Livestock Farming with Care: towards sustainable production of animal-source food

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ABSTRACT

This paper introduces a concept for sustainable production of animal-source food. This concept of “Livestock Farming with Care” is founded on care ethics with an integrated approach based on four principles: One Health (i.e. healthy and safe for animals and humans); Customized Care (i.e. from the individual animal’s perspective and integrity); No Nuisance (i.e. from an environmental and societal perspective) and Credible Performance (i.e. from an economic and public prospect). It is acknowledged that the diversity in farming systems ranging from traditional smallholder practices to high output production systems requires integrated and customized solutions based on this general concept. Emerging technologies as included in “Precision Livestock Farming” can be beneficial to the implementation.

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1. Introduction

Global demand for animal products is expected to double by 2050, based on estimates for growth of the world population, increasing incomes and further urbanization [1,2]. The majority of the increased demand will occur in Asia, Africa and Latin America, especially in the so-called middle-class of society. At present this middle-class comprises two billion of the world’s population of seven billion people, and is expected to increase to around five billion of a population of nine billion in 2050 [3,4].

In 2006, the FAO published the report “Livestock’s Long Shadow” [5]. This report clearly demonstrated that current animal production practices place severe pressure on the environment, through emissions to air, water and soil and via utilization of natural resources, including land, water and fossil energy. At present the livestock sector, is responsible for about 15% of global greenhouse gas (GHG) emissions [6], whereas it uses about 70% of the available agricultural land and represents about 8% of global water withdrawals. A major challenge to the livestock production sector is thus to foster a sustainable food security, in order to feed the world within the carrying capacity of planet earth.

In recent years, worldwide livestock production systems have intensified in terms of productivity per animal or unit of land or labour [1]. Various non-governmental organizations acknowledge a series of social concerns related to intensification of various livestock farming practices. These concerns affect the social licence to produce, based on normative values such as food and nutrition security, food safety, sustainability, animal welfare, animal health and human health [7]. To address these issues it has been argued that a well-organized, highly efficient livestock farming practice provides the best opportunities for sustainability [8–10]. However, a strict technological approach has not been widely accepted. Moreover, legislation or suggested improvements can result in trade-offs with other issues (e.g. animal welfare versus environmental performance in resource use efficiency) [11].

The Netherlands is renowned for its intensive livestock production, based on tradition, stockmanship, innovative entrepreneurship and knowledge. Expensive land and high labour costs resulted in the implementation of efficient farming practices including smart breeding programmes, customized nutrition, specific animal care, modern housing and environmental technologies. This livestock farming practice became an integrated part of the food production sector by resourcing residuals from the food industry [12]. Recent societal debates in the Netherlands concerning the drawbacks of intensive livestock production [13] resulted in new guidelines and arrangements for future development of livestock production in the Dutch context [14], referred to as the concept ‘Livestock Farming with Care’.

This introductory paper describes the conceptual framework behind ‘Livestock Farming with Care’, as a guideline to sustainable production of animal-source food, based on care ethics. Moreover, it provides an insight into the four basic principles (i.e. One Health; Customized Care; No Nuisance and Credible Performance) and demonstrates the necessity for integrated and customized application of these standards in a diversity of farming systems and the potential role of emerging technologies, such as precision farming.

2. THE CONCEPT OF LIVESTOCK FARMING WITH CARE

Responsible animal farming demands endless attention to good care, in the notion that care is related to accompanied concerns [15]. Our conceptual framework has thus been based on care ethics, that is widely implemented in the human health domain [16], and implies the following aspects of care: a. caring about: societal awareness for keeping animals in the livestock production sector with consideration to social concerns; b. taking care of: responsibilities for keeping animals in the livestock production sector with a social license to produce; c. care giving: provision of professional care to animals in the livestock production sector.
This implies that, although there are protocols and standards, the quintessence is an attitude of professional quality in daily practice. Indicating that values such as responsibility, trust, commitment and operating carefully are held in high esteem [17]. These moral values have to become basic assets in a chain of custody from producers to consumers and provide added value to the economics of the food production chain. Within this perspective, care and economy are not intrinsically opposite.

The application of care ethics, thus accommodate to address societal concerns in livestock production practices. This requires a sound and professional attitude of all within the entire livestock related food production chain, as well as others including citizens, consumers, civil society, government and non-governmental organizations.

Care ethics is not just a guide to the devoted (careful) treatment of animals in livestock production systems, necessitating a conscious (careful) compliance with professional standards and values, but also aims to provide a safeguard for the (careful) accountancy of general concerns of the various stakeholders. The derivative guideline for an integrated “Livestock Farming with Care” is here represented by an integrated approach involving four areas of concern:

A: **One Health** (health and safety of animals and humans);

   Safeguarding human and animal health, related to livestock production. This comprises more than food safety; it includes eradication of infectious animal and zoonotic diseases emerging from livestock farming and transports; and mitigation of the consequences of the use of antibiotics, such as the development of microbe resistance to antibiotics.

B: **Customized Care** (from the perspective of the integrity of the animal);

   Ensuring robustness, dignity and integrity of the production animal. This comprises more than compliance to human standards for animal welfare aspects, it includes respecting the specific biological traits and requirements of individual animals in the group, resulting in observed good animal welfare on farm.

C: **No Nuisance** (with regard for environmental and societal perspectives);

   Avoiding exposure of the environment to critical emissions of waste materials: i.e. dust, noise, malodour or pathogens originating from the livestock production systems; including the sustainable management of natural resources, biodiversity and prevention of land degradation.

D: **Credible Performance** (from a socio-economic perspective);

   Guaranteeing a responsible and trustworthy livestock production sector with sound perspectives for farmers in local, national, regional or global food production chains.

### 3. AN INTEGRATED AND CUSTOMIZED APPROACH

In many cases, the four above mentioned concerns are treated separately by policy, legislation, regulation and political lobbies at global, national, regional and local level. While there is an urgent need to adopt integrated approaches to the issues involved.

The concept of “Livestock Farming with Care” should not be applied as a global confectionary standard for livestock production, but has to be customized to the diversity of farming and production systems related to the various socio-cultural traditions and environmental constraints.

The main function of livestock farming in the Western world is production of animal-source food. The majority of these animals are kept in large-scale, intensive systems (i.e. high animal productivity per unit of land, labour or capital). In developing countries, however, mixed crop-livestock systems produce the majority of the cereal and livestock domestic products. The majority of these mixed-crop livestock systems are small-scale, also referred to as smallholder systems [18,19]. Livestock in these smallholder systems often fulfill additional functions to food production: e.g. fertilizer, traction and cost reduction.

There is no single solution (e.g., intensification) for achieving a sustainable supply of animal-source food. Basic solutions for an issue involving a trade-off with regard to any of the four areas mentioned previously, requires a more comprehensive and synergistic approach. For example, strategies aimed at improving layer hen or broiler welfare in conventional intensive systems, can increase land use requirements and emissions of greenhouse gasses (GHGs) within the production chain [11,20,21]. Therefore, improvement of welfare together with environmental performance often requires an innovative adjustment at the system level.

Although increasing the productivity per animal can be useful in certain areas, i.e. pasture-based beef production systems in Central America [22], this is less desirable from an animal welfare perspective in intensive broiler production system in the Netherlands [23,24]. A smallholder in Sub-Saharan Africa might benefit more from increasing the survival rate of his stock, than from improving the productivity of his animals, as the number of animals is economically more important than their productivity. These considerations will result in different breeding and feeding strategies, tailored towards local conditions and incorporating both tangible and intangible benefits for animals [25].

Feeding the world with regard for our sustainable responsibility, therefore, should be directed to integrated and customized solutions built on the various strengths of the diversity in production systems worldwide.

### 4. TECHNOLOGICAL PERSPECTIVES

Major innovations are anticipated within the domains of nanotechnology, genomics and information technology. These modern technologies have also become available for livestock farming, implementing the driving forces in ICT (computing power, wireless sensing, location awareness, internet access).

Inspired by precision agriculture [26], a farming practice of Precision Livestock Farming (PLF) is under development [27–29]. PLF makes it possible to implement real time livestock management, conform the guidelines of “Livestock Farming with Care”, by allowing for the individual variation of animals within a herd, the spatial and temporal variation in conditions, and an integrative environmental, health and safety performance on farm. ICT based precision livestock farming allows farmers to address the needs of individual animals whenever or where ever it is needed. The animals are perfectly capable of asking for this attention, all the humans have to do is to learn to understand their signals.

The social innovation is that the farmer will have the tools to be transparent in providing the appropriate care for the individual animal assuming that the farmer becomes familiar with the signs of individual animals. This transparency then becomes part of the whole production chain [30] and is not limited to a specific farming type or region. The actual “Credible Performance” with respect to "One Health, Customized Care and No Nuisance" can be recorded and traced in food chain quality assurance systems.

The international development of PLF technology will provide the tools for the necessary real time data acquisition and handling. The information technology tools can be differentiated between sensing (“extra eyes, ears and noses” by telemetry, sensor technologies and deductive tracers), data handling and storage techniques (web-based, wireless, broadband, Internet of the Future), dynamic decision support modelling (“extra brains” by smart computers and models) and manual or robotic implementation of routine decisions. The information gathered in precision
livestock farming serves tracking and tracing opportunities in a transparent quality control of the whole chain of custody from farming up to retail. Prerequisite is to consider the social and political acceptance of the PLF methodology.

5. EPILOGUE

Are these normative principles and managerial approaches providing a panacea for current problems with respect to livestock farming with care? With respect to the basic approach indeed, but implementation of concrete measures remains the main challenge [31, 32]. In the meantime, the major problem at present is that the rational analyses and solutions to husbandry problems remain incompatible with the emotional discussion in society.

Normative principles and managerial approaches have to be practically combined and specified. It has to be clarified how care ethics is ‘imprinted’ within different management practices related to PLF. These tailor made practices do not only have to be developed further in relation to the different types of animal husbandry practiced in western and developing economies, but also in relation to mainstream rural types of husbandry practised in greater parts of East- and West Africa and Asia.

As an incentive for further discussion this special issue offers contributions at different epistemological levels of research: ethical and normative principles, general system approaches, and the consequences for zoonosis, economics and retail and consumer issues. Contributions are included from various fields of research each with their scientific cultures, principles and methodologies. As such this special issue does not only offer papers on technological aspects, but also a reflection of the societal aspects in opinion forming papers. Herein lies the other major challenge to a caring animal husbandry: how to interrelate these different scientific approaches in a really interdisciplinary and trans disciplinary way of thinking and acting.

References


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