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Issues of sustainability in animal production and the implications for science: An international perspective

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ABSTRACT

Issues of sustainability in animal production in developed countries involve a trend away from intensive production systems and destruction of the environment, towards improved animal welfare and increased product quality, with an emphasis on reduced use of chemicals in production systems. The negative environmental impact and the loss of biodiversity, due to livestock production systems, are major issues in both developed and developing countries. In developing countries, desertification and deforestation, the sustainable management of wildlife systems and the need to reduce competition between humans and animals for scarce resources, are all major issues of sustainability. While the developed world is looking towards "de-intensifying" its animal agriculture, the developing regions of the world have a perceived need to intensify animal production systems in order to support increasing populations, urban growth and an increased demand for animal products.

The implications for scientific research include: aiming to optimise rather than maximise production; greater emphasis on the ecological aspects of sustainable systems, maintenance of biodiversity and natural resources; and minimising external inputs and satisfying the food, income and social needs of rural communities. Scientific communities must increasingly seek international collaboration in a global approach to the challenge of sustainable animal production.

Keywords: sustainability; science; animal production; international.

INTRODUCTION

The ongoing worldwide damage to the environment, the imbalance of ecological systems and indeed human social systems, the escalating numbers of humans creating an unremitting demand for increased food production and the rapid rate of use and abuse of non-renewable and renewable resources, mean that conventional agricultural systems can no longer be supported or promoted. As Qureshi (1993) put it "the world conscience has been aroused to level where long-term resource conservation must be the primary concern wherever an ecosystem is being tapped to satisfy human needs". We need agricultural systems that are sustainable and take from the land only what can be put back. The move towards sustainability is not a whim, it is a necessity. Francis (1989) poses the question: "Can we afford a sustainable agriculture?" and answers "...we cannot afford any other type. There's no rational alternative to developing a sustainable agriculture."

Definition of Sustainability

To define sustainability is a major challenge. Sustainability is a vision, which differs in colour, texture, shape, time and space, depending upon the context in which it is beheld. Definitions of sustainability litter the literature and "sustainability" has become a catch phrase, a precise definition for which will probably continue to be elusive (Keeney, 1989). The concept of sustainability was initially introduced as a basis for recognising use thresholds and is central to policy documents as early as 1980 (Blaschke *et al.*, 1991) and formed the basis of political philosophies as early as 1972 (Values Party Manifesto, 1975).

A recent definition provided by FAO (1992) views sustainability as "management and conservation of the natural resource base.....conserving land, water, plant and animal genetic resources, non-degrading and technically appropriate, economically viable, socially acceptable." The FAO definition, although fairly thorough, does not mention maintenance of the natural ecosystem. Blaschke *et al.* (1991) discussed the myriad factors involved in reaching a suitable definition of sustainability and arrived at the following definition "A sustainable agroecosystem has the goal of increasing social value, while maintaining ecological processes essential for perpetuating itself and connected ecosystems, and providing products whose net value (incorporating externalities) exceeds the net cost of inputs." It is pertinent to add "cultural acceptability of a sustainable system" to these definitions. In biological terms, animal production is the exploitation of plants and animals for the benefit of people. The sustainability of animal production is dependent on the scale, intensity and type of exploitation. The concept of sustainability for animal production means that as well as being food producers, farmers are stewards of the environment (Zijpp, 1993).

This paper provides a brief overview of issues concerned with improving the sustainability of animal agriculture in developed and developing countries and discusses the implications of the sustainability movement for scientific research. Given the general scope of this paper, the author has limited any personal comment and discussion of particular issues, in favour of presenting a range of issues which are related to sustainability and whose importance will vary depending on the reader's definition of sustainability.

ISSUES OF SUSTAINABILITY IN ANIMAL PRODUCTION

A Global Approach to Sustainability

Fitzhugh (1993) emphasised the need to think globally in relation to sustainable animal production, saying that we can no longer think of increasing yields and production without consideration for the environmental, economic and social issues from the impact of animal production, at national, regional and international levels.

Developed Countries

In developed countries, animal production is going through an adaptation process and the traditional power base of farmers is being superseded by multinational companies; traditional production systems are being questioned and limited by new legislation and consumers are becoming increasingly powerful forces in dictating acceptable production systems and products (Zijpp, 1993). There is a movement away from intensive animal production systems and towards more ethically, socially and environmentally acceptable animal production systems. Major issues which surround the move towards sustainability in developed countries are:

- * the need to move away from intensive animal production systems
- * the ecological impact of animal agriculture
- * improving animal welfare
- * reducing chemical inputs
- * improving product quality

Developing Countries

In developing countries, there is a drive to maximise food production and profit, from available resources because of the growing populations, particularly in urban areas (Qureshi, 1993). The population of developing regions of the world is expected to increase from 4 billion in 1993 to 7 billion by 2025 (UN, 1988). The debt servicing needs of many developing countries have forced them to reduce feed imports and seek sustainable alternative feeding systems (Sansoucy, 1993). In most of these countries, natural resources are burdened and exploited with no regard for the future. The main issues of concern in developing regions are:

- * feeding the increasing human population
- * reducing the impact of livestock on desertification and deforestation
- * maintaining traditional practices
- * reducing the competition between humans and animals for scarce resources
- * managing wildlife systems and maintaining ecosystems

An Issue in Common

One issue which both developed and developing countries have in common is the impact of livestock production systems on the ecological environment. This impact is different depending upon whether the production system is intensive or extensive. Intensive production systems in developed countries, through unbalanced mineral input-output ratios,

have increased the pollution of soil and water, and the health and welfare standards of intensive systems are under heavy scrutiny by the general public (Zijpp, 1993). Thus intensive animal production in developed countries is likely to be phased out and lower cost, less intensive multiple purpose livestock production systems are predicted (Fitzhugh 1993). In developing regions of the world, the contribution of extensive animal management systems to desertification and deforestation have stimulated worldwide concern (Li Pun and Sere, 1993). According to Qureshi (1993), livestock have been unfairly blamed for erosion and desertification, in many cases, and the main issue for areas where desertification is a problem is how to relate the concept of carrying capacity in a dynamic ecosystem with a variable rainfall. The issue of deforestation is well covered by Hecht (1993) and, using Amazonia as an example, she emphasises that there are many reasons for livestock-stimulated deforestation and that, despite the great ecological cost, the development of Amazonia is seen "as an important means of resolving internal social tensions and assuring continued accumulation (of capital) for entrepreneurs who are not able to participate in urban investments" - livestock being a "relatively secure investment". Hecht suggests viable alternatives to the wholesale destruction of tropical rainforest but expresses concern that the advantage of current livestock systems may "systematically work against even well designed, more ecologically sound agroforestry systems".

IMPLICATIONS FOR SCIENCE

The creative participation of scientists is pivotal to developing animal production systems which can be sustained into the future. The challenge for science is to combine knowledge from the basic biological sciences with applied research results, and confront the growing dilemma of how to optimise animal production with a diminishing natural resource base, how to feed an exploding human population and how to protect and balance the ecological environment (Francis, 1989). Animal scientists need to develop an international perspective and set research strategies on the assumption that animal agriculture is a positive factor in long-term sustainable agriculture (Fitzhugh, 1993).

Research relating to sustainable animal production in developing countries needs to focus on (Qureshi, 1993): improving the efficiency of utilisation of local feed resources; encouraging diversity of farming systems; maintaining biological diversity; provision of adequate economic returns to the livestock producer; increasing the resilience of the producer and the production system to adverse environmental and socioeconomic factors; and minimising the destruction of the environment through livestock farming. It is also essential to improve communication networks in developing countries and ensure that all levels of the community and not just the scientists, policy makers and financiers, participate in decision-making (Qureshi, 1993). The incorporation of traditional and indigenous knowledge is paramount to the development of sustainable livestock production systems. In most cases, such knowledge has been gained from living in harmony with a particular environment or ecosystem and can provide some simple secrets on how to develop more sustainable farming systems.

An example of research programmes which facilitate the movement towards sustainability in a developing country are provided from The International Livestock Centre for Africa (Fitzhugh, 1993):

- * characterisation and conservation of indigenous plant and animal genetic resources
- * matching animal genetic resources to feed resources to optimise productivity
- * developing mixed crop-livestock systems involving food, fuelwood and feed production
- * evaluation of the environmental impact of livestock management practices in different agroecological zones
- * policy options to encourage sustainable development of mixed farming systems

In developed countries research strategies can no longer centre on improving livestock productivity. Consumption of livestock products is high and the population growth low. To develop systems of sustainable animal production in the developed world, much information is necessary. A large variety of science disciplines and perspectives will be needed to monitor the status of the environment and to analyse ecosystems and relate these to animal production procedures. Some suggestions for research strategies in developed countries from Zijpp (1993) are:

- * to measure the health, welfare and productivity of animals under alternative production systems.
- * produce models to maximise efficient use of natural resources and to simulate food production chains in order to study their effects on waste production and food quality.
- * to increase our knowledge of interactions between nutrition, genetic make-up, housing and management for animal production health and welfare traits.
- * to preserve our environment and reduce chemical inputs and breed animals for pest and disease resistance.

CONCLUSIONS

There are many issues related to the sustainability of animal production systems, and these can differ markedly between, and within, developed and developing countries. Their relative importance will depend on where and when they are being faced. These issues will change as our animal production systems move closer to being sustainable and as the environment and the socio-economic climate in the world changes. The ecological, economic, social and cultural goals of animal production need to be brought together. Research in sustainability should become a unifying concept in animal science, to satisfy the needs of present

and future generations. Sustainable animal production needs to seek a balance with nature and focus on the efficient use of renewable resources and promote alternative management strategies to conventional, environmentally threatening production systems. As Francis (1989) so aptly puts it "to achieve this will require an adjustment in thinking about agricultural development beyond that of the perspective involved in the human domination of nature with industrial, chemical-dependent technology".

For developing countries, partnerships with research institutes in developed countries can provide access to advanced technology and knowledge while in return, animal scientists in developed countries have the opportunity to broaden their often narrow focus and become involved in long-term issues facing humankind. The growing populations in developing countries and their food requirements are global issues. In animal science the research agenda demands a holistic approach and the mobilisation of creative science with international focus and cooperation to meet the challenge of sustainability of our planet.

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