Livestock, ethics, and quality of life

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ABSTRACT: Agricultural and animal scientists need to embrace a new vision beyond the single-minded existing pursuit of biological efficiency. The public in the West is no longer concerned solely with cheap food. Other paramount issues define quality of life, including: health and safety of foods; nutritional value; traditional, regional, locally produced, and organic foods; animal welfare; sustainable farming, environment, and rural resources. The paper provides examples of how the credibility of animal scientists has been lost due to some recent unethical behavior. Research, teaching and application of agricultural and animal science, especially of biotechnology, need to be reshaped into a new "Quality of Life Agricultural Era" to replace the "Era of Intensification." This new era will need fresh assumptions, beliefs and leadership to match the emerging social agenda of the 21st century. Animal scientists have a special role in implementing this new plausibility structure.

Key Words: Biotechnology, Ethics, Intensification, Livestock

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Introduction: Livestock and Human Society

Livestock have made a unique contribution to the quality of human life since domestication started about 12,000 yr ago. Since then, during several major agricultural eras, livestock played a key role in freeing humanity from the drudgery of manual food production and permitting many new activities thus raising the quality of life. The eras may broadly be summarized thus:

1) *Hunting and gathering.* Wild animals hunted for food, clothing, fuel, and other products;

2) *Domestication of animals and plants.* Settled farming with animals providing draught power, food and manure and facilitating human migration, transhumant and nomadic lifestyles;

3) *Steam power and fossil fuel.* Animals used less for power and more for food;

4) *Intensification.* Animals increasingly seen as disposable resources in large scale specialized food production systems.

Western society produced the Intensification Era, which is now accelerating in Europe and North America. Few Western people now have contact with farm animals, though most in the world have lifestyles that remain integrated with their livestock. Over the last 50 yr in developed countries, animal science and business management have turned livestock into disposable biological resources that are processed swiftly on a huge scale to supply animal products to distant markets. This paradigm of intensive animal production and associated crop farming is new in human experience and has no track record of sustainability. Today there are clear signals that it is unsustainable, such as nitrates in drinking water leading to legislated restrictions (European Commission, 1992), which has resulted in all farmland in Denmark, Germany, and the Netherlands being designated Nitrogen sensitive areas.

Knowledge, Values, and Ethics

Knowledge Keepers

Each agricultural era has its group of knowledge keepers who are identified by their skill at providing society with what it wants. Thus, the values of society are reflected in the type of agriculture and food system that is designed and operated by the knowledge keepers. In successive eras knowledge keepers were first the hunters, then the domesticators and managers of livestock and crops and then the skilled breeders of plants and animals. Over the last 150 yr in the West, scientists have become the knowledge keepers facilitating substantial increases in food production. During the last few decades of the 20th century agricultural

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scientists have joined with business managers and together they comprise the new knowledge keepers of the food chain leading the way into more and more intensification.

Society and Values

Public concern over the continued intensification of food production in the developed world is growing. During the last decade of the 20th century a variety of informed sources in society began to highlight some of these concerns including environmental pollution, human health, food safety, treatment of animals, and depletion of rural life. The fact that some extremist groups have adopted this agenda does not permit us to dismiss these as fringe issues. They are increasingly documented by hard data. The tragic and expensive epidemic of foot and mouth disease (FMD) in the UK in 2001 is only one of a series of major symptoms. The FMD epidemic has been studied by an independent Policy Commission on Food and Agriculture set up by the UK government. Their report (Curry, 2002) identifies intensification as unsustainable and concluded, among other things, that "Radical measures are needed to cut through the deep malaise (of farming). Tinkering at the edges will not turn the industry around."

Public opinion, certainly in Europe, now declares that these issues cannot be ignored (European Union Eurobarometer, 1998). The food chain is the subject of criticism, legislation, and increasing supervision by national and European Union bodies such as the UK Food Standards Authority, which acts to protect the public interest. The need for increasing external regulation indicates a disjunction between scientists and society, which is a sad state of affairs. It should indicate to the knowledge keepers the need to review their assumptions and ethical behavior.

Knowledge Keepers in Intensification of Food Production

The current knowledge keepers, scientists and food chain businesses, see their paradigm of intensification as the only way forward. On the other hand, society is now dissatisfied with the consequences of intensification (Pretty, 1998). Interaction between them has become confrontational and defensive. It is now essential for the knowledge keepers to review their position in society, to examine their assumptions and to have courage to change appropriately. To fail will bring disaster. Imagine the chaos if, in times of changes in earlier agricultural eras, hunters continued killing domestic livestock and argued that was the only way forward. Equally later, imagine the confusion if livestock farmers insisted on taking their domestic animals onto the improved crops being cultivated with tractors. When society changes its values then the knowledge keepers must change. Scientists have successfully led farming into intensification to produce more and cheaper food by research into the biology of animals and also by studying animal production systems designed to improve efficiency and increase scale. In the last decade society has started to declare other values in addition to cost. We scientists, who are the knowledge keepers, must change our assumptions or risk causing chaos in society.

Scientists who argue that biotechnology and molecular engineering are introducing a new era in food production to replace the earlier green revolution fail to understand the issue. Biotechnology is simply a set of scientific techniques which potentially offers new ways of producing food. Applied within the current assumptions of science and business, biotechnology will, of course, accelerate intensification of food production which society is now questioning. Thinking people recognize that, used discerningly, biotechnology appears to offer new techniques to improve the quality of life (Hodges, 1986). But since intensification of food production is already impacting quality of life negatively, the role of biotechnology must be very carefully studied and agreed by all the stakeholders. The fact that scientists happen to have discovered biotechnology at this juncture should not automatically result in it being installed as the new engine of food production regardless of the consequences. There are rational arguments for and against the ability of biotechnology to solve hunger in developing countries which need full and detailed debate before use.

Values in Western Society from 1945 to 1990

We need to remember why and how intensification has developed. At the end of the Second World War, the public in Europe and North America wanted to rebuild and to improve the broken physical infrastructures of life. In agriculture those values called for more food to replace hunger and malnutrition. My generation of agricultural scientists responded. Most agricultural research was independent of vested business interests. Governments largely paid both for research and extension in agriculture. Food production increased enormously until there was no shortage. Around 1970 society values changed again. People were no longer hungry and wanted cheaper food. The goal of increased production was replaced by productivity.

Scientific Reductionism and Business Methods

Scientists responded to these changing values in society by focusing upon biological efficiency, using reductionist methods by which a specialist understands only one discipline of biology. In agricultural education, generalists were replaced by specialists and the terms "animal husbandry" and "animal production" were dropped in favor of "animal science." Scientists also began to forge links with businesses serving food production up- and downstream. This duo is a powerful combination of two types of knowledge keepers. Together they pro-

duced continuous intensification and scale of production systems, which have widespread impacts upon quality of life. Increasingly the duo, rather than the farmer or the consumer, makes the key decisions. While consumers choose among food products offered by suppliers, crucial policy decisions affecting innovative products in the food chain are not market-driven but originate from scientists and suppliers. An example is the recent introduction of genetically modified (GM) food. Customers felt excluded. They want more input in new policy decisions (Hodges, 1999).

Values in Society Are Changing Again Today

Today, especially in Europe, many educated and informed people are uneasy over the impact this powerful duo has upon sustainability of life in general. Society no longer asks agriculture solely for cheap food. There are serious new values for the knowledge keepers who now find themselves out of phase with society by continuing to focus only upon efficiency. The time is ripe and urgent for animal scientists to revisit their beliefs and assumptions.

Knowledge is Power

Knowledge itself is a neutral resource and has no moral character. The way humans use knowledge determines its impact upon the quality of life. Very early in human civilization, the writer of Genesis, the first book in the Bible, described the moral dilemma facing humanity by an allegory of the Tree of the Knowledge of Good and Evil. We understand this freedom to use knowledge for good or for evil. For example, nuclear power, television, and mathematics can be used to enhance life or to negate life. With a piece of wood we may build a house, cook a meal, keep warm or—using the wood as a weapon—we can kill another person. In the same way, scientific knowledge and business knowledge can be used for good or evil—to enrich the quality of life or to degrade or even destroy it.

Ethics

Use of knowledge involves ethics. Socrates (470?–399 BC) defined ethics as "Knowing the difference between good and evil and choosing to do good". We face choices to use scientific and business knowledge in ways that deeply affect human society for good or evil. Unethical use of such knowledge can reshape for the worse the multitude of components that together form the community of life.

Making ethical decisions is not easy. Unethical tyrants like Hitler and Saddam Hussein use scientific knowledge to cause evil and suffering. Most scientists are not cast in the mold of deliberately choosing evil. Scientists face two different ethical dilemmas: the dilemma of wanting to do good but not always knowing what bad consequences may flow from use of new scientific knowledge in biology; the second is being linked with businesses serving farming whose assumptions, behavior, and decisions are motivated by profit and shareholder value which are legitimate but represent the interests of only one segment of society.

Scientific Reductionism, Risk, and Ethics

Dangers of Reductionism

Reductionism and specialization have released a great flow of scientific knowledge and, over the last 50 yr, they have produced an abundance of cheap food. As scientists we know more and more about less and less. Our professional understanding of how the whole of life works is limited. Human progress requires different specialist groups to work together to gain fuller understanding of the whole. This linkage calls for transparency and accountability in community. In animal science, reductionism has isolated scientists from society and even from each other. This is dangerous. The peril of reductionism was recognized by the French philosopher and physicist Pascal (1623–1662) who said: "Since we cannot know everything about everything, it is better to know something about everything than everything about something." The danger presented by Pascal as an alternative can be avoided in an open, transparent, and accountable community. Some agricultural scientists using reductionist methods will undoubtedly be needed in the future, but it is vital that they broaden their thinking to embrace the larger context of life. In addition, the food chain in the emerging Quality of Life Era needs policy-making scientists of vision who comprehend the larger picture including the ethical implications of researching and applying new knowledge in society. Scientific isolation is dangerous as recognized by Pascal.

Risk

Until we know everything about everything we shall never be able to make perfect predictions about the effects of changes we introduce. Therefore, as biological scientists we assess risk by using probabilities. The discipline of statistics, within the reductionist paradigm, has contributed substantially to progress in food production. Today we are challenged by a new type of risk. Our scientific training and assumptions find us ill equipped to think in new ways about risk. The risks associated with some new biological techniques are so great that the public are rightly not satisfied with a probability. The global HIV/AIDS epidemic results from the transfer of molecules from one primate species to another (mankind) and the original transfer is thought to have happened only once. The public wants to know how all risk can be eliminated. As with nuclear power, the probability of an event occurring only once is too much.

Quality of Life

Human Progress and Quality of Life

Some may ask, "Are you suggesting that all research be stopped?" The question reveals a simplistic view of life. The fact that we always have limited knowledge and face risks should not stop humans from searching for new knowledge. Attempts to stop the search would fail and would also deny the possibilities of progress to increase the quality of life for all mankind and especially for the 75% of the world population of six billion whose life quality is low. But to be positive and sustainable human progress must be ethical. The great need today therefore is not to stop research but to be more thoughtful about *the type of knowledge we seek* and *then to use it ethically*.

Any society aspiring to be civilized must have a foundation of ethical behaviour underlying the physical, economic, and social infrastructures. Ethical decision-making modifies the short-term economic objective of maximizing efficiency of resource use and minimizing costs by seeking the best overall and long-term interests of all stakeholders. Ethical decision-making involves public and transparent consultation on key innovative proposals and policy changes by opening the decision-making process to discussion and input by all stakeholders including those likely to suffer negative effects. In the longer term, quality of life is not divisible. If some members of the human community are victims of, or are excluded from, progress, the whole body of humanity will eventually suffer including the sub-set of original beneficiaries.

Today in Western politics, where business influences are so strong there is a tendency to define quality of life only in economic and consumption terms. A meaningful life needs many other positive components defined by our culture, beliefs, and values. This is recognition of the wisdom first voiced 3,200 yr ago by Moses and later quoted by Jesus "Men and women cannot live by bread alone" (Deut. 8:3; Matt. 4:4). While economic and material prosperity is necessary for building Quality of Life, it becomes destructive when allowed to dominate.

Ethics Means Recognizing Relationships

Ethics is a relational and community issue. Today the world of more than six billion people is shrinking to a village community. The current focus in Western society upon the rights of the individual blurs our vision of community. Excessive emphasis upon individual and national competition distorts progress into ruthless self-interest. A human population without ethics means the end of civil society with civilization declining into primitive lifestyles. To survive we need ethics in private behavior; but it is paramount in a civilized society that ethics are built into the acceptable behavior of professional groups. Otherwise prosperity for a minority will deplete the quality of life of current and future stakeholders and will eventually destroy it for all. Without ethics there are no long-term winners. These self-evident truths apply to agricultural scientists as a profession and to all other powerful groups of knowledge keepers.

Bioethics in the Food Chain

Civilized society has institutional mechanisms to place sanctions upon medical doctors and pharmaceutical companies who fail to behave ethically. A major difference between medicine and the food chain is the necessity for everyone to eat. Therefore it is not ethical for one group of professional specialists to decide unilaterally to use new knowledge that will affect the whole of the food chain for everyone forever. Choice is not only required by ethics—it is also the basis of the market economy. Use of specialized knowledge on a grand scale in the food chain does not remove the right of consumers to make decisions for themselves. The ethical obligations of transparency, disclosure, and choice should be binding upon scientists and businesses in the food chain.

Ethics and Animal Scientists

Lost Credibility of Animal Scientists

Animal scientists now face a very serious problem. We need carefully to examine the reasons why the consuming public no longer trusts the knowledge keepers (agricultural scientists). It is not adequate for scientists to react by attributing public disquiet to extremists on issues of trade, environment, globalization, or a failure to understand science. The facts are very different as shown by the European Union Eurobarometer (1998). Throughout the European Union of 380 million people, 70–75% has reservations about food safety, do not trust scientists in the food chain, have lost confidence in their governments to protect consumer food interests and think that genetic and other manipulations of livestock go beyond acceptable limits of changing the biological status quo.

Recent Unethical Behavior in the Food Chain

Several large-scale cases have recently occurred where the public perceives unethical behavior on the part of some leading scientists, multinational companies and governments. Here are two major examples—there are others.

Case A. Bovine Spongiform Encephalopathy (BSE)

This new and fatal cattle disease became an epidemic in the UK as a result of livestock intensification. The formal independent report to the UK government (Phillips et al., 2000) said "A vital industry has been dealt a body blow" and referring to new variant Creutzfeldt-

Jakob Disease (nvCJD), "BSE has caused a harrowing fatal disease for humans." Here is a brief history.

Following unrecognized cases in the early 1980s, BSE was diagnosed in 1986 as a new, lethal condition in cattle. It was subsequently thought (Horn et al., 2001) that earlier cases and cycles probably took place over several decades. Following diagnosis, high profile scientists said repeatedly in public that BSE could not affect humans and that beef was safe to eat. In 1988, meat and bone meal (MBM) containing bovine offal was suspected as the vector (Wilesmith et al., 1988). This led slowly to the UK government banning MBM totally from animal feed by 1996. However, there was indecision and uncertainty for several years. Regrettably exports of MBM continued to other EU countries and when the EU banned MBM it was then exported from the UK to more distant markets. The full consequences of this unethical behavior by agribusiness have yet to be revealed.

In 1997, scientists announced that nvCJD was a new fatal human condition caused by eating beef from cows affected with BSE (Bruce et al., 1997). One hundred thirty-three people had died by the end of summer 2003. Uncertainty on exposure/dose, incubation period and susceptibility leads to estimates between a few hundred and several thousands who do not know they are infected (Horn et al., 2001). To date, there is no early diagnosis and no treatment.

Summary Statistics of BSE in the UK

There have been 190,000 cows with BSE on 36,000 UK farms between 1986 and 2002, peaking in 1992 with 37,289 cases and slowly declining to 900 cases in 2002. BSE cases have occurred in 19 European countries plus Israel, Japan, and Canada.

Why Credibility of Scientists Was Undermined by BSE and nvCJD

1) Scientists had never heard of, nor anticipated this new disease;

2) After diagnosis scientists remained ignorant for several years of how it was transmitted between cows;

3) At time of writing, summer 2003, the origin of BSE remains unknown to scientists;

4) For 11 yr, leading scientists stated that BSE was specific to cattle and posed no threat to human health. This was a conclusion beyond available data and knowledge. They should have said: "We do not know."

Case B. Genetically Modified Food (GM Food)

1) GM Food appeared unannounced in food stores in Europe in 1997;

2) GM Food ingredients were mainly imported;

3) Food products containing GM ingredients were not labeled;

4) Consumers were offered no choice between GM and non-GM Food.

With BSE as a background, safety assurances from scientists working for multinational companies fell on very skeptical ears. The companies and their scientists, mainly from the USA and Switzerland, then made a serious mistake by seeking to attribute European consumer concerns to environmental fringe groups, or to government trade protectionism, or to a superstitious view of science. These statements further inflamed consumers. Based upon the testimony of scientists that there is no difference (substantive equivalence) between GM and non-GM Foods the US government made the original decision not to label. After protests from consumers in Europe the labeling issue moved from scientists to consumers where it rightly belongs. Consequently the major European supermarkets responded to consumer concerns by not stocking GM Food products. European governments and the EU require labels thus supporting market economy principles of choice. This scenario is described in Hodges (1999).

Unethical behavior is central to this GM Food debacle, which concerns the attitude of the multinational companies who evidently thought consumers of food were a captive market. In the market economy it is the consumers' privilege, not the manufacturers' right, to decide whether to buy a new product. This approach has backfired and brought discredit on the multinational companies and their scientists.

The suspicions and ire of the European consumers were aroused by the following items:

1) Apparent intention of gaining corporate control over the world's food supplies;

2) Terminator gene technology;

3) Choice of global staple foods for the first generation of genetically modified crops;

4) First generation GMF only equipped to increase tolerance of the growing crop to chemicals marketed by the same company;

5) Absence of benefit to the consumer;

6) Fears that second generation GM products with transgenes designed to affect plant and animal physiological processes will cause human physiological misbalances;

7) The argument that Western society has to eat GM Foods so that the hungry people of the developing world do not face famine;

8) Scientific assurances that GMF is equivalent to Non-GM Food, seen as attempts to remove the right of the consumer to know and to choose;

9) Statements by some scientists that all GMF is safe—thus seeking to give a generic clearance—but seen as dissembling. Each new genetically modified product is unique and must be tested just as each pharmaceutical product is tested (Hodges, 2000).

Animal Scientists and Society

Lost credibility is serious. As animal scientists we must examine what we, as knowledge keepers, are doing. Evidently, the current corpus of animal scientists

think that their role is to search for and to apply in livestock production and the food chain any new techniques which will increase biological and economic efficiency. Although highly successful until recently there is now clear evidence that continuous use of these techniques is unsustainable. This does not mean research is failing to yield further increases in biological and economic efficiency. Rather it means that other negative consequences are appearing which in another context are called collateral damage. Society does not want collateral damage like BSE, nvCJD, and FMD etc.

Why the Public is Suspicious of Animal Scientists

1) The collateral damage took scientists by surprise. This tells the public that scientists are not able to anticipate all the societal consequences of the drive for increasing intensity of food production.

2) Scientific leaders and spokesmen provided false scientific information by reassuring the public that there was no danger to humans. This tells the public that animal scientists have been domesticated by government and business.

3) The scientific community has not acknowledged accountability for what happened, has not issued any statement of regret, and apparently continues unchanged to research and to apply further similar techniques.

4) In their evident excitement with biotechnology, scientists have mandated themselves to use new techniques in the public domain. Since the public feels threatened by molecular engineering itself, the role that scientists have assumed has changed their image from benign servants of society to a new intellectual elite already committed to the biological restructuring of humanity. These fears have been well presented by Francis Fukuyama (2002) in his recent book "Our Post Human Future."

Conflicting Views of Biotechnology: Society and Scientists

Many scientists tend to see biotechnology as a natural step in man's process of understanding, controlling and modifying nature. This technological imperative requires that if we are able to do something we should do it immediately. But the public increasingly asks the ethical question, "Why do it just because we are technically able to do it?" (Cook, 2000). The justification, often quoted by scientific spokesmen, for using biotechnology is that without it there will not be enough food for the world population. This is not a convincing argument for introducing GM Food with no evident consumer benefit in Western society that already has food surpluses. Coming from those whose business plans seek to market GM Food universally, it appears as a shallow and self-serving position. The view of educated and informed members of society, including some scientists, is that extreme caution is needed in using the products of biotechnology because these techniques breach fundamental biological boundaries from which a new class of unknown negative consequences may flow. People fear that changing the basic nature of food animals will affect human health, safety, the nutritional value of food, and the quality of life in irreversible ways as already demonstrated by BSE and nvCJD. Further the costs and disruption borne by society of seeking to overcome new and epidemic-sized problems are enormous. Nevertheless this caution lies parallel to a deep respect for science and hope that the new frontiers in biotechnology may eventually be able to solve some old and intractable problems in livestock production (Hodges, 1986). But approved use should only follow long-term, thorough, and independent testing instead of the current rush to market.

The New Agricultural Era: Quality of Life

In the emerging era of post-intensive agriculture, scientists need new assumptions, roles and skills to meet awakened public sensibilities, values and expectations. Another man-made tragedy like BSE/nvCJD will produce a revolution against animal products.

We are challenged to review what we are doing as scientists; to examine our professional objectives, our ethics, and our role in society. This process is undoubtedly painful. It is far easier to ignore the issues raised by society and continue in the comfort of reductionism. For most of us science is enjoyable. It is pleasant to meet colleagues and to debate the scientific frontiers of our speciality. Our scientific peers rarely question *why* we research. We assume that animal science as we practice and teach it automatically contributes positively to society.

Science engages in a restless search within the scientific boundaries. But culturally we conform to the assumptions of our professional group, which are set by the corpus of animal scientists. This specialist world is now under challenge. This is not a challenge to the proven value of the scientific method. It is a call to examine the current assumptions of animal scientists as a sub-set of human beings with their own sub-culture, agenda, language, and protocols. We must not only listen to the new agenda of society—we must seek to interpret and fulfill it in creative ways. In this new task we may be helped by the concept of plausibility structures.

Plausibility Structures and Food in 20th and 21st centuries

Peter Berger in his "Heretical Imperative" (1979) provides a model which may enable us to grapple with these somewhat alien issues. Berger defines a Plausibility Structure as "*a social structure of ideas and practices that create the conditions determining what beliefs are plausible within the society in question.*"

The reward of my generation of animal scientists from 1945 to 1990 was improvement in farmers' income

and good quality, healthy food at ever reducing unit costs in real terms. This belief formulated within the plausibility structure of that period was vindicated. That era has now gone. Single-minded pursuit of efficient resource use in food production is no longer appropriate. Continuation of the assumptions on efficiency will take food production farther and farther along the road of large-scale intensification, which will result in more negative consequences and will increasingly conflict with the 21st century plausibility structures of society. Faced with these new circumstances, agricultural and animal scientists now face the task of formulating new beliefs about the role of science in food production.

New Plausibility Structures in Society

What are the new Plausibility Structures of the 21st century in western society? They cannot be defined for food and agriculture in isolation because, in the public consciousness, they form a larger package including natural resources, the environment, and personal expectations on life quality as a whole.

Starting with food, while the unit price of food is always important *price is no longer the only factor*. The three key factors about food in the public mind today are: *Health, Safety, and Nutritional Value*, which are placed above basic cost as shown by the European Union Eurobarometer (1998). With these three criteria always in mind, consumers in the West now search for and buy a variety of foods of high gustatory quality from traditional, regional, ethnic, processed, locally produced, organic, or natural biofoods systems. The consumer willingly pays higher than basic prices for these products. The priority given to safety demands that food must be free of risk. That expectation is no more unreasonable than requiring piped water to be free of poison or air to be free of pollutants. It is worthy of note that some insurance companies now exclude damage from GM food from their policies along with war and nuclear accidents.

Consumers are also citizens with further ideas of how society should be shaped. These plausibility structures include the environment and its many attributes, animal welfare, countryside for recreation and tourism and the quality of rural life. Food, in other words, is now part of a complex package of quality of life issues, which means it should be produced from a sustainable and agreeable rural economy in which natural resources are managed to provide high life quality both for local residents and all citizens.

Scientists within the New Plausibility Structures

Agricultural and animal scientists now face the task of formulating a larger vision of their contribution to society. It will not be easy as the goal of biological efficiency has been the foundational assumption of a whole generation of animal scientists. How can animal scientists contribute to the new Quality of Life Agricultural Era? Here are some suggestions for starters.

Animal scientists need to decouple themselves from:

1) The single-minded pursuit of biological efficiency.
2) Advocacy of techniques that encourage further intensification and scale of production.
3) Profit and shareholder value as a primary research aim.
4) A posture that promotes higher consumption of animal products per capita as an end in itself.

Animal scientists need to make new contributions to society by:

1) Regaining and maintaining scientific objectivity, not only in the learned journals, but in the eyes of the consumer.
2) Positioning themselves as objective, thoughtful servants of the whole of society.
3) Listening to what the public as consumers and as citizens are saying about food related to quality of life.
4) Ensuring science is independent of self-serving interests.
5) Rethinking the nature of risk in the context of radical biotechnologies. This means evaluating risk in terms of the consequences flowing from one failure rather than from small probabilities of failure.
6) Designing and researching new hypotheses and questions that will enrich life quality.
7) Engaging in dialogue with other components in the food chain community, including business, to ensure that information flows in both directions with the aim of improving transparency and accountability (Hodges, 2002).

Implications: The challenge for Leaders in Animal Science

Building community is always difficult whether in a family, business, government, university, church, research institution, or nation. It is particularly difficult to build community in a market economy society. Without an ethical foundation, science and capitalism are no more sustainable than communism and central planning. Animal science needs new types of leaders with: a deep understanding of science; a grasp of the changed values of society; a perception of the risks of biotechnology; a creative vision of how science can improve life for the whole world; a recognition that the good life involves more than material prosperity; and the ability to lead agriculture and food production into the emerging Quality of Life Era. True leadership requires the ability to interpret changing social expectations into fresh beliefs, assumptions, and practices. Leadership of this caliber requires those extra qualities that distinguish statesmen from politicians.

Literature Cited

Berger, P. L. 1979. Heretical Imperative: Contemporary possibilities of religious affirmation. Doubleday, New York.

Bruce, M. E., R. E. Will, J. W. Ironside, I. McConnell, D. Drummond, A. Suttie, L. McCardle, A. Chree, J. Hope, C. Birkett, S. Cousens, H. Fraser, and C. J. Bostock. 1997. Transmission to mice indicates that "new variant" CJD is caused by the BSE agent. Nature 389:498–501.

Cook, E. D. 2000. The relationship of ethics to livestock and quality of life. Pages 243–251 in Livestock, Ethics and Quality of Life. J. Hodges and I. K. Han, ed. CABI Publishing, Wallingford, UK.

Curry, D. 2001. Farming and Food: a Sustainable Future. Report of Policy Commission on the Future of Farming and Food. UK Government Cabinet Office, London.

European Commission. 1992. Directive 2087/92.

European Union Eurobarometer. 1998. Food Quality. European Union Eurobarometer 50:1.

Fukuyama, F. 2002. Our Posthuman Future. Farrar Straus and Giroux, New York.

Hodges, J. 1986. Prospects for using biotechnology for livestock improvement. World Anim. Rev. 56:2–10.

Hodges, J. 1999. Genetically modified food muddle. Livest. Prod. Sci. 62:51–60.

Hodges, J. 2000. Polarization on genetically modified food. Livest. Prod. Sci. 63:159–164.

Hodges, J. 2002. Connectedness and community in the food chain. Livest. Prod. Sci. 75:59–62.

Horn G., M. Bobrow, M. Bruce, M. Goedert, A. Mclean, and J. Webster. 2001. Review of the origin of BSE. Report to UK Government Department of Environment, Food and Rural Affairs. Stationery Office, Norwich, UK.

Pascal, B. Pensées. 1993. Trans. P. Kreeft. Ignatius, San Francisco, California.

Phillips Lord, J. Bridgeman, and M. Ferguson-Smith. 2000. Report, evidence and supporting papers of the Inquiry into the emergence and identification of Bovine Spongiform Encephalopathy (BSE) and variant Creutzfeldt-Jakob Disease (vCJD) and the action taken in response to it up to 20 March 1996. UK Government Stationery Office, Norwich, UK.

Pretty, J. 1998. The Living Land. Earthscan Publications, London UK.

Wilesmith J. W., G. A. Wells, M. P. Cranwell, and J. P. Ryan. 1988. Bovine spongiform encephalopathy: Epidemiological studies. Vet. Rec. 25:638–644.