, physical, odorous and acoustic elements. Waiblinger et al. (2006) separate human contact on farm in **five distinct categories**: 1) Visual presence, 2) visual movement with possible vocal interactions, but with no physical contact, 3) physical contact, 4) feeding (rewarding) and 5) invasive contact. A simpler approach is drawn for the animal's perception of interaction with humans: positive, negative, or neutral. The nature of the relationship between a human and an animal is dynamic and is formed on the basis of previous interactions between the two. At the same time, the current interactions create the basis for any future contact and influence any mutual perspective association, like individual handling. The quantity and quality of the daily interactions between animal and its human caretaker outline the nature of the human-animal relationship. Handling of animals affects the way that animals react to human presence and the emotions they develop (Waiblinger et al., 2006).

Positive versus negative human-animal relationship

Although **animals** can recognise individual humans and develop a particular relationship with them, they might as well generalise their opinion about one person to other humans with whom they interact. Cattle are among the farm animals that often discriminate between different persons (Taylor and Davis, 1998). Interestingly, the animals' opinion about humans will be affected by the stockperson's behaviour towards animals, which in turn is affected by the stockperson's attitudes and beliefs about the animals. Attitude, as a person's preoccupation or tendency to like or dislike another entity, incorporates three elements: the person's perception of the object, the person's behaviour toward it and the person's emotional relation to it. As it is obvious, attitude toward an animal cannot be measured directly, but the behavioural, emotional and cognitive responses of the stockperson can be used to evaluate it. Attitude questionnaires (Hemsworth et al., 2000) and behavioural observations of the caretakers have been used in human-animal relationship studies (Hemsworth, 2003).

It is generally accepted that a good (**gentle handling**⁸) versus a bad (**aversive handling**) interaction between humans and animals has effects that decrease or increase respectively fear of humans (Rushen et al., 1999). Since fear or fright serve the purpose of protecting an animal from a potentially harmful factor, it is reasonable to assume that the degree of withdrawal behaviour performed under farm conditions can be a measure of an animal's fear of humans. Aversive handling increases fear of humans and has numerous negative consequences for the animals, thus compromising their welfare (Waiblinger et al., 2006). Studies have found that aversive handling methods like pushing or hitting, are positively correlated with the animals' fear of humans, which as a powerful emotional state that evokes defensive reflections, consists in itself of a welfare compromising factor, generally regarded as a state of suffering (Hemsworth, 2007). The fear of humans is indicated primarily by behavioural responses such as avoidance of humans or induction of abnormal behaviour, and physiological responses, such as chronic stress response revealed by free cortisol

concentrations (Hemsworth et al., 1993). Cows, heifers and calves which show high fear of humans, exhibit higher frequency in chronic and acute stress responses, traumatic incidents, injury and death occurrence (Waiblinger et al., 2006). The physiological stress responses of dairy cows to different handling methods have been studied only to a limited extent. Cows that were given extra handling during their first calving showed lower cortisol concentrations in their milk, suggesting lower stress levels. Such change in cortisol concentration that was not accompanied by change in heart rate, may be a indication for chronic stress rather than acute stress response (Hemsworth et al., 1989). Negative human-animal relationship and the stress it can cause, may have negative impacts on product quality and the productivity of the livestock, while making management of the animals more difficult and dangerous for both animal and human stockperson. In dairy cows, reduced milk output or milk letdown is associated with bad human-animal interactions; a reduction of 10% in milk yield has been suggested by Rushen et al. (1999) when cows are milked in the presence of an aversively handling stockperson. Studies using the behavioural response of dairy cows have also found that fear of humans has negative effects on productivity (Hemsworth, 2003; Hemsworth et al., 2000).

Similarly, handling that is perceived by the animals as positive and gentle will lower their fear of people and increase their confidence and comfort in human presence. Gentle handling is one which evokes pleasant emotions and a positive human-animal interaction (Figure 2, adapted from (Waiblinger et al., 2006). Moreover, a good human-animal relationship can be beneficial for animals under unpleasant or stressful conditions, like isolation or tethering. During traumatic events, presence of a human that the animal is familiar with can reduce the perceived aversiveness and distress, calm it and reduce any injury risk for the animal. However, even if the quality of the human-animal relationship is very high, some interactions are still perceived by the animal as negative and aversive because they are painful or cause suffering (i.e. dehorning).

⁸ Physical contact, like stroking or brushing, or giving food rewards (Rushen et al., 1999)

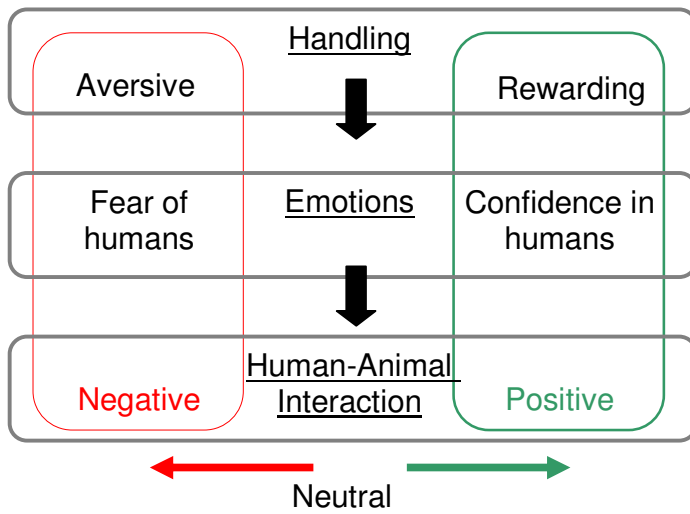


Figure 3: The effect of handling on the human-animal interaction

Aversive handling will increase animals' fear of humans and subsequently will have a negative effect on the human-animal interaction, while rewarding handling will strengthen pleasant emotions towards humans and contribute to a positive human-animal interaction. The relative importance of the emotions created by the different handling methods will characterise the human-animal relationship from positive to neutral to negative.

To accomplish a high quality of human-animal relationship, a regular positive human-animal contact is required. This is most possible to achieve in husbandry systems that involve frequent, intense and continuous interactions between animals and stockpersons. Furthermore, to develop such a relationship requires a mutual recognition on individual level, which is possible only with sufficient contact between the caretaker and the animal under her/his care (Waiblinger et al., 2006)

2.5.3 Naturalness and rearing of organic calves

During the rearing of an organic dairy calf the highest possible degree of naturalness can –following the concept- be reached when the rearing conditions are as natural as possible. Natural conditions include natural outdoor environment, cow-calf free contact (licking, suckling), social environment (mixed animals of different sexes and ages in natural group numbers), natural feed and weaning time (milk and fodder for proper rumen development).

In practice, the life of a calf in an organic dairy system can deviate from naturalness, if the above mentioned natural conditions are only provided to a limit in dairy farms, where common management features are early weaning, bucket feeding or cow-calf separation soon after birth. In fact, there is no regulation in the EEC 2092/91 or in the IFOAM Basic Standards concerning the time cow and calf have to spend together before separation. If the calf is not suckling its mother, calves can have the possibility to express their natural suckling behaviour by suckling nurse cows. In case that the dairy farm does not follow any natural suckling practice, teat buckets or automatic suckling machines are often used in order to satisfy the calves' suckling behaviour (Vaarst et al., 2001).

Still, if we want to implement naturalness in a dairy system, there are several management practices that can be used to promote the degree of naturalness in calf rearing, at least to some extent:

Natural suckling

The calf's natural suckling reflex can be expressed also on artificial teat feeding systems, but natural milk feeding from a cow, apart from enabling natural behaviour for both cow and calf, it ensures enough milk consumption for the calf and natural communication between calf and dam (Grondahl et al., 2000). When separated from her calf, a cow will exhibit a clear behavioural response, characterized by increased activity and vocalizations. Such behaviour would normally serve as an aid to reunite cow and calf. The extent of such behavioural response increases with the time that cow and calf spend together before the

separation likely because of more time available for maternal bonding (von Keyserlingk and Weary, 2007).

Feeding milk ad libitum

Although the common practice in most intensive systems is twice-a-day feeding, when dairy calves are given the possibility, they will consume much more milk than they are usually provided with (Jasper and Weary, 2002), while allowing for a more natural feeding behaviour. Ad lib feeding involves feeding at will, not only in terms of quantity but also in terms of feeding frequency and amount of time that the calf will be occupied by the feeding process.

Outdoor access and space allowance

When animals are confined then their natural behaviour is blocked to a varying extent depending on the housing system (Friend and Dellmeier, 1988) and as Chua et al (2002) state 'space allowance appears to be an important determinant for expression of normal and naturally occurring locomotion'. More space allowance to each individual is offered in grouped housing systems compared to individual pens, also providing for better socialization (Jensen and Kyhn, 2000).

Grouped housing, play and social contact

Under natural conditions, although the cow initially isolates her calf from the rest of the herd, some days after birth the cow will 'introduce' the calf to the group. Calves, as herd animals are social and would naturally live in groups formed by other members of the herd in a range of ages and a mixture of sexes. The opportunity to associate with other animals is of vital importance for the behavioural development of a calf (Hall, 2002). Ethological analysis on individual versus group rearing systems found that calves housed in groups developed full social interaction and better welfare levels as compared to individually housed calves (Babu et al., 2004). In combination, larger calf groups and greater space allowance will also promote playing behaviour and locomotor activity; locomotor

play in calves typically involves vigorous jumping, kicking, and running, with often sudden stops and turns in a new direction and is usually performed by several calves simultaneously (Jensen and Kyhn, 2000).

HAR (Human-Animal Relationship)

Defending natural living conditions for domestic animals could mean to exclude human interference in the life of the herd. This would practically mean that animals would live in a natural state where they would not receive any kind of human intervention like medical treatment or calving aid, even though they could be in need of it for an improved welfare (e.g. neonatal mortality) (Mellor and Stafford, 2003). Furthermore, a natural life, as it would be 'in the wild', involves also many 'negative' states for an animal such as fear, hunger or extreme weather conditions. Frustration and discomfort are integral parts of a life in nature, just like other 'positive' features such as fresh air, space, social contact and opportunities for stimulating interaction with the environment (Vaarst et al., 2001).

In the given frame of a production system, implementation of naturalness is done in order to improve welfare, including lack of fear and distress. In a dairy system, handling or any kind of human-animal interaction will be probably necessary at some point, therefore a developed and also positive human-animal relationship will deliver better results for both, humans and animals. Fear of humans is initiating stress for the animal, and although this might be characterised as another natural condition, subjecting a fearful animal with no escape possibility to continuous human contact is not. Next to this, fear of humans has negative effects on behaviour, such as increased startle and reactivity. Animals can as well regard humans as part of their social environment, relate them to positive situations such as feeding or shelter providing or may recognize them as companionship (Raussi, 2003).

Therefore a positive relationship between the stockperson and the animals has to be established. Additionally, considering other aspects of natural living, the relationship that the caretaker will have with the calves is influencing not only the animals' fear of humans, but also the success of a natural rearing system

(Grondahl et al., 2000). The interactions between cattle and humans may also be affected by the breed, as there are genetic differences in handling acceptance. The age and phase of life may also influence the human-animal relationship; cows after calving appear to be more sensitive in either a positive or negative way toward humans. Early experiences of calves with handling caretakers are also decisive for their view of humans. Isolated or individual rearing may show a positive human-animal relationship (Friend and Dellmeier, 1988).

3 CASE STUDY: HOW CAN THE CONCEPT OF NATURALNESS BE BEST IMPLEMENTED IN REARING OF ORGANIC DAIRY CALVES

3.1 Material and Methods

Location and farm selection

The case study was carried out in dairy farms in Norway and in Sweden, within the frame of a calf welfare project. This project, as part of an EU research project, is aiming to minimize medicine use in organic dairy herds through improved welfare and welfare planning (see www.aniplan.coreportal.org).

The Swedish farms were located at the region of Götaland, at the south-western part of Sweden. The Norwegian farms were located at the Nordmøre County, near Tingvoll, in mid-Norway.

Norway and Sweden are two countries where the concept of animal welfare has been implemented in their legislation. Norway was one of the first countries world wide with its own Animal Protection Act since 1935. Applicable Norwegian law for animal protection started to develop at the end of the 1960s and came into force from 1974 (Norwegian action plan on animal welfare, 2008). In Sweden, the first animal welfare legislation came already in 1857. However, it wasn't an extensive law but only one paragraph prohibiting cruelty towards animals. An animal welfare act came first in 1944 and Sweden got its current Animal Welfare Act and the Animal Welfare Ordinance in 1988 (at that time the most advanced in the world). These are regulating general rules on animal welfare covering all areas of animal management for 'laboratory' and domestic animals in captivity (Swedish Statute 1988:534, 2007).

Furthermore they are two countries with the first organic (biodynamic) farms already in 1932 for Norway and 1934 for Sweden (Lund, 2000).

In 2006, 19% of the arable land, or 510.000 ha, were farmed organically in Sweden. However, only 6.3% was certified organic according to the IFOAM standards, since Sweden has a special regulation making it possible to obtain subsidies for organic farming without also having to pay the additional cost of official certification. The current extent of organic agriculture for the two Nordic

countries is shown in Table 3 (organic land hectares, number of organic farms and organic share of total agricultural land for each country):

Table 4: Extent of organic agriculture in Norway and Sweden in 2007

Norway	43,033 ha	2,496 farms	4.1% of total agricultural land
Sweden-IFOAM certified land	200,010 ha	2,951 farms	6.3% of total agricultural land
Sweden-all certified land	510.000 ha		19% of total agricultural land

(IFOAM, 2007b; Swedish Board of Agriculture, 2008)

In Sweden, animal production is converted to a lesser extent. In 2005, only 5.8% of the dairy cows were certified organic, while about 9% of the milk sold for consumption was organic. The government has set a goal to increase the organic production and consumption in Sweden. One of the means to reach this goal is to increase the public consumption (from schools, hospitals, etc.) of organic food products to 25% of the total purchase (Anon., 2007).

Differences in agricultural production between the two countries are pronounced as Norway is not a member of the EU, although the country still is bound to follow most of the EU regulations as a result of the EEA agreement. The country has a long tradition of subsidising agriculture in order to be self-sufficient, while the Swedish policy during the last 30-40 years rather has been to open up the Swedish agricultural sector to world market prices. Thus, the economic conditions for farmers have been and still are different in the two countries. After entering the EU in 1994, Sweden introduced milk quotas for dairy farmers (these were introduced by the EU as a way of limiting milk production across member states). In 2007, according to Debio, the national organic certification and inspection body of Norway, the number of organic dairy farms in Norway was 307, with a total of 6030 milking cows in the whole country (K. Johnsen, personal communication). In Sweden, the respective numbers according to KRAV, the Swedish organic certification and inspection body, are: 473 organic dairy farms and 27283 organic milking cows (H. Bengtsson, personal communication).

The selected farms for the case study were 12 dairy farms, 6 organic and 6 conventional. Four farms were in Sweden and the other eight were in Norway. The selection of the farms was based on the different calf rearing systems used with the aim to visit as different calf rearing systems as possible. This holds true particularly for the Swedish farms, which were also located in more distanced areas, compared to the proximity amongst the Norwegian farms. Moreover, another parameter for the farm selection in Norway was the collaboration with another researcher carrying out tests on the human-calf relationship also for logistical reasons. The farms were visited during the period 22 January to 1 February 2008.

The farmers accepted without hesitation to participate, with one exception. This was farmer with ID number C11, who was initially not that keen on having visitors in the cow-barn because the animals in that period were suffering from a virus infection causing diarrhoea. This hesitation was mostly directed to the work on the human-animal relationship test and was finally overcome.

Data collection

The data collection was based on an interview with the farmer. Each farmer was asked questions, both closed and open, based on a questionnaire (see 'Farmer's questionnaire', Appendix II). The duration of the interviews was between 1 and 2 hours. Four out of twelve interviews were fully translated from Swedish or Norwegian into English during the interview, four were partly translated and four were carried out in English (no need for translation). For some questions, answers were brief and could be translated word to word, while for other questions the answers were pretty long and the translator had to keep brief notes and translate the main ideas and most important quotes of the farmer at the end of his answer. The interviews were also recorded and the recordings were used as help tools for clarifications.

The farmers were initially asked general questions about the dairy farm concerning number of milking cows, average milk production, replacement rates, breeding method and number of people working on the dairy farm. Then

the farmers were asked to describe briefly the calf rearing methods used on their dairy farm.

The questions following were concerning animal welfare. The farmers were asked about what animal welfare is in their opinion, what factors affect it and how calf welfare can be assessed and a conversation was developed around their conception of welfare, with focus on the calves. They were also asked about the concept of naturalness, its relation to the welfare of the animals and, if possible, how it could be best implemented in a dairy production system.

Finally the farmers were asked about their education, any animal-related background and their motivation for dairying organically in the case of the organic farmers or their opinion about organic dairy systems, in the case of non-organic farmers. Each interview was accompanied by a visit to the animal facilities, to inspect the cows and the calves and the general rearing conditions.

Three animal researchers were also interviewed; 2 ethologists from the Swedish university of Agricultural Sciences and 1 animal welfare consultant from the Bioforsk Norwegian Institute for Agricultural and Environmental Research. The researchers were also asked questions about the concept of animal welfare and naturalness in an open conversation based on a questionnaire, with some of the questions identical to the ones asked to farmers (see 'Researcher's questionnaire', Appendix III)

3.2 Results

The results of the case study are derived from the closed questions of the questionnaire, the open discussion around the topic of welfare and also observations during the farm visits. The results are presented in the tables below first for the farmers and then for the researchers (see appendices IV and V for the full farmers' and researchers' interviews respectively.)

3.2.1 Farmers' interview

The dairy farms

In Tables 4 and 5 below the main characteristics of the organic and non-organic dairy farms respectively are presented, such as average milk yield and cow replacement rate. Breeding with artificial insemination and dehorning of the cattle are management practices carried out in all of the dairy farms, organic and non-organic.

Table 5: The organic farms

Characteristic	Farms ID					
	O1	O2	O3	O4	O7	O12
Location	Sweden	Sweden	Sweden	Sweden	Norway	Norway
Number of cows	330	40	140	80	43	20
Average milk production /cow/year ECM	9800	7000	8750	10000	6500	6750
Replacement (%)	35	18	35	50	20	30
Breeding method	A.I.	A.I.	A.I.	A.I.	A.I.	A.I.
Mutilations	Dhrn ¹ & Castr ²	Dhrn & Castr	Dhrn	Dhrn	Dhrn	Partly Dhrn ³
Persons working on the farm ⁴	12	2	4	1	1	2

Dehorning, ² Castration, ³ Some cows left with their horns ⁴ Numbers refer to people working on the land as well, and do not necessarily coincide with the number of people working with the animals

Table 6: The non-organic farms

Characteristic	Farms ID					
	C5	C6	C8	C9	C10	C11
Location	Norway	Norway	Norway	Norway	Norway	Norway
Number of cows	56	20	33	40	30	41
Average milk production /cow/year ECM	7500	8500	8000	7800	7000	6800
Replacement (%)	30	46	21	42	30	Very low ¹
Breeding method	A.I.	A.I.	A.I.	A.I.	A.I.	A.I.
Mutilations	Dhrn	Dhrn	Dhrn	Dhrn	Partly Dhrn ²	Dhrn
Persons working on the farm	1	2	3	4	2	2

¹ New built barn, herd in the process of increasing, ² Because of breeding

The calf rearing system

In Table 6 the different calf rearing systems are described. Only farmers O1 and O2 have established a natural suckling feeding system. Farmer C10 is the only non organic farmer to include a few days of suckling in his calf rearing system. Many of the farms in Norway were in the process of rebuilding their facilities, in order to establish loose housing systems.

Table 7: The different rearing systems

Farm ID	Time calves stay with their mother	Type of feeding (after separation)	..until the age of	Type of housing	Additional info
O1	4-5 days	Suckling of foster cows	6-7 weeks	Grouped (up to 20 calves and 3-4 foster cows)	7-weeks-limit because older calves eat a lot and prevent young ones from suckling enough
O2	No separation	Free suckling of all cows	12 weeks	Loose with permanent outdoor access	cows tied up
O3	1 week	Automatic feeding	12 weeks	Grouped (15-22 calves)	Previously: suckling system for 1-2 months with only spring calving

O4	3 days	Teat bucket	10 days	Individual box	New investment for the farmers
		Automatic feeding	12 weeks	Grouped (15 calves)	
C5	5-6 hours	Teat bottle	1 week	Individual box	New facilities for the cows, old barn for the calves
		teat bucket	12 weeks	Grouped (2 and 6 calves)	
C6	Immediate separation	teat bottle	3 weeks	Individual box	
			8 weeks	Grouped (2-3 calves)	
O7	2-3 days	teat bucket	8 weeks	Individual box or Grouped (2 calves)	Calves older than 2 months tied up, temporary conditions
C8	Immediate separation	teat bottle	1 week	Individual box	Barn in the process of rebuilding
			8 weeks	Grouped (9-10 calves)	
C9	Immediate separation	teat bottle	2 weeks	Individual box	Building new housing facilities
			8 weeks	Grouped (6 calves)	
C10	2-7 days	teat bottle	3 weeks	Louse housing with permanent outdoor access	cows tied up
		Milk bar	12 weeks		
C11	30 minutes	teat bottle	3 weeks	Individual box	building new facilities with automatic milking and feeding
		Milk bar	10-12 weeks	Grouped (6 calves)	
O12	3-5 days	teat bucket	8 weeks	Grouped (2-6 calves)	Calves older than 6 months and cows are tied up
		bucket	12 weeks		

The farmers

The farmers were asked about their motivation to farm organically (or lack of motivation to farm organically) and their agricultural background (farming knowledge, education) (see Tables 7 and 8).

Table 8: The organic farmers

Farmer ID	Motivation for organic farming	Origin of organic farming knowledge	Education	Year of conversion
O1	environmental issues and in an economically viable system that is better for the animals, interesting and challenging	practical experience and short courses	basic agricultural and intensive course in dairy management	1995
O2	excess milk that the EU did not give quota for	University researchers conducting projects on the farm	carpenter	1995
O3	favorable market conditions coinciding with need to invest in new facilities, it is a challenge and fun	courses, reading, contact with other farmers	2-year-agricultural college	2001
O4	By coincidence but changed their philosophy	practical experience practice	master in animal keeping(agronomy)	2005
O7	self-dependency, less pesticides, more environmentally friendly	short course, info from organic research institute	forest engineer	2007
O12	self dependency, friendlier for the environment, better for animal health	Working in other organic farms in Sweden & Holland	1 yr in biodynamic farming school and 1 yr in an animal husbandry school	1986

Table 9: The non-organic farmers

Farmer ID	Lack of motivationn for organic farming	Origin of farming knowledge	Education	Start of farming
C5	not enough space, bad weather conditions of the area, a lot of extra work	short course, reading	chemist	Grown on the farm
C6	We are almost like organic already, traditional, organic need more land and ideology	agronomy high-school	agronomy high-school (vocational school)	Grown on the farm
C8	it can be difficult to reduce pesticides- depends on the soil	agronomy high-school	agronomy high-school (vocational school)	Grown on the farm
C9	Organic farming is not so much better	agronomy high-school	agronomy high-school (vocational school)	Grown on the farm
C10	there is no big difference with my practice, can't convert because of weeds	agronomy high-school	agronomy high-school (vocational school)	Grown on the farm
C11	Difficult / inconvenient because of soil type. Haven't thought so much about it.	practical experience	No formal education	Grown on the farm

Calf welfare

When the farmers were asked what animal welfare is in their opinion and what is the most important welfare factor, their answers did not always coincide (see upper part of Table 9). Most of the farmers believe that provision of food and of appropriate resting place are welfare aspects, while expression of natural behaviour comes next, along with space allowance and happiness. A dry, clean and soft resting place is the most popular element for welfare assessment among the farmers, while the old housing facilities appears as the most common reason why the farmers were not satisfied by the welfare conditions on their farms (Table 9).

Table 10: Farmers' approaches to animal welfare: aspects

What is animal welfare?	Farmer ID											
	O1	O2	O3	O4	C5	C6	O7	C8	C9	C10	C11	O12
Happiness	X		X				*	X	X			
Tranquillity	X				X			X		X		
Play	X	X										
Health			X				X*	X	*			
Food provision/quality	X		X*		X	*	X	*		X*	X*	X
Milking			X							X		
Dry/clean/soft resting place	X*		X		X*	X	X		X		X*	X
Good air quality					X					X		
Space allowance	X					X*		*			X*	X
Outdoor access						X				X	X*	X
Natural behaviour	X*	X*		X*			X					X
Positive HAR							X		X		X*	*
Individual care							X			X	X*	
Steady routines										X		X
Elements for assessment	O1	O2	O3	O4	C5	C6	O7	C8	C9	C10	C11	O12
Feed provision/quality			X			X		X		X		
Disease levels			X	X			X			X		
Space allowance				X		X	X					
Animal behaviour-HAR				X	X						X	X
Housing (floor, air)	X				X	X		X	X	X	X	X
Individual animal check				X					X			
It is not possible to measure welfare		X										
Are you satisfied by the	O1	O2	O3	O4	C5	C6	O7	C8	C9	C10	C11	O12

actual welfare situation of your calves? Why?	+/-	+	+/-	-	-	+/-	-	-	+/-	+/-	+	-
It not static, an aim you always try to accomplish	X		X									
Calves satisfied,playful		X									X	
Economic obstacles			X	X								
Old housing facilities				X	X			X	X	X		X
Not loose system						X	X					X
Appropriate housing			X						X		X	
Calves don't suckle on each other											X	

* indication of the factors the each farmer identified as most important for animal welfare

In Table 10 it is shown what restrictions to welfare the farmers face. It appears that lack of time, of money and of appropriate housing make it difficult to accomplish high welfare, according to the farmers.

Table 11: Farmers' approaches to welfare: restrictions

What poses/removes restrictions to accomplish welfare?	O1	O2	O3	O4	C5	C6	O7	C8	C9	C10	C11	O12
Give them choices/ offer them what they like/ live their own life	X	X									X	
Economy			X	X						X		X
Facilities' appropriateness			X	X		X						X
Cover basic needs (feed, water, bedding)					X							
Small herd size							X					
Time/work								X	X	X		
Outdoor access										X		
Skilled caretaker	X											X

Affective states

Farmers were asked if animals have emotions in their opinion. With the exception of farmer O2 who believes that maybe they don't, all the other farmers answered positively, and generally consider emotions to be (very) important for the welfare of an animal. When asked to give an example of affective states of animals, the farmers generally pointed out to negative emotions as they result by cow-calf separation and unfamiliar situations (lack of routine) (see Table 11).

Table 12: Farmers' approaches to welfare: affective states

Importance of emotions for animal welfare		O1	O2	O3	O4	C5	C6	O7	C8	C9	C10	C11	O12
Extremely important		X											
Very important					X	X				X	X		X
Important				X			X	X				X	
Somehow important									X				
Animals may not have emotions			X										
Cause of affective states		O1	O2	O3	O4	C5	C6	O7	C8	C9	C10	C11	O12
negative	Separation cow-calf	X		X	X						X		
	Hierarchy, competition							X	X				
	Unfamiliar situations					X	X		X			X	X
	Bad weather in the summer										X		
	Lack of food						X			X		X	
	Bad HAR											X	
positive	Socialising					X		X					
	Routines	X						X					X
	Good HAR									X	X		
	Outdoor access					X				X			X
	Food variety												X
	Being milked									X			

Naturalness

When asked whether natural living conditions are important for calf welfare, all the farmers answered positively. When asked why naturally living conditions are important for calf welfare, the answers were somehow unspecific, including responses like 'it is as it is', 'it is not a matter of discussion', 'it is obvious', 'it is the way it should be'. As it is shown in Table 12, most of the farmers stated that being with its dam is one of the natural living aspects for a calf, which generally do not coincide with the natural living conditions that each farm provides. Interestingly, five of the organic farmers did not mention it, possibly because they take it for granted since they provide natural suckling in their systems.

Table 12 presents the different answers that the farmers gave to the open questions of the questionnaire.

Table 13: Naturalness and calf welfare-the farmers' view

	Farmer ID
--	-----------

Why is natural living important for calf welfare?	O1	O2	O3	O4	C5	C6	O7	C8	C9	C10	C11	O12
Easier management	X											
Better health		X							X			
It is important for the consumers			X									
Obvious/The way it should be/out of respect for nature		X	X	X							X	X
Natural = good				X	X	X			X	X	X	X
It is their need	X						X					
It is pleasurable	X							X			X	
Better production										X	X	
What is natural living for a calf?	O1	O2	O3	O4	C5	C6	O7	C8	C9	C10	C11	O12
Outdoors access	X	X		X	X							X
Grazing		X										
Live their own life		X										
Play	X										X	
Appropriate resting place	X		X		X							
Enough/fresh/various food	X		X			X	X		X			X
Socialising				X			X		X			X
Freedom/not tied up				X								
Be with the cow					X	X		X	X	X	X	X
Shelter/protection							X					
Human contact							X					
Natural weaning											X	
What natural living conditions does the farm provide?	O1	O2	O3	O4	C5	C6	O7	C8	C9	C10	C11	O12
Natural suckling	X	X	X	X								
Feed		X										
Soft floor	X											
Outdoor access in the summer					X			X		X		X
Outdoor access in the winter										X		X
Individual boxes that allow visual contact between calves							X		X			
Grouped housing									X		X	
Fresh air and light											X	
Calving outdoors in the summer										X		
Veterinary care												X
Individual care/washing												X
The farm does not provide enough natural living conditions			X		X	X						

When asked whether a calf can have a natural life in a production system, some farmers were positive, as long as some preconditions exist, some farmers were negative and some believe that a compromised natural life is possible (see Table 13).

Table 14: Can a calf have a natural life in a production system?-the farmers' view

Farmer ID	
	Yes
O2	For sure, with free cows and calves running around
C6	Yes almost, even with nurse cows
C8	Yes, if it's outdoors in the summer
	Partly
O7	It is a compromise in order to have production
O4	Partly. Suckling for 3 days and having outdoors access in the summer is natural
C11	Not fully, looking far back natural life was before domestication
O12	Possible only to some extent, because you also have to earn some money. Calves can have a natural life more than cows because they have more space.
C9	Not fully-you can't let them free
	No
O3	Not really, but what you don't know you don't miss, because animals are adaptive to their environment
C5	No
C10	May be not a natural life, but since they are domesticated they can have a good life yes
O1	Difficult to answer, there has been genetic change and naturalness has been left behind, the animals are not given a natural life, we are manipulating their environment

In Table 14 the farmers' view of mutilating the cattle is shown, in relation to naturalness. With the exception of farmers O4 and C8 who believe that horns are not necessary for natural behaviour, the rest of the farmers think that mutilations are compromising naturalness. They all pointed out that dehorning, may not be natural but it is crucial mainly for safety reasons .

Table 15: Are mutilations compromising naturalness?

Farmer ID	Yes
O1	Yes
O2	Yes, but it is easier to handle the animals.
O3	Yes, but it is safer for both (humans and animals). Naturally no horns would be the best

C5	Yes, but it is safer. It is good and bad.
C6	Yes, it's not natural and painful
O7	Yes, but it's necessary for the worker's safety, also if some have and some don't it affects their hierarchy. Try to breed them without horns
C9	Yes, but it is good for their welfare-it is dangerous for loose housing systems
C10	Yes, but they don't need them; they need them in the wild. But it is a painful procedure
C11	It is for the safety between the animals and also a breeding goal. It is a compromise for welfare because they are a bit afraid after the mutilation and you have to pet them during the first week after dehorning
O12	Yes but it can be good welfare. If you have space it is best for the cows to have their horns but if you don't have enough space it is bad for the cows lower in the hierarchy
	No
O4	No, animals don't need horns for natural behaviour. Also it is less dangerous for both
C8	No. But they compromise welfare-dehorning at least, but not sure about castration

3.2.2 Researchers' interview

The researchers

The researchers that were interviewed are presented in Table 15 below.

Table 16: The researchers

Researcher ID	
R1	Ethologist in the Department of Animal Environment and Health, Section of Ethology, Swedish University of Agricultural Sciences
R2	Ethologist in the Department of Animal Environment and Health, Section of Ethology, Swedish University of Agricultural Sciences
R3	Animal welfare researcher and consultant in the Organic Food and Farming Division, Bioforsk Norwegian Institute for Agricultural and Environmental Research

The dairy farm

When asked about the dairy farm characteristics that enable natural behaviour (Table 16), the researchers unanimously mentioned space allowance and a loose housing system.

Table 17: What are the characteristics of a dairy farm that enable natural behaviour?

	Researcher ID				Researcher ID		
Characteristics	R1	R2	R3	Characteristics	R1	R2	R3

Grouped housing	X			Ad lib feed		X	X
Suckling system	X		X	Age groups		X	
Loose housing	X	X	X	Outdoor access			X
Social contact	X		X	Space allowance	X	X	X
Grooming	X			Deep litter with straw/dry and clean bedding		X	X

The calf rearing system

Separation from its mother does not really affect the calf as long as it can suckle another cow. The emotional bond created between a cow and calf seems to be stronger for the cow, who is the one to be affected by the separation (see Table 17).

Table 18: Characteristics of a calf rearing system

Researcher ID	R1	R2	R3
How does separation from the mother affect calf behaviour?	It affects mainly the cow if there was time for maternal bond, no negative effect on the calf if it stays with a foster cow		
When is it preferable to separate?	A few hours after birth	24 hours	24 hours
What is the best weaning age?	3-4 months	a balance one has to find-9 months would be the best for the calf	About 2-3 months, gradually-for the rumen development

The farmer

In Table 18 the answers of the researchers are presented, when asked what makes a good dairy farmer in terms of animal welfare and what demonstrates a good human-animal relationship.

Table 19: The dairy farmer and animal welfare

ID	What are in your opinion important characteristics for a dairy farmer as far as animal welfare is concerned?
R1	To take the time to look at each individual and have an overview on each calf

R2	To have ‘an eye’ for the animals, to look at them and understand if they are fine or not, if they look happy although they seem healthy
R3	To take the time to look and to be with the animals, to check their welfare, to start with calves –if they are clean, healthy, have enough fodder/water/all essentials
	What are the indicators of a good human-animal relationship?
R1	<ul style="list-style-type: none"> • If you can approach the animals (but it could also be that they just approach you in order to suckle your finger because they have not satisfied their suckling behaviour)
R2	<ul style="list-style-type: none"> • If the animals don’t get stressed/are relaxed in the presence of a human
R3	<ul style="list-style-type: none"> • Calm animals when the stockperson is entering the pen • If he/she is approaching and handling the animals in a positive/calm way • If the animals that are outdoors follow him/her back inside and not the opposite

Organic dairy

While they pointed out to a possibility for expressing natural behaviour in organic systems as a strength, the researchers noted that outdoor access should be regulated as compulsory for calves earlier than 6 months, that parasite infections could compromise welfare under the existing regulation and that the organic requirement to leave the cow with the calf together for some time after calving may need to be researched more extensively (see Table 19).

Table 20: Strengths and weaknesses of organic farming in relation to animal welfare

ID	Strengths	Weaknesses
R1	Organic livestock farming promotes natural behaviour	Not regulated <u>outdoor access</u> for calves before 6 months of age. More space allowance and small/naturally occurring groups should be regulated
R2	Entails a philosophy that focuses on welfare, provides conditions where animals can express naturally (e.g. calves can play)	<u>Cow-calf bonding</u> during the first days after calving leads to conflict between farmers and regulations on the issue of cow-calf separation
R3	Regulations on naturalness, health and biological functions of the animals	Welfare-compromising regulation in the case of <u>parasite treatments</u> . A health plan should be added to make the farmer conscious

Calf welfare

All researchers believe that good health and proper biological function is part of animal welfare and two of the three believe it is the most important welfare aspect (see Table 20).

Table 21: Researchers' approaches to welfare: aspects and restrictions

What is animal welfare?	Researcher ID			What poses/ removes restrictions to accomplish welfare?	Researcher ID		
	R1	R2	R3		R1	R2	R3
Natural behaviour/ needs	X		X*	Knowledge	X		X
Health/Biological functioning	X	X*	X*	Technology	X		
Positive feelings	X*	X		Economy	X		X
Enough food and water/ long eating time	X			Satisfaction of their essential behavioural needs		X	X

* the stars indicate the factors the each researcher identified as most important for animal welfare

Affective states

All three researchers believe that animals have emotions and that emotions are very important for welfare (Table 21).

Table 22: Researchers' approaches to welfare: affective states

ID	Do animals have emotions?	How important are they for animal welfare?	Examples of affective states (frustration)
R1	Yes	Very important	Not performing certain behaviours that are important
R2	Yes	Very important	A bad caretaker that can't handle animals in the right way
R3	Yes	Very important	Harsh handling, no food, bad food, little space, not getting milked (not getting their natural needs satisfied), non predictable situations

Naturalness

Researcher R2 believes that for animals in captivity there are some behavioural needs that are essential and have to be satisfied, so that animals can have a

good welfare; but these behavioural needs do not include all natural behaviours in captive animals, not all behavioural needs are necessary to be expressed for welfare accomplishment (see Table 22).

Table 23: Naturalness and calf welfare-the researchers' view

R1	R2	R3
Why is natural living important for calf welfare?		
Outdoor living is giving them input and choices- we don't know how important are for them	For animals in captivity the essential behavioural needs have to be satisfied, not all natural behaviours	Because it is an integral part of welfare
What are the natural needs of a calf?		
Outdoor access	the ones that if they are not allowed to be expressed then there are negative effects on the animals like bad health, injury, abnormal behaviour, inactivity, apathy	Outdoor access
Space allowance		Space allowance
Socialising		Socialising
Play		Play
Subject to different weather conditions		Food and water
		Suckling
	Shelter	

When asked whether a natural life for a calf is possible to accomplish under production conditions, the researchers' opinions diverge: researcher R1 believes that natural living cannot be totally provided, while R2 believes that a natural life is nearly possible and R3 believes natural life is feasible as long as the calf can suckle and be in small groups (see Table 23).

Table 24: Can a calf have a natural life in a production system?-the researchers' view

R1	No, you can't provide everything that a natural life involves, they cannot choose freely. You can provide most important aspects, but not all. Still they can have a good welfare indoors, even if it is not natural. Natural life can have a compromised welfare
R2	Yes, if the calf can suckle (mother cow, foster cow), and be in small groups
R3	It is nearly possible, not fully as long as it is domesticated

Finally, researchers were asked whether mutilating an animal is a compromise for naturalness and welfare. While they all agree that dehorning the cattle is compromising naturalness, researchers R2 and R3 also agree that dehorning is a compromise for welfare as well (see Table 24).

Table 25: Are mutilations compromising a) naturalness, b) welfare?

R1	a) Yes. b) It is painful 'on the spot' if made without anaesthesia, but better welfare if you have them in confinement.
R2	a) Yes, it could be that it is affecting natural behaviour but it is more of a feeling that she has. b) Yes, the animals look miserable, even if there is no pain; it is changing a lot in their lives
R3	a) Yes b) Yes. You take away a part of their body, we don't know how important horns are or if they need them, they use them in social life, hierarchy

3.2.3 Welfare evaluation

Each farmer and each researcher was asked how much they agree or disagree with the statements in Table 25 regarding reasons for welfare provision. All of the interviewers agree or strongly agree that animal welfare has to be provided because animals are sentient and because it's the farmers moral duty.

Table 26: Ethical justifications for animal welfare provision

AW has to be provided because:	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
it is required by the law	C10, R3	O2, O4, C8, C9, C12	C6	O3, C5, O7,	O1, O4, C11, R1, R2
it is the farmer's moral obligation				O2, O3, C5, C6, O7, C8, C9, C10	O1, O4, C11, C12, R1, R2, R3
animals are sentient creatures				O2, C5, C6, O7, C8, C10, R2, R3	O1, O3, O4, C9, C11, C12, R1
life has a value of its own		C12	R2	O2, C5, C6, O7, C8, C9, C10	O1, O3, O4, C11, R1, R3
it's a sign of respect to nature			O3, R2	O1, O2, C5, C6, C8, C9, C10, C12, R1	O7, C11, R3

Each researcher and each farmer was asked to evaluate the welfare situation of hypothetical animals experiencing variable states of health, emotions and 'naturalness'. The Figures 4, 5 and 6 below show the relative value of welfare under each hypothetical condition, for the researchers, the organic farmers and the non-organic farmers (1-10, 1=low and 10=high welfare).

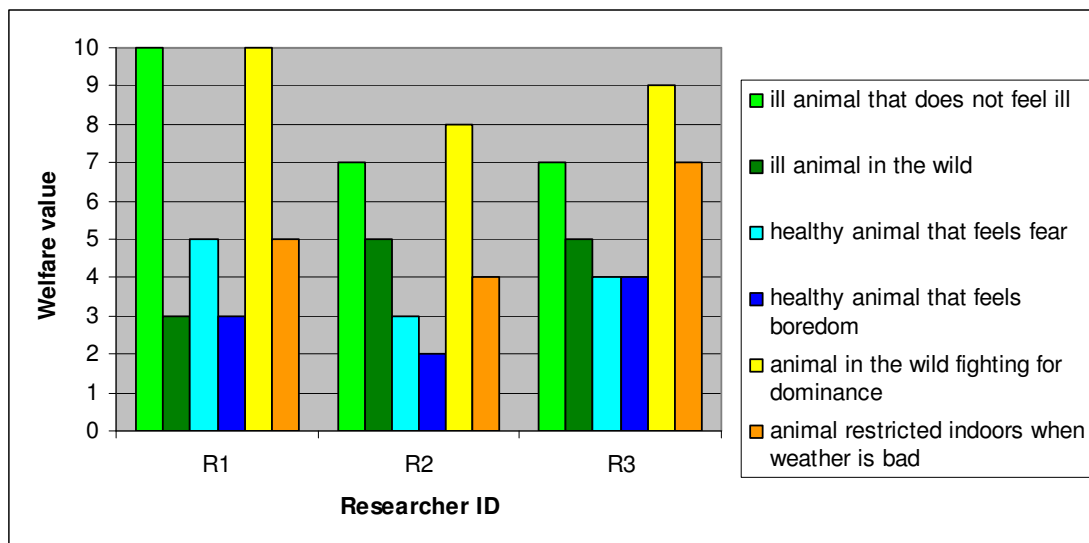


Figure 4: Researchers' welfare evaluation

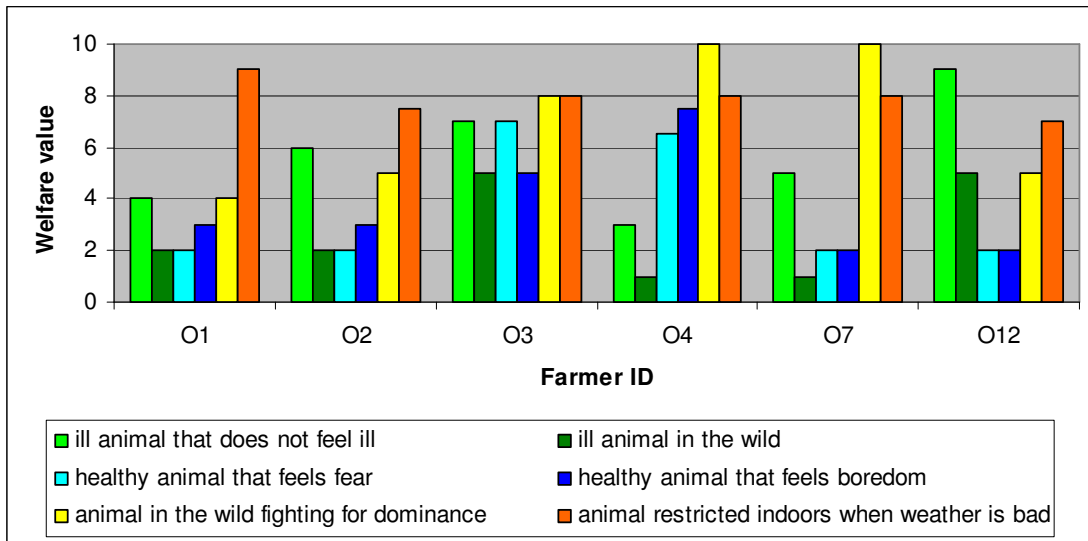


Figure 5: Organic farmers' welfare evaluation

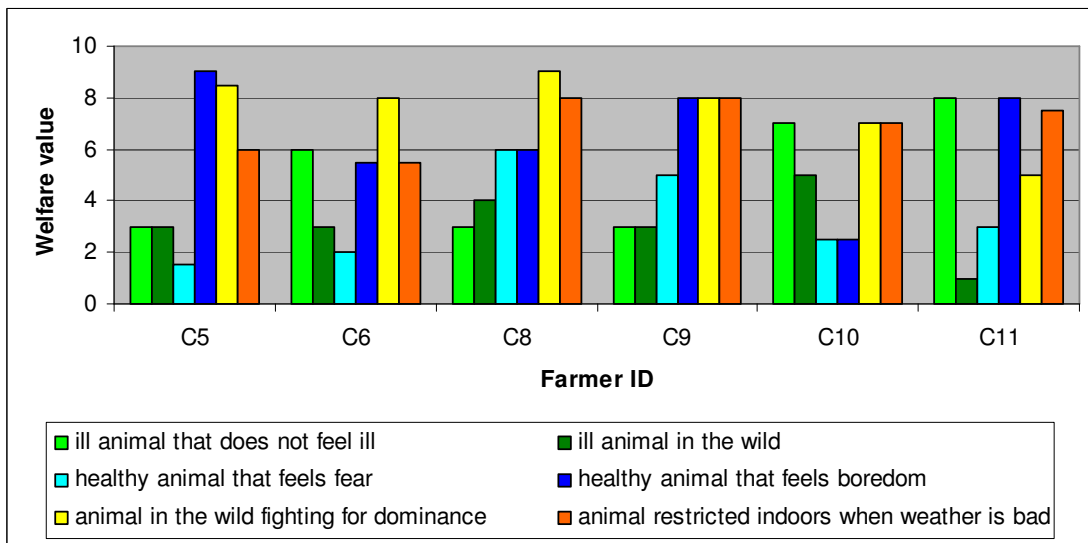


Figure 6: Non-organic farmers' welfare evaluation

4 DISCUSSION

Approaching animal welfare from an organic point of view

Exploring the animal welfare concept, different approaches have been found throughout the literature and it has been argued that approaching welfare cannot be separated from how one evaluates life quality for animals. Three approaches have been identified (Duncan and Fraser, 1997) as major understandings of what is a life quality for an animal based on biological functionality, feelings' subjectivity and naturalness.

In organic farming, animal welfare is given great consideration as a goal to maintain and increase. The organic philosophy sets the welfare of animals as a precondition for fair farming (principle of fairness) (IFOAM, 2007a), and places respect for their distinctive characteristics and their physiological and behavioural needs amongst its general principles (IFOAM, 2005). It has been widely argued that animal welfare in organic farming is interpreted in terms of natural living (Lund, 2006), but other approaches to welfare are also incorporated in the organic view, such as biological functionality since health and productivity seem to be inherent to agricultural production systems.

The EU organic regulation (Council Regulation 2092/91, 1991) has been reviewed with focus on dairy calf rearing and it has been shown that the welfare related requirements, in terms of naturalness in organic livestock production are limited. Tethering prohibition (§ 6.1.4, annex B), stocking densities that allow the animals to make all natural movements (§ 8.2.2, Annex B) and ban on the use of individual boxes after 1 week of age (§ 8.3.7, Annex B) can demonstrate that there are quite a few standards dealing with naturalness, but they are apparently not enough to ensure welfare (based on naturalness) on organic farms.

In particular, the guidelines for animal welfare do not focus on many distinctive features of a calf's natural life, leaving space for a range of inconsistencies between organic philosophy and actual practice. According to the Council Regulation (EEC) No 2092/91, although calves have to be fed with natural milk, preferably maternal (§ 4.5, Annex B), the time period before a calf is separated from its mother is not clearly determined and beyond the point of separation,

natural suckling (of the mother or of foster cows) is not ensured. Weaning time is required not to be less than 3 months of age (also § 4.5), which is though still much less than observed natural weaning (Reinhardt and Reinhardt, 1981). Inadequate implementation of naturalness in dairy farming is also manifested in the (EEC) No 2092/91 by the general permission of practices such as artificial insemination, mutilating in the form of dehorning or restricted outdoor access. In specific, although systematic mutilations are not allowed, dehorning of young animals may be authorised for reasons of safety (§ 6.1.3, Annex B), when for instance, this can be avoided if enough space is provided (i.e. free range conditions) where the cows are able to perform avoidance behaviour and keep individual distances (Menke et al., 2004). Reproduction of the herd should be based on natural methods, but artificial insemination is allowed (§ 6.1.1, Annex B) and also widely practiced, as also shown from the interviews. In the selection of breeds the capacity of the breed to adapt to the local conditions has to be taken into account (§ 3.1, Annex B), but the actual selection of breeds can be basically carried out in a manner that productivity may be given priority over adaptability. Outdoor access must be provided to the animals (§ 8.3.1, Annex B), but in loose housing systems outdoor access is not obligatory during the winter (§ 8.3.2).

Dilemmas in theory are dilemmas in practice

In the organic regulations the concept of naturalness is not explicitly taken care of and within the organic requirements natural living measures are implemented to a limit. This is leading to a range of dilemmas around the topic of welfare and can be attributed to two reasons: firstly to the fact that animal welfare in organic farming is not solely defined in terms of naturalness but also in terms of biological functioning and subjective feelings (Alroe et al., 2001). Therefore good health and/or avoidance of suffering may be given priority over natural integrity in certain situations. Dehorning for reasons of safety against injury and suffering is a vivid example, also verified by the interviews.

A second reason for the dilemmas is identified as the fact that organic livestock systems are – in the same way as conventional systems - agricultural production systems where the concept of naturalness as free living in nature, has been primarily removed in order to control the animals and to achieve production under human supervision. In dairy farming, elements of animal maternity are used in order to obtain production: dairy systems are based on the utilization of one of the basic functions of maternity, milk provision for the new born. Production of milk by the mother is naturally initiated because of the offspring and destined to it, but within the frame of a dairy farm this natural relationship is principally disturbed, altered and eventually blocked. It can therefore be argued that naturalness is attempted to be implemented in a dairy calf rearing system where it has been first and foremost removed since the system is basically taking advantage of the missing key feature of naturalness. Examples where the inconsistency between naturalness and production is evident are the cow-calf separation, the lack of natural suckling or the premature weaning age of calves.

In order to overcome these dilemmas that are generated as an apparent conflict of interests, it has to be made clear the extent to which naturalness is desired in organic animal systems. And to do that it is necessary that the organic guidelines give a clear definition of animal welfare and of naturalness. Defining what is regarded as animal welfare and what is meant by natural, could be the first step in demonstrating to what extent elements of naturalness may be excluded to serve human interests over animal interests, so that the inconsistency between theory and practice can be settled according to the organic philosophy and ethics.

Parallel to this, implementation of elements of naturalness may be further incorporated in the organic requirements of calf rearing. Based on the cow-calf 'natural relationship' from birth to weaning, elements of naturalness which can be encouraged in organic dairy calf rearing include natural suckling, milk feeding ad libitum (at least for a certain -natural- time period), outdoor access, space allowance and social contact. It is understood that the greater the degree that

these elements will be implemented, the more priority naturalness will be given, and therefore these elements can also be used for assessment of naturalness in dairy systems.

Motivated by the findings in the literature review and by the fact that only few of the welfare assessment studies found had a focus on animal welfare in the organic sense of the term – i.e. assessing how well the animals are doing concerning the expression of their behavioural patterns and satisfaction of natural needs - the case study set to explore how animal welfare is approached in organic dairy calf rearing systems and how far the concept of naturalness is implemented.

The interviews

Since the sample of interviewees was not random or representative of a group, the results from this case study cannot be generalized. It was initially intended to include more questions and gather more information about the farms and the dairy systems, but this has not been possible for mainly two reasons. Firstly, the farmers were occupied by their work on the farm and could not afford the time to spend in a longer interview. Secondly, in many of the interviews translation was necessary, fully or partly, which required additional time and effort for all participants. Then, another obstacle met concerns the interaction between the farmers and the author. Several reasons were noticed why a farmer might not give his real/true opinion/information:

- a farmer may have felt that he/she has to give the 'correct' answer to a question and therefore not always the 'true' one,
- a farmer may have not understood the question,
- a farmer may not have an answer to the question,
- a farmer may have contradictory answers to different questions,
- a farmer may get offended/be disturbed by a question,
- a farmer may not want to answer a question.

This involves the farmers' view of the author as a foreigner on the farm, whose intentions might have been of questionable nature. It is worth mentioning that some farmers were suspicious or afraid that the information obtained from the farm visits might be used against them, while some were proud to present their methods and some were accepting the input from the interview as 'food for thought' on the subject of animal welfare, which as they said, they had not thought about previously in a certain way.

The farmers

The farmers were generally well educated. With the exception of one farmer in each case, all of the non-organic farmers had at least basic agricultural knowledge and all of the organic farmers had additionally specialized courses on farming management methods (biodynamic studies, organic farming courses, master in agronomy).

Farmers' perception of animal welfare

The farmers seem to approach welfare in a multiform manner, which includes combined elements of all three major approaches to welfare. In specific, factors that make the animals feel well (being full and not hungry, being calm, happy, playful, comfortable), contribute to good health and growth (nutrition of good quality, low disease susceptibility, clean environment, appropriate air humidity and quality) and offer natural living conditions (outdoor access, ability to move freely and adequate space allowance, fresh feed, water and air) were all identified by the farmers as welfare aspects, something that can be also shown in the welfare evaluation figures. It is significant to notice though that when asked what animal welfare is, natural living was mentioned by the organic farmers and not by the non-organic ones. It was only the organic farmers who without exception included natural behaviour among the aspects of animal welfare, and half of them also list it as the most important one. Affective states are evaluated as important or very important for animal welfare by most of the farmers. When asked to give an example, farmers pointed out to stress or

frustration caused by unfamiliar situations or disturbed routines and by the cow-calf separation and the role of positive emotions also appears to be important, with fewer examples mentioned though. The farmers recognise the importance of hierarchy between the animals, of socialising and of outdoor access as significant for positive affective states. This shows how elements of natural living and natural behaviour of the animals, such as being outdoors, socialising or being undisturbed in the relationships they form with each other, are regarded by the farmers also as aspects of positive affective states, important for welfare. Biological functionality though is revealing its significance for the farmers in the case of assessment. Welfare assessment is approached by criteria with measurable aspects in a way that they can be evaluated objectively, referring to housing conditions, such as floor characteristics, temperature, air humidity, bedding, as well as the health and hygiene condition of individual animals, i.e. lack of infections, injuries or diseases.

Farmers' perception of naturalness

When asked about naturalness, all farmers expressed the opinion that natural living is important for animal welfare, but when asked why natural living is important, their answers were not explicitly stating a justification [i.e. *'it is the best for them'* (farmer C10), *'it is their need'* (farmer O7) or *'because it is like this, it is not a thing to discuss, I cannot find an argument, it is the way it should be, it is better for the animals not to be restricted in an unnatural environment'* (farmer O12)].

In combination with the fact that all of the farmers (except O3 who was neutral) agree or strongly agree that animal welfare provision is a sign of respect to nature, we can conclude that natural living involves an own value which cannot be further analysed or divided, because to live a natural life aims at a desirable situation and at the same time consists of the realised aim. Therefore a natural life is good in itself and living a natural life is essential for welfare. Additionally, natural living denotes a state of things, an order, which is required ethically because it embodies the way things ought to be, the right and the ideal way.

Conclusively, naturalness is perceived not only as principally significant for welfare, but also as ideal and an ethical obligation that represents the right order of things; naturalness is what and how *it should be*.

After verifying that naturalness *should be* but *is not* in practice, we have to try and explore the inconsistency. This inconsistency is primarily to be seen on the farms by the fact that only few aspects of naturalness are in practice implemented in the dairy systems, something also verified by the farmers themselves (farmers O3, C5, C6). In specific, while the farmers' notion of natural needs includes many aspects of a natural life (e.g. 'be with the mother', 'socialise', 'be outdoors' and 'have enough/ fresh food'), the aspects that are actually implemented on the farms are restricted to one or two at a time. Reasons for this inconsistency are partly derived from the restrictions to welfare that the farmers face (for instance because of small or old facilities where the animals were tied up), which consequently do not allow them to accomplish naturalness as much as they believe it should be implemented. Another part of this inconsistency may be attributed to the fact that the farmers have no clear awareness of the elements of a natural life in their mind, as these are illustrated by scientific research (for example natural weaning was mentioned only by farmer C11 as an aspect of a natural life, when natural weaning time has been found to take place at 7-14 months of age in semiwild herds (Reinhardt, 2002)). A third component of this inconsistency may be lying on the fact that the farmers' opinion about naturalness is not truly reflected in the interview. This different, 'untrue' opinion may have been extracted from the farmers as a result of the author's presence on the farm as a foreign body, who is simultaneously a potential criticism to their farming practice and ethics, forcing a pre-constructed answer as most likely the 'correct' one.

Elements of naturalness in the dairy systems

In all the farms, organic and non organic, practice of artificial insemination is carried out systematically and with no exception.

Similarly, mutilating the cows by dehorning is carried out in all farms, organic and non-organic. However, some exceptions were met in two farms.

Natural suckling for at least few days was taking place in the organic farms, but not in the non-organic farms, with the exception of farm C10. Although not required by regulation, farmer C10 provided up to 7 days of natural suckling to new born calves and their mothers, while most of the non-organic farmers separated mother and calf immediately after birth. In a similar way, only two farmers, O1 and O2, had established an alternative calf rearing system with natural suckling, while in the rest four organic farms natural suckling is taking place for a restricted time period (3-7 days after birth). Nevertheless, in these two alternative systems where calves were allowed to suckle up to 7 weeks and 12 weeks of age, the average milk production is 9800 and 7000 ECM⁹ per cow respectively and both farmers were satisfied by the way their system worked for them and their animals. Farmer O1 established a suckling system where 3-4 foster cows were suckled by a group of calves (maximum 20 calves) and farmer O2 allowed free suckling of all milking cows by the calves of the farm throughout the year. In farm O3, natural suckling system was also established and foster cows were used for this purpose, but the calves were allowed to suckle naturally only up to 1 week of age.

In all the non-organic farms the calves were housed for the first 1 to 3 weeks of their life in individual boxes, with the exception of the farm C10 where no calf was housed individually. In the organic farms on the other hand the calves were mostly housed in groups after being separated from their mother (in farm O4 calves spend 1 week in an individual box), with the exception of farm O7 where calves were housed in individual boxes or in groups of 2 until the age of 2 months, when they were weaned and tied up.

Weaning age for the calves in the organic farms was 12 weeks of age as required by regulation, with the exception of farm O7 where the farmer is weaning the calves at 8 weeks of age. In three of the non-organic farms (C6, C8

⁹ Energy Corrected Milk

and C9) weaning takes place at 8 weeks of age and at 10-12 weeks in farms C5, C10 and C11.

What can be concluded out of this summarised overview of the farming systems is that the organic systems implement more elements of naturalness in their calf rearing systems as a result of regulations (organic versus non-organic). Additionally, elements of naturalness can be implemented regardless of regulation requirements, as a result of the farmer's perception of welfare (C10 as compared to the rest non-organic farmers, or O1 and O2 with long term natural suckling and satisfactory -similar or higher- production as compared to the rest of the organic farmers).

Elements of naturalness may be lacking from an organic system also as a result of the farmers' economic restrictions (O7 as compared to the other organic farms). Farmers attribute restrictions to welfare provision mainly to the housing facilities. They identified economy, old facilities or small facilities where the animals were tied up (not loose), as the reasons why provision of welfare is not satisfactory enough. Restrictions to welfare are also set by the time and effort that has to be invested by the caretaker and his/her ability to please the animals' preferences (pleased animals have been identified as well-fed and playful).

Therefore, three elements are recognised as important to the implementation of naturalness in dairy calf systems: regulation on natural living aspects, the farmer's perception of what is good for the animals and the means (economy, time, facilities) to realise the several aspects of a natural life of the calves.

The researchers

The researchers approached welfare in a direct manner with accurate terminology and expressed clearly that good biological functioning is essential for welfare but also consider affective states very important, as well as natural behaviour. They all believe that animals have emotions and that emotions are very important for welfare. By the examples given it is easy to recognise that negative emotions come as a result of restrictions to performing natural behaviours. They all express positively towards the organic approach to

livestock production as giving possibilities for natural behaviour (R1, R2) and promoting welfare in a holistic way including biological functioning aspects (R3). Missing aspects of naturalness though are pointed out by researcher R1 on earlier outdoor access and housing in naturally occurring groups, while R3 focuses on impaired health and potential suffering by inadequate parasite treatments and R2 focuses also on potential suffering of the cow-calf separation (no bonding better than little bonding). R2 pointed out that research might have missed something in the issue of cow-calf bonding as it recommends a minimum time before separation of the two, while the farmers argue that separating the calf from the cow after a few days of bonding is more detrimental (than immediate separation) to the welfare of the animals, especially for the cow, who is noticeably suffering.

Elements of natural life are indicated as crucial for animal welfare. R2 in particular is separating certain behavioural needs as essential for welfare, compared to other behavioural needs which are not considered of vital importance for welfare accomplishment. The essential behavioural needs are identified as the natural needs that will impair biological functionality if not satisfied. R1 and R2 express a different view on natural needs that seem to serve an end in themselves next to good health and pleasant feelings.

It has been generally expressed that the caretaker must be qualified and skilled to 'understand' the animals, their desires and needs so that he/she can provide them with what they require or he/she has to give to the animals time and individual care, ensure they have all they need and watch them closely at all times. Such features are important for welfare and need to come from the stockperson whose responsibility is the herd's welfare. Furthermore, calm and trustful animals indicate a positive attitude towards their caretaker, which shows that a qualified stockperson and a positive interaction between the two sides promote animal welfare in terms of feelings and stress levels and facilitate management.

Ultimately, it can be said that provision of naturalness within a farming system will greatly depend on the knowledge of what is natural for the animals, the perception of what animal welfare is and the capability and available means to accomplish it.

5 CONCLUSIONS

Most of the different animal welfare approaches found across the literature have been identified as belonging to one of the following categories: (i) the biological functioning approach which sets the good health and productivity of an animal as the most important welfare factor, (ii) the feelings-based approach, according to which an animal is experiencing welfare when it feels well, and (iii) the natural living approach, which claims that the realisation of the animal's nature is most relevant to its welfare. It has been widely argued that approaching welfare cannot be separated from how one evaluates life quality for animals.

The organic regulation has been reviewed in this thesis with focus on dairy calf rearing and it has been shown that the welfare related requirements, in terms of naturalness are limited. This missing implementation of natural living measures within the organic requirements is leading to a range of dilemmas around the topic of welfare. In order to overcome these dilemmas and clarify to what extent it is desirable to provide naturalness, it is suggested that the organic theory is lacking a clear definition of animal welfare and to the extent where elements of natural living are incorporated, also a definition of what is natural. These definitions are necessary to reflect the organic philosophy and will help clarify the organic practice and ethics.

Parallel to this clarification, further implementation of elements of naturalness may be incorporated in the organic requirements. During the rearing of organic dairy calves, the highest possible degree of naturalness can be reached when the rearing conditions are as natural as possible. From the elements of naturalness, indicators can be derived that can be used as tools for welfare assessment and include extent of natural suckling, of feeding milk ad libitum, of outdoor access, of space allowance and of social contact. The degree up to which these natural living aspects will be implemented, can be identified by the way naturalness is defined and the degree it is desirable to be reached.

From the case study it can be concluded that the organic systems implement more elements of naturalness in their calf rearing systems as a result of

regulation. Elements of naturalness can be implemented though regardless of regulation requirements, as a result of the farmer's perception of welfare, which makes the role of the stockperson a very important one. The farmers seem to approach welfare in a multiform manner, which includes combined elements of all three major approaches to welfare. The interpretation of good welfare is connected to the concept of natural for the farmers and living a natural life considered in itself essential for welfare. Still, elements of naturalness may be lacking from an organic system, independent of regulation or stockperson, as a result of the farmers' economic restrictions and the trade-off resulting from his production aims.

6 SUMMARY

The concept of animal welfare has been approached in variable ways throughout the scientific and philosophical world and no consensus seems to exist about what a quality of life is for animals in agricultural systems. Aim of the study is to compile and compare the different animal welfare approaches found across the literature and examine implications of the organic approach to welfare for the rearing of organic dairy calves. Three main approaches to animal welfare have been identified in the literature. According to the *biological functioning* approach, welfare is accomplished when the animals are healthy and productive. In the *subjective feelings* approach welfare is accomplished when the animals are feeling good. In the *natural living* approach a natural life is considered as a life of welfare, during which the animal is fulfilling its life by experiencing its inherent nature. The different approaches result from different underlying values and concerns about how animals ought to be treated reflecting how science based arguments are connected to ethical guidelines. In organic farming the concept of naturalness is of major importance. In the organic philosophy, animal welfare is interpreted in terms of natural living (natural behaviour, environment and feed), but in the organic regulations the naturalness related requirements in dairy calf rearing are limited. Furthermore, a case study was conducted in 12 dairy farms in Norway and Sweden, in order to examine how the concept of naturalness can be best implemented in organic dairy calf rearing. The results show that implementation of naturalness in dairy calf rearing depends on regulation, on the farmer's perception of welfare and on economic restrictions. Elements of naturalness that could be further implemented in organic dairy calf rearing, include natural suckling, feeding milk ad libitum, space allowance, outdoor access and socializing possibilities. To determine the extent to which these elements of naturalness should be implemented in an organic dairy system, it is suggested that a definition of animal welfare and of naturalness is needed, in order to overcome the dilemmas existing between organic theory and practice.

7 REFERENCES

1. Algers, B. 1992. Natural behavior--a natural concept? *Berliner und Munchener Tierarztliche Wochenschrift* 105:372-374.
2. Algers, B. and V. Lund. 2007. A biological approach to the concept of natural behaviour. Centre for bioethics . IX Annual Swedish Symposium on Biomedicine, Ethics and Society, Seglarhotellet, Sandhamn, 11-12 June.
3. Alroe, H. F., M. Vaarst, and E. S. Kristensen. 2001. Does organic farming face distinctive livestock welfare issues?-A conceptual analysis. *Journal of Agricultural & Environmental Ethics* 14:275-299.
4. Anon. 2007. Aktionsplan 2010. För en ökad ekologisk konsumtion och produktion [Action plan 2010. To increase organic consumption and production]. Swedish Board of Agriculture Online. Available: www.sjv.se/download/18.313fdc3e116c968a300800026/Aktionsplan2010.pdf.
5. Anon. 2008. CalfCare. Ontario Veal Association Online.
6. Appleby, M. C. 1997. Introduction. Page xi in *Animal Welfare*. M. C. Appleby and B. O. Hughes, eds. Wallingford, UK: CAB INTERNATIONAL.
7. Aristotle. 1894. *Nicomachean Ethics*. 1102a 5-6, 1103a 16-20. Translated by William David Ross, Clarendon Press 1908 ed. Oxford.
8. Arkow, P. 1998. Application of ethics to animal welfare. *Applied Animal Behaviour Science* 59:193-200.
9. Baars, T., J. P. T. M. Wagenaar, S. Padel, and W. Lockeretz. 2004. The Role of Animals in Farming Systems: a Historical Perspective. Page 13 in *Animal health and welfare in organic agriculture*. M. Vaarst, S. Roderick, V. Lund, and W. Lockeretz, eds. CABI Publishing.
10. Babu, L. K., H. N. Pandey, and A. Sahoo. 2004. Effect of individual versus group rearing on ethological and physiological responses of crossbred calves. *Applied Animal Behaviour Science* 87:177-191.
11. Bayvel, A. C. D. 2005a. Animals in science and agriculture - A global perspective. *Biologist* 52:339-344.

12. Bayvel, A. C. D. 2005b. The use of animals in agriculture and science: Historical context, international considerations and future direction. *OIE Revue Scientifique et Technique* 24:791-813.
13. Bentham, J. 1907. *An Introduction to the Principles of Morals and Legislation*. Oxford: Clarendon Press.
14. Bracke, M. B. M., B. M. Spruijt, and J. H. M. Metz. 1999. Overall animal welfare assessment reviewed. Part 1: Is it possible? *NJAS wageningen journal of life sciences*; Vol 47, No 3/4 (1999).
15. Bracke, M. B. M. and H. Hopster. 2006. Assessing the importance of natural behavior for animal welfare. *Journal of Agricultural and Environmental Ethics* 19:77-89.
16. Broom, D. M. 1986. Indicators of poor welfare. *British Veterinary Journal* 142:524-526.
17. Broom, D. M. 1988. The scientific assessment of animal welfare. *Applied Animal Behaviour Science* 20:5-19.
18. Broom, D. M. 1991. Animal welfare: concepts and measurement. *J. Anim Sci.* 69:4167-4175.
19. Broom, D. M. 2002. Does present legislation help animal welfare? F. Ellendorff, ed. *Institute for Animal Science and Animal Behaviour, Federal Agricultural Research Centre (FAL), Braunschweig : FAL.*
20. BSAS. 2007. Animal welfare. *British Society of Animal Science Online*. Accessed Oct. 6, 2007.
21. CAC / GL 32. 1999. Guidelines for the production, processing, labelling and marketing of organically produced foods. *Codex Alimentarius Commission Online*. Available: <http://www.codexalimentarius.net/>.
22. Caporale, V., B. Alessandrini, P. la Villa, and S. Del Papa. 2005. Global perspectives on animal welfare: Europe. *OIE Revue Scientifique et Technique* 24:567-577.
23. Chua, B., E. Coenen, J. van Delen, and D. M. Weary. 2002. Effects of Pair Versus Individual Housing on the Behavior and Performance of Dairy Calves. *J. Dairy Sci.* 85:360-364.
24. Council Directive 91/629/EEC. 1991. Council Directive (91/629/EEC) of 19 November 1991 laying down minimum standards for the protection of calves. *Official Journal L 340 ,11/12/1991 p.0028 - 0032.*

25. Council Regulation 2092/91. 1991. Council Regulation (EEC) No 2092/91 of 24 June 1991 on organic production of agricultural products and indications referring thereto on agricultural products and foodstuffs. Official Journal L 198, 22/7/91, p.1-15. Regulation as last amended by Regulation (EC) No 1991/2006 of 21 December 2006 (OJ L 411, 30.12.2006, p. 18). Consolidated version of January 1, 2007.
26. Council Regulation 1804/1999. 1999. Council Regulation (EC) No 1804/1999 of 19 July 1999 supplementing Regulation (EEC) No 2092/91 on organic production of agricultural products and indications referring thereto on agricultural products and foodstuffs to include livestock production. Official Journal L 222, 24/8/99, p. 23.
27. Council Regulation 834/2007. 2007. Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labelling of organic products and repealing Regulation (EEC) No 2092/91. Official Journal L 189, 20/7/07, p. 23.
28. Crawford, H. K. 2006. Farmnote 42/98 : Calf rearing : feeding systems [WA AGRIC]. Western Australia, Department of agriculture.
29. Croney, C. C. and S. T. Millman. 2007. The ethical and behavioral bases for farm animal welfare legislation. J. Anim Sci. 85:556-565.
30. Curtis, S. E. 1987. Animal well-being and animal care. Veterinary Clinics of North America: Food Animal Practice 3:369-382.
31. DARCOF. 2000. Principles of Organic Farming. Danish Research Centre for Organic Farming Online. Available: <http://www.darcof.dk/organic/Princip.pdf>.
32. Dawkins, M. S. 1980. Animal suffering: The science of animal welfare. Chapman and Hall, London.
33. Dawkins, M. S. 2004. Using behaviour to assess animal welfare. Animal Welfare 13.
34. Dawkins, M. S. 2006. Through animal eyes: What behaviour tells us. Applied Animal Behaviour Science 100:4-10.
35. Desire, L., A. Boissy, and I. Veissier. 2002. Emotions in farm animals:: a new approach to animal welfare in applied ethology. Behavioural Processes 60:165-180.
36. Duncan, I. J. H. 1978. The interpretation of preference tests in animal behaviour. Appl. Anim. Ethol. 4:197-200.

37. Duncan, I. J. H. 1993. Welfare is to do with what animals feel. *J. Agric. Environ. Ethics* 6:8-14.
38. Duncan, I. J. H. 1996. Animal welfare defined in terms of feelings. *Acta Agriculturae Scandinavica (Section A - Animal Science)* 27:29-35.
39. Duncan, I. J. H. 2005. Science-based assessment of animal welfare: Farm animals. *OIE Revue Scientifique et Technique* 24:483-492.
40. Duncan, I. J. H. 2006. The changing concept of animal sentience. *Applied Animal Behaviour Science* 100:11-19.
41. Duncan, I. J. H. and J. C. Petherick. 1991. The implications of cognitive processes for animal welfare. *J. Anim Sci.* 69:5017-5022
42. Duncan, I. J. H. and D. Fraser. 1997. Understanding animal welfare. Page 19 in *Animal welfare*. M.-C. Appleby and B.-O. Hughes, eds. Wallingford, UK: CAB INTERNATIONAL.
43. FAO. 2002. Organic agriculture, environment and food safety. Food and Agriculture Organization of the United Nations Online. Available: <http://www.fao.org/docrep/005/y4137e/y4137e00.htm>.
44. Farm Animal Welfare Council. 1993. 2nd report on priorities for animal welfare research and development. Department for Environment, Food and Rural Affairs Publications, London, 26 pp.
45. Field, T. G. and R. E. Taylor. 2007. *Scientific Farm Animal Production: An introduction to animal science*. 9th ed. Upper Saddle River, N.J. : Pearson Prentice Hall, 2008.
46. Forkman, B. 2002. Learning and cognition. Page 51 in *The ethology of domestic animals. An Introductory text*. P. Jensen, ed. CABI Publishing.
47. Francione, G. L. 2007. Reflections on animals, property, and the law and rain without thunder. *Law and contemporary problems* 70:9-57.
48. Fraser, A. F. and D. M. Broom. 1997. *Farm animal behaviour and welfare*. 3 ed. Wallingford, OX10 8DE, UK: CAB International.
49. Fraser, D. 1998. Animal welfare. *Encyclopedia of Animal Rights and Animal Welfare*. M. Bekoff, ed. Westport, Connecticut: Greenwood Press.
50. Fraser, D. 1999. Animal ethics and animal welfare science: bridging the two cultures. *Applied Animal Behaviour Science* 65:171-189.

51. Fraser, D. 2001a. The "new perception" of animal agriculture: legless cows, featherless chickens, and a need for genuine analysis. *J. Anim Sci.* 79:634-641.
52. Fraser, D. 2001b. The culture and agriculture of animal production. *ANZCCART News* 14:1-4.
53. Fraser, D., D. M. Weary, E. A. Pajor, and B. N. Milligan. 1997. A scientific conception of animal welfare that reflects ethical concerns. *Animal Welfare* 6:187-205.
54. Friend, T. H. and G. R. Dellmeier. 1988. Common practices and problems related to artificially rearing calves: An ethological analysis. *Appl. Anim. Behav. Sci.* 20:47-62.
55. Grondahl, A. M., E. M. Skancke, C. M. Mejdell, and J. H. Jansen. 2000. Growth rate, health and welfare in a dairy herd with natural suckling until 6-8 weeks of age. *Acta Veterinaria Scandinavica* 49:16.
56. Hall, S. J. G. 2002. Behaviour of cattle. Page 131 in *The ethology of domestic animals. An introductory text.* P. Jensen, ed. CABI Publishing.
57. Hammarberg, K. E. 2001. Animal welfare in relation to standards in organic farming. *Acta veterinaria Scandinavica. Supplementum* 95:17-25.
58. Hemsworth, P. H. 2003. Human-animal interactions in livestock production. *Applied Animal Behaviour Science* 81:185-198.
59. Hemsworth, P. H. 2007. Ethical stockmanship. *Australian Veterinary Journal* 85:194-200.
60. Hemsworth, P. H., J. L. Barnett, A. J. Tilbrook, and C. Hansen. 1989. The Effects of Handling by Humans at Calving and During Milking on the Behaviour and Milk Cortisol Concentrations of Primiparous Dairy Cows. *Applied Animal Behaviour Science* 22:313-326.
61. Hemsworth, P. H., J. L. Barnett, and G. J. Coleman. 1993. The Human-Animal Relationship in Agriculture and its Consequences for the Animal. *Animal Welfare* 2:33-51.
62. Hemsworth, P. H., G. J. Coleman, J. L. Barnett, and S. Borg. 2000. Relationships between human-animal interactions and productivity of commercial dairy cows. *J. Anim Sci.* 78:2821-2831.

63. Hodges, J. 2003. Livestock, ethics, and quality of life. *J. Anim Sci.* 81:2887-2894.
64. Hoglund, J., C. Svensson, and A. Hessel. 2001. A field survey on the status of internal parasites in calves on organic dairy farms in southwestern Sweden. *Veterinary Parasitology* 99:113-128.
65. Horgan, R. and A. Gavinelli. 2006. The expanding role of animal welfare within EU legislation and beyond. *Livestock Science* 103:303-307.
66. Hovi, M., A. Sundrum, and S. M. Thamsborg. 2003. Animal health and welfare in organic livestock production in Europe: Current state and future challenges. *Livestock Production Science* 80:41-53.
67. Hurnik, J. F. 1988. Welfare of farm animals. *Applied Animal Behaviour Science* 20:105-117.
68. Hurnik, J. F. and H. Lehman. 1988. Ethics and farm animal welfare. *Journal of Agricultural Ethics* 1:305-318.
69. Hursthouse, R. 2001. *On Virtue Ethics*. Oxford University Press, Oxford.
70. Ibrahim, D. M. 2007. A return to Descartes: property, profit, and the corporate ownership of animals. *Law and contemporary problems*. 70:89-115.
71. IFOAM. 2005. *The IFOAM Norms for Organic Production and Processing*. International Federation of Organic Agriculture Movements.
72. IFOAM. 2007a. *Principles Of Organic Agriculture*. International Federation Of Organic Agriculture Movements Online. Available: http://www.ifoam.org/about_ifoam/principles/index.html.
73. IFOAM. 2007b. *The world of organic agriculture- Statistics and Emerging Trends 2007*. International Federation of Organic Agriculture Movements (IFOAM), Bonn, Germany.
74. IFOAM EU Group. 2007. *Comments to the Analysis Table of the European Commission on Implementing Rules*. Approved by the IFOAM EU Group 29th October 2007. International Federation of Organic Agriculture Movements -EU Regional Group.
75. Ikerd, J. 2006. Contradictions of principles in organic farming. Page 221 in *Organic-agriculture:-a-global-perspective*. P. Kristiansen, A. Taji, and J. Reganold, eds. Wallingford, UK: CABI..

76. Illmann, G. and M. Spinka. 1993. Maternal behaviour of dairy heifers and sucking of their newborn calves in group housing. *Applied Animal Behaviour Science* 36:91-98.
77. Jasper, J. and D. M. Weary. 2002. Effects of Ad Libitum Milk Intake on Dairy Calves. *J. Dairy Sci.* 85:3054-3058.
78. Jensen, M. B. and R. Kyhn. 2000. Play behaviour in group-housed dairy calves, the effect of space allowance. *Applied Animal Behaviour Science* 67:35-46.
79. Jensen, P. 2002a. Behavioural genetics, evolution and domestication. The ethology of domestic animals. An introductory text. P. Jensen, ed. CABI Publishing.
80. Jensen, P. 2002b. Natural behaviour and behavioural needs of farm animals. Franz Ellendorff, ed. Institute for Animal Science and Animal Behaviour, Federal Agricultural Research Centre (FAL), Braunschweig : FAL.
81. Jensen, M. B., L. J. Pedersen, and J. Ladewig. 2004. The use of demand functions to assess behavioural priorities in farm animals. *Animal Welfare* 13:27-32.
82. Jensen, P. 2006. Domestication--From behaviour to genes and back again. *Applied Animal Behaviour Science* 97:3-15.
83. Kapila, P. F. 2003. Mechanised animal husbandry. Praha: CZU-ITS/ Czech University of Life Sciences Prague, Tropics and Subtropics Institute.
84. Keeling, L. and P. Jensen. 2002. Behavioural disturbances, stress and welfare. Page 79 in *The ethology of domestic animals. An introductory text.* P. Jensen, ed. CABI Publishing.
85. Kijlstra, A. and I. A. J. M. Eijck. 2006. Animal health in organic livestock production systems: A review. *NJAS - Wageningen Journal of Life Sciences* 54:77-94.
86. Kiley-Worthington, M. 1989. Ecological, ethological, and ethically sound environments for animals: Toward symbiosis. *Journal of Agricultural Ethics* 2:323-347.
87. Knierim, U. and W. T. Jackson. 1997. Legislation. Page 249 in *Animal welfare.* M.-C. Appleby and B.-O. Hughes, eds. Wallingford, UK: CAB INTERNATIONAL

88. . Krohn, C. C. 2001. Effects of different suckling systems on milk production, udder health, reproduction, calf growth and some behavioural aspects in high producing dairy cows - A review. *Applied Animal Behaviour Science* 72:271-280.
89. Lampkin, N. 2002. Livestock husbandry. Page 272 in *Organic Farming*. Ipswich: Olp Pond.
90. Langhout, M. S. 2006. Suckling, a natural calf rearing system for organic dairy farms. Paper presented at Joint Organic Congress, Odense, Denmark, May 30-31, 2006. *Organic eprints*. Online. Available: <http://orgprints.org/7697/>.
91. Lemos, J. 2007. Foot and Aristotle on Virtues and Flourishing. *Philosophia* 35:43-62.
92. Leroux, J., A. Pinschoff, and O. Schmid. 2007. Veterinary treatments. Working document for IFOAM EU meeting 2-5 December 2007. Draft Position Paper. Commented by Henriksen, B.
93. Lund, V. 2000. What is ecological animal husbandry? *Ecological Animal Husbandry in the Nordic Countries*. Proceedings from NJF-seminar No.303 Horsens, Denmark 16-17 September 1999, DARCOF Report no.2/2000. J. E. Hermansen, V. Lund, and E. Thuen, eds. Danish Research Centre for Organic Farming.
94. Lund, V. 2002. Ethics and Animal Welfare in Organic Animal Husbandry- An interdisciplinary approach. *Acta Universitatis Agriculturae Sueciae Veterinaria* 137. Department of Animal Environment and Health. Swedish University of Agricultural Sciences, Skara, Sweden. Doctoral thesis.
95. Lund, V. 2006. Natural living--a precondition for animal welfare in organic farming. *Livestock Science* 100:71-83.
96. Lund, V. and H. Röcklinsberg. 2001. Outlining a concept of animal welfare for organic farming systems. *Journal of Agricultural and Environmental Ethics* 14:391-424.
97. Lund, V. and B. Algers. 2003. Research on animal health and welfare in organic farming--a literature review. *Livestock Production Science* 80:55-68.
98. Lund, V., R. Anthony, and H. Röcklinsberg. 2004. The ethical contract as a tool in organic animal husbandry. *Journal of Agricultural and Environmental Ethics* 17:23-49.

99. Lund, V. and I. A. S. Olsson. 2006. Animal agriculture: Symbiosis, culture, or ethical conflict? *Journal of Agricultural & Environmental Ethics* 19:47-56.
100. Marie, M. 2006. Ethics: The new challenge for animal agriculture. *Livestock Science* 103:203-207.
101. Mason, G. J. and N. R. Latham. 2004. Can't stop, won't stop: is stereotypy a reliable animal welfare indicator? *Animal Welfare* 13:S57-S69.
102. Matheny, G. and C. Leahy. 2007. Farm animal welfare, legislation and trade. *Law and contemporary problems* 70:325-358.
103. Maxwell, A., D. McKeegan, and K. A. Ellis. 2006. Extended suckling systems for dairy calves: Is this possible for organic dairy farmers? *Cattle Practice* 14:219.
104. Mellor, D. J. and K. J. Stafford. 2003. Assessing the welfare status of newborn farm animals. *Animal Welfare* 12:695-698.
105. Menke, C., S. Waiblinger, M. Studnitz, and M. Bestman. 2004. Mutilations in organic animal husbandry: dilemmas involving animal welfare, humans and environmental protection. Page 163 in *Animal health and welfare in organic agriculture*. M. Vaarst, S. Roderick, V. Lund, and W. Lockeretz, eds. CABI Publishing.
106. Mignon-Grasteau, S., A. Boissy, J. Bouix, J. M. Faure, A. D. Fisher, G. N. Hinch, P. Jensen, P. Le Neindre, P. de, P. Prunet, M. Vandeputte, and C. Beaumont. 2005. Genetics of adaptation and domestication in livestock. *Livestock Production Science* 93:3-14.
107. Moberg, G. P. 1987. A Model for Assessing the Impact of Behavioral Stress on Domestic Animals. *J. Anim Sci.* 65:1228-1235.
108. Molony, V. and J. E. Kent. 1997. Assessment of acute pain in farm animals using behavioral and physiological measurements. *J. Anim Sci.* 75:266-272.
109. Narveson, J. and C. Wellman. 1970. Utilitarianism and moral norms. *The Journal of Value Inquiry* 4:273-286.
110. Norwegian action plan on animal welfare. 2008. Proposition to the Storting No 12 (2002-2003) Animal Welfare and Animal Husbandry. Norwegian Ministry of Agriculture and Food Parliamentary Report nr12 Regarding animal husbandry and animal welfare Online. Available: <http://www.regjeringen.no/en/dep/lmd/Documents/Reports-and->

<plans/Plans/2006/Norwegian-Action-Plan-on-Animal-Welfare.html?id=456113>.

111. Oxford University Press. 1989. Oxford English Dictionary. 2 ed.
112. Paul, E. S., E. J. Harding, and M. Mendl. 2005. Measuring emotional processes in animals: The utility of a cognitive approach. *Neuroscience and Biobehavioral Reviews* 29:469-491.
113. Price, E. O. 1984. Behavioural aspects of animal domestication. *Q. Rev. Biol.* 59:1-32.
114. Raussi, S. 2003. Human-cattle interactions in group housing. *Applied Animal Behaviour Science* 80:245-262.
115. Regan, T. 1988. *The Case for Animal Rights*. Routledge, London and New York.
116. Reinhardt, V. 2002. Artificial Weaning of Calves: Benefits and Costs. *Journal of Applied Animal Welfare Science* 5:251-255.
117. Reinhardt, V. and A. Reinhardt. 1981. Natural sucking performance and age of weaning in zebu cattle (*Bos indicus*). *J. Agric. Sci.* 96:309-312.
118. Rollin, B. E. 1990. Animal welfare, animal rights and agriculture. *J. Anim Sci.* 68:3456-3461.
119. Rollin, B. E. 1993. Animal welfare, Science, and Value. *Journal of Agricultural & Environmental Ethics* 6:44-50.
120. Rollin, B. E. 2004. Annual Meeting Keynote Address: Animal agriculture and emerging social ethics for animals. *J. Anim Sci.* 82:955-964.
121. Rollin, B. E. 2006. The regulation of animal research and the emergence of animal ethics: A conceptual history. *Theoretical Medicine and Bioethics* 27:285-304.
122. Rushen, J., A. A. Taylor, and A. M. de Passille. 1999. Domestic animals' fear of humans and its effect on their welfare. *Applied Animal Behaviour Science* 65:285-303.
123. Sandøe, P. and H. B. Simonsen. 1992. Assessing Animal Welfare: Where Does Science End and Philosophy Begin? *Animal Welfare* 1:257-267.

124. Sandøe, P., N. Holtug, and R. Crisp. 1997. Ethics. Page 3 in Animal welfare. M.-C. Appleby and B.-O. Hughes, eds. Wallingford, UK: CAB INTERNATIONAL.
125. Seamer, J. H. 1998. Human stewardship and animal welfare. *Applied Animal Behaviour Science* 59:201-205.
126. Singer, P. 1990. *Animal Liberation*. 2nd edn. ed. Avon Books, New York, USA.
127. Spinka, M. 2006. How important is natural behaviour in animal farming systems? *Applied Animal Behaviour Science* 100:117-128.
128. Stafleu, F. R., F. J. Grommers, and J. Vorstenbosch. 1996. Animal welfare: Evolution and erosion of a moral concept. *Animal Welfare* 5:225-234.
129. Stricklin, R. 2003. Assessment of animal welfare: a matter of ethics. Page 39 in *The science and ethics behind animal well-being assessment*. R. Reynnells, ed. USDA, Jamie L. Whitten Federal Building, Washington DC, USA, 28th May 2003.
130. Sundrum, A. 2001. Organic livestock farming a critical review. *Livestock Production Science* 67:207-215.
131. Swanson, J. C. 1995. Farm animal well-being and intensive production systems. *J. Anim Sci.* 73:2744-2751.
132. Swedish Board of Agriculture. 2008. Jordbruksverket Online.
133. Swedish Statute 1988:534. 2007. The Animal Welfare Act. Consolidated text (as last amended by SFS 2007:362 of 31 May 2007). Unofficial translation. Ministry of Agriculture, Stockholm Sweden, October 2007 Online. Available: <http://www.sweden.gov.se/content/1/c6/09/03/10/de7ea843.pdf>.
134. Szybel, D. 1998. Distinguishing Animal Rights from Animal Welfare. Page 43 in *Encyclopedia of Animal Rights and Animal Welfare*. M. Bekoff, ed. Westport, Connecticut: Greenwood Press.
135. Szybel, D. 2006. The Rights of Animal Persons. *Animal Liberation Philosophy and Policy Journal* 4:1-37.
136. Tannenbaum, J. 1991. Ethics and animal welfare: the inextricable connection. *Journal of the American Veterinary Medical Association* 198:1360-1376.

137. Taylor, A. 1999. Animals and the moral community. Page 11 in Magpies, Monkeys and Morals. What philosophers say about animal liberation. Broadview.
138. Taylor, A. A. and H. Davis. 1998. Individual humans as discriminative stimuli for cattle (*Bos taurus*). *Applied Animal Behaviour Science* 58:13-21.
139. UFAW. 2007. Animal sentience and the five freedoms. Universities Federation for Animal Welfare Online. Accessed Oct. 9, 2007.
140. USDA. 2002. Colostum feeding. Info Sheet. Veterinary Services, Centers for Epidemiology and Animal Health, APHIS, USDA, December 2002 Online.
141. Vaarst, M., L. Alban, L. Mogensen, S. Milan, E. S. Kristensen, and T. Kirstensen. 2001. Health and welfare in danish dairy cattle in the transition to organic production: problems, priorities and perspectives. *Journal of Agricultural & Environmental Ethics* 14:367-390.
142. Vaarst, M., S. Roderick, V. Lund, W. Lockeretz, and M. Hovi. 2004. Organic principles and values: the framework for organic animal husbandry. Page 1 in *Animal health and welfare in organic agriculture*. M. Vaarst, S. Roderick, V. Lund, and W. Lockeretz, eds. CABI Publishing.
143. Valle, P. S., G. Lien, O. Flaten, M. Koesling, and M. Ebbesvik. 2007. Herd health and health management in organic versus conventional dairy herds in Norway. *Livestock Science* 112:123-132.
144. Verhoog, H., M. Matze, E. L. Van Bueren, and T. Baars. 2003. The role of the concept of the natural (naturalness) in organic farming. *Journal of Agricultural and Environmental Ethics* 16:29-49.
145. Verhoog, H., V. Lund, and H. F. Alroe. 2004. Animal welfare, ethics and organic farming. Page 73 in *Animal health and welfare in organic agriculture*. M. Vaarst, S. Roderick, V. Lund, and W. Lockeretz, eds. CABI Publishing.
146. von Borell, E. and J. T. Sorensen. 2004. Organic livestock production in Europe: aims, rules and trends with special emphasis on animal health and welfare. *Livestock Production Science* 90:3-9.
147. von Keyserlingk, M. A. G. and D. M. Weary. 2006. Feeding calves more milk: A practical approach. Research Reports, Dairy education and research centre, The University of British Columbia.

148. von Keyserlingk, M. A. G. and D. M. Weary. 2007. Maternal behavior in cattle. *Hormones and Behavior* 52:106-113.
149. Wagenaar, J. P. T. M. and J. Langhout. 2007a. Suckling systems in calf rearing in organic dairy farming in the Netherlands. Paper presented at 3rd QLIF Congress: Improving Sustainability in Organic and Low Input Food Production Systems, University of Hohenheim, Germany, March 20-23, 2007. Organic eprints. Online. Available: <http://orgprints.org/9851/>.
150. Wagenaar, J. P. T. M. and J. Langhout. 2007b. Practical implications of increasing 'natural living' through suckling systems in organic dairy calf rearing. *NJAS - Wageningen Journal of Life Sciences* 54:375-386.
151. Waiblinger, S., J. Baumgartner, M. Kiley-Worthington, and K. Niebuhr. 2004. Applied ethology: the basis for improved animal welfare in organic farming. Page 117 in *Animal health and welfare in organic agriculture*. M. Vaarst, S. Roderick, V. Lund, and W. Lockeretz, eds. CABI Publishing.
152. Waiblinger, S., X. Boivin, V. Pedersen, M. V. Tosi, A. M. Janczak, E. K. Visser, and R. B. Jones. 2006. Assessing the human-animal relationship in farmed species: A critical review. *Applied Animal Behaviour Science* 101:185-242.
153. Watanabe, S. 2007. How animal psychology contributes to animal welfare. *Applied Animal Behaviour Science* 106:193-202.
154. Webster, J. 1994. *Animal Welfare: A Cool Eye Towards Eden*. 1 ed. Wiley-Blackwell.
155. Wemelsfelder, F. and L. Birke. 1997. Environmental challenge. Page 35 in *Animal welfare*.
156. Woodward, L. 2002. Science and research in organic farming. EFRC Pamphlet series, Policy and Research Department, Elm Farm Research Centre. Organic eprints Online. Available: <http://orgprints.org/3835>.

8 LIST OF APPENDICES

Appendix I The General Principles of the IFOAM Basic Standards for Organic Production and Processing

Appendix II Farmer's Questionnaire

Appendix III Researcher's Questionnaire

Appendix IV Farmers' Interviews

Appendix V Researchers' Interviews

Appendix I

The General Principles of the IFOAM Basic Standards for Organic Production and Processing as cited in the IFOAM Norms, Version 2005

ORGANIC ECOSYSTEMS

- *Organic farming benefits the quality of ecosystems.*
- *Organic farming methods conserve and grow soil, maintain water quality and use water efficiently and responsibly.*
- *Genetic engineering is excluded from organic production and processing.*
- *Organic management sustains and prevents degradation of common biotic and abiotic resources including areas used for rangeland, fisheries, forests, and forage for bees, as well as neighbouring land, air and water.*

GENERAL REQUIREMENTS

- *Organic agriculture develops a viable and sustainable agro-ecosystem, by working compatibly with natural living systems and cycles.*
- *The whole farm including livestock is converted to organic management practices according to the standards over a period of time.*
- *Organic production systems require an ongoing commitment to organic production practices.*

CROP PRODUCTION

- *Species and varieties cultivated in organic agriculture systems are selected for adaptability to the local soil and climatic conditions and tolerance to pests and diseases. All seeds and plant material are certified organic.*
- *A conversion period enables the establishment of an organic management system and builds soil fertility.*
- *Soil and soil management is the foundation of organic production. Organic growing systems are soil based, care for the soil and surrounding ecosystems and provide support for a diversity of species, while encouraging nutrient cycling and mitigating soil and nutrient losses.*
- *Organic farming returns microbial plant or animal material to the soil to*

increase or maintain its fertility and biological activity.

- *Organic farming systems apply biological and cultural means to prevent unacceptable losses from pests, diseases and weeds. They use crops and varieties that are well adapted to the environment and a balanced fertility program to maintain fertile soils with high biological activity, locally adapted rotations, companion planting, green manures, and other recognised organic practices. Growth and development should take place in a natural manner.*
- *All relevant measures are taken to ensure that organic soil and food is protected from contamination.*

ANIMAL HUSBANDRY

- *Organic livestock husbandry is based on the harmonious relationship between land, plant and livestock, respect of the physiological and behavioural needs of the livestock and the feeding of good quality organically grown feedstuff.*
- *The establishment of organic animal husbandry requires an interim period, the conversion period. Animal husbandry systems that change from conventional to organic production require a conversion period to develop natural behaviour, immunity and metabolic functions.*
- *Organic animals are born and raised in organic holdings.*
- *Breeds are adapted to local conditions.*
- *Organic farming respects the animal's distinctive characteristics.*
- *Organic animals receive their nutritional needs from organic forage and feed of good quality.*
- *Organic management practices promote and maintain the health and well-being of animals through balanced organic nutrition, stress-free living conditions and breed selection for resistance to diseases, parasites and infections.*
- *Organic animals are subjected to min stress during transport and slaughter.*
- *Bee keeping is an important activity that contributes to enhancement of*

the agriculture and forestry production through the pollinating action of bees.

PROCESSING AND HANDLING

- *Organic processing and handling provides consumers with nutritious, high quality supplies, of organic products and organic farmers with a market without compromise to the organic integrity of their products.*
- *Organic processed products are only made from organic ingredients.*
- *Organic food is processed by biological, mechanical and physical methods in a way that maintains the vital quality of each ingredient and the finished product.*
- *Organic food is protected from pests and diseases by the use of good manufacturing practices that include proper cleaning, sanitation and hygiene, without the use of chemical treatment or irradiation.*
- *Organic product packaging has minimal adverse impacts on the product or on the environment.*
- *Organic food is safe, of high quality, and free of substances used to clean, disinfect and sanitise food and food processing facilities.*
- *Organic fibre is processed from organic raw materials in an environmentally sound way that considers the entire product life cycle.*

LABELING

- *Organic products are clearly and accurately labelled as organic.*
- *Organic fibre, textiles and apparel are labelled in a way that accurately conveys the organic content of the product.*

SOCIAL JUSTICE

- *Social justice and social rights are an integral part of organic agriculture and processing*

AQUACULTURE

- *Conversion in organic agriculture production reflects the diversity of species and production methods*
- *Organic aquaculture management maintains the biodiversity of natural aquatic ecosystems, the health of the aquatic environment and the quality*

of surrounding aquatic and terrestrial ecosystem.

- *Organic aquatic plants are grown and harvested sustainably without adverse impacts on natural areas.*
- *Organic animals begin life on organic units.*
- *Organic aquatic animals receive their nutritional needs from good quality, organic and other sustainable sources.*
- *Organic management practices promote and maintain the health and well-being of animals through balanced organic nutrition, stress free living conditions appropriate to the species and breed selection for resistance to diseases, parasites and infections.*
- *Organic animals are subjected to minimum stress during transport and slaughter. (IFOAM, 2005)*

Appendix II
Farmer's questionnaire

ID Number:

Date:

Persons present at the interview:

Name of the farmer:

Farm:

1) The dairy farm

1.1 Kind of system: Year of conversion, if organic:

1.2 Number of cows kept:

1.3 Production:

1.4 Replacement rate:

1.5 Breeding method:

1.6 Number of persons occupied:

2) The calf rearing system

2.1 Housing type (description based on observations):

2.2 Grouped calf housing since (age):

2.3 Number of calves per herd:

2.4 Suckling time after birth:

2.5 Feeding method

a) Age 1 (up to.....):

b) Age 2 (up to.....):

3) The farmer

3.1 Motivation for (not) organic farming:

3.2 Origin of organic farming knowledge:

3.3 Education:

3.4 Animal-related background, if any:

4) Calf welfare

4.1 What is welfare?

4.2 What is the most important welfare factor?

4.3 How can welfare be assessed by an inspector?

4.4 Is the actual welfare situation of the calves satisfying for the farmer?

4.5 Why?

4.6 How difficult/easy is it to accomplish high welfare?

4.7 Do you think that animals have emotions?

4.8 If yes, how important are emotional states for welfare?

4.9 What causes frustration to the animals/ what makes them happy?

5) Implementation of naturalness

5.1 The organic regulation for calf rearing has an orientation towards more natural management practices, such as minimum suckling period, provision of natural milk, outdoor access, grouped housing, restricted medicine use etc

Do you think that natural living conditions are important for calves/calf rearing?

5.2 Why is natural living important?

5.3 What are the natural needs of an animal?

5.4 What are the natural living conditions that the farm provides?

5.5 Can a calf have a natural life in a production system?

5.6 Mutilations taking place:

5.7 Are mutilations compromising naturalness?

5.8 Welfare examples (1-10, 1=low and 10=high welfare)

- a) ill animal that doesn't feel ill:
- b) ill animal in the wild:
- c) healthy animal that feels fear:
- d) healthy animal that feels boredom or deprivation:
- e) animal in the wild fighting for dominance:
- f) animal restricted indoors when weather is bad:

5.9 Animal welfare has to be provided

- a) because it is required by the law

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

- b) it is the farmer's moral obligation

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

- c) because animals are sentient creatures

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

- d) because life has a value of its own

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

- e) as a sign of respect to nature

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

Appendix III
Researcher's questionnaire

Date:

Name:

1) The farm

What are the characteristics of a dairy farm that enable natural behaviour?

2) The calf rearing system

2.1 How does separation from the mother affect calf behaviour?

2.2 When is it preferable to separate?

2.3 What is the best weaning age?

3) The farmer

3.1 What are in your opinion important characteristics for an (organic) dairy farmer?

3.2 What are the indicators of a good/ bad human-animal relationship?

4) Organic dairy

4.1 What is your personal opinion about organic livestock farming and animal welfare in organic systems?

(Strengths /Weaknesses)

5) Calf welfare

5.1 What are the aspects of welfare in your opinion?

5.2 What is the most important welfare factor?

5.3 How does human-animal relationship affect welfare?

5.4 How difficult/easy is it to accomplish high welfare?

5.5 Do you think that animals have emotions?

5.6 If yes, how important are emotional states for welfare?

5.7 What causes stress, frustration, and discomfort to the animals?

6) Implementation of naturalness

6.1 Do you think that natural living conditions are important for calf rearing?

6.2 Why is natural living important?

6.3 What are the natural needs of a calf?

6.4 Can a calf have a natural life in a production system?

6.5 Are mutilations compromising welfare?

6.6 Are mutilations compromising naturalness?

6.7 Welfare examples (1-10, 1=low and 10=high welfare)

g) ill animal that doesn't feel ill:

h) ill animal in the wild:

i) healthy animal that feels fear:

j) healthy animal that feels boredom or deprivation:

k) animal in the wild fighting for dominance:.....

l) animal restricted indoors when weather is bad:

6.8 Animal welfare has to be provided

f) because it is required by the law

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

g) it is the farmer's moral obligation

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

h) because animals are sentient creatures

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

i) because life has a value of its own

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

j) as a sign of respect to nature

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

Appendix IV

The farmers' interviews

Description of the calf rearing system

Farm ID	
O1	Mixed suckling calf rearing system: calves spend their first 4-5 days with their mothers and then are grouped together with ideally 3-4 foster cows and with up to 20 calves, until the age of 6-7 weeks-not longer because the older calves in the group eat a lot and push away the younger ones and don't let them suckle enough. This alternative system started because suckling of cows reduced uter diseases (the cows were getting healthy earlier). System has to be kept in balance according to how much milk the cows yield, the number of calves and the time the calves are allowed to suckle when the calves are not hungry, they are content and full and relaxed and they are playing and they are not disturbing the cow all the time, then you have accomplished <i>harmony</i> in the suckling system.
O2	Alternative free suckling system: The calves are free to run around in the whole barn and suckle freely from any cow up to the age of 12 weeks, free outdoor access. Cows tied up with outdoor access 6 months during the year (spring-summer). The system has the disadvantage that the calf suckling activity is initiating milk letdown by the cow (sometimes milk is dripping from the cow's teats) and when the cows are going to be milked the process is delayed because of bad timing-the calf has to be put at the teat to restart the hormone activity of milk letdown
O3	Calves stay with their mother and/or nurse cows for almost their first week of life. Then they are housed in groups of 15-22 calves/herd and are fed by an automatic feeding system up to 12 weeks old. Previously the farm had a different calf rearing system with only spring calving where the calves were suckling for 1-2 months ('were growing fast and very healthy'), also natural breeding was taking place to some extent. Disadvantages of the previous system: a bit too much mastitis, need for a lot of straw, painful separation
O4	Large and old barn, partly renovated, where calves were housed in separate part of building from cows; Calves stay originally with their mother for 3 days, then they are housed in individual boxes up to 1 week of age, where they are fed with milk by a teat bucket. After the age of 10 days they are transferred in another room where they are housed in large (15) groups, where there is automatic feeding installed, until they are 12 weeks old
C5	Calves in different building than the cows: the calves were kept in an old barn and the cows were in large, new facilities with automatic milking. The calves are separated from their mother 5-6 hours after birth. They are then fed with teat bottles and kept up to 1 week of age in an individual stall. At 1 week they are housed in groups of 2 until they are 2-3 weeks old and then later in groups of 6 until they are weaned, at 12 weeks of age. Grouped-housed calves are fed by a teat bucket
C6	Calves are separated from their mothers immediately after birth and fed maternal milk out of a teat bottle for 1 week. They are housed individually until they are 3 weeks old and then they get housed in groups of 2-3. They are fed by teat bottles until they are 2 months.

O7	Calves stay with their mother in the calving pen for the first 3 days of their life. Then they are moved in individual boxes and after some weeks they are housed in groups of 2-3, and fed by a teat bucket until they are 2 months old. Calves older than 2 months are tied up
C8	Calves are separated from their mother immediately after birth and are put in individual boxes where they are fed maternal milk by a teat bottle for 1 week. After 1 week of age they are put in groups of 9-10 and fed by teat bottles until they are 2 months old. Some in closed stalls and some tied up-barn in the process of rebuilding
C9	Calves are separated from their mother immediately after birth and are put in individual boxes for 2 weeks. Then at the age of 2 weeks they are put in groups of 6 calves per herd, in a new built barn (inclined floors in a loose housing system). The calves are e fed milk by a teat bottle until they are weaned at the age of 2 months
C10	Calves spend their first few days up to 1 week with their mothers, suckling. Then they are put in groups of 7-8 and are fed by teat bottles. The teat bottles are removed after the calves are 3 weeks old and replaced by a milk bar. Calves in a loose housing system where they can move freely to resting place, feeding place or move outdoors, doors permanently open, cows tethered
C11	Calves are separated from their mother after approximately half an hour after birth and are put in individual boxes, where they are fed by teat bottles up to 3 weeks of age. Then they are put in stalls in groups of 6 are fed from milk bar with one teat until they are 3 weeks old. Then the teat is removed and they are fed from a milk bar until weaned, 2.5 months old. Cows were tied up, but a new big barn was being built for loose system with automatic milking
O12	Calving is concentrated from spring till October. Calves stay with their mother for the first 3-5 days of their life to suckle, in the calving pen. Then they spend a couple of days alone to learn how to eat from the teat bucket and then they are put in groups of 2-6 in stalls. The teat bucket is used until they are 2 months old and then only a bucket, until the weaning at 3 months of age. Calves older than 6 months and cows are tied up

What is animal welfare?

Farmer ID	
O1	Comfort, happiness, harmony, when animals are peaceful, calm and playing, not hungry. Also not to force them to stand on hard concrete floor.
O2	Never thought about it before, I don't know, it is something that is obvious if they like life, if they play.
O3	Appropriate environment (floor, food, milking), low disease susceptibility, feeling good
O4	Possibility to behave naturally
C5	Dry, clean and soft place in the barn with good ventilation-good air quality, not humidity. Also quality and frequency of feed.

C6	Clean, dry and enough bedding material, enough space for each animal, outdoor access in the summer
O7	Primary needs (food, housing, natural behaviour, individual care, contact)
C8	Calm animals (who are also more productive), satisfied animals, health with low disease susceptibility
C9	Dry and clean resting place, satisfied animals
C10	enough good food, water, fresh air in the winter, steady routines, calm situations in the barn, hoof trimming, long outdoor access
C11	Eat well, be dry, have free access to fodder, important to pet them and be with them, to have straw and soft bedding like rubber mats, animals free to move in and out of the barn
O12	When the animals are free to walk around in and out of the stable, when they are clean and can lie down on straw and not concrete, free to express their hierarchy and can isolate themselves.

What is the most important aspect of welfare?

Farmer ID	
O1	Hygiene
O2	Outdoor access, grazing
O3	Feed
O4	Natural behaviour
C5	Good resting place (dry, soft and clean)
C6	Enough space and food
O7	Health and happiness
C8	Enough space and food
C9	Health
C10	Primary needs (food and water)
C11	All equal
O12	A good human-animal relationship

What are the elements for welfare assessment?

Farmer ID	
O1	Rubber instead of concrete floor for lying, but the standards are poor. Research must help to aim at higher standards.
O2	I don't know, I don't think it is possible to measure it, it is a very difficult question
O3	Feed quality and disease levels
O4	Number of sick animals, hoof problems, injuries, available space
C5	By the good behaviour of the animals- not afraid of humans, relaxed and clean
C6	Housing conditions, feed quality, ability to move naturally-not tied up
O7	Measure the available space, health situation
C8	It is difficult to see before it is really bad, if they have food and are clean
C9	By looking at the individual animals, at the building and the equipment.
C10	appropriate building and facilities like rubber mats and eating place and if the animals get food, also from tests of the milk contents
C11	If the barn is not dirty, the fodder is fresh, if the air quality is good, if the animals are afraid and gathered at a corner
O12	If they are clean or dirty, frightened or calm, if it's quiet in the stable, if the air quality is good, how the resting place looks like

Which factors influence welfare?

Farmer ID	
O1	High growth rate, enough food, appropriate group size and balance between milk letdown the foster cow and milk intake by the suckling calves, no hard (concrete) floor, longevity, lack of disease/fast recovery from disease
O2	High growth (weight gain), few health problems, freedom to be outdoors and graze, surveillance by the caretaker
O3	Hygiene, dry and clean bedding, good food, skilled caretaker that is engaged to the animals, farmers that live for the cows, and not from the cows. It is important to have an eye for the animals, to be able to understand how it feels, when it is well and when not. Also automatic milking helps them live their lives, be milked whenever they want, keep the distances they want from each other
O4	No concrete floor, appropriate cubicle size, small herd (family farm) with 40-50 cows is the best, high growth rate
C5	Feed, air quality in the barn, bedding
C6	Outdoor access in the summer, enough bedding material, enough space

O7	Regular contact with caretaker, steady feeding routines, expression of social behaviour, being outdoors and graze, not tied up
C8	Space to move freely, eat concentrate at will, not dirty, enough fodder, new housing system
C9	Human care, enough time available of the caretaker, suitable housing
C10	Quality of fodder, variation in feed (different kinds), freedom to go outdoors at will
C11	Freedom to move indoors and outdoors, enough feed, bedding (warm, clean, dry and soft), good caretaker that pets the animals
O12	Food of good quality, good handling behaviour, with enough space to move

a) Are you satisfied by the actual welfare situation of your calves? b) Why?

Farmer ID	a	b
O1	It is always the aim	It is something you are always trying to do. You also get economic benefit out of healthy animals
O2	Yes	The calves are jumping around and they look satisfied
O3	Could be better	You try all the time to increase welfare, but it depends on the money you are prepared to invest. In the previous system calf welfare was a bit better, they were out.
O4	No	Would like to offer the animals more space
C5	No	Old housing with bad ventilation
C6	It can always be better	More loose system is better
O7	No	Old housing, where the calves are tied up
C8	No	Old housing which is dirty
C9	Nearly	New building where there is right calf size in right pen, and automatic feeding will be installed soon. But the bull calves remain in the old barn where the floor is flat and dirty.
C10	Generally yes, but not completely	There is no good floor at the eating area-it is cement, but they had no other option when the barn was built
C11	Yes	They have deep litter with straw, they have access to fodder, they have enough time with bottle teats and they are pleased and then they don't suck on each other and they make better utilisation of the milk because it takes a long time the eating procedure and this has positive impacts on their health-you can see it on their skin and the

		manure and also from the fact that they get fat
O12	No, it could be much better	Old building where the animals are tied and it's not easy to clean them-if the system is loose they can clean themselves

What are the restrictions to welfare?

Farmer ID	
O1	We have to give animals options to choose for themselves and they will tell us what they like, what they prefer. A skilled caretaker is important, he must have an eye/ feeling for them, All animal handling should be done on the conditions set by the animal
O2	Probably they have to live their own life
O3	Depends on money for facilities
O4	Economy is the major concern of the farmer is milk production, the facilities have to help him and enable his plan, good AW needs money , if you let them do/eat what they want, then you have bad economy, but also reduces problems and gives better results. Contradiction between AW – (economic) growing plan
C5	Easy , with provision of what they need (feed, bedding)
C6	Not very difficult, by rebuilding the barn
O7	Small number of animals makes it easier
C8	You need time to wash them and feed them
C9	It is not difficult if you have time .
C10	It is a lot of work and a lot of money . It is about space and money because you always give them too little space inside.
C11	It is easy; you just have to think what you like for yourself.
O12	It depends on the building type and the caretaker -if you have problems yourself you can't be a good caretaker. It can always be much better, but you need the income .

Affective states

Farmer ID	<i>Do animals have emotions?</i>	<i>If yes, how important are emotions for animal welfare?</i>
O1	Yes, absolutely	Extremely
O2	Not sure, maybe no	N/A

O3	Yes	Important
O4	Yes	Very important
C5	Of course	Very important
C6	Yes, but also instinct	Important
O7	Yes	Important, but primary needs come first
C8	Yes	Somehow important
C9	Yes	Very important
C10	Yes, absolutely	Very important. They also have high instinct.
C11	Yes	Important
O12	Yes	Very important
<i>Examples of affective states (frustration, discomfort, happiness)</i>		
O1	The pain of separation causes restlessness and vocalisations. You have to adapt to the animals and their needs, they want routines (for example in feeding) otherwise it is stressful for them.	
O2	Crosses of negative energy lines where the animals don't like to stand and that they know how to avoid when they are outdoors- they don't like that they are tied up. They also know where the positive crosses are.	
O3	Separation of mother and calf	
O4	Mother-calf separation	
C5	They get stressed when new ones come in the herd, they are happy to be outdoors in the spring, to develop their social behaviour as they like and form small groups	
C6	they get frustrated if they don't get enough food and when they are in unfamiliar situations	
O7	They don't like to fight for food, or change from regularity. They like social contact with other animals and with the farmer because they are herd animals.	
C8	They don't like new (unfamiliar situations). They have hierarchy which is important for them.	
C9	A satisfied cow (not afraid or scared) has high welfare and therefore also high production. Enough food, contact with the farmer, being milked, being outdoors makes her happy.	
C10	They like if you talk to them- the farmer enjoys it himself- and caress them, they like to be brushed and scratched and washed.	

	Changed or bad routine and bad weather in the summer makes them frustrated, separation of mother-calf is tolerated by the calf but not by the mother especially after some days
C11	It affects welfare negatively if you are harsh on them and run and shout and make noise in the barn. Also they get frustrated by little food.
O12	When they have changes in their environment or rhythm (like when new cows are introduced every year) they get stressed because they like routines very much. They are happy if they have outdoor access, they can run, or choose between different types of grass.

Are natural living conditions important for calf welfare? Why?

Farmer ID	
O1	Yes, natural behaviour is important because it defines how animals can be managed easier and smarter, without use of violence
O2	They must be because since he converted he is giving them less concentrates and more roughage and they have better health and less stomach disorders
O3	Yes, it is important for the consumers
O4	Yes, it is better for the animals; it is how it should be. Sometimes though cows may stop eating if they have to suckle their calves and then they get thin
C5	Yes because natural is good
C6	Yes because natural is good. It has to do with their comfort and welfare, they have to move naturally
O7	Yes it is their need to live naturally
C8	Not so important because the calves can still live with the bottle too, but under natural conditions they seem quite good and satisfied
C9	Yes it's a good start of life, natural is good
C10	Yes it is the best for the animals and then also for the farmer
C11	Yes because it is not nice to separate a mother from a calf, it is obvious that they enjoy it more and then you also have better production
O12	Yes because it is like this, it is not a thing to discuss, cannot find an argument, it is the way it should be, it is better for the animals not to be restricted in an unnatural environment

What is natural living for a calf?

Farmer ID	
O1	To be outdoors, not on hard concrete floor but on soft surfaces that allow lying, to

	be full (not hungry) and playful
O2	To be out and graze, to live their own life
O3	To have fresh food and resting place
O4	To have outdoor access in the summer, not to be tied, to be free, to be socialising
C5	To have straw, to be outdoors, to be together mother and calf
C6	Calf with its mother, drinking milk
O7	Food, protection and social contact (with both people and other animals)
C8	Calf with its mother, but difficult
C9	Calf that suckles its mother, to have food, to have social contact, to develop relationships
C10	Mother and calf should be together (the natural needs are different for an animal in the wild and an animal in a production system)
C11	It is the cow and the calf together, calves playing around until they are naturally weaned
O12	When they are gathered all together-the whole 'family' with cows and bull and many calves of different ages, in a different region where they can be out also in the winter and have grass types to choose from the whole year long

What are the natural living conditions that the farm provides?

Farmer ID	
O1	No hard floor, suckling time. It is difficult to provide natural conditions, they cannot express all behaviours indoors, and they need enough space.
O2	Feed, calves with the cows (free suckling)
O3	You cannot have conditions like in the wild, cause then you would get no milk. You have to make it artificial in order to get milk.
O4	Cow with the calf the first 3 days
C5	Maybe outdoors in the summer. No natural living conditions, you have limits within the 4 walls, straw would be better for them.
C6	It does not provide enough natural living conditions
O7	The boxes are close to each other so that they can see each other and have contact
C8	They are outdoors in the summer

C9	Grouped housing and individual boxes that enable contact in front (visual)
C10	The cows are calving outside which is the best, except from their first calving, then they are left alone and peaceful, they have concentrated calving period in September, long time out and 2 months they spend them on different field-'they go on holidays'
C11	They can be in groups, they have fresh air and light
O12	They have outdoors access as much as possible, especially in the summer but also in the winter. They get veterinary care since they are kept captive, they get cleaned by the farmer since they are tied and cannot clean themselves, and they get enough food.

Appendix V

The researchers' interviews

What are the characteristics of a dairy farm that enable natural behaviour?

Researcher ID	
R1	A farm that provides for freedom of movement, to play, to be kept in groups, satisfaction of the calves' suckling behaviour as often as they would like, even with automatic feeding, social relationships, grooming
R2	Loose housing system, deep litter with straw is preferable, enough space for calves to run around, free access to food and water at all times, grouped in similar ages
R3	If the animals have access outdoors, space allowance, if they have social contacts, if there is cow-calf contact, dry and clean bedding, that the animals have free access to fodder and can lay down whenever they want

How does separation from the mother affect calf behaviour?

Researcher ID	
1	If there is a nurse cow that takes the place of the mother, then maybe there is no effect on the calf, they don't react really. If mother and calf had the time to bond it affects mainly the cow, but the calf needs something big and warm that gives milk and keeps it clean
2	A calf can manage without its mother, with a foster cow. As long as they can suckle, especially freely, they seem fine
3	Mainly affects the cow. An area that I would like to explore further.

When is it preferable to separate?

Researcher ID	
1	A few hours after birth is the best, not immediately, so that the calf can have stimulation from the cow. If you start to have a relationship, the longer you wait the harder it gets.
2	1 day (balancing the pain of separation, what is the best for the calves and what is practical to do)
3	24 hours, but it also depends on the housing system (if they are close but not in the same pen after the separation could be longer). But after 4 days the vocalisations from the mother increase a lot.

What is the best weaning age?

Researcher ID	
1	3-4 months
2	It is a balance one has to find, you have to weigh the things against each other (9 months would be the best for the calf)
3	Important to start with both milk and fodder for the development of the rumen (otherwise it is a compromised welfare too) and it should come gradually. About 2-3 months; not a strong opinion.

What are in your opinion important characteristics for a dairy farmer as far as welfare is concerned?

Researcher ID	
1	To take the time to look at each individual and have an overview on each calf because it is not easy in grouped housing
2	The farmer needs to have an eye for the animals, to look at them and understand if they are fine or not, if they look happy although they seem healthy
3	To take time to see and to be with the animals, to check their welfare, to start with calves –if they are clean, healthy, enough fodder, water, all essentials, the farmer should know what is important for animals

What are the indicators of a good human-animal relationship?

Researcher ID	
1	If you can approach animals is indicating a good relationship, but it could also be that they just approach you in order to suckle your finger because of lack of satisfaction of their suckling behaviour
2	If they animals get stressed in the presence of the human or if they are relaxed
3	Calm animals when the stockperson is entering the pen, if he is approaching the animals in a positive way, not rough, calm handling. If the animals that are outdoors follow the farmer back inside and not the opposite, it also means that they are not afraid, not frustrated during milking

What is your personal opinion about organic livestock farming and animal welfare in organic systems?

Researcher ID	
1	Organic agriculture is a very good way of proceeding in the production of food, it is good and we need more of it.

	<p>Strengths: the possibilities that organic farming offers to act natural is good for their welfare, the regulation tries to improve welfare.</p> <p>Weaknesses: It is a shame that calves don't have to go outdoors by regulation before 6 months of age, they should provide more space-not too big groups of animals because they don't occur naturally, should work on improving</p>
2	<p>It was idealistic at the beginning, now a lot of farmers do it for the money (for example because the milk prices are going up). But converting, farmers can also change their mind because they start thinking about the positive aspects (for example, less use of chemicals that are also very dangerous for the farmers' health)</p> <p>Strengths: good for the animals, calves can go out and play and it entails a philosophy that focuses on welfare</p> <p>Weaknesses: the farmers can be in conflict with regulations in the issue of cow-calf separation; research may have missed something that is important for welfare</p>
3	<p>Animal welfare should be good in organic and conventional systems, not just better in organic, because this could mean that it is not really good welfare</p> <p>Strengths: It is regulated so welfare should be really good, take care of the naturalness of the animals and the health and their biological functions, but it depends mainly on the farmer and the farm conditions.</p> <p>Weaknesses: Some regulations could be compromising welfare, like in the case of parasites, so it is a challenge. Some additions might be better, like a health plan that makes the farmer more conscious and brings welfare up as an important issue of the farm.</p>

What are the aspects of welfare in your opinion?

Researcher ID	
1	Enough food and water, healthy animals, natural behaviour as much as possible-the behaviours that are important for the species, but escaping a predator is not something they need. 'Psychological welfare'-that they can do what they want. A long eating time is important for physiology and behaviour, not to get bored otherwise they have a lot of time with nothing to do. [The welfare concept started when we put animals in confinement]
2	Coping with environmental situation, including health and also how animals feel, but it is not measurable
3	Naturalness (natural behaviour and natural needs) and health and biological functioning

What is the most important welfare factor?

Researcher ID	
1	How the animals interpret their own feelings
2	Being able to cope in the environment they live
3	All 3

How does human-animal relationship affect welfare?

Researcher ID	
1	It should come from the farmer, take initiative
2	The human has to like animals, to treat them nice so that they don't get stressed or gather on the corner (and you have stressed animals to handle which is more difficult). The person who works with animals has to care about them, otherwise they should not work with animals
3	It is important as long as you keep them and handle them, because you can see their needs better- important for management

How difficult/easy is it to accomplish high welfare?

Researcher ID	
1	It is quite easy; we have a lot of knowledge and technology, you just have to invest
2	You have to satisfy their essential behavioural needs
3	Depends on our knowledge of their natural needs and behaviour, and on the money we have available. If we have these, then it should not be so difficult (not easy and not uneasy). It is also important to have technical knowledge (for pens).

Are natural living conditions important for calf welfare? Why?

Researcher ID	
1	Yes. Outdoor living is important, they get more input that we don't know how important are for them, they can choose where they want to lie down and it is important for them
2	It is not important for animals in captivity that they must express all their natural behaviours. There are behavioural needs that are essential and if these essential needs are satisfied in captivity then it is not necessary that they express all their behavioural needs
3	Yes, because natural living is a part of animal welfare

What are the natural needs of a calf?

Researcher ID	
1	Being outdoors and having enough space, being able to be with other animals and interact and develop social contact, being subjected to different weather conditions
2	(essential ones)The ones that if they are not allowed to be expressed then there are negative effects on the animals like bad health, injury, abnormal behaviour, inactivity, apathy
3	To have food and water, to suckle, contact with other calves, to be out in the summer, to have fresh air, enough space to play, dry bedding, and protected space

Statutory declaration

I assure that this master-thesis is a result of my personal work and that no others than the indicated aids have been used for its completion. Moreover, I assure that all quotations and statements that have been used literally or in general manner from published or unpublished writings are marked as such ones. Beyond this, I assure that this master-thesis has not been used neither completely nor in parts for the passing of any previous examination.

Stuttgart-Hohenheim,

28/03/2008,

A handwritten signature in black ink, appearing to be 'D. L. G.', with a long horizontal line extending to the right.