

## Securing our food supply over the next 10,000 years

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### Abstract

A secure food supply is the most fundamental requirement of all living organisms, including humans. In those countries with well-fed citizens, that food supply has increasingly been taken for granted. A symptom of the complacency of today's society is the discarding of long-held expertise and knowledge from institutions. These cost-cutting exercises demonstrate insufficient understanding of the value of hard-won accumulated knowledge about food production. The current emphasis on short-term, competitive funding of research in many organisations concerned with both managed and natural ecosystems is contributing to the problem. Also, across the globe, the increasing dominance of urban political influence – remote from the farming landscape – unwittingly contributes to land degradation.

The credibility of science is today being questioned; the agricultural sciences need to respond by protecting the hard-won knowledge entrusted to this generation and pass it on in better shape to future generations. Farmers too need to play a leading role in the evolution of trustworthy food production systems which allow sufficient rewards to them for sustaining the natural resources on which we all depend. In Australia, the greater social disadvantage found in rural regions compared to cities means that it is increasingly difficult to sustain farming families and the infrastructure needed to support them. We must move beyond today's focus on the short-term, towards knowledge systems better suited to inter-generational timeframes.

### Introduction

Imagine tomorrow not being able to fill your trolley at the supermarket with affordable, abundant and safe food. This is a reality today for some billions of people! A large part of the problem for the poor and the hungry in this world is the insincerity and hypocrisy of western nations (Heiser 1973) where we have become so well fed that we take our food and fibre, and the system that provides it, for granted. Few complain when our decision makers choose to allow building or mining on prime agricultural land. It is axiomatic that most people believe there must be plenty of soil left to exploit – sadly, that is not the case.

Complacency is perhaps the biggest threat as it has encouraged society to focus mostly on short-term horizons. Accordingly, governments, institutions and consumers pay lip service to 'sustainability'. Today, in Australia, there is virtually no hope of securing funding support for any study of the 'sustainability' of food production over even one human generation (25 years). And yet, man should be vitally concerned about food production for at least the next 10,000 years.

We in Australia have close to the highest per capita consumption of food and energy in the world and a high percentage of overweight people. As Andrew West of NZ AgResearch (2005) has stated, "The consumer is not always right"! This paper will explore some of the issues limiting the ability of *Homo sapiens* to seriously tackle global food security and attempt to provide a few wishful guidelines for the future.

### Lessons from the past

*Fragility and impermanence.* Many failed food production schemes have already become the subject of archeological digs. Jared Diamond (2005) has chronicled the collapse of many of our previous societies. Nevertheless, man has managed to survive thus far for some 2,000,000 years. Agriculture, which came about because hunting and gathering were no longer able to provide sufficient food for increasing human populations, has only existed for just the last 0.5% of that time (approximately 10,000 years) (Cohen

1977). According to Tribe (2002), “the lesson from history is unambiguous. Past civilisations, based on agricultural development, in the end have proved to be fragile and impermanent.”

*All civilisations depend on food.* “First people were few, and farmers nonexistent. Then there were many more people, and most of them were farmers. Now we are billions. Most of us no longer farm, but the few who do support the rest” (Vasey 1992). This highlights the fact that an increasing proportion of the human population are urbanised and therefore have become less connected to, and knowledgeable about, the systems of food production upon which we all depend.

*The high cost of low farm-gate prices.* In ‘The Evolution of Urban Society’, Adams (1965) described how the development of politically organised societies depends upon the creation of a surplus allowing wealth to be accumulated by those *organising* the production of food. These food surpluses not only ensure that all humans are well fed but also guarantee low prices so that the urban majority are satisfied and civil unrest does not arise. Throughout history, food prices have never taken into account the full costs of production, including the costs of environmental degradation – hence the collapse of many previous agricultural societies. Today, this is still the case as consumers insist on cheap and abundant food supplies which result in farmers continuing to be ‘price takers’.

In some countries, low prices are topped up with subsidies to farmers. Lipton (2004) points out the perverse outcomes of those subsidies; they are disliked both by the consumers in wealthy countries who offer the subsidies and by the poor farmers in countries that are affected by them. He has also pointed out that human poverty – and land degradation – can largely be attributed to three factors: cheap food, scarce investment in agricultural regions, and urban bias by governments which has led to inequities in the development of social infrastructure (Lipton 1989).

*Complacency.* Thus we have a toxic mix of continuing depletion of natural resources, such as soil, that support food production, a continuing need for food surpluses and hence cheap prices and finally complacency on the part of most humans who eat, including the decision makers. Those who govern, in common with some 95% of the developed world in urban societies, typically understand food production poorly. Symptoms of complacency can be seen not only in the disconnect between food prices and environmental stewardship but also in the relatively low social status of farmers, agricultural workers (including scientists and educators) and those who choose to study the practice and/or science of farming.

*Deregulation of prices.* Deregulation of farm prices, whilst increasing the regulation of environmental issues such as native vegetation and water, have led to a predictable clash of goals with severe consequences for the farming community. “Australian governments, strongly influenced by economic rationalist ideology, have given insufficient consideration to the rural social landscape. Little critical reflection has taken place about whether Australia, and its farmers, would actually benefit from deregulation, or what the social impacts of this trend might be. Deregulation inevitably invokes structural adjustment, forces farmers out of agriculture, depopulates rural areas, and creates social hardship. There are also environmental ramifications” (Vanclay 2003). This process continues unabated as Australia attempts to manage water across catchments.

## **Current constraints**

*Short-term funding.* How can research projects, which are commonly funded for just 3 years, answer questions relevant to food security over generations, let alone thousands of years? Whilst the funding of Cooperative Research Centres in Australia, over 7 year cycles, gives the illusion of longer term funding, their ‘mid-term reviews’ still reinforce 3-year horizons for most research projects. And it is not only research that suffers from stop-start inefficiencies. Important long-term environmental work is hampered by the intermittent support for programs such as Landcare and of social and economic programs such as the Rural Financial Counselling Service.

*Short-term careers.* The stop-start nature of research funding has resulted in less secure and less attractive careers for researchers thus impacting on the continuity of knowledge. The throwing of career-

long expertise on the scrap heap through, for example, voluntary redundancies from agricultural institutions, inhibits inter-generational transfer of knowledge. This practice is ensuring that many wheels will need to be re-invented. As Lowe (2006) has said in relation to a sustainable future for Australia “as long as politicians are more concerned about the next election than the next generation, we won't get the reforms we need”.

*Unstable institutions.* The ‘churn’ of government departments which frequently change their names and roles is not helpful to the maintenance of trustworthy sources of information. For example, in New South Wales, the change from NSW Agriculture to NSW Agriculture & Fisheries to NSW Department of Primary Industries and most recently to NSW Industry & Investment, has done little to bolster morale among current employees, has disenfranchised the goodwill of former employees and confused the public. Other States too have suffered similar upheavals leading to rapid changes in primary client groups and important priorities (Wissemann *et al.* 2003).

*Managerialism.* Morale in national research institutions and universities has been affected by a rise in ‘top-down’ management thus restricting the opportunity for ‘bottom-up’ creativity by researchers. “Managerialism, that combination of over-management, political correctness and paralysis by analysis has infected science to an incredible degree” (Paltridge 2003). In 1994, a Federal Senate enquiry into the administration and funding of rural research in CSIRO found serious problems affecting the maintenance of a critical mass of researchers. “The final result will be that the critical mass necessary for efficient research will be lost in many areas vital to Australia’s agricultural economy. The Committee recommends that the CSIRO Board address the problems of employment insecurity, poor conditions of employment, low career status, excessive accountability, stresses of fund-raising, ineffective industrial participation and low morale among its rural research staff as a matter of urgency” (Anonymous 1994). Sixteen years later, it seems that little has changed as, according to Beeby (2010), “Scientists at CSIRO ... are becoming more confused, frustrated, unhappy and burned out by battles with management bureaucracy, according to a new report.”

Researchers in universities, national and state research bodies are commonly highly constrained from making public comments about their research, especially if the content might relate to government policy; the consequence is diminished public trust in those bodies. As noted by Saunders (2006) “Managerialism has radically curtailed freedom of speech in the modern Australian university”. Universities in Australia have recently been seen by the Federal Government as a significant export ‘industry’! As Macquarie University’s Vice Chancellor, Stephen Schwartz (2010) has stated recently: “We live in the age of money, and money is what the modern university is all about”. Added to this, the proposed bureaucracy of the Tertiary Education Quality and Standards Agency will ensure that “morale among academics will further decline and many will flee the profession” (Gora 2010) resulting in lower quality education.

*Socially disadvantaged regions.* Issues such as the inability to attract sufficient skilled employees to rural regions are exacerbated by the lack of investment in regional infrastructure, an issue that is linked to population policy. How can regions ever be ‘sustainable’ if obstetric services are not available to welcome the next generation? Regional centres surely need equivalent ‘quality of life’ services to those in urban areas if problems of social disadvantage are ever to be overcome in the regions.

*Publish AND perish.* “Modern science is incredibly competitive” (Paltridge 2003), resulting in the perverse outcome of an ever-burgeoning but largely unread literature. Governments, in order to quantify intensely competitive research performance, have resorted to the ridiculous methodology of *counting* the number of published papers thus valuing quantity over quality. Today we have “... a scientific literature so vast and overladen with the minutiae of the unimportant that most of it is never read by anyone” (Paltridge 2003). This is accompanied by the explosion of some 20,000 scientific journals, allowing many papers to eventually be published in spite of the fact that initial peer review by quality journals may have found those papers to be unworthy of publication. The result is that, as exemplified by the interpretation of the diverse literature on climate change, the scientific literature is being found wanting. Eventually, this could threaten the trust in the objectivity of science that has been built up over the past century and, in particular, the science concerning approaches to sustainable farming which, by its very nature, depends on multi-disciplinary understanding of complex, long-term, biophysical and bioeconomic systems.

## Some guidelines for the future

*Nurturing inter-generational knowledge.* As a secure food supply indefinitely into the future is not assured, human societies across the world must respond by abandoning their complacency and developing and protecting robust knowledge systems that will transfer knowledge reliably between generations. The young discipline of Agricultural Science needs to respond in new ways to regain the trust it deserves. It can do this by focusing on the provision of objective information accompanied by explicit declarations of any vested interests. We need new ways of representing the complexity of multi-disciplinary knowledge as it exists in literature, models and as primary datasets. We need an ever-evolving, robust scaffold of knowledge that can be trusted, not only by scientists, but also by farmers, consumers, journalists and policy makers.

*Long-term focus.* Because of the critical need for food security over the long-term, ongoing support over the long-term is warranted. A critical mass of well-trained researchers, recruited from the most talented of our students, need to enjoy rewarding and productive careers without the burden and inefficiency of stop-start, short-term project funding. Projects judged to be worthy need 'over-the-horizon' funding so that long-term outcomes can be realised.

*Efficient life cycle of production/consumption.* It is clear that we will always need sufficient quantities of high quality and safe food energy and protein, whether it is derived from soil in paddocks or from industrial processes. Currently, "constraints are emerging in terms of land and water resources as well as imperatives to reduce greenhouse gas emissions" (Keating and Carberry 2010). Issues such as soil erosion and soil loss through urbanisation and mining, together with water and nutrient cycles need to be tackled urgently. Ideally, food needs to be produced near where it is consumed so that the life cycle of food production, processing, transport, consumption and waste nutrient recycling can be made as efficient as possible.

*Farmer involvement.* Importantly, farmers need to become more engaged in long-term issues, including research directions, as top-down approaches have not been effective in maintaining the skill base to support our food supply system. They also need to help develop, in conjunction with consumers, a new system of rewards so that those who feed us can afford to do so whilst sustaining the natural resources that support food production. Profitable farming will also result in thriving regional communities.

*Homo sapiens as part of global ecology.* If we are to enjoy sufficient safe and healthy food over the long-term, for at least the next 10,000 years, we will need to better understand the ecological interactions that support this hungry organism, man, and his co-inhabitants of this finite planet and implement policies in the light of this understanding. Although human populations have thus far adjusted to ecological challenges (Cohen 1977), the scale and speed of change currently required of human food production systems, is unprecedented.

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