Review

Ethical management of food systems: plant based diet as a holistic approach

Tina HT Chiu RD[1], Chin-Lon Lin MD[2,3]

[1]*Taiwan Vegetarian Nutrition Society, Xindian City, Taipei, Taiwan.*
[2]*The Buddhist Dalin Tzu-Chi General Hospital, Dalin, Chia-Yi, Taiwan*
[3]*Department of Medicine, College of Medicine, Tzu-Chi University, Hualien, Taiwan*

While improvement in agricultural technology had enabled the production of abundant food, it has thus far failed to eliminate hunger. Malnutrition is expected to reach an all time high. Evidences have suggested that animal based diet has put immense pressure on the already fragile food system, contributing to problems in terms of global food security, health security, and environmental sustainability. Plant based dietary approaches may therefore, target some of these problems from the roots, and may be a solution to improving ethical issues and equity in the current food system. This paper examines how meat production and consumption contributed to the current crises in the food system through the lens of ethics – the moral compass – to find directions on how the present generation should eat, and how the food system could be maintained for a better future.

Key Words: vegetarian diet, ethics, food supply, ecosystem, meat

INTRODUCTION

The rising human population – which is expected to reach 9.2 billion by 2050[1] – has exerted greater demands on natural resources to provide the necessities for life. Although technology had enabled abundant food production, food has not been distributed equally. As a result, both under-nutrition and obesity are major public health problems today.[2, 3] Meanwhile, environmental degradation, energy intensive agriculture and climate changes continue to hinder the sustainability of the current food system. How the growing population could be supplied with adequate, wholesome foods to maintain health will be a major challenge of this century. Principles of ethics and equity may act as a moral compass to provide guidance on better management of the food system.

A FRAMEWORK OF ETHICS IN THE FOOD SYSTEM

The study of ethics involves the evaluation of morality through various ethical philosophies. In the past, issues in food and health security were frequently examined through the human rights perspective. However the scope and the impact of these issues could be far reaching that other elements of the food system such as the environment, the animals and the plants, need to be considered. This paper presents arguments based on the three predominant contemporary normative ethical theories: utilitarian, deontological, and virtue perspectives. The utilitarian perspective is a consequence based approach in which the morality of an act depends on the consequences of that act.[4] The deontological perspective is a duty based approach in which choices are morally required, forbidden, or permitted, that guide and assess our choices of what we ought to do.[5] Some examples of moral duties defined by WD Ross are: duty of beneficence, duty of non-maleficence ("do no harm"), duty of justice and duty of gratitude.[6] The virtue perspective is a character based approach, in which morality stems from the character of the individual. Possessing a virtuous character makes one moral and one's actions a mere reflection of one's inner morality. The three central concepts of virtue ethics are: virtue, practical wisdom, and eudaimonia.[7]

For the purpose of this paper, we have integrated the three ethical perspectives into a Tree Model (Figure 1). In this model, the virtue ethics represents the roots; the deontological ethics represents the trunk, the branch and the foliage; and the utilitarian ethics represents the fruits. This model serves as a framework to help one conceptualize how the three ethical perspectives are related when examining the morality of current practices through these lenses. In this framework, a holistic solution to ethical management of the food system should contribute to the greater good as a whole, in accordance with moral duties such as benevolence and non-maleficence that stem from virtuous characters and wisdom. Unethical acts, on the other hand, are acts within the food system that threaten the well-being of the majority and the environment, that create injustice and suffering, that violate moral duties, as well as acts that are motivated by greed and cruelty or other characters opposing to virtue.

Corresponding Author: Dr. Chin-Lon Lin, The Buddhist Dalin Tzu-Chi General Hospital, Dalin, Chia-Yi, Taiwan; Department of Medicine, College of Medicine, Tzu-Chi University, Hualien, Taiwan 2 Ming-Sheng Road, Dalin, Chia-Yi, Taiwan.
Tel:(03)8561825~5305;Fax(03)8572546
Email: cllinmd@mail.tcu.edu.tw
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ISSUES OF ETHICS AND EQUITY IN THE FOOD SYSTEM

Food security

A recent report from the Food and Agriculture Organization of the United Nation (FAO) estimated that hunger and under-nourishment will reach a historical high of 1020 millions in 2009, with the greatest number from the Asia Pacific (642 millions), and highest prevalence in-Sub-Saharan Africa (32%).[8] Ironically, at the same time, more than one billion adults are overweight with at least 300 million of them clinically obese.[3] The co-existence of obesity and under-nutrition is the consequence of inequal-

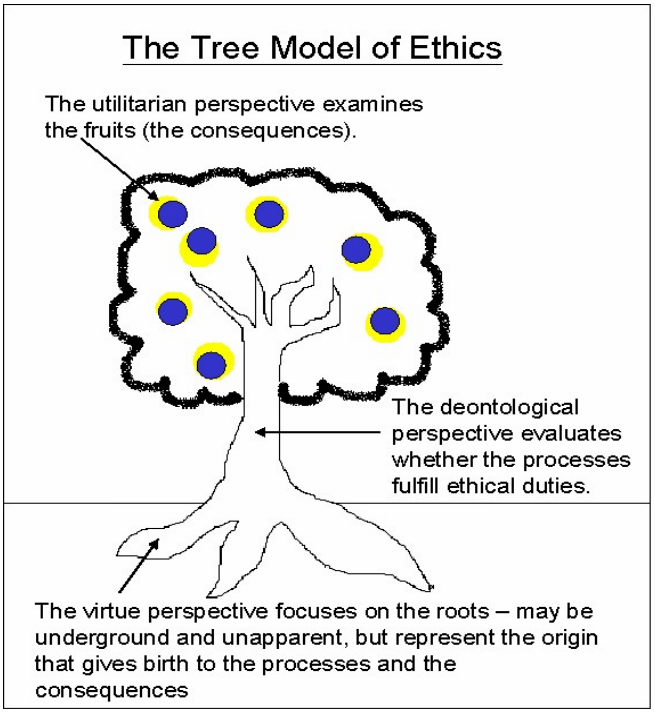

Figure 1. The Tree Model of Ethics

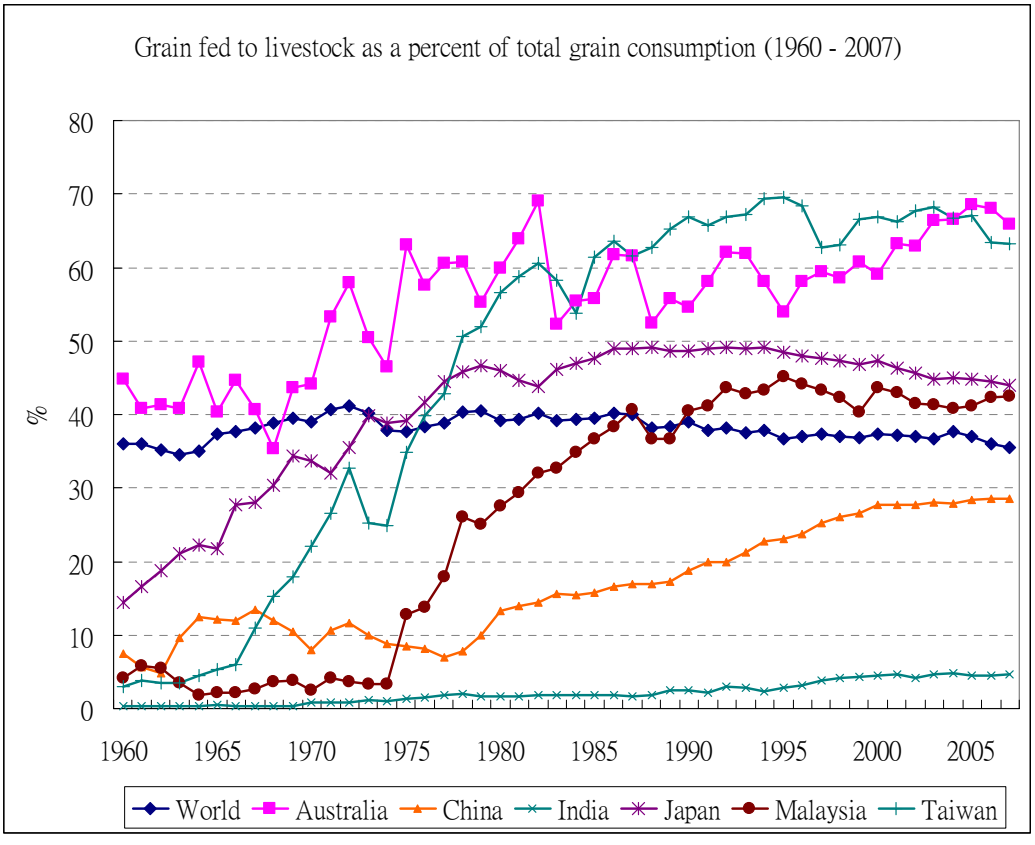

Figure 2. Percent of grain consumed fed to livestock. Data retrieved from World Resource Institute online database.

ity in food distribution due to multifaceted causes. These include natural disasters, human conflicts, economical and political instability. High meat consumption may have, in part, contributed to the fragility of the present food system. Animal based diet puts more stress on agriculture, as feeds need to be grown first for animals – a medium in which energy and nutrients are inefficiently transferred. Meat production, compared with soy on a per gram of protein basis, requires 6–17 times more land, 4.4–26 times more water, 6–20 times more fossil fuel, and 7 times more phosphate rock.[9] Figure 2 shows the percentage of total consumed grains fed to livestock, from 1960 to 2007 in the world and in selected countries in Asia Pacific.[10] Throughout the past fifty years, approximately 35% – 40% of consumed grains in the world had been used to feed livestock, with Australia and Taiwan having the highest proportion (60-70% range) in recent years. There is an increasing trend among emerging economies such as China (from 7.5% in 1960 to 28.5% in 2007) and Malaysia (from 4.1% in 1960 to 42.5% in 2007). As grains and soy are fed to livestock, the availability of these foods for human consumption is reduced, driving the price of food to increase and making these foods less affordable to the poor. In the end, a disproportionate majority of food goes directly or indirectly to feed the wealthy. Meats, in this respect, could be deemed as a tool that directs more grains to the wealthy, who otherwise, could not have consumed so much. The planting of feed crops, may often take advantage directly or indirectly of those in poverty, who are more likely to be nutritionally compromised and need the land to plant a variety of indigenous crops to support their own nutrition and health. With the current population growth and the adaptation of a meat based diet in many countries, the disparity in food availability between the rich and the poor will likely widen in the future. Plant based diet, may allow increased available crops for human consumption and therefore could potentially alleviate food insecurity.

Health security

Major health threats related to animal foods arise from both the production system and the health consequence of meat consumption. These include infectious diseases from antibiotic resistant microbes and novel viruses, and diet related chronic diseases.

Approximately 50% of all antibiotics have been applied to animal agriculture, to prevent the spread of infections in the unnaturally crowded factory farming environment, and also to enhance the level of yields.[11] Such overuse has led to accumulation of antibiotics in meat intended for human consumption,[12] and allowed microbes found in food animals such as chicken and pork to develop antibiotics resistant genes.[13, 14] These could potentially worsen the antimicrobial resistance crisis in humans.[11, 15]

Viral infections associated with hunting and meat production activities could potentially lead to serious health problems. Bush meats from hunting activities in Africa have been found to contain novel strains of retroviruses (similar to HIV). Hunting and slaughtering activities involving blood contact with these animals have led to the spread of such viruses.[16] Indeed, cases of zoonotic transmission of retroviruses to human occur more frequently than most people realize in both Africa and Asia.[16-18] These potential threats, similar to HIV, should be a concern for public health and ethics. There is also a large economical cost associated with animal-related transmission of infectious diseases. In Asia, severe acute respiratory syndrome (SARS) originated from the live animal market, possibly spread from bats to civets,[19] which in turn were eaten by humans. This disease had cost the Southeast Asian economy a total of 60 billions USD.[20] Outbreaks of the bird flu, H5N1 and the recent swine flu, H1N1, are more examples of viral infections, showing how production of foods from animal origin could potentially contribute to alarming public health problems. Close contact of animals with human in high density areas provide opportunities for microorganisms to colonize different host species through mutation. This can potentially result in brand new strains of microorganisms that are beyond our control. In addition, globalization has made the spread of any infectious diseases more efficient than ever. The above examples illustrate the potential and unknown dangers of intensive animal farming and exploitation of wild life, both of which are rooted in the demand for food from animal sources.

Meat eating is also linked to the current major leading causes of death such as cardiovascular diseases and cancer.[21] Well-established evidence has shown that saturated fat – animals being the primary source – increases cholesterol level in the human body, therefore leading to cardiovascular diseases.[22] Vegetarians have been shown to have lower incidence of ischemic heart disease.[23, 24] The 2007 World Cancer Foundation's report, *Food, Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective*, categorizes the evidence in terms of red meat and processed meat to colorectal cancer as "convincing".[25] Consumption of meat has also been linked to hypertension and diabetes.[26, 27] Plant based diets, on the other hand, are considered protective, as they contain chemopreventive nutrients and phytochemicals that are deficient in animal sources of food. Although vegetarian diets, especially a vegan diet, may be inadequate in vitamin B12, the potential risk of vitamin B12 deficiency is miniscule and preventable by vitamin B12 supplementation or consumption of fortified foods. In comparison there is a much higher risk for cardiovascular diseases and some cancers correlated to the consumption of animal foods.[21] The American Dietetics Association has also stated in its position paper that "appropriately planned vegetarian diets are healthful, nutritionally adequate, and provide health benefits in the prevention and treatment of certain diseases".[28]

Pro-arguments for animal foods tend to focus on choosing lean meat and low fat dairy as healthy alternatives. The effect of this strategy is likely minimal in the reduction of chronic diseases at the population level, as harmful substances are not completely eliminated from the food system. For example, the eliminated fat portion most often end up being disguised in other food items, such as cream, sausage, and other processed foods, which then re-enter human's diet.[29] These food items might be sold at a lower price, to those who are less health conscious and usually those with a lower income, thus creating health disparity between the rich and the poor. The production of lean meat unfortunately results in the fat

portion of meat being consumed in other forms, inevitably leading problems in health security and equity.

From the utilitarian perspective, animal based diets pose serious health threats in both production and long term consumption. Thus a major reduction of meat consumption, especially by those who over consume, is not only ethical but also vital for the health of our population.

Animal welfare

The brutality of killing animals and factory animal farming has also been an important reason why many people choose to become vegetarians.[30, 31] The conscience of a virtuous person does not allow one to tolerate death camp-like treatment of animals. For meat eaters, such conscience is often blinded. The reality of animal farming is often unapparent especially when meats are elegantly served in a social-cognitive environment where meat eating is encouraged, while the suffering cries of animals are unheard. As an illustrative example of moral conscience, butchers who have to kill animals, experience fear and guilt from their acts, such that they sing the following song (translated from Chinese) before slaughtering, in an effort to shed guilt:

Piggy, Piggy, please don't blame me!
You are a dish for humankind!
He doesn't eat, I don't kill.
To revenge – go to those who eat meat!

Torturing and killing of animals could also have a more global effect. In many philosophies and traditions, it is well accepted that killing procreates killing and that wars and human conflicts originate in part, from the killing of animals.[31, 32] Perhaps, when our conscience is conditioned to tolerate killing and torturing of animals, killing and torturing in other forms become more acceptable. From the virtue perspective, the loss of compassion and the breeding of cruelty should be of serious ethical concern.

Environmental sustainability and biodiversity

According to a 2006 FAO report, *Livestock's Long Shadow,* livestock production had been one of the primary culprits for environmental crises such as global warming, land degradation, air and water pollution, and loss of biodiversity.[33] In this report, livestock occupied 26% of the earth's entire land surface, used up 33% of global arable land for feed production. and had been responsible for 18% of greenhouse gas (GHG) emission.[33] Seventy percent of the Amazonian rainforest had been degraded for cattle rearing.[33] As rainforests were replaced by pastures and cattle, biodiversity quickly disappeared, and carbon dioxide was released into the atmosphere.[34] Deforestation itself accounted for about 20% of global emission of green house gases.[35] With increasing GHG emission since the publication of *Livestock's Long Shadow* and some previous potential under-estimation, the Worldwatch Institute, in its 2009 report, had estimated livestock related GHG emission to be greater than 51%.[36] One study revealed that a diet based on vegetables, cereal, and legumes is associated with the lowest GHG emissions except when those foods are transported by airplanes.[37] Animal products, including dairy, are associated with higher GHG emission, with the highest emission occurring in meats from ruminants.[37] A comparison of vegetarian versus omnivorous diets also revealed that the omnivorous diet required 2.9 times more water, 2.5 times more primary energy, 13 times more fertilizer, and 1.4 times more pesticides, than the vegetarian counterpart.[38] A plant based diet, therefore, offers a promising solution for mitigating climate change and improving environmental sustainability.

Meat centered diets also immensely threaten biodiversity and indigenous cultures. The Amazonian rainforest – 70% of which degraded for cattle rearing – is the home to approximately 40,000 plant species, 427 mammals, 1,294 birds, 378 reptiles, 427 amphibians, 3,000 species of fish, and 200,000 indigenous people from 180 ethnic tribes.[34] For them, the rainforest is a home that provides food, shelter, tools, medicine, and the pathway to their spiritual life.[34] Ethical issues, then emerge as to whether it is morally right to destroy the biodiversity and other human cultures to satisfy the appetite of the wealthy of this generation. The impact of such loss is profound. Many of the yet-to-know species could potentially contain ingredients that might be applied to many other fields of human endeavor, such as medicine, as ethnobotanist Mark J Plotkin put it:

There exists no shortage of "wonder drug" waiting to be found in the rainforests, yet we in the industrialized world are woefully ignorant about the chemical – and, therefore, medicinal – potential of most tropical plants.[39]

These are precious resources, generated by millions of years of natural evolution, and may not be restorable by carbon market or reforestation. The value of the rainforest and the ocean are often under-appreciated in current civilizations. Ignorance of the real costs of consuming fish for food has led to the continuous exploitation of the ocean, so that 91% of marine species have reached the state of depletion (>50% decline), 38% collapse (>90% decline), and 7% extinction (100% decline).[40] With the current trend, a global collapse of all taxonomical groups currently fished is estimated to occur by the mid-21st century.[40] With fisheries collapsing, one wonders whether it is ethical for dietary guidelines to encourage consumption of fish for n-3 fatty acids, the health benefit of which is still under debate,[41, 42] and probably unnecessary in vegetarians who are already shown to have a lower risk of cardiovascular diseases.[24, 42]

Livestock sector – although considered a significant social and political sector for some developing countries – generates less than 1.5% of total GDP in the global economy[43] at the expense of long term environmental sustainability. Rainforests and other natural resources, if managed properly, contain unlimited potential for economic transformation. For example, if the intellectual property rights of the medicinal compounds were to be rewarded partially to the indigenous populations who first discovered them, [39] some of the native people could potentially generate higher income with their knowledge of the medicinal plants than their current farming, fishing, and animal rearing practices. The opportunity cost of meat production, therefore requires closer examination. Meat production, from this perspective, probably has led to the destruction of the resources that could potentially improve equity and long term well-being for the indigenous population. An ancient Chinese proverb says: *Do*

not kill the hen for the eggs; it would be unwise to sacrifice the foundation of our future well-being for temporary satisfaction. Destroying precious natural resources to produce meat may be equivalent to killing a poor man's hen to obtain the eggs to feed a rich man.

From the utilitarian perspective, animal based diet, either derived from intensive animal agriculture or from exploitation of wild life in the natural habitat, is linked to environmental degradation. These consequences are threatening the ability of the land and the ocean to produce food, and the survival of many species including human beings. From the deontological perspective, environmental stewardship should be considered a moral duty, and dietary choices that help preserve the environment ought to be practiced. In the natural world, organisms higher on the food chain usually exist in smaller numbers to ensure balance within the ecosystem. Human beings have conquered many natural threats that enabled the human population to multiply beyond natural balance. Thus, eating those lower on the food chain – plants instead of animal – is naturally indicated for sustainability.

CONCLUSION:

The animal based diet practice, as it is consumed by many affluent people today, originates from the human's apathy for cruelty (virtue perspective), proceeds in overexploitation (deontological perspective), and results in food insecurity, health insecurity, environmental degradation, as well as the loss of precious natural resources and biodiversity (utilitarian perspective). Such practice resembles a malignant tumor that selfishly grasps all the nutrients and resources for itself, leaving the rest of the host undernourished, and then driving the entire system to failure. The growing demands for the emerging economy to consume food like the affluent, is likened to cancer metastases to other organs. A plant based diet may provide a point of entry to solve many problems we face in the food system today. Its most virtuous effect, according to Buddha's teaching, lies in the taming of our material desire, and the nurturing of our reverence for life. These may constitute the essence to a common collaborative well being.

AUTHOR DISCLOSURES

None

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Tina HT Chiu RD[1], Chin-Lon Lin MD[2,3]

[1]*Taiwan Vegetarian Nutrition Society, Xindian City, Taipei, Taiwan.*
[2]*The Buddhist Dalin Tzu-Chi General Hospital, Dalin, Chia-Yi, Taiwan*
[3]*Department of Medicine, College of Medicine, Tzu-Chi University, Hualien, Taiwan*

以倫理經營糧食體系: 植物性飲食為全方位之道

雖然農業科技已促成大量食物增產，但至今卻無法全面解決飢荒問題。營養不足已達前所未有的高數量。證據顯示，動物性飲食對早已脆弱的糧食體系添增更多壓力、加速全球糧食與衛生危機及危害環境永續性。選擇植物性飲食是可能的治本方法，促使目前的糧食體系運作更符合倫理，更加強公平性。本文以倫理之觀點探討肉類的生產與食用對於現今糧食體系危機的影響，並找尋更理想的解決之道。

關鍵字: 素食飲食、倫理、糧食供應、生態系統、肉類