



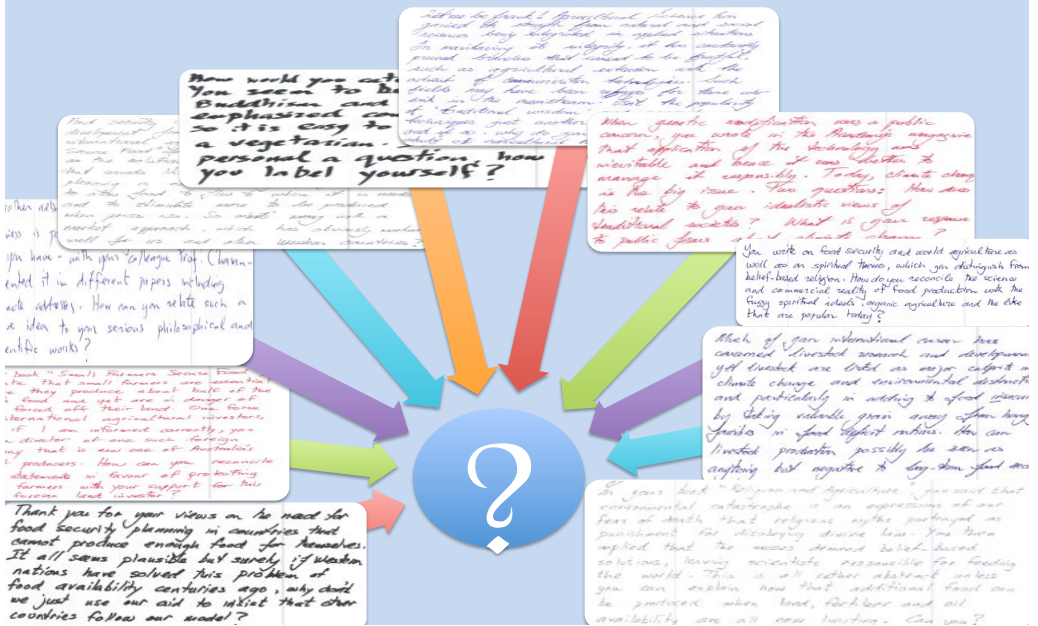
Beliefs that Bias Food & Agriculture

Questions I'm Often Asked

Lindsay Falvey

These ten essays answer questions addressed to the author in various forms. Some are personal, while others relate to global issues. All are answered with candor and detailed explanation. The answers will not suit those who seek confirmation of popular viewpoints, nor will they suit those who insist they are doing good without having knowledge of what they are really doing. But they will admirably suit those extremely important persons from all walks of life who are open to new knowledge, who can accept challenges to their beliefs and received knowledge. The answers cover such topics as:

- *Why livestock are critical to food security*
- *Why free trade and markets can't solve food shortages*
- *Why aid shouldn't insist poor countries follow our model*
- *How to reconcile science and commerce with popular ideals*
- *How Gross Domestic Happiness can be a serious topic*
- *How more food can be produced with less land and fertilizer*
- *Why labels like Buddhist and vegetarian confuse life*
- *Why traditional wisdom is critical to development*
- *How misrepresentation fuels fears about climate change*
- *Why small farmers and foreign agribusiness must coexist*



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Lindsay Falvey

2013

The Institute for International Development

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Question and Answer

How to reprise lost paradise, where clansmen were always content?

On this we ever ask advice, not noting our command's contempt.

Replies arise if we ask right, as sages' sayings still console,

except when wished as black or white, thus missing their integral whole.

*Each answer's angst makes us ask more – thus are our suspect lives sustained,
supremely sure if we spark war, for our ideals are deep ingrained.*

*We're punished by our primal rites, wedding hubris with hoarded wealth,
monopolizing basic rights, and molding ethics in our stealth.*

*Blinded by our biased questions, we trust faith as truth we squander,
never knowing our great fortune – blind in paradise we wander.*

Acknowledgements

These ten essays have varied provenances. Some are edited extracts from conferences or publications. These include: the 15th Asian Australian Animal Production Congress in Bangkok; a Food Security, Science, Sustainability and Governance conference in Melbourne; a planned Yoko Civilization Research Institute of Japan conference and book; an Animal Husbandry Association of Thailand and British Society of Animal Science International Conference on Integrating Livestock-Crop Systems to meet the Challenges of Globalization in Khon Kaen; the 13th Asian Australian Animal Production Congress in Hanoi, and an article published in the international journal of the Asian Agri-History Foundation based in India. I thank each one for stimulating the ideas that allowed themes to be put into context.

Other sections and essays have been written for this book. Copious references are presented in endnotes to reflect the diverse sources used. This is essential for works such as this that attempt to integrate thought that is otherwise sequestered within a discipline or protected by beliefs or biases.

Consistent with previous books, I also acknowledge my motivation, which is mainly a desire to arrange my own thoughts. When asked such questions as those posed for each chapter and providing a verbal reply, I invariably spend time afterwards examining the subject from other viewpoints. Sometimes I learn that I was wrong or find an unchallenged belief beneath what I thought was a considered opinion. Reading and writing provides a discipline that corrects such biases and beliefs, and so reduces the stress that wrongly held views inevitably bring. In acknowledging this origin of the book, and knowing that it may still contain bias and beliefs, I yet hope that it helps clarify the subjects it addresses.

JLF

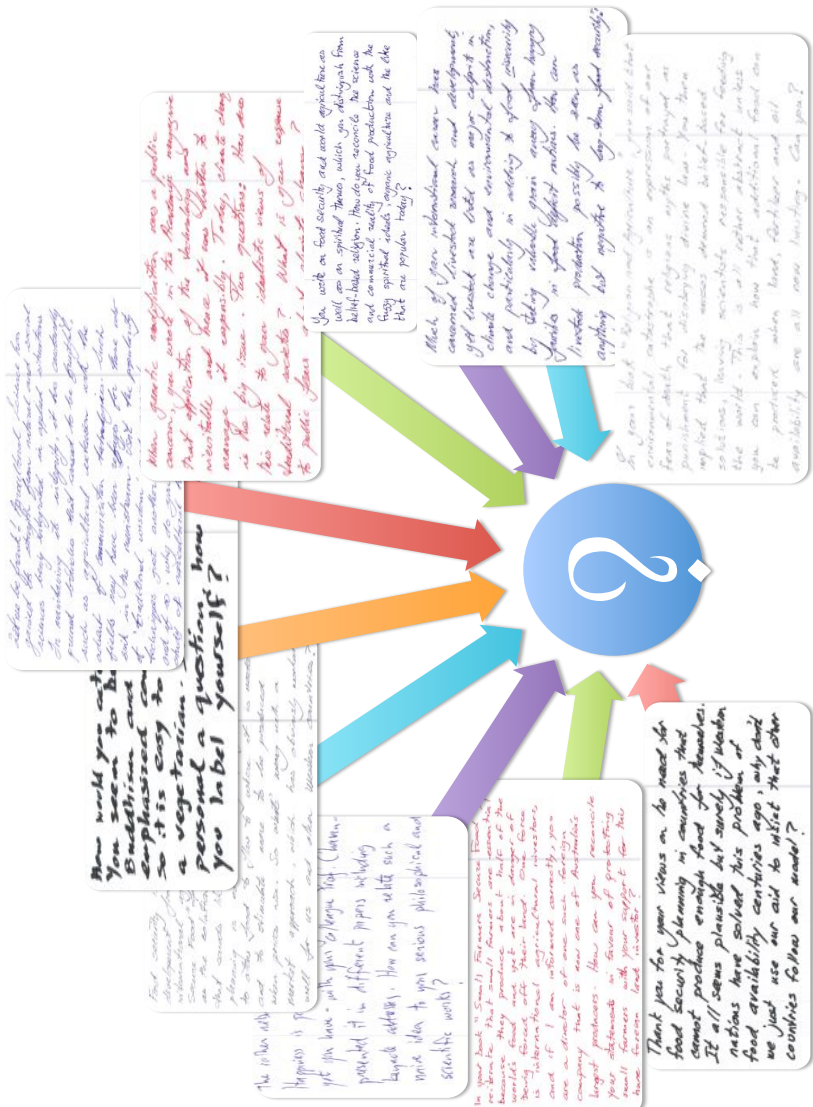
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Author's Preface

It is normal for one culture to view itself as superior to another. And it is normal for the culture of a powerful tribe or nation to expand through adoption, enforcement or incentive. So when we who live in comfortable Western lifestyles regard poorer nations, it is quite normal to assume that we have some experience relevant to them. Thus we use our influence to help them become more like us. What could be better than a life like that of the urban middle-class in a Western country? The question is confirmed as rhetorical by the rush we observe of those other persons seeking to emulate our lifestyles. Accordingly, possessed of superior knowledge and experience, we see ourselves as compassionate in extending aid to our poor cousins in less fortunate parts of the world so they can catch up to us. Thus we hope that in a brave new future we will all live in a world as peaceful and well-serviced as our leafy suburbs.

I accept this view as pervasive. It has taken a beating in recent years in the USA and Europe more than in Australia, but it remains a powerful meme. But in accepting that the view is pervasive, I am not accepting it as accurate. In fact, I find it dangerously wrong. In the essays in this book I address some of the questions that arise from that general view. They range from issues as diverse as meat, nature, rights, technology, spirituality, death, history, traditions and business. The questions posed are paraphrases of those I am asked in public fora and across dinner tables, here contrived to each generate a discussion.

The essays are not highly intellectual, even if the copious footnotes give that impression and support the views presented. They are my opinions and experience – but as I state herein, I consider informed opinion and real experience to be the basis for genuine discussion. On these subjects I have considerable knowledge and experience. By comparison, I do not consider mass media debates to be worthwhile when uninformed

opinions, vested interests, beliefs or biases are given equal credence in the face of knowledge informed by research and education. In these essays for example, I make no concessions to popular politics on climate change, or to religious beliefs that provide no real benefits.

The issues posed are grouped into ten questions that each introduce their respective essays, and are here duplicated:

Much of your international career has concerned livestock research and development, yet livestock are listed as major culprits in climate change and environmental destruction, and particularly in adding to food insecurity by taking valuable grain away from hungry families in food deficit nations. How can livestock production possibly be seen as anything but negative to long-term food security?

Food security is a major issue in the international development fraternity, yet you criticize these international agencies in your book 'Small Farmers Secure Food' for their reliance on free trade as the solution. In fact, you advocate something that sounds like central planning! Surely planning is not necessary for free trade to allow food to flow to where it is needed and to stimulate more to be produced when prices rise. So what's wrong with a market approach, which has obviously worked well for us and other Western countries?

Thank you for your views on the need for food security planning in countries that cannot produce enough food for themselves. It all seems plausible but surely if Western nations have solved this problem of food availability centuries ago, why don't we just use our aid to insist that other countries follow our model?

You write on food security and world agriculture as well as on spiritual themes, which you distinguish from belief-based religion. How do you reconcile the science and commercial reality of food production with the fuzzy spiritual ideals, organic agriculture and the like that are trendy today?

The rather nebulous concept of Gross Domestic Happiness is popular among NGOs and politicians, yet you have – with your colleague Prof. Charan – presented it in different papers including international keynote

addresses. How can you relate such a naïve idea to your serious philosophical and scientific works?

In your book 'Religion and Agriculture', you said that environmental catastrophe is an expression of our fear of death that religious myths portrayed as punishment for disobeying divine law. You then implied that the masses demand belief-based solutions, leaving scientists responsible for feeding the world. This is all rather abstract unless you can explain how that additional food can be produced when land, fertilizer and oil availability are all now limiting. Can you?

How would you categorize yourself? You seem to be influenced by Buddhism and you have emphasized compassion for animals, so it is easy to assume you are a vegetarian. If it is not too personal a question, how would you label yourself?

Let me be frank! Agricultural science has gained its strength from natural and social sciences being integrated in applied situations. In maintaining its integrity, it has constantly pruned branches that ceased to be fruitful, such as agricultural extension with the advent of communication technologies. Such fields may have been refuges for those who sink in the mainstream. Isn't the popularity of 'traditional wisdom' and ancient techniques just another haven from real science, and if so, why do you support it and the study of agricultural history?

When genetic modification was a public concern, you wrote in the Academy's magazine that application of the technology was inevitable and hence it was better to manage it responsibly. Today, climate change is the big issue. Two questions: How does this relate to your idealistic views of traditional societies? What is your response to public fears about climate change?

In your book 'Small Farmers Secure Food' you reiterate that small farmers are essential because they produce about half of the world's food and yet are in danger of being forced off their land. One force is international agricultural investors, and if I am informed correctly, you are a director of one such foreign company that is now one of Australia's largest producers. How can you reconcile your statements in favour of protecting small farmers with your support for this huge foreign land investor?

Chapter 1

Much of your international career has concerned livestock research and development, yet livestock are listed as major culprits in climate change and environmental destruction, and particularly in adding to food insecurity by taking valuable grain away from hungry families in food deficit nations. How can livestock production possibly be seen as anything but negative to long-term food security?

It is correct to note that my primary field of agricultural science was in livestock research, much of which relates to Asia and other developing regions. It is also true to note that there is much controversy over the feeding of grains to livestock before feeding hungry people, although as this essay points out the matter is far from that simple. It is also reasonable to accept that some environmental degradation occurs from mismanagement of domestic animals, while livestock's relative contribution to climate change awaits further definition. I take the most critical aspect of your question to be the role of livestock and animal science with respect to the hungry poor.¹

Introducing Food Security

Food security is probably the major global issue. Where food is scarce, governance is weak and all security is compromised. This has been the case since Empires and States began and may be traced back into prehistory as the basis of a tribe's or a nation's security. Today, we think we are more sophisticated than that. But we are not – and with a burgeoning population, instant international communication and enhanced means of fleeing from disastrous events, food security is not only the first principle of national security, but also of international security. Migration can undo the best intentions of precarious States while

also undermining the lifestyles of protected economies. It is thus a primary responsibility of government and international development to ensure that conflicts and disasters do not threaten access to the most basic forms of food that a population needs to survive. This essay explains how livestock form a key part of such food and national security.

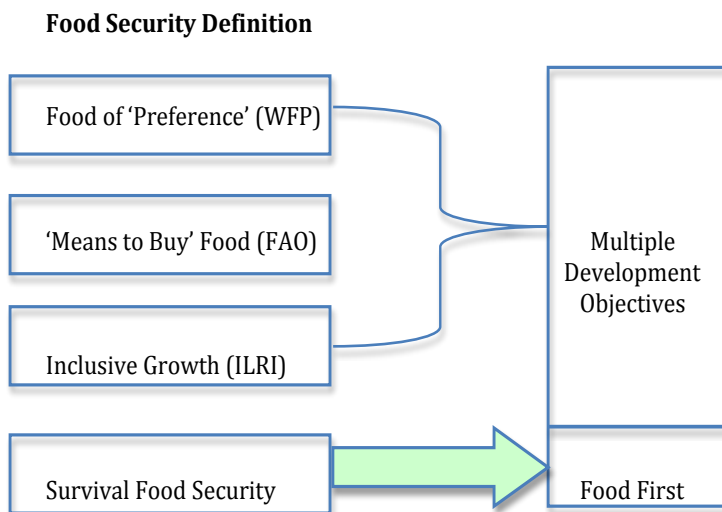
It has become fashionable to refer to the ability of a food system to maintain security as 'resilience', which so far as it extends to livestock requires acknowledgement of different types of production systems for different consumers. Such resilience refers here to ensuring the food needed to survive through natural disasters, epidemics and conflicts. It does not refer to luxury foods such as T-Bone steaks or even hamburgers.

So we are not discussing the food security of the 1996 World Food Summit, which stated that 'food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.'² We are being much more realistic – we are discussing food for survival. When food is really scarce food preferences mean little, and the world has recently increased that risk where promotion of free trade in food has directed poor country policies away from survival food security planning.³

We are also concerned here with something more real than food security in the sense propounded by FAO, which claims that 'one of the hardest challenges for food security is ensuring that all who need food have the means to buy it'.⁴ That is part of food security, but another critical part is the two billion small farmers who feed themselves and their families and are not in the 'buying' economy. In addition, we do well to conceive food security as a psychological state of safety as much as a physical state of eating, and thereby to empathize with those who are in need of food rather than some national average or international benchmark.⁵ These are all aspects of real food security.

How do livestock form a critical part of such real food security? They meet multiple development objectives while also contributing to food security, as shown in the following Figure. They also provide multiple outputs, including: high-quality protein; income; draught and traction power for agriculture; nutrient recycling; various edible and non-edible by-products, and they can reproduce themselves. I like to mention the forgotten livestock 3Rs – ruminants, rabbits and rodents – which thrive on waste products and lands not suited to other forms of food production. Of course, poultry in its varied forms also has a role, particularly in converting household waste products into edible protein.

Livestock Contribute Through all Definitions of Food Security



Livestock are not as important in overall food security as cereals, which are the major human foodstuffs. This may explain why they have been neglected in discussions, and also perhaps because their products are seen as luxury foods. Thus as FAO has

noted 'although much has been said about livestock's role in achieving food security, in reality, the subject has been only partially addressed and no current document fully covers the topic' – their 2011 report 'is an attempt to fill the gap'.⁶

The gap is also being addressed by the world's principal livestock research centre – the International Livestock Research Institute (ILRI). Until recently focused on poverty as a function of its donors' worldviews, it now focuses on food security in combination with such objectives of poverty alleviation, environmental care and health issues.⁷ In making this change, ILRI consulted animal scientists and development experts about which of three livestock sector scenarios, derived in conjunction with the World Bank,⁸ might be of greatest developmental value. The three scenarios were:

- Systems that support inclusive growth, agricultural transition, wellbeing of people now and in the future, supply gap reduction, and environmental and human health challenges.
- Low growth systems in which livestock may benefit from targeted research not conducted by others.
- Growth where livestock's negative effects on environmental services or human health might be mollified.

As a Board member of ILRI, I am encouraged to see food security mentioned, and in a context of the other competing forces on poor countries. I realize it is unlikely to be the primary focus given the economic paradigm of free trade that influences Western discourse. Nevertheless, there is another way to see livestock.

Seeing Livestock Correctly

It is reasonable to ask why livestock has been largely omitted from the most important subject in international development. One response is that our Western bias in development

approaches has caused livestock to be viewed from that perspective rather than as integral to the farming systems of smallholders in poor countries. A further expression of this may well be an assumption that herder-lifestyles and small mixed farmers are inferior and will inevitably disappear and therefore should be encouraged in their demise. Such biases, where they exist, are a disservice to science as much as they would be to development.

An external review of ILRI that I was privileged to lead prefaced its report by noting that while ‘global figures indicate that livestock are important in providing some 20 percent of food energy and 30 percent of protein ... these figures mask their relatively higher value to the poor, in terms of geographical distribution, the excess consumption of animal products in some diets and nutrient deficiencies in others, as well as cultural dietary differences’.⁹ Livestock associated with the rural poor are not usually those that are criticized among new global concerns; they do not consume much grain, are not the only source of risk of animal-to-human disease transmission, environmental damage or even the largest greenhouse gas emitters. These common criticisms of animal production are less relevant to the low-intensity systems of the poor than to the industrial systems created to feed cities. And in fact, nomadic or mixed small farming systems are highly evolved efficient systems understood by nomads and farmers in a manner forgotten by narrow Western conceptions. Similarly, fixed conceptions of animal production commonly overlook the role of rabbits, rodents, poultry, native pigs, native goats, native sheep, native cattle, buffalo, yak, camels, horses, fish, reptiles, insects and other animals providing meat, milk, blood and other food products in areas remote from affluent markets.

If we separate animal production into rangeland, integrated farming, intensive production and landless systems, we find that each contributes to food security. From the extensive pastoral systems of Mongolia and Tibetan China, to the mixed

crop-and-livestock systems that involve billions across most poor countries, to the intensive production systems that provide low value byproducts to the urban poor especially in China, to the landless dairy herders and milkers of India that ensure their neighbours have regular animal protein in their diets, each system contributes to the food security of the vulnerable poor though not necessarily in market forms recognizable to the global middle classes.

The animal raisers that service such ‘markets’ differ from those in commercially-linked systems. They view dung not only as manure, but also as a construction material and a cooking fuel, and animals themselves as not only for ploughing but also for traction, packing and working mills while providing a regular small income and nutritional contribution from milk, eggs, hair and blood. They prefer small breeds to large ones because they mitigate the risk of losing an animal, and may view a product such as meat as an end-of-working-life byproduct; they see milk as more than a liquid drink, butter or cheese and more as a storable and transportable product. And they know that the financial value of an animal set by an urban market can as a consequence grossly understate its economic value. The following boxes summarize some of the differences.

Why Livestock Owners Persist with Low Financial Returns
 (value exceeds financial (monetized) return)

Sources of Financial Returns

- Sales of meat
- Sales of milk
- Sales of hides
- Sale of wool/hair
- Sales of byproducts

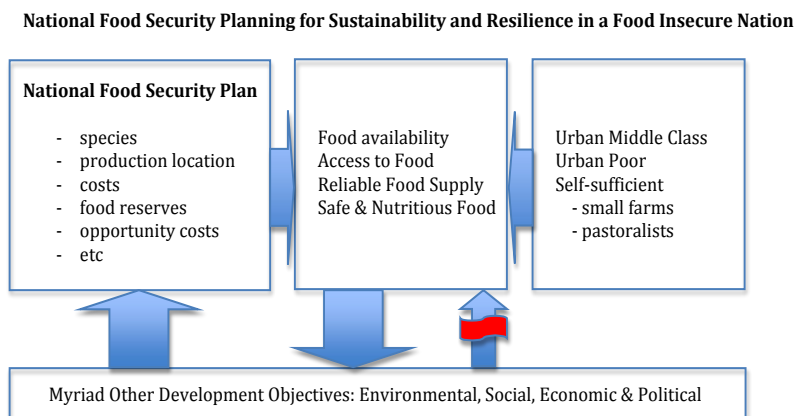
Value of Livestock to Owners

- Sales of meat
- Sales of milk
- Sales of hides
- Sale of wool/hair
- Sales of byproducts
- Traction/transport
- Draught power
- Dung: fuel/manure
- Savings
- Risk mitigation
- Status
- Religion/Tradition

So rather than assume that nomadic and pastoral systems will tend toward sedentary mixed crop-livestock systems or that all systems will move towards commercial agriculture, it is more realistic to address the needs and contributions of each animal production system. We have seen the negative environmental effects of naive sedentarization of nomadic herders, for example after 70 years of enforced settlement of Mongolian pastoralists under Russia’s governance.¹⁰ And rather than assume commercial production is the end game, we may do well to see that small subsistence farmers and their animals are providing a great service by feeding up to two billion small-farming families around the world. If those families were to migrate to cities, the consequent increase in food demand would not be met from current levels of production of broadacre agriculture even if it used all the land once tilled by small farmers.

Who is Food Insecure?

The need for planning of food security is indicated in the following Figure, which differs from the approaches found in much international literature.



FAO has collated the various UN approaches to food security into the four aspects of: food availability; access to food (during conflicts and crises also); reliability of supply, and sound food safety and nutrition.¹¹ A food system that meets all four aspects simultaneously is considered to be ‘sustainable and resilient’.¹² It is an ideal, for it seeks production of adequate food, its transportation with minimum waste and sale at affordable prices, and then adds other ideals such as monetized environmental and public nutritional education costs. It assumes free movement of food across the world and that it is possible to plan systems that are resilient to wars, economic crashes, disease and natural disasters. Nevertheless we can use the approach to define in gross terms who is food insecure. And just to be sure that I am clear, I emphasize that like many ideals, this FAO approach is a worthy goal – but to believe that such a golden age will be reached is unrealistic, and it is such beliefs that can lead to excesses.

And by recognizing this view as just an ideal, we cannot ethically impose it on food-vulnerable persons unless we somehow separately guarantee their food security. For this reason it remains more responsible to approach food security on a local rather than a global basis, which when matched with the need for legislative and sometimes military power, usually means at a national level. Hence this advocacy for realistic national food security planning based on the needs of each country, as in the previous Figure.¹³ However, since most work uses averages, the following Table of protein and energy intakes (gday⁻¹) is indicative.

Dietary Protein and Energy, and Undernourishment per Region¹⁴

Region	Protein	Energy	Calorie Deficit (%)
World	76	2,780	13
Developed countries	102	3,420	<5
Developing countries	70	2,630	16
Asia (incl. Oceania)	70	2,610	16

Some take heart that figures quoted for undernourishment indicate an absolute decrease of about five percent in the actual numbers of persons, which with rising world population represents a decrease in the percentage of undernourishment in the world from the 1980 figure of 28 percent to 13 percent in 2007 (16 percent for developing countries).¹⁵ Such arithmetic is based on food calorific intake, which omits consideration of nutritional quality – also defined as malnourishment. Malnourishment includes diets deficient in minerals and vitamins, or otherwise grossly imbalanced, and extends to some two billion persons most of whom as a consequence are exposed to increased health risks. This leads to such estimates as 146 million children being underweight, of which 31 percent are stunted.¹⁶ It is in these areas that animal products make a specific contribution.

Animal Products in Food Security

Average world consumption of food products derived from livestock totals about 13 percent in calorific terms and 28 percent in terms of protein in meat, milk, eggs and offal. The following Table presents the change in average output of selected global animal products per person over 40 years. Increased availability on a global basis does not mean that the diet of marginalized persons has improved. Where they can access these products, nutrients deficient in many diets may be reduced, particularly protein (including amino acids not readily accessible from plant foods) and micronutrients (such as iron, zinc, vitamin A, vitamin B12 and calcium) in diets of children and reproducing women. While there are no agreed nutritional scales that recommend the amounts of livestock products for different categories of persons, it is suggested that regionally gross protein consumption levels exceed the minimums except in sub-Saharan Africa.

Increases in Average Global Animal Product Output per Person¹⁷

Product	1967 (kg)	2007 (kg)	Increase (%)
Milk	110	102	-8
Beef (incl. buffalo)	11	10	-7
Pork	10	15	52
Eggs	5	10	83
Poultry	4	13	269
Sheep/goat meat	2	2	5

We all know that a healthy diet need not rely on animal products. In rich economies this leads some advocates to erroneously suggest that animals should not be considered in development planning. However, in poor countries with significant parts of the population existing on marginal diets, means of augmenting amino acid and micronutrient deficiencies may be accomplished most easily through the incorporation of animal products. Benefits accrue from small amounts of animal products, for example from meat that provides zinc and iron as well as increasing absorption of iron from plants,¹⁸ and both meat and milk that provide vitamin B12, riboflavin and vitamin A, and milk that provides calcium. With iron deficiency affecting some 1.6 billion people,¹⁹ impairing mental development of 40–60 percent of children in developing countries and implicated in 20 percent of maternal deaths each year,²⁰ ensuring reliable access to small amounts of animal products remains key to food security. And with meat consumption projected to rise more in developing than developed countries, as indicated in the following Table, it is impossible to ignore the potential role of animal food products in the diets of even the urban poor.

Projected Rise in Meat and Dairy Product Consumption²¹

Product	World Consumption (t x10⁶)			Developing Countries (t x10⁶)		
	2010	2050	% Rise	2010	2050	% Rise
All meat	269	464	173	158	330	209
Dairy (not butter)	657	1,038	158	296	641	216

Average national food consumption figures suggest an increase in animal food products in diets with rises in income.²² However, national figures hide within-country variations, and simple correlations of income and animal product consumption can miss cultural taboos such as pig meat consumption in Muslim communities or social changes such as in Thailand where a traditionally non-milk-drinking society changed to one with school milk representing 25 percent of national milk consumption compared to between one and nine percent elsewhere in the country.²³ And lest we misjudge such changes in consumption as decadent among the wealthy, it is helpful to note that much of the change is a response to wanting what is perceived as best for one's children.

Supplying some 13 percent of global calorific intake and perhaps 28 percent of protein, livestock products are a significant and routine component of human diets. Misconceptions of vegetarianism in India, for example, commonly omit the country's role as the world's leading dairy product producer and consumer.²⁴ Likewise Western fads of vegetarianism show little impact on the quantum of what may be termed localized overconsumption of some livestock products. The following Table presents the rankings of consumption levels for major foodstuffs of some animal products in developing and low-income developing countries compared to world averages. It indicates the continuing importance of animal food products – an importance that becomes acutely obvious when the needs of food-insecure persons are considered.

Calorie Consumption Ranking of Animal Products²⁵

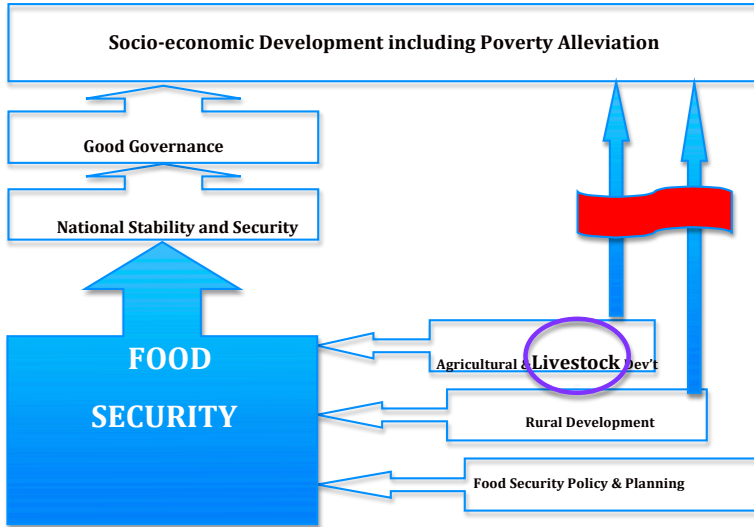
Product	World	Developing Nations	Low-Income Nations
Milk	6	7	9
Pork	7	6	13
Beef	14	16	17
Poultry	12	17	19
Eggs	17	18	22
Lamb	23	23	20

Animal Production in a Food-insecure World

Livestock production has increased markedly in East and Southeast Asia in recent decades while in sub-Saharan Africa production has lagged. Intensive production systems are responsible for most of the increase. China produces about 70 million tons of eggs and 15 million tons of poultry meat compared to India's 3 million and 0.6 million. Nevertheless, poultry production in India is rising fast and consumption rose from around 22 percent in 1985 to some 50 percent of livestock protein consumed per person in 2003.²⁶ As in Thailand, Vietnam increased dairy product consumption by 300 percent between 1996 and 2002.²⁷ The traditional dairy country of India has increased consumption from 178 grams per day in 1992 to 258 in 2009.²⁸ While such trends are less evident in poorer Asian countries like Bangladesh,²⁹ the increased production and consumption of animal products in Asia is a significant development phenomenon.

Some Asian nations are major exporters – Thailand is a case in point as one of the world's major agricultural exporters and home to one of the world's multinational agribusiness groups, Charoen Pokphand (CP). And other Asian nations also export animal products – for example, Malaysia exports milk products. But this does not add much to basic survival food security for such product mainly serves wealthy markets. The response is not to seek a means of directing exported product to the hungry poor but to see the international food trade as business – and to separately see national food security in food-insecure countries as essential to good governance as indicated in the following Figure.

Livestock Development: A Critical Component of Good Governance



Good governance for food security requires a special national plan in poor food-insecure nations, unlike Western and other food-sufficient countries. However, policies for animal production in food-insecure countries are often similar to those in food exporting nations, which can increase the risk of food shortages and malnutrition. For example, Western approaches to monogastric and feedlot ruminant diets compete with humans for grain. While it is logical that ruminants should be raised on extensive non-arable lands utilizing plants inedible to humans, dietary preferences override such an ethic in rich market-driven production systems. Even when one country is in food deficit, another country's decision to continue feeding grain to livestock is usually based on price signals. Such reliance on market signals to provide needed food can work under conditions of surplus and when the hungry in the deficit country have purchasing power – but not if either one of these factors fails. In any case, totally grazing-based ruminant production accounts for only about 12 and nine percent of world milk and meat respectively.

More important is the system of mixed grazing and crop residues occasionally supplemented with concentrates, which produces some 88 percent of world milk (but only six percent of meat).³⁰ Practicing animal scientists know the contributions of animals to food security, such as highlighted in the Box.

In a food-insecure country, animals increase food security by:

- 1. consuming products unsuited to humans*
- 2. occupying lands unsuited to agriculture*
- 3. providing manure for crop nutrient recycling*
- 4. providing draught or traction for agriculture and other purposes*
- 5. remediating key human nutrient deficiencies*
- 6. acting as self-reproducing food (protein) bank, used timely³¹*
- 7. being a food producing asset for landless farmers³²*
- 8. being a live store of food products for insecure times.*

These contributions are reduced in situations where animal production diverts feed from humans. An attempt to quantify this by FAO³³ based on trade, animal feed and crop statistics standardized by protein content indicated ‘a tendency for countries with intensive livestock systems to consume more human-edible protein than they provide compared to countries with extensive ruminant systems that augment overall supply of protein’. In confirming accepted viewpoints, such work leads some to recommend reductions of intensive animal production and expansion of mixed systems of ruminant grazing or animal consumption of biological waste products. But this is unlikely to occur since demand for grain-fed livestock – both monogastrics and ruminants – is correlated with rising affluence. A more practical recommendation in such situations is to address the options available for the nutritionally marginalized proportion of the population. Such alternative animal production thinking leads to a wider spectrum of species and production efficiencies being considered, such as rabbits in China and paddy rats in rice cultures.

Animal Production Systems

A conventional breakdown of animal production systems is presented in the following Table, which is anomalous in terms of poor-country landless animal producers and feedlot-based milk and sheep meat. Useful for most other purposes, such presentations do not provide direct information about food security. This is a clear indication that for recent decades, food production has been a focus rather than food security. Two consequences have been a reliance on average food availability figures that miss food insecure hotspots, and inadvertent support for free trade in food including essential food for survival. The latter assumption of free trade arguments for essential foods has been shown to be false in the 2007 closure of exports of rice when some wheat crops failed and national food shortages loomed in vulnerable countries.³⁴

World Animal Production (mill. t.) by Production System

	Grazing	Mixed Rainfed	Mixed Irrigated	Industrial	Total
Milk	72	319	203	?	594
Pork	1	13	29	52	95
Poultry	1	8	12	53	74
Beef	15	29	13	4	61
Eggs	1	6	17	36	59
Sheep meat	4	4	4	?	59

Rather than rely on gross national averages, it is thus more useful to break animal production into the social segments that rely on a specific production system for their nutrition, survival and livelihood. One useful categorization of animal food products in relation to food security is that used by the recent (2011) FAO discussion,³⁵ namely:

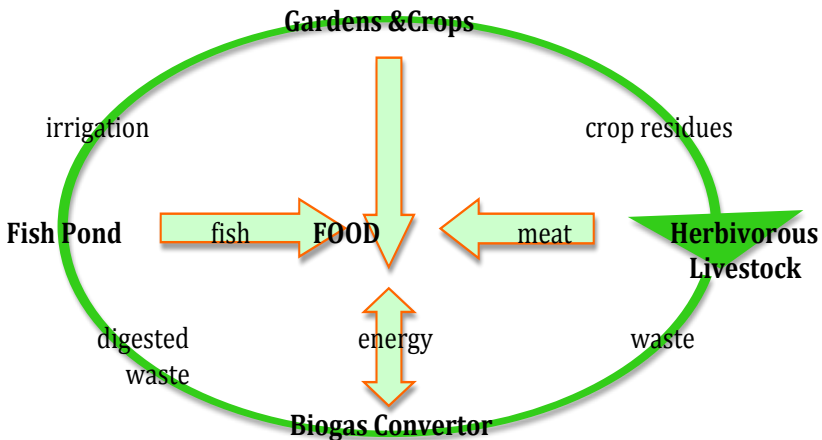
1. Livestock-dependent societies
2. Small mixed farmers
3. Urban populations

1. Livestock-dependent societies: Comprising some 120 million people who raise mainly ruminants on uncultivated and usually non-arable areas, such societies may derive 90 percent of total farm production from livestock.³⁶ Including both pastoralists and ranchers, these systems are said to produce about 19 percent of world meat production and about 12 percent of milk. On the margins of Asia, such systems in Australia make it the world's largest exporter (some 45 percent of production).³⁷ Likewise in Mongolia, extensive livestock production contributes some 30 percent of GDP and 20 percent of export earnings. Extensive livestock production and nomadic systems are often mistakenly viewed as primitive or simple – derogatory views of Mongol herder invaders and misreadings of Cain and Abel myths seem to fuel the bias toward sedentary agriculture without acknowledging the continuing useful role of nomadic and rangeland herders. In fact they represent a highly evolved interaction with otherwise uninhabitable landscapes. While it may seem that their numbers are declining, persons from livestock dependant societies need not be forced into cities, which would increase the overall demand for food of such persons by at least 30 percent above current consumption levels. Thus we might simplistically estimate that by not migrating to cities – that is, by continuing in their extensive lifestyles – their animal products contribute directly to food security to the extent of about 160 million persons.

2. Small mixed farmers: Defining a mixed farm as one where more than 10 percent of animal feed is from agricultural by-products or more than 10 percent of the farm production value is from other agricultural enterprises³⁸ leads to a wide range of animal production systems. It is these rain-fed mixed systems that produce much of world meat and milk – 48 percent of beef, 53 percent of milk and 33 percent of mutton. Often such farms are subject to single-product analyses of efficiency, which can grossly underestimate draught and traction functions and other products of large animals. For this reason it may be more constructive to use the Asian integrated farming system as the

basis for small-scale mixed farms rather than the more generalized global definitions.

Yet even the small-scale integrated farms of Asia take myriad forms, one of which is described in the following Figure that indicates the cycle crop residues through livestock, biogas and fishponds to produce outputs of crops, meat, fish and energy for cooking or other purposes.



In such farms, animals perform a range of functions in addition to the usual food products, including waste usage, provision of fertilizer and insect pest control.³⁹ Small breeds are more efficient in such systems as numbers can be varied more easily across seasons and conditions, and allow a more regular source of protein in diets. An important consideration in such farms is that they follow the same systems that have evolved through trial and error over millennia. Much development literature about such farms and ideals such as Permaculture, as discussed in another essay herein, may be viewed as a belated Western appreciation of the internal efficiencies and resilience of small mixed farms. At the same time, the miracle of China's food exports when mass starvation was predicted has included reliance on small-scale farms integrated with small animals.

Small-integrated farms that support some two billion persons are a major contributor to food security because they allow that third of humanity to continue feeding themselves in rural settings and so not add to the major food security issue that has arisen in cities. We may again simplistically estimate the food security benefit of such small farmers as being the higher potential yields of small farmers plus the 30+ percent extra production required for food to reach urban dwellers. Within this rough total, the contribution attributable to their animal production is difficult to estimate, but if we assume a yield differential in favour of small farms of 20 percent together with the 30 percent more food required for city dwellers, a total contribution equivalent to one billion persons might be claimed.

3. Urban populations: With more than half of the world's population now living in cities, although the proportion may be only 35 percent in developing countries, supply of food to cities is a critical and rising aspect of food security. It is in this urban environment that the nexus between food and poverty is important – on farms the association is more complex and variable. With already 300 million urban dwellers considered to be extremely poor and the majority of these in Asia,⁴⁰ food security related to severe undernourishment and precarious access to food is a major issue. Animal food products play a role in meeting this need, but not necessarily in the way espoused in work that has focused on the animal product consumption of the emerging middle classes of Asia. The contribution of that segment to food security is not through nutrition of consumers as much as through possible returns to animal producers who may circulate the additional wealth in rural areas and so perhaps have some effect on price induced food insecurity in rural towns.

In large cities, animal products are highly accessible to the urban rich and middle classes, but much less so to the price sensitive poor, who are in turn subject to risks of unsafe products resulting from poor hygiene, poor refrigeration and unregulated

toxin and residue levels. Having no viable connections to agriculture, the urban poor do not have the nutritional buffer of animal products or any protein reserve and are thus the most vulnerable to disease and early death. Similarly, the usual animal products do not readily lend themselves to the trend for urban households to hoard food when prices become volatile. For example, the food crisis of 2007–08 led to poor households in urban Bangladesh limiting their purchases of meat, fish and eggs.⁴¹ If such situations are not ameliorated by good governance and national food security plans, malnutrition results – or mayhem when urban groups riot.

How can cheap and reliable animal product supply to urban dwellers be managed? In fact, while the question continues to be asked in some aid arenas, it has been faced by various responsible governments, which use such mechanisms as:

- animal businesses kept within city limits
- periurban farms
- small-farm contract-growers supply linked to cities
- large commercial operations with integrated market chains
- home production
- international trade, including low-value animal parts
- alternative foods.

Urban-based livestock production is under constant pressure from concerns about compromised lifestyle amenity and risks to human health. Consequently animals are more common in poor urban areas whereby their product provides some measure of compensation to those who cannot afford supermarket prices. But even these producers are now being forced out as planners allocate priority to health risk mitigation without regard to food security for the poorest persons. For example, a constant population of more than 200,000 poultry was raised within Jakarta in 2003 and was increasing until such production was banned in the Avian Influenza programs of 2008;⁴² in Thailand tax incentives were provided to urban livestock producers to move out of Bangkok.⁴³ But China provides a better example.

The success of Chinese governments in maintaining food security in huge urban agglomerations has been linked to a much higher emphasis on self-sufficiency – much higher than is encouraged by international agencies. I have elsewhere warned against uncritical acceptance of free-trade assumptions related to food security for survival, and praised the responsible actions of India and China in this regard. Rather than claim that Chinese ‘preoccupation with self-sufficiency is partly attributable to changes in city boundaries under the Great Leap Forward’,⁴⁴ it would be more reasonable to acknowledge a sound Chinese understanding of food security and its management as a primary responsibility.

One component of the Chinese approach is to define city limits much wider than elsewhere to allow urban agricultural production within the urban governance ambit. Beijing is said to supply 70 percent of vegetables and milk internally⁴⁵ and Shanghai meets at least milk and egg demand from within city limits by governance of an area that elsewhere would be defined as 87 percent rural.⁴⁶ It is not a matter of simply noting that such land might be otherwise classified as periurban agriculture that has long been the major source of food for most cities – estimated to supply 34 percent of meat and 70 percent of egg production worldwide in the late 1990s.⁴⁷ Rather, the important difference is that urban food needs are managed as a priority by the city administration. The destabilizing urban-rural divide that Western nations bemoan at home has been addressed in China to the benefit of both cities and the countryside.

As less than 10 percent of world food crosses international borders, and as most internationally traded food comes from wealthy nations, it is no exaggeration to say that the absolute priority for food security is for national governments to focus on domestic production and delivery. At its most basic level, food security for survival should not be a component of discussions about free trade in food. In the case of animals, their mobility has

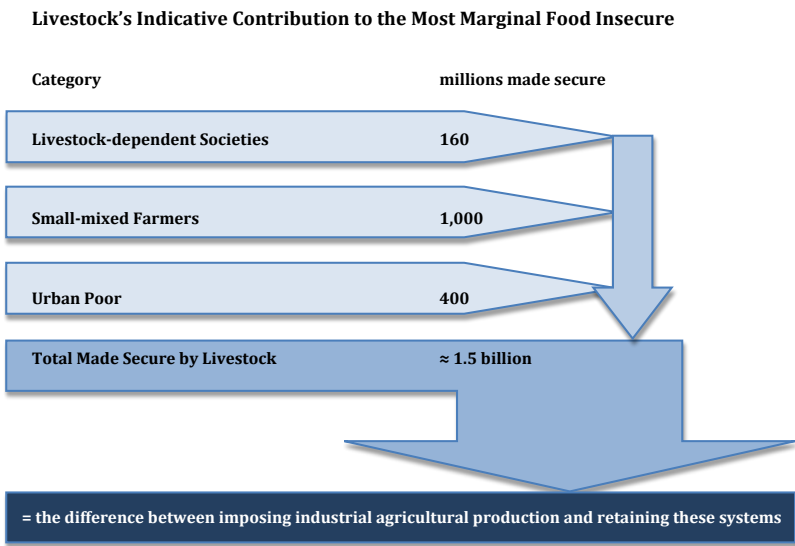
facilitated some live cross-border trade in Africa and Asia, such as the traditional walking of cattle and buffalo into Thailand.⁴⁸ This includes large-scale animal smuggling – it is estimated that unofficially one million birds per month enter Vietnam from China.⁴⁹ Such market chains are being increasingly regulated in the interests of zoonotic disease control and food hygiene, but improvements remain compromised as food demand outstrips regulatory controls.

Other means of ensuring the security of animal food products in cities can be elicited, including home production of small animals including rodents, fish tanks, penned small ruminants and elevated poultry pens. These measures are ultimately more important than postulations about international trade in animal products as a basis for food security of the urban poor. However, the minor contributor of international trade is studied in much more detail perhaps because it is of greater familiarity to those trained in Western research modes.

One example is a sophisticated consideration of several complex models to examine the impact of 15 combinations of population, income and climate change on food security through to the year 2050.⁵⁰ The conclusion that the deleterious impacts of climate change on food security can be forestalled by economic growth based on increases in agricultural productivity and international trade in food products addresses the needs of urban dwellers and assumes downward trends in food prices. These are the best theoretical results available, but they contrast with the successful approach taken in China, which is based on the historical lesson that cities without secure food supplies are ungovernable. Food security is thus seen as the basis of national security, and for this reason is increasingly attracting the interest of military intelligence groups.

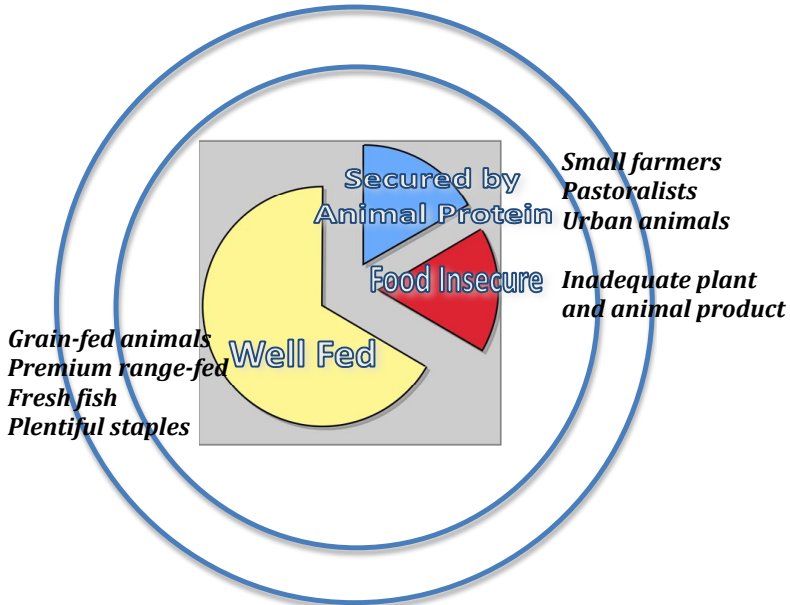
Estimating the number of persons kept productively alive by animal products meeting the increased demand in cities is more difficult than for pastoral (160 million) and small mixed farms

(maybe one billion). If we say that the situation is grave for about 30 percent of urban inhabitants of third-world cities, we arrive at the usual figure of about one billion food insecure persons globally. If, for the sake of argument, we take the same figure of 30 percent for highly urbanized China, then perhaps some 200 million persons otherwise food insecure are rendered food secure by such urban policies as China's. Add this to elements of such policies in other nations and we could guess that the figure might be more than 400 million. The sum of livestock's contribution to food security might then be as shown in the following Figure.



The sum of animal products to absolute food security from these three livestock systems – pastoral, small farms and urban livestock – might therefore be some 1.5 billion persons. This means that these 1.5 billion persons could otherwise be subject to health-debilitating diseases if animal protein had not been included in their diet. But such estimates are gross at best, and overlap with the one billion chronically food insecure persons whose primary need is not necessarily animal protein.

These figures are only part of the livestock story. The following Diagram shows the overall picture with livestock contributing to food security of 85 percent of the world's population.



From this current basis of livestock supporting food security in often forgotten ways, some discussion of the possible future for animal production is warranted to balance unfounded suggestions that livestock may decline in importance.

Future Animal Production in Food Security

Demand for animal products by the middle class will rise with wealth and population increase – both of which are increasingly urban and Asian phenomena. By 2050, poultry meat demand is estimated to be 230 percent of that in 2005 and other livestock products about 160 percent.⁵¹ Requirements for about double the current animal product consumption with at least some

increase in price represents another future food security impost on the urban poor. We know that production systems can be increased in efficiency, and that wastage can be reduced, but these do not obviously lead to a doubling of availability of animal food products. The only other path for either increased availability or decreased price is technological innovation, and with declines in investment in agricultural research, large breakthroughs are no longer predicted. That is, except where research investment has been maintained or increased, and again China stands out as the leader. This may be one continuing factor in future animal production for food security – adapting from the experience of whoever are the world leaders in the field.

Another factor is a change in focus from the same old animals to embrace those most suited to the production environment, which remains one of the fundamental tenets of the science of animal production. For example, one field of animal production that may provide needed animal protein is aquaculture. Having increased from about 40 to 52 billion tons between 2002 and 2006, with more than 60 percent of production being in China,⁵² aquaculture now represents about half of global fish consumption.⁵³ The high feed conversion rates of some farmed species, and their adaptability to small production facilities, make this form of animal production of increasing importance in food security.

Following the above tenet of producing what is most suited to an environment, which includes markets, it may be postulated that in general future animal foods may be sourced from:

- current grain-based animal industries for the wealthy
- current subsistence animal protein for pastoralists and small integrated producers
- aquacultured fish at household level, even in cities
- farmed and home-caged efficient roughage convertors such as rodents and rabbits
- large and small-scale farmed insect and larvae protein

- laboratory/factory produced meat-type protein products⁵⁴
- factory-produced 'protein biscuits' from treated animal and other wastes.

Some animal scientists consider these points to be fanciful, which illustrates the problem of entrenching ideas in silos of existing domestic animal production, particularly those based on Western mores. As Nobel Laureate and animal scientist Peter Doherty notes, 'following the obvious path is not likely to lead to a novel question, interpretation or solution'.⁵⁵ It should be axiomatic to global-thinking animal scientists that a Western food focus in a poor and food insecure country means orientation of animal science to the wealthy, not to food security. I am not arguing that animal science should not serve wealthy markets, just that we should not delude ourselves into thinking that research on grain-fed ruminants – and many other subjects – contributes to the wellbeing of the food-poor, and that we should accept that such production may reduce overall food security.

Between the futuristic foods and current animal production lies a key opportunity for the urban poor through increased efficiency of use of byproducts and waste resources. Without such efficiencies, producing the needed 100 percent more poultry, 80 percent more sheep and goats, 50 percent more cattle and buffalo and 40 percent more pigs is not feasible using current technologies without taking existing food resources from some segment of the population – most likely the food-poor. In my writings I have used the conservative figures of 25 to 30 percent wastage of food delivered to cities compared to food consumed on subsistence farms; other analysts suggest higher figures.⁵⁶

Reducing wastage is presently approached by concentrating animal production in intensive farms. This serves market economies where luxury livestock products effectively displace basic foods of the poor. But it relies on grain being fed to poultry, pigs and cattle. If grass-fed steak was considered superior to grain-fed, then perhaps pastoral livestock production might be

linked to market forces and save grain currently wasted on ruminant production. But is it that easy? No, because grains are also fed to monogastrics and these grains may not be suited to human consumption because of coarseness or weather and pest damage. Nevertheless, it is apposite to recall that 15 years ago, one major grain user and exporter tried to claim that grains fed to livestock served as a food security reserve for emergency support to other nations.⁵⁷

Small mixed farmers feed agricultural byproducts, food waste and small animals including insects to livestock foraging near fields and houses. They also cut and carry forage for ruminants in systems that are extremely efficient compared to large-scale commercial and intensive production systems. With adequate disease control and remediation of nutrient deficiencies these systems based on indigenous breeds can show production levels similar to higher-cost commercial systems using exotic breeds. But production efficiencies do not necessarily translate into meeting the needs of the urban poor since most infrastructure to deliver food to cities is based on capturing profits along the supply chain, and greater profits may be gained from supplying middle and upper class demand.

Answering the Question

So while livestock may seem to contribute to food insecurity, they are in fact a major contributor to the opposite – real food security. The above arguments leave us with the conclusion that while extensive ruminant grazing systems and small mixed farms are the most efficient production systems, the vast majority of animal products that can be delivered to cities is and will be from specialized intensive production, particularly for poultry and pigs. The trend is already well established. Further intensification, with increased appreciation of animal welfare, can hone efficiencies in financial terms, but will almost certainly incur some additional natural resource costs. Asian production

systems that utilize agro-industrial and other wastes already demonstrate greater resource efficiencies than Western-style production systems. Under this scenario, the urban poor may access livestock products that the wealthy classes reject – offal in some markets, suspect-quality meat or milk in others. It sounds inequitable, but it is consistent with historical precedents, and survival ranks above ideology in such matters.

Livestock food security also requires resilience, which has been approached in China by ensuring that its large cities are generally food self-sufficient through the inclusion of food production zones within urban boundaries assisted by judicious use of subsidies. These means are not favoured by many in the international development community who remain enamored of free trade to allow food to flow ‘to where it is needed’ under assumptions that the poor have purchasing power. It is time that animal scientists considered that the future for livestock food security for those most at risk – the urban poor – may be more likely to follow the Chinese than the Western model, which will incidentally produce constant challenges to animal welfare, zoonotic disease and environmental management.

It is usual these days in an essay such as this to include a large section on climate change, and it is mentioned in the question that this essay addresses. However, I have not done this because I consider it to be subsumed within the concept of resilience. Production and delivery systems that can withstand or recover from shocks of climate variability, political instability and other disasters should characterize responsible government planning and international development assistance related to food security. Thus livestock food security like national food security in general includes a disaster risk management approach that acknowledges the slow-acting environmental changes that may increase vulnerability to sudden events.⁵⁸

So we may conclude that intensive production will continue to be important and become more efficient, with associated animal

welfare and environmental concerns – but that this has little relevance to real food security. A range of simple urban and home-based animal protein production systems may better serve food security for the urban poor. And we may note that food reserves against poor seasons and disasters need to be reintroduced regardless of trade-based arguments for food security.⁵⁹ For animal foods such reserves include a wide range of traditional preserved products, animals that graze and scavenge by themselves and urban animal production including home-based production systems. That is why they are called 'live'-stock. Complementing these are the small mixed farmers and pastoralists in poor countries that are both producers and consumers of livestock products and whose livestock food security maintains healthy persons outside cities. The alternative of massive urban migration would increase livestock production requirements from industrial systems by more than 130 percent.

Research to increase the efficiency of the livestock production systems that meet each of the needs of pastoralists, small mixed farms and urban consumers is a primary responsibility of future animal science. Each requires a multidisciplinary approach. This is not necessarily the view of international development agencies. For example, the Asian Development Bank sees the main drivers of change in agriculture in the Greater Mekong Subregion as: accelerated globalization and trade liberalization; climate change; degradation of the agricultural resource base, and investments in transport infrastructure that facilitate cross-border trade and economic growth.⁶⁰ To guide development in the sector to meet future needs, the ADB has determined to focus on agricultural research and development, private sector involvement, and institutional mechanisms for regional cooperation. With rates of return to public investment of 40–50 percent from agricultural research this makes financial sense, but the approach conceives livestock as a source of high value traded food, contributing to food security only through trade. In fact, returns to small-farm research may be even higher.⁶¹

ADB is a major influence on livestock policy in Asia and its late appreciation of food security continues to be hampered by a focus on trade. This is evident in their discussion about global food prices, which rose by more than 30 percent year-on-year to 2011 mainly resulting from large increases in cereal, edible oil, and meat prices.⁶² While it is convenient to relate price rises to unusual weather events, the spectre of the 2007–2008 food crisis continues today as a result of reduced food stocks and increasingly unpredictable weather. Thus ADB calculates food price inflation in Asia to be around 10 percent per annum, which with growing population they translate into increased poverty – in fact the result could be much worse, as it leads to increased urban food insecurity. In such international agency documents, monetized arguments commonly lead to conclusions of poverty when a worse fate looms – hunger, which in cities is linked to anarchy. Food security is a relatively new concern in such agencies, to the extent that some aid-dependant food-insecure island states have only recently been allowed to consider the concept of real food security.⁶³

The danger of entrenched views is mirrored by those who become attached to alternative forms of food production, such as nature farming or non-GMO foods. In both cases I have argued in other essays herein for open-minded consideration of all forms of agriculture in order to meet world food needs. Ideologies such as individual environmental beliefs that prejudice the lives of other persons should be subjugated to meeting basic food needs of the world.⁶⁴ The same was true of once-held Western prejudices against assistance to dairying in the tropics, which my long-term colleague Charan Chantalakhana and I worked to overcome.⁶⁵ A similar blindspot remains about the role of small farmers in food production, and the personal benefits of their lifestyles in many cases in Asia – a phenomenon that linked self-sufficiency to ‘gross domestic happiness’ as is also the subject of another essay in this book.⁶⁶ In each case, a tendency to denigrate what works has been exacerbated by a partial understanding of the role and conduct of science, including

animal science. It occurs when we forget that science is a methodology that aims to correct our inherent biases, and that the reductionism required for much experimentation can limit our worldview unless we consciously practice to remain aware of interactions.⁶⁷

As in other essays, I find that I must reiterate the merit of long-held values, which in this case means a return to the millennia-old pillars of food security. These are small farmers, food reserves and national food security planning. From Hebrew stories of Joseph in Egypt through Vespasian's becoming Rome's Caesar by controlling food security to recent lessons from India's and Russia's actions to recent grain shortages, the pillars of food security remain the same, and all contain major components of animal production. These pillars have been toppled by a cut-down application of economics. Yet essential human values and risk management are present in Western economic models – they have simply not been applied in the race for financial accumulations. Through reflection and that wisdom that is embedded in all healthy cultures' actions, from national decision-making down to individual integrity, an enhanced understanding can be expected to lead to an increased role for animal production in food security.

Thus in summary, I see livestock playing a major role in basic food-security, which in turn is the first principle of national security and international security. Food-insecure populations emigrate and undermine precarious States. Even at the level of more luxurious food-security expressed in UN ideals, livestock products are critical. Outside single product industrial farms, livestock provide multiple outputs, including: high-quality protein; income; draught and traction power; nutrient recycling; various edible and non-edible by-products, and they reproduce themselves. Children and reproductive-age women, whose diets are deficient in amino acids not readily accessible from plant foods or in micronutrients, benefit significantly from even small amounts of animal protein, which globally makes up perhaps 28

percent of protein intake. In Asia, livestock production has increased markedly in recent decades, particularly from intensive systems in China as part of its planned food-security – an approach that provides lessons for smaller food-insecure countries.

This conclusion is what my international career in livestock research and development has led me to – accepting while minimizing the possible costs of livestock in such forms as climate change and environmental destruction in order to secure food for the marginalized poor of the world. Seen in this way, to rephrase the question, livestock production can be seen as highly positive to long-term food security.

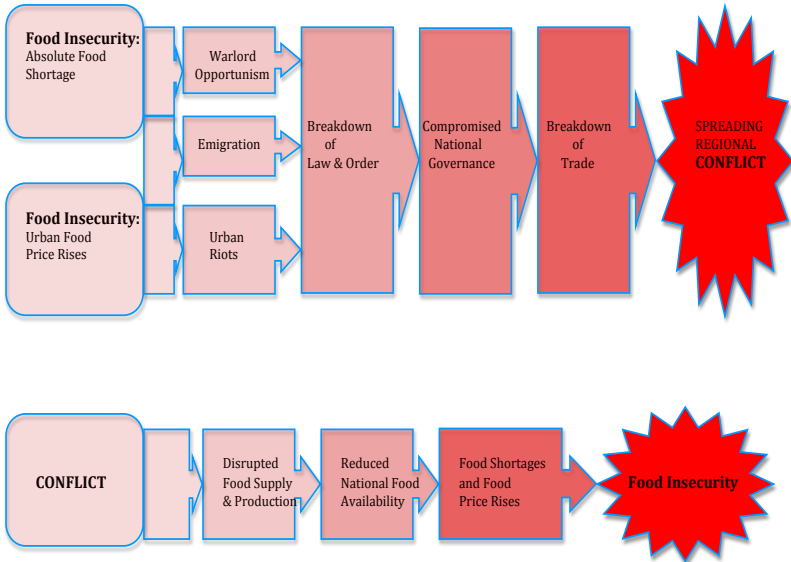
Chapter 2

Food security is a major issue in the international development fraternity, yet you criticize these international agencies in your book ‘Small Farmers Secure Food’ for their reliance on free trade as the solution. In fact, you advocate something that sounds like central planning! Surely planning is not necessary for free trade to allow food to flow to where it is needed and to stimulate more to be produced when prices rise. So what’s wrong with a market approach, which has obviously worked well for us and other Western countries?

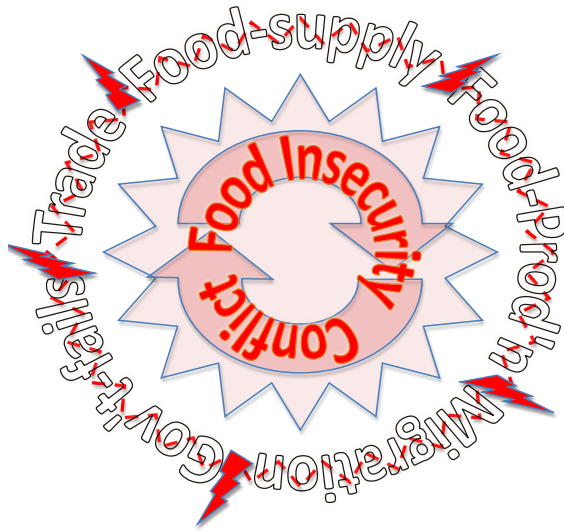
The West is *not* the Context⁶⁸

You are correct in noting that I take development agencies to task when they insist on free trade in foods essential for survival in food-poor countries. That is indeed the subject of the book, ‘Small Farmers Secure Food’. You might also suggest, as some other commentators have, that it is the Western countries that have pioneered concerns about sustainability and climate change. In this essay I will deal with those matters as part of the general argument. This introductory section explains why food security can no longer follow Western mores, and why the situation is not only a threat to the food-poor countries, but also to the West itself.

While it is clear that ‘food itself frequently becomes a weapon during conflict’,⁶⁹ it is less commonly acknowledged that conversely, food insecurity makes states ungovernable. The following Figure illustrates both lines of causation, the first indicating food insecurity from either shortages or urban price rises leading to conflict even beyond a nation’s borders, and the second showing how conflict can lead to food insecurity.



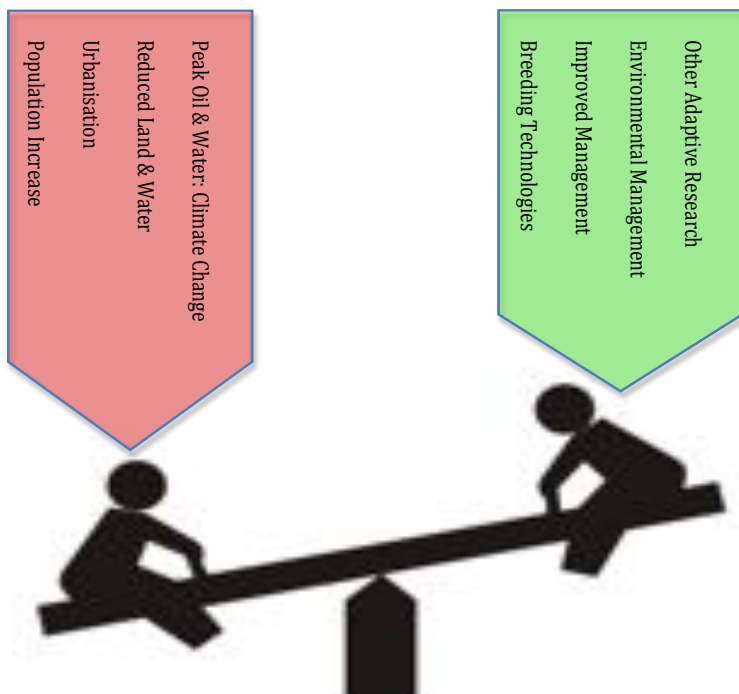
Historically both relationships between food security and conflict have been understood well by great leaders, but this is easy to overlook in an era of relative stability and comfort for billions more persons than ever before. The recognition that security of essential food is part of a group's security and therefore needs to be centrally planned is older than nation-states. In the preface to a recent book, I describe how peace was re-established in ancient Rome after Nero's demise by focused attention on management of food for the urban masses. In that case a wise Caesar understood that no state can be governed unless food supply to cities is secure, and this underpinned the golden era of Rome that we continue to study today.⁷⁰ Those elements that are currently understood to be as critical to social and economic wellbeing – ability to govern, trade, control of borders, food supply and its production – are all threatened by conflict caused by food insecurity, as portrayed in graphic representation of an explosion destroying these pillars of civilization in the next Figure.



Nine or ten billion people in 2050 will require much more food. Agricultural scientists will recall what I see as one of the greatest ever applications of science and technology – the Green Revolution – as having done this once within our lifetimes. Its critical ingredient was technology. This is an important point to remember when it is argued that it cannot be done the same way again because today there is less extra land, water and fertilizer available, and because climate may be changing faster than in recent centuries. In fact, agricultural science addresses these issues – as it always has – through breeding for yield increases, increasing nutrient-use efficiency in plants and animals, reducing plant water requirements and associated engineering inventions. It is a critical part of the answer and one commonly overlooked by the continuing attractive Malthusian⁷¹ forecasts of famine.

Boserup⁷² enlightened this blindspot of reason in her work of the 1960s, and it has been constantly confirmed as an almost universal principle that technology is the major factor forestalling Malthusian demise – such a role of technology in staving off catastrophe is well known in defence spending.

Agricultural scientist and Nobel Laureate Norman Borlaug expressed this as 'two opposing forces, the scientific power of food production and the biologic power of human reproduction'.⁷³ Some wider groupings of those forces are depicted in the following Figure as the continual balance that must be managed well to ensure food security.

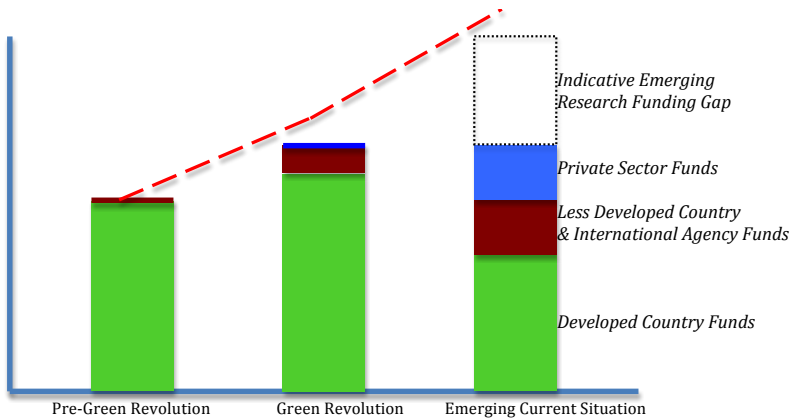


With OECD nations under-investing in food production research – because they are largely food secure – food-insecure nations can no longer rely on simply adapting research conducted in rich nations. Together with population increase this is creating the risks of food-insecurity that induce conflict and migration today. According to the argument of this essay, this is a further compelling reason for national food security planning to be an absolute priority in food-insecure nations. However, in many

cases such planning is poor because ideological or global commercial interests prefer free trade to apply to all foodstuffs. Such a view suits OECD nations, and especially Australia with its subsidy-free agriculture, but it is not viable for a poor government that faces food shortages in large cities. Unfortunately, in the main, international development assistance follows the rich country worldview of food, which has led to food policies of food-insecure countries being copies of those of rich countries. This can increase food insecurity. Certain nations have addressed this decades ago, China being the prime example, but few non-Western nations can negotiate as strongly as China.

With some 640 million malnourished persons in Asia and Pacific (63 percent of the world total)⁷⁴ compared to 265 million in Sub-Saharan Africa (26 percent) the issue has implications for Australia in terms of national security, or if viewed from a social responsibility perspective, in terms of development assistance.

As the major means of increasing food production to meet rising demand, agricultural research should be a priority investment by all governments. However, reductions in such expenditure in more developed countries in response to domestic food security has led to a major gap in global research funds despite increased investment by less developed countries, international agencies and the private sector. This is demonstrated in following Figure, in which the dotted red line indicates rising demand from population increase, urbanization and wealthy diets. While only for illustrative purposes, the Figure indicates that before the Green Revolution, agricultural research was overwhelmingly conducted by more developed countries. The Green Revolution utilized this knowledge and through adaptive research made it practical for new environments, which in demonstrating the utility of the approach stimulated less developed countries with assistance from international agencies to increase investment in agricultural research. However, since those halcyon days of the 1960s and 70s food demand has continued to rise and total real expenditure on agricultural research has decreased.



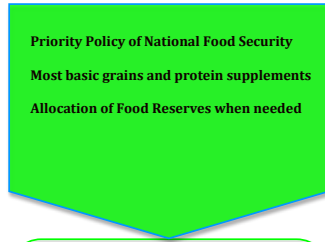
Before considering food security planning, it is important to briefly clarify the term ‘food insecurity’, for there are various definitions represented in the literature.

Defining ‘Food Insecurity’

The commonly quoted World Food Summit (WFS)⁷⁵ definition of food security reflects ideals distant from the food insecurity situations that produce conflict and migration. Staving off such effects stimulates much aid, but rather than seeing this as selfish, it may be better understood as a fundamental part of our natures. This is why the late international agriculturist Professor Derek Tribe⁷⁶ preferred to call it ‘enlightened self-interest’ that allows us to end up ‘doing well by doing good’.⁷⁷ So while the WFS approach maintains that ‘food security is achieved when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet dietary needs and food preferences for an active and healthy life’, real food insecurity is not simply its opposite, as the following Figure illustrates.



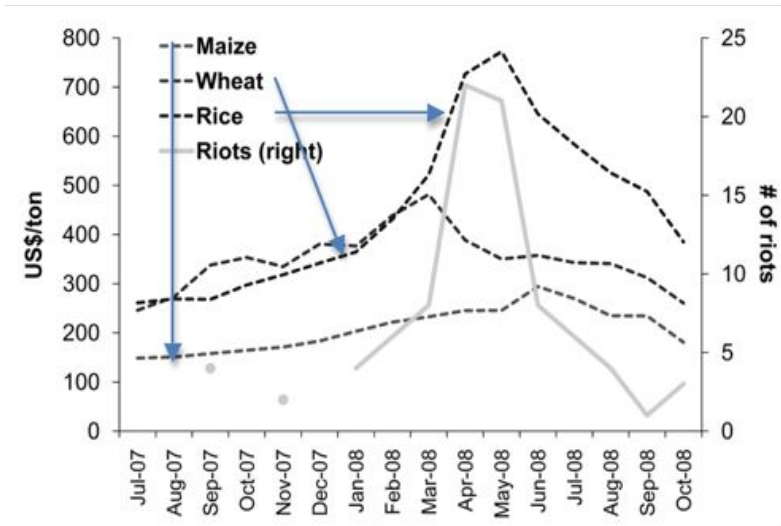
cf.



In many ways the WFS definition, which is widely used in development rhetoric, is an ideal that – if ever approached – is abandoned in the face of real food insecurity indicated by widespread hunger, nutrition and starvation. This latter situation has tended to be treated as disaster relief with its fine humanitarian tradition. However, basing action on these two polarized approaches – idealized states of food availability and famine relief – has left planning for reduced risk and increased resilience to a rather uncoordinated clutch of development projects. The alternative approach of ensuring security over the most basic food essential for survival in a nation allows the foundation for other development. Meanwhile, the precarious parts of the poor world remain in a state of uncertainty about their food supply, which apart from nutritional suffering takes an added debilitating mental toll.

Real food insecurity is a psychological as well as a physical state. It occurs in situations as diverse as drought, flood, crop pest-attacks, animal disease epidemics, political withholding of food, disruption by wars and city food prices rising beyond incomes. Once acute, it rapidly leads to changes in ‘preferences’ for particular foods and progresses to a willingness to consume what is available just to survive. If it is seen as a natural event, it

has in the past tended to lead to a survival response – to outwait the famine or the war – because there is little hope. However, today with the poor in cities being the most vulnerable, urban riots against rapid price rises, such as for rice in 2007-8 as shown in the Figure⁷⁸ can lead to another security threat, that of unplanned migration.



The concept of food security as a precondition of national security and governance is difficult to communicate in major food-exporting nations, which in approximate order are Brazil, Argentina, Australia, New Zealand, USA, Thailand, Malaysia and Canada. This is illustrated by the low levels of community support for agriculture in such countries; in Australia for example, such apathy may be compounded with increased urbanization and migrants of recent decades coming from urban more than rural backgrounds. With such an attitudinal shift, declines in agricultural and food industry innovation have become evident as a result of reductions in agricultural research investment, which has declined from five to three percent over the past three decades, as in other similar countries.⁷⁹ Yet even in a food surplus nation such as Australia, it is recommended that

‘policy, regulatory and program areas related to food should be brought together’,⁸⁰ more for efficiency and safety aspects of food than security in the sense of absolute availability as discussed in this essay. In recommending that coordination be through an Australian Food Security Agency, the focus is on nutritious food, environmental and food-related data collection, research strategy, land use planning and efficient regulatory procedures.

These recommendations of PMSEIC are excellent ideas for a food-surplus and wealthy nation such as Australia. Except for a few details, they are even more relevant to food-insecure countries. The principle is one of planning, which despite a reigning ethos of *laissez faire*, market economics and free trade, is increasingly understood as critical to all forms of security, from health to national defence. However, because planning has been associated with socialism in Western propaganda and remains anathema in some sectors of government responsible for support and regulation of trade and commerce, it is important to be clear about what is meant by food security planning.

Food Security Planning

Planning has been inherent to the economic success of Western nations. That success is more evident in the rise to their current status as wealthy nations than in more recent welfare policies for example, which have largely been made possible by those successes from earlier economic planning. Contrary to once popular thought, planning does not have any greater link to socialism than to capitalist states. That confusion seems to arise from Hayek’s⁸¹ argument that planners could never develop sufficient knowledge or responsiveness to improve on a free market. True as this may be, it assumes that fast responses to increased prices lead to increased supply; in the case of an essential commodity such as food, a shortage caused by a drought for example usually requires waiting for the next

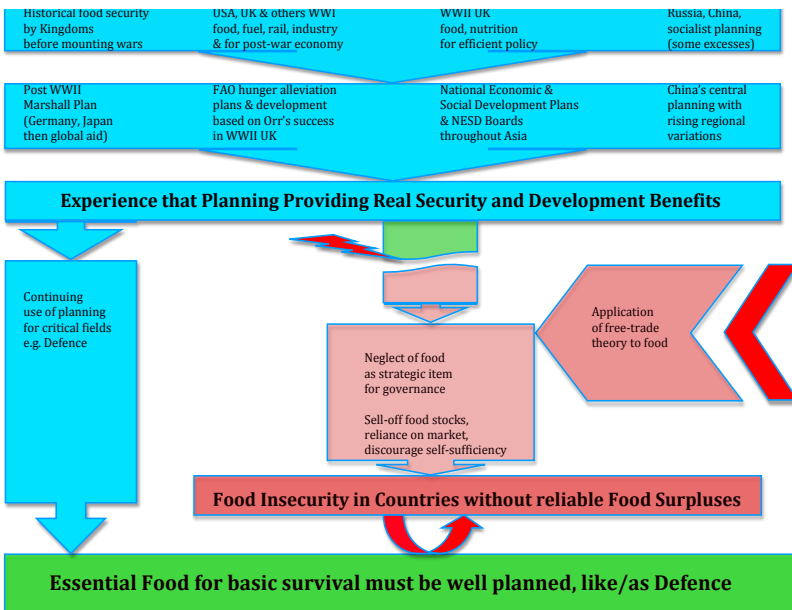
growing season, before which starvation becomes a reality. Current arguments that free global trade in food will allow food to flow to where it is needed are based on Hayek's view but continue to ignore such situations as widespread crop failures from climate events, or even the possibility of two coincident events in major nations such as India and China. Moral considerations enter the discussion at this point to further challenge a totally unplanned approach to national food security based only on an economic theory.

It is important not to apply economic theories in ignorance of their origins and meanings. For example, the erroneous and common invocation of Adam Smith as the inventor of the 'invisible hand' of free markets linking profit-seeking to overall societal good. In fact, Smith's invisible hand was part of his moral philosophy and he knew the failures of free markets in certain circumstances. Agricultural research is a prime modern example – long-term payoffs that are hard to capture have always relied on government investment. Assumptions that the private sector can replace such government investment have proved to be wrong. Even more concerning is relaxation of regulation, such as for banking, by governments in response to free market theorists leading to excesses that impose huge costs on the wider society. As Nobel Laureate Joseph Stiglitz wryly observed, 'the reason that the invisible hand often seems invisible is that it is often not there'.⁸² Planning in this context may be seen as a means of making up for the absence of that market mechanism – market failure as it is often termed.

Economic planning was key to the USA's response to global conditions during WWI for food, fuel, railroad and war industries and the approach was repeated in WWII to huge benefit.⁸³ It continues in the form of funding for military research although it has waned for other sectors including food production.⁸⁴ Planning was also the basis of agricultural scientist Orr's⁸⁵ work that allowed the British public to be better nourished than the rest of Europe through WWII and led to the creation of the Food

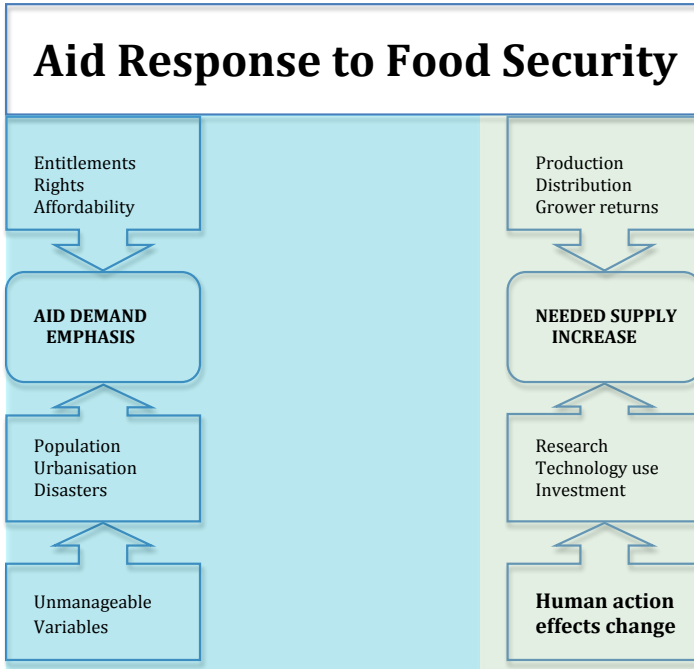
and Agricultural Organization of the United Nations (FAO) with him as inaugural Director-General.⁸⁶

From such organizations as FAO, planning became the basis of economic development, and clearly formed a critical part of the rapid economic rise of Asia, where five-year rolling plans for government investment underpinned World Bank and other international lending and aid. Much of that planning took a long-range perspective. In the case of food security, such long-term vision is particularly necessary because food production is subject to large and uncontrollable variations in seasons. Shortages of food highlight how different it is from non-essential commodities. Remaining with economic jargon for the moment, it is quite obvious that food price is infinitely inelastic, as Primo Levi reminds us in excruciatingly practical terms.⁸⁷ That is why planning for food security is critical to nations where supply and access to food is not secure. The beneficial role of development planning in food security is shown in the following Figure.



In the halcyon days of international aid, food security was well supported until it became a collateral victim of unconsidered application of free-trade theory. Managed food stockpiles were then sold-off on the promise that needed grain could be purchased in an emergency – and this seemed reasonable in many quarters since wealthy countries continued to produce new yield-increasing technologies from their well-funded agricultural research programs and grain became cheaper year-on-year. But with reductions in such research funding, increased volatility of food prices and increases in the non-food producing population in third-world cities, lack of food security planning has highlighted strategic weaknesses in global security models. This should be ringing alarm bells to all concerned with security, just as the food situation in 1972-4 did.

The world food crisis of 1972-4 forced policy-makers to consider the complexity of global food supply and demand-side issues⁸⁸ and led to such innovations as the creation of the International Food Policy Research Institute (IFPRI) in 1975. World Bank and similar initiatives influenced others culminating in such programs as the European Union's 1981 Plan of Action to Combat Hunger in the World. Nobel Laureate Amartya Sen clarified aspects of the issue in his work on entitlements and access,⁸⁹ inadvertently orienting attention to food demand more than increased supply. Within that paradigm national food security planning appealed widely but was easily compromised by the not-necessarily-related issue of poverty,⁹⁰ which led to the idealistic WFS's 1996 definition of food security discussed above. If we continue with current approaches we will divert action further away from the primary need. The relative emphasis of recent aid on equity and rights to food being oriented to demand for food at the expense of a focus on increased supply is expressed in the next Figure by the areas coloured. It indicates that continued bias towards demand and away from food supply increases the risk of food insecurity.

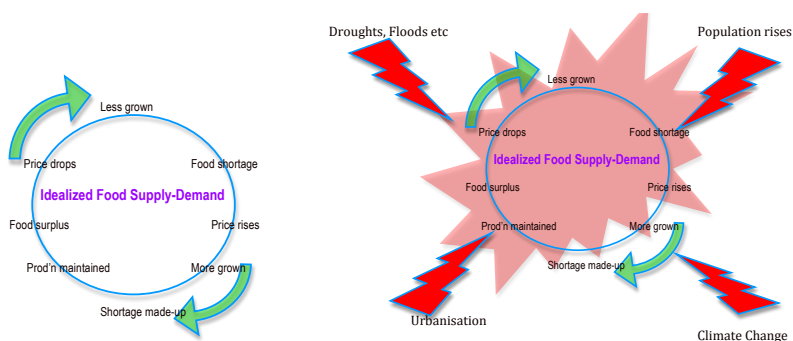


The outcome of a demand focus above supply is today's biased understanding that emphasizes equity and access more than production. This further compromises production with unclear understanding of such issues as; environmental impacts from agriculture, genetically modified organisms (GMOs), supermarket power and Western eating disorders. Trying to match these diverse demands of the wealthy world with the food demands the food-insecure world is one way of interpreting the eloquent 'Doubly Green Revolution' rhetoric,⁹¹ but mixing objectives inevitably compromises outcomes with convergence of aid on such mechanisms as Poverty Reduction Strategies. The assumption appears to be that creation of increased purchasing power can make food markets work, which begs two questions:

- during a food shortage what do people eat while they work on becoming wealthier?
- where will the extra food come from?

Aggravating this issue is the reality that ‘the capacity to make food policy is probably weakest in just those poorest countries where the new challenges are emerging most rapidly’,⁹² which simply means that food security planning is the most critical input that aid can make in those food-insecure countries.

Perhaps one reason that planning has not been adequate derives from a simplistic view of the means by which food is produced and its criticality to life. The production cycle for food is season-long and in many situations this is once per year. If disaster relief is factored in, the delay may be shortened. But this does not consider either the marginality of the global surplus in many years or the simultaneous China and India crop failure scenario. The simple supply-demand cycle assumed by many discussions of food security is depicted in the left-hand diagram of the following Figure.



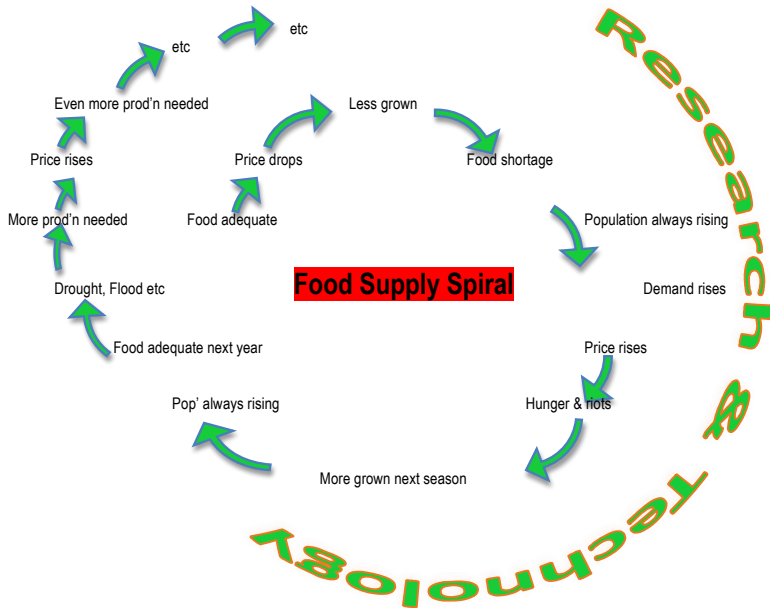
That supply-demand image is labeled here as ‘idealized’ since it ignores the continual pressures of the unpredictability of environmental factors and the increasing pressures of population and urbanization. These pressures, indicated on the right-hand diagram of the Figure have the effect of shattering the ‘cycle’, which is felt in terms of hunger, malnutrition and starvation as food remains short until a new season arrives.

A more realistic depiction of the dynamic of food security is presented in next Figure depicted as a spiral driven by research. It considers the forces of population, environmental and other imposts and illustrates an ever-widening need for more food being produced – which is not possible without continuous research and the application of technology. The conception is still a gross simplification, but it illustrates, at the very least, the role for planning and research.

In particular, the continued demand pressures of rising population and urbanization that are increased by rising climate variability and unplanned destruction of food-producing lands and water combine to continually drive food demand higher. Hence the apparent cyclical supply-demand relationship described in the preceding Figure is in fact not a closed economic cycle but one fuelled by these increasing demand and hazard factors. To meet such increased supply is not simply a matter of demand-feedback to a production facility as may be the case in a manufacturing model where additional machinery may increase production of an item in demand – and where a lag in supply just delays a preferred purchase rather than leading to death. Hence the following Figure presents the supply driver as agricultural research and the constant application of new technologies from research. As the key factor of meeting rising food demand, research relevant to food-insecure nations is a critical component of food security planning that requires the same sacrosanct position in policy as other aspects of food security detailed herein.

The Figure also highlights the open-ended nature of the food production dynamic, as if we are naïve in imagining that we can predict stability or sustainability. The source of this open-endedness is our own natures, which oscillate between survival modes when threatened by food insecurity and relegation of food production to a low status occupation when food is in surplus. Our failure to recognize this, and to maintain it as a pillar of governance, is an Achilles' heel of civilization more than is war or

climate change. I see the interest of defence planners in food security and the historical focus of leaders on feeding their masses as recognition of this fundamental role of food security management. Today we would do well to learn from such history.



But times have changed since food security planning was last considered in the labyrinth of economic theories – as indicated in the following Table.⁹³ Combining all of these factors and others, as is considered in the dynamic model managed by IFPRI,⁹⁴ allows the continuing evolving understanding of humans and their relations to food, but it does not provide precise recommendations to food-insecure nations that seek to seriously reduce the risk of losing their ability to govern if food supply is not guaranteed. Such a risk-mitigation approach to planning requires the acceptance of what appears to wealthy eyes to be economic inefficiencies – but in effect they are not inefficient if the economic costs of starvation, anarchy and migration are fully considered.

Changes in Factors Relevant to Food Security Planning

		Food policy 'old'	Food policy 'new'
1	Population	Mostly rural	Mostly urban
2	Rural jobs	Mostly agricultural	Mostly non-agricultural
3	Employment in the food sector	Mostly in food production and primary marketing	Mostly in food manufacturing and retail
4	Actors in food marketing	Grain traders	Food companies
5	Supply chains	Short – small number of food miles	Long – large number of food miles
6	Typical food preparation	Mostly food cooked at home	High proportion of pre-prepared meals, food eaten out
7	Typical food	Basic staples, unbranded	Processed food, branded products More animal products in the diet
8	Packaging	Low	High
9	Purchased food bought in	Local stalls or shops, open markets	Supermarkets
10	Food safety issues	Pesticide poisoning of field workers Toxins associated with poor storage	Pesticide residues in food Adulteration Bio-safety issues in processed foods (salmonella, listeriosis)
11	Nutrition problems	Under-nutrition	Chronic dietary diseases (obesity, heart disease, diabetes)
12	Nutrient issues	Micronutrients	Fat Sugar
13	Food-insecure	'Peasants'	Urban and rural poor
14	Main sources of national food shocks	Poor rainfall and other production shocks	International price and other trade problems
15	Main sources of household food shocks	Poor rainfall and other production shocks	Income shocks causing food poverty
16	Remedies for household food shortage	Safety nets, food-based relief	Social protection, income transfers
17	Fora for food policy	Ministries of agriculture, relief/rehabilitation, health	Ministries of trade and industry, consumer affairs Food activist groups, NGOs
18	Focus of food policy	Agricultural technology, parastatal reform, supplementary feeding, food for work	Competition and rent-seeking in the value chain, industrial structure in the retail sector, futures markets, waste management, advertising, health education, food safety
19	Key international institutions	FAO, WFP, UNICEF, WHO, CGIAR	FAO, UNIDO, ILO, WHO, WTO

The components of such a food security plan for a food-insecure country would include:

- assessment of the risk of food shortages
- assessment of acceptable levels of short-term malnutrition
- stimulating local production efficiencies
- consideration of options for covering periods of risk, including:
 - binding contracts with food surplus nations
 - managed grain reserve storage facilities
 - domestic programs that encourage production
 - domestic programs that encourage self-sufficiency
 - limiting free trade in food to non-essentials

Such a plan would be revised annually to maintain its currency and to evaluate efficiencies. It would begin with an understanding of the vulnerability of a nation to food shortages and creation of a risk mitigation strategy. At present, the focus of development agencies tends to be at international level and to relate to past institutional structures for either food relief or international food trade, although some approaches relate to family level.⁹⁵ But the need is for a national plan, because security is a government's first priority. The plan would be an outcome of a national food security policy that makes food security risk reduction a priority at all levels in a country. One conception is the disaster risk reduction approach of the UN Hyogo Framework, as considered in an FAO publication.⁹⁶ This arrangement can be represented diagrammatically as in the following Figure.

Food security planning requires coordination of a range of existing activities under a different management structure from that usually recommended to food-insecure nations. It also requires additional resources. The fledgling developments in Australia, albeit for economic rather than absolute reasons of security, indicate the need for institutional revisions. Even more additional resources are required in food-insecure nations for research and grain stockpile management – both of which are

highly specialized fields that cannot deliver their potential without guaranteed funds. The ‘more of the same’ approach favoured by dominant international players is not acknowledging this change,⁹⁷ which may be contributing to development agencies being increasingly marginalized by informed governments in food-poor countries.



This will lead to a major shift from the paradigm of recent times where agricultural development is supposed to accommodate food security while it is buried in poverty alleviation programs. Let me now discuss the implications of food security planning on national policy further.

National Policy Implications for Food Security

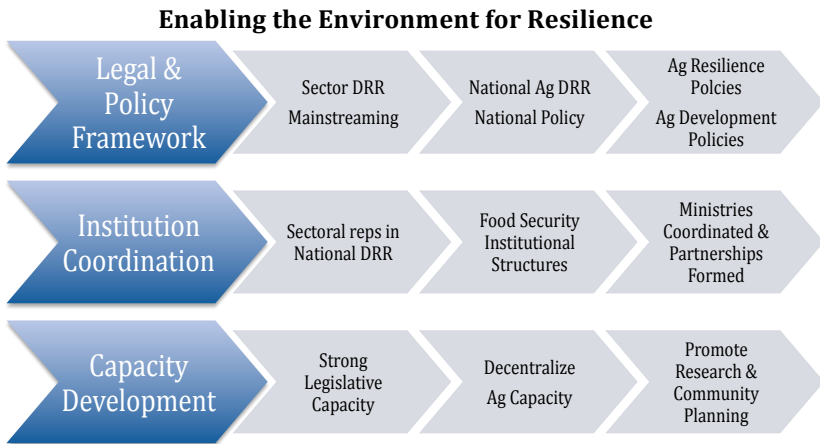
Purists may see the food security planning approach described above as something between a planned and an unplanned

economy. It relies on risk analysis, managed stockpiles, international contracts, investments in research and some export limitations as well as incentives for a level of self-sufficiency and increased production. As such it may be seen as a planned market economy.⁹⁸ It requires an integrated policy that covers most sectors of government, and occupies a higher priority than food or agricultural policy in a major net food-exporting nation. The best current example may well be China.

An FAO report on food security⁹⁹ published in 1998 quoted The State Council of China from 1996, viz; ‘Only when the Chinese people are free from food availability and stability of food supply worries can they concentrate on and support the current reform, thus ensuring a sustained, rapid and healthy development of the economy’. China has adhered to this ethic prior to that date and since, culminating in today’s food exports from China, and Chinese use of land in other countries for food and other production. From the late 1980s, I recall senior agricultural scientists visiting China laconically being told that the three top policy priorities for China were ‘food, food and food’. Research investment, production incentives, and market intervention all played important parts in this Chinese success in food.

A major review of the food situation in China more than a decade later (2009) noted that China had ‘maintained a grain self-sufficiency rate above 95% in recent years’ and had become the world’s largest producer of meat and eggs by 2007.¹⁰⁰ Having reached average national self-sufficiency, pockets of food insecurity continued, such as in marginally productive environments. This has led to the policy adding a focus on those counties by recognizing their natural resource limitations and the need for different approaches. The allocation of research resources, infrastructure investment and incentives to these areas is expected to lead to further improvements in food self-sufficiency. The report suggests that lessons from China may be of value elsewhere where food insecurity continues, a sentiment studiously neglected by much international discourse.

It is a curious inconsistency that China’s success results from a process that is remarkably consistent with that once explicated by international development institutions, while those institutions themselves seem to have compromised their ‘plans’ by pursuing parallel and even competing policies. In the case of China, an enabling environment was created through the three pillars of a legal and policy framework, institutional structures and coordination, and capacity development – these are also the three pillars of the Disaster Risk Reduction (DRR) approach presented by the UN, as in the following Figure.¹⁰¹ Perhaps the point that needs to be emphasized is that food insecurity is a disaster in itself, not only a consequence of disastrous earthquakes, floods and cyclones.



This DRR approach applied to food security illustrates the lesson of China’s experience that a priority policy is not one that can be compromised by mixing with other objectives. Unfortunately, the rest of the developing world with the exception of India, has been distracted from such single-minded approaches by other ideologies in international development policy. The implications for national food security policy that might be drawn from this comparison include:

- policies relating to food promulgated by international development agencies have not necessarily focused on food security specifically, it being more likely to be mentioned under general agricultural development in terms akin to policies of food secure nations;
- agricultural policies recommended for food-insecure countries have assumed that international trade rather than local production will form the underpinning element of food security;
- investment in infrastructure – irrigation, roads, electricity etc – should grow out of the food security plan and then, where logical, be enhanced to also serve urban or secondary and tertiary industrial needs rather than the reverse, and
- investment in agricultural research and education must be overt and consistent, with these professional fields having status appropriate to their underpinning contribution to national security and development.

These are examples of policy implications – lessons from experience. The main point is that made in the introduction to this essay that food security is a precursor to national security and the ability to govern. The lesson is not easily learned nor perhaps as necessary today in wealthy nations with low population densities, protected borders and surplus food. However, the reality of global food security today means that professionals in the field will increasingly look to experience from such nations as China and India. An example of that experience is seen in the closure of rice exports by India after a drought reduced wheat harvests below national self-sufficiency levels in 2007, which is commonly seen as the trigger for the global rice price spike of 2007-8 and resultant starvation and malnutrition.

The Western and development agency response to the Indian actions was to criticize its government for interfering with the global rice market. Almost the same words of criticism – as if it is an approved diplomatic dictum – were used in 2010 to criticize

Russia for closing its exports of wheat after drought reduced yields. Such official responses are not only outdated, they have grave moral implications since the role of government is to first protect and serve its citizens. There is no moral obligation to adhere to an alien economic theory. Even if, in some obscure quarter it is not agreed that it is government's role to feed its own citizens first, we only have to look at millennially-instilled human behaviours that stimulate us to protect family before tribe, and in turn tribe before the wider group and that group before foreigners.

In my opinion, India acted accordingly to the maxims of good governance, morality and human behaviour. At the same time, it further showed the world the maturity of an ancient culture in dealing with food when it did not ban exports of the luxury rice Basmati but only the most basic grain that Western nations do not consume, and did not apply the ban to exports to neighbouring Bangladesh which similarly suffered a food shortage in that year. Among the lessons learned, three old and clear messages challenge those arguments that rest only on free trade ideology, viz;

- essential foods for survival must be guaranteed in order to be able to govern,
- neighbours' food-security is critical to controlling unwanted immigration or conflict induced by hunger, and
- the foodstuffs of importance to basic food-security for survival are not usually those known to wealthy consumers.

In addition to this wider conception of the factors involved in real food security, another potential area of conflict of ideas also looms. For example, the environmental consciousness of wealthy nations inevitably affects their willingness to fund international development – but that consciousness may not be shared by nations with complex food insecurity. Thus our conceptions of sustainability and its regulation are also challenged – but as discussed in another essay in this volume, our understanding of sustainability is impractically idealistic.

Regulations on Sustainability and Climate Change

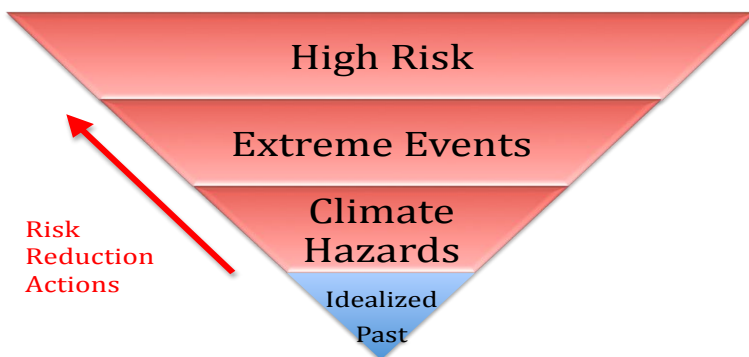
The role of government in regulating food security to conform to sustainability principles seems relatively clear in wealthy nations. It takes the form of government decisions about funding, regulating short-term over-exploitive activities and public education. The same principles are required of poor country governments that accept development assistance – but out of necessity their practice is distinctly different. For example, small farmers on marginal dry soils highly susceptible to erosion cannot simply be banned from farming to feed their families. They are not readily convertible into factory hands for non-existent factories and the only alternative of migration to urban centres adds to the total food demand because it takes some 30 percent more food to feed an urban dweller than a subsistence farmer due to transportation losses and time related waste.

A practical implementation of sustainability principles in a food-insecure nation must balance conflicting needs rather than detailed absolute regulations. The enemy of effective regulation is always an inability to enforce, for it leads to a lack of respect for other regulations and even the process of regulation. This observation itself is counter to the development argument that there are universal sustainability rules that must be applied globally, UN-style.

More practical – as learned over the past five decades since the first blush of the Green Revolution – is the inclusion of sustainability as a principle in enhanced agricultural research funding. Improved crop yields, increased efficiency of fertilizer usage, enhanced disease resistance and appropriate animal production systems all relate to sustainability. Sound international assistance includes these research aspects.¹⁰² Increased government and international research that meets each of these outcomes while observing sustainability criteria may well be the first step in effective sustainability regulation.

Such a flexible interpretation of sustainability regulation relates primarily to small and subsistence farmers in poor countries. However, across all agricultural regions, large-scale agribusinesses also exist, and these are more suited to the wealthy nation approach to regulation. Paradoxically, some NGOs claim that such firms may choose to operate in poor nations to escape regulation in their home countries – where this is true it should be highlighted and where it is not, development professionals should curb such gossip. Sustainability in food production by global agribusiness companies implies adherence to the principles and practices of the home nation.

Sustainability has recently further confused the nebulous rhetoric of climate change, a subject fraught with opinion, emotion and speculation that compromises scientific process. I contend that the major relevance of climate change to food security in both food-insecure and food secure nations¹⁰³ is as a focus for disaster risk management and for agricultural research. Management approaches to risks introduced by climate change are well known and articulated widely, such as in the following Figure,¹⁰⁴ which indicates the accumulation of risks in terms of increased frequency and severity of unfavourable climate events. Resilience of food production thus relies on risk management planning and agricultural research in changeable environments – as noted earlier as the basis for effective food security planning.



In fact, research to adapt crops and animals to new environments including climatic environments has always been a major function of agricultural experimentation even before it was formalized into modern science. One current example is that of applications of molecular biology (genetic modification) to enhance food security. The technologies are well established and have been a critical part of China's food security. With appropriate regulation that guarantees access to essential genetic material by small farmers, it will contribute to the imminent advances in Sub-Saharan Africa's food security.

GMO technology is still in its early stages of development, and it is expected that multiple-desirable-trait techniques will be refined to allow such combined benefits as drought tolerance and disease resistance in crops. Already there is widespread use of varieties of maize, oil seed and brassica crops that are resistant to chewing insects. Bio-fortification of nutrients deficient in vulnerable human diets is the next step, in such products as 'Golden Rice' with its added facility to produce Vitamin A, one of the world's major micronutrient deficiencies associated with significant health effects.¹⁰⁵ Other imminent technologies of genetic modification include: pathogen and sucking insect resistance, improved processing and storage ability, and drought resistance. Beyond the foreseeable future, anticipated technologies include such food-security grails as salinity tolerance, enhanced nitrogen use, high temperature tolerance and even enhanced photosynthetic efficiency.¹⁰⁶

Genetic modification is only one of many technologies of agricultural research that serves food security and is mentioned here to highlight it as a continuum with the intensive breeding work that has produced the food consumed across all nations today. That past intensive breeding has produced crops adapted to new environments, including higher temperatures, wetter and drier conditions and resilience to climate variability. This means that crops have been adapted to the three major effects of past

climate changes. Continued breeding work, using the new tools of genetic modification, is now accelerating the rate of adaption to new climates. It is related to sustainability by making sustainability a breeding objective, and hence regulation would logically take that form more than preventing research or restricting the release of climate-change-adapted food crops.

These are great challenges to governments subject to lobby, as in some Western democracies, or subject to dominance by other nations where lobbies close off markets and development assistance, such as aid to African countries with GM crops having been interrupted by anti-GM lobbies.¹⁰⁷ In addition to moral questions, the roles of sovereign governance and foreign aid themselves should be queried in these circumstances.

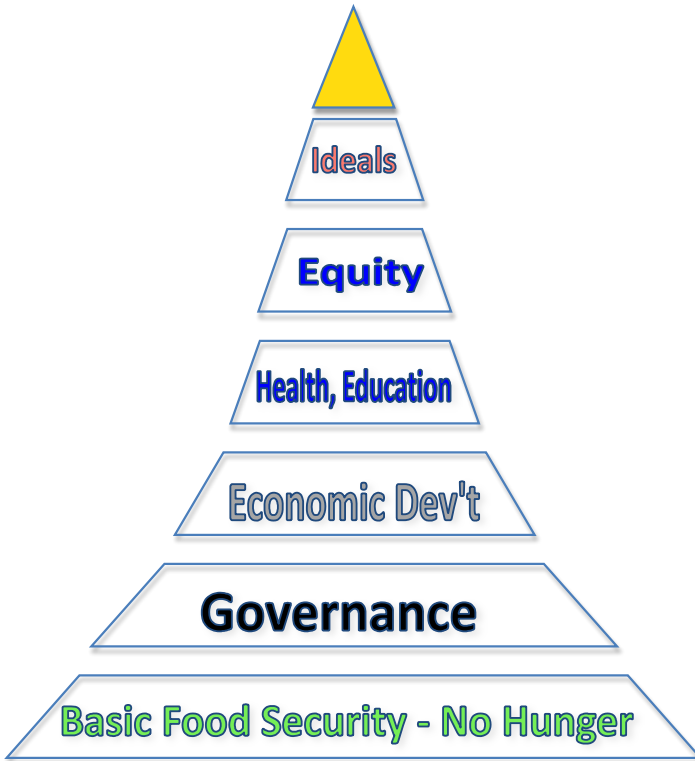
How Government Meets the Challenge

From a Western perspective it is normal to assume that government is comprised of a parliament (legislature), an executive for implementation of legislation and an independent judiciary that enforces the laws and also ensures that parliament and executive act within their powers. But this is not necessarily the case in food-insecure nations. The response that good governance for another nation requires adoption of a democratic system resembling ours may be unrealistic, but it can serve a purpose. It can force much unnecessary discussion about good governance back to acknowledgement of the role of government being the protection and, where possible, the enhancement of their peoples' ability to live fulfilling lives. Defined in these basic terms – expressed most eloquently in the US Declaration of Independence as the inalienable right 'to life, liberty and the pursuit of happiness' – the first role of government is to ensure that people have the essentials of life, the first of which is security over their food.

The challenge of securing food for a nation is not usually a focus of government in wealthy nations for the simple reasons that; (i) it appears to be unnecessary except for marginalized persons, and (ii) the types of democracies adopted in most wealthy nations encourage reactive rather than visionary actions by government. In food-insecure nations, such governance systems can rapidly fail when disenfranchised groups express their dissatisfaction through violence, such as the food insecurity riots graphed in an earlier Figure. The role of government in food-insecure nations is to plan for sustainable means of securing basic food supply for its people. In practical terms, it is food security planning that is the challenge.

Accepting the role of planning for food security in a food-insecure nation requires actions that continue to be judged by wealthier nations as economically inefficient at best, and otherwise as counter to global interests. Rather than use their dominance to insist on what they see as more economically efficient actions, it behooves wealthy nations to respect other nations' sovereignty, for that is also an internationally agreed role of governance. In any case, such assumed economic inefficiency is from partial analyses that value lives in poor nations below those in rich nations. This is what any suggestion that increases the risk of starvation in any situation means.

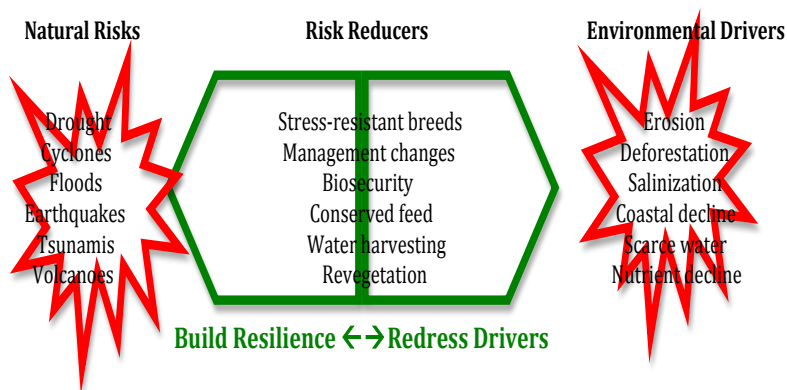
Expressed as a hierarchy of government responsibilities as in the following Figure, securing the food base for the population forms the foundation on which the actions of fulfilling other responsibilities can be built, beginning with the governance structures necessary for stable economic development. After that social programs can be reliably planned. This hierarchy indicates the inadvisability of attempting food security as a component of general social or economic development programs.



Governments of food-insecure and poor nations that accept their role to feed their own people as a priority have followed some common paths, of which planning is the primary action. As described earlier this follows steps of: assessing the risk of food shortages; determining acceptable levels of short-term malnutrition; stimulating local production efficiencies, and covering risks by such mechanisms as firm forward contracts, grain storage, research, enhanced local production and self-sufficiency, and limiting free international trade in food to non-essential food products.

If one item is selected from this list as an indicator of the reason the world has moved backwards in this field, it is the studied ignorance of the benefits of past government research

contributions to reduce food supply risks. Continued squeezing of such funding over at least the past two decades has not affected food security in wealthy food surplus nations directly, but it has reversed the once sustained rise in crop yields from the Green Revolution of the 1960-70s that was correlated to overall agricultural R&D investment.¹⁰⁸ Dependence on continued agricultural research for sustainability of food security is a simple means of defining the huge challenge that governments in food-insecure nations have in fulfilling their role. The role of governments in wealthy nations is to support those food-insecure governments, not to encourage them into policies that lead to their people being at risk of malnutrition or starvation. The criticality of research and its link to sustainability in food security is described in the following Figure.¹⁰⁹



The Figure is presented in the same disaster risk reduction framework used earlier in this essay. Crop and animal breeding and management research are oriented to sustained food production. Sustainable resource management in this context is oriented to that sustained food production objective, not to a fanciful objective of an unchanged natural environment. With such an approach, the ‘environmental drivers of risk’ such as deforestation, soil degradation and water scarcity become subjects of sustainable food production research. This increases

resilience of the system to major shocks from natural disasters such as drought and floods.

Answering the Question

Food security has recently become a major interest of the international development fraternity. A skeptic might suggest that this is simply a reflection of their neglect of the subject for too long. From the preceding discussion it should be clear that I consider that it is not simply neglect but actions that work against real food security that have stimulated this token revision of past policies. Proselytizing free trade as the solution has added to the risk of insecurity and downgraded the essential role of national planning for food security. Products seldom flow to where they are needed unless that demand is accompanied by purchasing power; and when the product is food the situation is even less sure and more critical than when it is non-essential products. This is where such terms as protectionism and trade barriers lose their pejorative inflection and become sound policy for moral action. Such planning is not against free trade, in fact it allows it to occur – for free trade requires stability and lack of conflict, neither of which can exist if one's neighbours are starving. Western policy models based on surplus food, or even on food exports as a major component of national income such as in New Zealand and Australia, naturally favour free trade for their own benefit. An entirely different approach is needed for a country that cannot reliably feed its people.

This is the overriding role of government in food-insecure countries – to plan for food security. It also defines a role of government in wealthy nations to assist such food security planning, rather than seeking to turn food-insecure nations into dependent customers of wealthy nation food exports. This is not anti-agribusiness or anti-trade, it makes good economic sense. The food-insecure nation maintained in a stable state can become a customer and/or develop other industries – but if it is

politically unstable, trade is interrupted and emigration threatens other nations.

The other issues discussed in this essay – sustainability and climate change – are contained within the central tenet that food security planning is the primary role of government in food-insecure nations. It is a global issue because food insecurity has global consequences, but its solution is a national one – the job of each sovereign government.

The implication of such a conclusion is that seeking one solution to fit all cases is futile and that the situation requires awareness that policies will differ, attitudes to sustainability will vary and even tolerances of malnutrition will not be the same across all jurisdictions. Agricultural research on the other hand has great economies of scale across similar climatic regions, produces extremely high rates of economic return compared to other sectors and has a basis for investment, albeit in need of refreshing.

Western nation experience is relevant in terms of its past successes from planned development. If aid was objectively allocated, one might expect that it would first be allocated to such food security needs as; planning for a measure of food self-sufficiency, managing food storages, ensuring firm supply contracts of the most basic grains/staples and continuous participation in global agricultural research, especially in marginal regions. The responsibility of government in this case is to focus international aid on first priorities instead of ideological objectives. This is no doubt an unpopular conclusion, but one derived from international development's own experience and from our millennia-old knowledge of the unpredictable actions of desperate hungry humans – multiplied today by billions.

Chapter 3

Thank you for your views on the need for food security planning in countries that cannot produce enough food for themselves. It all seems plausible but surely if Western nations have solved this problem of food availability centuries ago, why don't we just use our aid to insist that other countries follow our model?

The Success of the West

The common view of 'our model' – the Western model – of development, imparted effectively by schools oriented to creating good future patriots may not be quite true. The West today enjoys great food security, and contains capacity to increase food production even further, and it considers its own nutritional problems in such terms as obesity, bulimia, anorexia and ignorance. Famine is not mentioned – that is a problem of the third world that we are somehow above by virtue of superior knowledge, ability and organization. This Western self-image is pervasive and is reinforced by the history that we offer our children and the middle classes of the rest of the world. It is worth considering this version of history briefly.

The party line runs like this: Western history might be simplified to a picture of the West as a continuation from the great Greco-Roman civilizations that after adopting Christianity experienced the Renaissance in or before the 1600s. With this flowering of artistic and scientific creativity, the West began discovering other parts of the globe and incidentally expanded international trade to general benefit. Meanwhile, learning among the general population grew through the invention of metal moveable type and widespread scientific curiosity led, in 1778 to Scotland's James Watt making the first steam engine efficient enough to substitute for other energy sources. With efficiencies and other innovations

through the early 1800s, the textile industry and metallurgical advances unpinned great increases in wealth for some European nations. With these technologies and international involvements through colonies, Europe and increasingly the New World under the same general umbrella of the 'West', extended its cultural influence and helped other nations enter the industrial age. Apart from interruptions during major wars, this generous approach to sharing the benefits of industrialization continued into its modern forms of international development assistance – aid. In food production as for other industries, the West applied ever-new industrial technologies that allowed food surpluses at the same time as releasing peasants from drudgery to enjoy the benefits of the ever-richer Western civilizations. Periods of hardship occurred but were corrected through the evolution of modern democracy, which became a further boon that the West shared with the world.

Of course, this potted history – stylized in the diagram – can be disputed in a hundred ways, but it is probably a fair representation of the general public's view. Hence your question appears not only logical, but also fair. And that is the problem: the worldview it reflects arises from a long-established bias that is not logical and as a consequence is not fair.



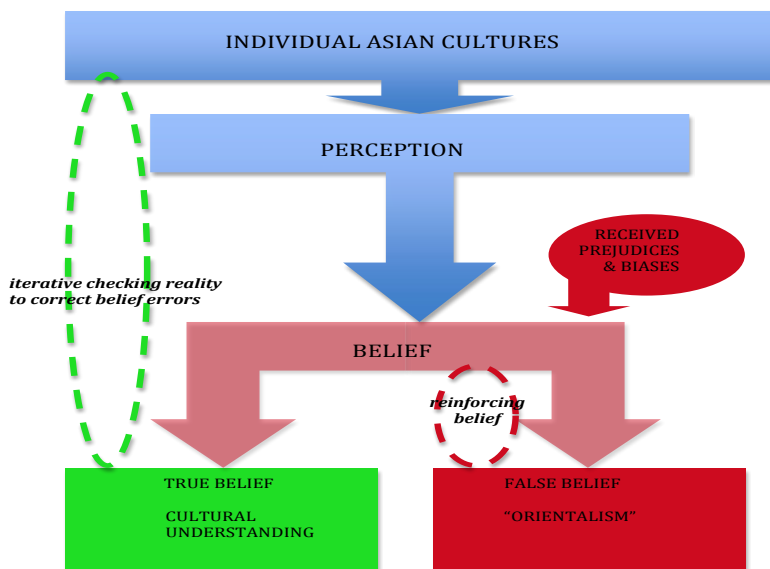
Balancing the Bias

In his detailed book, 'Orientalism', Said¹¹⁰ uses colonial British, French and later US approaches to regions from the Middle East to Northern Asia to demonstrate the origins of an unfounded Western superiority. He provides a useful means of correcting the imbalance that shows worldviews such as those of the title question to be based on erroneous assumptions. Essentially, the origins of modern East-West relations derive from the East being a Western academic invention that set the boundaries for Western involvement and precluded objective understanding and respect of other cultures. Schools of oriental studies and the like established in colonial powers adopted a quasi-scientific approach to research that made their outputs seem objective when the basis of their comparisons were more akin to straw men and straw cultures of their own invention than to real Asians.

Said notes: 'A field like Orientalism has a cumulative and corporate identity, one that is particularly strong given its associations with traditional learning (the classics, the Bible, philology), public institutions (governments, trading companies, geographical societies, universities), and generically determined writing (travel books, books of exploration, fantasy, exotic description). The result for Orientalism has been a sort of consensus: certain things, certain types of statement, certain types of work have seemed for the Orientalist correct. He has built his work and research upon them, and they in turn have pressed hard upon new writers and scholars. Orientalism can thus be regarded as a manner of regularized (or Orientalized) writing, vision, and study, dominated by imperatives, perspectives, and ideological biases ostensibly suited to the Orient. The Orient is taught, researched, administered, and pronounced upon in certain discrete ways.'¹¹¹

The following diagram illustrates the way in which a false belief in the West has been reinforced by subjective bias, according to

Said's general thesis. Beginning from the top of the diagram, the nature of individual Asian cultures is filtered by the perceptions of observers from another culture and supplemented by prejudices, other received biases and ignorance to produce a belief about Asian cultures. This belief then becomes the benchmark against which new ideas, romantic writings and even academic research is compared so that a remarkable conformity between Western intellectual discourse about Asia and received beliefs is constantly reinforced (the red iterative ellipse indicated on the right side of the diagram). On the other hand, the green iterative ellipse on the left side indicates a continuous objective assessment of understanding against reality rather than belief – and is closer to the impartial seeking of knowledge of great scholars, and a cousin to the scientific method that has produced the reliable new knowledge in recent centuries in other fields. It is in fact the age-old and modern version of Plato's theory of knowledge.¹¹² The simple diagram thus indicates how the West 'invented' the Orient in its own mind.



This invented Orient became the subject of most subsequent study and romantic writing, which cemented myths about habits, beliefs, attitudes and even basic capacity through romantic novels, academic texts and colleges producing colonial civil servants. It assumed the status of truth in Nietzsche's sense that 'truths are illusions about which one has forgotten that this is what they are.'¹¹³ As an influential academic tradition, and expressed in today's terms from today's worldview, it can be seen as fostering racism, imperialism and failing to consider the viewpoint of the other. But of course we cannot judge the past by today's views – the point here is to acknowledge that our views today are coloured by our culture, which in turn has a biased past. This is the basis of Said's contention that Orientalism is a political lens through which the West views the Orient. No equivalent field of Occidentalism emerged in the Orient even in periods when that civilization was more advanced than the Occident (the West).

Conventional Western history overlooks the eighth to the sixteenth century domination of an Oriental culture – in that case Arab – of the West, which includes a most advanced period of European development. Said says this categorically. 'Anyone who has the slightest acquaintance with Arab or Islamic history will know that [the Abbasid period] was a high point of Islamic civilization, as brilliant a period of cultural history as the High Renaissance of Italy'.¹¹⁴ By limiting Western study and understanding of the East (the Orient) to an imagined world that Said has labeled Orientalism, stereotypic descriptions have been serially developed around such themes as sensuality, despotism, inaccuracy and backwardness. In turn this dispelled more profound insights about the East by simply not providing an academic or political foundation for contrary ideas. Thus while there were certainly differences in style – particularly between British and French writings – all 'kept intact the separateness of the Orient, its eccentricity, its backwardness, its silent indifference, its feminine penetrability, its supine malleability'.¹¹⁵ With such a separation from reality, reinforced definitions of

Oriental 'backwardness, degeneracy, and inequality with the West most easily associated themselves early in the nineteenth century with ideas about the biological bases of racial inequality',¹¹⁶ particularly between advanced European-Aryan and other races. This in turn was used to justify the Western 'civilizing' annexation of Eastern lands. This is obviously quite a different history to the potted school version introduced at the beginning of this essay.

Perhaps the most telling aspect of this subjective field of study is the uncharacteristic disdain its scholars could maintain for their life's work, such as Noldeke announcement that all of his Orientalist works confirmed his 'low opinion' of Eastern races.¹¹⁷ Such emotion allowed the objective colonial approach of territorial dominance that defined the most successful enterprises, those of Britain. Carrying the 'white man's burden' responsibly, these British enterprises contrasted with other less organized approaches, which reinforced an hierarchy of colonial power with the British seeing themselves at its peak. The French version of Orientalism included a wide novelistic genre that was essentially considered licentious and socially dangerous by the ruling British. The combination of these attitudes produced the aberrant outcome that learning Oriental languages was discouraged except in the case of linguists who could argue the superior lineage of Indo-European languages over Semitic, just as intermarriage with Orientals was discouraged by the British.

Britain's relationship with the East became Europe's and the New World's. It was simplified to possession and efficient administration justified by such earlier independent statements as Emer de Vattel's that European states should assume ownership of lands inhabited by insignificant natives.¹¹⁸ With Britain clearly the major beneficiary of the geographical expansion of the colonial period, France suddenly increased its interest in acquiring foreign lands after the ignominy of losing the Alsace-Lorraine territories to Prussia in 1870. In this period, French geographical societies had more than twice as many

members as those of all Europe, and new influential associations were founded including the Comité de l'Asie Française, the Comité d'Orient and the Société Asiatique. European history acknowledged this spurt of activity as France facing 'up to its transnational responsibilities during the last two decades of the nineteenth century'.¹¹⁹ Different in their approaches, the British and French used the compromised field of Orientalism as a tool to assume control of the Orient up to the twentieth century, not the least through educational systems delivering a Western worldview to colonial subjects.

As the twentieth century progressed, some objections to the rigid separateness of Orientalism became evident, such as Richards' challenge to assumed models for studying Chinese thought.¹²⁰ But old models persist even into modern times, and as Said¹²¹ points out in referring to Massignon's¹²² continued interpretation of the Israel-Palestinian conflict as clouded by his insistence on the Isaac and Ishmael argument, and Judaist conflict with Christianity. Such interpretations that have undermined objectivity in academia have incidentally added fuel to misunderstanding that part of the East, and also to general anti-Semitism. The bias also warps history in such ways as Gibb's¹²³ explanation that the West's learning from the East during the advanced period of Arab governance of Spain and southern France was simply a reintroduction of the West's earlier values. And that view continues today in support of the West's preference to portray its own lineage as deriving directly from ancient Egypt through Greece and Rome.

As the Western power-base shifted from Europe to the USA after WWII, a new approach to the East was possible, but in fact it tended to simply follow the old imagined paradigm described by new social science terminologies. This has produced such perpetuation of the imagined 'other' as Huntington's 1993 'Clash of Civilizations',¹²⁴ and in the same year Johnson's article calling for a return to Western-controlled colonialism for nations that 'are not yet fit to govern themselves'.¹²⁵ This is somewhat similar

to the sentiment of the title question. And it is based not only on gross misrepresentation but also on complete disregard for non-Western value systems and of objective consideration of the relative powerlessness of non-Western states. This effectively defined the context for the age of Western development assistance, which was remarkably close to the title question's suggestion that Western aid be used to 'insist that other countries follow our model'.

Aid to Do What?

In the colonial era when European nations assumed forms of ownership over the resources, lands or products of various parts of the globe New World nations were either in the colonial category themselves, or asserting new policies that would have even greater impact. Thus in the 1900, the USA introduced an 'Open Door' policy that presaged today's free trade ideals and was able to benefit from imports without taking responsibility for their costs of production. It was this new mode of dominance that cemented the them-and-us scenario that led to independence movements around the world and Japan's actions in WWI & WWII with the West described as the 'white peril'.¹²⁶

With this new mode of trade without colonization, the USA slowly developed an international awareness and created foreign policy based on 'the flag of the nation' following the trader. This is the context of the US rationalization that 'the doors of the nation which are closed must be battered down' as Woodrow Wilson remarked in his 'History of the American People'.¹²⁷ The rules of international trade were being changed radically in this period, and allowed such businessmen as Rhodes in Africa and Reuter in India to gain huge franchises with limited associated responsibility. It is an irony of international development that the morality espoused in such unbalanced exploitation found expression in the cultures of the less developed part of the globe as they struggled toward nationhood and economic

development. However, economic development requires start-up capital, and the capital itself was a tradable commodity dominated by the West. Seen from this perspective, Western aid was a means of insisting on free trade and open investment rights in poor countries – and as explained in another essay, free trade in basic foods for survival continues to be supported by aid with a collateral effect being increased hunger. Added to this is the chagrin of recipients that aid seldom is a gift, for the large dollops come as loans.

Loans to developing countries, even before the post WWII Marshall Plan and its successors, allowed leverage over countries with exports demanded by the lenders. Favourable deals were struck which, when combined with incentives for local corruption, led to more doors being ‘battered down’ and local moralities being breached. It is this aspect of history, usually dressed in finer disguises that gave rise to Indian Nobel Laureate Tagore’s 1921 statement that: ‘Those who live ... away from the east, have now got to recognize that Europe has completely lost her former moral prestige in Asia. She is no longer regarded as the champion throughout the world of fair dealing and the exponent of high principle, but rather as an upholder of Western race supremacy, and the exploiter of those outside her own borders.’¹²⁸

That the West could not understand such statements then or even now does nothing to deny their validity while doing much to reinforce the cultural deafness that has accrued from industrial power. US President Wilson nominated 14 points during WWI that revolved around free trade and were seen by the West as fair and a boon that made everyone richer. Little has changed in international development since then and free trade has now become a pillar of international agreements and aid. But the economically disadvantaged of the world that have felt the effects of free trade have long seen through the intentions that lurk behind fine-sounding programs. Those nations with the capacity to industrialize have been doing so in recent decades to

produce the shifting global power-base that characterizes today's economy.

Persistent Western myopia renders this situation unrecognizable in much of the developed world. Even feelings that something may be missing from the Western system are now commoditized in wellbeing industries rather than examined as a spiritual malaise. Yet confrontations between China and the West more than a century ago produced insightful observations that retain their relevance today, such as that of Liang Chi Chao: 'Material life is merely a means for the maintenance of spiritual life; it should never be taken as a substitute for the object which it serves ... In Western nations today, the tendency is to regard life solely as material development with the result that, no matter how plausible the contrivances, the malady only becomes worse ... Our [China's] problem is, under the condition of this unprecedented scientific progress, how can the Confucian ideal of equilibrium be applied so that every man may live a balanced life.'¹²⁹

Liang identified the difference between East and West as not a material difference of developed and yet-to-be-developed but as a spiritual difference. Without denying the benefits of material developments, Liang emphasized the central role of avoiding both physical famine and spiritual famine, with the latter accompanying importation of value-free Western models of development. Even the Westernized and Western-raised Sun Yat Sen of China deplored the loss of traditional virtues in China's young men in his Three Principles of 1924. Later in India, Gandhi made similar observations using terms such as 'spiritual suicide' and 'this quiet petrification of the soul into matter'¹³⁰ to describe the effect of consumer-based social development. Tagore invoked the cyclical historical terms of the East to define the effect of blind adoption of the spirit-free materialism of the modern West. He said 'Great civilizations have flourished in the East as well as the West because they produced food for the spirit of man for all time ... These great civilizations were at last

run to death by men of the type of our precocious schoolboys of modern times, smart and superficially critical, worshippers of self, shrewd bargainers in the market of profit and power, efficient in their handling of the ephemeral, who ... eventually ... set their neighbours' houses on fire and were themselves enveloped by flames.'¹³¹

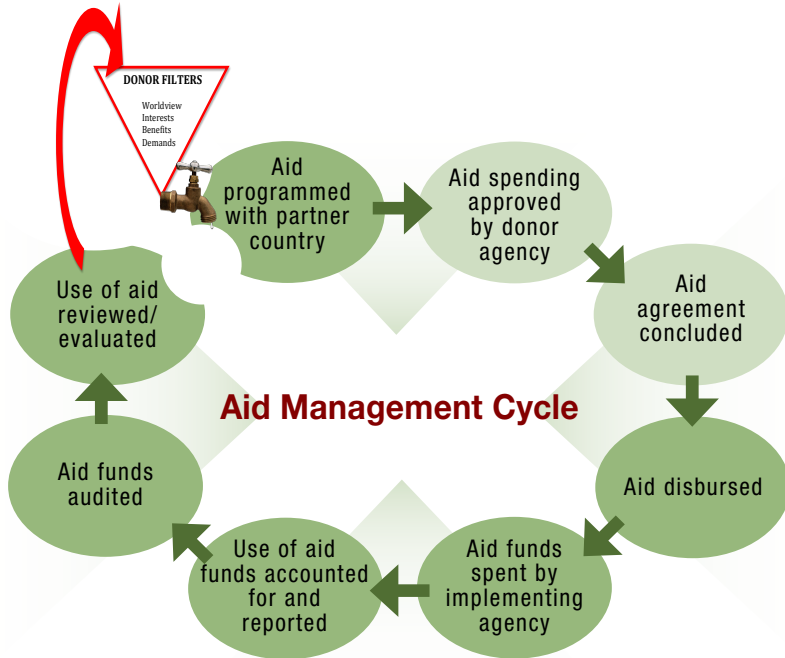
All this is background to understanding how such seemingly naïve (to Western eyes) government policies of self-sufficiency as a moral virtue can be promulgated seriously. The worldview that produces such outcomes has all but been destroyed in the West, yet has persisted in parallel with material development in the East. Gandhi exemplified the approach, yet he is viewed as both great and quaint at the same time in the West. In China, Confucian values produced moral villages that aimed at self-sufficiency through the 1920s, which in turn influenced Mao Zsedong's ideal of harmonious socialism. In such approaches, as in current Islamic national consciousness, the West is seen to have failed by conspicuously placing material progress above values, and local protests may be less about despots than leaders who have followed Western value systems.

To rhetorically label such divergent views as a 'Clash of Civilizations'¹³² may appeal to Western audiences, but it also indicates the conflict and competition-oriented approach inherent in the modern West. The dichotomy has long been identified in the East, and a faithful remnant has maintained the thought among Asian intellectuals. From time to time those intellectuals influence the pervasive power of the West's free trade, international debt and military menace. Today, the world has changed so much that Western tactics honed through the post-colonial period may cease to be effective when cheap labour combines with education and governmental-restraint on speculation to produce a West indebted to the East and reliant on its products. If the seeds of man's spiritual nature remain viable in the East, which I acknowledge is easy to romanticize and overstate, this may offer hope to both the East and the West.

Zhang Junmai in 1920s China saw this when he noted that, ‘the fundamental principles upon which our nation is founded are quietism, as opposed to Western activism; spiritual satisfaction, as opposed to the striving for material advantage; a self-sufficient agrarianism, as opposed to profit-seeking mercantilism; and a morally transforming sense of brotherhood rather than racial segregation. ... A nation founded on agriculture lacks a knowledge of the industrial art, [but] it is likewise without material demands; thus, though it exists over a long period of time, it can maintain a standard of poverty but equality, scarcity but peace. But how will it be hereafter?’¹³³

We now live in Zhang’s hereafter where we have institutionalized Western biases and beliefs. The Figure below presenting the ‘aid management cycle’ has been adapted from its source¹³⁴ to highlight, in red, the filtering of what aid flows through the tap and under what conditions. Far from being a cooperative partnership following an iterative joint learning pathway, it is more a cycle of dependence on hierarchies perceived by the donor. Contrasting with this perspective is that elucidated above of an alternative worldview that does not seek ‘development’ devoid of equality or peace or one measured only in economic terms. Of course, not all aid follows this path of power, but seldom does official aid acknowledge cultural difference in such terms as those of Zhang Junmai presented above.

Such a different cultural viewpoint – that equality and peace may only be possible in conjunction with poverty and scarcity – is incompatible with most thinking and forms of governance in the West. So the title question – ‘if Western nations have solved this problem of food availability centuries ago, why don’t we just use our aid to insist that other countries follow our model?’ – becomes more problematic. With the West’s worldview being so different from others’, and aid not being what it seems to be, it may be time to face a few basic facts relevant to the question.



Facing Some Facts

Returning to the above potted (*italicized*) Western view of history, we can now briefly clarify, or at least question, some of those assumed 'facts'.

i) *The West is a continuation from Greco-Roman civilizations*: This is a useful lineage to explain the origins of some Western values, but it ignores the strong involvement of areas south of the Mediterranean in both the Greek and Roman periods including Egypt, and indeed the long post-Roman role of Constantinople in the cultural and governance values of what became Europe. An exploration of the origins of today's Western values may well find Celtic, Germanic and other tribal ethics and ritual mixed in with those received from dominating cultures such as Indo-

Persian influences from Mithraicism and Proto-Sanskrit language, probably via the Middle East.

ii) *Christianity gave rise to the West's superiority*: If we accept that Western world dominance is simply a passing phase as all other empires have been, then there is no need to attempt to justify why, but only what led to current dominance. Most analysts attribute it to the triple factors of the Industrial Revolution, the colonial era and something that could be described as an inherent curiosity. I discount the last of these as not being evidently different from any other culture, notwithstanding centuries of the type of propaganda so clearly denounced in 'Orientalism'.¹³⁵ Likewise links between Christianity and the Industrial Revolution and colonizing are at best circumstantial because, for example, the younger religion Islam was the vessel for much of the knowledge necessary for the former, and was also an expansionist religion albeit with a different colonizing model from those already distinct versions of each of Britain and France.

iii) *The Renaissance grew out of the fertile Western culture*: The word 'Renaissance' was first coined from the French historian Michelet¹³⁶ in the 19th century and is still viewed by some as a nostalgia for the Greco-Roman culture lost through the Middle Ages. The latter period of the Middle Ages in Europe that preceded the Renaissance was in fact critical to the flowering that characterizes the arts of Florence, possibly as an expression of confidence to express understanding from learned works that were mainly written in Arabic and Greek, and introduced by the dominant influence in Europe – the Arabic culture centred on Cordoba. Seen in context, the Renaissance may have arisen less from Western imagination than from a new-found confidence in cultural expression and learning coupled with wealth generated from international trade. Some might go so far as to note the parallel to the expansion of science and art in China in the present era.

iv) *Scientific curiosity fueled international discovery*: This belief seems to stem from the European age of exploration. The history of such exploits make up much of basic historical school education in and influenced by the West. These conspicuously omit reference to earlier Indian and Arab coastal trading from China to the Middle East, the frequent voyages of the Malay's to Africa and elsewhere, great sea migrations in the Pacific, and tellingly, the 15th century Chinese global exploration that overlapped with the tentative European toes first being dipped into international waters.¹³⁷ The science itself seems to have been much more a product of, or at least stimulated by, Arab culture reintroducing lost texts and knowledge during its peaceful administration of southern Europe.

v) *International trade was the basis of colonial expansion*: This seems largely accurate, although the ethic of trade was one of imposing monopolies and what is today called exploitation. While I do not agree that we should judge past actions by today's ethics, it remains valid to acknowledge that the lop-sided trade allowed Europe to enhance its lifestyle. But was it trade that led to Western colonization or was it exploration that led to trade? This simplistic chicken-and-egg question applies equally to all societies' exploration-trade nexûs across millennia, and in the European case, has some interesting antecedents. The European era of discovery began with the Portuguese and the Spanish in the 16th century, just after the decline of the Andalusian Arab governance that had included what is now Portugal, Spain, Gibraltar and parts of southern France – the decline is said to have commenced with the sacking of Cordoba in the 13th century and the surrender of Emir in 1492.¹³⁸ It is possible that the global expansion of Christianity was fueled from the rising success of 15th century defeats of the Arab rule in Europe, for it soon led to a Papal line being drawn around the globe to define Spanish and Portuguese rights – still said to be evident today in the West Australian state border.¹³⁹ But it is more likely that trade followed discovery as it has for other societies because it allowed Europeans to find and militarily conquer the source of spices,

textiles and other luxuries that they had previously bought from Arab and Indian traders.

vi) *Education was made widespread by the discovery of the printing press:* Gutenberg's 15th century movable metallic type did allow widespread printing and reading to emerge, but not necessarily modern education. Education in that period served only few compared to the systems of today. In Europe, most modern systems date from the 18th or 19th centuries, although education began earlier in Scotland dating from the mid-16th century, which was incidentally the origin of the first practical innovations of the Industrial Revolution. In mainland Europe, compulsory schooling arose from the Protestant Revolution's aim to allow parishioners to read the Bible in their own language, as first legislated in the free city of Strasbourg in 1598.¹⁴⁰ Gutenberg's printing technology had been perfected and revealed in that city, facilitating educational development in the novel religio-political environment of the era, which incidentally became a catalytic component of democratic capitalism.

vii) *The Industrial Revolution produced agricultural efficiency:* This is correct so far as it goes, but could equally well be stated in reverse, that is: agricultural efficiency produced the Industrial Revolution. This is because what is generally called 'the Agricultural Revolution' may be seen to have begun before the Industrial Revolution and to be continuing today. Agriculture produced food for the factories of industry, a process that was made possible by farmers feeling that if they worked harder, they could keep the benefits for themselves rather than lose it to an overlord as in feudal systems. So agricultural efficiency rose with changes in governance systems, beginning in Britain as did the Industrial Revolution, and continued into the Scientific Revolution that defines today's world.¹⁴¹ In fact the 'Agricultural Revolution' is a description of a long-term process of development more than a revolution and may be seen to have occurred in every agricultural society, including the 'revolution' of Arab agriculture from the 8th century, and of course the

greatest of advances, which were in the Neolithic Period some 10,000 years ago. And it is apposite to recall that Adam Smith once noted that late 18th century China had a better developed agricultural market system than anywhere in Europe.¹⁴²

viii) *International aid aims to benefit others by extending the Industrial Revolution:* As described earlier in this essay, aid may seem altruistic from the worldview of the donor even when it undermines others' worldviews to the extent that it can be counterproductive – such as the observation elsewhere in this book that Western insistence on free trade of food can increase hunger when its objective is to decrease it.¹⁴³ Nevertheless, it may be accurate to say that aid aims to extend the Industrial Revolution, and this has been impressively successful in overall food production in the Green Revolution. Since its introduction through the Marshall Plan, modern forms of aid have introduced industrial technologies, but over subsequent decades aid has drifted toward being a tool of foreign affairs and trade. In many cases it aims to change the governance, worldview and culture of other nations – whether this is as a 'benefit' to recipient peoples is increasingly contested.

ix) *Democracy is an essential precursor to development:* This mantra of persons from the West is not supported by research; Bardhan quotes three reviews, one of which concludes that democracy hinders development, another that democracy generally assists development, and a third that it makes little difference.¹⁴⁴ The view that democracy is essential for development is often associated with securing property rights, but property is only a recent ascription to the ideal of democracy and has clearly been shown to be wrong when functioning democracy makes the property of richer persons less secure. There is ample historical evidence of undemocratic restrictions of rights and trade being used to allow a people to 'get ahead' in the development phase of a nation, as in the early USA and more recently in Asian nations. In some ways invocation of democracy as an essential component of development follows the same

unfairness that Prime Minister Mahathir of Malaysia once noted of Western attempts to curb logging in his nation by noting that the West had completed its development and logging phases and now wants to preclude other nations from reaching the same state of development. It may be that a period of strong central leadership assists the creation of sound governance that can evolve with economic development toward democracy – whatever the term ‘democracy’ is considered to mean.

x) *Famine is not an issue in the West*: If this is true today, it has not been true until very recently – and I do not consider it true in any case. It is only necessary to point out here that Western nations are food-sufficient nations as a result of limited populations, agriculturally suitable soils and climates and the application of science to continuously solve pest and disease issues while discovering new means of increasing yields. The following sections deal with this subject in more detail.

Famine in the West

Western history notes the occurrence of famines, but not always in the terms relevant to this discussion. In the Middle-Ages famines were frequent up to the late 1500s with huge proportions of populations across Europe dying. But all this was before the Enlightened period that informs the West’s current worldview. Otherwise, periods of starvation are often buried in the collateral impacts of war, such as the French famines of the turn of the 17th century, which caused more than two million deaths.

The Irish famine from the 1840s is an exception because it is used in New World stories and histories. However, it is less common to find references to the reason for that famine being directly related to a version of free trade by British insistence that Irish food exports be allowed to flow to that richer overlord’s markets. And it is even less common to find references

to mass starvation in Europe during more recent times. To foster cultural cohesion, history has been presented selectively in such matters as Russian famines sometimes being considered European and sometimes not, and in listing China's Great Leap Forward without acknowledging that China later fed itself.

More realistically, famine may be presented as in the following Table. The list is not exhaustive or indicative of severity – though all killed large proportions of their populations. Lists are longer in recent times because we know more; the recurrence of famine in the Western world throughout this history is stark.

Century	General Location
5 th BCE	Roman Empire
5 th -9 th AD	Western Europe & fall of Roman Empire
7 th – 8 th	Middle East & Spain
9 th -11 th	Central Americas & fall of Mayan Empire
9 th	Frankish Empire; China
10 th	Byzantine Empire
11 th	Europe; Britain; India; Egypt; Mexico
13 th	Russia; Japan; Britain; Portugal; North America;
14 th	Europe; China; India; post-Tamerlane Asia Minor
15 th	India; Mexico; Japan
16 th	Spain; Italy; France; Ethiopia; Britain
17 th	Russia; Europe; Japan; India; Britain; Ireland; Sahel zone; Sweden; Finland;
18 th	India; Prussia; France; Arabia; Britain; West Africa; Ireland; Italy; India; Czech; Saxony; Sweden; Morocco; Japan; Iceland; Egypt; Tunisia
19 th	China; Indonesia; Europe; Cape Verde; Japan; India; Scotland; Ireland; Finland; Sweden; Iran; Turkey; Brazil; North Africa; USA; Ethiopia; Russia
20 th	China; Lebanon; Armenia; Germany; Russia; Iran; Turkestan; Rwanda; Burundi; Ukraine; Poland; Greece; India; Netherlands; Vietnam; Ethiopia; Nigeria; Sahel zone; Bangladesh; Cambodia; Uganda; Somalia; North Korea; Sudan;
21 st	Congo; Zimbabwe; Sudan, Malawi; Niger; Horn of Africa; Myanmar; North Korea; Kenya; Afghanistan; Bangladesh; Tajikistan; Sahel zone; Mali; Somalia

Even though it is not highlighted, the fact is that famine recurred in all centuries in Europe. It recurred in living memory, but is again buried under wartime statistics, as discussed below. And to complete the rebalancing of past biases it is important to consider the New World nations that form part of 'the West', and again starvation is evident in the war histories of the USA and the 1890s and even the 1930s depression in Australia.

20th Century Famine in Europe

Perhaps the grimmest lesson about famine, and its prevalence even in our supposedly stable and civilized West is that of Europe in the aftermath of WWII. As Lowe describes this period, an absence of law and order and ubiquitous violence, exploitation and expulsions, caused external observers to predict 'Europe-wide civil war. The deliberate fragmentation of communities has sown an irreversible mistrust between neighbours; and universal famine had made personal morality an irrelevance.'¹⁴⁵

Famine resulted from various causes; popular among explanations is military blockades as they conjure up pictures of deliberate governmental action to prevent food arriving. While such vignettes are part of the picture, there were other more insidious works afoot. These included burning or otherwise destroying farms, re-flooding southern Italian marshes to reduce food production and incidentally reintroducing malaria, opening sea dykes into Dutch farm lands as well as the routine plundering of food stores by soldiers. And after the effect of invading armies, retreat was accompanied by destruction of food producing assets in an effort to slow down the enemy's advances. Stalin insisted his own people destroy their own houses and food before they evacuated, and Himmler ordered that 'not one person, no quintal of grain, no railway track must remain behind ... The enemy must find a country totally burned and destroyed'. And so many areas were ravaged once on invasion and again on retreat.¹⁴⁶

Between 35 and 40 million died as a result of the war according to Lowe, not just from bombs and guns; starvation also claimed millions. The displacement that accompanied the war, both during and after, was on a scale unprecedented in Europe or the world, and relocating people scavenged from uncultivated and abandoned potato patches and stealing what fruit might be on untended trees while being hounded by those 'reclaiming' their country purged of other ethnicities. During the war itself, most ordinary folk were hungry; international trade had already been a component of feeding cities, and it had ceased with blockades. Luxury foods disappear first in such situations and generate angst, but that is the angst of change, not of survival, which was to follow in Europe for many. Rationing became common, and home rearing of rabbits replaced lamb, pork and beef. This was just the beginning.

It was perhaps Greece that succumbed to famine first with more than 100,000 starving to death in 1941-2 as a result of disrupted food movements, hoarding by farmers and breakdown of law and order. The parlous state of the country led to a German-British agreement to allow food ships to supply Greece throughout the war. Yet even then, some 60% of the 410,000 wartime deaths in Greece were attributed to starvation.¹⁴⁷ Better-governed countries such as Holland managed food supplies for longer but suffered from compulsory requisitions of food by invading armies and by 1944 sugar beets and tulip bulbs formed part of the diet. Worse came, and petitions to Britain to allow food ships through were allowed, but only in limited quantities and some 16-20,000 Dutch starved to death. This was in Holland, a country with links to both the Germans and the British. But Germany was concerned about its own food security even before the war, and in 1942-3, despite good harvests food was scarce. From an adequate average national daily calorific intake of 2,570 at the start of the war, the average German was existing on about 1,400 calories by the end. The obvious means of supplementing their own people's needs was for the Germans to commandeer food

from their occupied territories, and so Belgium and France averaged 1,300 calories per day; food was also taken from Norway and Czechoslovakia. But it became even worse in Holland where, as the last country to be liberated and with the sea having been let into the agricultural fields, national average calorific intake fell to 400, half that of concentration camp inmates.¹⁴⁸

Some starvation was a secondary effect of war; in other cases it was a deliberate act. Poland and Ukraine were to be emptied for German farmers using starvation on a scale that was planned to exceed the Holocaust in numbers of deaths. Food was offered to Poles and others needed for work, and surplus food transported to Germany. The plan failed as people migrated and more forced labour was needed but was maintained where control was absolute – thus some 1.3 to 1.63 million Soviet prisoners were starved to death.

Food proved as valuable a weapon as guns. But the end of war did not mean the end of starvation in Europe. The Allies were unprepared for the task of feeding millions of starving people in Europe in the absence of local infrastructure, governance and law and order. Calorific levels for the British-controlled zone in Germany fell to around 1,000 and in the French zone were lower. A year after the end of the war in Italy, food riots and a ‘hunger march’ occurred, rations in Budapest fell to 556 calories per day, children were eating grass in Berlin, tropical fish in the Naples’ aquarium were stolen for food ... and so on.

The problem was both absolute shortages of food and the difficulties of distribution in the absence of either functioning infrastructure or law and order. And the only source of both order and food was the Allied occupying forces, which soon recognized that law and order could only be reestablished if starvation was tackled as the primary problem.¹⁴⁹ Food also became the only currency of value and exchange of sexual favours for food became common post war as ‘the animal

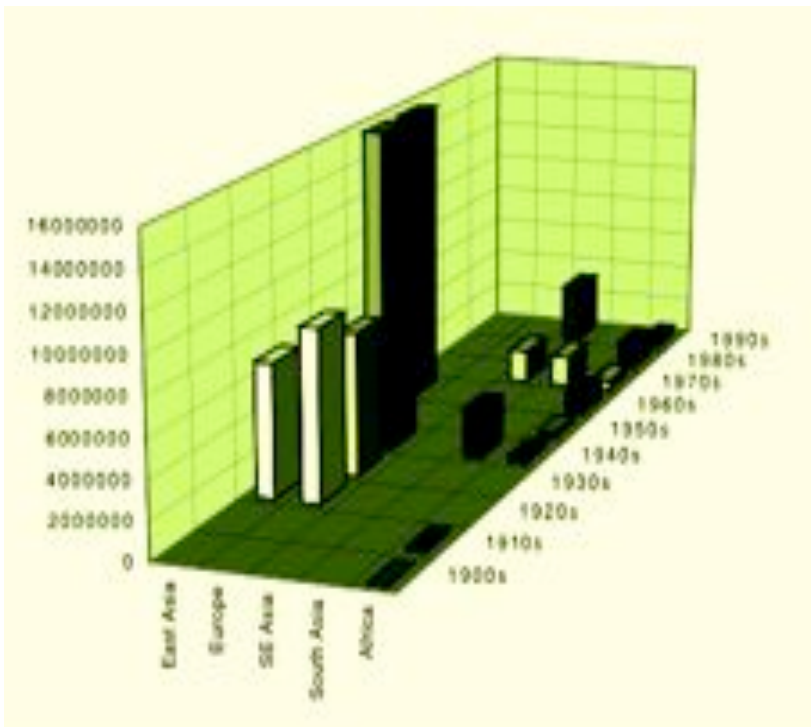
struggle for existence governed everything. Food. That was the only thing that mattered. Food for the children. Food for yourself. Food at the cost of any abasement and depravity. And after food a little warmth and shelter.¹⁵⁰ Such conditions led to black market profiteering, widespread theft and violence. And once a measure of stability occurred in the countryside, peasants and shopkeepers became the new privileged class for they controlled food supply – one indicator was that farmhouses in Czechoslovakia grew to twice their prewar size with postwar wealth generated from sales to the food-poor urban middle class. And in Italy, reallocation of underused land to peasants fostered increased food production – until the old hierarchy reestablished itself. In that short period, throughout much of Europe a communist sympathy was easily fostered as, ‘in a continent that was constantly hovering on the brink of starvation, control of the workforce was an extremely powerful tool’.¹⁵¹

As the Allies sought to reestablish some normality in the zones for which they accepted responsibility, both the British and the American military governments introduced penalties of death for anyone rioting over food. As Lowe comments, ‘there is little difference between announcements like this and those made by the Nazis themselves, and indeed it was perhaps the semblance of continuity between the two systems of control which made the announcement so effective’.¹⁵² But such measures do not create more food, and it seems that deaths in camps managed by France were higher than in camps managed by others of the Allies simply because of the extreme food crisis in 1945 in France.

And even when food became a little more available in Hungary, its value and the onset of hyper-inflation led to such examples as a substantial book advance payment buying only food for one meal, and to factory workers continuing to accept worthless wages as long as they received a free lunch each day. In 1947, France experienced strikes over food shortages and inflation. Enmities generated by envy of those who had prospered from the war – businessmen and politicians – when others remained

close to starvation fostered a fertile ground for communist sympathy, and so ushered in Europe’s continuing war with itself in the form of the Cold War and omnipresent fear of conflict.

The following Figure¹⁵³ shows famine impact (number of deaths) by global region and decade of the 20th century and indicates that Europe was second only to East Asia in famine-related mortality, with its severity being greater than famine events in South and Southeast Asia and Africa for the whole century. This runs counter to popular Western belief. The later Green Revolution accounts for a large part of the reduced incidence of famine in South and Southeast Asia. The Figure incidentally highlights the association of food security – the opposite of the risk of famine – with good governance, which clearly failed in 1920s and 1930s Europe.



So the title question's assumption that the West has 'solved this problem of food availability centuries ago' is not accurate. Famine has stalked the West as much as anywhere else, even when the West considered itself at the height of its civilization.

Answering the Question

Famine is an omnipresent global risk. Minimizing its impact or avoiding it where possible is a first priority of governments. The West remembered this from WWII; it applied its science to the problem, but it has also the advantage of agriculturally suitable lands and climates, and effective control over resources in other parts of the world. With surplus food, the West formulates food strategies based on food safety more than food security, more on exports than on securing sufficient basic food for survival of the populace. This is why food security planning in countries that cannot produce enough food for themselves is essential, and why it is not viable to simply allocate aid to introduce the West's food production model in countries that differ from the West. Such nations also differ from each other in terms of international negotiating power, knowledge-base, soil quality, land and water availability, population density and culture. Each requires its own food security plan as the first responsibility of government, regardless of whether that government is democratic or not.

The 'problem' of food availability for an ever-growing global population is never solved. It is only a problem in the sense that this promotes a focus on the most basic material aspect of life – a focus that is otherwise distracted by a myriad of other material wants that, compared to survival food, are luxuries. The West has 'solved the problem' just like the ancient lands of Iraq's fertile crescent, ancient Rome, China, India and other great civilizations, which of course means that it is always a fragile dynamic. In modern terms for a country that does not reliably produce enough food for its population, a plan to secure that food is not

just the main moral imperative of government but in fact a practical means of maintaining the level of law and order that underpins civil society.

Another matter that others asking such questions from a Western perspective commonly introduce is a concern for the resources used by agriculture and the resultant pollution – oil, fertilizers and pesticides in particular. At its simplest, the title question’s suggestion that the Western form of agriculture can be spread across the planet implies that such resources are available. Human ingenuity has consistently produced new means of accessing resources, but there must be a limit, and costs often rise – which puts such resources out of the reach of poor countries.

Without considering the alternative of so-called organic agriculture – which is discussed in another essay – it is worth noting that the majority of poor country agriculture that produces half of the world’s food uses ‘organic’ techniques. To follow the West as in the title question would mean that the majority of the world would use more fertilizer, more pesticide, more oil and less labour. All of these run counter to other popular arguments, such as: mined fertilizers and oil are approaching ‘peaks’ of availability; fertilizer, pesticide and oil are pollutants, and unemployment produces huge welfare costs. But these are other subjects. The complexity of ensuring adequate food relies on the world’s best science rather than any misplaced Western superiority.

I hope this explains why my views on the need for food security planning in countries that cannot produce enough food for themselves is the most moral and most practical approach to food policy. It is not simply ‘plausible’ – it acknowledges that the way that Western nations have solved their problems of food availability are neither centuries-old nor infallible. And it also notes that use of our aid to insist that other countries follow our model would produce more problems than it would solve.

Chapter 4

You write on food security and world agriculture as well as on spiritual themes, which you distinguish from belief-based religion. How do you reconcile the science and commercial reality of food production with fuzzy spiritual ideals, organic agriculture and the like that are trendy today?

This essay considers alternative forms of food production within a spiritual gestalt.¹⁵⁴ It argues for an open-minded consideration of all forms of food production, and seeks to stifle arguments that one form of agriculture is superior to another. It takes world food demand as its context for both food production and spiritual outpourings such as compassion. And it considers science as a peak of rational learning that is best applied with the insight of spiritual understanding. By taking this approach the rationale behind linkages between science and spiritual matters with respect to food can be explicated. The argument follows through a discussion of what we are feeding, the language of science and spirituality, spiritual nourishment and the oft-forgotten balance between *scientia* and *sapientia* to explain that holistic agriculture exists in large-scale commercial practice, just as it does in smallholder agriculture – but that if either lacks a spiritual element, it tends toward environmental and social exploitation. Hence this essay contains occasional religious language.



What are we feeding?

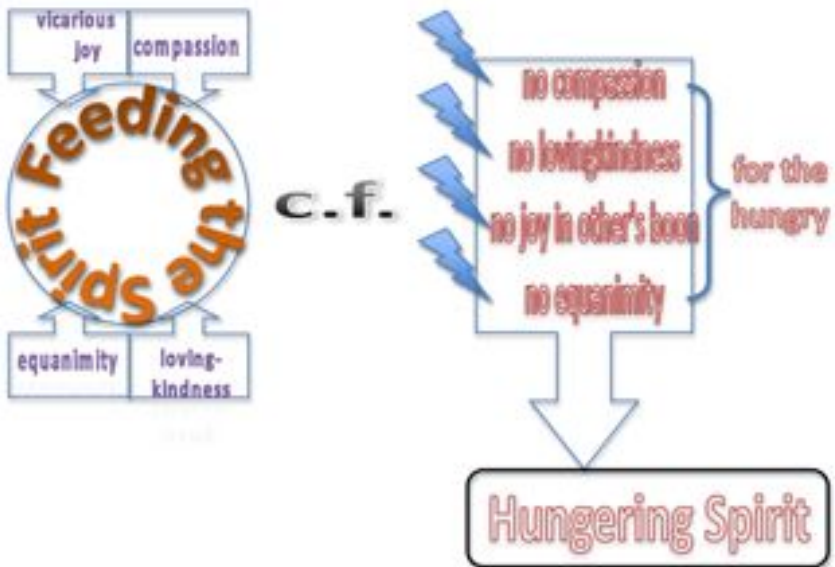
If the body is fed, then the next activity of the considered life¹⁵⁵ is nourishment of the soul. This axiom of the sages comes to us from philosophy and religion. Today feeding the body is reliant on centuries of technology, whether we eat from supermarkets or our own gardens. Yet we easily focus on individualistic notions of physical wellbeing in place of spiritual development. This possibly occurs for the same reasons that the spiritual intent of religions is subverted by belief-based practices. Such is our human nature – spiritual development appeals, but is easily displaced by physical and belief systems purporting to offer easier salvation.

Salvation from what? Simply put, we seek salvation from the fundamental fear of death in its various forms of loss, change and disappointment. When we recognize this motivation we can readily understand why personal health has become confused with spiritual development. I do not mean to deny the benefits of physical health – but excessive, sometimes obsessive, interest in physical health seems to be psychologically unhealthy. The matter is better expressed in the rhetorical question: ‘what is the benefit of living ten more years if one is not at peace with oneself?’ Christians will recognize the sentiment as ‘what shall it profit a man if he shall gain the whole world but lose his own soul?’¹⁵⁶

Technology leads to longer lives. The two major technological fields that allowed increased longevity have been public health and agricultural science. The former reduced epidemics and infant mortality when the latter ensured food was available. Of course, both fields also led to today’s huge population as well as increased longevity, which in turn produced a need for more technology to produce even more food. As an agricultural scientist who has spent much of his life concerned with international food production, the body that I see we need to feed

is not the individual living a comfortable lifestyle but the global population. And at this point, I should be clear that I cannot see any way to feed an estimated nine or more billion persons without the application of modern technology.

This creates a dilemma for those who do not like the use of some technologies yet wish to live by values of compassion and equity. The Diagram below illustrates the virtues that feed the spirit compared to their lack creating a hungering of the spirit – in today’s parlance, angst. At the personal level the anxiety becomes, ‘how can I advocate alternative forms of food production if they may lead to others starving?’ To an extent, such questions are part of life. They are a simple illustration that there are no tidy answers to existential questions. But we can respond constructively, for example by realizing that the essence of spiritual values is testing each experience ourselves in terms of its contribution to reducing suffering. It is for these reasons that I am uncomfortable with belief-based or prescriptive solutions of some schools of alternative agriculture.

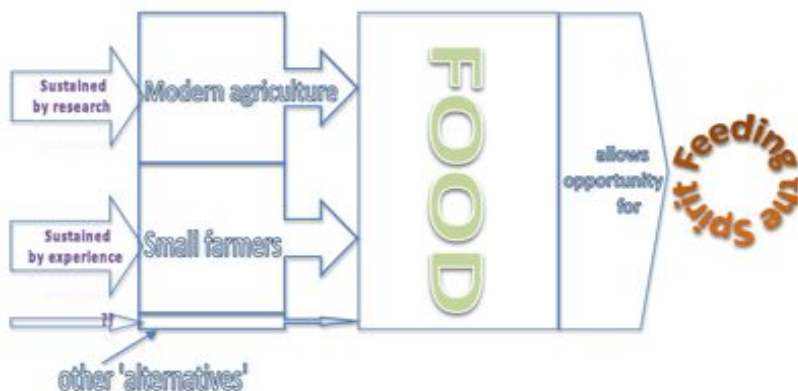


How can I reconcile this statement – that some schools of alternative agriculture are not advancing spiritual development – when elsewhere I have supported self-sufficient agriculture?¹⁵⁷ The answer is in the previous paragraph: each of us must test these matters in our own experience, not simply trust a guru. In saying this, albeit using an Indian word, I am conscious of the benefits of learning in the manner of one's culture. Thus the guru system works because the guru knows his role (and when to end it) and the disciple knows his – within the culture in which the guru is a spiritual teacher. But it is that same culture from which the teachings of sages – advanced gurus if you like – include the reference above to test matters in one's own experience. One version includes words to the effect 'do not trust your guru, but test it yourself ...'.¹⁵⁸

So I put the question again. 'Can we claim that we are feeding our own spirits by advocating a food production technology that restricts the ability of others to feed their bodies?' If we are conscious of the choice, of course we cannot. If we are ignorant of global food issues and seek to feed our spirits, then as soon as our eyes are opened to global needs we are faced with mental suffering. The essence of the question above is in the word 'advocate' – a word in this context that could equally well be translated as evangelize, proselytize, spread the word, advertise, extend the truth, and so on. Not grasping after converts is the essence. The only way that we can feed our spirit while feeding our body from a specific practice such as gardening or a prescribed approach to growing our own food is to conduct that practice for ourselves. This is the nature of spiritual development – it is a personal practice requiring diligence, not the warm fuzziness of joining a social network. To advocate that others follow our chosen practice by claiming that it contains some specific truth is more likely to feed our egos than our spirits.

Technology does not feed the spirit, but it does feed the bodies of the world. In a book recently published¹⁵⁹ I show that small

farmers feed up to half of the world mostly from garden-size plots designed to feed their families before selling any surplus. At the same time, I note the continuing need for broadacre farming – that is, modern technologically-driven large-scale farming. Both are needed to meet the foreseen population of nine billion or so, most of whom will be in cities. Both rely on new technologies. Alternative forms of food production hardly feature in this schema illustrated in the Figure below.



So let's be clear: modern farming technology is not evil. It has no sinister agenda to pillage the environment. Like all technology – it is benign in itself. Of course it can be used in different ways like any other technology. The way it is practiced today produces many unwanted and some unnecessary environmental and social side effects. But that is a product of our societies and individuals, not of the technology, just as atomic theory can be applied in various ways. While we base our societies on a material and consumer foundation, we must expect excesses in the use of all technologies. In food production, I expect that we are re-entering a phase of socially and environmentally exploitive use of technologies because the financial rewards of owning part of the food supply system are becoming even more commercially attractive. Such matters may be regulated by good governance,

which ensures that the needs and aspirations of society are not compromised by private actions.

Regardless of its misuse, modern farming is integrally reliant on new technology. In an earlier discussion of sustainability¹⁶⁰ I have somewhat flippantly noted that the system on which we are now reliant in fact sustains research. Could this be a mechanism of sustainable agriculture in a modern context? The technology that supports farming comes from research, which builds on the great experimental agricultural science tradition that began in Alsace in the 1830s,¹⁶¹ which happens to be around the point of inflection for the acceleration of population growth indicated in the following Graph. It also comes from other practices – two areas that feed into the continued development of technology are from traditional food production systems (i.e. century-old practices of long extant communities), and alternative agricultures.



So I do not see ‘modern’ agriculture as opposed to, for example, ‘organic’ agriculture. I see them as parts of the same process. The language of opposition is easy, and serves to create the separateness that facilitates cult-think. It takes a more open mind to relate this to wider human endeavours, such as feeding the human population. If we are to feed our spirits we need to open our minds and to keep them clear. We may feed our bodies and spirits through specific mindful agricultural practices. But, as I see it, we compromise feeding both our spirit and our body if we are absorbed in proselytizing for social change.

Explained in this way, the question asked at the beginning of this section – ‘what are we feeding?’ – may be answered succinctly as follows. If we make food production our spiritual practice we may feed our own body and spirit at the same time, but if we promote a belief, we should take care that we are not feeding something more akin to our egos. You may say that this is playing with language. It is, just as quotes we hear every day, such as ‘as Marx said, religion is the opium of the people’, when in fact what he said is defined by an important context. He said, ‘But man is no abstract being squatting outside the world. Man is the world of man—state, society. This state and this society produce religion, which is an inverted consciousness of the world; because they are in an inverted world. ... Religious suffering is, at one and the same time, the expression of real suffering and a protest against real suffering. Religion is the sigh of the oppressed creature, the heart of a heartless world, and the soul of soulless conditions. It is the opium of the people.’¹⁶²

Marx’s theme is almost a spiritual explanation – a recognition that suffering is key to understanding society and life. Yet he is referring to the religion of the masses. We easily forget that magical themes of divine intervention define religion for most of the world, even within the West. In addition, religious tags are used in revolutionary conflicts and so define popular politics. Thus religion is, as Marc Bloch identified, essentially political.¹⁶³ Politics has been defined as a theological debate about moral

order¹⁶⁴ within popular expectations of religion – especially in the salvation religions of Buddhism, Christianity and Islam.

Thus religion for the masses is about everyday concerns, and does not differ from animist practices that seek to influence rain, harvests, diseases or hunts. We can see this, for example, in the insinuation of *nats* in Myanmar and *phi* in Thailand into local versions of Buddhism. In contrast, the spiritual aspects of religion deal with transcending such attachments, but as it is ipso facto popular interpretations that serve the masses, so we should not be surprised to see religion defining politics – and being a means by which the public can be politically manipulated.¹⁶⁵

Yes this is playing with language for that is how language works. Here we are using the metaphor of ‘feeding’ the spirit, and such language is already complicated by our use of it in everyday religion and science. So let me explore that subject for a minute to ensure we do not lose spiritual matters in semantics.

Language in Religion, Science and Spirit

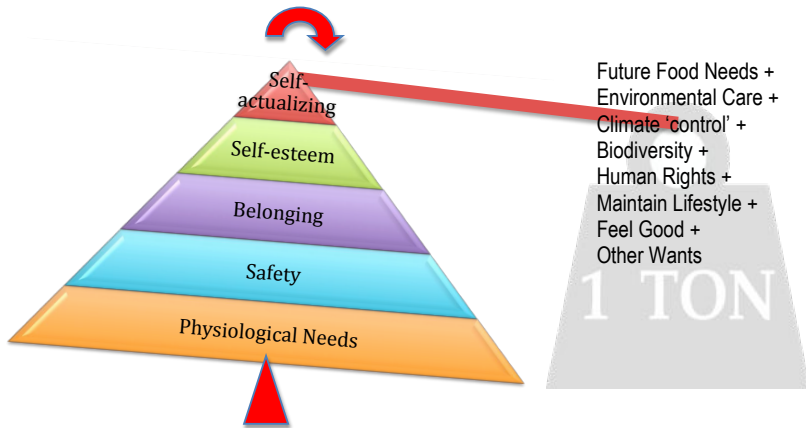
We need food to live. Six billion of us require huge amounts of food. A future predicted population of at least nine billion requires, not just 50 percent more food, but probably 80-100 percent more, to cater for urban and transport wastage and civilized food preferences. If in the language of religion we agree that it is an ‘unconditional duty for mankind to exist’,¹⁶⁶ this food must be grown. In fact, even the irreligious seem to agree. If we were to all grow our own food from our own small gardens, cities would become quite different as would civilization. This may be a good thing – pointless hedonism replaced by productive work appeals to many would-be social engineers. But it does not seem possible under the reigning ideologies of democratic capitalism. And social engineering for spiritual development has never proven sustainable, as we demonstrated as recently as last century through megalomaniac tyranny. Thus I see that our

science-based food production systems that feed civil society today seem destined to continue.

Science in its best form – a methodology and language for understanding nature – has no belief base beyond doubting our senses and when applied as technology is oriented to maintaining man's survival, like the role of religion quoted above. Science does this through the precautionary principle, which put simply, precludes engaging in developments that place human survival at risk. The idea is obviously widely agreed. However, if it is taken to mean that man has the ability to understand the implications of all his actions and to control outcomes relative to his survival, it is more difficult to agree. Yet both religion and scientism (not science) contain an unspoken assumption that we have both the ability to comprehend and control nature. When we do that, we are already viewing nature as something other than ourselves. This can easily occur when we enjoy a surfeit of material comfort and indulge in luxurious ideologies.

You and I are enjoying luxury – sitting on top of Maslow's¹⁶⁷ pyramid and self-actualizing, but it is at the expense of others when they face famine. So I pose the question: how can we feed the future population and care for the environment and 'control' the climate and stop species extinction and advance human rights and maintain our lifestyles and comfort and and and ... ? We cannot – and to try to do so is to rock Maslow's pyramid (as indicated in the Figure below) that we have made unstable by these multiple 'wants'. We cannot do all this from our current approaches, although modern agriculture offers more hope of feeding the world than what are called 'alternatives'.

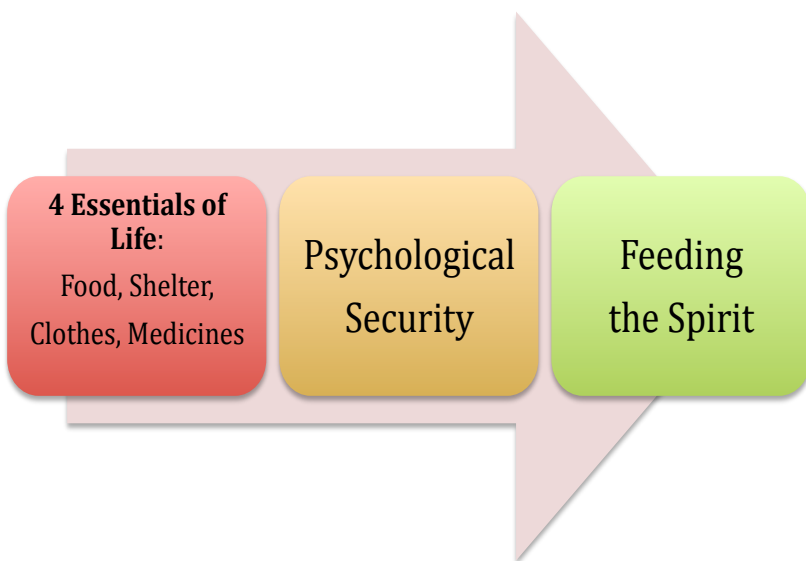
This may not be what believers in 'alternative agriculture' expect to hear, but consider it this way: the problems of modern agriculture that we discuss are made known to us by the same science that is said to have created the problems.



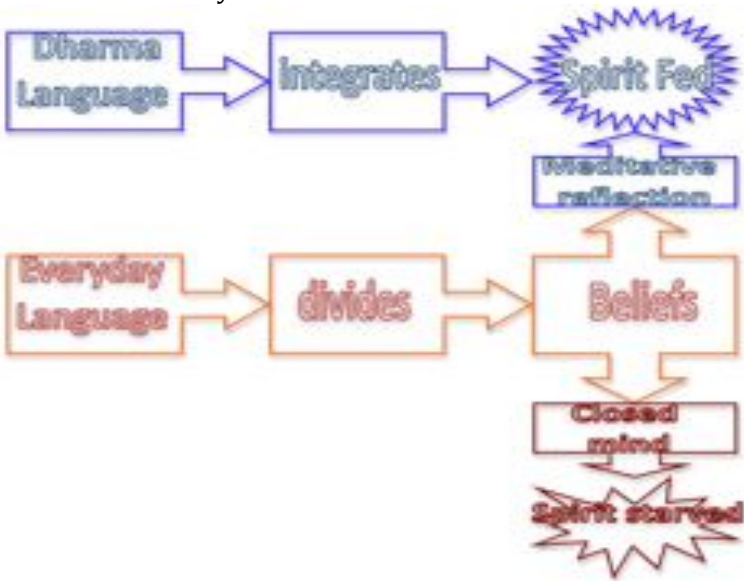
Our knowledge of environmental contamination, for example, is a product of scientific ability to detect such contamination. If application of technology caused the problem, science is charged with developing technologies to solve the problem. It has also solved problems the public has forgotten, which is why, for example, it is more fashionable today to criticize the Green Revolution as environmentally destructive. But that overlooks the relief it brought from the suffering and starvation that faced the world at the time. There is never a single solution in a complex system, and life is the most complex system we know of. This is why the 'silver bullet' or 'win-win' journalistic euphemisms are derided by scientists, for they know no intervention in a biological system has only a single effect.

The Green Revolution fed much of the world, but here it can also serve to demonstrate how we neglect to 'feed the spirit while feeding the body'. It highlights how we were spectacularly successful in feeding the body while paying little attention to feeding the spirit. Ancient production systems were swept aside by modern Western approaches and many Asian scientists were trained as if only technology mattered. Fortunately many farmers and a few scientists retained a language of a wider system in which the spiritual needs of food producers were considered.

This nexus between first feeding the body then feeding the spirit is what the sages have related down the ages. First seek the essentials of life and then devote yourself to spiritual practice. The essentials of life – food, shelter, clothing and basic medical attention – have been defined for 2,500 years or longer, as has the subsequent imperative to pursue spiritual development as indicated in the following Diagram. We attended to the language of the body but not the language of the spirit through the Green Revolution. But the spirit is nourished by personal action, and it takes a strong social fabric to withstand fraying of its strands from unregulated materialism. These are strange things to most modern ears, but it does not take much reading to see that this has been a cycle of learning and forgetting, of rise and decline in civilizations across the ages. Most Westerners for example, in lauding the governmental successes of the Greco-Roman world, forget that the enemy that aware citizens sought to guard against was not a barbarian force but luxury.¹⁶⁸ That was how the wise of that time recognized the distinct needs of the spirit and the body.



Failing to make such distinctions distorts reality, which is relevant when considering how we feed our spirits. Yet distinctions are the most useful means of communicating in everyday language. Many insightful persons have explained this. One whom I admire is the late Thai-Buddhist monk Buddhadasa who spoke of everyday language and Dharma language.¹⁶⁹ I cannot present this essay in Dharma language and so I rely on contrast, categorizations and distinctions to make my points. To feed the spirit from such discourse requires reflection more than reaction, consideration more than confrontation, as indicated in the next Diagram. Then you may see things as they really are – not by you agreeing with me or any other modern-day tractarian, but by developing your own spiritual discernment. This leads me to say that seeing things as they really are is a definition of wisdom – and by saying that I have defined wisdom as the opposite of delusion. So I use everyday language to contrast wisdom with delusion. I need to use the comparative language of everyday communication to present the idea in discussion, in this case here in this essay.



If wisdom is seeing things as they are, then beliefs and preconceived notions and fixed ideas are not wise. Believing that we can maintain things in some comfortable state is a delusion; it is not wise. Yet much of what is said about sustainability assumes that we can control life to suit our fixed ideas of what is natural. But nothing is fixed and thus there is no fixed idea in science; the scientific method as illustrated in the following Figure uses its null hypothesis to remove our human predilection to fixity and our tendency to believe our senses.



The *Scientific Method*, with its *Null Hypothesis*, is a continuous attempt to minimize human tendencies to believe their senses, jump to conclusions and bias outcomes. Non scientific approaches do not usually do this.

How does all this relate to different forms of food production? How does it apply to our spiritual natures? Put simply, it means that it is not productive to claim that one food production system is superior to another – each may be the most appropriate for a specific circumstance. In terms of our spiritual natures, it means that a belief – that is a fixed view of what is the truth – arrests development. Perhaps it can be a stepping-stone if we are starting from a cultural base reliant on belief. But in any case, our common tendency to think we know a ‘truth’ intellectually is but a superficial aspect of knowing in our own spiritual experience. Some people claim that what ‘feels right’ through intuition is the ‘truth’; there are even some in the more individualistic cultures who say that there is an absolute ‘truth’ for each person, such that ‘that is your truth, mine is different’.

But these are not truths, they are the beliefs, fixed views and protective delusions that have served the majority of persons who do not seek to deeply nourish the spirit. To express it in Western secular language this means those who do not seek a deep personal understanding. So in such a context, how does feeding the spirit relate to feeding the body?

Feeding the Spirit

Feeding the spirit may be akin to the feeling of contentment in today's lexicon, such as is attempted in the essay about gross domestic happiness in Thailand,¹⁷⁰ which highlights the conflict between social and individual spiritual objectives. Within the field of agriculture such confusion may be more common since food is basic for life, and because agricultural metaphor pervades spiritual discourse.

This abundance of scriptural metaphor exists for two reasons:

- At the time of great spiritual advances around the world between 500 BCE and AD 100, agriculture was the central activity of the stable societies that produced scriptures because agricultural technologies economically underwrote a small elite part of society to organize spiritual practice and codify religions.
- The flows of nature understood from agricultural practices were the obvious metaphors comprehensible to all. Thus it remains commonplace today to talk of 'growth', 'cultivating', 'nurture' and 'nourishment' in spiritual and psychological discussions. So too, we here speak of 'feeding' the spirit in language drawn from the practices that feed the body.

Our spirits are fed by stillness and reflection to appreciate the myriad interactions that are life. As we appreciate the uncountable interactions that affect all material and non-material things, we harness our rational consciousness in attempts to

understand life and ourselves. At this stage of our rational development we overcome our inability to comprehend such diverse interactions by using mathematical models, such as for climate change, social policy, international finance systems, meteorological forecasting and various aspects of food production. But if we ignorantly believe the results of a model, or worse, believe that a model is perfect and delivers the ‘truth’ we are but a clanging cymbal of fear and delusion. Such is the common state of common man.

Thus a well-fed spirit is essential to awareness of the limits of rationality. For a very small part of humanity, science provides ever-unfolding explanations that can engender wonder and thus lead to insight. For others, a meditation practice to calm the mind and so comprehend more clearly may assist. For yet others it may be removing themselves from distracting lifestyles – such as those who retreat to monasteries or immerse themselves in gardening or small-scale farming. But the wise men of the ages have passed down the advice that most occupations offer the same benefit if engaged in with full awareness. However, rather than full awareness, society tends to foster rational thought and diversionary beliefs. We may feed the spirit by understanding what is lost in such circumstances. Let me take a popular belief in sustainable agriculture as an example.

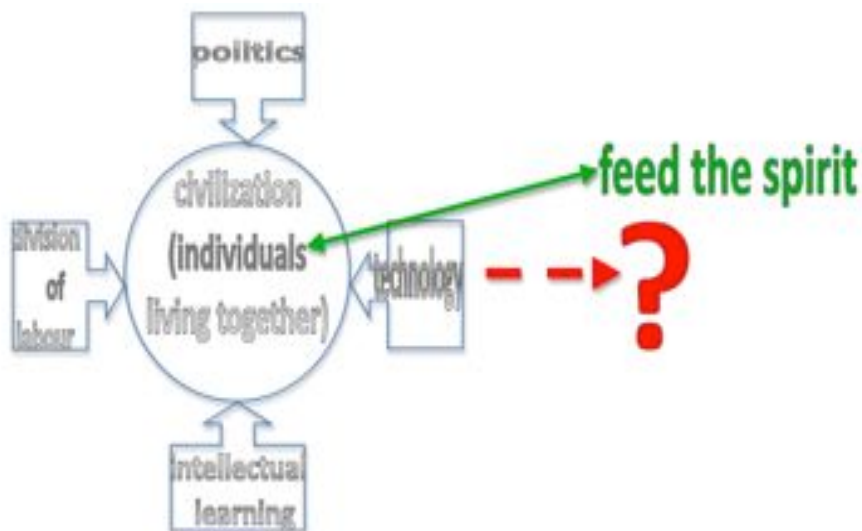
Sustainable agriculture is today’s grail of both ‘organic’ and modern (‘scientific’) agriculture. ‘Organic’ agriculture is served by some science supplemented by convictions and conventions – the subject is touched on in another essay herein. For the moment, I focus on the mainstream agricultural science that serves modern agriculture. It builds on soil science principles known to the ancient Greeks, on such technologies as the nitrogen fixation by legumes and soil amelioration by lime practiced by the Romans, on genetic principles deduced by Mendel in his monastery garden as well as on millennia-old irrigation technologies. However, for most discussions it is assumed to have commenced with commercializing of manufactured inorganic fertilizers and

organic pesticides, which for fertilizers can be traced to the first modern experimental farm of Jean-Baptiste Boussingault at Pechelbronn in Alsace, France in the 1830s.¹⁷¹

Since that time – the mid-nineteenth century – huge increases in food production have resulted; a working estimate of the increase in production resulting from that application of science is 475 percent. This means nearly six times as much food is produced today than in the 1850s when chemical innovations were first developed. Of course, if they had not been developed most of us would never have been born. With such success, including the accelerated introduction of the technologies to Asia known as the Green Revolution, inevitable contingent effects accrue. Those undesirable outcomes are not unique to these technologies, but are rather the consequence of all human attempts at manipulating life. As we observed above, the myriad interrelationships of life are beyond our ability to comprehend. If they could be comprehended, no responsible person would implement harmful ideas in the first place. Examples of our limited comprehension abound, from ancient Roman water pipes made from lead causing neurological deterioration, to past irrigation systems sterilizing soil by salinity, to narrowing genetic bases of major cereals increasing the risk of disease in more than one grain at the same time.

It is easy to say that humans act this way when separated from the spirit. But does this help in practical terms? Has civilization ever combined spiritual and economic development? The answer looks negative if we accept that civilization is the lifestyle of living in cities characterized by politics, intellectual learning, technology and divisions in labour. It doesn't specifically include anything to do with spiritual progress. If civilization is living harmoniously together as might be claimed of Confucian society, it may be a foundation for feeding the spirit, but it is not guaranteed. At base, we feed our spirits individually by knowing ourselves, as indicated in the Figure below. If we live in a civilized society, we probably have time to feed our spirit. But if we seek to do so by

adopting an alternative lifestyle, we inevitably find that our ideals are compromised by our dependencies on the wider society. This is the situation for the majority of recluses, as is most evident in religious traditions where those supposedly separated from the world are supported by those living in the world through gifts of food and clothes. Many believe that such giving brings merit to them, but that belief is not spiritual development.



If one is looking for prescriptive answers, all of the above must sound depressing. But it is only so because we are fixed on one view – wanting something to be as we imagine, and trying to control things that way. In fact ‘control’ is assumed in so much of Western discourse and even in science when it is separated from its contextual understanding. We do well to recognize that it has become second nature to us to assume a separation between our spiritual and rational natures. And this includes all of us who live in modern lifestyles. Let me use the example of Western society to illustrate how this separation from our essential nature affects us and reduces our wellbeing.

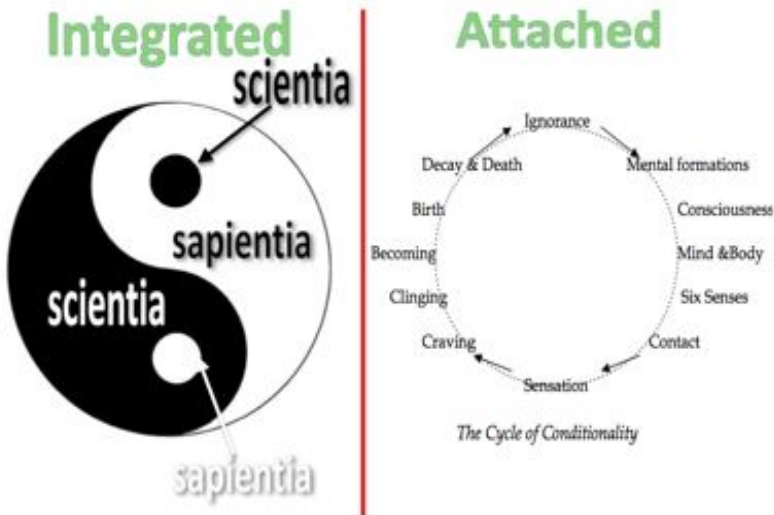
Scientia and Sapientia

The rational values on which modern society is based rely on technology produced by science to deliver ever-greater comfort, health and food. But that science is a pale imitation of the Latin word from which it is derived – *scientia*, which once included that other part of knowledge known from experiential research – *sapientia*. This is the outcome of spiritual searchers over millennia, which has been translated into everyday language as teachings and moral guidelines for those who do not have the time or application to discover things for themselves. As the two are separated today, feeding the spirit requires us to accord equal credibility to both *sapientia* and *scientia*. Perhaps we might even call the integration of the two ‘wisdom’ or ‘insight’.¹⁷²

Insights into the natural world indicate the essentialness of variations, cycles, arising and decay, and the sublime state of living within, understanding, and accepting that process. The Buddhist paradigm called ‘Dependent Origination’¹⁷³ expresses the instantaneous cycle that occurs in our minds when they are not insightful, that is when they are attached to some idea or thing. The cycle begins at any point indicated in the following Diagram, such as ignorance of interactions allowing a mental formation such as ‘sustainable agriculture’ to be conceived and so stimulate mental and physical effort, sensory involvement, and a craving for the realisation of the concept. Identification with the idea leads to disappointment when it fails to achieve all that was imagined, until a new deluded mental formation arises and a new cycle begins. This way of life is essentially inconsistent with the natural order and hence always produces consequences or conditions in which other outcomes may occur.

As an explanation of *karma vipaka* (actions and their effects), the above is instructive in terms of what feeds the spirit. If we find that a specific form of agriculture in which we believe – be it ‘natural agriculture’, ‘organic agriculture’, ‘biodynamic

agriculture', 'Permaculture', 'Steiner agriculture' or any other type – does not provide the output we desire (feeding all people, reliable yields, unblemished fruit etc.), we are disappointed because we are in this delusional cycle. Of course, many adherents to a particular type of agriculture argue that they are not disappointed, but often they have not tested their ideas or themselves in the diversity of global environments or oriented their thoughts to feeding the world's population.



With a blend of *sciential* and *sapiential* knowledge, it would seem that fitting in with the natural state is more likely to feed the spirit. The agricultural environment is not the original natural state of the environment; it is man-made and man-maintained. If there is a form of food production that hardly touches nature (excluding man), it is akin to the food gathering of early humans. Does this mean that we must abandon hope of finding a 'natural' or 'organic' form of agriculture? Or does it mean that we have somehow retreated from the wisdom of integrated knowledge? To accept the first is to share some views of the deep ecologists¹⁷⁴ who value ecological integrity above human aspirations – they say that humans are just another species that may or may not

survive. While true, this is fatuous intellectualism, for each species and individual and especially humans will strive to survive no matter what.

The integrated view – wisdom – regards agriculture as an act of humans within nature. As part of the natural world, human acts are *ipso facto* natural. Buddhism appears to accept this logic and simply uses it to illustrate that karmic consequences are also part of the natural order.¹⁷⁵ Humans only differ from other beings in terms of their different cognitive ability, which allows them to understand more of the natural order. Humans may, by their very human-ness, also be the only beings subject to the 'suffering of change', and the desire for sustainability may be a blind attempt to escape this suffering.¹⁷⁶ Acting on this desire might be a means of feeding the spirit.

So, if we now return to the dichotomous language of everyday, we may divide agriculture differently into two types: one that is conducted with wisdom and so is done with constant awareness of the incomprehensible interactions and unforeseeable effects while always seeking to mitigate their excesses, and another that is oriented to producing food without regard for the consequences. This second outcome sounds remarkably like the Biblical¹⁷⁷ story of the rich man's barns full of grain, which allows him to 'eat, drink and be merry', but not for long. I once tried to make this even clearer by rendering it into a Buddhist story.¹⁷⁸

Our discussion of the integration of *scientia* and *sapientia* indicates that it is one more ideal. Civilized societies have not proven able to keep them united for long. Our histories suggest that when unity occurs it soon degenerates into beliefs, usually defined as '-isms', ranging through environmentalism, communism, sustainability, organic farm-ism to free market-ism. All are ideologies and all subject to the same flaw of the unthinking acceptance that wise men advise against. But as we must live in a world of billions of people with a continually increasing population, it is not practical to suggest that we can

revert to living in a manner that does not impact the environment. Perhaps the most practical response, if the most responsible actions of consumption reduction cannot be achieved, is to minimize the negative impact. This is the ‘reverence for life’ of the great Alsatian Albert Schweitzer, which he expressed as ‘the farmer who has mowed down a thousand flowers in his meadow in order to feed his cows must be careful on his way home not to strike the head off a single flower by the side of the road in idle amusement, for he thereby infringes the law of life without being under the pressure of necessity’.¹⁷⁹ Wisely practicing agriculture in this manner seems the best possible outcome for feeding the body and the spirit at the same time – at least at our current stage of technological development.

One means of considering the gap between *scientia* and *sapientia* is through wider cultural appreciation; without overstating the differences, the holistic aspects of Eastern traditions may be seen to contrast with the sapientially-deficient aspects of some modern agriculture, which is perceived as emanating from the West.

Answering the Question

To paraphrase: feeding the spirit relies on first feeding the body. But it doesn’t flow automatically. It is subsequent actions of humans after their basic needs are met that determines the spiritual benefit of an action. Thus food production may or may not be a spiritual act; it is clear that we can grow food while committing all sorts of environmental and social violence – and that food is just as nutritious as that produced lovingly by a cloistered monk. When we imagine that the monk’s produce is somehow healthier than that derived from, for example, broadacre agribusinesses we are projecting our personal spiritual need onto the production system and its products. To my understanding, this is the essence of sages’ conclusions about human actions across millennia.

The action of producing food may be part of the means of feeding the spirit, in the same manner that most human actions may – it depends on awareness and deep motivations. All systems of food production conducted with awareness seek to minimize environmental damage – some interpret this as good commercial sense, while others see it as a spiritual act in itself and yet others see it as obedience to a religious rule. So using environmental attitudes alone as an indication of the holism of an agricultural system is not helpful. This conclusion is obviously not that of popular ‘organic’ or ‘natural’ agriculture in its various religious guises – as discussed in another essay in this book. But I find it consistent with the wisdom of all cultures across all times. While not part of this discussion, it is also worth observing that the sages have also noted equanimity and informed compassion as key virtues of spiritually mature persons, which is often described in practical terms as not criticizing or denigrating others’ actions. If this is a test of the holism of one form of agriculture over another, it is most curious that advocates of ‘alternative’ agriculture are often the most vocal of critics.

While it is axiomatic that all systems of agriculture interfere with nature, this too seems to be forgotten in the search for personal spiritual nourishment in ideologies. Likewise, the simple extension of this logic is that nature includes humans and their technologies, thus making all actions ‘natural’ – neither good nor evil. The next step in the discussion brings us to the reality that we must feed billions of humans. It is possible to consider this impartially and conclude that a proportion of the human population will always starve to death. The surprising consistency over most of my life of the number of three-quarters to one billion persons being hungry (even though the huge increase in population means that the percentage of such persons has reduced dramatically with the application of science) causes me to ask whether this is a coincidence or representative of the nature of human life. How can I ask that? Because we have had a global surplus of food through most recent years, yet have

disrupted its accessibility by repetitive human actions, such as war-induced famine in Europe less than a lifetime ago, as discussed in another essay in this book.

But such an observation of the results of humanness does not exempt us from the moral responsibility to apply technologies that will feed as many persons as possible at all times. Yes that will impact the natural environment – that is natural. Yes, spiritual and bodily nourishment may coincide for some food producers – probably mainly smallholders in poor countries. But for the majority of persons concerned with this type of discussion, spiritual nourishment may come from other aspects of their lives than the way their food is produced. This is because, believers in one or other special form of agriculture rely on the security and services of the civilized societies in which they live. To enjoy such luxury while dictating that others must act in accordance with an ungrounded ideal seems hypocritical at best.

Put simply, for food consumers who live in cities spiritual nourishment will be found in the practices of their normal lives, rather than in belief-driven agricultural systems. Future food production systems may possibly engage urban dwellers, which may allow feeding the spirit while feeding the body, but this does not necessarily make those food production systems superior to broadacre or smallholder farming. In comparing scientific and alternative forms of food production we seek in vain for one form of food production that is absolutely more holistic than another.

This is why when I write on food security and world agriculture I feel no conflict with my other writings on spiritual themes. I take pains to separate spiritual from belief-based religion only to make the point about our individual natures. It seems to me the question is not about reconciling spiritual matters with science and technology in global food production or another field, but rather that the question should be how we can each feed our spiritual hunger by our every thought and action.

Chapter 5

The rather nebulous concept of Gross Domestic Happiness is popular among NGOs and politicians, yet you have – with your colleague Prof. Charan – presented it in different papers including international keynote addresses. How can you relate such a naïve idea to your serious philosophical and scientific works?

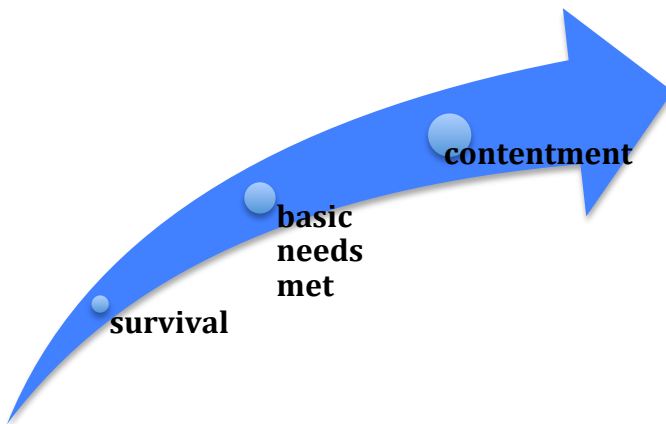
The Nebulous Concept of GDH

I agree the concept seems nebulous, but this may be due to our unfamiliarity with it, rather like the difficulty some in our culture had a few centuries ago in accepting that the earth was not the centre of the universe. It is an ideal – and like all ideals should not be taken as literally attainable but as a direction in which to strive. If this sounds too vague, consider all the other ideals we use to maintain stability – democracy and human rights for example. It may also be the sort of thought that arises with age and experience, for it has been discussed among my older peers, particularly in Thailand, more productively than among the young enthusiasts. And the elders relate it to wisdom in terms somewhat reminiscent of Sophocles' Antigone; 'the most important part of happiness is therefore wisdom ... so men in old age can discover wisdom'.¹⁸⁰

The ideal of Gross Domestic (or National) Happiness is usually ascribed to Jigme Singye Wangchuck, HM the King of Bhutan, and his statement in the 1980s that 'Gross National Happiness is more important than Gross National Product'. The idea has, as your question notes, been further popularized by social idealists seeking to appeal to economically disenfranchised voters in countries as diverse as Australia, Thailand and the UK. However, rather than dismissing it as an unrealistic ideal or as crass political manipulation, I argue that the concept of GDH has

already provided benefits to both Western and developing country societies.

Before proceeding I make the distinction between the modern popular fascination with happiness as a cure for the general angst of life, and the contentment and wellbeing that is experienced by wise persons. The first stimulates surveys – some seemingly well conducted – that reveal strange trends, such as indicators of happiness in a US example that became lower than average for the recession years of 1973, 1982, 1992 and 2001 not showing the same trend for the more severe downturn beginning in 2009, when in fact indicators rose to a record high.¹⁸¹ Such findings simply highlight the lack of constant correlation between material measures and happiness. This seems logical since once one has what one needs or even thinks one needs, the marginal utility of more of anything must decline, in rational circumstances. As the following Figure illustrates, there is a leveling off after contentment is reached, unless external diversions are fostered.



Material surplus exists in much of the world today – that fact itself indicating the success of past GDP-based policy. However, the assumptions on which that approach was based, of competition for scarce resources, seems outdated where

material comfort is not lacking. The anomaly of rising angst with rising material comfort is the major issue of Western society. GDP was not designed to account for non-monetized or very cheap transactions, which far from disappearing with Middle-Ages barter trading increasingly defines the modern world. For example, I am sitting in Strasbourg typing this paragraph while simultaneously using the internet to check information from credible global sources through online services of the Universities of Melbourne, Cambridge and Cornell, yet few common GDP indicators will pick up the economic benefit of this technology. If we must measure these things, we need something better than the simple GDP-related data.

This need for a broader information base was the reason for the French creation of a Commission on the Measurement of Economic Performance and Social Progress, designed around Nobel Laureates Stiglitz and Sen.¹⁸² The report of the Commission specifically notes that: ‘... the time is ripe for our measurement system to shift emphasis from measuring economic production to measuring people’s wellbeing. And measures of wellbeing should be put in a context of sustainability.’¹⁸³ Without shying away from the difficulties of measurement, the Commission offers means of reorienting policy formulation to better reflect ‘wellbeing’. Having started well, I wonder about the future of such a Commission in the current political climate.

Broader attempts to rank the ‘happiness’ of countries against per capita income usually place nations such as Switzerland near the top and poor nations in turmoil at the bottom. Such charts are compromised by their crude assessments of happiness yet nevertheless raise some questions that assist in understanding the concept of GDH. For example, they highlight gross differences between otherwise similar countries and so suggest other factors that may be associated with happiness, such as feelings of participation in political processes rather than powerlessness, and the relative gap between rich and poor in the society. Of

course, the curve is asymptotic indicating that at very low income levels increased income increases wellbeing – beyond this threshold money is less of a determinant. These general findings are borne out when longevity and frequency of illness are considered, and such anomalies as high longevity with relatively low income are attributed to state allocations to health and education, such as in Kerala in India, or to retained community support networks among migrant communities in the USA. One study concludes that: ‘a civic sense, social equality and control over our own lives constitute the magic triangle of wellbeing in society’.¹⁸⁴ But is it as simple as that, for such work commonly glosses over the individual’s search for happiness and the overall good of society?

So discussion of the concept requires consideration of both personal and wider social contentment. In Western philosophy Bentham once developed a scale for maximizing pleasure, which he interpreted as the basis for absolute good. Mill then improved upon the idea with his concept of maximum happiness. Grouped as utilitarianism, these ideas applied to the proportion of persons in a society enjoying this happiness – the greater good. Thus the individual gives up some happiness for the sake of the wider society, a suggestion that Kant rejected. As with Mill’s ideal, which was consistent with the emerging practical application of such worldviews in the then infant USA, Christian traditions in the West have consistently subordinated the individual to the greater good. In the East, the tradition of Buddhism for example, encouraged broadly-based compassion as a foundation for happiness as well as the greater good of society, thereby not requiring any individual to feel that he had sacrificed his state for the wider group. I take this ideal of ‘genuine good’ (*sadattha*) that enhances the welfare and contentment of both oneself and others’¹⁸⁵ as the basis of the following sections of this essay, and in deference to the question, I take smallholder agriculture as the focus.¹⁸⁶

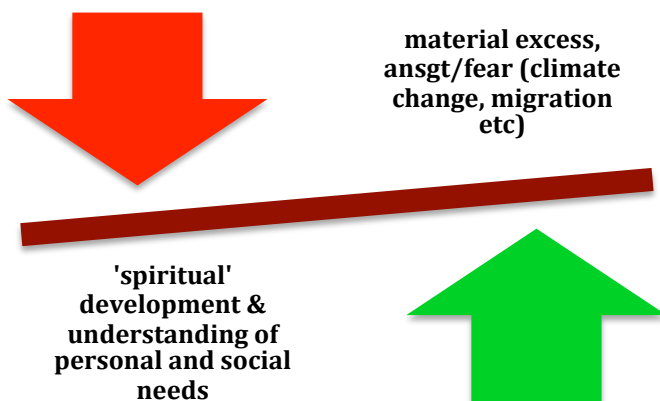
Global Fears and Small Farmers

'Wellbeing' may be a better term than 'happiness' in material-oriented discussions. While it is reasonable to argue that happiness is not the opposite of unhappiness, it seems equally reasonable to assume that wellbeing is undermined by such factors as those introduced in the preceding section, and today's common fears. The closing decades of the twentieth century highlighted global concerns about population increase, poverty, food security, natural resources depletion, sustainability and so on. Such issues had earlier been expressed by the World Commission on Environment and Development: 'Over the course of this century, the relationship between the human world and the planet that sustains it has undergone a profound change. When the century began, neither human numbers nor technology had the power to radically alter planetary systems. As the century closes, not only do vastly increased human numbers and their activities have that power, but major, unintended changes are occurring in the atmosphere, in soils, in waters, among plants and animals, and in the relationships among all of these. The rate of change is outstripping the ability of scientific disciplines and our current capabilities to assess and advise. It is frustrating the attempts of political and economic institutions, which evolved in a different, more fragmented world, to adapt and cope. It deeply worries many people who are seeking ways to place those concerns on the political agendas.'¹⁸⁷

So far as fears about population, migration, food and environmental sustainability are concerned, agricultural development continues to assume that the answer lies in commercialization based on high-yielding varieties and high chemical, physical and mechanical inputs. This more-of-the-same thinking is based on the erroneous assumption that 'mixed farming is muddled thinking',¹⁸⁸ as indicated by Lord Astor and Dr. Seebom Rowntree who suggested that: 'we are now at the beginning of second agricultural revolution which is inaugurating a new farming system based upon the specialized

and mechanized production of grain, meat, eggs, vegetables and fruit.' Not only is this neither new nor a revolution, it ignores social considerations that impinge on stability and security, as well as on personal and general wellbeing and contentment.

The quality of rural life is occasionally mentioned in such modernizing policies, but only in romantic or condescending terms as a continuing aberration that will soon disappear. However, there are a billion or so small farmers of the poor world earning less than US\$1 per day in rural areas¹⁸⁹ who use mixed farming systems.¹⁹⁰ Measuring income without considering the benefits of the culture and life-style easily leads to policies that seek to replace existing smallholder systems. Yet it seems that the angst of material-based lifestyles reduces contentment while spiritual development encouraged in simple lifestyles increases contentment, as per the following Figure.



If smallholder development is to be valued as a useful activity, a sincere intention on the part of the policy makers and politicians to improve both the productivity and the quality of life of smallholders requires an understanding of the strength of the existing systems. Too often, the babies of sustainability and quality of life are thrown out with the bathwaters of genuinely

outmoded techniques. Of course it is difficult to discern the real merits of improving existing smallholder agriculture if one is trained to simply compare alternatives according to financial criteria. Such smallholder merits include:¹⁹¹

- Providing social security and welfare for rural people, especially village farmers.
- Sustaining national, social, political and economic stability.
- Promoting conservation of national traditions, cultures and nature.
- Supporting a self-sufficiency economy and social equity.
- Maintaining national food security.
- Alleviating rural poverty.
- Providing a level of contentment in excess of that generated by enhanced income or GDP.

This last point about a higher level of contentment rather than GDP has been called GDH – Gross Domestic Happiness – which in the case of smallholders in Thailand lends itself to further discussion according to both the Buddhist and Western philosophical considerations introduced earlier in this essay.

Smallholder Self-Sufficiency

Smallholder agriculture is the main agricultural occupation of the world. Forgetting this fact leads national and provincial comparisons to overlook the real economic benefit of what in Thailand was called ‘sufficiency economy’. This may sound excessive, but in fact it is accurate – and it is for these reasons that sufficiency economy was promoted by HM the King of Thailand.¹⁹² In that case, its characteristics included family independency, efficient use of locally available resources, sustainability of the agricultural systems, optimum rather than maximum production and resilience against external social and economic stresses. By eschewing reliance on the usual GDP rhetoric in favour of independence and security as products of national importance, sufficiency economy became part of

national planning. In putting basic needs first it also appeals to traditional Buddhist values in the Thai society.

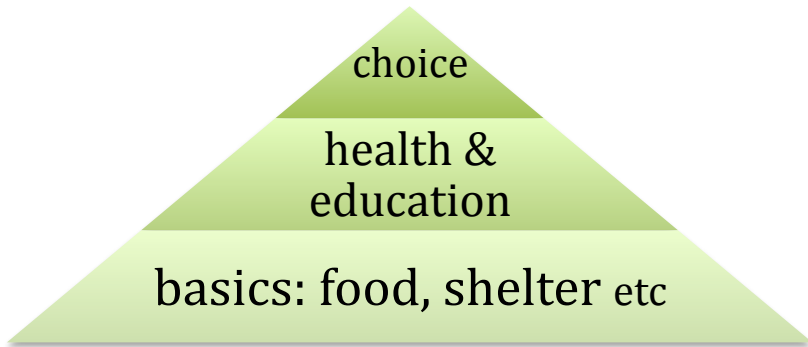
Of course this is not a peculiarly Buddhist approach and it doesn't take long for informed persons to see the elements of sufficiency economy in Islam and other religions. But it is convenient to continue with the Thai example as the time that sufficiency economy was seriously discussed coincided with concern over social and cultural erosion threatening national integrity. This is perhaps more intelligible to Western readers in the 1970s language of Schumacher: 'Buddhist economics must be very different from the economics of modern materialism, since the Buddhist sees the essence of civilization not in multiplication of wants but in the purification of human character. Character, at the same time, is formed primarily by a man's work. And work, properly conducted in conditions of human dignity and freedom blesses those who do it and equally their products. ... We have stood this truth on its head by considering material gains to be more important than people, and by considering consumption to be more important than creative activity. We have shifted the emphasis from the worker to his product. If we follow the Buddhist teachings, we may well find that economic planning would seek full employment in terms of being gainfully occupied, not necessarily in producing items for consumption. For example, encouraging young mothers to work in factories would be seen as 'uneconomic', just as employment of an artisan as a soldier might be.'¹⁹³

This view considers people as the focus, not just as a resource for production as in GDP approaches. This has been noted in detail by at least two informed Thai Buddhist observers.^{194,195} Optimum material production to satisfy basic needs is logical and accepted by all these approaches, but after satisfaction of basic needs a person may well be more content in developing his 'inner happiness' rather than being encouraged to hedonistic pursuits. This may sound like Protestant wowsersism but in secular terms may be understood as real 'sustainability' being both *elusive*

when we try to control it and *illusory* when we are ignorant of its real meaning.¹⁹⁶

Without relapsing into religious ‘faithful remnant’¹⁹⁷ imagery, it is necessary here to note that, in the Thai situation, there is a pool of population resident in rural areas practicing self-sufficiency. Those people seem more content with their lot than the average urbanites. It is these communities that absorbed their children, brothers and sisters back when the severe 1997 Asian financial crisis sacrificed urban employees. The resilience of these smallholder farmers forms the backbone of the country,¹⁹⁸ the rest being a subset of a global economy. As noted in a 2005 paper; ‘people in these farming systems may not be rich in money, but they are richer in mental and spiritual values’.¹⁹⁹

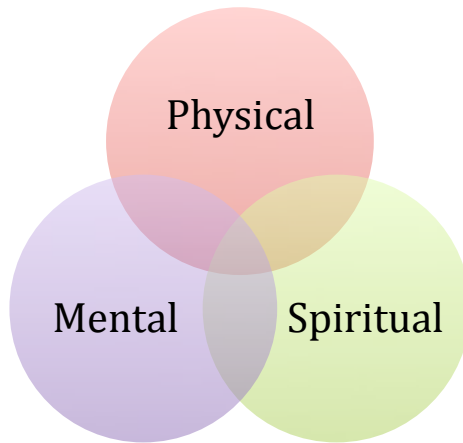
The concept of maximizing wellbeing, be it in the sense of Bentham, Mills or variations of Buddhism, would suggest careful implementation of an approach that combines essential development of rural economies (such as health and balanced educational services) while retaining their essence of contentment. As the following Figure shows, this is simply the age-old realization that after basic needs are met, some other factors related to community benefit such as health and education services lead to increased contentment, and that beyond that point personal choices may be made. Where social pressure favours consumption, the angst mentioned earlier arises. But the alternative of a virtuous cycle can also be cultivated, as a later Diagram illustrates. This would also recognize the feeling of community as an essential part of the rural wellbeing.



What is Wellbeing?

Some broad criteria for wellbeing have been developed in the Thai case comprising four groups: physical, mental, social and spiritual.²⁰⁰ In the following Figure, the central overlapping segment represents wellbeing or contentment. Physical wellbeing for small farmers meant sufficient food for the family through droughts and other environmental vicissitudes, regular physical exercise, roles for all persons including the elderly and communion with nature.

Mental wellbeing meant feeling unstressed, hopeful and confident in oneself, supported by such joys as cyclical festivities, folk songs and work-made-pleasurable as in traditional rice planting being conducted communally with singing, flirting and festivities. Spiritual wellbeing seemed to overlap with mental wellbeing and included conscious choices for contentment as the next step after meeting basic needs. Thus it is concluded that: 'Humanity can no longer live happily with the present economic model of GDP-oriented development. A development model oriented towards happiness or wellbeing is what we should be looking for.'²⁰¹ The commoditization of the GDP approach was seen to divorce relations with others and nature by interposing a monetized transaction, and opening a slippery slope to greed, excessive consumerism, selfishness and dishonesty.



This can sound airy-fairy and bland if one forgets that social rules in most religions were in fact accumulated wisdom that aimed to sustain resource bases and community cohesion. Thai village wood lots being made sacred is an example of guarding against over-use of forest products.²⁰² Whether we like to approach this from the perspective of development, knowledge, wisdom, ethics or religion, the concept of GDH – or communal and personal wellbeing – is wider than the usual GDP approach.

An issue therefore arises: how can the GDH or wellbeing benefits of the rural community be retained in the face of development policy based on GDP principles, which have already been shown to erode the very values that contribute to overall wellbeing? To answer this, it is instructive to list some of the negative consequences of GDP-oriented policy making, as follows.

Economic aspects;

- Wider income gaps between rich and poor
- Increased farm household debt
- Increased costs of farm production
- Increased materialistic wants (demand for non essentials)

Social aspects;

- Increased rural to urban migration, with reduced life quality
- Weakened social, traditional, and cultural values
- Weakened family bonds and structures
- Increased materialism and greed
- Weakened integrity, ethics and other human qualities

Impacts on natural resources and environment

- Accelerated deforestation
- Continued soil degradation
- Increased incidence of droughts and shortages
- Destruction of biodiversity and wildlife
- Reduced fish resources and mangrove areas
- Reduced indigenous plant and animal germplasms
- Increased farm pollution
- Unsustainability of agricultural systems
- Increased dependency on fossil fuel and chemicals
- Increased farm operating costs
- Use of inappropriate technology
- Increased farm household debt
- Loss of land tenure
- Increased dependency on export markets
- Greater exposure to unfair free trade
- Long-term national instability and insecurity
- Increased risks of economic crises and global fluctuations
- Increased incidence of social conflicts
- Increased costs of living without income rises for the poor
- Increased conflict between urban and rural social strata
- Excessive dependence on foreign investment
- Instability of monetary and financial systems
- Increased crime and terrorist activities
- Lowered moral integrity in the general population

The complementary, rather than alternative, approach pursued in Thailand was the sufficiency economy as introduced earlier.

Explaining the Sufficiency Economy Idea

The King's espousal of the sufficiency economy concept led to the following definition compiled by the National Economic and Social Development Board (NESDB) of Thailand: 'Sufficiency Economy is a philosophy that stresses the middle path as an overriding principle for appropriate conduct by the populace at all levels. This applies to conduct starting from the level of the families, community, as well as the level of nation in development and administration so as to modernize in line with the forces of globalization. Sufficiency means moderation, reasonableness, and the need of self-immunity for sufficient protection from impact arising from internal and external changes.'²⁰³

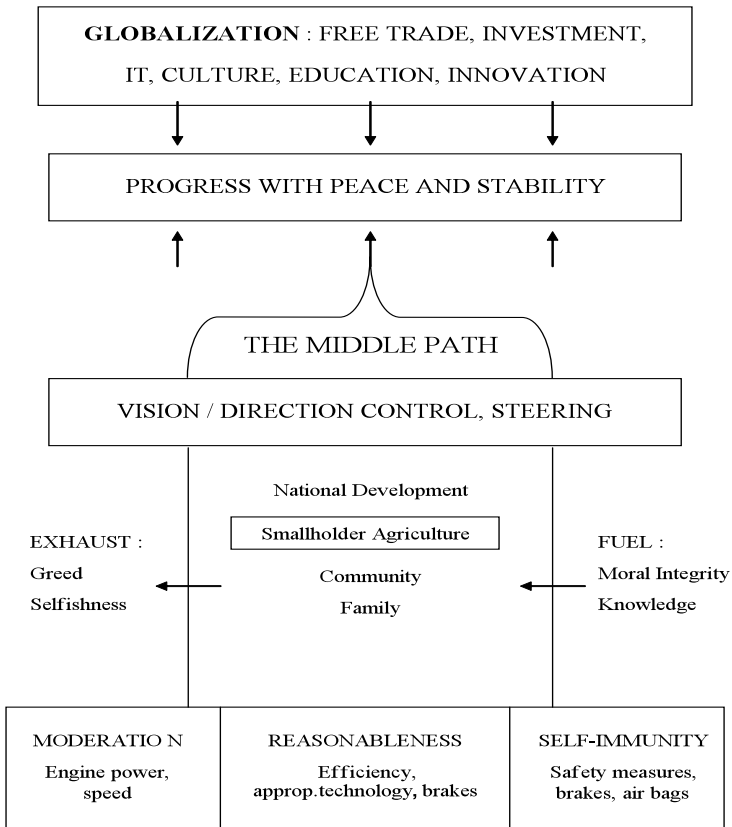
Pinning the subject down has occupied many experienced and intelligent minds.²⁰⁴ Numerous technical meetings discussed experiences and academic studies offered steps towards a practical approach to GDH planning in terms of overall wellbeing.^{205,206,207} One way of conceptualizing the sufficiency economy was as a metaphorical car as in the following diagram for which I am indebted to Charan;²⁰⁸ it uses the Buddhist concept of the Middle Path,²⁰⁹ in which others may see the Christian 'strait gate and narrow way'²¹⁰ or the Muslim 'difficult pass'.²¹¹ But the poetry of the Tao lines indelibly bring the subject back to food security:

'the great Way is very smooth
but people love bypaths

the court is very well kept
the fields are very weedy
the granaries are very empty.'²¹²

In Buddhism, the Middle Path cautions against extreme views that are ultimately evidenced in greed and selfishness. If some people accumulate unlimited wealth while the vast majority of others remain poor, hungry, and ill and the environment and

human survival are threatened, this is not the Middle Path. In these same terms, it is morally unjustifiable, socially and politically unfair and also unsustainable; it also reduces happiness in both the rich and the poor according to surveys in Western environments.²¹³ The central principles of moderation, reasonableness, and self-immunity of this approach are illustrated in the following Figure as elements of the car. Thus moderation is appropriate use of the car's power, reasonableness is driving carefully, and self-immunity is the car's safety devices. The metaphor is simplistic, but has served to explain the idea to many across Asia and so must have some broad application.



Without labouring the metaphor it can be seen, for example, that reasonableness involves the values listed earlier. This is consistent with the definition of sufficiency economy presented by the NESDB, which continues from the earlier quoted paragraph with the words: 'To achieve this, an application of knowledge with due consideration and prudence is essential. In particular great care is needed in the utilization of theories and methodologies for planning and implementation in every step. At the same time, it is essential to strengthen the moral fiber of nation, so that everyone, particularly public officials, academics, businessmen at all levels, adheres first and foremost to the principles of honesty and integrity. In addition, a way of life based on patience, perseverance, diligence, wisdom and prudence is indispensable to create balance and be able to cope appropriately with critical challenges arising from extensive and rapid socio-economics, environmental, and cultural changes in the world.'²¹⁴

The car metaphor reflects the sufficiency economy as strengthening people's moral integrity. Knowledge delivery systems are seen as the preferred fuel for the car, because people must be self-aware, well-informed, and self-disciplined – and this seems to conduce to improved or retained wellbeing. Be this as it may, the difficulty lies in implementing practical programs for improved wellbeing.

Implementing Wellbeing

Nebulous as it is, implementation of enhanced wellbeing – or GDH if you like – has been segregated into a five-fold approach of; national development policy; social and farmer movements; community demonstrations; smallholder-agriculture support and services, and development of appropriate indicators to reflect the important contributions of smallholder agriculture.

National development policy includes sufficiency economy in national goals by specifically acknowledging smallholder

agriculture separate from large-scale commercial producers in a 'two agricultures' approach to policy.²¹⁵ Where small farmers are the majority of a population, a social risk analysis of their vulnerability as a threat to national social stability would form part of economic analyses. This means social and farmer movements with family and community discipline and moral resilience. Community demonstrations would showcase examples, and smallholder support services would include training based on extant values. Indicators for smallholder farm contributions would then be required and this demands humility from urban-oriented planners. The ideal is being approached through such practical steps – one recent example concerns biodiversity indicators.²¹⁶

Rather than attempt a list, it is apposite to return to the point from which we started out and to know it for the first time – for it is not a matter of commoditizing everything into performance measures, but more a matter of understanding the missing spiritual dimension in modern systems that creates the malaise of modern life. One simple means of explaining how this difference has arisen is also offered from the Thai and Buddhist example in terms of the use of the word 'development'.

This essay has necessarily used the conventional meaning of 'development' common to the international community. However, in many Asian contexts such as in Thailand until very recently, it has had a different meaning. The Thai word การพัฒนา '*karnpattana*' is commonly used to translate 'development' yet its origins and meaning relate to the self-development or cultivation of personal mental and behavioral traits that conduce to insight. In the terms of what is the natural way for humans to act this is a duty,²¹⁷ a concept developed in broader terms elsewhere.²¹⁸ Thus in this essay, these two meanings for the one word – 'development' – are at times almost opposites. Such confusion has been highlighted by various sages, or as the West today prefers to see them, geniuses. Put succinctly, this means that each individual must pursue his own 'development', which then

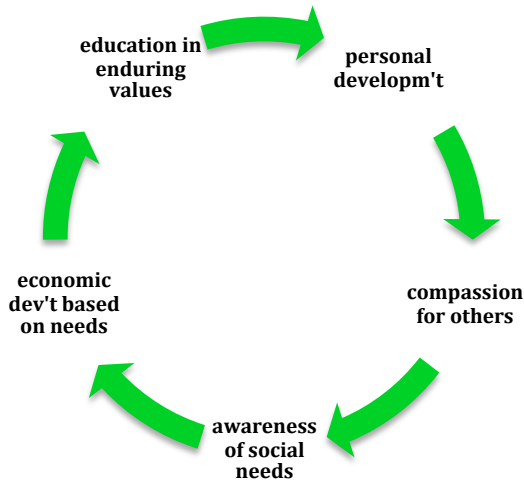
may allow wider social development, and so result in both personal and social wellbeing in the style explained in the introduction from the work of Kalupahana.²¹⁹

Answering the Question

This essay has summarized earlier addresses that sought to explain GDH and related ideas. It will no doubt be seen as lightweight and illogical in parts. By some measures these would be accurate criticisms. But as in the case of others before me, including my colleague Charan with whom this work was conducted, I note that mixing of spiritual ideas with rational discussion commonly produces this outcome. Having said this let me now re-approach the question and state that while it may seem rationally nebulous, the concept of Gross Domestic Happiness contains deep insight into an important element for balancing the excesses of modern life. This in itself is sufficient 'reason' to consider it. I assume this motivation in intelligent persons that persist with the idea – even when they are interrupted by cloying acolytes who mistake its shadows for the light.

With respect to the detail of the title question, I relate this apparently 'naïve idea of GDH to my more serious philosophical and scientific works' through the same line of argument that I presented in the book 'Religion and Agriculture'.²²⁰ That logic considers sustainability and environmental matters from both Western and Eastern perspectives through Christianity and Buddhism respectively. One does not have to be religious to use this approach because in this case religions are simply recognition of the source of the values and worldviews imbibed by growing up within a culture. The conclusion of that book is that there is no inherent environmental value in either religion in the sense espoused by secular environmentalists. A corollary of that conclusion is that each tradition focuses on personal development as the only worthwhile activity after basic needs

are met – psychological maturity if you like. With that maturity comes awareness that social and other guidelines are useful for those trapped in circumstances where they cannot meet basic needs and those who have become attached to mental and physical attractions and seek some relief from their angst. The following Figure is an idealized self-reinforcing societal model.



This virtuous cycle of personal and social contentment is the basis of personal wellbeing – I expect that point is clear even to those who might reject the idea. That this personal wellbeing is essential to wider social wellbeing may be less clear. The contentment of marginalized persons meeting their basic needs and whose wellbeing increases by access to basic health care and education is instructive. And even those material contributions seem hard for a central agency to deliver. This brings us back to the materialistic studies that rank Switzerland more highly than comparably wealthy nations and attribute the difference to, among other matters, community engagement in political processes. Rather than centrally managed projects, local engagement in health and other facilities would increase wellbeing without reducing existing levels of contentment.

Chapter 6

In your book 'Religion and Agriculture', you said that environmental catastrophe is an expression of our fear of death that religious myths portrayed as punishment for disobeying divine law. You then implied that the masses demand belief-based solutions, leaving scientists responsible for feeding the world. This is all rather abstract unless you can explain how that additional food can be produced when land, fertilizer and oil availability are all now limiting. Can you?

Thank you for linking our environmental concern to our worry that we are the cause, and to our fear of death. This universal fear was an essential part of the myths and beliefs of religion; now secular populations less educated in the rites of their own cultures seek a new salvation in response to their fear. Whether it is fear that we will destroy nature or that millions will starve, belief-based solutions are to be questioned by rational knowledge. This is why scientists are essential for sound advice on these subjects, much more so than are emotive views. Who else than scientists has sufficient knowledge to cut through the curtain of belief and uninformed opinion. And in the conduct of this evidence-based research the scientist who has an historical understanding will be the most valuable. I have said this elsewhere. However, to extend this to the question as to how the food needed to feed a burgeoning world population can be produced from a declining resource base, also implies that perhaps the environment must be sacrificed. And that is not what I am suggesting.

The question can be broken down into components to better explain why food production need not be restricted by limiting resources or need blight the natural environment. To do this, it is useful to first consider the implications of continuing in the

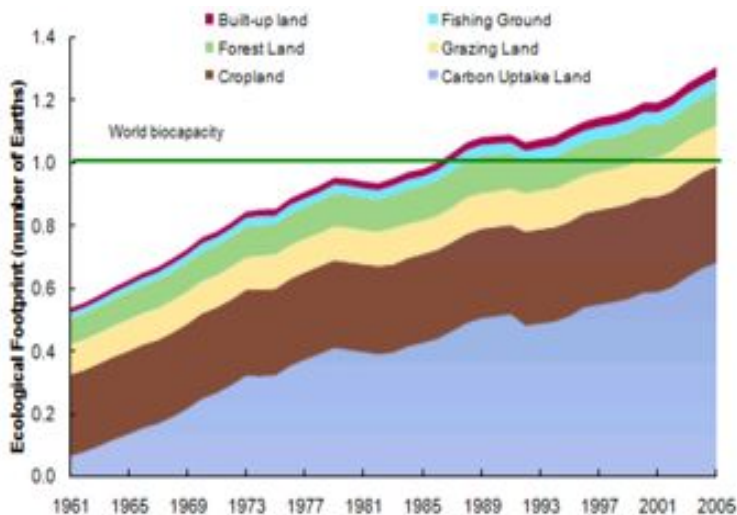
current system, and to then consider the commonly listed constraints such as land, fertilizer and oil availability. Thereafter it is necessary to consider the role of technology and its development, and later the non-agricultural food products that it could lead to. In this way, I will 'explain how that additional food can be produced when land, fertilizer and oil availability are all now limiting'.

'Sustaining' the Status Quo

Sustaining current food production systems and productivity levels cannot feed increasing numbers of people. The whole confused terminology of sustainability must be set aside for rational discussion of matters concerning interconnected dynamic systems, as discussed in an earlier book.²²¹ In essence concerns with sustainability reflect fears of vulnerability that are in turn a reflection of the lack of control an individual has over his own food supply, and his separation from the cyclical rhythms of nature. Sustainability in this way is seen as a yearning for control, and that has in turn infected some elements of food production planning. The more healthy use of the term 'sustainability' argues that we should sustain the base for food production by caring for soils and adapting to the availability of limited resource inputs including oil and phosphate. Noble as this sounds, it is unlikely to occur for the simple reason that human nature has not changed. It is normal for a scarce resource to be captured by powerful groups for the express purpose of exploitation of both the resource and those in need of it.

Those in need of resources are farmers that feed the increasing majority of urban dwellers; the impact of limited resources is higher prices for food in cities. As urban poverty is the high risk social issue of the world because hungry urbanites riot, vandalize property and migrate, to claim that the status quo system is sustainable is quite wrongheaded. Furthermore, the fashionable shorthand communication tool for our interaction with the

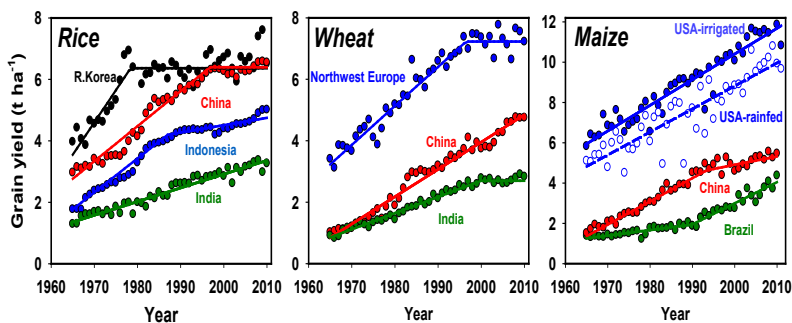
natural environment today – our ecological footprint – provides a clear illustration of the endgame for the status quo, as in the following Figure.²²² If this 2008 Figure is correct, we have already exceeded the ecological capacity for urban land, forests, fishing and grazing and will soon have exceeded it for cropping land.



But such Figures are misleading as they are based on assumptions of ecological resilience that can only be tested in real life and real time. And in any case, as is discussed more fully in a later section, technology effectively raises the horizontal capacity limit. Nevertheless, the Figure illustrates that we are approaching limits from current approaches to food production.

What are current approaches? Agricultural science studies the highly complex interactions of living systems; this is why I have said that it is more complicated than rocket science. But farming is a long way removed from agricultural science, and the distance has made the science seem unnecessary to some. The success of past agricultural science innovations and the surpluses of food in

developed countries have further fueled reductions in agricultural science investment. This means that the continuous yield increases from research that have underpinned the status quo cannot be expected from current approaches. Yields are already showing trends of tapering off for major food grains, as illustrated in the following Figure.²²³ Anomalies exist in Brazil and China where research investment has been maintained, and for maize in the USA from private sector investment – each further emphasizing the critical role of research.



Also in stark contrast to the detailed research conducted in agricultural science is the relatively crude nature of broadacre farming, where fertilizer is applied at rates above those needed by plants simply because of the losses associated with application techniques even for phosphorus. In similar fashion, fossil fuel is used to pump fossil groundwater to irrigate crops with more water than they need. This is not done out of ignorance. Both scientists and informed farmers know it is wasteful and unsustainable. But with agricultural commodity prices still low despite recent rises, farmers must operate according to business principles – and investment in more efficient technologies does not add up even for many advanced farmers.

Technologies exist for increased efficiency of use of fertilizers, such as GPS-precision allocation of fertilizers based on soil-type

and previous years' yields for each digitized unit of a field – and for irrigation through drips and regulated membrane tubes that can dispense water and fertilizer at controlled rates. And reduced oil consumption not only results from such innovations, but also through harvest, tillage, seeding and fertilizer operations being combined into one operation per crop. Such technologies exist, and are used to varying extents, but do not represent the main production systems today. The reason? In addition to costs as mentioned above, such innovations do not apply to the majority of food producers – smallholders who feed their own two billion of the world and provide a surplus for others in urban centres of developing countries.

These small farmers are often left out of discussions about technology and food surplus, which is a grave oversight that I return to later in this essay. For the moment, it is sufficient to say that smallholder agriculture has not approached the yield limits determined from research. For example, at the CGIAR centre – the International Rice Research Institute – consistent production of 21 t/ha/year of rice has been demonstrated, yet the average for the Philippines where IRRI is located is 8 t, while in Africa it is 4 t.²²⁴ The point is that currently potential to increase production exists for the smallholder sector as well as the broadacre sector. In addition, there remains huge capacity to reduce wastage of food, beginning with 30 percent extra food needed to feed an urbanite compared to a farmer. And to acknowledge today's political correctness one must also refer to 'eating disorders', but here let's note that while they may waste food those problems are better addressed through social than agricultural programs.

Many opportunities exist within the current system, but each rely on unprecedented goodwill to share food and resources. Goodwill can be stimulated under emergency circumstances, such as Britain during World War II when Orr formulated national rations that allowed his countrymen to be better fed than the rest of Europe despite grave shortages. That initiative led to the creation of the UN Food and Agricultural Organization

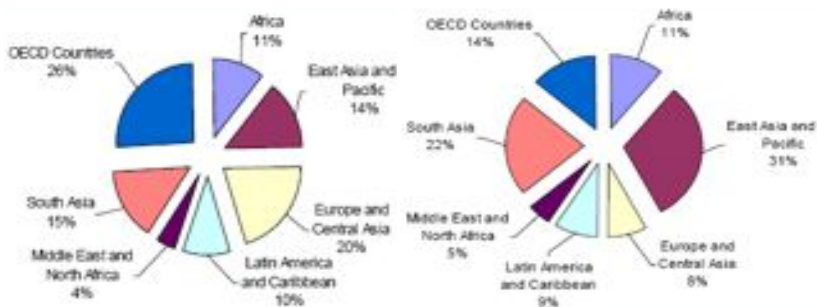
with Orr as its inaugural Director to extend such nutritional benefits globally.²²⁵ However, despite world accolades and the Nobel Peace Prize,²²⁶ he resigned early in disappointment over the retraction of such goodwill post-war. The world has not seen such international development leadership since. So sharing does not seem to be part of the answer despite its emotive appeal. And even though efficiencies may be possible in food-abundant countries, the world requires more food to be grown in total and we worry that the resources need to grow such food are dwindling. So let's look at the mentioned resources, which were critical to the Green Revolution – land, water, oil and some fertilizers.

Limitations on Agricultural Growth

It was the Club of Rome²²⁷ that introduced the phrase 'Limits to Growth' and the concept of limits to growth being of concern for the world. That concern was based on population growth and expected technologies of the 1970s, much of which has now been outdated, although the Malthusian flavour of the argument remains appealing. And for good reason since it can easily become true if a society neglects to continuously develop new technologies, which leads sooner or later to fierce competition for rare key inputs. The concerns of the present day relate to 'peaks' in the availability of such inputs as land, fertilizer, water and oil, and surely it is always best to use limited resources in the most efficient manner possible.

The limiting resources for current systems of food production – land, fertilizers, water and oil – can be discussed at length according to their various parameters. Such detail would not be productive to this essay and so three will be dismissed summarily in this paragraph in order to use the best example as a basis for productive argument. Arable land is finite, and as the usual Figure²²⁸ presented below indicates, is more limiting in the populous regions of the world; the pie chart on the left refers to

arable land while that on the right refers to population. However, the Figure assumes that forests and designated parks are sacrosanct, which means that arable land is within some 10 percent of its limit – but if we do not take this view, there is potential to expand agricultural lands by some 30 percent. Whether we cling to ideals of wilderness or not, such awareness is essential to recognizing the overriding benefit of concentrating food production on the best land to obtain the highest yields rather than expand into new areas. Water is limited, but use of it is profligate; technologies for improved efficiency in irrigation – the major use for water – have demonstrated reductions in agricultural use of more than 50 percent. For example, rice has been shown to grow productively with 25 percent of the water normally used. Oil as an energy source is limited, and alternative energy sources are being developed for a range of purposes. But among fertilizers, phosphorus is a mined resource that is said to be limited in supply, and is critical to food production; no substitute for phosphorus is known. For this reason, the following discussion uses fertilizers, specifically phosphorus, to show the effect of a limiting resource on food production.



It is possible to use fertilizers more efficiently – that has been demonstrated from agricultural research, and it is possible to reduce the proportion that is currently wasted. Having only used fertilizers at high levels over the past hundred years or so, we have now become dependent on them for the daily miracle of producing enough food for the world. The Green Revolution

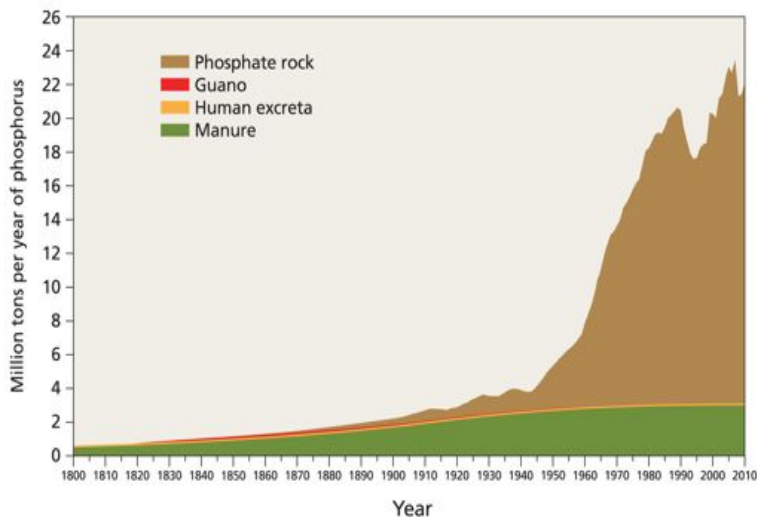
relied on fertilizers in conjunction with irrigation water and high-yielding-varieties. Today we produce nitrogen fertilizer from the air using fossil fuel energy. That is a concern in environmental terms, but the next major source of fear about food is more likely to come from mined fertilizer since such natural resources are limited. Phosphorus – essential to life and lacking in all cropped soils – is the obvious issue.

Mined phosphate is sourced mainly from China and Morocco-controlled Western Sahara (37 and 32 percent of world production) with smaller amounts coming from South Africa and the USA.²²⁹ Potassium, the third of the macro-nutrients on which modern agriculture is based is less critical. But both phosphorus and potassium fertilizers are mined, and thus accessible reserves must be seen to be either finite or otherwise expensive to exploit. Estimates for phosphate availability at current trends range from 50 to hundreds of years. The scenario is being set for protectionist policies as part of national interests, which should be of concern if no solution is in sight. We have had a first taste of this in the 2007–8 food price crisis when phosphate fertilizer prices increased by about 300 percent. Much of this was caused by panic buying, which is the way that these human crises unfold.

Over the last two centuries, the period when human population has risen sharply, the sources of phosphorus have changed markedly with rock phosphate providing virtually all the incremental phosphorus needed, although in recent decades production may have peaked, as shown in the next Figure.²³⁰

Fears that fertilizer reserves may one day be exhausted have been fueled by studies following the ‘peak oil’ methodology that aims to relate long-term demand to supply – those studies suggest that ‘peak phosphorus’ has already been passed. Even if other reserves are discovered and known lower yielding reserves are used, the price of phosphorus will rise making it limiting to poorer farmers. And just to put this in context, those ringing alarm bells have a double message for our times, for

while fertilizers feed the world, their overuse is currently polluting wide environments, potentially accelerating global warming and increasing agricultural soil acidity.



What can be done? Research will be discussed in the next section, but other means of addressing the issue also exist. These include: soil conservation so that the nutrient-rich top soil is not allowed to wash or blow away; reducing overuse of fertilizer especially where encouraged by subsidies, and recycling nutrients wasted in sewage. This last point highlights that China is ahead of the West, and in fact China has shown leadership not just in using sewage in agriculture but in including farm areas under city administration. Urban 'greening' is a new fad in Western cities, but the real benefits come from ideas that China is using already. With nearly two million piggeries that produce more than a million tonnes of solid manure plus another five million tonnes in liquid form,²³¹ China still has potential to harness more nutrients into its recycling programs. Yes, there are health risks and that should be the subject for research not an excuse for inaction, as it tends to be where life is more comfortable.

Research into mitigating such health risks and more particularly various ways of enhancing the capture and recapture of phosphorus is the means by which this limiting resource will be managed. Peak phosphorus is easily beaten up into a fear if only its absolute criticality to agriculture is focused on. However, a major reason for optimism is forgotten in such fear mongering; that is, phosphorus is recyclable like water, but unlike oil. It is thus not valid to use parallels between phosphorus and oil. In addition to the capture methods such as those mentioned above for sewage, research into means of chemically and biologically harvesting phosphorus from various wastes and waterways around agricultural lands has already started.

So, in terms of limited natural resources, technological research emerges as the engine of sustained food production. And to return to the opening paragraph of this section in which a reference is made to the continuing attraction of Malthus' dire predictions²³² – valid as they were in his context of the Irish food problem of his time – we must now acknowledge that we have learned something in the intervening two hundred years. Boserup drew this to the world's attention in her observation that Malthus' prophecy was continually forestalled by technological innovation.²³³ And that is why agricultural science research is a critical ongoing investment for mankind.

The Role of Technology

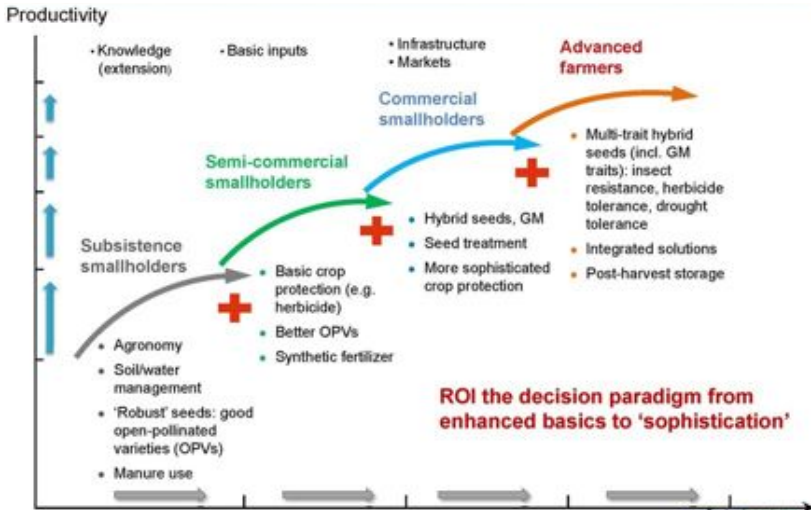
Technology is a natural resource. And it is created almost *ex nihilo* – although not quite as it relies on civilization maintaining support of its intellectual elite. This may seem counterintuitive to those who see natural resources as finite and consider manmade interventions to be anything but natural. But in fact, the current popular way of viewing these matters is aberrant; in the past technological innovations such as fire to make foods edible or safer would have been accepted as simply logical human use of the natural phenomenon of fire. Planting seeds of desired plants

to gain fruits and grains was likewise simply fitting in with nature, and when climate changed, moving to new more favoured lands was as natural as the migrations of other animals in accordance with nature's cycles. From such examples it is only a small step to today's agriculture with genetic manipulation, for example, being the current iteration of the selective breeding conducted by humans for more than 10,000 years, which itself was a human learning from observations of nature's genetic diversity as a means of adapting to diverse environments.

The environment and the plants and animals of food production today are adapted to the outcomes that humans desire. It is not unnatural. To argue differently is to exclude humans from nature, and that arrogance quickly leads to social disaster. The sustaining balance of nature can be upset when we, being inside nature itself, exceed its thresholds. When we do upset that balance, over time a new balanced state in turn arises – but we may not like it. In addition, we have an inherent bias to view these dynamic states as static. Nature is always dynamic and its myriad interactions are so complex that with our present knowledge we must conclude that it is not possible to know how it all works. We live in this dynamic state, even though we thirst after a comfortable stable state, and it is within this dynamism that technology is developed from research to enhance the products of a system that meet human demands. If those technological or other demands exceed the system's capacity to provide them, then a new state will emerge and it may not suit us. But it would be a natural occurrence, just as the human actions that led to it would have been.

As the following Figure illustrates,²³⁴ the development of what we see as agriculture today, is still visible in the world with the three groups of; subsistence farmers feeding their families, semi-commercial small farmers using increasing amounts of modern technology and advanced farmers using whatever technology offers them a financial advantage. As I have stated in here and elsewhere,²³⁵ each type of agriculture offers efficiencies that

should not be discarded on some assumption that Western approaches are an absolute good. The lesson is that all forms of agriculture use human-developed technologies, and all are part of the natural system of food production.



Accepting technology as part of the natural environment, we are offered a trove of opportunities, just as has been the case since civilization began – and at this point, it is worth recalling that civilization, living in cities, is a product of the development of agriculture. The early civilizations were tentative and precarious, and today it is just as provisional as ever, and more than ever it relies of sustained food supplies to cities. The technologies that can illustrate how we will feed ourselves for the foreseeable future include those that address such concerns as ‘peak phosphorus’, plateauing crop yields and a range of other matters. It is not the purpose of this essay to detail the bank of exciting scientific knowledge and the ready-to-apply technologies that could increase food production further – that can be easily accessed from such reliable sources as the CGIAR²³⁶ and reputable universities and research organizations. A couple of examples can therefore suffice.

Peak phosphorus can readily be portrayed in apocalyptic terms that ignore research outcomes. Yet technological means of increasing the efficiency of plant phosphorus uptake have been considered since the concern was raised in scientific circles, which is decades before it became a public issue.²³⁷ One example of current research focusing on increased efficiency of fertilizer use has effectively increased the land area on which nutritionally valuable legume crops can grow.²³⁸ Low fertility and acid soils with free iron and aluminium oxides that render soil phosphorus unavailable to plants have not been able to support good legume crops across wide areas of Africa, Australia and China, because a legume's microbial nitrogen fixation process requires high levels of phosphorus. Applying phosphorus and nitrogen fertilizers in such situations is not viable for reasons of cost, low efficacy and high pollution risks. The research bred new strains of common beans and soya beans that thrive in low phosphorus regimes through increased efficiency of phosphorus uptake. Thus technology is continuing to effectively increase the arable areas while reducing overall fertilizer requirements and at that same time increasing food production.

Other research that addresses the finitude of mined phosphorus focuses on chemical 'harvesting' of phosphorus pollutants that escape from inefficient uses of phosphorus in cities and agriculture.²³⁹ So when it is argued that there is no substitute for the essential phosphorus in DNA and ATP, it is wise to recall that unlike fossil fuels, recycling and increased efficiency of uptake in crops are key to addressing current fears. Likewise in terms of limited water availability, it is more than a decade since a review of international research needs indicated that water management and breeding for water stress tolerance warranted CGIAR investment, as summarized in the following Table.²⁴⁰

Technology has become a fourth component of the old economic trinity in agricultural production of land, labour and capital. This is because technology can substitute for, or if you like it can

increase the efficiency of use of, each of the three. So in addition to reducing food wastage and applying known technologies, the continuing potential to further increase production offers confidence that there can be sufficient food to meet future needs – if scientific and technological research is funded appropriately. There are also more reasons for optimism in terms of what technology offers in the vestigial science of non-agricultural foods.

Strategy	Examples
Genetics – drought escape	Short duration plus seedling vigor to reduce yield penalty
Genetics – drought avoidance	Deep roots with root tips able to penetrate hard pan (rice)
Genetics – drought tolerance	<ol style="list-style-type: none"> 1. Enhanced expression of transcription factors that are master switches of several drought tolerant pathways. 2. Osmotic adjustment in roots and leaves to retain water. 3. Hydrophobic barriers in roots and leaves to retain water. 4. Aquaporins (water channels) to speed water movement. 5. Altered hormonal signaling among roots, leaves and seeds.
Genetics and water management	Aerobic rice for water saving in irrigated environments and high yields in upland environments.

Non-Agricultural Foods

One does not have to be a futurologist²⁴¹ to foresee that food need not come from conventional agriculture. We may even need a new word since the Latin *agricultura* from *agri*, genitive of *ager* ‘a field’ (as in ‘acre’) and *cultura* ‘cultivation’ ties food production to the land. Agriculture as we think about it is only 10,000 years old, which is a short time in human historical terms, and we are now

attuned to ever faster rates of technological and system change. The future will no doubt include land-based food production possibly even for luxury food products. But there will also be urban food production on a scale that will make current garden plots seem primitive. Why? Because demand will drive the need for accessible food. At present food is so cheap in Western countries that it leads to unnecessary environmental and animal welfare impacts; price rises are part of the answer. But price rises will not suit the majority of urban consumers especially the largest growing urban group, the very poor. Something cheap and home-produced will be necessary.

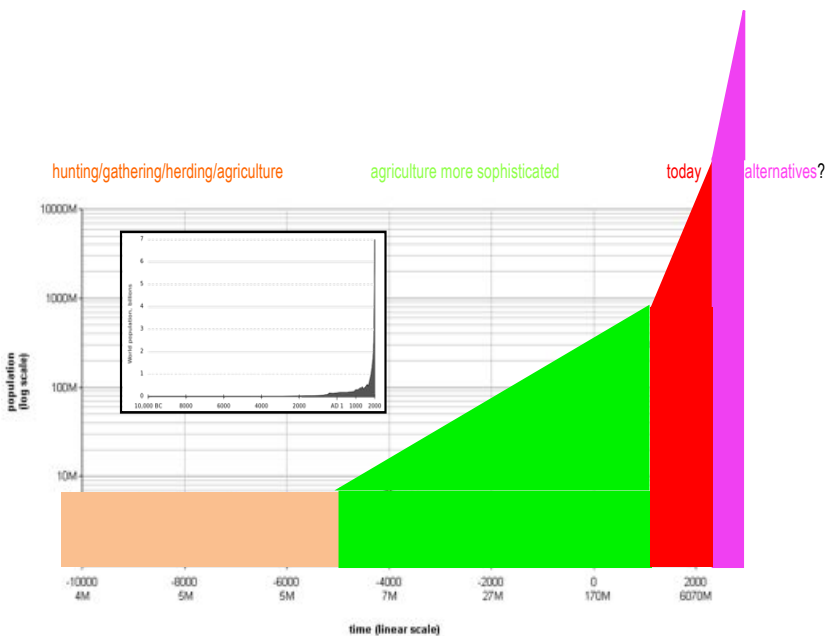
Some items listed elsewhere²⁴² include: home fish tanks for food not aesthetics; 'vertical vegetable venetians'; 'fungi farms in your flat'; 'living algal soups'; 'home hutches' for rabbit meat (one pair → 30 per year @ 1.5kg); 'rodent rooms' or 'guinea-pig granjas' (one pair → 60 per year @ 800g),²⁴³ and worm farms. In addition, future agribusiness can be expected to deliver cheap city food from factory-produced fruit, vegetable, and cloned meat production managed through robotics. Technology will, at least partially allow the separation of food from soil, just as it has long been separating food from toil for the majority of consumers.

Bioreactors based on cellular cultures already produce nutritious food. Some is traditional in such forms as cheese, and remind us of past crises in food availability when preservation was a means of surviving lean periods. Learning from nature has been the basis of progress, and part of this approach continues today in science. Thus it is not unrealistic to expect that the life-sustaining process of photosynthesis will be able to be copied in some human-managed form to use sunlight to produce new edible carbohydrates. As one of the inputs for conversion of CO₂, such technologies offer dual benefits of reducing greenhouse gases and increasing food production.

Another means of using wastes and producing food at the same time is algal production facilities. Technologies are known for

algal conversion of wastes into food, fertilizer, fuels and a range of useful chemicals. Rather than always concentrating on the doomsayers' message of environmental and food catastrophe, such technologies offer means of reducing the eutrofication of waterways that has resulted from fertilizer overuse and nutrients in urban wastes. Plankton, yeast and other sources of 'synthetic' food are also known to be able to produce nutritious human diets, and in fact, one wonders why the title 'synthetic'²⁴⁴ is applied except for situations where consumers are committed to what are already old-fashioned ideas of where food comes from. I prefer to call them 'soil-less foods'. Urban consumers eating processed supermarket foods already consume products that preserve, bulk-out, texturize and colour products that they might not otherwise consider to be food. It seems analogous to insular Anglo-Saxons being appalled by other cultures' appreciation of dog or snail meat – both of which if mistakenly consumed as a familiar product they would probably find tasty. In all cases, these soil-less foods would be an adjunct to continuous production of existing farm products, rather than substitutes.

To gain a glimpse of the historical changes in the human diet it is instructive to consider that hunting and gathering has served the human race for much longer than has agriculture. The following Figure only starts at the point when hunting and gathering was practiced at the same time as herding and early agriculture. After that period, an exponential rise in population occurred with the development of new agricultural technologies (green) followed by an acceleration of the exponential (red) from today's intensive agribusiness and efficient smallholder agriculture. Beyond this point, a further rise in population (purple) may rely on non-agricultural food products. The coloured plot is approximate and based on a logarithmic scale as indicated on the Y axis; the same data expressed in arithmetic terms is illustrated in the graphic insert. All data are those commonly used by the UN and in this case are taken from US sources.²⁴⁵



As in agriculture, protein has been the grail of much soil-less food research, which has mostly relied on plant and animal byproducts including parts of seeds of soybeans, peanuts, sunflower, cotton, sesame, rape, various other oil cakes and meals, casein, trash fish and krill and other mixed marine life. Yeast products, for example, offer potential for a huge range of artificial foods. These will first be used to feed farm animals, and humans will then eat products from those animals. But the next step is for humans to consume such foods directly. Research into the processes for such production and for testing their safety has been going on for more than a century. Some attribute the concept to 19th century Russian chemists whose ideas were made practical with scientific advances of the 1950s,²⁴⁶ but in fact the field has long attracted scientists from everywhere. It is thus not new, and we should expect this research to be feeding at least some humans in the foreseeable future.

If such soil-less foods sound too fanciful, the future can also be discussed from the one of the same perspectives that is commonly used in the West today to fuel apocalyptic fears – meat consumption. While Western vegetarianism is almost a marginal curiosity in terms of world food consumption, the influence of lobby on Western thought is real. It sometimes invokes Hindu India as an example, forgetting the culture’s essential dairy food products that support those hundreds of millions. Demand for animal products by the exploding global middle classes are trending towards a need for a 230 percent increase in global poultry meat and a 160 percent for other livestock products.²⁴⁷ Such demand will be met for the sake of social stability and impose further demands on overall agricultural production, and hence the same pattern of increased efficiency of production can be expected.

But choice may also become a greater factor for those who seek animal protein rather than high-status animal food products. In animal science, one of the fundamental tenets is to produce animals suited to an environment, which means that aquaculture, for example, will continue to rise in importance. Having increased in production by some 30 percent in the four years to 2006, mostly in China,²⁴⁸ aquaculture is poised to provide the majority of the global fish market.²⁴⁹ High feed conversion rates and potential adaptability to small-scale home production make fish important in food security. It is reminiscent of the practices of Europe’s Cistercian monks several centuries ago.

As noted in another essay herein, future animal foods may be sourced from: current grain-based animal industries for the wealthy; current subsistence animal protein for pastoralists and small integrated producers; aquacultured fish at household level, even in cities; farmed and home-caged efficient roughage convertors such as rodents and rabbits; large and small-scale farmed insect and larvae protein; laboratory/factory produced meat-type protein products²⁵⁰ and factory-produced ‘protein biscuits’ produced from animal and other product wastes.

Technology will surprise us all in adapting existing systems better to their environments, and in throwing up new foods and food production methods.

To maintain flexibility in our technologies to feed and otherwise assist the world²⁵¹ requires awareness that promotion of a Western food focus in a poor and food insecure country orients science to the wealthy when the real need is for basic food security. This will continue in response to market forces, but what is required to meet the needs of the food insecure is a continuous cycle of technology development, or 'sustained research' if you like – as illustrated simplistically in the following Figure.

But what of the majority of the world's food producers, the small mixed farmers? Their virtues are long known and often denied. Their nutrient-recycling efficiency results from the use of agricultural byproducts, small animals including insects, various wastes in their production systems and the use of forage from non-arable lands. Technologies that further increase efficiency will surely be developed, but there is also a lesson awaiting those who like Doherty are prepared to eschew the 'obvious path' and realize that our measure of efficiency itself is often limited to financial yardsticks. But a different yardstick is needed when capital is not the limiting resource in a particular situation, but is rather nutrients, knowledge, water, land, labour, disease-resistance or any one of several other possibilities. Such a realization would revolutionize most of current conventional economic analyses. In fact, it may even be more correct to say that it could return economic analysis to its intended role from current imprisonment by its fiscal focus. This is part of the change we should expect in the future as part of providing the extra food that the world demands.



Thus we also have this additional source of soil-less foods to feed the world. In fact we might do better to acknowledge that the unifying element in all of these means for increased food is the same one that has allowed our species to flourish to date – that is, the natural resource of human ingenuity.

Answering the Question

For someone of my experience and profession a conclusion that food is plentiful is unusual. This is because we know the precarious situation of the world's current food production and distributions systems. The reason that I am hopeful is that, knowing the risks, I can join the constant message that we must invest more of our best brains in this fundamental and complex field. I admit that in a Western world where lobby and influence trump knowledge and facts there is a need to somehow penetrate the general consciousness. As the question notes, the public susceptibility to such messages plays to our general fear of

death compounded by feelings of guilt at causing the supposedly dilemma between starvation and environmental preservation. And as that introduction also notes, scientists are the ones left responsible to apply environmentally risky technologies and to feed the world. The above sections explain 'how the additional food that is needed can be produced when land, fertilizer and oil availability are in decline'. They can be summarized as follows.

Even though we know how to produce much more food than we currently do, concerns persist that the essential resources and inputs for such production are approaching their limits. This irrepressible spectre of Malthus²⁵² consistently ignores the continuous development of new technologies that predate agriculture and are ever accelerating. Thus hunger caused by lack of knowledge about food production has been forestalled more than once in our generation as a function of technological innovation, as clearly espoused by Boserup.²⁵³ Agricultural research has provided such large economic rates of return that some without knowledge of the field have claimed that the calculations are in error – but they are not. With the promise of technology continuously being delivered where research is well funded, future food production seems at least as secure as it ever has been. This is cause for optimism in itself, and is reinforced by the reserve-opportunity of non-agricultural foods.

Having presented these reasons for confidence, it is important to note that this essay does not address the separate issue that is variously raised under headings of equity, fairness or rights. If the world reaches a stage that food from conventional agricultural sources is insufficient, the most vulnerable persons will most likely be the poor in cities who can neither produce their own food nor afford to buy it. A realistic view of the future would probably have these persons relying on the food products rejected by more fortunate others, such as decaying animal products, offcuts, weather-damaged grains and fermenting vegetables. As unsavoury as this may sound in both social-equity

and culinary terms, it is probably still an improvement on the lifestyles of the marginalized persons of the world in past eras.

Beyond these probable measures of meeting food needs, lies the factory production of the soil-less foods, which will most likely differ from the 'nut-meats' and other products that are known to middle class consumers. Bulk production of soil-less foods for the urban poor may well differ from dinner table meals – syrups, amorphous soupy stews and dried out chewy lumps of indeterminate origin. But apart from their appearance they will be nutritious. This is not so far from the science fiction depiction of a steak being the most valuable product within a dystopian city and biscuit like products being distributed to the urban poor, as depicted in *Soylent Green*²⁵⁴ – although the extreme of the eponymous product of the film plays on apocalyptic fears more than science. Industrial production of cheap nutritious food supplements by or for government welfare programs seems more likely. Thus food is again tied to good governance.

In the meantime it makes sense to reduce wastage, value efficiently produced food such as grass-fed beef and legume crops in parallel with cereal grains and to use byproducts wherever possible. The environmental catastrophe expressing the fear of death that religions once portrayed as retribution to sinful societies may continue to fuel mass belief-based causes and solutions – that may be the nature of the masses. Scientists, on the other hand must determine means of managing environmentally risky technologies while feeding the world. If we meet our responsibility to fund agricultural and food research there is reason for confidence that the additional food can be produced even if land, fertilizer, water and oil are less available.

Chapter 7

How would you categorize yourself? You seem to be influenced by Buddhism and you have emphasized compassion for animals, so it is easy to assume you are a vegetarian. If it is not too personal a question, how would you label yourself?

There is much within this question and so I must treat it serially starting with categorization and moving onto meat diets and animal care while occasionally mentioning Buddhism. In taking this approach, I intend to point out that labeling does not assist us unless we remain aware of why we label and the compromises it requires. Thus if the question was asked at cocktail party where a short and socially acceptable response would be polite, I expect that my response would be misunderstood as cryptic obfuscation. An essay provides a useful means to illustrate my answer. Let me begin with discussing categorization.

Beware Categorization

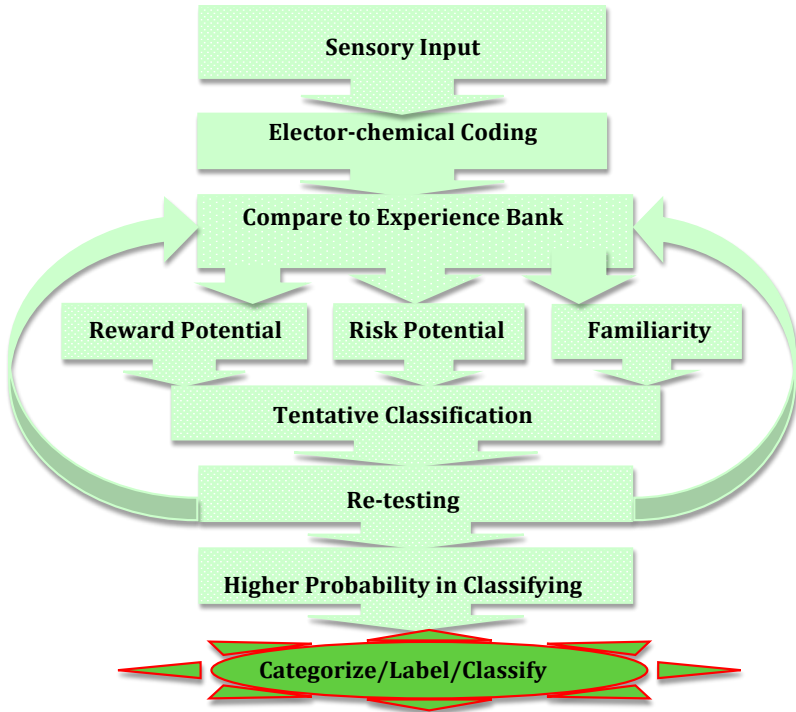
In our modern quest for individual importance, we are often annoyed by the routine questions that seek to categorize us. Sure, we are proud of some of our associations, such as where we work or live, yet we long to be known in terms of how we differ from others. At any rate, this is how I have often felt. When asked ‘what do you do?’ I have to think of an answer that might suit the questioner, for I do not fit routine categories. And the categories of life are routine: job, nationality, education, work experience, networks – and even before such matters are discussed, assessments have been made on the basis of such sensory categories as smell, dress, accent, habits, posture, skin colour and so on. The same applies to viewpoints, which are sometimes misnamed as values, such as being vegan or vegetarian.

Nothing in the above observation is new, except perhaps for our enhanced modern fantasy of individualism. We categorize as part of our nature. It allows shortcuts to thinking and so frees up mental capacities for other interactions with the environment. This ability to categorize has been honed by countless ancestors who exhibited such survival benefits as being able to categorize and harvest nutritious berries while avoiding the poisonous ones as a rote action while being on the lookout for the children and predators. Thus our predilection to categorization is natural and useful.

Unless our lifestyle remains constant, however, some of our natural traits can interfere with our wellbeing. Our tastes for fat and sugar are natural and have served our ancestors well in their survival when nutritional energy was in short supply, which throughout human existence has been very often. Those individuals with a taste for fat and sugar had a survival advantage for they sought it out, ate it and survived to become our forebears. Today with technological sophistication that eases our physical burdens and allows fat and sugar to be easily over-produced and over-consumed, we find that the same natural predilection for those tastes is associated with major health issues.²⁵⁵ Thus a predilection can be natural yet not useful. Either way, it seems that unless we are very wary, we follow a basic process from seeing, hearing or other sensory inputs through to labeling, such as described in the following Diagram.

So just because categorizing is natural does not mean it is perennially good; it depends on circumstances. Stereotypes are a type of categorizing – Muslim, Black, Asian, vegetarian, communist etc – and these lead to prejudice, which is generally seen as socially negative. Likewise, fashions take hold of large proportions of the public, even though most victims have the opportunity to think whether they want to be part of a fashion or not. Why do they allow themselves to be manipulated? Of course, the answer includes the desire to be part of something, and this

involves relinquishing some objectivity. It is easily done, and has similarities with our tendency to categorize in place of conscious thought. Thus we even label ourselves as part of our identity.



Labeling Ourselves

Natural or not, I find it difficult to abandon myself to such labeling. When I am asked – because I sometimes write on quasi-religious themes – if I am Buddhist or Christian or whatever, I decline to be categorized. An example from one newspaper²⁵⁶ that portrayed me in a balanced and quite different manner from other articles seeking sensation on an unrelated topic at the time indicates this middle or ‘matter-of-fact’ approach. I know that to

agree to any category means that I will immediately be assigned the list of attributes that the questioner defines. All scientists know the distinct limits of such taxonomies, and that the indiscriminate categorization can produce odd combinations if all must conform to predetermined categories in the popular lexicon – consider ‘pathogenic anabolics’ or ‘social capitalists’ or ‘ovo-lacto-vegetarians’, for example. These are not unproductive, just humorous, but some other outcomes of categorizing can be harmful.

Categorization produces at least two possible outcomes. The first is a sanctification of categories themselves, which then leads to all things being defined as within or as variations from the categories – rather like classifying mushrooms as plants for some characteristics and animals for others. Perhaps this is a natural and good thing, but the major initial distinctions have been made between naturally occurring substances, such as plant or animal, while the further refinements tend to be between mental constructs, such as democratic or authoritarian. The second possible outcome is constantly re-creating categories as knowledge and circumstances change, such as new nations coming into being, or plant taxonomy informed by DNA profiling.²⁵⁷

But there is still another option, which is avoidance of categorizing in the first place, because for each category to which we think we might belong, reflection reveals that we may also belong to its opposite category. This is one way of reading the confronting poem by Thich Nah Hanh – ‘Call Me By My True Name’.²⁵⁸ Expressed in other terms, we may render the poem as ‘do not accept categories or concepts just because your peers or mentors or family do, but critically assess all things in your own experience’. To claim that insight as being Buddhist would be an example of categorization and is completely unnecessary unless one is proselytizing. Likewise it is not possible to categorize Buddhism, for example, as vegetarian since both meat-eating and vegetarianism are accepted in the scriptures and ancient

Buddhist cultures. And in any case 'Buddhism' is a category that is somewhat artificial and only recently imposed by our culture,²⁵⁹ which is now in the process of further redefining what it accepts as Buddhism – yet the philosophy itself advises against indiscriminate categorization. Such categorizing in our modern individualistic society has produced such popular aberrations as 'if it feels good for you, do it', which can at times be the opposite of the original advice; to divorce advice from its cultural and temporal context means that 'Buddhist' assumptions of ongoing practice of mindfulness are forgotten.

If viewed in context, the Indian conception of what we are labeling as Buddhism might be seen as simply 'dharma', which was understood as something like 'the way of living in harmony with all things being our duty once our basic needs are fulfilled'. Few would argue with such a sentiment today. But it is vague and resists categorizing and so is not considered in common dialogue. Our Western mindsets seek easy categories so we can 'get on with it' and 'keep the discussion going'. With such an approach we concentrate on the minor differences between things rather than the overwhelming majority of similarities and this produces a constant mental bias in our analyses of each situation. This seems to me to be one of the sources of our misperception of reality, and it stops us from seeing wisely.

Seeing Wisely

Is the answer then to seek only the company of those who see this reality and who strive to be aware at all times? This is hardly practical. Should one renounce the world, or accept it with its inconsistencies? The former is always attractive – especially to men it seems; but it is a simple categorizing into two groups and a closing of the mind to the significant overlap between the two. Personally I find stimulation from both the inconsistencies of the world as well as from serious colleagues who live largely separated from the world. So you might say that both, in fact all,

are my teachers. All are internalized in me – the aggressive, the comforting, the wise, and so on.

With this multitude I contain within me,²⁶⁰ it is far from a lonely path trying to be aware, and it brings new companionship in becoming closer to other parts of life. If I am content with contradicting and contrary views and experiences, I am part of the world – ‘in’ not ‘of’ the world in Christian terms.²⁶¹ This will not seem new, unless it is forgotten that discriminating awareness is critical to self-development, and discrimination here may be defined as categorizing wisely. Here I find another anomaly – everyday language uses the same words that I have in my mind as I write, yet it does not place the same meanings on them. I see that many have forever struggled with this miscommunication,²⁶² and I take comfort in my simple view of human-ness even though it may be unintelligible to many others.

If our human-ness is definable by our major interests, categorized and then not discussed openly, those interests nevertheless govern most of our actions. Take for example the distraction that a passing feminine form can provide for a healthy man; this is a natural part of evolutionary programming. Or take the example of ageing in a comfortable Western land where it is not unusual to hear discussions of such themes as pension schemes, health, travel, and so on. These are but proxies for addressing death, which leads me to conclude that wise men of past epochs have defined our human-ness very well.

Sages have consistently identified these two – sex and fear of death – as the most powerful drivers of our thoughts, motivations and actions. We are generally programmed to appreciate the opposite gender, and we fear our own death. Of these two, the first in the form of ‘inducement to reproduce’, conspicuously fills billboards, advertisements, art and entertainment today. Likewise, ‘dread of death’ occupies the same space although less conspicuously, but is not usually discussed openly. If it is discussed, death is tightly constrained by

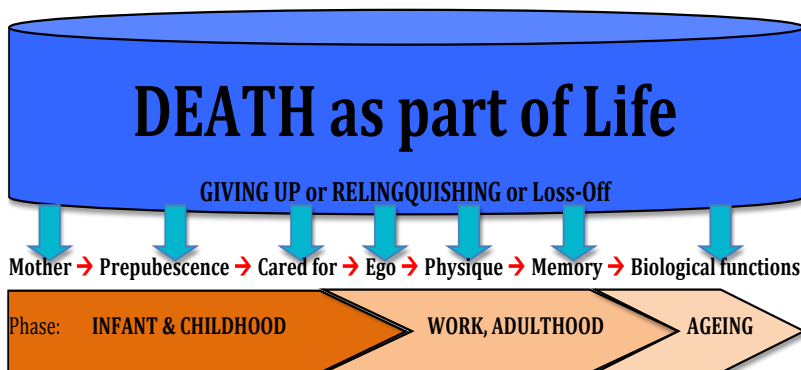
pre-defined categories. And here I might highlight that some believers claim that not eating animal flesh is 'not causing the death of others' as if in attempting to banish death from their diet, they might banish it from their lives. So in not usually being objectively discussed, death is doubly hidden from our consciousness. Freud claimed that suppressed sexual gratification leads to the pervasive angst of society, but he also acknowledged its link to our universal fear of death.²⁶³ He, like other wise persons, have long observed that this repression creates unspecified fears and chasing after diversions. But let me delve deeper into this dread of death in terms of categorization.

Categorizing Death

Is death just another category? If it is, it may just be another artifice to label a continuum. This useful device leads me to consider death as a process rather than a single event. This is not the sentimentality of 'birth being the beginning of death', or of post death fantasies. But it is practical to consider that I am already dying, and not just in the sense of the increasing frequency of uncorrected aberrations of cell division that can overtake the various organisms that make up my body and mind. I can see dying and death in those things that defined 'me' at one time and which no longer exist. For example, many aspects of 'me' have died; physical stamina, rapid learning, preaching, or being a technical researcher, a CEO, an academic etc. I once rode horses rounding up cattle from vast lands in the remote north of Australia – but I am sure I cannot do it now. If I ever harboured the delusion that such matters defined me, now many decades later I cannot! That 'me' is already dead. The animals I have killed and eaten are part of that chain of death that is my life, just like anyone else's. As this applies to all that I am doing, I – like everyone else – am dying. *C'est la vie!*

If death is 'letting go', then we are surely letting go of things all through life as the following Diagram illustrates. Letting go in a

mindful manner by sloughing off habits, tastes, activities, colleagues and so on. This means being cognizant of death, of seeing through the artifice of the category labeled 'death'. It is natural and hence inevitable and can be accepted as part of life, like sex and eating. And as for all parts of life, it is not its category or a particular variation that makes an action a 'sin' or 'not conducive to liberation' but our intention in that action. Seen like this the remaining concern might only be that of regret for what is 'let go' and in itself this indicates our limits of awareness of natural processes. The more we look at life and live in harmony with it, the more death is evidently critical to the process. Yet I have another lingering concern that relates to attachments to such things as; self image (which in moments like this I know is full of falsity and see as Solomon did '... all is vanity'),²⁶⁴ everyday enjoyments (but these also change), my wife (who has gifted me with confidence to further pursue self-knowledge), and my ideas (like those clumsily expressed here, and which change over time). Detachment from these concerns is easier to accept for all things once they are seen to be transient. The exception is close personal relationships.



So if awareness is the antidote for the unthinking categorizing that we seem programmed to accept, then it is the same awareness of death as a continuous process that can instruct our understanding of the death of our body and mind. No doubt we

all enjoy some degree of attachment to a person, even if we are not psychological dependent on them, and such long-shared experiences of mutual developmental support will be missed. But all attachments contain the seeds of their own death if we will but be aware – that is what both essential Buddhism²⁶⁵ and Freud²⁶⁶ have observed albeit with different outcomes. Such a life-embracing approach accepts death as always occurring – in our own lives and to persons who surround us. It incidentally involves being aware that categorization is an artifice used as a tool of communication, and thus any conclusions based on it must be examined with wise discrimination. Categorization is the binary system of our dichotomous thinking,²⁶⁷ but the categories are no more real than the binary symbols used in complex computer calculations. Our continued development rests on our approaching categories, like all things, with awareness.

To take the example of awareness applied to one category – vegetarianism – could mean for example, being aware of such matters as; human nutritional needs, means of minimizing an animal's pain, the conflicting teachings of the elders in all great traditions, our tendencies for anthropomorphic projection and so on. The matter is discussed more fully below.

This has been expressed in the Buddhist Kalama Sutta²⁶⁸ as in all serious spiritual advice, such as the following extract attributed to the Muslim Alhazen (also known as Abū 'Alī al-Hasan ibn ... al-Haytham):²⁶⁹ "Therefore, the seeker after the truth is not one who studies the writings of the ancients and, following his natural disposition, puts his trust in them, but rather the one who suspects his faith in them and questions what he gathers from them, the one who submits to argument and demonstration, and not to the sayings of a human being whose nature is fraught with all kinds of imperfection and deficiency. Thus the duty of the man who investigates the writings of scientists, if learning the truth is his goal, is to make himself an enemy of all that he reads, and, applying his mind to the core and margins of its content, attack it from every side. He should also suspect himself as he performs

his critical examination of it, so that he may avoid falling into either prejudice or leniency.'

So it seems to me that accepting a categorization like vegetarianism should include a discriminating awareness of death as introduced above, for obviously eating an animal's flesh involves its death. But if we are to consider vegetarianism, we must also be aware of where such an idea might have come from and how it developed, which would include speculation about humans' early and continuing carnivorous history as hunters and how their trait of rituals concerning animals, meat and sacrifices might have somehow linked into religions to emerge into a popular Western vegetarianism today. I begin with a short discussion of it possible origins.

Origins of Vegetarianism

No one knows if humans have ever been vegetarian or not; all indicators – incisor teeth, digestive secretions, stomach conformation and so on – suggest omnivorism. Archeological evidence suggests our line has relied on meat consumption for its health for 1.5 millions years.²⁷⁰ Our best theories of the origins of civilization include the practice of agriculture, but it seems that domestication of animals probably preceded that of plants, perhaps starting with dogs as food. In any case, hunting and probably herding preceded cropping and continued in parallel with agriculture, giving rise to stories of conflict between the two in many cultures. It is noteworthy that in one such tale, it was the animal offering of the hunter Abel that pleased God's nostrils', which in turn spurred his brother, the farmer Cain, to enviously murder him.²⁷¹ There is little to commend vegetarianism in the adopted religion of the West's dominant culture.

The origins of vegetarianism remain a mystery though most modern adherents trace it to ancient India and Greece where the oldest records of the practice exist, often in association with

religious ethics of non-violence,²⁷² and in the Greek case including a belief in animals having souls.²⁷³ Homer²⁷⁴ refers to vegetarianism but such writings are mythical, and the earliest known regional practice is from the 6th century BCE among the Orphics, Pythagoras and Empedocles who variously adopted it as a belief. At the same time, the philosophies of the Peripatetics, Stoics and Epicureans did not include vegetarianism, and the Stoics insisted on meat being an essential component of the diet, although Seneca may not have.²⁷⁵

Since that era vegetarianism has been uncommon in Europe and remained rare after the advent of Christianity, apart from a few monks, until the Renaissance when it was practiced by such personalities as Leonardo da Vinci.²⁷⁶ But it only reached measureable levels in the 19th and 20th centuries (<3 percent).²⁷⁷ Christ is said to have eaten at least fish,²⁷⁸ and the great theologians Saints Augustine and Thomas Aquinas argued that no special duty is owed to animals,²⁷⁹ and even the great friend of animals Saint Francis of Assisi left no indication of his dietary interests.²⁸⁰ As in Christianity, both Judaism and Islam are generally seen as condoning hunting for food with restrictions on eating animals that prey, and classifying them as non-kosher or haram.

The lineage is more explicit in India, and may be the source of Greek and consequently early European flirtations with the practice. Vedic teachings, the world's oldest writings, appear to proscribe the eating of flesh under certain conditions and more recent Indian traditions such as Jainism have refined vegetarianism into a spiritual practice.²⁸¹ The older and evolving Hindu traditions include one of Shiva's names as *Mrigavyadha*, which means deer or animal hunter, and hunting for food is a common theme through the Ramayana and Mahabharata. The Indian King Ashoka (304–232 BCE) is sometimes evoked as an archetypal vegetarian advocate of nonviolence to animals as recorded in the edicts he had carved into cliffs and pillars, although his earlier career was one of massive human slaughter.

The concept is better understood within that tradition from the scriptural observation that 'life survives on life'.²⁸² And it worth noting here that 350 million vegetarians in today's India continue the practice and maintain a balanced diet through significant consumption of dairy products; for as is often forgotten, India remains the world's largest milk producing and consuming nation.²⁸³

By the time Eastern philosophy began to reenter Western consciousness, Descartes²⁸⁴ and Kant²⁸⁵ had denied any ethical duty to animals but the fragmented Protestant ideals of Europe that were pieced together in the New World led to Christian vegetarian sects.²⁸⁶ By the early nineteenth century such ideas flowed back to England culminating in vegetarianism being promoted as part of temperance and anti-vivisection movements. This was the period when the first Vegetarian Societies were formed.²⁸⁷

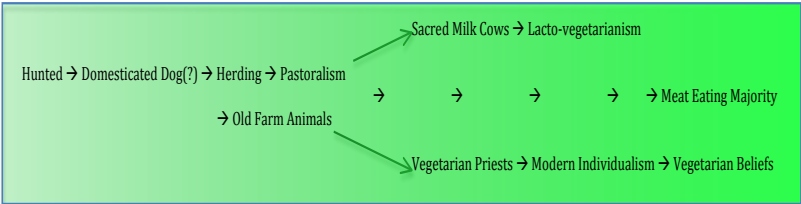
Indian religions were then seeping down to popular levels and were being appropriated for Western ideals among some groups, especially the concept of nonviolence advocated by Gandhi. Ascription of attitudes of nonviolence toward animals is widely claimed, though some appear over zealous, such as attempts to link to Schweitzer's 'reverence for life' ethic, which speaks more of awareness and respect than dogmatic practice. Schweitzer like many persons found meat consumption less conducive to his wellbeing in old age, but continued to eat meat until shortly before his death.²⁸⁸ Appropriations of histories in order to gain celebrity vegetarians across the ages may be more worthy of deeper ethical discussion among theologians than can be considered here. Such a review might also question reliance on such unchallenged notions as progress.

The origins of vegetarian ideas summarized in the first line of the Diagram below are based on modern views of progress. In that deeply embedded belief of our cultural discourse, humans are seen to have progressed from a primitive to a civilized state with

vegetarianism emerging with civilized progress on a path towards a utopian state. I find this view chauvinistic and unsupported by reality. Reality is closer to the second line in the Diagram, which is more consistent with archaeological, anthropological, sociological, technological and economic observations. Thus reality is closer to hunting preceding domestication of animals, which is followed by herding and agricultural lifestyles, each of which feed into the majority cultures of today. Each also produces the minority spin-offs of pastoralism leading to measures to protect milk-producing cows and to settled agriculture creating pure priests to intervene between humans and gods. However, in saying that this second line in the Diagram is closer to reality, I am not agreeing with it entirely, as the subsequent Figure will illustrate. In the meantime, it is useful to consider hunting, which is clearly an early if not the earliest means of ensuring meat in the human diet.



Differing Worldviews



Early Hunting

According to one accepted theory, the global warming that marked the end of the ice age produced new temperate climates that suited humans more than insulated mammals such as bison and mammoths. Edible temperate plants might then have offered

an incentive for cultivation that in turn required sedentarization and in turn encouraged domestication of tractable animals. At the same time, the tradition of hunting wild animals for food continued. Agriculture is commonly dated to some 10,000 years ago with sheep domesticated around the same era followed by goats, cattle and pigs. Using animals for agricultural work became common about 6,000 years ago and thus created an even closer bond between humans and livestock. Appealing as this lineage is, it does not explain human dietary meat, and it has also tended to overshadow the fact that hunting predates the emergence of the species *Homo sapiens* – other *Homo* species including australopithecines also relied on animals for food.²⁸⁹ Stone tools and fire were implements of hunting and hunting logically formed the earliest stories and myths than accompanied rituals, including sacrificial rites. There is a better theory, as follows.

Hunting for food using bows and arrows can be dated to about 18,000 years ago and domestication of the dog to about 15,000 years²⁹⁰ long before agriculture began, and appears to have been contiguous with today's hunting by some remaining indigenes. From those societies as well as from archeological evidence the multiple uses of animal products beyond protein is evident – for example, bone tools, sinew ties, fur and feathers for warmth, and leather for flexible and durable tools and clothing. The deities of these prehistoric groups were depicted as predators or prey. Over time, these essentials of survival became symbols of dominance as cultures became more sophisticated and local leaders were represented as brave hunters, an attribute then ascribed to the gods, such as predecessors of the Roman Diana. With such divine associations, taboos protected animals in sacred areas. But agricultural areas were not sacred in this sense – different gods governed these fields – and hunting here became what today might be called pest-control. Yet the gods of hunters and herders seem to have been adopted by the agriculturists, possibly because the hunter-herders could dominate sedentary croppers, and so the earliest human rituals seem to involve

treating animals as if they were part of the continuum with humans and gods. This seems more caring and respectful of animals than some misinformed policies today. In any case, rituals involving animals have long coloured religions up to the present day in the intentional care that was the origin of Muslim halal and Jewish kosher slaughter procedures.

Ritual Killing

It is not possible to know the origins of ritual, myth or religion, but this has never been an obstacle to the development of theories, which often evolve into beliefs. Human and animal sacrifice as a means of social union with gods is the primary candidate among such theories elucidated in the 19th century.²⁹¹ Refinements thus produced rituals of purification, gifting, expiation and worship, culminating in such rituals as the Christian Eucharist. The theory has been variously interpreted and criticized yet its influence is evident in Freud's works on totemism through to his final writings.²⁹² So in the absence of alternative ideas, it is assumed that sacrifice was the origin of ritual and thus religious observance.

A society's ritual is in effect the rules for behaviour in sacred matters and the means of passing between the sacred and the profane. They share such traits as; feelings of awe and dread, being embedded in mythical belief structures and containing rich symbolism. However, while rituals are a universal characteristic of humans, there is little uniformity in what is considered sacred or profane. Not only does it vary between cultures but also between individuals within a culture – priests and shamans, for example, may work to different interpretations than others in their group. Rituals include avoidance behaviours, usually described today through the Polynesian word *tabu*,²⁹³ infringement of which leads to unwanted consequences unless rituals of purification are performed.

Such taboos and purification rites differ from those involving sacrifice,²⁹⁴ which require the destruction, injury or death of the sacrificial person, animal or other sacrificial object. The beneficiary of the sacrifice may be either those who make the sacrifice or the sacrificial object itself. Here we gain hints as to the rituals that may derive from hunters and pastoralists and then evolved into some of the rites adopted by sedentary agriculturists. The sacrificer believes that he is gaining some benefit from his action, be it rain for crops, a spiritual linkage with the object or forgiveness for offending a taboo. We may also see some of these linkages in rites of passage such as at birth, puberty, marriage, conception and death, as well as in initiations and seasonal rituals. All define separation from one type of life in order to enter another via the transitional rite – or if you like, death of one life and reemergence to another, to use the language of earlier in this essay.

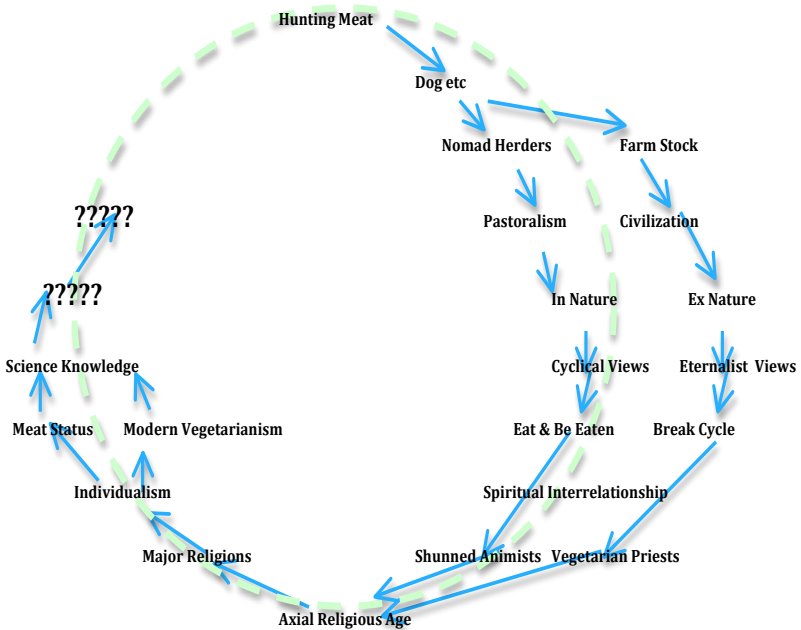
One interpretation of pre-history traces meat eating to omnivorousness that includes cannibalism as a cultural more. Apparent slaughter sites with human bone remains in Neanderthal and other Paleolithic sites²⁹⁵ are said to suggest cannibalism perhaps associated with food shortages.²⁹⁶ Genetic marker studies²⁹⁷ have also been interpreted to suggest that the evolutionary adaptation carried by many modern humans that protects brain tissue from risks of prion damage may also imply cannibalism. While disputed, this notion has been defended as a workable theory for further research.²⁹⁸ Diverse myths include references to the practice, from Germanic stories such as Hansel and Gretel to Biblical tales of a pact between women to eat each others' children.²⁹⁹ In reality cannibalism occurs even today under conditions of starvation, but even then is considered by many to be abhorrent – a reaction perhaps explained by Freud's postulate that civilization persists by controlling the individual's instinctual urges, among which 'are those of incest, cannibalism, and lust for killing'³⁰⁰ within which cannibalism is 'the murder and eating of the father by his sons' as a metaphor for the development of the self.³⁰¹ While this too may be seen as a source

of rites that mimic cannibalism, it may be less important than rites derived from human sacrifice shifting to animal sacrifice and ultimately to such symbols of flesh and blood as bread and wine.

The transition from rites to religious ritual in symbolic forms is evident in the idea that hierarchical social castes can be seen as reflections of the cycles of life. Just as smaller animals are eaten by larger ones with mammals eating the most, so one would expect that the most powerful person in a group would be at the top rank. However, most commonly this rank is allocated to priests. Why? One answer is so that priests can interrupt the cycle that has humans on the top of temporal life and the gods above consuming humans sacrificed to them. The priests may then become a source of vegetarianism as part of their absolute purity to be able to conduct sacrifices pleasurable to the gods. In this way priests are said to have broken the cyclic chain of eating and being eaten and so made that whole cosmos of life sustainable (in an earlier notion of that word).³⁰² It is not a large leap to see such a self-purifying ideal in modern Western individualism when ethical explications are touted as irrefutable logic against meat eating. And yes, I can see that some of these ethical arguments have merit as mentioned in the following section. But before that, let me consolidate some of the disparate thoughts of the previous three sections.

I introduced the second line of the preceding Diagram as closer to reality than the first, but indicated that it still did not represent the way that objective thought and reflection makes it appear, to me at least. The following Figure takes the same general information and presents it in a cyclic manner, indicating some diversions and reunions in humans' understanding of themselves. The Figure has limitations but it does provide an explanation of this insight, and raises more questions than are answered by most ethical arguments about vegetarianism. Let me introduce the diagram.

If we use hunting as the beginning of human reliance on meat, we are led to accept that the dog is the mammal with the longest domestication history, and that there is pre-historical evidence of it serving as a food source. It also seems plausible that herding of semi-domesticated animals would increase food security in times of animal migration with climate change. Nomadic herders could then evolve into extensive pastoralists as some nomadic herders continued their practices concurrently with the domestication of plants for food that led to agriculture. Agriculture with its requirements of sedentary lifestyles and additional labour favoured sharing of labour, specialization and the expansion of influence of a non-labouring elite. That is civilization. These parallel developments – pastoralism and civilization – may be characterized as working within the changes of nature for pastoralism, and acting external to nature to control it for agriculture.



This last point requires elaboration since popular belief erroneously holds that early agriculture was more within natural cycles than today's. If this is true it may be less due to religions or belief than to available technologies. Why do I say this? Because the definition of agriculture as used in agricultural science, economic history and other searching analyses of this major interaction of humans with the natural environment is threefold: orienting a crop or animal to the environment; orienting an environment to a crop or animal, and managing both the environment and crops or animals for optimal production throughout the growth cycle. In today's language this is genetic manipulation, engineered landscapes and structures, and complex use of chemical and mechanical tools to manage production. Agriculture is thus an attempt to exert control over nature.

Continuing with the paths in the above Diagram, the impact of lifestyles on cosmological understanding produced cyclical views of life and death within the beliefs of the pastoral groups. However, at the same time in the civilized groups supported by agriculture it produced eternalist beliefs based on humans being able to intervene to stave off their greatest fear – death. While those who remained living close to their animals saw that life and death was about eating and being eaten in a cycle, they were either absorbed with agricultural expansion or marginalized as 'primitives'. Those who sought to control nature evolved beliefs in which animals and humans were consumed by the gods above them who demanded human sacrifices. Historical records of priests who maintained their purity by abstaining from meat (and sex) and thus breaking the cycle could offer alternative sacrifices to gods on behalf of their societies.

Then the Figure moves onto widespread agricultural dominance and, for reasons still unclear, the Axial Age³⁰³ when the great religions' figures emerged – Confucius, Lao Tzu, Zoroaster, Socrates, Plato, Ezekiel, Zechariah, Jeremiah, the Buddha and so on. This is when the belief systems of agricultural and pastoral

lifestyles converged and endured through the recent two millennia, according to this theory. It ended with advancing technological development allowing greater control over nature in the form of disease control, vastly increased means of providing essential agricultural nutrients and controlling pests and innumerable tools that made life long and comfortable. And with this feeling of being able to control nature (seen today in apparently serious suggestions about how we might manipulate climate to our own needs) came a cosmology of individualism that encourages modern Westernized persons to consider themselves first – as gods if you like.

With such persons being gods unto themselves, comes the feeling that ‘I am morally superior and care for animals and will therefore not kill other beings’ as a disguise for the fear that despite being god-like I will still die. Meanwhile the vast majority of the population continues to eat meat because they like it and it seems natural. The only improvement for the society that I can postulate from this current situation is through increased knowledge and awareness from science, and this will inform each of vegetarianism, healthy meat consumption and care for animals. It might even be seen as a second Axial Age since it may well unify human understanding on a global scale. I find the above Figure satisfying as a work-in-progress for understanding our behaviour; it certainly provides more sustaining food for thought than beliefs, invidious comparisons, justifications and misunderstandings of human-animal interactions.

Food for Thought

The moral argument for abstaining from meat when separated from beliefs relies on objectively challenging common views – a worthy approach to life as ascribed to both the Buddha and Socrates. But somehow this leads advocates to linking ‘oppression of women, oppression of the environment, and the oppressive treatment of nonhuman animals’.³⁰⁴ Some even liken

intensive animal production to Nazi death camps³⁰⁵ although others decry such comparisons saying it is similar to the misuse of the word 'rape' in environmental terms.³⁰⁶ At base these are beliefs that are defended through selective histories, strange evolutionary assumptions, sophist philosophy, scriptural literalism and political alignment – a listing that in fact describes sections of one of the many collations on the subject.³⁰⁷ The common theme of believers who see meat eating as unnatural lead to the anomalous conclusions that humans can exist outside nature. Nevertheless, such discussions do serve to highlight the extent to which the meat consumer is isolated from meat production and particularly slaughter.

One conclusion in the debate suggests 'that we may, if we desire, eat meat from humanely raised and slaughtered animals in moderation and with appreciation. But whether we eat meat or refrain from it, we are in duty bound to concern ourselves with the well-being of the animals who supply it.'³⁰⁸ This is the context for animal welfare, the practical outcome of the arguments surrounding meat eating. And once realized, that context provides the logical understanding that, as humans exist only as part of nature, we consume the products of nature just as we are consumed to become renewed products of nature. This old cyclical revelation is fashionably denied, for it means that death and decay are parts of our lives – which is what much vegetarianism seeks to deny. Denial is apparently sustainable within the fantasy of lions lying with lambs³⁰⁹ since predators of humans have largely been controlled, and Western death rites symbolically seek to protect us from being eaten through absurdly strong coffins.³¹⁰ And here is the nub of meat-free evangelists – it is distinctly Western in outlook when it talks of the ease of access to essential nutrients otherwise obtained from meat.

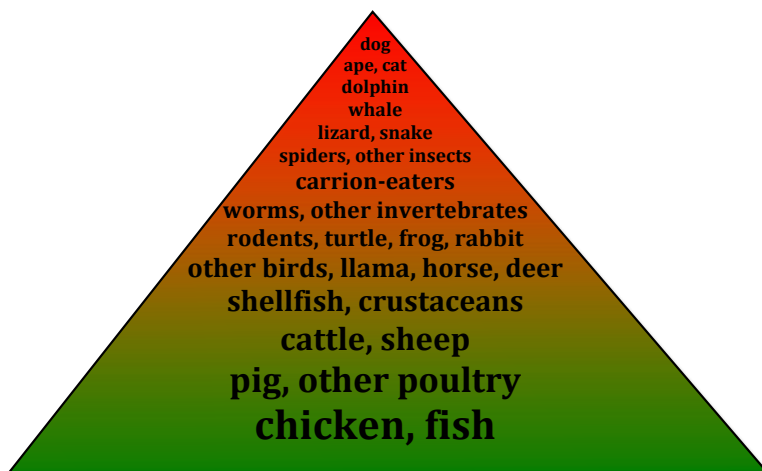
For most of the world, the abundant food choices needed to balance vegetarian diets and available to Western consumers, do not exist. Such ethnocentricity, as Plumwood³¹¹ termed it, is little

more than cultural hegemony. In any case, by claiming that meat comes from ‘inhumane factory farms’, such arguments work against public education about the benign and productive role of ruminants on pastures adapted to grazing. Added to this are the various benefits of livestock for the majority of the world as village refuse recyclers and as providers of power, manure and a range of other products in systems that have proved sustainable over millennia. In these ecosystems, animals are usually respected for their essential roles; the same may often be true on Western farms. But when extremists damn all meat production and consumption, I am concerned less by their wrongheadedness than by their undermining of care for animals through civilization’s most moral approach of animal welfare. And it is in the subject of animal welfare that I would expect to find a meeting point in objective ethical discourse. But again I find – with an exception mentioned in the following section – that vegetarian ethical stances resort to beliefs isolated from knowledge.

Modern Ethical Vegetarianism

The ethical arguments concerning vegetarianism are based on, among other points, unnecessary slaughter of animals and concerns about some meat industry practices. Objections stem from ascription of rights to animals, equity of access to food and religious beliefs. Utilitarian arguments, which suggest that alternative means of surviving exist without resort to eating meat, have been embellished with considerations of sentience in a manner that links animal liberation thought with some religious beliefs. Such hierarchies as presented in the following Figure – a ‘pyramid of meat preferences’ – include various aversions and cultural values. An interesting aspect of that pyramid is that it is clearly not a hierarchy of sentience, which would likely follow that of an evolutionary tree. Groups that consider killing, whether of a domestic animal or human, as never justifiable, except in extremely rare circumstances, also

claim that humans should behave at a higher level than other animals.³¹² Studies that show meat-eating aversion after exposure to animal production and slaughter processes also indicate deliberate suppression of such knowledge in daily life.³¹³ Rather than reducing stress in normal life, such suppression is conceivably just one more source of the angst that underlies modern lifestyles. Extremes of vegetarianism, such as veganism, go further in claiming that consumption of eggs and milk products deprives chicks of life and calves of milk – although these tend to be rationalizations of what for serious practitioners is part of a spiritual discipline.



Ethics has been fundamental to the development of animal welfare as a means of considering the stresses placed on animals raised for slaughter. This has led to research aimed at measuring stress levels under various production regimes, which in general reveals the huge impact humans have had over the past millennia in selectively breeding domestic animals suited to human requirements. Thus poultry may feel more secure in certain cages and sheds than in the open air and pigs may prefer pens of a size where they can mark and keep an area clean, and in the case of farrowing sows not be concerned about having their

young exposed to danger. However to be consistent, one might then argue that such breeding to suit human's requirements is itself an impost on animal welfare; one example may be dairy cows bred with udders so large they cannot walk comfortably.

Using pain and stress as indicators of suffering seems the most caring approach possible. It does not consider the nebulous concept of an animal's 'happiness' or joy in an English spring day³¹⁴ and it avoids the difficulty with ethical arguments about where sentience ends. This is where Singer loses some of his disciples, as his line between which animals are sentient and which are not is arbitrary, just as it has been for other philosophers³¹⁵ and legalistic Buddhists. The scientific approach to alleviating pain and suffering also caters for the often neglected observation that all living things have defence mechanisms against threats to their survival;³¹⁶ this applies to humans and plants as well as to bacteria and other life forms – it is a simple reflection of ancient observations that cycles of life demand that one species consumes another. I find it curious that modern ecological concern often neglects this 'red in tooth and claw' definition of nature.³¹⁷

In ethical terms, I find the most convincing argument against excessive meat consumption to be the extreme inefficiency of luxury products such as grain-fed beef. Ruminants, which are evolutionarily adapted to consume fibrous forage rather than concentrated nutrient sources, may be said to potentially remove food from hungry humans when fed grain. The argument may not have been valid while grain feeding of ruminants was restricted to Western cultures that exported surplus grain. But the explosion of the Asian middle class demand for such products has stimulated grain feeding to ruminants in Asia – and this is precisely where food insecurity is highest. Market demand will always bring the luxury product to the affluent consumer, and beggar the poor and marginal urbanite in this new world order. That is a more significant ethical dilemma than, for example, environmental rationalizations of vegetarianism.

The argument for environmental vegetarianism, in fact often veganism, is based on observations that industrial animal industries pollute and rely on non-renewable resources, which impacts negatively through climate change, air pollution, land degradation, deforestation, and biodiversity decline. Livestock is said to contribute up to 20-30 percent³¹⁸ of greenhouse gas emissions expressed as 100-year CO₂ equivalents.³¹⁹ Fueled by emotive television advertisements, this argument apparently convinces some persons to forgo meat in the interests of ‘saving the planet’, which as explained elsewhere is often a proxy for lost beliefs that offer immortality.³²⁰ The drift in animal product consumption is significant, but in fact the following Figure³²¹ indicates a greater global need for increased grain production.



Supported by arguments of overgrazing, feed-grain production and future global food demand,³²² it is relatively easy to conclude that ‘the livestock sector emerges as one of the top two or three most significant contributors to the most serious environmental

problems, at every scale from local to global'.³²³ The essence of such comparisons is the calculation that up to six times the resources are needed to feed a Westerner than someone following a traditional diet in a developing nation, who it is assumed will emulate the Western diet as soon as possible.³²⁴ I am not convinced by these arguments.

While I am an advocate of grass-fed ruminant meat instead of grain-fed, this is a matter of logical use of otherwise unusable lands. But clearly the numbers of pig and poultry products consumed will require crops since feeding waste products will be insufficient, and human health concerns will always trump environmental principles. Rather than focus on partial analyses, we do better to acknowledge that the total food system relies on fossil energy, as does heating, cooling, cooking and transportation – and this is unlikely to change through individual action. Similarly, livestock are essential components of the biological cycle, allowing nutrient flows to accelerate. Of course, such acceleration of recycling alarms some who prefer a supposed golden age of slower turnover – presumably pining for a return to the ice ages. All such fancies ignore the fact that the driver of these matters is human numbers. The important point is that the system is more complex than can be governed by pedantic ethical rules.

Ethical dilemmas for vegetarians are further highlighted by technological developments such as discussed in another essay herein that refers in passing to the production of synthetic meat products. One meat-protein equivalent product that can substitute nutritionally for the benefits most usually and most readily obtained from natural meat,³²⁵ and not based on soy or other vegetable products is the tissue engineered *in vitro* meat pioneered by NASA as a possible food source for space travelers.³²⁶ It has since developed into ongoing research programs in Europe to 'grow' meat in laboratories.³²⁷ Based on cultivating muscle cells, initial work has used turkey, goldfish and lamb muscle cells in experimental products that attempt to

mimic existing meat types such as fish fillets, sausages and hamburgers. A recent hamburger synthesized from 'organic cow' muscle cells by Maastricht physiologist Mark Post has apparently attracted funding from a Google founder in its search for the celebrity and cash needed to advance idea these days.³²⁸ This desire to substitute for existing meat products coupled with very high production costs seems an essential phase for novelty's sake, but its long-term benefit is probably as a cheap bulk food for the poor.

Such meat products are not presently suited to bulk production of nutritional substitutes for the poor, although that eventuality will introduce new dilemmas for those with fixed ethical views on such matters.³²⁹ The synthetic process appeals to some animal-rights groups because there is no animal involvement beyond a few initial cells. The subsequent self-culturing process could probably also be applied for milk and egg products, all of which could be enhanced with other beneficial nutrients. Environmental groups also observe that it would reduce land use and greenhouse gases by substituting for conventional livestock production systems. However, statements that 'cultured meat could potentially be produced with up to 96% lower greenhouse gas emissions, 45% less energy, 99% lower land use, and 96% lower water use than conventional meat,'³³⁰ are at best speculative.

Just as the ethical and some religious justifications for vegetarianism rely on somewhat arbitrary definitions of sentience, so synthetic meat would pose a challenge since its origin is animal cells and their artificial reproduction presumable renders the product animal flesh. I assume that cells are not considered sentient and that perhaps the donor animal could go on to live a good life, but I expect that committed vegetarians would still harbour qualms about the product. And therein lies the difficulty of discussing a subject based in belief as Freud presciently observed in earlier days of science ... 'my illusions are not unalterable, as are those of religion [belief], they lack that

manic character' and 'science is not an illusion. What would be an illusion would be to think we might obtain elsewhere that which science cannot give us'.³³¹

An illustration of the illusion that vegetarianism may be justified on ethical grounds is the frequency with which the subject of 'speciesism' arises in relation to modern Western vegetarianism. In that conception, hierarchical values assigned to different animals with humans at the top such as in Biblical references,³³² are considered to be a form of immoral prejudice like racism. The idea goes beyond the protection of useful animals that dates at least to Aristotle³³³ and in fact is barely four decades old, having originated with a modern tractarian movement at Oxford that was concerned with the use of animals in research. They argued that if there is no biological difference between animals including humans then there should be no moral differences.³³⁴ As a philosophical field, speciesism is mired in unsavoury impracticalities such as comparisons about children, sub-normal adults, mammals, invertebrates, unnecessary comments on the Holocaust^{335,336} and extend to ascribing rights to plants and stones.³³⁷ I too see inter-relatedness in nature, but to link this to rights seems deluded.

All this may suggest that I do not consider that vegetarianism can be anything beyond an unreasoned belief – but that is not the case. I see two significant means by which vegetarianism has demonstrable benefits; the first relates to its conscious use in personal spiritual development, and the second is in influencing the now sophisticated science of animal welfare, as discussed in the following section. As a spiritual development practice, vegetarianism maintained at a conscious level rather than as a habit may serve to increase an individual's compassion toward other beings, and thus to an awareness of the intricate nature of interrelatedness. This is the basis of some Buddhist teachings, though it must be noted that Buddhism is by no means a vegetarian religion like Jainism. Mentioning this almost in passing is not intended to reflect its marginality in any way

except in terms of the probably small numbers of persons who can benefit from such spiritual practices above other approaches, which it seems to me is a small proportion of vegetarians. For the rest of society, including those pursuing their own spiritual development as well, social action seems much more common, and in my view the most compassionate approach is to seek the improved welfare of animals affected by humans. Compassion here means informed action rather than blind pity. Human action is thus based on either projection and emotion or the disciplined reflection of science. In either case, humans are taking the superior position of deciding what is best for animals, and so the notions of complete equality fail. And when a well-meaning speciesist is faced with feeding a starving child or an animal, his ethics are challenged, but I would hope that he might look after the welfare of the human first. Such are the problems that arise from unaware categorization. To me, these are reasons to further elevate the field of animal welfare as a scientific field of study.

Animal Welfare

The public's awareness of animal welfare may be characterized as a distinct preference not to cause unnecessary suffering, which is effectively the social licence in which animal production operates. To take an example, a large animal production business with which I am associated has adopted an ethic to exceed industry animal welfare standards and to adopt a system based loosely on the health and safety regulations related to employees. This does not mean that animal industries are otherwise unconcerned about the welfare of animals in their care; in fact it is my experience those who raise animals are usually more aware of their charges' natures and moods than are random observers who typically bring anthropocentric notions to animal behaviour. To me, it is unacceptable to assume that domestic animals bred for countless generations to suit human-managed situations should react the same way as wild animals, or that humans should determine subjectively what constitutes suffering

or states of contentment in animals. Livestock are neither wild animals nor pets – having been bred to suit human needs, responsibility for their welfare is part of livestock raising within the environment to which they are suited.

The field of animal welfare has developed from detailed scientific and observational knowledge of animal behaviour and production, both pillars of the demanding field of animal science. It is not an accumulation of popular opinion or even custom, although it is easily used politically to such effect. Basic parameters of welfare have thus built on observations of physiology, longevity, reproductive rates and behaviour; like modern medical science, it operates within the bio-psycho-socio environment of the concerned animal. Physiological measures, as with humans, are used as indicators of psychological as well as physical stress, and the different social nature of different species and groups is included in determining their welfare.

Extending throughout the lifetime of an animal, slaughter procedures also feature, which introduces a particularly difficult area for societies that have invested much effort in separating themselves from the transformation of animals into meat. In my opinion, this is a weakness in a society as well as a weakness in some aspirations to continuously improve animal welfare. If the ultimate death of animals bred for human purposes were addressed by society at large, other popular welfare concerns might be better resolved, including the use of animals in medical research. If one understands the cycles of life that humans orient to their own survival, debates that pit animal welfare against animal rights³³⁸ would not lead to the uncaring conclusion that animal welfare approaches infringe animal rights.³³⁹ In fact the opposite is true.

The rise in emotive public interest in animal welfare may also reflect differences in worldviews of animals between cultures. Indian traditions continuing today in the forms of Hinduism, Buddhism and especially Jainism enshrine animal welfare in

their core beliefs, with those that allow slaughter insisting that it be conducted with respect. In contrast, Western views of animals have tended to see them as property, and with rising wealth and comfort accompanied by a decline in traditional values, animal welfare arises as a concern in a manner similar to environmentalism.³⁴⁰ Some attribute this to the Abrahamic pastoral origins of Christianity, but such assertions omit consideration of the rules protecting animals within Judaism and Islam where an animal to be killed should be made comfortable with clean water and fresh grass before being calmed with ritual incantation.

Seen from this perspective, the emergence of organizations and legislation for the protection from cruelty to animals in the West may be seen as a belated catching-up with other cultures. I am aware that this interpretation does not sit well with current convention, which prefers to see care for animals³⁴¹ as building on the movements for abolition of slavery and rights for women and for some persons even being seen as akin to rights for nature.³⁴² But in fact the explanations are not mutually exclusive. In any case, 'the five freedoms' used today to convey the principle comprise freedom: from thirst and hunger; from discomfort; from pain and disease; from fear and distress, and to express normal behavior. This is practical and responsible. But well-meant yet uninformed mimicking of the basic needs for humans as expressed across the ages³⁴³ in a rising Western awareness inevitably leads to such proposals to the UN for a Universal Declaration on Animal Welfare,³⁴⁴ to the sometime bemusement of sophisticated non-Western members.

Apart from the philosophical and emotional origins of the subject in the West, animal welfare has become especially relevant with the advance of technologies that can easily offend welfare principles. Such offence is usually unwitting as it occurs incrementally with ever-newer tools being developed in response to affluent societies' demands for cheaper and safer food products. Thus intensive animal industries and even some

extensive pastoral practices are called into question. There is a genuine benefit in determining the comfort of an animal under high-density conditions and during such processes as debeaking, dehorning and mulesing, and in determining if they are indeed generally necessary. But this does not logically lead to condemning kosher or halal codes of slaughter; in fact an educated appreciation of those codes would possibly reveal them as advances in animal welfare that long predated European sensitivities. The scientific approach to assessing suffering shares some observational characteristics with these ancient discoveries, although it must be admitted that it is difficult to conduct debates based on science and logic with less informed yet well-meaning public sentiments.

It is at this point that I should declare an interest. I have been engaged in animal production research and development in various countries for over 40 years. This experience has made me sensitive to the realities of modern societies' demands and to means of improving the wellbeing of animals. In addition, I have had association with Thailand and its Buddhism for nearly as long, and have read and practiced to the extent that I remain impressed by the ancient wisdom and personal spiritual cultivation associated with kind treatment of living beings. These combined experiences have led me to consider animal welfare as the most effective and reasonable approach to continuous enhancement of the human-animal interrelationship. From this background, I was in the 1990s, the inaugural chair of the Animal Welfare Research Centre, a combined activity of the Victorian State government, Melbourne and Monash universities and subsequently various international players. More recently I have been instrumental in creating an Independent Animal Welfare Advisory Group of international leaders within a major sheep producing company in Australia. I mention these examples to illustrate that my reflections have a basis in reality, which has led me to a surprising conclusion as mentioned in the final section of this essay.

If, as I fully expect, the global economic balance continues to shift toward Asia, animal products will accelerate in demand as the newly affluent seek to provide improved nourishment for their children and to adopt high-status diets. This is where demand for animal products arises, not domestic Western markets, and certainly not in a low population country like Australia. Export of animal products from nations such as Australia offer a means to improve the welfare of all animals. It would be more productive than the nation seeking to close off animal products to those with rising purchasing power for that would only encourage other suppliers with less comparative advantage, which would require shortcuts in welfare and production inputs to meet market demand. And to return to the earlier theme, I would say that attention to welfare does much more for animal wellbeing than does the promotion of vegetarianism.

Answering the Question

As the foregoing explains, I do not consider the question as framed – ‘how would you categorize yourself’ – to be a real question, although the assumptions it contains deserve a response. I hope I have explained that Buddhism is much more than a set of rules and that I do not see vegetarianism as part of it – even compassion for animals is not separate from compassion in general. Thus I cannot label myself in the terms of your question. But to pay respect to its other aspects I have discussed diverse views and facts.

This essay has roamed over wide ground, canvassing elements raised in the question to arrive at what might be a different paraphrase of the question’s essence. From a starting point of considering the pitfalls of categorization in social contexts, it acknowledges that we may in fact contribute to this by seeking to label ourselves. These processes may be part of the natural evolution that created our brains to instinctively simplify the myriad conflicting sensory inputs and as a means of survival by

associating ourselves with a group. In this context we might say that an aspect of wisdom is to be watchful of instinctual behaviour that may not conduce to our wellbeing. And, as discussed earlier, we may use categorizations to mask fears, such as when we categorize death and seek to separate ourselves from it in contrast to the wise who acknowledge it as part of the great cycle of life. And it is these two themes that allowed the question's complexity to be simplified to a consideration of vegetarianism in terms of a categorical belief and of death or killing.

With the origins of vegetarianism buried in conjecture about human relations with animals in hunting forming the basis of religious rites and its social evolution into ritual killing, it seems a short step to labeling meat eating as unsavoury. A short step in the sense that it has been recent so far as we know, occurring possibly in the Axial Age³⁴⁵ to which most major religions trace their beginnings. And as the cycle of eating and being eaten was broken by priests adopting 'pure' rituals to intervene between humans and gods, so modern Western vegetarianism can be seen as a reflection of the individualistic notion that we are each equal to the priests if not the gods. Thus we have ethical beliefs for vegetarianism based on environmental, health, global food supply and now climate arguments. Of these, as I have noted, I find merit in the ancient Indian spiritual traditions that follow life practices with awareness to effect a psychological breakthrough in our relationship with all other things. At a social level, concern for animal welfare offers a means of gently increasing such awareness while improving the life of animals without the necessity to suspend rational thought. And this allows us to objectively consider the nature of the world that we have inherited and continue to demand our comforts from today.

Today's animal industries have developed, one could almost say evolved, under the hand of humans such that most domestic animals could not comfortably survive without humans. And breeding an animal for maximum productive output that

requires it to be uncomfortable for most of its short life is a welfare offence in my opinion. But even this is made grey because our animal breeding over millennia has led to altered mental capacities as part of domestication. Perhaps the bovine in Douglas Adam's 'Restaurant at the End of the Universe' that takes pleasure in recommending parts of its delicious flesh to diners is alerting us to this aspect of domestication.³⁴⁶ This sustained orientation of animals to our use through applied genetics brings a responsibility to care for these animals. That alone should be justification for animal welfare principles to be applied generally. It is apparently the motivation of those traditions that include detailed social laws, which alas does not seem to include the West's adopted tradition. Farm activities usually include good animal care, primarily because those who choose to raise animals today usually like them, and so in those cases animal and human welfare coincide. However, where intensive production systems separate workers from relationships with animals there is a need for regulation based on sound animal welfare principles. This should provide a clue to the source of the issues that arise in the form of ideologies born of urban affluence – for such ideas come from a much larger and even more alienated part of society.

The separation of consumers from their food and in this case, the animals that become meat, can foster the security of ignorance for the majority. Who sees inside a slaughterhouse these days? It similarly fosters impractical ideas of vegetarianism on the basis of animal rights with little awareness of the global vacuum in which such action takes place. Separation from food animals seems inevitable but I cannot see why awareness should also be separated, which leads me to what I introduced earlier as a surprising conclusion – surprising to urbanites who have not had contact with the meat when it was alive.

My conclusion is that if we are to eat meat, we must be prepared to raise and kill the animal ourselves. As this is obviously impractical it is not supposed to be taken literally, but as a means

of being aware of our actions and intentions. Raising and killing an animal with awareness would, in my view, engender a more realistic respect for the animal and its meat than esoteric recommendations to abstain. I do not even go the next step of suggesting that one should seek absolution or penance by only buying from sources that follow ‘approved’ procedures by sporting a manifesto.³⁴⁷ It is one’s own motivation that counts, and this may well lead some toward vegetarianism. That would be as valid a path to a meatless diet as one that is prescribed for good health reasons, which is seldom the case.

There is little doubt that excessive meat consumption is not good for one’s health just as there is also little doubt that excess of most foods can cause problems. The balance is the key, which to me is a diet with some meat. This seems more reliably healthy than a vegan diet, and with a similar mixture of logic and observation, it seems to me that meat and milk from grass-fed ruminants provides the best source of land-based animal products. It also happens to complement rather than compete with agriculture, which cannot be said of most other forms of animal production. Arguments to the contrary rely on examples of overgrazing and incompletely understood extrapolations of greenhouse gas emissions, and omit global comparisons with other meat industries. And like it or not, humans will demand meat for as long as it is perceived as a luxury product. I therefore see our responsibility to animals as respecting their role in our lives including as food, but not to the exclusion of a greater responsibility to our fellow humans. This is why I would like to remain beyond such categorizations of Buddhism or vegetarianism.

Chapter 8

Let me be frank! Agricultural science has gained its strength from natural and social sciences being integrated in applied situations. In maintaining its integrity, it has constantly pruned branches that ceased to be fruitful, such as agricultural extension with the advent of communication technologies. Such fields may have been refuges for those who sink in the mainstream. Isn't the popularity of 'traditional wisdom' and ancient techniques just another haven from real science, and if so, why do you support it and the study of agricultural history?

Traditional wisdom and ancient agricultural techniques, far from being a 'haven from real science', represent the context essential for a true scientist to conduct his research. That is the basis of the great field of agricultural science that has fed us through these decades of our fastest increase in population. Let me explain how it works through myriad examples in which agricultural history continues to inform agricultural science. And by way of balance, I will consider the woolliness that can follow romantic ascriptions to past societies and practices represented in some modern 'rediscoveries' by zealous Western scientism. First, let me muse on the subject of agricultural history.³⁴⁸

Why Agri-History is Important

Today, we who write are mostly distant from the agricultural life of the past, which peppers many historical perspectives with the pitfalls of value judgments, secularism and a romantic view that has been referred to as 'stubborn enticing otherness'.³⁴⁹ Much of the following uses Indian and Southeast Asian examples rather than the usual Western approach of starting with the fertile crescent of Iraq, leading into ancient Egypt, Greece and thence

Europe. Nevertheless, the same argument may be based on that traditional version of history.

Even though most of history grows out of agriculture it is seldom considered as its centre. Nevertheless, it was agriculture that allowed the settled life that led to civilization, or alternatively³⁵⁰ was enforced on captive populations by overlords seeking military manpower. In either case, it was agriculture's efficiencies in food security that allowed a leisured class to engage in writing and the codification of religions as part of consolidating ethics and power bases. Histories that centre on rulers or states do not seem conscious that they are using a proxy for agricultural history, and so miss much that history offers the present. This alone makes agricultural history important, but so do many other factors.

As a great birthplace of agriculture, India has established the link between the state and food production, culminating at one point in Kautilya's *'Arthashastra'*³⁵¹ with its overt recognition of the role of violence in a kingdom secure in its food base. Yet here too, it is easy to reduce history to empires and miss the bonds between nature, religion and society that invariably emerge with agricultural occupations.

In my own country Australia, awareness of the food production practices of the indigenous population prior to European settlement has begun to instill an understanding of the cultural meaning of landscape and food. While easy to overstate, this seems to offer a means of appreciating the eras over which such landscapes are formed and to recognize that humans have always altered the environment, as continues today in modern agriculture's shaping of the land, its waters and even its air. It also informs the sense of feeling 'at home' in our homelands and our cultural ideals of beauty and aesthetics. In this sense, agriculture is a civilizing influence on the land as it is for society – it brings concepts of ownership, territory and power as well as of identity, nature, terroir and equity. Indian and Pakistani

ownership of and identification with the noble Basmati rice is an example.³⁵² And all of these concepts once came from the reverence of food security as a value underpinning society.

As we have all been shaped by our experiences, so has our social milieu been formed by agriculture. Our aphorisms often reveal agricultural roots, as shown for example, in a book on Thai folklore.³⁵³ Our festivals vary across regions according to agricultural calendars – and we continue to hold onto these festivals, even when a foreign religion supplants traditional beliefs. So it is well said that agricultural history is more than the history of agriculture, it is the source of history itself although this is often either assumed or neglected in various presentations of history, be they religiously or evidentially based.

The link of agriculture to religion repeats itself through civilizations, yet the common focus on rulers limits this understanding when contextualizing history. For example, the Hebrew story adopted by Christianity of Moses being found in the marshes of the Nile River³⁵⁴ is commonly considered to have been at the site known archeologically from its Greek name of Tanis. Yet much of its history is related under the name of its ruler and builder Raamses and the architecture of the Egyptian pharaohs, and even then the site is overshadowed by the better-preserved and more popular ruins in drier upstream climates. Thus neither the religious nor the architectural stories develop the otherwise obvious agricultural aspects of such a major ruling city being deep in the fertile Nile Delta, and neither dwells on its later demise probably being from siltation and climate change rather than non-historical conquests by the Israelites.³⁵⁵

There are also differences with today's civilized viewpoints, such as time itself. In agricultural contexts time can be elastic – waiting on the rain and when it arrives acting quickly. The difference pervades the many rural-urban divisions of every country today where long codified seasonal festivals may be viewed quite differently in 'the bush' and the city. Historical texts

that relate Asian battles as taking place between growing seasons too easily portray this as a quaint custom. Thus they can miss the deeper knowledge that war and expansion of a realm waited on the agricultural calendar, which was the essence of the religions, the oracles and auspicious days for battles to begin. It waited on agriculture because a secure food supply was the common need of both ordinary people and armies. And the objective of war was often manpower for rice production.³⁵⁶

While such arguments are sometimes reduced to romantic ideas of synchronicity, they are facts that deserve proper consideration through the overwhelming majority of human history. It made sense for the rhythm of life to be determined by nature's cycles of food production. And this seems consistent with the views of those who note that the existential angst that characterizes modern society appears to be correlated with alienation from nature, seasonal foods and ritualized traditions.³⁵⁷ Agri-history is part of unraveling this aspect of our natures also.

Agricultural Urbanization

With agriculture providing the surplus that led to urbanization at least 9,500 years ago in South Asia and significant cities appearing about 5,000 years ago,³⁵⁸ worldviews must have begun to diverge between sedentary and nomadic peoples. Confrontations between farmers and pastoralists passed down in religious stories and customs indicate differences, albeit written by the victors – the agricultural cities. Power structures to defend cities will have required rituals and beliefs, which may well have been adapted from a past nomadic lifestyle, maybe even pre-Vedic hymns and rituals. Thus some interaction may have accompanied periodic conflict when farming sporadically took over pastoral lands. As pastoralists opened new well-watered grasslands farmers followed and thus also followed trade, wealth, sophistication in religions and the literature from which we glean glimpses of the past.

Rather than springing into being as fully formed political entities, cities will have followed various models of governance, with trade as the connecting element. Technology no doubt followed trade with agriculture as its major focus since it was the major business of the populace until cities became more sophisticated. Thus innovations in the use of labour, metal tools, irrigation, nurseries, and animal and plant breeding affected farming technologies and encouraged a new group of suppliers for ores and skills as agriculture expanded. In this milieu, new cities based on trade that could purchase food must have assumed an importance perhaps in some cases greater than agricultural cities. Such cities on trade routes were even more vulnerable to food insecurity as a siege could threaten all wealth, and so food reserves became an integral part of urban management. Without the ability to feed a city, governance was not possible.

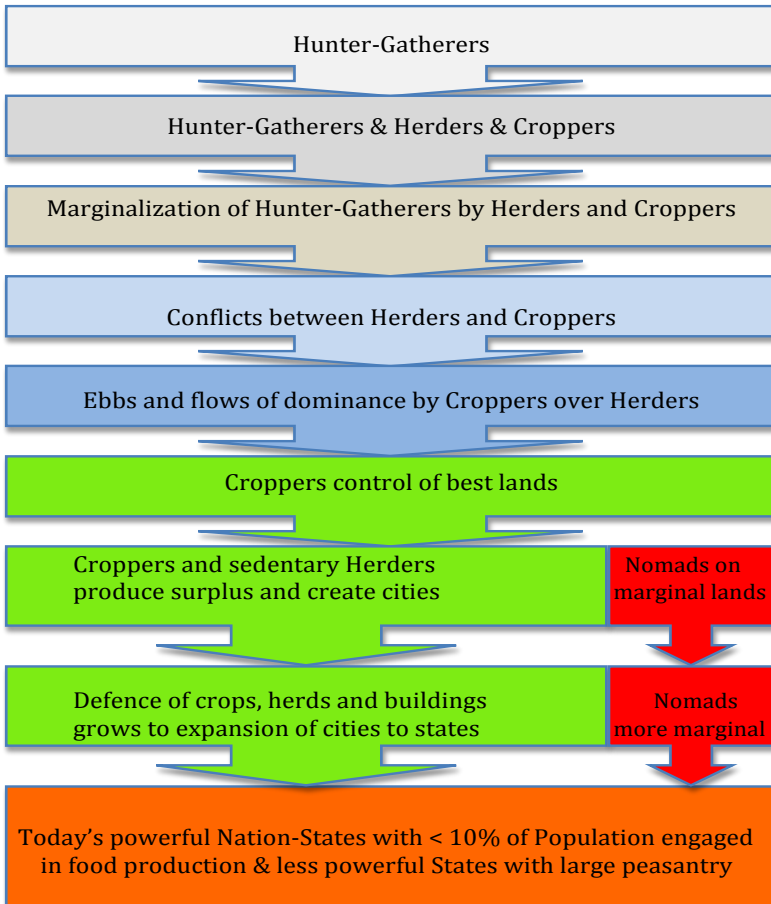
Such Indianized civilization expanded along trade routes in what is now Thailand, Malaysia and Indonesia and also extended to Cambodia through theocratic political systems that were to establish the basis for much of Southeast Asia's cultures.³⁵⁹ And with that assumption of Indian manners by local chieftains, attractive technologies were adopted, some of which remain obvious today such as the distinctly different rice harvesting techniques of southern Thailand compared to those practiced in the other more Chinese-influenced regions of that country.³⁶⁰ As the Agri-History Foundation of India publications indicate,³⁶¹ much of the information about these developments, particularly in India, is to be found in ancient texts – sometimes referred to as religious texts. So it is not only the Vedic scriptures that point to the indissoluble link of agriculture to religion, but also the less ancient Buddhist and Jain texts that indicate the associations of trade routes, cities and technologies.

We now understand the expansion of agriculture and hence agricultural cities as being isolated harbours in a sea of pastoralists more than a wave progressively washing over a

'primitive' pastoralism two to three millennia ago. Harbours – in both the sense of protection from mobile pastoral aggressors, and as trade entrepôts often on coasts and rivers. Eventually, possibly in the Gupta era, as agriculture began to encroach on pastoral lands more consistently, it must have been under a replicable agrarian governance system that allowed some autonomy for local chieftains – a model of early colonial expansion. Alliances would have been cemented through common rituals and religions, giving rise to some shared literature among the increasingly diverse elite. Linking religion and power allowed economic progress as rulers assumed divine status and spiritual rewards became a means of payment, even into later periods such as for the construction of the Angkor Wat complex in Cambodia.³⁶² Meanwhile continuing pastoralists, sometimes marginalized from their preferred lands, possibly remained somewhat unified by their early Vedic rituals, which allowed some degree of interaction with settled farmers who observed similar rituals and this may have reduced potential conflict to ritualistic games.³⁶³

Whatever the basis of farmer-pastoralist interaction, pastoralism continued as the dominant lifestyle into the present millennium. This was common to areas both contiguous with and distant from India, from Central Asia to Mongolia and the Middle East. Agriculture relied on rivers or at least water sources and storages that were easily developed for farming, and such land was far more scarce than dense jungles and uncontrollable floodplains, and even the arid-lands where pastoralism evolved an ecologically-balanced system that lasted into the 20th century. But nestled against this vast pastoral sea was the excessively well-watered tropical landscape of Southeast Asia, which was largely useless to pastoralists in its native state of floodplains, swamps, dense forests and carnivorous predators. These areas awaited further innovations before they could be tamed, eventually leading to the major kingdoms of mainland Southeast Asia.

A fairly conventional view of history allows us to see this social evolution illustratively in the following Figure, which shows the rise of agriculture (croppers) and its incipient domination over time to lead to today's two major forms of agriculture – industrial agriculture and ‘traditional’ peasant agriculture, roughly split between wealthy and poorer nations respectively.



From even such a simplistic overview of agricultural history it becomes clear that the agricultural cities gave rise to cultures

adjacent to dry regions where water was reliable or with seasonal rains. This represents the regions where millets and wheat were domesticated – adjacent to pastoralists’ domains. Rice, on the other hand, was related to flooded environments, and as a peculiarly Asian crop it is of interest to speculate on cultural differences between rice cultures and those that developed from wheat for example. Such is another lesson from agricultural history; yet another relates to war.

War and Agriculture

Forestalling conflict allowed agriculture to expand across the millennia, and so sophisticated governance and diplomacy arrangements evolved, again using common rituals for negotiations. In the agricultural cities housing mixed populations – of merchants, farmers, visiting pastoralists, pilgrims and religious leaders – stability arose along with agreement to a ‘rule of law’. In this context, farming alone did not underwrite food security for non-agricultural vocations, as it was subject to droughts, pestilence, floods and attacks from other expansionist states or pastoralists. Thus food security became a primary occupation of governance, built on the best possible agricultural base linked to both war and religion. War damaged food production while religion promised some protection from the gods through rituals. With food being the first priority of governance, seasonal military activity enlisted farmers for the dry season when little agricultural work was needed, and when they could well be motivated by earlier crop losses from conflict or weather. Nevertheless, the modern image of sedentary agriculture vulnerable to repeated attack was probably less common to this mobile agricultural population until investment in infrastructure made one piece of fertile land near water more valuable than another.

The phenomenon is also suggested in the once sustainable *muang fai* irrigation system of the traditional Tai ethnic group,

which was based on annual repair or rebuilding of simple porous wooden weirs across small swift flowing streams.³⁶⁴ Over time, weirs became more sophisticated and hence more worth defending, which in turn led to the organization of governance being based on watersheds since all on one river shared a common need for defence as well as equitable water allocation. The governance system developed with minor rulers of a river valley being consolidated into larger catchments with larger rulers who could command countless paddy fields³⁶⁵ – such as in King Mengrai’s northern Thai kingdom of *Lanna* (million rice fields). An echo of the same folk expectation may be found in the Indianized names of the Thai Kings who in adopting the title *Rama*, that reincarnation of Vishnu, acquire among other names ‘Lord of the Waters’.

So power developed around land and water with religious and other symbols protecting the centrality of farming and immovable infrastructure until the modern era. One anthropologist has described the arrival of the Western ideas and consequent demise of the integrated religious era in the words ‘The Spirits Aren’t So Powerful Anymore’.³⁶⁶ However, through the long era before today, defence of both agricultural cities and villages was necessary from marauding pastoralists, nomads, forest dwellers and wildlife from whom new agricultural land was constantly being annexed – and the farmers knew that such lands were also occupied by spirits that had to be appeased. So it seems that farming communities while adopting the rites of the great religions also maintained the life of the gods and spirits of the forest, trees, rivers and places giving rise to the continuing folk-interpretations of, for example, rural Buddhism in Cambodia, Lao, Myanmar and Thailand. As civilization arose with farming and required a strong power base, we can see the role of dharma in its early Hindu iterations of duty to the god-king as distinct from Buddhistic interpretations of the word ‘dharma’ as fitting in with natural law – although some may see the two reconciled in Arjuna’s story.³⁶⁷

Once agriculture has become established with its stratified society and power base, it is open to an acceleration of technological innovation and labour efficiencies. Thus 'walled towns were more common, and long-distance trade was more visible in dynastic core settlements where military activity was a permanent adjunct to farming'.³⁶⁸ But this situation arose after a long ebb and flow of power between pastoralists and farmers, which together with civilization, religion and writing, is a defining role of agriculture that still continues towards its apparent inevitable conclusion in some parts of the world today. Thus agricultural history teaches that if one accepts the notion that agriculture underpinned the creation of civilization, the major religions and writing, one must also accept that it was a cause of expansionist militarism.

With troops protecting farmers, agriculture expanded into more remote areas and incorporated new tribes and peoples into the supporting roles of the new society, such as toolmakers, domesticated-animal herders, traders, forest-product gatherers integrated into civilized society, builders, priests and militia. Independent communities settled nearby to benefit from the protection and trade opportunities of agricultural cities and so by early in the current millennium across the Subcontinent the landscape must have contained thousands of agriculture-based settlements linked by travelling traders and separated by forests, deserts or other unsettled lands.

Such a scenario seems to differ from more centralized power bases in European and Chinese agricultural history. As such it provides a clearer view of the central role of agriculture such as in the ancient Tamil poem – 'Food is first for all living things, made of food, and because food is but soil and water mingled together, those who bring water into fields create living beings and life in this world. Even kings with vast domains strive in vain, when their land is dry and fields sown with seeds look only to the sky for rain. So Pandya king who makes dreadful war, do not mistake my words: quickly expand watery places that are built to

bring streams to your land! For those who control water reap rewards and those who fail cannot endure.³⁶⁹ One might speculate that the difference may well be that military expansion under a centralized power was planned from a base of agricultural surplus and well-stored grains and that takeover targets were other agricultural settlements, whereas expansion under the Subcontinent model of chiefs was to develop new agricultural lands as the first priority.

Expansionist farmers of Asia were not necessarily the naïve folk imagined in Western projections of their *paysan*, but in some cases were farmer-warriors. Using their assets accumulated in one settlement, they attacked others in loose companies of other potential beneficiaries including merchants. Records in religious writings indicate that 'conquest and trade went hand-in-hand with religious endowments and investments in farming.'³⁷⁰ Thus we have the aggressive agriculturist; fighting as part of farming. Warring was part of the agricultural calendar, and those that became superior were fighters and farmers. Conquests continued and centres expanded their influence such that by the dawn of the European colonial period, cities such as Vijayanagar (Victory City) were suggested as surpassing Paris in their edifices, festivals and rights to tribute.³⁷¹

Today, agriculture is the dominant practice. So integrated is it with power and so successful has it been in underwriting that power-base that it is often forgotten. Thus we have some food-insecure nations paying inadequate attention to the need to secure the food necessary to maintain their licence to govern. At the same time across Asia, some tribal groups in lightly populated forests and jungles are still sustained by albeit reduced wildlife and vegetable products that they trade to supplement their shifting cultivation (jhum, swidden agriculture, slash-and-burn etc), and in other areas some pastoralists control water sources for their animals. Despite well-meaning preservation projects, these areas remain today's frontier for

agricultural expansion. This is one more lesson of agricultural history; another is the link of agriculture to the sacred.

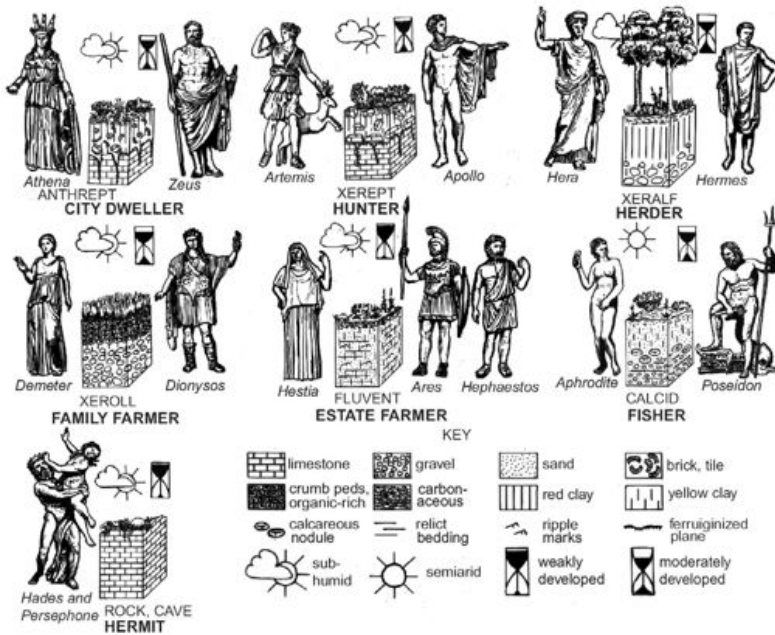
The Sanctity of the Soil

To bring the discussion a little closer to today, we may consider the continuation of rituals, such as at Easter in Christian societies, where a mixture of ritual sacrifice and fertility symbols such as eggs, chicks and rabbits are invoked as a distant echo of their ancient springtime role to coax the soil to produce food. This serves as a reminder that agricultural history and religions are interlinked from the period when human life was integrated with nature. But the association goes much further, and gives rise to the title of this section, influenced by the Zoroastrianism that arose in ancient Persia and influenced most subsequent religions – the sanctity of the soil.³⁷²

Soil samples taken from the sites of ancient Greek temples suggest an association between soil type and a temple's principle deity.³⁷³ This may sound conjectural, but is explicable when we recall that throughout agricultural history different agricultural and herding lifestyles were associated with different deities. The collection of such deities to reside at Mount Olympus was perhaps more a political advance in uniting disparate groups and their deities than an advance in spiritual understanding.

Detailed consideration of 84 temples sites of Classical (480-338 BCE) Greece, found 'a consistent correlation of soil type with particular deities'. Temples to Athena and Zeus on soils of citadels (Anthrept) contrast with those of Artemis and Apollo on rocky wilderness soils (Orthent, Xerept). Hera and Hermes were worshipped on clayey soils (Xeralfs) suited to cattle grazing. Sanctuaries of Demeter and Dionysos are on fertile soils (Xerolls) suitable for mixed farming, whereas alluvial soils (Fluvents) of large farming estates were sacred to Hestia, Ares and Hephaestos. Temples of Aphrodite and Poseidon are on arid soils

(Calcidis) near fishing harbours, while caves were sacred to Persephone and Hades.³⁷⁴ This is presented in the following Figure³⁷⁵ with images of Greek deities and their temples' associations with climate (sun and cloud), degree of soil development (hourglass) and soil taxonomy.



Different soils suit different agricultural activities and documentation and rituals associated with each deity tell of the relationship of different agriculturists with their soil. Not so distant in time are the religions that underpin Western and Middle Eastern cultures – the Abrahamic religions. Originating from nomadic lifestyles, these religions tended to single deities that oversee ‘their people’ – other tribes are not their ‘brothers’ or ‘neighbours’ of the modern Christian teachings. It is instructive that the first mention of a city in these Abrahamic

stories is that erected by the outcast Cain, the crop cultivator who murdered his nomadic brother, Abel.³⁷⁶

The Cain and Abel myth is not just about a battle for the land *per se* but a contest for fertile land with water. Nomads – from the Greek ‘nomas’ refers to searching for good pasture – preferred such lands as much as croppers. And both recognized the value of good soil. In dominating most situations, groups of croppers in settlements with military might gained more of the fertile soils and expanded cities, producing today’s megapoli that cover much of the world’s most productive agricultural land. Apart from informing us of such economic development linkages, agricultural history also explains why soil was treated as sacred – it produced the essential element of survival, food.

The deities of the nomads who preceded and co-existed with the croppers were assumed by the early croppers, and so rituals and beliefs about the soil were more common than might be claimed from interpretations that fail to acknowledge agricultural history. This has led one commentator to state that ‘the dominant beliefs of the past 2000 years are the result of an ancient migration from soils such as xerepts and xeralfs to soils such as fluvents and rendolls’.³⁷⁷

And so across those Classical ages, rituals such as reverential pouring of blood onto soil morphed into pouring of wine in ancient Greek religious practice.³⁷⁸ Homer eulogized that the ‘divine soil [χθω´ ν δ´ια] made fresh-sprung grass to grow, and dewy lotus, crocus and hyacinth’.³⁷⁹ Both Sophocles³⁸⁰ and Apollonius of Rhodes³⁸¹ referred to ‘sacred soil’ [‘ιερὸν πε´δον] and Plato introduced the idea that the quality of soil influences the healthiness of the food it produces and hence affects our ‘soul’.³⁸² These ideas sound more like those of Asian religions than the progenitors of Western belief systems. It is therefore instructive to consider the relationship between traditional and modern agriculture, and some of the belief-based forms of agriculture that have emerged in the West in response to its ‘lack

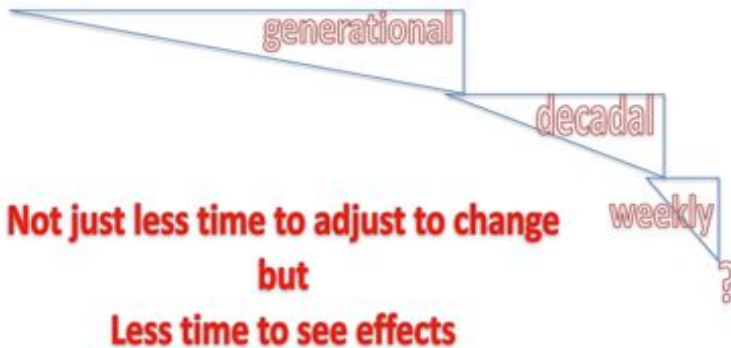
of soul'. One such form of Western agriculture promulgated by Steiner³⁸³ in fact engages in rituals that make soil sacred and thus in this Platonic sense claims to link soil to soul.

Linking Traditional and Modern Knowledge³⁸⁴

Sensitive Western observers often claim that Asian religions with their animistic inclusions tend more to environmental and animal welfare matters than routine Western approaches. Perhaps this is related to Asian cultures not artificially separating humans from other life forms, which is said to allow those societies to make more objective social decisions on such subjects as abortion and infanticide, as noted in a Yoko Civilization conference.³⁸⁵ If that is true, it might also apply to those arguments about genetic manipulation in the West that have become mired in assumptions of stewardship. Without such a cultural constraint, as Fukuyama³⁸⁶ argues in the case of abortion, the action can be considered in terms of impact on a society or individuals. A bridge already developing between traditional Eastern and modern Western views can inform many such considerations, including, as discussed later, one peculiarly Western ideal called Permaculture. But there is another factor to consider first, for in cases like genetic manipulation we are faced with such rapid technological change that it exceeds our ability to consider moral and social values.

By speeding up the process, we cannot expect to know the consequences of immediately applied novelties that are in any case rapidly replaced with even newer products. What once changed over a generation has shortened to take only a decade, and now a week, as indicated in the following Figure. So with this understanding, how can we know where an innovation like genetic modification will lead us? Genetic manipulation of food to increase yields from existing agricultural areas and to adapt food crops to areas previously unsuitable for agriculture is promoted as part of the solution to world food needs. But we are

challenged to reflect on the myriad interrelationships thrown up by such a new breeding technology. We know how to manage many of these issues as they are also products of long extant breeding technologies, such as aggressive weeds, narrowing gene pools and reduced byproduct output. Nevertheless, since the time for reacting is reduced, it commits us to even more research and technology.



Realistically, we must accept that the world will need more food and that such technologies reflect the way the world is going. Megacities, population, trade exploitation, absurdly cheap supermarket prices, and uneven application of science are all realities, and all should be open to objective consideration by wise persons. But more commonly, the subject is fraught with opinion, misinformation and outdated knowledge, and exacerbated by lobby groups that confuse those charged with alleviating the problems. I find the whole field fueled with misguided passion.

Being misguided, can we expect to bridge the gap between wise and unconsidered agriculture? In another essay, I have implied that we feed both body and spirit by introducing wisdom into agriculture. So it follows that it is wise for fixed views in lobbies and sects to open to each other with full awareness. You may say that this will never happen, but in fact it may be just the way that

the best part of modern agriculture works. If we set aside myopic and political views about ownership of food, genes or chemicals, we see that modern agriculture is constantly changing as science feeds in new knowledge. Just as models, such as those for climate change, are always being improved as new knowledge is provided, so models for agriculture change. At this moment as ever, traditional knowledge of intercropping from Asia and Africa is being integrated into modern agricultural systems. And so are ideas from alternative forms of agriculture, such as treating soil as a living medium rather than an inert substrate. It is not a case of 'either-or' or 'them-versus-us', but of integrating knowledge. It is a sort of middle path, as has evolved in some traditional systems over millennia.

One example of a traditional system is detailed in an earlier book about Thai agriculture concerning the Tai ethnic group.³⁸⁷ The Tai emerged as lowland wet rice growers in China more than a millennium ago, migrating south with their glutinous rice and unique *muang-fai* irrigation technology, which proved sustainable for a millennium. As the migrating Tai merged with the co-existing Mon-Khmer culture, the interaction built an administrative system that could balance human foibles in a complex irrigation system. This was all supported by a blend of animism, Buddhism and good governance that combined traditional ceremonies with rice production. Other traditional Tai value systems included the retention of sacred woodlots as shown in the following Figure.³⁸⁸ These, like spirit worship, seem to have linked practices to an overall worldview in a manner forgotten in modern Western ideologies. Such systems did not arrive fully formed – they evolved in response to problems, trials for solutions and adoption of viable foreign technologies.

The Tai social organization relied on local leaders elected by those in a village and a valley. Their roles included: calculating the amount of water and its allocation to individual farmers; coordinating construction of weirs and canals; coordinating annual repairs required after each wet season; managing

propitiatory and other rituals associated with rice culture, and collecting fees for irrigation system maintenance and associated rituals. The system served Thai agriculture until the twentieth century when it was overtaken in the national Royal Irrigation Department and replaced by modern technologies.



Where other groups copied the old technology they also adopted the religious ceremonies in the same pattern as croppers and nomads, presumably as effective means of maintaining social and psychological wellbeing in the communities. As mentioned earlier, the titles of community leaders related to water management including religious rites still remain in the title of HM The King of Thailand. The contrast with a secular or newly invented belief base in the West for a 'permanent' agriculture is clear; one is based on holistic knowledge passed down for a millennia while the other is based on a partial ecological awareness that some see as a reactionary fashion that aims to compensate for an emptiness in Western life. Yet the two cosmologies could share much more than they do. Linking the two cultures seems the obvious next step, for the benefit of both. In fact we might see such appreciation of Asian traditions as a retrieval of the missing link to the sacredness of soil from ancient Persia and Greece.

Another link is described by Uphoff³⁸⁹ as a means of enhancing management productivity by learning from small farmers and integrative technologies. Far from being an approach that eschews technology or science, it acknowledges the same interrelationship on which agricultural science is based. That is, Phenotype (production of grain, for example) is a function of Genetic and Environmental interactions, that is: $P \approx G + E$, as in the box below. He calls the approach 'agroecologically-informed'. Rather than assuming that one solution suits all cases, genetic potential is captured by creating the best growing environment rather than following fertilizer recipes. This management relies on understanding the ways that crops and animals operate as components of ecosystems, especially in symbiotic relationships. So beginning with the best available genotypes from breeding, while recognizing that further genetic improvement may yet be made, the most efficient transformation of water and nutrients into food is achieved as a basis for continuing improvement. This

is modern agriculture operating with inputs from cultural traditions in agriculture.

In this approach, rice yield increases of 50-100 percent and water use reductions of 25-50 percent have been demonstrated in controlled experiments and a range of other benefits have been measured.³⁹⁰ But no recipe can be offered since this is an approach to working within an environment, not controlling an environment. Numerous other examples are recorded in the literature.³⁹¹ The system is the basis of so-called ‘prescription farming’ whereby each fractal of land has fertilizer applied according to its soil type, history, crop and current needs controlled through a tractor-mounted GPS data bank; the technology exists in modern agriculture, but the incentive to use it is at best variable. Both Uphoff’s and ‘prescription farming’ are examples of bridging the gap between different agricultural *-isms* by wisely learning from the experience of other approaches.



Another example of the approach may be seen in a recent review of Southeast Asian practices, as in the following Diagram.³⁹² This notes that the efficient use of feed resources is the primary

driver of productivity from animals since availability of arable land, water, fossil fuels and fertilizers is continually decreasing. By shifting priorities, increased production of ruminant protein from waste and low-value products is feasible. That research concluded that fixed recipes of technologies are wasteful and often irrelevant and certainly less effective than participatory research-extension-farmer linkages.³⁹³



Some of the priorities for feed resource use that arose from this review included: intensive use of crop residues; integrated ruminant-oil palm systems; use of oil palm by-products; wider technology adoption; systems methodologies; mitigation of climate change impacts on feed; research-extension-farmer linkages; year-round feeding systems, and integrated farming systems. Such strategies define the current changes in those systems.

The holistic approach of traditional systems extends beyond farming to livestock, even when not part of integrated farming

systems. For example, in the case of livestock in Africa, the eloquent title³⁹⁴ – not by food alone³⁹⁵ – evoked the link of traditional values to non-financial essentials in development. In that forum of the assembled African and international scientists, one of three recommendations was for enhanced incorporation of indigenous knowledge.

These are just examples from the hundreds available that illustrate the meeting of ‘modern’ and other forms of agriculture. It is a redefinition of ‘modern’ if you like. Rather than interpret ‘modern’ to mean selfish unconcern for health and the environment as is implied by advocates of many ‘alternative’ agricultures, it may be defined as the ongoing absorption and application of new knowledge from all sources. Seen in this way, technology is part of that knowledge, and ‘modern’ agriculture is more holistic than other forms that exclude new knowledge and experience. But, of course, not all modern agriculture is practiced in this way. The ascription of selfish unconcern to some modern agriculture is valid, but those who act thus do so in all their activities not just food production.

While the above examples illustrate good reasons why traditional agricultural systems and agricultural history should be part of any complete understanding of food production systems, they do not overtly focus on integrating spiritual values. This in itself indicates the Western bias in international development. Yet it is true to say that an holistic approach to food production – indeed to life – is being sought in Western societies through a range of actions from psychotherapy to environmentalism. It often comes as a surprise to lay persons when they realize that such holism is commonly expressed in sensitive scientists’ work. Even more surprising to such non-science educated persons is the observation of the ultimate emptiness of following impulses to reunite with nature according to belief-based dogmas for food production. This may be what you mean in your question about avoiding hard science. To illustrate the point that holism is not defined by belief but by

intelligent and open-minded practice, the following section considers two Western ‘alternative’ agricultures – Permaculture and Steiner Agriculture – as examples of the pitfalls of excluding knowledge that offends one’s beliefs.

Permaculture and Steiner Agriculture

Permaculture³⁹⁶ is a series of practices that seeks permanent agricultural output from mixed production approaches as inspired by Mollison.³⁹⁷ Biodynamic (Steiner) Agriculture,³⁹⁸ which is somewhat similar, is an interpretation of Steiner’s cryptic insights into nature with an added spiritual dimension. They are here discussed from a paper of the Asian Agri-History Foundation.³⁹⁹

Permaculture originated in Australia and has evolved into ideals and practices that aim to be sustainable within multi-species systems deemed to be natural. It is a worthy goal and a useful means of educating a generation in the West that is alienated from nature and its cycles. On the other hand, its practices are not new and offer little of the spiritual integration that many, otherwise similar, traditional Asian approaches have retained. This point is confusing to modern Asian adherents as they are often just as alienated from their own agricultural and cultural roots, especially as a result of recent nation-building projects.

Small Asian farmers offer long experience that is often overlooked by advocates of Permaculture and other alternative approaches. Two reasons may be proffered;

- Western, like other cultures’, predilection to beliefs that hark back to calmer times when man was closer to nature, and
- the cultures of the West emphasizing material ease in place of traditional myths and religion to produce a generation ignorant of its own stories.

Perhaps Steiner's agricultural approach is a fairer example for this part of the discussion because it is based on his spiritual insights. Steiner's premise reflected the thought of Germany of his era, and so assumed that the human race was in decline – in his estimation as a result of eating an unnatural diet produced with the use of inorganic fertilizers. He advocated humus and manure enhanced by ethereal forces to grow fresh fruit, vegetables and meat as a means of revitalizing humans. His disciples interpreted his complex insights into simple practices they called Biodynamic Agriculture, yet even with this mythic belief-base Steiner's ideas are restricted in application, perhaps more so than those of the newcomer Permaculture. Could this be a function of failing to conform to their home cultures, which today acknowledge a global society?

Both Permaculture and Biodynamic Agriculture contain valuable ideas and ideals. Steiner in his *Eight Lectures on Agricultural Science*⁴⁰⁰ presented some remarkable insights and Permaculture has likewise made some in the current generation aware of food production. Some of Steiner's explanations proved erroneous while others proved productive, and in the same way some of Permaculture's outputs are useful, even if its explanations are deficient. At the same time, a craving for a belief above skepticism tends to alienate disciples of both of these alternative agricultures from science.

Science on the other hand is the insatiable knowledge magnet of modern man. Its cultural open-mindedness in agriculture may be seen as having received a fillip from colonialism, which apart from the litany of negatives, allowed a form of cultural interchange between those sensitive enough to appreciate the views of others. In the case of India, Sir Robert Howard⁴⁰¹ – a director of an Indian research institute in the early twentieth century – provides an example that is, incidentally, the opposite of the Orientalism discussed in another essay of this book. Beginning with 'the white man's burden' of developing the colonies, Howard gradually came to appreciate the benefits of

traditional Indian peasant agriculture over industrial approaches to food production. His focus was largely soil based and he contrasted the sustainability of the traditional humus-based agriculture with the decline of civilizations that failed to respect the soil. His belief – that ‘at least half the illnesses of mankind will disappear once our food supplies are raised from fertile soil and consumed in a fresh condition’ – echoes sentiments from Steiner in Europe.

Likewise King,⁴⁰² after considering the directions of industrial agriculture in 1910s found Asia’s traditional systems to be valuable, even if again some of his explanations have since proved erroneous. Whether or not King, Howard and Steiner misunderstood the chemistry of humus or some other detail is irrelevant to today’s discussions; the important point is that all three appreciated the benefits of peasant agriculture. King noted the durability of Chinese and other Asian agriculture, Howard revered the traditional practices of India, while Steiner’s ideas stimulated a more European or Western approach, one legacy of which may be the secular New World version called Permaculture.

As the scientific concept of ecology found a lay language it gained ground in public consciousness and entered the Permaculture lexicon. It has taken such forms as maximizing biomass per unit of land area without chemical fertilizers through mixed-species production. Again these practices move a step closer to those of Asian peasants. Those originating the concept of Permaculture were Australian and as a function of that continent’s relative dryness, oriented it to the perennial issue of water conservation in conjunction with land use.⁴⁰³ By reforming of the landscape, it was claimed that agriculture could be sustained permanently – but its ideas were hardly new and were less developed than those that had been honed over millennia elsewhere. In addition, these environmental modifications were essentially a variation of the same old attitude of extensive control of nature that underpins agriculture from peasant to industrial systems.

While the approach of Permaculture needed no greater justification than recognition of the millennia-old ongoing practices of small farmers in Asia, its intellectual isolation led it to seek credibility as part of Fukuoka's⁴⁰⁴ holistic work. That referencing has been selective and retains a Western emphasis. The continued isolation of second-generation adherents to Permaculture even allowed claims that government manure projects in developing countries were part of the same 'discovery'. But in fact, such practices have always been more common in the world than has industrial agriculture. Yet Permaculture as an output of the West may yet be useful in such situations if it makes integrated thought more credible. For example as noted elsewhere,⁴⁰⁵ the self-sufficiency movement in Thailand attracts mainly lip service and is understood by many as a reaction to fiscal imperatives – because decision-makers in Thailand follow Western norms.

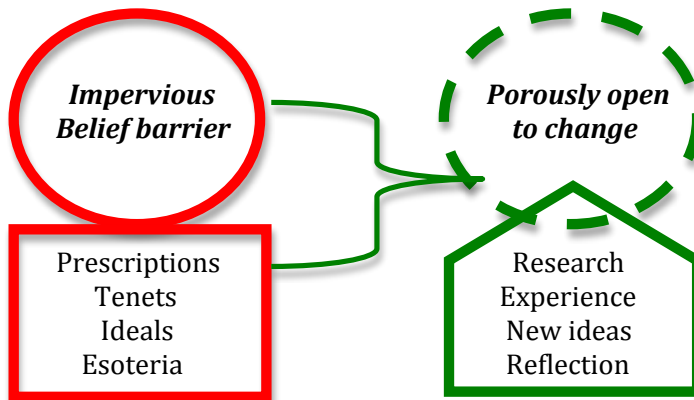
'Alternative' agricultures differ from modern agriculture in terms of openness to new knowledge, as indicated in the Diagram below. In fact, I see them less as 'alternatives' than as beliefs, which also makes them differ from the Asian practices that they unconsciously mimic. Why? Because Asian systems have proven conservatively open to trying all sorts of foreign technologies over the millennia, and they retained a spiritual dimension.

The objectives of Western alternative agricultural approaches discussed here are essentially similar to those of traditional Asian agriculture, minus that integrated spiritual dimension. No doubt there are practitioners of Permaculture, Steiner and other alternative agricultures whose own worldviews have been influenced by their endeavours. Some may even see their group as the beginning of a brave new world. But such fervour comes and goes and does not expand unless society in general adopts the principle and allows itself to be governed accordingly. Other conservation prophets have failed to sustain their message in the West; all four mentioned herein – King, Howard, Steiner, and Mollison – share this fate and their disciples are few and of

limited influence. The world is not heading in that direction. Yet I still see some value in these approaches.

“Alternative” Agriculture

Modern Science Agriculture



To assess that value we must ask, ‘can traditional agricultural practices be de-sanctified – stripped of myth and other holistic worldviews – and applied in a secular environment to the same effect?’ My answer is probably not. The holistic involvement of traditional practices cannot be faked – they either define life and the society or they are subject to the whims of human nature. Westernized adherents would do well to learn from remnant traditional agriculturists in Asia. They might also learn by linking with the traditions of self-understanding that have long existed in the West as well as in immigrating Asian religions, and so gain further insight into the realms that their rhetoric purports to explore. From such insights one might expect that their dis-integrated criticisms of industrial agriculture might be abandoned in the light of the imperative of fostering the best of all forms of agriculture to feed a population that may soon be beyond both traditional and industrial agricultural production capabilities.

The point is simply that the more open-minded we are then the more we may learn from other parts of history, the world and science. And then we may feed our spirits. Thus Permaculture and Steiner Agriculture may be of value in widening understanding of other forms of agriculture, and of course vice versa. And all forms of food production have a responsibility to understand global social needs and trends. These trends currently herald a future where food production systems are even further removed from what we have so far called ‘modern’, ‘industrial’, ‘conventional’, ‘traditional’, ‘organic’ or ‘alternative’ agriculture.

Answering the Question

It is absolutely true that agricultural science has gained its strength from natural and social sciences being integrated in applied situations, and that this integrity has been maintained by regularly pruning outdated approaches. However, to suggest that traditional agricultural systems and agricultural history are soft options to hard sciences is to misunderstand agricultural science, indeed all sciences.

Science may use a reductionist approach to understand the workings of nature, and indeed it can be a trap for some technological scientists who forget the holistic realm of which their research as a minute part, as I have detailed in my 40 years reflection of the profession.⁴⁰⁶ Likewise, modelers can be trapped into believing a model can represent reality rather than serve as a tool for integrating new knowledge. But these traps are known and guarded against so far as is humanly possible by adherence to methods that acknowledge such human frailties as a tendency to belief. Trusting one’s sensory inputs more than objective information is a trap in this sense, even though it is surely a great evolutionary advance of our mind’s ability to sort sensory input into patterns developed from previous experience. It is also a

means of ensuring that one sticks to, in Beckerman's⁴⁰⁷ words 'the boredom of work and loneliness of thought' rather than follow scientism's talkfests.

In stating the obvious fact that science operates holistically in attempting to counter the vicissitudes of human fallibility, it should be even more obvious that science learns from traditional human interactions with nature. Some of those interactions continue to be extant today, and some are discoverable through consideration of agricultural history. Holism can benefit from conceiving the universe as one living system in the manner of the early Lovelock,⁴⁰⁸ but it is not beneficial if the theory becomes a belief – almost a religion – as has unfortunately occurred with aspects of the Gaia theory.

The alternative to a scientific approach is one based on unchallengeable beliefs. But often attempts to converse seem akin to trying to discuss spiritual openness with religious fundamentalists for whom no widening of understanding can occur. These arguments, to me, put paid to the question's implication that the study of traditional agriculture and agricultural history are not useful. However, it does not address the assertion that these fields are soft options. I shall now dismiss that assertion.

Practitioners seldom raise the idea of soft options in higher study and research, for they know that their inspiration and information comes from diverse disciplinary sources. The critique is usually offered by those who purport to understand the science and in so doing claim a superior intelligence to the general public who may not have had exposure to science education. It is rather like the annoying blogs where a commentator will introduce his argument by saying 'as a scientist ...' and signing the blog with the appellation B.Sc. I do not know anyone in the profession who accepts an unspecified B.Sc. alone as an indication of scientific credibility. Somewhat similarly, the mutual and immature rejection between some

humanities-based psychology approaches and some biologically-based behavioural science fails to understand either discipline's history of knowledge. Perhaps I am being too frank about the question and undergraduate education. It is a shorthand way of indicating that science draws from all disciplines, just as all disciplines draw from science. That is how we advance our knowledge.

One final aspect of the question remains – that is the additional element of spirituality that is omnipresent in traditional agriculture and agricultural history. This is a byproduct of the question, yet highlights a theme that pervades many essays in this book. Such a consideration allows us to address such subjects as feeding the world's billions, tending to our own personal development and understanding our own interactions with the rest of nature. It is not that modern agriculture has lost this perspective, but that modern life in general has separated itself from man's major interaction with nature, which is food production.

This is why I support the study of hard science as well as traditional agriculture, tradition wisdom if you like, and agricultural history.

Chapter 9

When genetic modification was a public concern, you wrote in the *Academy's*⁴⁰⁹ magazine that application of the technology was inevitable and hence it was better to manage it responsibly. Today, climate change is the big issue. Two questions: How does this relate to your idealistic views of traditional societies? What is your response to public fears about climate change?

The public concern about climate change does indeed share elements with that of genetic modification, including misunderstanding of complex science and all the difficulties of moderating opinion with knowledge. Nevertheless, climate change is a matter for which responsible governments should prepare their citizens. I think it is better to present it in a long-term historical context rather than as a catastrophe suddenly brought on by selfish human actions. In addressing your question, I therefore discuss: the inevitability of misunderstanding; a way of viewing climate change in historical agricultural terms; the sources of information used in diverse ways for public information, and my view of the most responsible actions that we may take. First, let me lower expectations by outlining how the outputs of our societies' elite minds are often misunderstood and even misrepresented.

Misrepresenting Science

My conclusion that application of technology is inevitable and that it is therefore imperative to manage it responsibly was misrepresented in the case of genetic modification (GM) as your question implies – but in fact no more than is usual today. It seems to me that much public information misrepresents science or even scientists' informed statements. The situation is the more

disturbing when we learn that the public increasingly forms its views from infotainment and very short reports that often exaggerate to attract an audience. This is the world we live in, so bemoaning it is more the occupation of old grumps than a matter that science should attempt to counter. The masses have always strayed after false gods.

Before discussing climate change itself, let me use a subject that is impacted by poor responses to climate change to illustrate how easily misunderstanding can also fuel misrepresentation. The subject is food security. Misunderstanding in my experience has arisen for two general reasons:

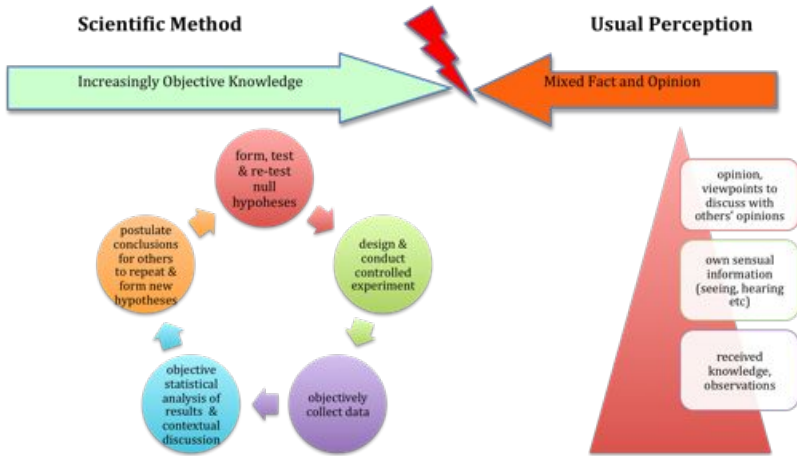
- the subject can be extremely complex and it takes rare skills of communication to relay its myriad interactions to concerned laypersons
- in addition to having politically correct stances, the subject lends itself to single-issue hobby horses – for example in advocating consideration of small farmers in poor countries, I have been variously claimed by supporters of organic farming, anti-GM lobbies and even anti-agribusiness groups. In each of these three instances, I find the labels humorous since I have written – I thought clearly – against the excesses of organics and their belief-based systems, for the continued application of molecular biological science and for the need of large scale agribusiness in parallel with smallholder agriculture.

I now find such misunderstanding and even misrepresentation inevitable. Attempts to clarify either tend to be ignored or to fuel more of the same. Politicians must also know the phenomenon. Those who believe in a specific issue will read selectively, either consciously or otherwise, and so support their conviction in the same manner as a fundamentalist. The phenomenon has been around as long as modern science, as Charles Darwin once observed: ‘But as my conclusions have lately been much misrepresented, and it has been stated that I attribute the modification of species exclusively to natural selection, I may be

permitted to remark that in the first edition of this work, and subsequently, I placed in a most conspicuous position – namely, at the close of the Introduction – the following words: "I am convinced that natural selection has been the main but not the exclusive means of modification." This has been of no avail. Great is the power of steady misrepresentation; but the history of science shows that fortunately this power does not long endure.'⁴¹⁰

It might be expected that I would take some hope of increased understanding from Darwin's statement. However, I must relate that I have also heard it quoted recently by a mathematician⁴¹¹ speaking on misrepresentation of climate change science. And he also challenged Darwin's assertion that 'steady misrepresentation ... does not long endure' by wryly observing that creationism continues to misrepresent Darwin 150 years later.

I now find it more productive to accept misrepresentation and misunderstanding as part of the normal human responses that the scientific method aims to minimize. Our inherent biases and indeed the way our brains have evolved include shortcuts as a means of coping with the otherwise overwhelming data inputs that new situations require us to interpret. Scientists are expected as part of their vocation to follow the scientific method to eliminate all possible biases, but the wider public is not under any compulsion to do the same even if they are aware of this old and major breakthrough of science about our cognition. As the following Figure illustrates, both scientific and general public approaches inform what is seen as knowledge, although one form is more objective than the other; it also indicates why clashes are inevitable.



And so, having resigned myself to misunderstanding let me continue to use food security as an example of a means of reducing scientism and scientific ignorance in the future. This may be done through education; pessimistically, many might say that this cannot be done where school education is politicized. But there is always hope through improved education of teachers who value their students above educational and political theory. My proposal for all who are interested is simple – it is: place an issue such as climate change in its historical context.

Securing Food in a Changing World

Climate is changing; it always has. Humans have adapted to these changes that have brought huge variations in oceanic levels, ice cover and desertification. Self-evident as it may seem, I introduce this fact in order to dismiss all those who claim that current changes threaten our species' survival. If we are threatened as a species, it is not revealed clearly in the outputs from any of the climate change modeling. But why should it be – the mathematics are not addressing such matters. Climate change studies do use historical information, including much sophisticated assessment

of CO₂ levels and temperatures across centuries and millennia. Different analyses can also be conducted for other indicators of climate and other changes. It is less common, however, to consider the history of human adaptation to climate change. In this section I present one view of the main aspect of human history – food security. It is not the only version of the history, but it is that which I find most plausible.

Pre-agricultural societies probably demonstrated a level of equity hard to imagine today – food was shared communally. Such egalitarian hunter-gatherer societies may not have been based on strict hierarchies of status and power, and may have also discouraged individual hoarding of food and attempts to dominate.⁴¹² With dispersed power and little identification with personal property, so the theory goes, there was no need to defend territory. In this world of the ‘noble savage’, the main incentive for the group was to maintain the degree of equity that most favoured group survival. Whoever successfully found food or game shared it, and even at group level it seems there were few attempts at storage. As climate changed, the group moved with the food sources – man following nature though with less idyllic lifestyles than those sometimes portrayed by seekers of lost Edens.

Primal urges for dominance were thus held in check by the conscious decisions of the group, supported by practices of shunning those who failed to conform. Such speculation naturally leads to further suggestions of genetic selection pressure against individual action through this phase of our species’ development.⁴¹³ Then came agriculture.

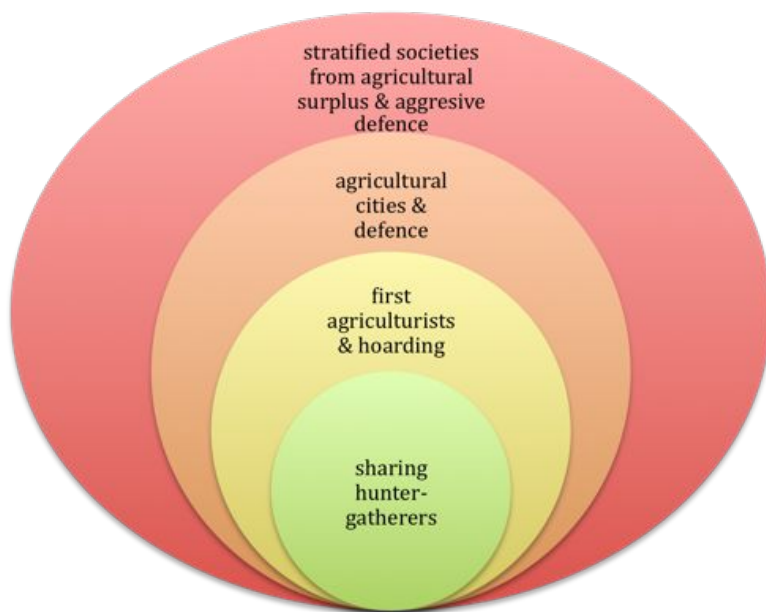
Agricultural societies, in stark contrast to this egalitarian ethic, encouraged individual initiative that included hoarding and aggression in the name of defence. This was a revolutionary change, although it took millennia and could not have been by any means a simple transition, since agriculture was a less efficient means of feeding a group than hunting and gathering.

Western philosophy offers explanations for the change in such forms as the introduction of private property, the class struggles of capitalism and natural competition. Some interpretations of Buddhism, while fundamentally disinterested in such historical developments, posit that hoarding is an outcome of agriculture that introduced an increase in human-induced suffering. It is thus relevant to ask what made agriculture attractive when it was almost always more labour intensive and dreary than hunting and gathering, and when the cities that agriculture created restricted movement when climate changed? The usual answer is that population increased and stressed the available natural resources accessible from hunting and gathering.

Increasing population would have required more food and this could be better provided from managed environments. Once perfected, agriculture produced surpluses in some seasons and allowed some of the group to retire from farming and pursue other social functions valued by the community. With this came different levels of status, the social stratification that is commonly regarded as a hallmark of civilization. Part of that specialization of functions within the society became a force to expand to new agricultural areas as population continued to rise and in response to climate change, inevitably leading to competition between agricultural communities. Conflict and conquest followed and thereby created a dominated class that could be forced into servile roles. The following Figure illustrates population expansion with size of the ellipses from sharing non-agricultural groups to today's food-surplus supported societies and assumptions of aggression.

A stratified society with a fighting force could also dominate an egalitarian hunter and gatherer community and annex their area for agriculture. Sometimes the power was balanced the other way, such as when hunters morphed into faster-moving nomads who could destroy agricultural cities. So the use of surplus resources from agriculture funded military capability as its first and essential partner. Major climatic change accelerated conflict

between herders and farmers, and between farming societies. The investment in land development for agriculture made it more valuable than undeveloped land and hence property became an inherited and traded commodity. Likewise, trade of agricultural produce commoditized output and made it worth storing, first against poor seasons, but also to await its increased value when food was scarce and so gain more power. In a period of sustained climate change, agricultural communities with a disciplined food storage policy dominated. And so inequality increased.



Reduced equity destabilizes a community, which in turn motivates some from the community to migrate, and in a world where most available land was already taken, to become aggressors.⁴¹⁴ This further supports these explanations for the spread of agriculture – not as a more efficient system in social or economic terms, but as a system that breeds inequality, instability and expansionist aggression. If agriculture was better

in some way, it seems it may derive in part from its underpinning of increased belligerence. In terms of climate change, the more belligerent agricultural societies were always moving towards better agricultural land. The implications of this postulation are devastating for anyone intent on finding such grails as sustainability, or seeking some perfect solution to feeding the world from an egalitarian ethic. Why? Because in the first instance, this form of agricultural sustainability is undermined by the greed and aggression that this scenario paints as an essential ingredient of successful agriculture – and this in turn leads to higher fertility rates as a guarantee of labour for future food supply. And second, the past successful egalitarian societies based on group cooperation in hunting and gathering maintained low populations through mechanisms that would be unpopular today, including infanticide.

In its short 10,000-year history, agriculture has moved from areas that are today deserts at the same rate of desertification. It does not have to be some divinely inspired exodus or prescient understanding of emerging climate changes, but rather a gradual movement with environmental changes to maintain reliable yields. If immigrants proved dominant, they displaced whoever was there beforehand. The hazards of more people living closer to each other and to animals added zoonotic disease risks to the risk of climate-induced crop failure and acted over millennia to contain population growth at levels that could be fed in most years by this expansion model. And as technologies evolved, expansion into new lands increased – a late stage of which we see today in most continents.

The centrality of low rates of population increase for community survival, even if not managed by humans, commands attention. Today's ethic of equality of survival rights for every person born contrasts with this earlier slow population increase and especially socially-determined ideal populations, and introduces a basic conflict with ideals of sustainability. With the only effective national population policies all favouring continuation

of population growth, one of humanity's key historical tools in adapting to climate change has been lost. With such realization we should expect periodic famines and large numbers of early deaths. We don't like to acknowledge such conflicts in this age when it is hard to isolate ourselves from the knowledge of such suffering.

So with the reality of climate change and the likely continued rise in population, food security should be the clear focus for the well-intentioned of today, for outcomes from survival to sustainability and even to social equity. Population seems likely to continue its rise regardless of the optimistic models of increased consumption leading to downturns in fertility. Where this is realized it leads to the self-evident conclusion that food availability must approximate food demand. However, as I argue elsewhere,⁴¹⁵ to leap from this axiom to promotion of free operation of markets to balance supply and demand is simplistic. Issues of access and availability are determined by far more than demand at any one time. It is suffice to note here that at its theoretical best, free movement of capital and food (among other products) must be matched by free movement of people if the theory is to be adhered to – and this will not occur under the nation-state models of today, or under any governance system that I know of. The defence forces that the dominant agricultural societies have built up over centuries will protect them from the others seeking to immigrate to escape food shortages resulting from population-aggravated climate change. Stuck in food deficit lands, such groups can only hope that their next agricultural season will be better, and those that survive to see it will define the changes in that society, as has occurred over millennia for those who did not or could not move.

It is interesting to ponder whether such selection pressure over millennia has produced a different mental predilection in marginalized lands compared to those dominant groups with productive lands. One unrelated theory on the subject examined Western human genetic selection pressures after the Industrial

Revolution when wealthy families produced and raised several times more children than workers. Examination of changes in attitudes in the wealthy group revealed an increasingly selfish tendency – indicated from wills bequeathing estates to genetic descendants rather than the needy as had previously been the case for the well-off. A conclusion from the research was that, as this represented the point of inflection in the population curve in Europe, the continuing gene pool contained a disproportionate representation of these more selfish individuals. It is even suggested that this may explain apparent differences between the mental predilections of the West and poorer countries.⁴¹⁶ Its not eugenics, but such conclusions also seem to be beyond wider discussion, which has limited our understanding of why our societies' actions are so far from our espoused intentions. However, I conclude that whatever the influence of such selection pressures are, they are likely to be small – and the little practical benefit that might arise from such knowledge would not help feed those who are short of food.

The obvious response to this food shortage from climate variability and other factors is carrying at least one season's food needs in food reserves. Such storage has been routine throughout most of humanity's agricultural history. But in recent decades we have naively assumed that factors governing production can be controlled, including the weather. This is the point we have now come to – an assumption that we are so powerful and dominant that not only have we induced changes in climate, but we can fix it. Anyone who has reflected on the intricacies of the innumerable interactions in living systems is humbled by the experience, and knows that our best mathematical models are just our first feeble attempts to understand a few of these myriad variables. More practical is the millennia-old approach of conservatively managed food storage for all who have missed out of the good lands that are more insulated from climate change.

One season's food for a society is in fact a minimal need, since climate variability is not predictable. Human actions are also unpredictable and often interrupt food supply, especially to large cities. Storage of food and taking over others' land are the age-old responses to these risks, but this response is negated by agriculturally dominant nations that have developed strong defence mechanisms – although some expansion of lands is always evident. That is another discussion.

With continued rising populations in marginalized lands, climate change increases the risk of hunger and infection from crop failure and animal diseases. So, well managed food production and storage policies, ring-fenced in national budgets and linked to national priority policies and programs for food security are a logical response to climate change. The heat generated by climate change arguments behooves any discussion of food security to consider the matter realistically, which in this discussion means across the history of agriculture.

Can such a controversial view of human history be included in schooling? Why not, if it strengthens society and world peace – after all that is the function of education more than the inculcation of skills for rent-seeking occupations. In such a realistic approach education's current revisionist versions could well be replaced by aspects of agricultural and climate history, as outlined in the next section.

The Climatic Sins of the Fathers

Early agriculture fed villages, then towns and cities, but its emergence ebbed and flowed. Anyone today who feels that we are past that stage would do well to reconsider the events described in this section. To slip back into barbarism is an easy event for any society, and society is most vulnerable when it is forgotten or worse denied that: 'to be civilized means to know one is potentially a barbarian'⁴¹⁷. Thus I now present an essential

description of early agricultural history as alternating periods when the major occupation was either hunting and gathering or agriculture, or in other words alternating periods of barbarism and civilization.

The agricultural warlike Mycenaen culture described in Achilles and other myths was a significant development from about 1600-1250 BCE. Yet by 1100 BCE its cities were empty and those who survived lived a simple non-urban subsistence lifestyle. The trappings of civilization disappeared as trade ceased, artisanal skills unrelated to farming were lost and their sophisticated writing script was forgotten. The Greece of Sparta we recall today was a reinvention of some 300 years later. The hiatus coincided with a change in climate to which, it is postulated, the Greeks adapted poorly with tensions developing into unplanned conflicts and wars.⁴¹⁸

Such stories are so well documented that they should not need repeating. But it seems that somehow we construct reality around the timeframes of our short lifetimes and so regard such historical information as interestingly impractical. Yet it describes an essence of our species' behaviour. Another example comes from the fertile Mesopotamian farms of five millennia ago where the empire of Akkad collapsed from drought and famine that resulted from climate change over a century.⁴¹⁹ 'The Curse of Akkad' written at the time is translated as:

'For the first time since cities were built and founded,
The great agricultural tracts produced no grain,
The inundated tracts produced no fish,
The irrigated orchards produced neither syrup nor wine,
The gathered clouds did not rain, the mašgurum⁴²⁰ did not grow.
At that time, one shekel's worth of oil was only one-half quart,
One shekel's worth of grain was only one-half quart. ...
These sold at such prices in the markets of all the cities!
He who slept on the roof, died on the roof,
He who slept in the house, had no burial,
People were flailing at themselves from hunger.'⁴²¹

Those educated in the Western culture will see the parallels in language and content with the Biblical Exodus stories, and will be reminded of several other similar historical utterances. While the point of such stories was possibly to illustrate allegorically the association of divine wrath with tragedy and release from worldly suffering with alignment to divine law, they could just as well have derived from extant oral stories. Climate-induced famines follow throughout agri-history.

Dominated by the Tigris and Euphrates Rivers, agricultural demise in the Mesopotamian region was correlated with reduced rainfall and river flows that were in turn associated with cooling as measured by the North Atlantic Oscillation.⁴²² Other parts of the globe have shown similar trends, and possibly because of its proximity to the USA, ‘the Maya [have become] the poster child for climate-induced decline’.⁴²³

After having developed about four millennia ago and sustained itself for about a millennium in Central America with agriculture based on maize, squashes and beans, the Maya civilization declined dramatically. Long-term drought is again implicated although the detailed study of the civilization’s experience also offers some further insight into the pattern of its demise. Based on lake sedimentation analysis, it is postulated that an extended period of high rainfall supported population growth and construction of the famous structures, before tapering off with periods of reduced rainfall interspersed with periods of real drought.⁴²⁴ Water source reductions of perhaps 40 percent over a century would have required markedly different governance arrangements, and perhaps the civilized Mayans could not adapt quickly enough.

The same story, correlations and postulation are made for the demise of the previously strong Tang dynasty of China around the same time.⁴²⁵ Further analyses indicate a general correlation between major wars and cooler average temperatures, which

were also associated with reduced grain harvests and reduced population.⁴²⁶ These studies are particularly intriguing since the temperature differentials seem very small – though variations about averages may have been great. More spectacular is coastal Peru in the period before the year 600 when an irrigated maize and bean civilization collapsed with canals being swamped by sand at the time of a strong El Niño cycle and associated floods, followed by a long El Niña period of drought.⁴²⁷

In Europe, climate change has also been implicated in the fall of the Roman Empire based on studies of tree rings across Austria, France and Germany.⁴²⁸ Alternating decadal temperature and rainfall patterns are suggested to have distracted ‘sustainable’ institutional arrangements based on the previously constant climate. Ensuing unrest led to migration and a weakened governance structures. Later, in the Middle Ages, climate was relatively stable – until a period of higher rainfall, which coincided with the Plague. Further analyses from a period where even more data is available – Europe between 1500 and 1800 and the Little Ice Age – allows consideration of population, migration, crop yields, conflicts, famines and epidemics. And this again indicates a possible link of cooling with yield declines, migration and conflict⁴²⁹ - see the following Box for examples.

Some 17th Century Examples of Climate Change Effects:⁴³⁰

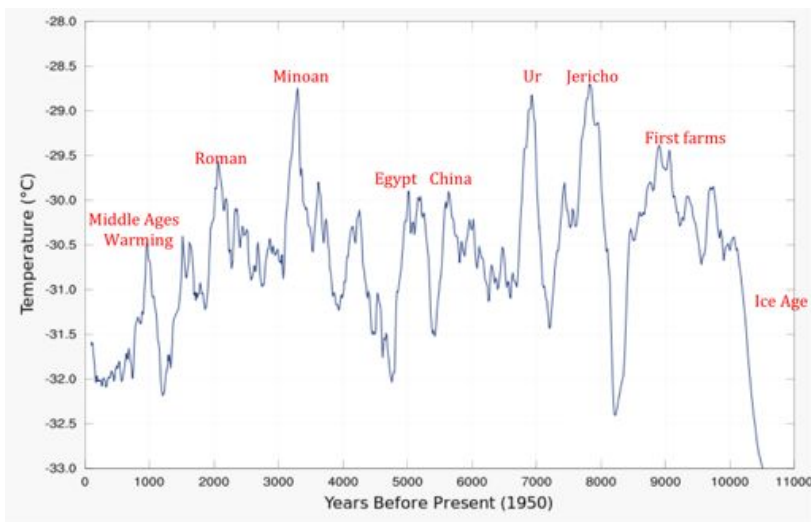
- Manchus conquered Ming China when harvests failed
- 20 percent of Scottish males emigrated to Europe
- foundlings in Florence were abandoned to starve
- plague killed some 100,000 in London
- 30 metres of water flooded over Mecca
- 30-Year War killed proportionately more than WWII
- the Baltic froze for the first time in European history
- the worst drought in 1,000 years in Aegean and Black Sea coasts
- fire destroyed two-thirds of Istanbul and its hinterland
- Russia redrew Europe’s borders as it fought for food
- bread prices correlated with rioting
- Rulers raised taxes, borrowed and defaulted as wars started
- Superstitions about climate ‘failure’ found ready religious ears

Tree rings have also been used to estimate annual rainfall for the Siem Reap region of Cambodia where the huge Angkor Wat complex was a regional power until a drought in the early 1400s. The theohydraulic system of the ancient Khmer relied on a steady supply of water as they had continually extended their canals and doubled their use of water in religious architectural features. Low stream and canal flows encouraged gradual siltation, which until recently was assumed to have caused the society's demise.⁴³¹ But now it seems that the weakened State was unprepared for the strong monsoons that followed resulting in floods that brought much more silt into the canals and streams.⁴³²

These précised versions of agricultural history are disputed by some anthropologists and archeologists, as should be the case for any theory. There are solid scholars on both sides of the debate, and it is relevant to observe in passing that this is not the case for the climate change 'debate'. The point to be recalled at all times is that we live in an age where control of nature in a 'sustained' form is somehow assumed to be real, when in fact we seek to sustain essential outputs for our survival (and comfort) from highly dynamic systems. The cycles of history may be a reflection of such natural cycles – I cannot say for sure – but it is worthy of note that it is somewhat easier to live in cold climates when it becomes a little warmer. The following widely used Figure derived from Greenland ice core data⁴³³ shows some dates for major civilizations that coincide with warming; the Figure is subjective and should not be used for more than an indication that climate affects civilizations' rise and decline.

It seems plausible that climate change is related to civilizations declining. Causal mechanisms are speculative and relating historical examples to today's paranoia is naïve. I find those who wallow in the wickedness of humans' environmental imposts causing disaster to be akin to religions assigning of periods of hardship to their gods' displeasure. The difference between

today's situation and that of ancient Mesopotamia, Central America, Greece and Rome and of more recent Peru, China and Europe is glaring. Yes we are more numerous as a result of our technologies, and yes many of us are vulnerable in many ways. But the nature of our possible demise may not necessarily be based on that of past civilizations. The rate of adaptive technological development today is beyond the ken of that of a century ago, the knowledge of which was in turn unthinkable for earlier societies. But there is a point worth highlighting, that times of social stress do seem to produce increased migration and conflict, and rigid governance structures unable to adapt quickly cannot maintain social stability – and that is a source of a decline for a civilization.



So, we may summarize the foregoing by simply noting that climate change is real and omnipresent. Human adaptation to the changes is reflected in migration, adaptive technologies and abandonment of civilized life for subsistence. Another major response is taking over lands less affected by the change. Some see this in expansion of Chinese agriculture today. Yet some persons still deny climate change and even claim that there are no real temperature variations today.

Warming Responses?

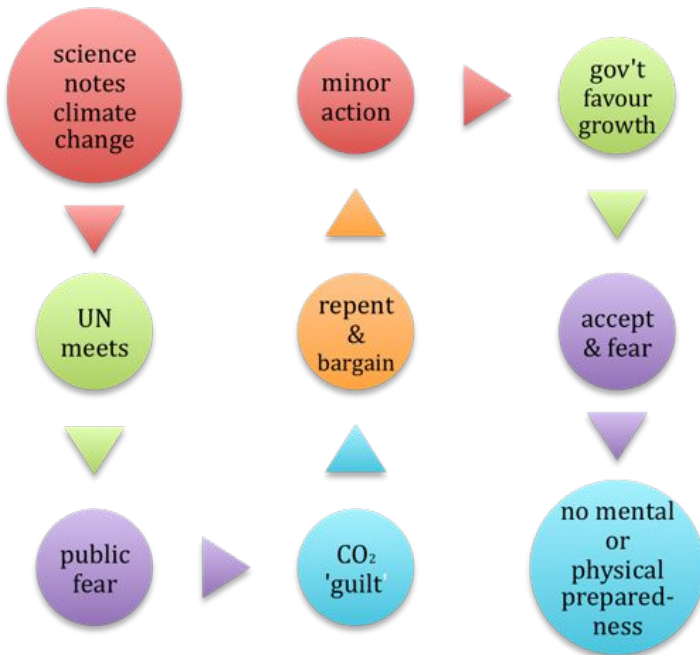
Quotidian instances such as an Inupiat village on an Alaskan island relocating because reduced ice cover made seal hunting more problematic, and increased incidence and destructiveness of storms have aided public acceptance that global warming is real.⁴³⁴ But is grasping at single events and sanitized case studies at all useful? Global warming may not be the cause of every environmental change that is observed despite the clamour to sensationalize it. This is the error of today, use of media – for the first time in history pervasive, free and instantaneous – means that sensation is demanded to gain attention. Apocalyptic scenarios sell best as they always have, and now climate change is cast into this role. We seem to have a predisposition to calamitous beliefs, which in our society seems to have morphed from religious to environmental prophets advising where we have sinned. As I have explained elsewhere,⁴³⁵ this could well be the correct comparison. But that does not help bring us closer to the facts in this case.

We cannot see the facts clearly from such isolated examples. This is not just because of the confusion of the prophets' messages, but also because the changes that concern scientific understanding are longer term than the current summer's heatwave. Melting glaciers and permafrost, hotter summers, Hurricane Katrina events, insects migrating to higher latitudes and so on can all be real without being a direct outcome of human actions causing global warming. A scientifically illiterate public doesn't know what to do with such unrelated information and so subverts the fear. Or to put it around the other way: 'this is why culture is opposed to science: science is sustained by a ruthless drive to knowledge, while culture is an attitude of feigning not to know/notice'.⁴³⁶

The public response to climate change, or even the simpler notion of warming has been twofold, either it is denied and discussion stops, or it is acknowledged as a sinful outcome of our

actions. Where it is accepted, it does not follow the logic that it should be the focus of adaptive research. Yet I see that as the most appropriate of the above responses. Why? Because the anticipated changes that cast the spell of fear in the public are taken from worst-case postulations, not those calculated as the most probable. The difference is not simply a matter of opinion, but of mathematical probabilities from the best data and the best minds available – so why dwell on the outer limits of lower probability except to create fear? A pillar of this essay is the traditional manipulations of the public mind by religion as practiced through the ages, arguments for which need not be recited here – they are detailed in ‘Religion and Agriculture’.⁴³⁷ But it is worth saying here that I think that the prophets of doom – those who label climate change as irredeemably caused by man’s uncaring exploitation of nature – are destined to win the public’s mind. This is because a prophet’s apocalyptic message is always more effective than the voice of reason since the prophets themselves, in believing their own message, are more motivated to convince others than are the reasonable scientists whose lives are based on skepticism, doubt and probabilities.

So the public message is that we must repent, and the response is somehow translated into minimal actions like separating garbage rather than reduced consumption. One view of this is illustrated in the following Figure. I apologize for introducing this trivial example, but it is useful here to illustrate that the huge technological innovations of recent times to use wastes and reuse materials and energy all result from a reasonable approach to the same information. However, the power of the doomsayer is proven by the public’s choice to not follow-up such factual information as it might disturb the comforting feeling of being saved through one’s own actions of repentance at the suburban altar of the garbage bin. Seen in this way, climate change is just today’s fear – in the past it has been such issues as genetic modification, nuclear threats, financial crises and even personal curses such as cancer, AIDS, tuberculosis or leprosy across different eras. We demand facts and then ignore them!



It is hard to get the facts straight in the public domain when increases in the incidence and frequency of bushfires, drought, floods and cyclones are used as examples of climate change. They may well be, but are these natural events of greater incidence and frequency than in earlier epochs. Of course, it can seem so from 24-hour 'news' claiming an event is the 'worst'/'biggest' disaster since Adam. But, facts are always a more reliable basis for discussion and decision-making. So what are the facts? If we take droughts as an example, it seems that there has not been a global increase in incidence over the past 60 years.⁴³⁸ The findings of that paper have been challenged – as is appropriate within scientific circles – but whatever the outcome, the main point here is that the key lies in where droughts have occurred, as the U.N. Climate Panel in 2012 concluded: 'Some regions of the world have experienced more intense and longer droughts, in

particular in southern Europe and West Africa, but in some regions droughts have become less frequent, less intense, or shorter, for example, in central North America and northwestern Australia.⁴³⁹

So it is the age-old dilemma of civilization – when climate changes, the immobile assets are in the wrong place. And this, fueled by public misinformation and denial leads to governments making poor decisions often at huge expense. The better response, as outlined above, is fact-based allocation of research funds to improve the environmental efficiency of everyday services.

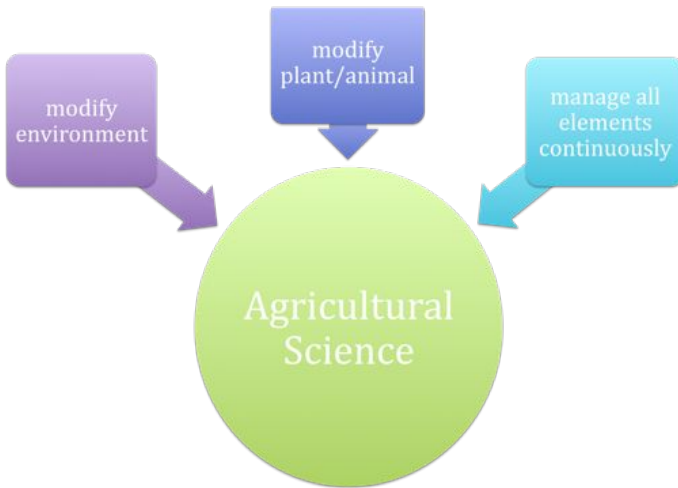
Risks and Research

Climate change research has the potential to become a gravy train. It would hardly be the fault of underfunded researchers if they were attracted to the gravy and salted their grant applications with it. And whether the good that comes from such reorientation is better than what might come from objectively funded research is hard to even guess. However, I consider that elite talent is a rarer commodity than research funds, in which case the responsibility is to use that talent most effectively. In the agricultural sciences, this danger of misuse of research talent may seem minimal since adaptation to climate change has long been a central tenet of its disciplines. But outside responsible and long-term projects, politicization has jargonized climate change into a quest to solve a ‘problem’ – and the effect has been to reduce funds for non-climate change research.

For agricultural science, that ‘problem’ has been the essence of adapting plants, animals and management systems to new environments. The threefold practical principles of agricultural science should not need repeating – but let me do that in case someone somewhere has forgotten. The three actions that make up agricultural science, as illustrated in the following Figure, are:

- modify the plant or animal to best suit the environment
- modify the environment to best suit the plant or animal
- manage the environment, plant and animal to optimize conditions for production

The first includes all breeding and genetic work, the second includes infrastructure such as irrigation, glasshouses and animal houses, and the third is the essence of agricultural management, itself one of the most complex of all management tasks.



If climate change is approached on this basis, we can see that the ability to grow all the major cereal crops, that represent the majority of global calorific intake, are products of adapting plants to new environments. Not only that, they have been adapted to engineering limitations at each stage of development, to social arrangements of landholdings and tastes, and to storability for that other aspect of managing for climate change. This is why, in my opinion, a major proportion of climate change research should be allocated through the integrated approaches of agricultural science.

Such a conclusion is bound to be unpopular, and in any case, I will be said to be biased. But then, any one issue put first on a

global agenda will suffer the same fate – just try googling ‘world’s biggest problems’ and see the lack of unanimity in the self-interested and parochial lists that appear under the most respectable banners. One way to cut through such bias – albeit ignoring the realities of politics – is to attempt a simple risk assessment.

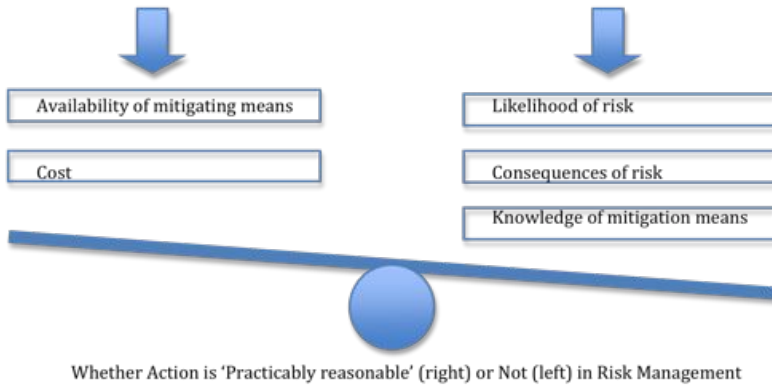
The International Panel on Climate Change introduced the main risks that concern commentators today; subsequent reports tend to discuss these matters more than introduce much that is new.⁴⁴⁰ Those topics remain: temperature increases; extreme weather events; crop failure in some areas and increased yields in others; ice melting; sea-level rises; various ecological shifts, and changes in disease-risk. The risks of these might be addressed separately, but in fact they are interrelated, for example, ecological shifts and disease risk may follow temperature and rainfall changes. However, it turns out that the variations in ranges for each such effect as projected from the models is so great as to render probability-based risk assessment unworkable in its normal applications. For this reason, some commentators have suggested an overall risk assessment of climate change.

A general risk assessment of climate change using the tools of what has developed into a sophisticated analytical field is equally compromised by the variations in probability data. Nevertheless, it serves to advance our discussion by providing a basis for some further consideration. This simple process immediately highlights the subjective nature of climate change risk when predictions are made from models not designed for predictive purposes. In addition, consequences cannot be assumed to be linear; for example, atmospheric CO₂ levels would be expected to lead to one set of effects up to a threshold and after that to produce other effects. Planetary homeostatic mechanisms are too complex for climate change or other models and hence predication of new norms after thresholds are exceeded can only be speculative. If the consequences are not easily predicted,

knowledge of means of mitigation cannot be specified either, nor can be, on the other side of the balance, availability of means or cost. So assessing the risk from a practical perspective as commonly claimed by well-meaning laymen is in fact not practical at all, which is why such public discussions usually return to the ‘we must do something’ fear response that humans have long embedded in their religions.

‘Doing something’ has occupied the sessions of too many international meetings seeking concerted international action. While it seems possible that international awareness has influenced the numbers of national laws purporting to do something about climate change, these fall far short of the actions dreamed of at those meetings. A less generous conclusion is that it has produced relabeling of general environmental legislation, which ‘if true, that is an indictment of years of green activism that has pushed for a global treaty first’.⁴⁴¹

The difficulty of pinning the information down to something suitable for international action mires that debate. This is the reason that more practical information has been prepared at national level in countries from which Panel scientists have been drawn, such as Australia. So, we find national climate change models and projected consequences informing national policy; this refers to policies that aim to enhance the resilience of the nation, which is a primary responsibility of government. However, in addition to the variable probabilities in the data, the countries in this fortunate position of having informed scientists and access to new information are commonly caught up in the modern iteration of governance systems that are subject to lobby and popular opinion. It would be easy to conclude that leadership is neither on the agenda nor possible, nationally let alone internationally. All of the above is represented in the following simple Diagram.



All of the above is a less frightening discourse than is usual about climate change. It does not mean that climate is not changing – it is as it always has. And it may mean that lifestyles will be completely undone by the speed of change, although there is little to substantiate that version of apocalypse. Or, it may mean that the rate of change is something that most peoples will adapt to through the usual historic means of migration, new technologies and revised value systems. This is the nub. We don't like change, or the threat of change, and we will fight against any element of our essential security being removed from us. Today's Westernized citizens seem to include in their rights the 'right' to stay in their chosen seaside or bush house even when it seems that floods and bushfires represent a clear threat. It is as if we have assumed 'rights' above those of nature – and this always leads to tears.

Juxtaposed against this introverted popular response is the much more serious increase in the vulnerability of people in populous poor countries. With hundreds of millions living in deltas and other areas subject to climate change risks, the logical response would be for international aid to increase agricultural, health and other practical research oriented to those people and places. However, aid allocated to such practical matters continues to decline, and I expect it will continue to do so until the wealthy

donor nations feel threatened by climate change immigrants. As with other matters, it seems that we resort to an ungenerous religious mode of thought rather than act objectively. We act as if the threat of climate change is a punishment for our sins of over-consumption and our repentant response is token aid to the affected, self-flagellation and fantasies about 'controlling' climate. On the aid front, climate change has made it even clearer that we use philanthropy to appease our guilty consciences as it is cheaper and easier than redressing the underlying causes of international inequity. A more honest approach would be to acknowledge that equity is an ideal that will never be attained, just as staving off climate change will never be attained.

Answering the Question

Just as genetic modification was misrepresented to the public so has been climate change, and just as I suggested for GM that inevitabilities are best faced head-on and managed responsibly so I suggest the same response to climate change. Through interpretations of history and instances of climate change disrupting civilizations, I have explained some of the practical responses and failures in past societies. The responses of established civilizations were no more ideal than our responses today, but the adaptive mechanisms of traditional groups indicate how we would probably behave if climate change impinged greatly on our comfort or threatened our survival. These responses differ from the majority of current public opinions about climate change and indicate pervading societal denial.

The world warmed by about 0.7°C through the 20th century, and projections have temperatures continuing to rise even if postulated causal factors such as greenhouse gas emissions are curtailed. The often-futile meetings of the past decade must surely be passing out of fashion by now as their dreams of 'controlling' global warming are dashed. Adaptation to climate

change on the other hand has been the historic reaction and emerges as the most responsible action, even in today's technologically advanced world. Much of this adaptive behaviour will occur over a generational time frame and will inevitably be made by private decisions if government does not muddy waters by subsidies and false promises. This is as basic as moving house to a more suitable region, or more significantly by planting new crop varieties as they are released from research programs. Encouraging such moves seems the appropriate government response rather than separating policies for mitigation, impact and adaptation.

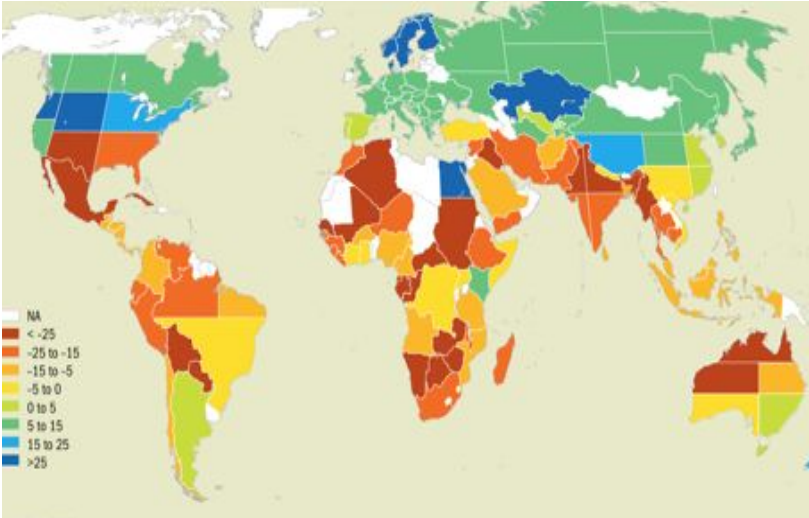
Continuing with the example of agriculture, policies of mitigation, impact and adaptation are interrelated. For example, mitigation might include encouragement of farming systems that conserve moisture and sequester carbon and at the same time are adapted to the new climate and so minimize overall impact. On the other hand, the traditional form of adaptation – mass migration – has largely been closed off by nations that control the best soils, climates and defence resources. Perhaps such an undesired impact is a reason for silence in climate change discussions on adaptive measures. As has been graphically noted: 'Talking about adaptation was for many years like farting at the dinner table, says an academic who has worked on adaptation over the past decade. Now that the world's appetite for emissions reduction has been revealed to be chronically weak, putting people off dinner is less of a problem.'⁴⁴²

But adaptation can also become mired in world discussions that remain based on the ever-improving climate change models because it seems that some policymakers assume models can define climate change for specific locations. But even with super-fast computers making the various models more precise, this may lead to both greater confidence and greater differences in outcomes of the various models and thus to further searches for other variables that might assist that elusive convergence of models' conclusions. This is the nature of modeling – not a failure

as some erroneously assume. In this situation, it is far better to act on adaptation measures now, and leave the model refinements to the experts, as may have been more productive in the first instance rather than confusing the public and through ignorance reducing the credibility of scientists and government.

The disparity in options between rich and poor nations highlighted in the foregoing discussion and other essays in this book is an argument for adaptation to be accepted as a primary international responsibility. For example, the Netherlands can afford \$200 billion for increased flood protection, but a poor country could not. Furthermore, if the projections of most models come to pass, it appears that the agriculture of Western nations will be less and possibly even beneficially affected overall by climate change while the populous tropical nations could be negatively affected. This is indicated in the following Figure for one estimate of the percentage changes from 2003 to 2080 if benefits from increased carbon fertilization are assumed.⁴⁴³

If populous countries are more affected, climate change would add to the already precarious food situation in the developing world. But again this is only part of the story, since increased weather variability is also a common projection. One study in the US suggests that hot weather estimates from models for the coming hundred years could lead to corn and soybean yield reductions by around 31 to 79 percent.⁴⁴⁴ Those authors are pessimistic about adaptive mechanisms but have not considered the range of research options, which I feel support a conclusion that reinstating investment in adaptive agricultural research is essential. The rate of change in climate can most probably be met from genetic, agricultural engineering and management research – if it is funded, which means the whole research training agenda as well. Even more important is the need for research in poor countries where, apart from struggling national research programs and the CGIAR,⁴⁴⁵ little continues these days.



I reiterate that raising crop productivity and resistance to pests, droughts and temperature variability has been shown to be possible in both Western, and through the Green Revolution, developing nations. Irrigation technology, wind abatement, shading, intercropping, glasshouses, soil conservation, sophisticated management and so on are all part of this research need and it is reasonable to expect research outputs to meet the challenge – if funded and if idealistic regulations that hamper feeding people are revised. The last point is worth noting; well-meaning environmental ideals from the West – such as European anti-GM requirements in some African nations – have hampered research and development in meeting this challenge. Such ‘green’ sentiments are often linked to insistence of preservation of biodiversity, national park reserves and maintenance of forest cover, which can only lead to disappointment. This is because we well know that if agriculture is not intensified from such research, forests and parks will be used in agricultural expansion at the same time that hungry migrants find their way north. The simple equation that escapes the ideological stance is that:



Agricultural intensification is thus needed in the most densely populated parts of the world where the majority of food producers are small risk-averse farmers, as outlined in another essay herein, and in more detail elsewhere.⁴⁴⁶ These critical food producers have mistakenly been neglected by policy, abused by power and relegated to a backward status, and as such are unlikely to suddenly change their practices to accord with a foreign idea like climate manipulation. In any case, they have no welfare safety-net to compensate for accepting any added risks. As the small surpluses of billions of small farmers also feed a substantial number of urbanites in their countries, climate-induced decreases in production will affect the poor in cities most severely when food prices rise.

So that is my response to diverse climate change opinion. It is mostly hot air, fear and manipulation, and misses the most important aspect of adaptive research for the most vulnerable aspect of life in the vulnerable regions of the world – food in poor countries. Regardless of detailed national climate change studies, international challenges such as mass starvation and migration will bring these larger issues to the doors of governments in rich and poor countries alike. That is why I say, as the question correctly observes, that history assists management of the inevitable, which is always our most responsible approach.

Chapter 10

In your book ‘Small Farmers Secure Food’ you reiterate that small farmers are essential because they produce about half of the world’s food and yet are in danger of being forced off their land. One force is international agricultural investors, and if I am informed correctly, you are a director of one such foreign company that is now one of Australia’s largest producers. How can you reconcile your statements in favour of protecting small farmers with your support for this huge foreign land investor?

It is worth repeating that small farmers produce half of the world’s food and are at risk of being dislodged. In the book mentioned the reasons are set out as emanating mainly from ill-considered policies of international development. Yet, as you note, international agribusiness can also dislodge small farmers in poor countries, although being attuned to matters of efficiency and profits they will seldom invest where lower yields or political problems introduce unacceptable risks. You are correct in stating that I am a director of a Middle Eastern company that is investing significantly in Australian agriculture, a role in which I find no intellectual or moral conflict with my support of small farmers in poor countries.

In fact, I see as complementary the roles of such large-scale investment in Australian agriculture and support for small farmers in populous poor nations. This can be explained by consideration of: overall food security; the efficiencies of small farmers; the role that agribusiness plays in overall food production; the need for responsible global and national governance with respect to food security; the prospects and limitations of both technology and biology, and some home truths about how food equity really works. Let me begin with food security.

Food Security

As this is the subject of another essay in this volume, I need not rehearse the whole argument. Its essence is that real food security is not well catered for by international agendas. This may have resulted from organizations set up for that purpose following developed country practices and donor whim. In addition, competition between sister agencies can produce intransigence – such as when the supposedly non-UN agency the World Trade Organization argues for free trade in all foods, and the United Nations Food and Agriculture Organization notes the need for national food security.

Food security has many facets, one of which is food producers who may be grouped into three categories; small farmers, Western family-style farmers and agribusiness. Other facets of food security include: trust in government; managed reserves; equity of access to food; distribution systems; price; trading-power imbalances; protected or open markets, and public education. Such factors are not the focus of this essay because they are not the responsibility of any of the three aforementioned production sources.

Small farmers produce around half of the world's food. As noted elsewhere, 'of the world's 530 million farms, FAO records 85 percent as less than two hectares, 12 percent between 2 and 10 hectares, 2.7 percent between 10 and 100 hectares, and 0.6 percent more than 100 hectares. ... The small farm sector of poor countries involves some two billion people – it feeds them and provides a surplus for non-producers in towns and cities. In round figures, small farmers feed half of the world, more if we only consider essential food for basic lifestyles, which would exclude such luxury foods as out of season produce and grain-fed livestock. Small farmer yields under these intensive conditions are often higher than under the extensive broadacre systems common in rich countries. And where research has been oriented

to small farms, yield increases among innovators have exceeded broadacre yield increases.⁴⁴⁷

Small farmers are thus critically important, a fact that we will return to shortly. The second category of food producer mentioned above is Western-style farmers. Numerically these farmers of course are more than agribusinesses, but they are far less than the number of small farmers, principally because the majority of the world's population is not in Western-style nations. This is easily illustrated by comparing farms sizes in selected countries. For example, in the period around the year 2000, average farm sizes for New World and wealthy nations such as Australia, Canada and the USA were 3,232; 273, and 178 hectares respectively. Figures for Old World and wealthy nations are lower although they are rising through consolidation accelerated by labour costs and technological innovation.⁴⁴⁸ Nevertheless, the matter seems resistant to facts and is thus worthy of further consideration in this discussion if for no other reasons than enlightening the confusion among many commentators about what is a small farm.

Essentially, the confusion as to what is a small farm arises in Western minds from what were in past generations family farms and are now in many cases too small to be financially viable. Such suboptimal farms are then usually consolidated, often being bought by neighbouring farmers that have sufficient resources and expertise to manage larger areas and use new technologies. Some farms are aggregated by agribusiness, although this constitutes a small minority of transactions and only a fraction of the total value of agricultural land sales. Nevertheless, nostalgia about life on the farm and the hardships of New World pioneers seem to cohere with the modern claims that somehow the lack of skills and finance of some who inherit farms is the fault of those neighbours and agribusinesses that buy them out, or of banks left holding poorly managed farm debt. These words may sound harsh to some who hold these views; I know many such persons

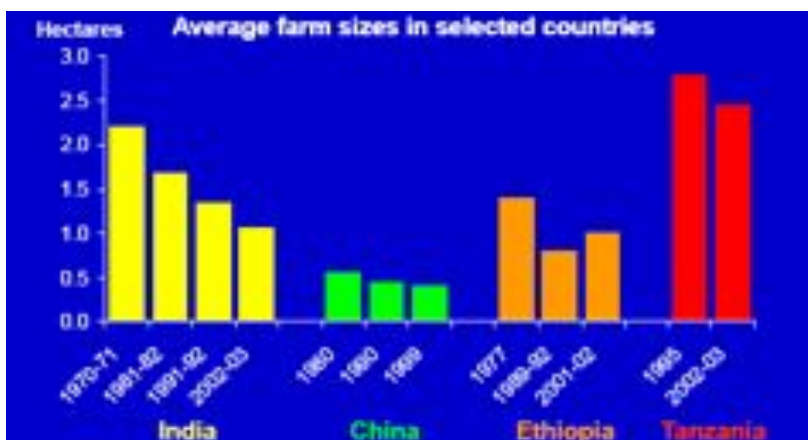
and acknowledge their feelings. However, I cannot see any compassion in responses that encourage feelings of victimhood.

If modern Western societies had desired to sustain such farming practices they would have maintained agricultural and rural subsidies and protected markets from foreign competition in food products. The fact that Western societies have not acted in that way may well be a reflection of their food surpluses. In the case of such nations as Australia and New Zealand where agricultural exports underwrite significant proportions of the economy, it may also reflect their desire for maintaining and enhancing national income. Understood in this way, the continuing transition of agriculture in most Western nations is leading to larger farm sizes, higher competencies in farm management and marketing of produce, and the use of complex technological innovations. Those Western nations that appear to continue to subsidize farming may be better understood as investing in bucolic vistas and romantic food artisans as part of their national image, such as in parts of Switzerland and France.

The mistaken idea that small farms are important in the West and that my references to small farmers includes them might be excused in those who do not consider where most food is produced – which is India, China, Southeast Asia and Africa. And this is where the real small farmers farm, on areas smaller than one hectare in many cases, as illustrated in the following Figure for selected countries to 2003⁴⁴⁹ – they have since shrunk further.

Another way to express this is to note that of the some 525 million farms in the world, 85 percent are smallholdings below two hectares, and of these about 87 percent are in Asia.⁴⁵⁰ Small farms are the norm for world food production and are seen by perhaps only a couple of percent of those persons who live or have adopted Western lifestyles – and who have a disproportionate influence on global development views. In addition to clarifying the misconception that the world is fed

from large farms, it is also important to understand that small farms offer potentially higher efficiencies than do large farms.



Small Farmer Efficiencies

It has long been shown that small farms are more productive⁴⁵¹ although sometimes more influential voices have argued that the higher productivity of small farms would reduce as new technologies were introduced on larger farms.⁴⁵² But this does not seem to be the case. A recent survey in India reveals small farms continuing to show higher productivity than large ones, even though their more intensive techniques mean lower per capita productivity – but then labour is not the constraint. Additionally, in welfare terms such poor persons are only made worse-off by policies that aim to increase average farm size. Asia in general has not followed the trend of Western nations in terms of farm size over recent decades with China in particular demonstrating that very small farms can maintain high levels of output in support of economic growth. In the Indian situation, fertilizer use, irrigation, crop intensity and technology uptake all declined as farm size increased.⁴⁵³

This advantage of small over large farms seems to be consistent where job opportunities in the non-agricultural sector are limited. This belies rural poverty alleviation program objectives of off-farm employment generation and favours retention of small farms.⁴⁵⁴ Likewise, it can be true that economic efficiency may be reduced where small farms are overly fragmented, but a study in Rwanda indicated that small farms can also offer economies of scale through consolidation.⁴⁵⁵ In effect this is a saving in time lost in movement between fragmented holdings and to a lesser extent, the inability to use certain machinery. But isolated examples are never a valid way of advancing knowledge.

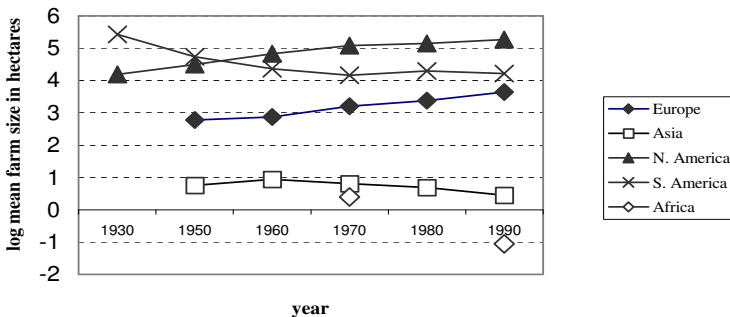
While it seems easy to extrapolate from small farms providing higher yields, it is not correct to therefore assume that small farms are more efficient unless the resource being used 'efficiently' is specified. The many variables include: the number of work-fit persons in the farm family, capital availability, information access, knowledge, transport and market access, availability of mechanization, labour-to-capital ratio, availability of additional land, input availability (improved seeds, fertilizers, irrigation, credit and pesticides), perception of risk and managerial skill. Thus, for example, credit in developing countries is generally cheaper for large farms that borrow through formal lenders than it is for small farms that use informal credit. Similarly, small farmers are commonly risk-averse because the consequences of a bad outcome are greater if subsistence is a major component of production, while large farmers may have greater appetites for risk, large capital backing and access to insurance.⁴⁵⁶

Where a farmer has better management skills, a large farm – up to a certain size – can be more efficient, although generalizations are confounded by differences between management requirements for different crops and natural endowments. Another confounding factor is the involvement of outside ownership, now popularly labeled as 'land grabs' without thought of the historicity of the actions or its possible benefits.

Even colonial period assumption of land seems to be overstated and based on ‘golden age’ myths of peasant equity; in fact it was limited by poor land quality in much of West and North Africa and high social and political costs in much of Asia, including British India. ‘In these regions, colonial and other plantations typically occupied below five per cent of farm area.’⁴⁵⁷

Nevertheless, large colonial holdings developed, particularly in Latin America, the Caribbean, and Southern and East Africa, where the benefits exceeded the costs of policing, technology, capital and management to allow improved productivity over underused lands. However, as ever, once new approaches become widespread, small farms prove more efficient.⁴⁵⁸ Some commentators stated that plantation crops remained the exception, although the small farm rubber production of Thailand continues adjacent to plantations in Malaysia – each have their own efficiencies in different economies.

The following Figure⁴⁵⁹ indicates changes in farm sizes per regions over 60 years; it uses a logarithmic scale, which means that an increment of 1 on the vertical scale is a 10-fold increase.



It seems trite to recall that small farms tend to be in the tropics and that rich countries tend to be concentrated in temperate regions.⁴⁶⁰ But it is worth mentioning here as it can lead to counterproductive policies that assume Western agriculture is the more efficient and is thus suitable for developing countries. Such an error is made by unquestioning assumptions that

current rich nation actions will produce similar benefits in other situations. The facts are that populous nations with strong small farmer bases have two significant advantages over the Western approaches, viz:

- Small farmers in poor nations who feed themselves and their families represent a saving of at least 30 percent of the food that would be required if they were forced off their land and into cities.
- Small farms remain the most efficient of the world's farms in terms of sustained productivity per limiting resource, which means that Western-style broadacre agriculture in place of small farms would require more land to produce the same food output on that land (plus the additional 30 percent mentioned above) – the total needed exceeds that available.

Once these arguments are presented, polarized views shift to assume that there must be something unfair with large agribusiness properties. After all, it is said, if small farms are more efficient, why are large farms created by profit-oriented businesses? Again the problem is hearing only half of the fact that each type of agriculture has its own efficiencies. In some cases biodynamic agriculture may even be more efficient – for example, if one values some esoteric externalities that are invisible to most of us. So, agribusiness has its advantages and its approach is therefore the most logical in certain circumstances.

The Role of Agribusiness

Agribusiness has advantages of scale, quality control and access to skills and markets. As above, this need not render it more efficient than small farmers in terms of yields and costs of production. But it can be more efficient in such terms as use of labour and supply chain integration. Its role in global food production is in situations where social and economic conditions do not otherwise encourage enhanced production or productive use of available resources – such as in wealthy countries with

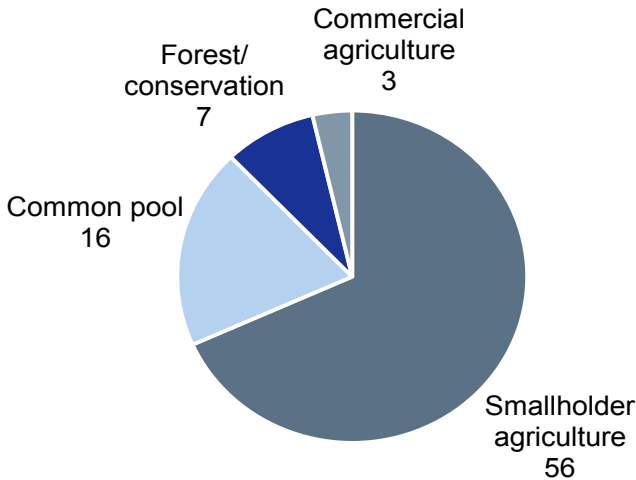
high labour rates, sub-optimal farm sizes and undeveloped processing facilities. But it can also suit poorer nations where its organizational benefits, capital and market access provide an improved production environment for small farms supplying agribusiness. While the terms are fungible, agribusiness is generally considered to be critical to 15-20 percent of world food supply. As this food is wholly oriented to urban populations, agribusiness can be seen as more critical to urban stability than small farmers, unless they are forced to migrate to cities. This explains the current flurry of investment in agribusiness in the world's very few reliable food surplus countries. It also explains the rising interest of defence analyses focusing on 'flash points' of political instability that can be aggravated by food shortages. Hence agribusiness, like small farmers, plays a critical role in global food supply.

Before discussing agribusiness *per se*, it is important to provide some context for the ongoing transitions in food production, somewhat in concert with rising populations and financial opportunities. The high cost of operating a farm in a developed country means that small farms in those countries are relegated to being; specialized producers of luxury commodities, lifestyle choices supported by off-farm earnings or increasingly impoverished persons that have not noticed recent economic policy transitions. These are the facts of life in a wealthy country – fanciful ideas of reversing the trend to move back to some imagined golden age are little more than a useful foil against excessively rapid policy change. This viewpoint means that the balance of information they sometimes offer should be given credence, but their utopian goals should not be believed in. A common means of expressing the rising importance of corporate farms is to compare the proportion of farms with their proportion of food production. In the USA in 2006 for example, 14 percent of all food was produced by two percent of farms, and while they might be called family farms, many were also large incorporated businesses.⁴⁶¹ This suits the economic politics of the West. But blithe expectation of reproducing this pattern in

poor and food deficit nations can produce unintended consequences.

As acknowledged in the introduction, agribusiness can also dislodge small farmers in poor countries, as illustrated in the following Diagram⁴⁶² of former land use before foreign agribusiness acquisition. In my opinion, such dislodgement can be viewed as either;

- an abuse of power in which small farmers are uncompensated and uninformed victims, or
- a logical economic development that must be implemented in conjunction with good national governance.



Agribusiness, like any other human endeavour, is neither good nor bad in itself, but is subject to being used for either purpose. It has the strength of a narrow focus on efficiency of use of expensive resources and inputs to produce profits. Where successful, this begins with detailed investigations and planning, in a manner that is usually more rigorous than that for planning of international agency development projects. Some say that this is because company directors are subject to far more stringent

legal obligations than bureaucrats, which is true in many developed nations but is not a convincing explanation in other regions.

Regardless of the governance and management reasons for differences between agribusiness investors and other large-scale agricultural development projects, there are key factors other than profit that affect agribusiness decisions, including:

- Political stability
- Foreign investment policy
- Repatriation and taxation policy
- Social risks and benefits of the investment
- Availability of technology and expertise
- Proximity to markets

Consideration of such matters explains the diversity of approaches used in agribusiness investment – such as contract farming, share-farming, input-credit arrangements, regular advice, harvest contracts, leasing, ownership, aggregation and upstream processing and marketing. The diversity means that we must limit this general discussion to short examples of the advantages of agribusiness in developed and developing countries. One approach that has proved adaptable across various cultures in the developing world is that of contract farming.

Contracting small farmers as suppliers to larger agribusinesses, particularly for high-value and animal products, has become common in developing countries since the 1960s. Its major drawbacks seem to be contract default and high transaction costs⁴⁶³ but it does offer income, technology, advisory and market benefits to small farmers and diverse supply lines and reduced capital exposure to agribusinesses. Contract farming has five general modalities, viz: centralized purchasing as for tobacco, cotton, sugarcane, bananas, coffee, tea, cocoa and rubber; nucleus estates of agribusinesses offering opportunities for satellite growers as for tree crops and dairying; multipartite

activities of statutory bodies, agribusinesses and small farmers as in China; informal entrepreneurs seasonally contracting farmers as for fresh fruit and vegetables destined for supermarkets; and informal intermediary subcontracting on behalf of agribusinesses.⁴⁶⁴

This is simply an example of one form of agribusiness operation in developing countries that has worked reasonably well. It and other forms have existed since at least colonial times, and will continue to exist – in both beneficial and other forms. Where it is less than beneficial, lessons exist from developed countries – that is, those with strong regulatory environments and an operational rule of law. But then discussions can be further confused when xenophobic reactions to foreign investment are manipulated for local purposes.

But before considering foreignness, we should put to rest unproductive argument about what constitutes a developed or a developing country – the terms remain qualitative, flexible and euphemistic shorthand that can both confuse and ease communication. A developed country in Europe may undergo gradual consolidation of land as agricultural technologies allow increased labour and capital efficiencies. However, a New World developed country such as Australia, with large underdeveloped areas may host more conspicuous changes. In many ways it is simpler to view the latter type of nation as developing, but governed by the rule of law and a strong regulatory environment. This is what makes the difference in terms of the confidence of the investor, government and the informed public.

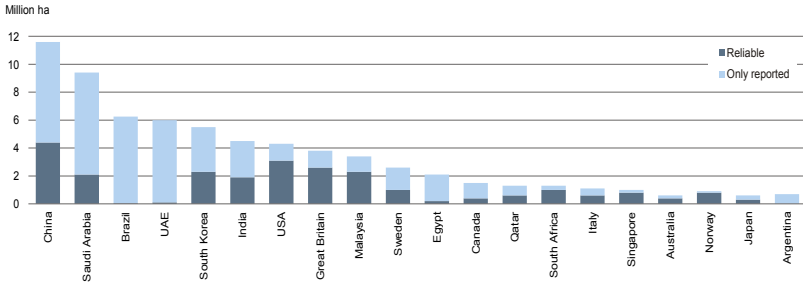
Continuing with the Australian example, a recent review⁴⁶⁵ indicates that foreign buyers of agricultural land are agribusiness companies or investment funds. These are the current iterations of the foreign ownership on which Australia has always relied for additional capital, employment generation, national income, exports, taxation, new technology, improved management, development of processing facilities and opening of new markets,

such as beef to Japan.⁴⁶⁶ It is investment like that, which taking pioneering risks over the past 200 years, has produced both successes and failures as it opened such new ventures as:⁴⁶⁷

- the Australian Agricultural Company (UK) – 202,000 hectare Peel River and Liverpool Plains development in 1824 for sheep and cattle
- the Van Diemen's Land Company (UK) – 142,000 hectare development in Tasmania in 1825 for dairy farming and cheese manufacture⁴⁶⁸
- Canadians George and William Chaffey's 100,000 hectares irrigation development near Mildura in 1895, which indirectly encouraged [Isaburo Takasuka](#) from Japan to experiment with commercial rice growing at Swan Hill⁴⁶⁹
- the Argentinean-British Vestey family's investment in Northern Territory beef and pioneering of refrigerated shipping, freezing and canning of meat in 1914⁴⁷⁰
- US funds support for the Fogg Dam Humpty Doo rice adventure in the Northern Territory in 1956
- Japanese and US investment in the Ord River Irrigation Area in the 1970s
- US cotton growers' development of a cotton industry on the Namoi River in 1961

The private sources of such funds make their investment less contentious than investments by other governments – a distinction assessed in terms of national interests and sovereignty. Nations operating under governance structures uncommon in the developed world and which have not emerged with strong private sectors, tend to manage their business through state-owned enterprises. Such a cultural mismatch is managed in the Australian case by a government foreign investment review process that considers national interest without compromising business initiatives.⁴⁷¹ As for other nations, Australian agribusiness also invests abroad, and while the total figures do not balance inward flows of funds, this can be readily understood in terms of Australia's low ratios of both population and capital availability to land area, because it

remains a vast and newly developed continent. But in global terms foreign investment in agricultural land is a constant factor – one estimate of the 20 major foreign investors in millions of hectares is illustrated in the following Figure.⁴⁷²



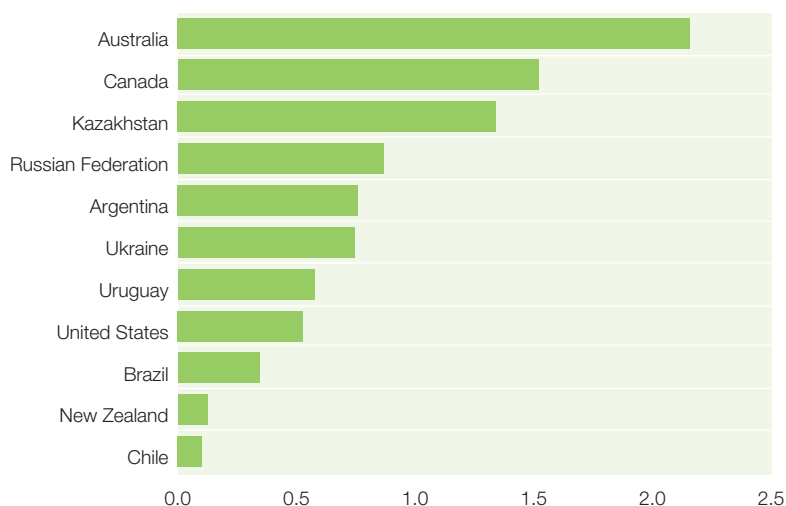
In terms of potential for investment, or if you like, areas of the world in need of inputs to produce food more efficiently and sustainably, the amount of arable land per person is an appropriate indicator. On this basis, as indicated in the following Figure,⁴⁷³ Australia is easily the most in need of investment. This Figure uses the FAO definition of arable land meaning land suitable for crops. Apart from indicating the reason why foreign investment in Australian agriculture is needed, the graph also implies something that Australians do not always acknowledge – that is, expertise is spread very thinly especially the expertise that is required to manage large areas efficiently and sustainably. Australia has had a sound record of educating specialists for such purposes in the past, but policy neglect has allowed that to wind down and for the best talent to be attracted to other sectors. In addition, given that Australia is a middle-income OECD country, the Figure implies that such a low ratio of people to land area would also mean that domestic capital to invest in agricultural development is limited.

I have used Australia as an example rather than developing countries because the question arises from my involvement in a foreign agribusiness investment, and because it offers a means of

explaining at least one beneficial role of agribusiness. Ethical, well-funded and long-term investment in agriculture provides distinct benefits to Australia. In my 40-odd years in the profession of agricultural science, I have learned that the two major constraints of Australian agriculture have been inadequate capital and limited market access. These constraints have in turn contributed to the slow uptake of new technologies and reliance on bulk raw commodities rather than processed export product. There are some who claim that credit limits Australian agriculture, but they fail to note that successful farms manage what debt they enter into very well.

Arable land per capita (hectares per person)

2012 population estimate



Hidden to most Western eyes within ‘capital’ is what may be called the ‘enemy of agricultural innovation’ – debt. Operating in an unsubsidized environment, Australian agriculture is in some ways more similar to developing than developed countries. Debts on agricultural land producing bulk commodities offer average returns that are not substantially above bank lending

rates – and banks are usually operating in business environments with much shorter time frames than the climatic cycles of Australian agriculture. Debt to finance agricultural operations may be different if it is only for real business purposes without ‘family farm’ lifestyle expectations mixed in. These should all be obvious matters, but in the continuous transition that always characterizes agriculture, the opportunity for misrepresentation is great and this has been used for unworthy political purpose. A foreign investor with a long term perspective and capital resources that are not otherwise available to agriculture in Australia should be welcome under this circumstance; one that has no debt at all, should be even more welcome.

From the viewpoint of the foreign investor, there are certain criteria that must be met, such as:

- financial viability of the investment;
- stability of government;
- rule of law, and
- a welcoming investment environment.

Where output from an agribusiness investment is destined for a specific export market, an ethical investor will also consider such other matters as:

- Is the country or region a regular and major net exporter of the product concerned?
- Is there no significant increase in social displacement than would otherwise occur?
- Does national policy prohibit restriction of exports except under conditions of war and catastrophe?
- Are there opportunities to improve production through investment in improved skills and technologies?

If the four initial criteria are met and the answer to the four questions is a firm ‘yes’, then investment can be seen to be potentially viable, and might proceed – but foreign investment remains risky and so even when a viable proposition arises it may not necessarily lead to investment.

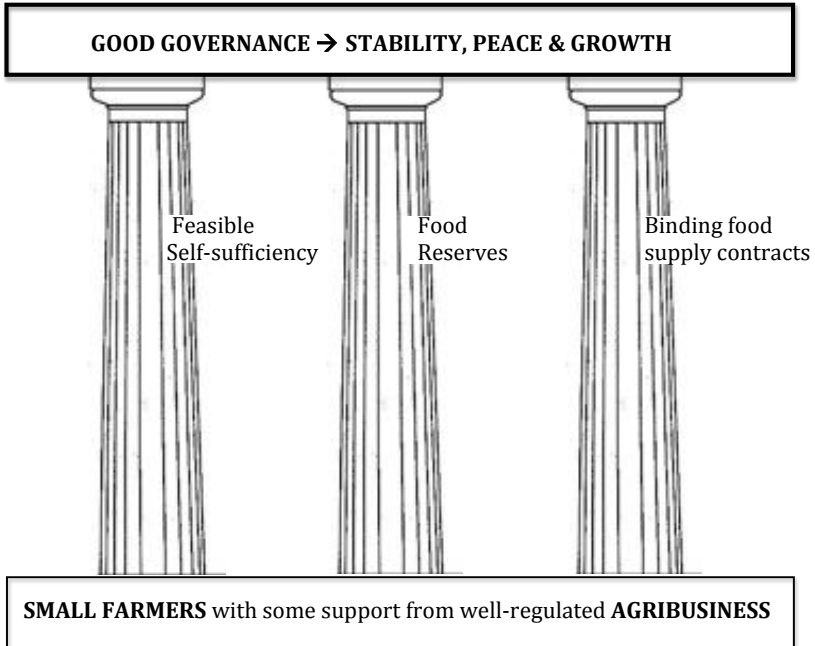
The rigor of this investment decision-making process exceeds that of international development agencies' assessments for loans, which is why debt loads from unviable projects and structural adjustment loans are criticized for constraining governments in poor nations.⁴⁷⁴ And with such detailed assessment, the agribusiness investor who proceeds will seek to minimize risk, which is why the ethics of an investor are important. However, Western law has long understood that reliance on human goodwill is an insufficient safeguard against exploitive actions, and so the same 'rule of law' that creates a reliable investment environment also becomes the means of ensuring that foreign investors abide by the law. As such governance structures are yet to develop in many poorer nations, ethical investment by foreign agribusiness requires an especially high level of integrity.

Good Food Governance

Good governance has been mentioned in more detail in another essay in this book. It is therefore only summarized here in terms of self-sufficient food production and food reserves, which combined with rule of law and enforced regulations as above, forms a basis for beneficial foreign investment in agriculture.

The first relates particularly to poor and food deficit countries – that is, countries that cannot reliably produce sufficient food for their populations, who in turn are not always able to purchase adequate imported food. This is a large proportion of the world's nations at different times. In this situation as argued elsewhere,⁴⁷⁵ the primary responsibility of government is to secure food for its citizens, which is best done through a priority food security plan. Such plans are built on the pillars of; encouragement of realistic levels of food self-sufficiency, food reserves to allay risks of poor harvests, and firm contracts with food exporting countries for supply of essential foods. Both small

farmers and agribusiness contribute to each of these three pillars of good food governance, as illustrated in the following Figure.



Providing an environment that encourages production of local food to achieve a degree of national self-sufficiency clearly involves subsistence farmers who are internally self-sufficient. It may also include agribusiness when governments can enact policies that allow commercial production of food for domestic markets with opportunity for sale in situations of surplus – although this mechanism has not been demonstrated widely. Some current investments by Middle Eastern groups in other Muslim countries appear to offer good options for such an approach.

Food reserves managed by or for government with provision for turnover of grain to ensure its nutritional utility may be supplied

by small surpluses of small farmers and the outputs of agribusiness. Such reserve schemes operate on a commercial basis insofar as grain is purchased at a fair price with government meeting welfare costs. Food reserves may also be comprised of imported grains. Contracts with food surplus nations are ideally binding and long term. As discussed below in terms of food equity, this imbalance of food power is simply a fact of human life, just as it always has been.

The most concerning aspect of governance in food insecure countries is not poor implementation of the above approach – if that was all, it might be expected that it could be remedied by international support. However, international support has been oriented to policies that have discouraged self-sufficiency and food reserves in the interests of creating free markets in global food. The theory is fine, but it is impractical for three main reasons:

- If poor persons in poor nations cannot afford global prices when their local food supply is insufficient from a crop failure for example, they cannot participate in the ideal market.
- If crops fail simultaneously in two major populous countries such as China and India, there would probably not be enough surplus food in the world to feed the hundreds of millions of persons affected. That is why both India and China do not follow the free food trade ethic when it comes to their own security.
- Food is unique, and applying a general theory developed for all goods trivializes the criticality of regular access to food for survival. Water is perhaps similar – which may explain the commercial interest to secure water rights where water is scarce.

This last example concerning water brings us back to enforceable regulations and the rule of law. Enforcement is critical and government needs the competence and will to act on behalf of its citizens if a large commercial group acts against the national

interest of food security under which regime its licence was granted in the first place. The rule of law provides citizens as well as government with means of seeking recourse against illegal actions. It also provides confidence to investors that they can enjoy reasonable returns on their capital.

As noted earlier, poor countries may not have the capability to adequately regulate such agribusinesses. Creating that capability is a bona fide function of international aid, as its benefits flow to all other sectors of the economy and society. However, the situation is different in food surplus nations with strong laws, such as Australia. In those discussions it is important not to be distracted by misused statistics that confuse processed grocery products with real food exports and imports to undermine the country's position as a significant food exporter.⁴⁷⁶ Food security in the sense discussed here relates to foods for healthy survival, not the many manufactured goods that are better considered luxuries. The difference is starkly evident in other countries when food suddenly becomes scarce.

In my opinion, nations that meet the criteria mentioned in the last few pages should be the least controversial targets for foreign agribusiness investors. The most obvious example is Australia, which needs capital and markets that allow use of technologies already available but not adopted locally due to capital limitations on most family farms. Agribusiness investment in that situation can raise management skills to higher levels. But when technologies are not adopted, less new ones are developed and food yields stagnate.

Technology

Technology drives our ability to continue feeding ourselves and the vast majority of that technology comes from detailed research conducted by highly trained scientists. I know this from experience, observation and from reviews of global agricultural

development. The best informed of those scientists also have an historical appreciation, such as described in another essay herein and promoted by the India-based Agri-History Foundation and its Journal.⁴⁷⁷ And in addition to these, I also caution against narrow technological approaches that forget the complex biological interactions that new developments affect.⁴⁷⁸ Unfortunately I am sometimes assumed to be supporting a return to old ways when in fact I am advocating that the best agricultural research includes all sources of information. And notwithstanding ideological criticisms to the contrary, intelligent researchers have long been accommodating the knowledge of traditional societies in fields such as medicine, engineering and agriculture. Such a wide sweep of possibilities requires funding and continuous education of new bright minds to maintain lengthy research efforts that sometimes transcend lifetimes.

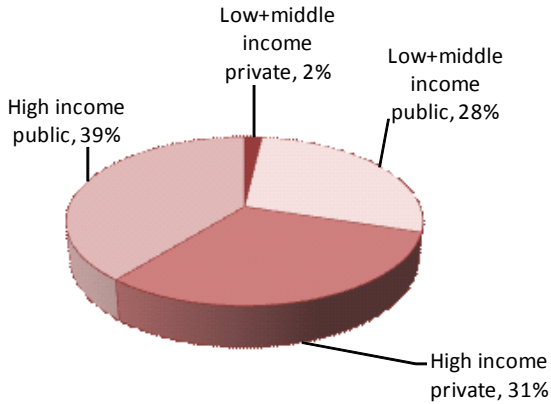
Agricultural research across recent centuries has been conducted in or by wealthy nations. That tradition stimulated the Green Revolution of the 1960-70s that fed hundreds of millions who would otherwise have starved. It did this by adapting technological knowledge to the needs of populous poor countries. However in recent decades, there has been a reduction in the public agricultural research investment by wealthy nations, probably because when food is secure – as it is for most wealthy nations – the benefits from such research seem to accrue disproportionately to the private sector. Logical as this reduction may be in domestic policy terms, it has meant that agricultural research related to food insecure countries can no longer rely simply on adapting innovations from wealthy nations. And in any case, many Western innovations require complex managerial environments that are not available in poor situations.

So who conducts research for the small farmers in the developing world? The obvious candidate for discussion is the Consultative Group on International Agricultural Research, the umbrella organization of the 15 international agricultural research centres that grew out of the Green Revolution. CGIAR is funded largely

like an aid organization with rich country donors supplying the bulk of funds that always fall short of demand. Their work is good, particularly in ensuring that research is maintained as the focus in the face of the various pressures within international aid. And their effect is great when linked to the emerging national research organizations of developing countries, and the rising leadership of China in agricultural research. Nevertheless, overall agricultural research oriented to small farmers in poor countries remains underfunded.

Agribusiness has funds and can attract high performers in research, usually through partial funding in Western institutions from which it seeks to own research products – patents, techniques, genetic rights etc. This attracts criticism, much of it nostalgically referring to past generous funding by governments from which results were available to the world. Perhaps we will one day return to such a world – it is a model that suits some non-Western nations that are of rising global influence – but for the foreseeable future it is more reasonable to look to creating efficiencies within current approaches.

Arguments supporting ownership of technologies developed with company funds are consistent with societal values of recent decades, which have also contributed to the decrease in public funding. Rather than criticize agribusiness for this social change, we do better to look at means of ensuring that agribusiness can engage efficiently in the global efforts to produce more food. In fact there are now many examples of corporate groups freely making their technologies available to poor countries that are not in a position to bear its costs. So to compare agricultural research investment today with past decades, we need to combine aid and private sector contributions. Another means of expressing this is the following Figure,⁴⁷⁹ which illustrates the already high proportion of global agricultural research (total of \$36 billion) contributed by the private sector from high-income countries – 31 percent.



In addition to the relative contributions of research funding coming from government and private sector sources, there is also a shift in the type of research funded by government. Clearly, rich country research to increase sustainable production will be oriented to the sector that has the capacity to apply that research – that is large farms, which means farmers that have incorporated and bought out neighbours to create viable units, and of course the corporate terminology also includes agribusiness groups.

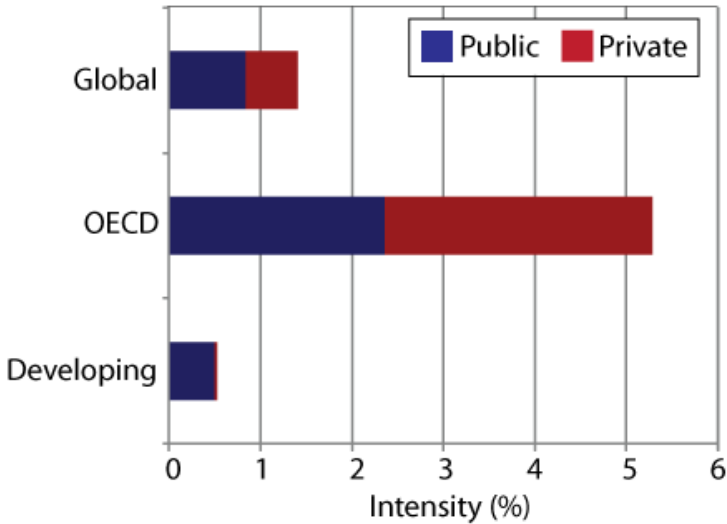
This transition in food production is also leading to a concentration of ownership in food production, and even more in food processing and distribution through supermarkets. As mentioned above, opposition to this change is often well-intentioned but ill-informed of the options available under democratic capitalism. And with the current focus on increased financial responsibility, it is likely that more emphasis will be pushed to the private sector.

Private-sector investment in agricultural research is expected to continue to increase in wealthy countries and the wealthier segments of developing countries. Across the world, agribusiness

is already the more significant promoter and user of new technologies for high-value crops and livestock. This has been accelerated by patent regulations, of which more is considered likely.⁴⁸⁰ At the same time, the decrease in publicly funded research remains of concern when it becomes a politically convenient means of government savings that leads to abrogation of responsibility for long-term socio-economic stability.

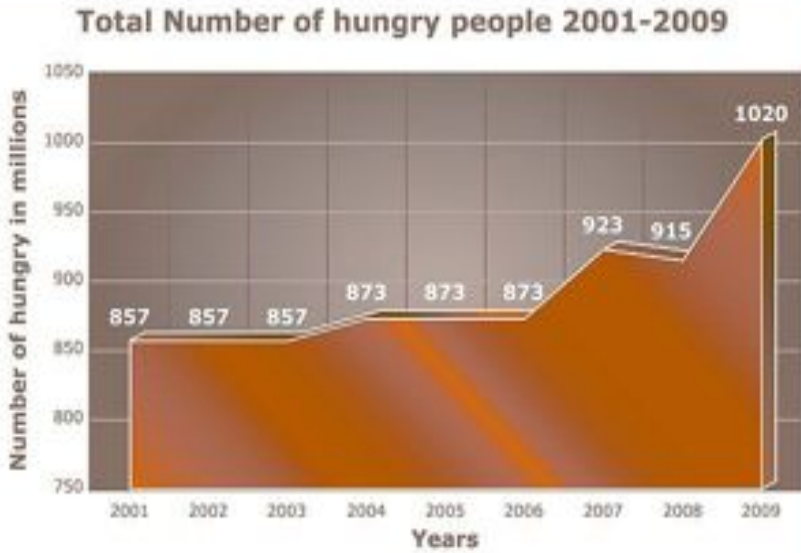
With this continuing shift from last century's reliance on government and philanthropic organizations, the next shift may well be increased cooperation between agribusiness and philanthropy, which may increase the efficiencies of the R&D continuum. Such changes in research emphasis may well include: reduced delays in adopting new technologies; clarification of ownership rights, and adapting commercial crops to new environments – all of which will bring a greater need for effective regulation. Government's role in regulation may in fact be made more effective as it exits from generating technology.⁴⁸¹ But such discussions can easily fall into the trap that Western mores set global change when in fact the world has already changed; for example, China already lends more for international development than does the World Bank and under less restrictive conditions

So part of the answer to the question relates to technology. Agribusiness – designated as private sector in the following Figure⁴⁸² – can be the largest provider on the basis of 'intensity', which means agricultural research expenditure divided by agricultural GDP. In global terms, the Figure also illustrates the inequity in research funding compared with where most food is produced, which is where most food is consumed – the populous developing world. This is a reflection of general inequities that are sometimes glossed over as something that will change in the brave new world that we are working towards. However, it is also worth considering that inequity may be a normal social state.



Home Truths about Food Equity

Food is such an important subject that it is irresponsible to consider it in idealistic terms. If a poor urban family in a developing country spends 70 percent of their income on barely sufficient food, a one-third increase food prices means hunger. 'FAO estimates that in the wake of global food price inflation in 2007/2008, and the subsequent economic recession, the number of chronically hungry in the world has risen by at least 100 million to more than one billion people. The greatest increase has been among the urban poor, women and children.'⁴⁸³ The following Figure⁴⁸⁴ illustrates the rise in hunger induced by those food price rises. Agricultural research is a major mitigating factor against urban hunger, as has occurred in China with its significant government support,⁴⁸⁵ but such funding is not the situation in other countries.



Hunger and starvation have always been with us, and they may always be. It has occurred in times when food was not scarce as well as when it was. We do well to acknowledge that food insecurity is not only about agricultural production, but also due to aggression, ideologies and prejudices that fuel hunger – and these characteristics seem unlikely to change. In fact, there are those who postulate that the rise of agriculture that has allowed the huge rise in world population is associated with an increased selfishness and competitiveness among humans.⁴⁸⁶

It is interesting to briefly explore this tangent that we have become more selfish and competitive. These characteristics are argued⁴⁸⁷ to have arisen with the development of agriculture as a means of providing rare goods that could enhance the status of their owner. For example, a strong man in a group might enslave others to tend a garden to produce such products for gifts at feasts in order to demonstrate his power through largesse. In this conception, the ‘tiller of the soil’ is given the security of being under the protection of the strong man. While this theory of the

origin of agriculture may not be mainstream, it does accommodate anomalies that other theories do not, including; why agriculture was adopted when it entailed much more work than hunting and gathering, and why great effort was apparently invested in growing species initially unsuited to new environments. In recent times, an economic historical interpretation of the social effects of the Industrial Revolution in the UK suggests a further social stratification, with wealthy families producing and raising many more children than their poorer peers and preserving that wealth across generations within the family rather than assisting others in need. More children born to acquisitive parents is thus claimed to have been a population selection pressure.⁴⁸⁸ These theories – two among many – are sufficient to make us consider that the inequities in the world today may be a reflection of these forces, and which could lead to the ancient conclusion that ‘there will never cease to be poor in the land’.⁴⁸⁹

Whether we are more selfish today than in past centuries or millennia must remain moot. What we can observe is that the number of malnourished persons has stayed remarkably constant over the past decades. This means the proportion of malnourished persons has decreased, which should be cause for celebration of the past successes of agricultural science since much of this is due to the technologies spread by the Green Revolution. However, two points stand out that require resolution, viz;

- means to increase food production in food-deficit countries are known and more could be developed with adequate research funding, and
- total global food production in recent decades has usually been sufficient on average for all persons to eat nutritious diets yet pockets of deprivation continue.

These two points are the nub of food inequity. If either or both did not apply, the number of hungry persons in the world would be less. However, I do not see either as likely to change. I have

discussed the first above – reductions in research funding. The second, global sharing of food is unlikely while food surplus nations produce that surplus for sale. This has been graphically confirmed by food producing lands being converted to biofuel production in pursuit of profit, often subsidized by wealthy governments. Reduced food availability from areas removed from food production led to starvation – yet policies did not change with that insight.⁴⁹⁰

So, the home truth is simply that relying on a well-meaning ideal such as ‘all people, at all times, having physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life’⁴⁹¹ may be a worthy goal, but remains unrealistic. Those words are from the World Food Summit, and might have been expected to energize participants towards it, but if we take the indicator of public contributions to research from public sources, it is clear that noble sentiments have not been matched by action. Inequity in access to food remains a global issue – not just that which accommodates ‘food preferences’, but even food that just allows reasonably healthy survival.

Answering the Question

Small farmers are indeed essential for the foreseeable future, not only because they produce about half of the world’s food, but because they also feed their own families – a total of some two billion persons. They are, as the question notes, in danger of being forced off their land, but not by agribusiness that is simply responding to market signals, but by poor government regulation. For this reason, I find that large agribusiness investment is more suited to well-governed countries that are major food exporters. In addition, the technologies essential for continued improvement in food production efficiencies are increasingly funded by agribusiness. This explains how I can support retention of real small farmers – those in poor countries

that are not food-secure – while assisting an agribusiness investment in Australia.

The role of large-scale investment in export agriculture from a well-governed food surplus nation and the role of support for small farmers in populous poor nations are thus different and complementary. There are two food production worlds in this conception – the 85 percent of world farms that are less than two hectares in size, and the large farms. In simple terms, the small farms are potentially more efficient in poor countries and provide valuable welfare support for rural communities, while large agribusiness farms are potentially more efficient in wealthy, well-governed food exporting countries where high labour rates contribute to economies of scale. But lest I paint the picture only in black and white, let me reiterate that agribusiness in poor countries can be well regulated, and can work with small farmers to mutual benefit, as seen in contract farming arrangements that have introduced capital, know-how and technology that would not otherwise have been accessible by small farmers.

The centrality of regulation in dealing with agribusiness is a role of government as part of its primary responsibility to ensure access to food. As the question is personal, I offer a personal response that my involvement with a large agribusiness investor in a rich food-surplus nation is the least controversial interaction. It is in the interests of the country hosting the investment in terms of employment, capital, technology uptake and markets. It is also in the interests of the world in enhancing food production above the levels of undercapitalized farms. I am less convinced about some agribusiness investments in poorly-governed food-deficit countries – although some are obviously beneficial.

To feed the world from agriculture requires each of small farmers, continuing Western family farms and agribusiness. Ensuring food for everyone always requires balancing on a knife-

edge. Thus to me, it is irresponsible to allow such a precarious commodity as food to be subject to ideologies of the well-fed. Ensuring the most efficient production, procurement and distribution of food relies on food-deficit nations securing reliable access to food, which is part of the explanation for wealthy food-deficit nations investing in underdeveloped resources in food-surplus nations. Protecting small farmers in the poor world is quite consistent with supporting a large foreign investor in Australian agriculture.

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paused, then shrugged and started into hers. Arthur stared at his feeling slightly ill. ‘Hey, Earthman,’ said Zaphod with a malicious grin on the face that wasn’t stuffing itself, ‘what’s eating you?’ And the band played on.”

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The Role of Technology’ in a book comprising some papers edited from the conference. The conference was cancelled as a result of the 2011 Japan earthquake, while preparations for the book proceeded until the demise of its key proponent, Mr. Yoshikazu Honda in October 2012, after which works were released from copyright back to authors. The image of Mt. Fuji (富士山) reproduced elsewhere in this book from the YCRI’s card is in homage to the lineage of these sections.

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