

Futurewatch*

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Food, Fibres

Global and Local

Food Wars: The Global Battle for Mouths, Minds and Markets, T. Lang, M. Heasman, Earthscan, 04. The food policy crisis /wars revolve around three dominant worldviews or paradigms. The Productionist features production-led monoculture supply-chains; Life Science Integrated is based on mechanistic, science-based interpretations of environment and health, treating food almost like a drug; Ecologically Integrated is also science informed, incorporating ecological principles, rediscovered local skills and rational knowledge. Detailed examination of trends in many aspects of the food industry include emphasis on the food/health link.

T. Moss, A. Bannon, *World Policy Journal*, Summer 04, report on the drive by poor African nations for reform of the global agricultural trading policies of the rich nations. The OECD nations spend nearly four times more on subsidies annually than they give in global foreign aid. Part of the resistance to reform comes from the political power of agricultural interest groups, but the idealised western view of small farms and rural life plays a part. Reformers must realise that change will be slow: they should select targets carefully and build opportunistic alliances.

S. B. Brush carefully examines and celebrates *Farmer's Bounty: Locating Crop Diversity in the Contemporary World*, Yale Univ. Press, 04. He concluded that the dilemmas of the "ownership" of such diversity will eventually favour the patent systems.

Far Eastern Economic Review, 14 Oct, 04 pp 32-35, explores the current policy struggle in China over the futures of retaining land use for food self-sufficiency based on cereals, or a free-trade led push to raise rural incomes and encourage export-led horticulture. Already half the global vegetable and melon production comes from China

US food economics expert T. E. Elam, *Australian Farm Journal*, June, 04 foresees that crop and feed conversions will have to become increasingly productive and efficient if the global meat demand over the next twenty-five years is to be met without damaging the environment. Shorter-term higher prices for constrained supply will reduce consumption and hurt producers. International agricultural policy experts warn, *National Business Review*, 8 April, 05, p13, that New Zealand producers cannot continue to produce food commodities at increasingly low prices without exhausting themselves and the natural environmental capital. The national clean, green image could fade if their international consumers are sufficiently concerned to factor in the ethics of production, processing and transport.

Down on the (Mostly Dairy) Farms

An international expert analysing the global dairy industry, M. Vooerbergen, notes that Australia and New Zealand are becoming the principal suppliers for the growing demand for these products. The EU's declining production is likely to remain within its borders, USA lacks the ambition and Argentina lacks the potential for dominance. *Countrywide*, August 04, p14.

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Growing for Good: Intensive Farming, Sustainability and New Zealand's Environment, Report from NZ Parliamentary Commissioner for the Environment, Nov. 04, looks at horticulture, sheep/beef and viticulture production but predominantly at dairying. Despite signs of progress, New Zealand farmers need to make radical changes to maintain the natural capital of their farms and ensure future prosperity. Well developed sets of environmental and social indicators are needed. Three areas of concern especially related to the dairying industry are:- remedying pollution from farms, managing the use of nitrogen fertiliser and dealing with faecal contamination of waterways.

The past decade has seen NZ dairy farms endeavouring to increase productivity to the limit from often overvalued land by using much more off-farm inputs especially nitrogen fertiliser and irrigation. Farm energy consumption has doubled over the past two decades. Water quality for drinking is declining as groundwater becomes contaminated. Soil erosion or sedimentation is becoming increasingly costly. See also selected reports and response in *Dairy Exporter Dec*, 04. Included is a response by AG Research CEO A. West on a research initiative to radically redesign dairyfarm systems. This should feature closed water cycles and much greater energy efficiency. Closed water systems would remove water from products such as milk, at source, to reduce energy wastage in transport.

A recent UK report on a five year research study warns that nitrogen pollution is becoming a major threat to the global environment. A transformed understanding of the effects of its excess on plants, water ways and grasslands has been achieved. *Nature*, 24 Feb, 05, p791. Further UK/German research warns that official estimations of greenhouse gas potentials have seriously underestimated the role of nitrous oxide from fertiliser use. *Nature*, 17 March, 05, p262.

N.Z.'s Meat Biologics Consortium seeks to move this major export earner further up the value chain into the highly lucrative meat biologics market. Intensive research is examining meat proteins and enzymes, for nutraceutical

and health supplements. One current success is chondroitin sulphate from cattle trachea which is combined with a shellfish-derived chemical to produce a beneficial supplement for arthritis. A similar policy is enabling the commercial production of keratin-based health products, for skin, cartilage and surgical dressings, from wool which is largely keratin. *Meat and Wool New Zealand*, June, 05.

The GM Debate Continues

Danish systems analysts K. Borch, B. Rasmussen, *Technological Forecasting and Social Change*, Vol 72, June 05, p 549-566, conducted studies among researchers and other stakeholders to establish a basis for dialogue in the highly conflicted area of GM crops. Their techniques are described. The results revealed the potential for a more free-flowing debate around three broad issues: - that a broad perspective on risk is crucial, that international regulation must make allowances for developing countries and that a better configuration of the risk debate is needed.

RAND, *The Future of Genetically Modified Crops: Lessons from the Green Revolution*, F. Wu, W. P. Butz, 04, provides a useful summary and comparison, with details on the science, funding, places, policies, failures and lessons. Particularly useful are: - the warnings that GM is one of several future options, the lessons from the past for broadening the impact of GM crops and relevant implications for stakeholders.

Agricultural Biotechnology: Meeting the Needs of the Poor, is embedded in FAO's annual *State of Food and Agriculture* report, May 04. FAO has finally come to an affirmative conclusion, drawing on its own exhaustive statistical and other research information with especial focus on Africa, which largely missed out on the Green Revolution. Driving its new position is concern for the 2030 horizon of food sufficiency for an extra two billion people.

Community researcher and biologist, L. Joensen, S. Semino, *Seedling*, Oct 04 explored the impact of GM soybeans cultivation in Argentina, where acreage has increased exponentially over the past decade. Stimulated by its financial crisis, Argentina has focused on export-

led GM soya. Forest has been cleared, but machinery has replaced labour and the rural exodus to the slums has exacerbated unemployment. Soil conditions have declined, and so has the diet, as soybeans replace mixed farm products. Rising hunger and malnutrition have led to official efforts to promote soy above the quality of the previous diet.

Introgression from Genetically Modified Plants into Wild Relatives, Eds, H. C. M. den Nijs *et al*, CABI, 04. Research into the natural hybridisation which occurs when some GM crops and their wild relatives grow close to each other. It shows that most pairings are barely affected, but some are, such as rice and sugar beet. Specific crops are detailed. The possibility of a "superweed" is so far relatively remote except for bad effects in beet crops.

New Perspectives on Fisheries

A consortia of experts, E. K. Pikitch *et al*, outline a new approach to fisheries management, ecosystem-based fishery management (EBFM) based on the holistic approach which considers not just the single target species, but rather the whole fish system and place of various species within it. Ocean Zoning is crucial to this. It examines type and level of allowable human activity, spatially and temporally. A key goal will also be examination of by-catch, a quarter of the current global marine fish catch, which can play a key role in ecosystems. Areas where there is limited data about target species require judicious use of the precautionary principle, but more data collection is a priority. New analytical and management tools will need to be developed. Rebuilding degraded systems may mean shorter term impacts for fishing industries and compensation. *Science*, 16 July 04.

National Institute of Water and Atmosphere (NIWA), is using a number of models, nested within each other to analyse different parts of oceanic systems. Trophic models summarise the species in such a system and changes. Already in NZ waters it has been found that larger fish are disappearing, and small species which are more efficient at exploiting available food, are taking over. *Water and*

Atmosphere, 12(2), 04.

Conservation ecologists of North Sea systems note that warming waters over the past twenty-five years are altering patterns of fish populations, sending them further north and deeper. Recovery of depleted fisheries will be hampered. *Science*, 13 May, 05, p 9337. A database of evidence over nearly eighty years records decline in the density of krill, crucial support for Southern Ocean fisheries. Their summer densities are affected by the extent of the previous winter's sea ice. Latterly, as krill have declined, salps, which tolerate warmer waters, are predominating. *Nature*, 4 Nov, 04, pp100-101.

Earlier international recognition of the threats to the health of unique habitats in international waters led to agreement that a network of marine reserves, representing these types of habitats, such as seamounts, thermal vents and deep ocean trenches, should be set up by 2012. Evidence of the wealth of species in these habitats mounts daily. The hurdles to realisation of such reserves are formidable. *Nature*, 4 Nov, 04, pp12-14

The End of the Line: How Overfishing is Changing the World and What We Eat, C. Clover, Ebury, 04, provides a readable journey through the follies of the various actors in the global fishing system, with some hopeful, possible, working policies.

Communications/Transport

Whose Power and Profit in IT?

Dutch futurist M. Bullinga, *The Futurist*, July-Aug, 04, foresees an era of "automatic governance" as we become surrounded with equipment containing self-service technology which continuously monitors our environment and most of our activities, then acts on that information. Governments will gain power as these ICT tools provide a safer, more law abiding world. Laws will automatically download via open-standards software into the objects cars, appliances, machinery and buildings in our physical environment rendering paper laws obsolete. Privacy will be better protected for those who are law

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abiding.

Information Technology and the Corrosion of Competitive Advantage, N. Carr, Harvard Business School Press, 04. The writer explores his argument that companies will soon be treating IT as a commodity which they acquire and put together according to need, or hire in as need be, rather than seeking advantage with bespoke systems.

Service-oriented architectures (SOA) are likely to create an industrial revolution for software, according to a leading Motorola strategist. Cheaper, more flexible computer systems are being developed to meet the demand of business for speed, flexibility and adaptability. For programmers, many questions need to be asked about the what? where? who? etc of the many services companies demand, together with the protocols for access to service, quality, security etc. Programmers will have to change their mindsets and skills to consider not just isolated applications, but the needs and character of the users. *Financial Times IT Review*, 26 Jan, p 1.

Free Culture: How Big Media Uses Technology and the Law to Lock Down Culture and Control Creativity, L. Lessig, Penguin 04 (Download free for non-commercial users). A Stanford Univ. expert on Internet law forcefully argues against the permissive extension of copyright law by a pliable Congress. The traditional governance of copyright sought to balance the protection for the authors and publisher, with the interests of wider creativity and "free culture". Copyright durations and their scope have been increased in USA to apply to all media and derivative works for over ninety years. Ultimately this power of corporations to preserve the status quo applies globally.

Point, Click and Vote: The Future of Internet Voting, R. M. Alvarez, T. E. Hall, Brookings 04. This argues that there is no way to know whether any argument regarding Internet voting is accurate unless real Internet voting systems are tested, and they should be tested in small-scale, scientific trials so that their successes and failure can be evaluated. Policy recommendations for US trials are presented.

Information Societies, for Development.

A World Summit on the Information Society (WSIS) was launched in Geneva in 2003 to be followed up in Tunisia in 2005, both aiming to foster efforts by governments, civil society and private sectors, in economic, social and cultural development with special reference to the Millennium Development Goals. Some of the key issues which New Zealand supported include: - leaving Internet governance under its present system; the importance of access to information; preservation of cultural heritage, including electronic records; the role of libraries in community and education; language on cultural diversity and rights of indigenous peoples; and the establishment of a new, voluntary development fund to support information and communication development. *N.Z. Libraries*, September 04.

Two economists show from research that mobile telephony has an enormous potential to boost economic growth in poor countries, because the style of use differs from rich countries. The number of subscribers is lower than the actual rate of usage since there is much greater subletting and sharing. Poverty reduction does not depend on the technology alone, health and education improvements are necessary. *The Economist*, 12 March, 05, p 72.

The Information Revolution and Developing Countries, E. J. Wilson, MIT Press, 04, an exploration of the under-wired and under-connected shows that ICT systems can bring growth and equity but can also become powerful engines of inequity. Assumptions that the Internet diffusion will spread to poor countries in neat concentric patterns is simplistic and misleading. Self-mobilisation of the dispossessed with international support to create networks works best.

The End of Newspapers?

Media magnate R. Murdoch warned recently that newspapers risk becoming "also-rans" to the Internet. Younger readers, 18-34, are getting their news from the latter source which encourages them to expect news presentations on demand, with a personal level of engagement, while challenging assumptions.

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They also seek to be linked to other communities of like-minded people, and to other sources of information. More help is needed in filtering the significant from the trivial. *Business Review Weekly*, May 26-June 1, 05, p 69.

US policy researcher, D. Westin, *Colombia Journalism Review*, March/April 05, is hopeful for the future of print journalism if it focuses on the reporting of facts. The clash of ideas and explosion of new outlets is drowning out this reporting, which underlies the value of opinions, the strategies in the debate, but does not replace them.

Watch For..

Research by the US Dept of Defense could make it possible to replace the microphones in mobile phones with sensors which detect speech by the speaker's nerve and muscle movements rather than sound. *New Scientist*, 9 April, 05, p 21.

Photonic connections with electronic microchips will enable present copper-wired computing to be replaced in the next decade, at low cost, with the speed of light. *Scientific American*, Nov 04.

Digital and other biometric and photographic techniques are changing the representation of the human face. Humans have new powers to recreate their faces, but since our faces are vehicles for much of our communication, what impact will these powers have? *New Scientist*, 2 Oct, 04, and *Secrets of the Face*, S. Kemp, Profile Books, 04.

Unused radio spectrum could be utilised without interference to existing users if some of the existing licensed bandwidth is freed up as TV shifts from analogue to digital. Alternatively "underlay" in the licensed bands could be permitted. Huge possibilities for connectivity in countries such as China and India could result. *The Economist*, 14 August 04, Pp. 57-59

Economics/Business**Provocative Perspectives**

P. Drucker argues that while USA is likely to be the world's richest and most productive

economy for some time it is no longer the dominant one. The emerging world economy is pluralistic, with a number of economic "blocs": the US-dominated NAFTA, EU, MERCOSUR, ASEAN, China, India. More significantly there are four world economies: information, money, multinationals and a mercantilist one of goods, services and trade. The modern information economy is multidirectional, universal, and creates new affinities and awareness. Space is eliminated, resulting in the replacement of national economic protections with international rules and regulations. The money economy, based on the Bretton Woods system, is undermined by the US government deficit, a system which cannot continue indefinitely. The multinational economy comprises small to medium sized companies, and only a fraction are manufacturers or American. Their fastest growth is in Japan, Mexico and Brazil, built on partnerships. There is little understanding of how these multinationals are managed. The new mercantilism is a policy of "blocs", the integration units of the new economy. They provide the "home" market but are becoming more protectionist against the outside especially in relation to agriculture. The essential problem is that unless there are imports there cannot be exports. The new world economy needs a new economic theory. *National Interest*, Spring 05.

J. Jacobs, leading thinker on urban economies (not economics), based her analysis on natural systems, not on standard economic theories of growth, specialization, division of labour and standardization. D. Ellerman outlines Jacob's analysis, recent supporting studies for it, and its policy implications. *Challenge*, May-June, 05. Natural sun-based energy systems have an economic analogy in the energy of embodied knowledge. How this is used distinguishes the quality of the local economy. Innovations come as diverse people with multiple skills and complementary knowledge jostle in companies and as the latter jostle together in a symbiotic urban web. The spillover between the diverse elements is the key to growth.

To grow, the producers must also export, and by building on each other's shoulders, they develop. Thus, trading "blocs" at the same level

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of development stimulate their growth, but enforced "level playing fields" of unequal economies "kicks away the ladder". Innovation is best encouraged by parallel path strategies, diverse concurrent experiments towards a common goal, rather than seeking the one best way or efficiency with one selected aspect. The analogy also applies to Universities, where learners take their imports (of knowledge) and export them, with value-added.

Applied to work and enterprise creation, innovation lies in the multiple uses and recombinations of a technology or knowledge input. Companies produce two types of products, the ones for which they were established, and the organisation of their trained people. They can either grow by getting bigger, or have offspring, such as partially owned spinoffs.

The Economics of Innocent Fraud: Truth for Our Time, J. K. Galbraith, Houghton Mifflin, 04. The fraud is the conventional wisdom of supply and demand, because producer power creates consumer demand. Another fraud is the that corporation management is subordinate to shareholder control. Legal systems should regulate corporations. And more.

Neoeconomy; George Bush's Gamble With America's Future, D. Altman, Public Affairs, 04. A dedicated group, the neoeconomists are seeking to revolutionise US by growing the economy to an equilibrium where living standards are far higher, by cutting taxes to encourage individual savings which would finance investment and accelerate growth. This is risky, it would widen inequalities of wealth, enrich the rich, and possibly collapse the capitalist system.

Around the Economies

The Economist, 4 Dec 04, p72 reports that if the US formed free trading agreements with all its trading partners it would gain at least \$450 billion annually, but it is not clear how this wealth would be distributed. The related job losses would be far less than the overall gains. Economic and finance experts D. H. Levey, S. S. Brown examine the evidence for the warnings of doom for the US economy as the national debt mounts. They conclude that a global, dollar-based regime will hold for a long time yet, as

there is no competitor. The only threat could come from rising protectionism and loss of competitive dynamism at home. *Foreign Affairs*, March/April, 05.

Tensions between India and Pakistan are easing as they jointly explore new possibilities for economic growth through cooperation to secure needed energy supplies. Environmental concerns are becoming more acute for both, as biomass and coal deplete forests and increase pollution. For both nations access to environmentally-friendly natural gas is a major solution, if piped from Iran, the Gulf States or Turkmenistan. This could be extended to Bangladesh or even Myanmar. Development of associated infrastructure such as roads requires cooperation. *East-West Center, Asia Pacific Issues*, No 75, Aug 04.

P. Mitra, D. Thompson note that trade is encouraging warmer relations between major rivals China and India. Indian companies are looking to China's skills as a manufacturing giant, while China seeks expertise from Indian IT services. They are reducing tariff barriers and may come to a free trade agreement. Competitive tensions are displayed in the increasing capabilities of their defense systems, especially naval, which both are modernising in order to secure their increasing needs for energy. Both pragmatically prefer a multipolar world which recognises their increasing significance. *Far Eastern Economic Review* (monthly), April 05.

The third round of negotiations for the *Global System of Trade Preferences Among Developing Countries (GSTP)*, 2004 allows such countries to provide trade preferences for products originating from other developing countries, without extension of such preference to developed countries. Currently South-South trade is running at twice that of the world average and it is hoped to build further export diversification across the three regions. *Third World Resurgence*, No 167-168, 05.

The recent Hui Taumata generated momentum for further development of the Maori role in the national economy. Demographics, stronger business skills and confidence point to greater results ahead. It is esti-

mated that forty-one billion dollars are locked up through the under-performance of Maori in employment and income generation. The Maori community needs to have an economy that serves Maori people's interests, that has a broader sense of social purpose, yet operates robust, profitable businesses. Proper care of assets means having a longer term perspective, a strategic time frame of a century. This affects the decisions made. *Management (NZ)*, May 05.

Business Ideas

The Hidden Power of Social Networks: Understanding How Work Really Gets Done in Organisations, R. Cross, A. Parker, Harvard Business School Press, 04. Better internal and external connections can be achieved if organisations can use social network analysis to get the most out of the hidden talent and ideas in their employees. It bypasses the formal planning diagrams and analyses the real information flows.

The Triple Bottom Line: Does It Add Up? Assessing the Sustainability of Business and CSR, Eds A. Henriques, J. Richardson, Earthscan, 04. In the last decade, this has gained wide acceptance as a major expression of corporate social responsibility (CSR). It is part of the global cultural revolution, the sustainability crisis, to overcome which only corporations have the resources, global reach and motivation.

The Moral Advantage: How to Succeed in Business by Doing the Right Thing, W. Damon, Berrett-Koehler, 04. Using forty-eight business leaders as case studies, four dimensions of business morality are examined: - generative (moral imagination), empathic (fostering trust and communication), restrictive (ethical do's and don'ts), and philanthropic.

Energy/Minerals

The Titans in Search of Energy

India and China are already competing commercially for secure energy supplies. The future geopolitical impacts could cause wider conflicts. India's energy minister reckons that the country's dependency on foreign supplies

will rise from 70% to 85% in fifteen years. China presently requires a third to be foreign sourced. Their joint demands and their growth rates are the biggest single factor in global energy demand. Oil and also gas, as LNG, are the main supplies needed. Some commentators consider that the tensions could be eased if there is greater regional and international co-operation. *Financial Times*, 26 April, 05, pp 12-15.

M. T. Klare, *Current History*, Dec 04, examines the geopolitical tensions arising from this thirst for energy, especially over the oil and gas pipelines. Many of the present tensions ascribed to ethnic or religious causes, eg Afghanistan, Angola, and Sudan are struggles between local power groups and international powers for oil and other valuable resources. The Caspian Basin illustrates the competition over the routing, building and control of oil and gas pipelines. Pipeline security is an ongoing security issue, for Saudi Arabia, Iraq, Algeria, Nigeria, Myanmar. Two other key factors in the geopolitics beside the global thirst for energy, are the shift of sources from easily accessible, mostly coastal sites to remote interior fields, and the growing politicization of energy production and transport. Violence associated with the pipelines is likely to be a significant feature of the world security environment, with unexpected shifts in alliances even between former adversaries. Arms races could develop.

The US government's unexpected, increasing interest in Africa, is examined M. T. Klare, D. Volman, *Current History*, May 04. Sub-Saharan Africa holds 7% of global energy reserves, chiefly in Nigeria, Chad, Gabon, Republic of Congo and Angola. Already the US Defense Dept is considering establishing a new Africa Command alongside existing commands for Europe, the Pacific, Persian Gulf and Latin America. An Africa Contingency Operations Training Assistance program is underway and military supplies to local governments are increasing. This US commitment could trigger extremist, violent, local opposition groups. See also *Blood and Oil: The Dangers and Consequences of America's Growing Dependency on Imported Petroleum*, M. T. Klare, Metropolitan Books/Hamish Hamilton,

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04.

R. M. Auty modelled the political economy of countries exporting oil under two different leasing systems, high and low. The latter, less common among such suppliers, encourages rapid GDP and facilitates democratic development. High-rentiers become locked into a "staple trap", frustrating diversification and democratic development. *Minerals and Energy*, Vol 19/4, 04.

Debate is intensifying over the potential of oil supply to meet demand. The peak oil movement bases its approach on analysis of oil geologists *M. K. Hubbert* and *C. Campbell*, and warns that the oil age is coming to an end. International Energy Association considers that if the necessary investment is made production is not threatened. NZ reactions are varied. *A. Janes*, *N.Z. Listener*, 13 Nov 04. See also a useful study, *The End of Oil*, *P. Roberts*, Bloomsbury, 04.

Why Carbon Fuels Will Dominate the 21st Century's Global Energy Economy, *P. Odell*, Multi-Science Publishing, 04, is an expert oil forecaster's perspective, focused on economics and technology. Better tools for exploration, production and refining can maintain supply and price signals will make difficult options, such as the massive Canadian tar sands, commercially viable. *J. Giles*, *Nature*, 17 June, 04, pp 694-695, explores some of the new techniques for extracting "every last drop" from existing sources. Currently 60% of the oil in reservoirs is not recovered.

Another perspective entirely, *Winning the Oil Endgame: Innovations for Profits, Jobs and Security*, *A. B. Lovins et al*, Earthscan, 04. A guru of the total industrial-ecology redesign movement offers sensible market-based policies for US or anywhere: - double efficiency of oil use, with vehicle redesign; use advanced biofuels to replace petrol; use natural gas efficiently and free the remainder to make hydrogen for fuel cells in cars.

Energy research experts *D. Yergin*, *M. Stoppard* outline the emerging global energy business of natural gas as a traded commodity. Its sources are global, with Russia as the Saudi Arabia. Suppliers and users are cementing new

relationships to secure long term supply and markets.

To transport gas by sea means liquefaction into LNG, and regasification on shore. One shipment is hugely cost efficient, since the gas is 600 times less voluminous refrigerated. Gas is chiefly an electricity source, and if used in the newer combined cycle gas turbines (CCGT) plants, can be produced close to urban users. Transport and technology improvements have lower costs, and the recent emergence of US as a gas importer has completed the development of a deregulated commodities market. Provided markets can work without disruptions and maintain necessary investment, LNG can continue to meet the demands for its environmentally friendly energy. *Foreign Affairs*, Nov/Dec 03.

Alternative Possibilities

Biofuels production is accelerating in a number of European countries, in US and China, encouraged by high oil prices and subsidies. Feedstocks come from a variety of sources according to local production, corn in USA, oilseeds and sugar beet in Europe, and animal fats. Biofuel production technologies are evolving. The biodiesel is usually used in cars as a mix, B5 in Europe (5% canola oil) or E10 in US (10% ethanol). *The Economist*, 14 May, p 59-61.

R. Priestley explores the prospects for the NZ biofuels industry, using the readily available feedstocks of tallow from meat-processing, and whey from milk processing. Tallow refining is proven in research and awaits the necessary investment for development, which is constrained by uncertain oil prices. Whey, converted to ethanol is already entering the vehicle fuels market. Other local sources include cellulose from timber and paper, and even municipal rubbish. *N.Z. Listener*, 2 July, 05.

The Hype About Hydrogen, *J. J. Romm*, Island Press, 04 argues that hydrogen is no panacea for fossil fuel replacement. Enormous investment is needed to develop infrastructure, and producing the hydrogen from any source save fossil fuels is as yet too costly. *L. Wald*, *Scientific American*, examines the Hydrogen Economy and concludes that hydrogen may eventually have a role in some niche applica-

tions but not as a transport fuel. *Science*, 13 Aug 04, offers a number of expert perspectives on the possible Hydrogen Economy and the related climate mitigation issues. These include a study of the Icelandic progress with hydrogen (the fishing fleet is the major target), intermediate technologies, stabilizing carbon dioxide levels with current technologies, progress on carbon sequestration, and the various options for large scale hydrogen production.

To meet its accelerating energy needs and deal with some of its severe pollution problems, China plans a massive nuclear energy programme starting with thirty existing-type systems and eventually aiming to have two hundred. Chinese nuclear technologists are developing the new type, a pebble-bed reactor which is smaller, safer and cheaper than existing types. It could eventually be used to produce clean hydrogen. *Wired*, Sept 04. A ten nation consortium is selecting from six innovative designs for the Generation IV International Forum (GIF) nuclear power plants, which could produce several prototypes to replace current models and also produce hydrogen. They are not water-cooled, run at very high temperatures which convert far more efficiently into electricity and some models do not need to reprocess plutonium. *Nature*, 20 May 04, Pp. 238-240

A. T. Jones, A. Westwood analyse the potential of Ocean Power, *The Futurist*, Jan-Feb, 05. Several countries, notably UK, have successfully developed such capacity, either using off-shore wind generation systems or the less-mature technologies of tidal and wave systems. This industry is expected to grow over the next five years as new technologies become commercial, with government support and favourable market conditions.

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