

Book reviews

The environment, our natural resources and modern technology. By Thomas R. DeGregori. Published in 2002 by Iowa State University Press. ISBN: 0813808693. 224 p.

The origin of the organic agriculture debate. By Thomas R. DeGregori. Published in 2004 by Iowa State University Press. ISBN: 0813805139. 211 p.

DeGregori's books deal with a paradox of the 20th century—that advances in science and technology are blamed for detrimental effects upon our environment while the gains in life expectancy (reflecting improved standard of living and health) that the advances gave us are largely denied. The paradox is epitomised/aphorised in his question “if science is killing us, why are we living so long?”.

In 2001, Iowa Press published his book “Agriculture and modern technology”. This book provided information on the benefits and downsides of modern technology—and what it will take to sort out the problems—from the philosophy of Plato to genetic engineering (DeGregori 2001). The latest books follow the theme, and, with his first book (“A theory of technology”, published in 1985), are described as a quadrilogy. However, whereas the 2001 book concentrates on agriculture, increased food supply (and the consequent increase in health and longevity), the next book presents information on the environment. The latest book (“The origin of the organic agriculture debate”) examines “natural” methods versus the alternatives. Although there are some overlaps in content of all three books published this century, the two latest books are important reading for those who are aiming to be socially responsible and live a “simple life”. Here, one can find out more about what it really costs to be a green consumer, and be reminded that “it is hard to be green when one is in the red”. Indeed, “Green consumerism” is described as a fetish of the affluent—nobody else can afford it...

From green consumerism, through racism, elitism, and environmentalism, and discussing various different, less technological racial groups (including

paradise in the Pacific), DeGregori moves to human endeavour as a creative force, explaining how technology gives us the promise of modernity.

Natural lifestyles are highly expensive. Food with the organic label tends to be more expensive in the shops than conventional food, reflecting lower yields and higher production costs. Furthermore, a calculation (Carlson 2000) has suggested that “recyclable, cheap, plain and nostalgic goods = \$459.40; expensive, high tech and sophisticated equivalents = \$145.83.” How many people can afford the simple life?

The ultimate (the word was chosen by DeGregori with care) in green consumerism is an eco-coffin made from recycled fibre-board or chicken excrement. The latest advance in corpus disposal (Reuters 2001) involves snap freezing in liquid N, resulting in “up to 65 pounds of pure organic matter, which is put into a thin, easily degradable coffin”. This enriches the soil even as autumn leaves, in comparison with conventional burial where “the body takes 50–60 years to decompose” and cremation which is reputed to emit poisonous gases with unknown effects (Reuters 2001).

Professor Tom Walker, FNZIAS and recipient of the RSNZ Rutherford Medal and NZIAS Jubilee Medal for outstanding contribution to science and the understanding of science, favours composting of bodies. However, it was pointed out to him by the then Governor-General, who had just presented him with the Rutherford Medal, that composting involves turning at regular intervals, and he, for one, did not feel favourably towards the concept.

As DeGregori explains, protection has many different facets. When other races are involved, where does “protection” become racism and elitism? “Charges of Racial Insensitivity Beset Environmentalists” appeared as a headline in “Christian science monitor” (November 1999). The problem occurs when environmentalists have assumed the right to speak for those who presumably cannot speak for themselves. The plight of the Huaorani of the Ecuadorian Amazon attracted many environmental and human-rights NGOs to act on their behalf—but when

contacted, nobody in the organisations “knew how to contact the Huaorani, and nor did they know what they wanted or even who they were”.

Closer to home, the Polynesians, aboriginals and Maori people have had similar histories and are now minority people in their ancestral lands. DeGregori acknowledges legitimate grievances, which must be addressed with “a combination of intelligent, militant activism and a positive response from at least some members of the dominant community”. He also provides evidence to suggest that the belief that “prehistoric Oceanic peoples avidly practised a ‘conservation ethic’ towards their island habitat” (Kirch 1984) is a myth. The islanders did what is normal to ensure personal survival and that of their immediate family (Pawson & Brooking 2002)—they mined the easily accessible and protein-rich seam of big-game resources until these game sources declined significantly (Anderson 1997).

Yet another way to protect the environment has been to consider it as a resource. The contradiction in the term “Ecotourism” is explained; it is an issue already under discussion in New Zealand. Creating and maintaining facilities requires the revenue of large volumes of tourists passing through; this places a strain on the environment. How many people can Milford Sound sustain? Or the National Parks? How does ‘minimal impact’ camping affect the environment? All these questions were headline news during the Christmas 2003/2004 holidays. DeGregori also discusses the different approaches to the disposal of excrement. “Some haul it out even when it could be recycled through the ecosystem. Some allow for burial of excrement at appropriate depth but not at elevations above the tree line, where it must be smeared on the north wall of rock faces so it can be degraded by sunlight. Not only are these ‘responsible’ forms of consumption expensive, they are time consuming and difficult due to all the consumption boycotts and taboos (Milbank 1991)”. Frankly, the thought of anybody smearing is enough to put the less intrepid explorer off moving above the tree line.

The second book is entitled “The origins of the organic debate” but covers more. In this book the focus is on the 19th and 20th centuries, with a “double-helix contrast of advances in science, medicine and agriculture with oppositional beliefs in homeopathy and organic agriculture”. Chapters cover such topics as integration, reductionism, vitalism and homeopathy, rejected knowledge, the Precautionary Principle, and risk.

Pasteur was probably the last great scientist to defend vitalism—the tenet that nature was possessed

of a soul as “even inanimate material showed signs of life, as demonstrated by such phenomenon as electricity and magnetism”. Vitalism persisted, but not in science. Holism was coined as an alternative (e.g., “Holism and evolution”, written by Jan Christian Smuts) and homeopathic medicine became recognised as part of the reaction to the emerging scientific enquiry of the 19th century. The issues in homeopathy, which include the reaction against MMR vaccine, are explained in detail—and anybody who has ever thought that vaccination is “over the top in this day and age” should read the section on the British Vaccination Acts of 1840 and 1853. The Acts showed vision which saved lives and health. “Tragically, among some groups the immunisation rate has fallen below the percentage (generally about 95%) necessary for ‘herd immunity’.”

Rejected knowledge involves idealising or romanticising the past—which is both wrong and dangerous. Organic agriculture, vegetarianisms and natural medicine are linked, and are described as an integral part of the Nazi ideology for many of its leading advocates. Richard Walther Darre, Nazi Minister of Agriculture from 1933–43, promoted chemical-free “agriculture according to the laws of nature” and “farming methods according to the laws of life”. It was during the 1940s that Tom Walker was working in Britain “digging for Victory” and explaining how to increase yields using fertilisers (Walker 2003). The chapter makes the point clearly that rejecting any knowledge gained through rigorous methods will prevent advancement of society unless the benefits and risks are explored—which is part of the Precautionary Principle.

The precautionary principle states that “when an activity raises threats of harm to the environment or human health, precautionary measures should be taken even if some cause and effect relationships are not fully established”. It does not say “if in doubt, don’t do it”. Green opponents have made capital of the fact that no scientist will ever declare “100% safe”; they have stated that “absence of evidence of harm is not evidence of absence of harm”. Following this train of thought leads us into a world where no novelty is ever allowed—life mimicking art even as the inhabitants of Newf kill any mutant, “The chrysalids” (Wyndham). As well as providing data and references that all concerned with the debate should have at their fingertips, the chapter provides balanced statements on what we should be considering—the alternatives to not trying to make advances. He reminds us that the BBC Panorama programme, which ran in the 1980s, “Are transplant

donors really dead?" (described as a farrago of inaccuracy) resulted in a reduction in organ donation for a decade. In "Feeding six billion people" the data on the application of science and technology to agriculture and consequent increases in yields and quality are presented. Its very success is part of our problem because it is taken so much for granted. And explaining it in simple terms is not easy. DeGregori assists remarkably, making the arguments easy for you.

Risk is the final chapter before the epilogue, and again helps to make the case that reasonable people seek to avoid unnecessary risk. Whereas we can try and explain that most people accept the risk of getting into a car or onto an aeroplane as a necessary part of life, DeGregori helps us explain that those at greatest risk are the very poorest, particularly in developing countries. In agricultural research, much of our work is about reducing risks to production, and our work has put New Zealand as one of the most efficient producers in the world. More than that, we have always had a strong technology transfer component to our work, and other countries have benefited from our research. In agricultural production we have been leaders in globalisation (Rowarth 2004); it is sometimes forgotten by Green opponents that less developed countries depend upon our advances for theirs.

Advances in scientific understanding have saved far more lives than they have taken. Although Jeremy Griffiths, author of "Species in denial" (Griffiths 2003) might argue, humans tend towards "doing good"; most scientists chose their career because they wanted to do something worthwhile—and "worthwhile" is judged in society's eyes. As John Dewey states it, science and technology are the means developed by humans to take that which threatens us and transform it by turning the "powers of nature to account" to advance the human endeavour (Dewey 1929).

DeGregori's second question, which continues to be answered with deafening silence, is "If modern food lacks nutrition, why are we so healthy?". The world is feeding more people, to a better state of nutrition, on very little more land (approximately 7% extra) than in the 1960s. Advances in science and technology, applied to agriculture, have allowed this extraordinary improvement. The problem is that society makes the wrong contrasts. Rivers in New Zealand contained less animal urine in the past than they do now, but gross domestic product was lower. Life was less complex in the past, but keeping clean took longer. Historical contrasts do not recognise the

risks and alternatives—the scenarios if a different choice not to use an advance in technology had been made.

DeGregori's books remind us that we make choices and deal with the consequences. The choice we made to use organo-phosphates increased crop yields but created the spectre of residues. Although nobody has died (except by deliberate overdose), and it could be argued that many people have lived with better nutrition, we are told that agriculturalists have poisoned the environment. Similarly, DDT, which has saved millions of lives by virtually eliminating malaria in some areas, is blamed for a decrease in numbers of birds of prey.

As scientists we "follow a noble calling", enthused by the excitement of the chase in discovery, but are victims of our own success and our own arrogance. In most areas of science we have moved faster than society; the lag in understanding is what we are now dealing with in the GE debate. Communication will be the answer, as it is in so many arguments between groups. In DeGregori's words, "Science offers the possibility to be a transcultural unifying force in a diverse world. Critics may point to its shortcomings, which are many as is the case for any human endeavour, but science offers a hope of overcoming the barriers that have historically divided us."

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J. S. ROWARTH
 Unitec New Zealand
 Private Bag 92 025
 Auckland

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Like many agricultural industry conferences these proceedings reflect the diverse nature of the technologies utilised in the sector, and there are not always clear themes or a framework to the proceedings that facilitates a concise review of the contents. Despite these limitations, there are some structural elements to the proceedings that can be used to guide readers.

In the initial part of the proceedings are some excellent papers that describe global economic and structural trends in the chicken meat industry. These papers set some future growth projections for the industry and discuss the likely distribution of production throughout the world. The next major section in the proceedings describes issues surrounding early chick development, and its relationship to hatching egg quality, gut and immune system development, early nutrition and intestinal microflora. There are several papers that undertake a detailed analysis of the growth potential of broiler chickens and on the reproductive potential of breeders.

Another significant component of the proceedings discusses the issues surrounding antibiotic growth

promotants (AGPs), alternatives to antibiotics, gut integrity, mycotoxins, enzymes, and natural antioxidants. There are also some papers on quality assurance processes and an interesting paper on resource allocation software for feed milling.

In the papers that make economic projections on the chicken meat industry there were several important strategic issues that readers may find useful in future planning. Firstly, there are projections for further growth of chicken meat consumption in the United States industry based on product differentiation, which will have important ramifications for Western economies. Secondly, there are concerns expressed in the proceedings about the supply of grain/protein meals that will represent a major constraint limiting the expansion of the chicken meat industry in Asia and many other countries. Clearly, Brazil is well placed to exploit both export demand for chicken meat, and supply feedstuffs to the poultry industry in other continents. The impact of the genetically modified organism (GMO) debate, and the stance of different countries on these issues, will need to be monitored very closely as the global grain industry differentiates these products. The only obvious deficiency in the proceedings was a dearth of analysis of the global grain trade to accompany the excellent analysis of the chicken meat industry.

An important economic principle outlined in the proceedings is the need for the application of the concept of calorific conversion of energy to proteinaceous mass. These principles seem very important in Western economies as a driver of further efficiency gains, but may have little relevance in under-developed economies. The analysis in the proceedings suggests that the high cost of the Western technology required for broiler chicken production, together with the low supplies of animal feedstuffs, is constraining growth of the chicken meat industry in Asia. The movement of populations from rural to urban centres in Asia is likely to alter this equilibrium, and many developed Asian economies provide a logical model for this transition. These socio-economic changes in Asia should have very large flow on ramifications for both the chicken meat industry supply and the global grain trade, and need to be modelled for effective long-term planning of the chicken meat industry in all countries.

The evolution of communication technologies and the globalisation of food retailing are having very significant impacts on the flow of consumer awareness and knowledge, and as a consequence many of the important issues confronting the chicken

meat industry have become consistent around the globe. The issues described in these proceedings are the use of genetically modified organisms, antibiotic growth promotants, environmental questions of odour and waste disposal, food safety issues, and bird health in relationship to fast growth. These proceedings attempt to discuss all these issues and provide some potential solutions and new research opportunities.

One of the most important themes that arises in many papers is the need for more compartmentalisation of broiler chicken growth that enables metabolic and immune function to be studied more precisely in the first 7–10 days of life. A greater understanding of these processes at a basic scientific level will be important for the future of the industry, as this early growth becomes a more significant component of overall growth. A practical paper within the proceedings suggests that 7-day weight is a key marker of performance, and that poor performance in early growth is rarely overcome despite the compensatory growth phenomena.

Another important theme arising in many papers is the need to develop technologies that can predict responses to nutrition supplements and define nutritional adequacy. The impact of phytase enzymes on mineral metabolism is well known, but the indirect effects of these enzymes on energy and protein metabolism clearly need additional definition, and may provide significant new opportunities to refine nutrient availability and feed conversion.

In addition to the papers on biological science there are also a few papers that provide insights into managerial systems that can be applied in food safety, resource allocation, and practical flock management.

There are several papers in which the role of litter composition is discussed in relationship to waste reduction and odour management. These issues are likely to be very important if the industry is to continue expansion at the rates projected, because these issues interact with the capacity to construct

shedding infrastructure in most countries. Studies of faecal output/composition and litter composition, in both laboratory models and commercial practice, have significant potential to impact on both economic performance and environmental outcomes.

In some ways the breadth of the topics covered in the proceedings illustrates one of the fundamental problems of technological innovation. If research and development activities remain broad with a limited focus then the rate of gain is likely to reflect the resources allocated. One of the major difficulties I foresee in resource allocation for research is establishing systems that objectively analyse both the opportunities and the risk of basic research, and then finds a balance with resources allocated to more applied research. There are often no clear answers to this problem, but thought should be given to international centres around the world with strategic alignments to the medical research community for research directed at questions of fundamental biology.

In conclusion, I encourage all poultry scientists to read the proceedings as a means of understanding the breadth of the issues confronting the chicken meat industry and the commonality of many of the problems. A detailed analysis of many of the papers will provide both researchers and commercial nutritionists with many new opportunities. The long-term challenge for the poultry science community is to improve resource allocation for research and development on a global basis, rather than a provincial continental basis. Many of the larger problems now require sustained research effort over the medium to long term (10–20 years) for effective solutions to be created and larger research groups will be required to maintain the momentum.

GREG PARKINSON

Victorian Institute of Animal Science
Department of Primary Industry
Victoria
Australia

