
Ethical Issues in Agricultural Adaptation and Mitigation Responses to Climate Change

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I will explore ethical issues in agricultural adaptation and mitigation responses to the challenge of climate change, looking first at a secular ethical framework for knowing “what ought to be done” and then exploring resources in the world religions for doing what is right and good.

A SECULAR ETHICAL FRAMEWORK FOR KNOWING WHAT OUGHT TO BE DONE

Most North Americans think of themselves as following an ethical approach to life. What response from us to the challenge of climate change would be ethically right in our practice of agriculture? Tom Hurka (1993: 23) offered one schema argument for examining the consequences of our practices for people living in our own family, city or country, for people in other countries (especially in developing countries), for future generations (our children and grandchildren), and for the environment valued for itself (earth, air, water, animals and plants as having value along with humans). For us as individuals, corporations or governments, the decisions we make—as we attempt to deal with the challenge of global climate change and its human implications and take account of the economic factors involved—can be either ethically right or ethically wrong.

Ethics need to be distinguished from opinion. Surveys to determine what people think is right or wrong about climate change, for example, describe opinions rather than ethics. Too often, governments and industries make decisions based upon polls of people’s opinions rather than on careful study of the ethical issues involved. Ethics is about *values* apart from people’s opinions. Ethics assumes that some beliefs about right and wrong may be incorrect, and the study of ethics attempts to discover which are correct. In short, there is right and wrong above what people *think* is right and wrong, beyond people’s opinions.

Ethical decisions require that we combine the scientific, social and economic facts relating to the threat of global climate change with general ethical principles that indicate right and wrong in all areas, and thus lead to specific policy recommendations. One can,

of course, argue over which ethical principles should be employed in such an analysis, and the employment of different principles could lead to different ethical conclusions and different policy recommendations. This difficulty can be dealt with by selecting ethical principles that are not radical or speculative but are widely accepted by writers on ethics. In this way, the policy proposals developed by an ethical analysis can be convincing to most people. Using “an analysis of consequences of actions” as an approach, allows one to move from areas of least controversy and broad agreement (*e.g.* impact on own family and country) to areas where the policy conclusions are more radical and the agreement less general (*e.g.* impact on the environment). General policy decisions in response to the challenge of climate change can favour either adaptation or mitigation. With adaptation, we follow current agricultural practices, let global temperatures rise, and make whatever changes this requires: move people from environmentally damaged areas, build sea walls, and so on. With mitigation, we make every effort to stop warming from occurring, by reducing our use of fossil fuels, by using mitigating technology (*e.g.* hybrid cars) and by making lifestyle changes. As we shall see, ethical responses to climate change strongly favor mitigation over adaptation in individual, industrial or government decision making. However, it is unlikely that either pure strategy is possible. According to current estimates, pure adaptation would result in a temperature and sea-level rises that would be faster than any in the last ten thousand years, and would be devastating for many human, as well as animal and plant, communities. But pure mitigation or avoidance—reducing warming to zero—would be enormously expensive, or even (with population growth) impossible, to achieve. Therefore, an ethically acceptable goal will likely involve some mixture of adaptation and mitigation.

Adopting the ethical principle of considering the consequences of our actions means that if an act or policy has good consequences then this counts ethically in its favour, and if it has bad or disastrous consequences this counts ethically against it (Hurka, 1993: 24). But how does one decide which consequences are good? One popular principle from utilitarian ethical theory says that good decisions are those that maximize the best consequences so as to produce the greatest good possible. Other philosophers (*e.g.* Rawls, 1971) care not only about the total good a choice or policy will produce, but also about the breadth and equality of its distribution. A less demanding “satisfying principle” (from the idea of “making satisfactory”) gives each of us “the duty only to bring about consequences that are reasonably good, either because these consequences are above an absolute threshold of satisfactoriness or because they represent a reasonable proportion of the most good the agent can produce” (Hurka, 1993: 25).

How do these ethical principles about “consequences” apply to decisions regarding climate change? Where actions such as burning fossil fuel and generating CO₂ foster global warming with its negative consequences, such as sea level rise displacing billions of people and destruction of animals and plants, it is clear that our ethical duty is to avoid such a result. If the result of allowing climate change would be disastrous, it is prudent to avoid this result even if we are not certain that it would come about (Hurka, 1993: 25).

In simple language, “better safe than sorry” applies when potential consequences of climate change are so serious. Now that we have a clear idea of how ethical judgments can

be made by examining the consequences of our actions or policies, let us turn to questions of agricultural practice and lifestyle change—starting with our immediate family then widening our concern to include others elsewhere in the world, future generations and finally nature itself.

Consequences: Humans Here and Now

Of course, we all care about how climate change will affect ourselves, our families and our businesses. This is simply our own self-interest and does not really count as *ethical*. Our behaviour becomes ethical when we take decisions regarding climate change that will benefit and not harm others living in our neighbourhood, city and country. When we focus only on the present, and the effects of our actions on our families and businesses, cities and country, many of the most harmful results of global climate change seem not to count; for example, damage to the environment from a rise in global temperatures—killing organisms and ecosystems—does not matter according to this principle since only humans, not nature, have ethical standing. And since the most severe consequences of climate change may affect future generations, such harm is ignored by the “humans here and now” principle. Ethical analysis on the “humans here and now” principle tends to favour adaptation rather than avoidance or mitigation behavior—it does not foster change and simply sits still while climate change continues. It would, however, support technological mitigation measures such as increasing the efficiency of heating, lighting, cars, electricity-generating plants and the production of our food—as long as it did not cost too much. To reach an ethical approach that would argue for less adaptation and greater mitigation requires that we extend our concern for consequences out beyond “humans here and now” to the wider principle of “humans everywhere in the present.”

Consequences: Humans Everywhere in the Present

This principle suggests that to maximize the good and be egalitarian in our ethics, we must be as concerned over the benefits and harms wrought by climate change in other countries as we are in our own. The effects of climate change on humans in all countries are included in our concern, but not the effects on future generations, which a more radical analysis would include. Extending the analysis to other countries strengthens some arguments for avoidance and mitigation. It suggests that as China, India, Africa, Latin America, *etc.*, industrialize, we in North America should help them by providing energy-efficient technologies (at costs they could afford). To be egalitarian about sharing the benefits of electricity, better food production and a higher standard of living means that we will likely have to alter our lifestyle and pay more for everything. To achieve this global benefit will cost developed countries like Canada and the United States more. But the result will be an increase in the standard of living for people in developing countries—an ethical result. Some sacrifice will be required in developed countries to meet the goal of enabling them to industrialize and achieve a higher quality of life, but with energy and agricultural efficiency so that additional CO₂ production and damage to the environment is minimized. The ethical challenge is to balance competing claims for equality among nations.

Consequences: For Future Generations

It is when we think of the effects of climate change on future generations in North America and elsewhere in the world that the realization of the need for mitigation from lifestyle change and altered agricultural practice is strongest. The predicted rises in sea level, the destruction of traditional habitats and industries and the loss of biodiversity push the ethically acceptable climate policy strongly towards mitigation rather than adaptation. We want to pass on a healthy environment and a sustainable world to our children and grandchildren. And just as an egalitarian ethical principle argues for equity between nations, so also we must ensure that there will be equity for future peoples—“seven generations into the future” to quote an Aboriginal teaching. When we factor in concern over global population growth, which threatens to increase in fifty years from six to ten billion people, the ethical challenge becomes very demanding. While we need to cut back in our consumption now to create opportunity for developing countries to industrialize, we also need to restrain ourselves even more severely if we are to create a lifestyle that is sustainable for large population increases in the future. Thus, the changes required include not only a reduction in patterns of consumption but also a reduction in the number of children we produce out of concern for equity for future generations.

Consequences: Nature Valued For Itself

We have widened our application of ethical principles from our own families and country to people everywhere and to future generations. But what about the environment, nature itself? In the recent past, our assumption has been that changes to the environment matter ethically only if human life is thereby affected. Even the 1987 Brundtland Commission report, which championed sustainability, boldly asserted that the wellbeing of people is the ultimate goal of all environment and development policies (World Commission on Environment and Development, 1987, p. xiv). A more radical view argues that we need to care for the natural world not just as a means to better human lives, but as an end in itself. When we adopt the ethical position of holding that nature has intrinsic value, the main problems to be dealt with are of two kinds:

- overpopulation by humans, which threatens to squeeze out other species and overwhelm the carrying capacity of the earth; and
- the rapid rate of climate change, faster in the last few decades than in previous history, which threatens many forms of life that require slower warming to be able to adapt successfully.

Thus, we are in danger of losing both individual species and whole ecosystems:

This will be bad both on an individualist environmental view—where individual animals and plants will suffer or find their natural life-activities impossible—and on a holistic view, where complex and fragile ecosystems, such as in the Arctic, the western prairies and the oceans, will disappear

—Hurka (1993: 32).

Concern for nature valued for itself leads us even more strongly to embrace the approach of avoidance or mitigation in our production of pollutants such as CO₂ that foster climate change. This ethical approach will require even more human sacrifice if ecosystems such as the Arctic or the southern prairies are to be preserved.

The ethical principles supporting the valuing of nature for itself can take several forms. Some argue that the pain and pleasure of animals has at least equal importance to the pain and pleasure of humans. Thus, climate changes that cause suffering to animals are to be avoided as are changes bringing misery to humans. Others value the flourishing of insects, fish and mammals, but argue that their value is less than that of humans because of our higher mental and rational capacities. A third approach, referred to as holistic environmental ethics, was given its classical statement by Aldo Leopold (1970: 262):

A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise.

This approach takes the bearers of intrinsic value to be the wholes of nature of which humans are simply a part, *e.g.* ecosystems such as the fish in their ocean habitat in relation to human fishing communities and the climate that sustains them all. Such ecosystems can extend out to include the entire earth biosphere and, according to holistic ethics, grant humans, either as individuals or groups, ethical significance only as contributing to the harmonious working of the overall whole. In this view, if humans by their behaviour both overpopulate and overconsume, they may be in danger of being wiped out as a species to save the functioning of the ecosystem of the earth. In the holistic view, ethical standing belongs not just to individual organisms or species but to the interrelated ecosystem wholes that they compose. Let us now examine a world religion's ethics approach.

ETHICAL RESOURCES IN WORLD RELIGIONS FOR ADAPTING AGRICULTURE TO CLIMATE CHANGE

Another source of guidance for making choices in relation to climate change and agriculture is found in the values of the world's religions. Although many North Americans are swayed by secular ethics, for Jews, Christians, Muslims, Hindus and Buddhists, their religious values, to a large extent, guide how they deal with questions of population growth (reproduction), consumption and the environment, which, as we have seen, are crucial factors in decision making with regard to agriculture and climate change. In the following analysis of religious values, we will focus on their teachings on what individuals, agriculture and governments can or should do, especially when it comes to genetic engineering, to make a difference in response to the challenge of climate change. Beyond Hurka's ethical principles (reviewed above), what are the added teachings offered by the major world religions to convince us that we are really interconnected with other humans and all of nature, and, therefore, we ought to take responsibility for the impact of our actions on other humans (living now and in the future) as well as on the animals and plants of the natural environment?

My sources for what follows are ethics theologians and layperson focus groups from the various religions all involved in the research of the Centre for Studies in Religion and

Society at the University of Victoria over the past five years. The lay focus groups have included scientists, government regulators, industry workers, animal-justice NGOs and private citizens.

Stakeholder views varied within and between focus groups, ranging from those that see all life forms as so strongly interconnected that species boundaries cannot really be identified (scientists, animal justice) to those who view animals as existing for human use and benefit (scientists). In a more modulated form, the latter anthropocentric position requires that although humans have a privileged position, still they must be good stewards, treat animals with respect, and not cause animals undue suffering unless essential for human health. In the religious traditions, this idea of the interconnectedness of humans and animals pervades the Eastern religions of Hinduism and Buddhism, while the model of human dominance with stewardship responsibilities characterizes the perspectives of the Western religions of Judaism, Christianity and Islam.

Interconnectedness of Humans, Animals and the Environment

As discussants in the agricultural scientists' focus group put it, there is a strong interconnectedness between humans, animals and the environment that is linked to feelings about the sanctity of life. This is indeed a good statement of the Eastern worldview manifested in the Hindu and Buddhist religions (Coward and Goa, 2004). The Hindu approach to animals is based on the notions of *karma*, *samsara* (rebirth), *ahimsa* (non-violence), and the presence of the divine in all beings (Narayanan, 2009). Animals, for Hindus, are human souls in different bodily forms. Eating an animal is, thus, quasi-cannibalism. Humans are reincarnated; they may have been animals in past lives, and they may be reborn as animals in future lives. Animals have no free choice, but humans do. Animals have to “burn off” bad *karma* they built up as humans over many lifetimes of making evil choices. Then they can be reborn as humans with free choice and the ability to move up or down “the ladder of being.” Hindus also follow *ahimsa*, the doctrine of not harming any living creature, animal or human. For them, according to the *Bhagavad Gita*, the divine exists equally in all beings, animals, like humans, are viewed as manifestations of the divine leading to a deep sense of unity and respect for all life forms and their interconnectedness in the divine. Thus, early in Hindu history (*i.e.* before 200 BCE) hospitals for animals were established in India. This reverence for animals was also the view of Mahatma Gandhi and other contemporary Hindu leaders. As a result, millions of Hindus eat no fish, meat or eggs. Vegetarian practice is the ideal. However, many others do eat chicken and fish, but no red meat. Devout Hindus refuse to kill animals, but some will eat those killed by others.

Like Hinduism, Buddhism also assumes “the interconnectedness of all life.” Buddhism adopts the worldview of *karma* and rebirth and the resulting ladder of existence on which animals (lower on the ladder) are beings like humans but in a different karmic form. Thus, Buddhists generally believe that they may have been an animal in a past life, and may be reborn as an animal in the future. All forms of life (humans, animals, plants, earth, air and water) are seen as interrelated and part of a much larger life-force, the Buddha Nature. To do harm or treat with disrespect any part of this entity (*e.g.* animals)

is to harm oneself and all of life. Consequently, the Buddha taught compassion for all sentient beings. Animals, as sentient beings, are highly respected in Buddhist scripture and teaching. Also, like Hinduism, the ethical teaching of Buddhism stresses *ahimsa* or non-violence toward all living beings. As a general rule, Buddhists refuse to hurt or kill an animal, or to eat meat, though some do choose to eat meat.

According to Zen-Buddhism teacher Philip Kapleau, to kill or harm an animal is to violate the Buddha Nature, the sacred harmony that unites and is manifested in all organisms (Walters and Portmess, 1992) As for Hindus, eating meat is seen as a kind of cannibalism because of the *samsara* or rebirth presupposition.

Given the Buddhist and Hindu belief in the interconnectedness of humans, plants, animals and the environment, the use of animals in scientific experimentation is viewed as problematic. If humans engage in genetic modification of animals, from the Hindu-Buddhist perspective this would be acceptable only if there are clear benefits to animals and humans (which could include climate-change mitigation) that could not be achieved in any other way. Such must be done in a way that does not interfere with the happiness of animals nor make them any less able to progress up the ladder of being to rebirth as a human and eventual release (*moksa* or *nirvana*).

In Buddhism, the issue of motivation is key. If animal biotechnology is done for frivolous or purely commercial “bottom-line” reasons, that is unacceptable. As the Buddhist scholar David Loy puts it, the genetic modification of plants or animals for food or as a response to climate change, may be acceptable if it reduces suffering and if it is done with the intention of bringing about a good result (Loy, 2005, 2009). Loy questions, however, whether humans have achieved such a level of awareness regarding their own motivations.

Human Dominance over Animals but with Stewardship Responsibility

Unlike the strong interconnectedness perspective of the Eastern religions, the Western religions of Judaism, Christianity and Islam see the human-animal relationship as one of animals having been created by God to serve human needs, but with humans having a stewardship responsibility in this relationship. This viewpoint was strongly present in the Agricultural Producers focus group, which also emphasized the need for human stewardship and respect for animals and plants. As the biblical book of *Genesis* presents it, humans are created with priority over animals and plants, which are there to meet human needs. There is a clear hierarchy of being with humans at the top and animals and plants lower down. At the same time, plants, animals and humans are seen to be parts of God's creation, all of which God blesses and sees as good. Therefore, humans in their stewardship responsibility are to minimize cruelty to animals, hence the *kosher* (Judaism) and *halal* (Islam) rules that are intended to ensure humane slaughtering of animals.

The mainstream attitude in Christianity until recently was that animals and plants are created by God for human use. As a participant in the Animal Justice focus group put it, *Genesis* teaches that humans have dominion over animals and are empowered to exploit animals to their own advantage, however they see fit. Unlike Muslims, Christians do not view animals as having an immortal soul. Christian views on these matters were

influenced by the Greeks. In particular, Aristotle exerted influence over Augustine and Aquinas. Aristotle argued that nature made animals and plants for the sake of humans. Augustine followed suit, saying that animals and animal suffering are here for the physical and spiritual benefit of humans. Aquinas agreed, claiming that animals have no reasoning ability and no immortal soul. Luther likewise limited rationality to humans and further emphasized the power of human “dominion.” (Linzey and Yamamoto, 1998: 65; Yarri, 2005).

This view is now being questioned by many Christian scholars, however, as a misreading of the Bible. Through the ages, there have been minority voices who have been advocates for animals, *e.g.*, Francis of Assisi (Yarri, 2005). In her recent reassessment, Donna Yarri argued that human dominion over animals should be understood as benevolent stewardship rather than autocratic despotism (Grant, 1999; Yarri, 2005). Many Christians now view plants, animals and humans together as parts of God’s creation, all of which God blesses as good and inherently valuable. This view is validated in the first chapter of *Genesis* in which it appears that humans and animals lived together harmoniously as vegetarians, and in other Old Testament descriptions of an agricultural society in which domesticated animals were treated with respect and compassion. More recently, a new generation of Christian environmentalists has come to see humans as part of an ecosystem in which humans and animals are an interdependent part of nature, a nature created by God [see especially Wirzba (2003)]. The idea is that animals are suffused with God’s Spirit (Nash, 1991: 117–121; Reuther, 1992: 247ff; Cobb, 1994: 173–180).

Regarding the use of animals in science, Andrew Linzey (1986, 1994:143–148), taking into account the above theological discussions, offered the following principles. Animals are not instrumental to human ends. Animals are not laboratory tools. Because animals are part of God’s creation and interdependent with humans, the motivation behind our use of animals in science, agriculture, or as food must be carefully analyzed (as Buddhists maintain). Animals, like humans, are valuable *in themselves* by virtue of their creation by God. As stewards of creation, humans are accountable to God in how they use animals. Such uses must not be for human ends only, but for the good of the whole interdependent creation. In the teaching and life of Jesus, we find a compassion for animals and their pain, and in the Holy Spirit, a hope that as the world struggles toward a New Birth, animals, humans and all of creation may regain their original state of peaceful coexistence (Romans 8: 18–39; Wirzba, 2003).

ANALYSIS OF ANIMAL BIOTECHNOLOGY APPLICATIONS

Having outlined the worldviews of the major religions toward animals, we will examine the implications of these values and precepts for specific animal and plant biotechnology applications.

Applications to Improve Nutritional Quality, Disease Resistance and the Economic Efficiency of Food Production

A motivation expressed by many of those involved in genomic science and plant/animal biotechnology is that these advancements will benefit the poor and all of humanity by

increasing the quality of food and the efficiency of global food production in the face of climate-change challenges. Participants in the Scientists focus group said that they are involved in agricultural biotechnology to achieve the greatest good for the greatest number. However, in the Animal Justice focus group, participants expressed that in our concern to help people we must not cause pain and suffering to animals. The Jewish religious tradition, with its twin values of *pekuach nefesh* and *tinkum olam* (saving human life and healing the brokenness of the world), supports such applications of animal biotechnology so long as the main motivation involved is not economic greed (Zoloth, 2009). For Buddhism, too, the major worry seems to be over motivation (Loy, 2009). For Hinduism, as Narayanan (2009) noted, aside from being proscribed from use in religious rituals or on holy days, many Hindus may welcome genetically modified foods, for examples chickens that produce more nutritious eggs, so long as there are no health hazards. Islamic scholars would follow Mohammad's example in leaving practical agricultural matters to be decided on the basis of their scientific and practical merits (Moosa, 2009). Thus, applications to increase nutritional quality and the economic efficiency of food production could be embraced, as long as the biotechnology in question did not increase animal suffering. If biotechnology applications help to increase the disease resistance or temperature/drought tolerance of animals and plants being raised for food, then this would reduce animal and human suffering and be judged a good thing.

Christians focus on the stewardship principle. One study in particular, *Engineering Genesis* (Bruce and Bruce, 1999), has examined Christian concerns in relation to the genetic engineering of animals. The book's key issue is the extent to which we are justified in intervening in the lives of animals for our benefit. While cruelty toward animals is clearly not acceptable, the use of biotechnology to increase milk production or to produce a therapeutic protein in milk is considered ethically acceptable. But respect for animals requires that they be seen as more than mere supermarket commodities or generators of bigger profits for producers and retailers. The authors expressed an additional worry that the introduction of animal biotechnology will further foster large-scale agribusiness approaches globally that will force small farmers out of business. Similar concerns were raised by the World Council of Churches in its 2006 report on genetics and agriculture (WCC, 2006). Its worry is that the introduction of GM animals in agriculture will reduce biodiversity and result in the loss of the cultures and the traditional knowledge of indigenous peoples and small farmers in developing countries along with our ability to respond to climate change. From this perspective, there is real danger that agricultural biotechnologies, as used by the market economy, may actually exacerbate problems of injustice and violence for the world's poor (WCC, 2006: 32, 72). Most adherents to religions would agree that concerns such as these, along with worries over causing pain and suffering, must be carefully weighed when the potential benefits of animal biotechnology are being considered.

Reduction of Negative Environmental Impacts

Some stakeholders noted that humans have the capacity to control a lot of what happens in our world, for good or evil. Whereas consumer demand for products such as ham-

burgers, that drives the clear-cutting of Amazon forests in order to produce more cattle for beef, leads to a bad result (increased global warming), the creation of the Enviropig, engineered to have less phosphorus in its manure and thus be less destructive to the environment, is an example of a technology designed to produce a good result (Golovan *et al.*, 2001). The Eastern religions of Hinduism and Buddhism, with their focus on the strong interconnectedness of humans with nature, would agree. The Western religions of Judaism, Islam and Christianity with their stewardship ethic, would also take a favourable view of applications that help to reduce negative environmental impacts and foster the mitigation of climate-change effects. Another example would be the engineering of trout to have a biomarker chip that will detect pollution in streams so that such human-generated problems can be better detected and regulated (Koop *et al.*, 2008). A further use of such engineered trout will be to more effectively test streams to see if their water is safe for human consumption, thus avoiding health risks, an application likely to find support in all religious traditions.

The Industrial Manufacture of Animals and Plants: Transgenics

Industrial agriculture uses the process of transgenesis to move a gene that expresses a desirable trait from the same species or another species into the genome of an animal that will then manifest that desirable trait. Resulting animals may be engineered to grow larger and/or more quickly (*e.g.* transgenic salmon), be less damaging to the environment (*e.g.* the Enviropig), be disease or drought resistant, or produce less methane.

Among Jewish scholars, there appears to be considerable support for the transgenic modification of animals, since it does not appear to be in violation of the prohibition against crossbreeding (*i.e.* it does not entail a sexual act between members of different species), and the “grafted element” (the moved gene) takes on the identity of the species into which it was grafted, so that there is no significant change of appearance. The *halakhic* (Jewish Law) issue at stake is the identity of the resulting genetically engineered entity, which depends in large part on its physical appearance. Although scholars admit that there is still ongoing debate, the consensus seems to be that the status of a cow, for example, that has been modified by genes derived from a pig, is still a cow as long as its general appearance is not changed. In effect, the identity of the “grafted” pig gene becomes submerged in the identity of the animal (in this case the cow) into which it has been placed. In discussions regarding genetically engineered poultry, the conclusion is that such chickens are *kosher* provided they exhibit the physical criteria of an identifiable species of *kosher* fowl—in other words, that they still look like chickens. Further, even when an animal has received genes from a non-*kosher* animal, it is permitted as food as long as there is no manifestation of the non-*kosher* gene donor. Given this argument, Jews would have no problem eating transgenic salmon.

In Islamic Law, the debate over transgenic animals rests on the question of whether humans have taken on the power of creation through genetic engineering. From this perspective, it would seem that transgenics are acceptable, since none of the elements (*i.e.* the genes) used in transgenics are human-made—Allah created them—and since no change occurs in the birth of the animal or in its natural stages of creation as given by

Allah. For Islam, then, according to these scholars, transgenics, like cloning, can neither be called “creation” nor even a partnership in creating, and is, therefore, judged to be acceptable. However, the production of transgenic animals must also be shown to be in the best interests of human society, to be useful in the mitigation of climate change, and must not cause harm to animals (Qasmi, 2003).

Christianity seems to take a more guarded approach to transgenic animals than either Judaism or Islam. Andrew Linzey (1986), a professor of theology and animal ethics at the University of Oxford argued that animals, like humans, are valuable *in themselves* by virtue of their creation by God. As co-creators or stewards of God’s creation, humans are accountable to God for the ways in which they use animals. Such uses must not be for human ends only, but for the good of all creation. From this perspective, the transgenic modification of animals goes against the God-given natural biodiversity of life. The presumption that humans know what is optimum for selection from the vast diversity and complexity of traits in an animal is an act of hubris. (This critique would seem to also apply to ordinary selective breeding.) Therefore, the use of transgenics in routine animal production to side-step normal breeding methods on the grounds of economics or convenience is not acceptable. However, transgenic applications such as the Enviropig, which foster human-animal interaction for the good of the environment and the mitigation of climate change, may be seen as acceptable.

Buddhism, in its analysis of transgenic applications, also focuses on the motivation involved. According to the Buddhist scholar David Loy (2005: 4), transgenic animals are not good or bad in and of themselves; it is the human motivation in developing and using them that matters. The Buddhist understanding of *karma* is that actions motivated by negative intentions tend to bring about adverse consequences, while actions motivated by good intentions tend to bring beneficial results. If our eagerness to develop and use transgenic animals is motivated by generosity, loving kindness and wisdom, which could include the mitigation of climate change, we can conclude that this technology is likely to bring good results. If, however, we are motivated by greed, ill will and delusion or ignorance, then we should expect this new technology to increase, rather than reduce, our suffering and frustration (*dukkha*). This Buddhist approach does not imply that any GM technology is bad in itself. Rather, it is our problematic and confused motivations that tend to lead to negative consequences. Loy offers a Buddhist rule of thumb: “Is our interest in developing transgenic animals due to our greed or ill will; and...can we become clear about why we are doing this? Among other things this means: do we clearly understand how this will reduce *dukkha* [the suffering of humans and animals], and what its other effects will be?” (Loy, 2005: 7). Loy doubts that we have reached such clarity of intention and understanding in our current industrial agricultural biotechnology.

Where Religions Draw the Line

As the religions consider the issues raised by genomics, genetics, and applications to animal biotechnology, places where they would “draw the line” are beginning to emerge. For Muslim scholars, any frivolous application or one that would alter the natural identity of an animal is rejected as a human usurpation of Allah’s role. In both science

and biotechnology, all use of animals must be shown to be required by human necessity and to minimize pain upon the animals involved (Masri, 1986: 192). In Judaism, the Talmud and other authorities are clear that animals are to be fed before humans eat and are not to be worked on the Sabbath, when they must be free to roam the fields. This last requirement would seem to run strongly counter to modern factory farming practices. According to one authority, the crowded, confined and inhumane ways food animals, such as chickens, are farmed makes it questionable whether or not they can be regarded as *kosher* regardless of how they are slaughtered (Regenstein, 1991: 194). However, here the overriding ethical principle for Judaism is that care and kindness to animals is for the higher purpose of humanizing humans in their relation with each other, rather than primarily out of concern for animals. The Talmud specifically rules out crossbreeding of animals. But, as we have seen above, transgenesis in animals has been found by Jewish scholars not to violate the crossbreeding prohibition or to significantly alter the natural identity of animals (e.g. the “cow-ness” of cows or the “chicken-ness” of chickens).

In Christianity, earlier thinkers such as Augustine, Aquinas and Luther all emphasized the principle of human dominion over animals, in which animals are seen to exist only for humans’ physical and spiritual benefit. Aquinas allowed that cruelty to animals is sinful, but was mainly concerned that cruelty to animals may lead to cruelty toward humans. Due to the theological shift taking place with the advent of Christian environmental ethics, however, humans are now seen to be part of, rather than separate from, nature. Historically, this may have its roots in St. Francis’s love for animals. However, Albert Schweitzer started the modern shift with his extension of Christian love to include “reverence for all of life” and the requirement that humans, if they cannot refrain from killing animals, must at least be ecologically respectful and just in such killing (Nash, 1991: 117–121). Rosemary Reuther (1992) noted that creation-centred theologians such as Norman Wirzba, Matthew Fox, Teilhard de Chardin and Alfred North Whitehead offered Christian theologies that overcome the human/nature dichotomy as well as the separation of nature from God. The American Methodist theologian John Cobb, Jr., (1993: 172) described God as sacramentally or even incarnationally present in all of nature. He wrote:

To think of all... living things as embodying Christ must give us pause. A creature in whom we see Christ cannot be only a commodity to be treated for our gain or casual pleasure.

If all are in Christ, observed Cobb (1994: 178), then in some way our treatment of animals is a reflection of how we treat Christ. Such a view clearly rules out any frivolous or instrumental use of animals. It also brings the Christian worldview with regard to animals very close to those of Hindus and Buddhists. Cobb concluded that this realization does not mean that Christians will suddenly be able to stop harming animals. But the recognition that like us, animals are in Christ, will lead humans to wrestle with problems related to their suffering that could result from climate change. For Cobb, any application in science or animal biotechnology that causes suffering is ruled out.

In contrast with the one-life orientations of Judaism, Christianity and Islam, the presuppositions of *karma* and rebirth lead Hindus and Buddhists to see the question of

where to draw the line in a quite different light. Since animals may have been humans in past lives, and will at some point be reborn as humans in the future, the use of animals in science or agriculture should be viewed with the same ethical restrictions one would use if they were human now. In scientific experiments, this means animals deserve the same health, safety and intrinsic-value considerations one would give to humans. In agriculture, the implication is that while animals can aid humans by pulling ploughs, for example, or providing dairy products, they should not be used for food, hence the vegetarian ideal. And whereas the Western religions have agreed to the sacrifice of animals in a laboratory environment for human-health benefits, the Eastern religions are much more reluctant to accept such treatment of animals. Not only is it seen as tantamount to engaging in the imprisonment and killing of beings with souls, but such treatment of animals will, in the Eastern view, also result in suffering in future lives for all of the humans involved (Chapple, 1986). The resultant suffering will not only be visited upon individual scientists, but upon the society that allowed animals to be used in processes in which their intrinsic nature as future human beings is ignored. Evidence of these consequences can already be seen in the negative aspects of science that now plague the world, such as death and disability from adverse drug reactions (*e.g.* the thalidomide tragedy), increased militarization, and ecological destruction from unsustainable agricultural practices (*i.e.* human violence upon the soil, air and water).

Buddhists express similar concerns about the future results of genetic experiments upon animals. While such activities may help to relieve human suffering in this life, from the Hindu/Buddhist long-term perspective of being reborn over and over until one reaches *nirvana* or enlightenment, such efforts pale into insignificance and are not worth the added suffering (*dukkha*) they bring to the scientists, animals and the societies involved. Thus, says the Buddhist scholar Christopher Chapple (1986), in the case of whether to use animals in scientific research, the three considerations of intentions, means and consequences would need to be considered in each situation. Many current uses of animals would be deemed unnecessary. Only in exceptional cases would the intention be deemed acceptable, such as the testing of a vaccine desperately needed to prevent an epidemic. The mitigation of the potentially devastating effects of climate change could also be included here. The means employed would have to ensure that pain to the animals is minimized, and the consequences considered: will lives of humans and animals, in fact, be saved? Will unintended reactions such as genetic damage, increased cancer risks, or the loss of biodiversity also occur? Such considerations, when used with care, would constitute a reasonable approach to evaluating the use of animals in biotechnology applications for some Hindus and Buddhists. Others, however, would reject altogether any attempt to justify animal biotechnology.

AREAS OF AGREEMENT

Having reviewed how various religious traditions draw the line, let us conclude by briefly noting areas of agreement. All religions would seem to share a common conviction that frivolous applications of animal biotechnology such as the glowfish, cosmetic research or the cloning of pets, are seriously questionable from a moral point of view. There is also a

common focus on motivation, especially in the Eastern traditions of Hinduism and Buddhism. If the application is meeting a real human or ecological need (e.g. the mitigation of climate change) it may be seen as acceptable. However, if it primarily reflects individual or corporate greed or a scientific drive to be first (hubris, vanity), then it is not viewed positively by any religion, nor indeed by the majority of the stakeholders interviewed for this study. Finally, the concern that the *telos* or species integrity of animals may be challenged by some kinds of genetic modifications was raised in the stakeholder focus groups and by the theologians of many religions. Doing such things as described above to animals, which are divinely created, generates a sense of abhorrence among lay people and a view that humans are overstepping their stewardship limits when they change the essential nature and identity of an animal. The religions are just beginning in their analysis of genetic applications and have yet to compare them with other alternatives that would, for example, be just as effective in meeting environmental challenges. For example, Tariq Ramadan (2009: 233), arguably the leading scholar of Islam in the West, said that reflection about respecting the environment or about how animals should be treated is virtually non-existent in Islam.

Policy and Regulatory Concerns from the Religions' Perspectives

Like NGOs, animal-rights groups, ethics committees and various secular publics, members of religious traditions comprise a wide segment of civil society and have distinct ethical views about animal and plant biotechnology that deserve to be included in public-policy and regulatory-decision making. In considering the acceptability of biotechnology, religious traditions address a broader spectrum of concerns than just scientific and regulatory issues. Religions tend to focus on moral issues, such as the place of animals and plants in the natural order, which the formal discourses of law and science typically rule out of bounds. Religious perspectives on the relationship of humans and animals depend on a number of presuppositions concerning the divine order of creation, the nature (*i.e.* soul, rationality) attributed to animals and the manifestation of the divine in and through them. As such, the genetic modification of animals, whether for research or commercial purposes, raises ethical concerns that are very important to followers of these traditions.

Religious views and beliefs about animals and plants are typically expressed in the form of dietary restrictions. In North America, with its multicultural and religious diversity (representing all of the religions discussed here), there is strong interest in clear and detailed labelling of commercial food items sufficient to give consumers the ability to select those that do not violate their religion's food prescriptions. For example, Hindus and Buddhists practising the vegetarian ideal of their traditions must be able to be confident that what they are purchasing and eating contains no animal materials. The same is true for secular vegetarians. Christians who hold theological convictions about the genetic modification of animals—for any one of the reasons discussed earlier—may wish to avoid genetically engineered foods in any form. Consequently, clear labelling seems especially important in a country such as Canada where freedom of religion is specified in the Canadian Charter of Rights (1982). As one member of the Health Researchers focus group, who self-identified as a Christian, put it, “My church creeds talk about respect for nature. That

pervades what I do in my work...and I think it pervades policies for the protection of human health that the Canadian government implements.”

In a recent study of the acceptability of genetically engineered foods for members of religious traditions, Conrad Brunk, Nola Ries and Leslie Rodgers gave special attention to the regulatory implications of religious dietary practices (Brunk *et al.*, 2009). Responding to the views expressed by groups of lay people from the major religious traditions, they drew the following conclusions:

- Nearly all religions have beliefs that place limits on the production, preparation or consumption of food. These practices will manifest themselves in consumer acceptance of new food technologies.
- For these religions, DNA is ontologically and ethically significant. Thus, transgenes from animals considered impure or inappropriate for consumption may constitute a “contamination” of foods into which they are transferred, and are likely to be met with rejection by consumers.
- Religious adherents need information not only as to whether a product contains genetically engineered organisms, but also about the source of any transgenic material.

Brunk *et al.* (2009) concluded that it is “incumbent upon regulators of food technology to establish mechanisms that require public access to the information about the origin of any transgenes in genetically modified products.” The dietary concerns of these religious communities or their concerns over climate change, fall within the fundamental rights of religious and moral conscience to which a liberal democratic society should ascribe special weight and respect. The same applies for secular vegetarians.

CONCLUSION

In this presentation I have described secular and religious ethical perspectives that can be engaged in evaluating agricultural responses to climate change.

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HAROLD COWARD is a scholar of international reputation whose contributions to the Universities of Victoria and Calgary throughout his extensive academic career are most distinguished. Most recently, he finished his tenure as founding director of the Centre for Studies in Religion and Society at the University of Victoria. In that capacity since 1992, he established a highly respected research-oriented Centre for the study of religion and society. In retirement, Dr. Coward continues to be involved with the Centre as a research fellow.

In 2002, he was selected as one of the twenty-five Power Thinkers in British Columbia by the *BC Business Magazine*. He has served as president of Academy II of the Royal Society of Canada, and, in 2001, he was appointed to the Genome BC board of directors and has chaired the ethics and society committee. His edited books include: *Ethics and Climate Change*; *Hard Choices: Climate Change in Canada*; *Visions of a New Earth*; *Religious Perspectives on Population, Consumption and Ecology*; and *Acceptable Genes: Religious Traditions and Genetically Modified Foods*. He was a presenter at the Pew Initiative on Food and Biotechnology workshop “Exploring the Moral and Ethical Aspects of Genetically Engineered and Cloned Animals,” in Washington, DC, in 2005.