

GENETIC ENGINEERING AND AUSTRALIAN AGRICULTURE: AGENDA FOR CORPORATE CONTROL¹

Geoffrey Lawrence

Commercial agriculture in Australia is heavily reliant upon productivity-boosting technologies. It is through improvements in productivity and the sale of an increased volume of rural products at home and abroad that farmers have been able to counterbalance the overall decline in the terms of trade for agriculture.

The 'technological imperative' built into modern farming has resulted in the adoption of an increasingly sophisticated mechanical and chemical input mix for agriculture, in the decline in the number of rural producers and in the growth of farm size. Agri-genetics - the application of the principles of biotechnology to agriculture - would appear to hasten these tendencies. Its influence in strengthening the concentration and centralisation of capital in agriculture and in encouraging the economic polarisation within particular agricultural industries has not been assessed in Australia. Evidence from the U.S. would suggest that traditional family farming may be disadvantaged by the application of agri-genetics.

This article examines the structural tendencies in Australian agriculture, discusses some recent agri-genetics research in Australia, and evaluates findings from abroad regarding the application of new products, as a means of assessing the likely impact of new biotechnologies upon Australian agriculture.

1 This is a shortened and updated version of a paper presented to the Annual Conference of the Sociological Association of Australia and New Zealand, Australian National University, Canberra, 28 November-2 December, 1988.

Technology and Agriculture

Commercial agriculture in Australia is tied intimately to the productivity-boosting technologies supplied by transnational agribusiness. Improvements in productivity and major increases in the volume of rural output have acted to counterbalance the overall decline in output prices relative to input prices (the terms of trade). The acquisition of more land by farmers and the use of newer technologies is the main means of improving individual performance. Average farm size has increased and the numbers of farm operators has fallen. From an estimated 203,350 properties in 1951-52, the number of commercial farms had steadily eroded to a level of 169,000 in 1988-89.

Several reasons have been advanced to explain the long term decline in the terms of trade for agriculture. The competitive export market in rural products, protectionist measures in competing nations, reductions in demand growth in developing nations, and favourable seasons abroad would seem to be part of the explanation.[2] But the main force appears to be technology itself. As economists have posited:

Technological change has allowed sustained growth in production, while also providing consumers of agricultural products with substitutes for some of these products (for example, synthetic fibres). These effects of technological change usually outweigh any increases in demand resulting from population and income growth, thereby causing real agricultural prices to fall. (Friemann, 1987:176)

There is a suggestion that the rate of structural change in agriculture should be accelerated so that the efficient producer can survive and prosper in the face of increased competition from abroad (National Farmers' Federation, 1981:53). It is recognised that the 2 per cent per annum growth in Australian farm productivity is substantially lower than 2.7 per cent per annum decline in the terms of trade for agricultural goods, making it apparently necessary for farmers to use the latest technologies to remain viable (Lloyd, 1986:224).

Farmers who are reluctant to make the appropriate on-farm changes, or are unable to borrow to purchase new lands and technologies, are considered to be destined for bankruptcy. The alternative is to work harder, take off-farm employment to supplement farm income, or develop novel

products or service activities. There are severe limits to each of these options (Lawrence,1987).

In most rural areas the decisions of rural producers to expand property size to take advantage of scale economies and to harness new technologies has had a marked effect on the structure of farming and upon the wider rural community. Yet these developments are taken as evidence that agriculture is serving the best interests of the nation (Malcolm & Lloyd,1987; Campbell,1980). After all, the most 'efficient' farmers are expanding and resources are being employed in a manner which is in accord with principles of economic efficiency (reduction in the costs per unit of farm output).

Technology is considered to be a positive force which will unequivocally benefit the world as a result of its ability to stimulate food and fibre production. It is also seen to be the mechanism by which Australian farmers can improve their position vis-a-vis competitors and maintain viability in the face of cost increases and deteriorating world prices (Friemann,1987; Campbell,1980).

Technology is viewed as the catalyst of progress in the agricultural sector and of progress in wider society. With the existing structure and dynamic of world capitalism as a 'given' in the model of commercial agriculture, recommendations from orthodox agricultural economists tend to be for the application of more productivity-increasing techniques and methods in farming, the accelerated movement from agriculture of the least efficient producers, the integration of family farming with the agribusiness sector, and the further exposure of the agricultural sector to world market forces. This process also involves the removal of the state from agricultural marketing and commodity underwriting (Friemann,1987; Fisher,1986; Lloyd, 1986; NFF, 1981; Campbell,1980).

However, the fusion of the interests of industrial capital with commercial farming would not seem to help the reproduction of commercial family-farm agriculture. Rather, it would appear to transform agriculture and rural society in a polarising manner, one consistent with the dynamics of wider capital accumulation (Lawrence,1987).

Social scientists Goodman, Sorj and Wilkinson (1987) describe two crucial ways in which the new technologies influence farming. *Appropriationism* is the name given to the process by which industrial capital

attempts to remove the barriers which the biological nature of agricultural production places in the way of corporate control of farming.

Industrial capital selects particular aspects of agricultural production and converts these into industrially-produced inputs prior to their re-incorporation into farming. The examples here are the various manufactured products used by most commercial farmers - fertilisers, insecticides, farm machinery and so forth. In earlier decades farmers employed crop rotations and animal manure as a fertiliser regime, natural substances to ward off insects, and horses to draw agricultural machinery. The appropriation of such inputs has enabled significant increases in output, but the legacy has been to place farmers in a position of dependency. Farmers are now heavily reliant upon manufacturing capital for productivity increases.

Through the second process, called *substitutionism*, corporate capital involved in food processing has sought to reduce its reliance upon farming. It has done this by attempting to produce food through industrial rather than agricultural processes. Cheese production, margarine manufacturing and the canning of processed meat and vegetable products represented an earlier form of substitutionism. New forms seek to 'decompose' natural products (corn, wheat flour, sugar) into substrates which can be reformulated as manufactured or reconstituted products. When reduced to their basic ingredients and transformed with chemical additives, preservatives, flavourings and flavour enhancers, or when substrates can be converted to new products (or more cheaply produced products) by genetically engineered micro-organisms, food production can take place in the factory rather than on the farm.

Appropriationism and substitutionism represent attempts by capital to overcome biological limitations to corporate penetration of agriculture. It is through substitutionism, however, that the processes of structural change in agriculture are taken to their limit.

While appropriationism transforms rural into industrial activities and thereby weakens the constraints of nature, the capitals constituted by this dynamic nevertheless retain symbiotic links with rural-based production...Substitutionism, however, [reduces] the rural product to a simple industrial input, opening the way to elimination of the rural production process, either by utilizing non-agricultural raw materials or by creating industrial substitutes for food and fibres Nature, whether as land, space or biological reproduction, then

no longer poses a binding constraint to the capitalist transformation of the production process and the social division of labour. (Goodman, Sorj and Wilkinson 1987:pp.57-8)

Australian farmers, who must use expensive industrial inputs to boost production (appropriationism), are now also finding that their farm products compete with industrially-manufactured foodstuffs (substitutionism). Their farm output is 'trivialised' because it becomes one of many competing inputs to the industrial food production system. Over time their land may be cheapened as a factor of production because foodstuffs can be created inexpensively in laboratory or factory settings. What was once a recognisable and largely impenetrable barrier between agriculture and industry is progressively removed.

The techniques of genetic engineering are being employed to assist scientists to transcend the biological limits to plant and animal growth. These technologies not only promise to raise output and increase the biological efficiency of existing species, but may also result in the production of entirely new forms of life. Some of the economic benefits which may flow from the application of genetic engineering in agriculture include the development of nitrogen-fixing cereal crops, the reduced use of pesticides in animal production systems (through the application of genetically-engineered vaccines), reduction of agrichemicals through the development of pest and disease resistant crops, and the use of genetically-engineered micro-organisms to decompose agrichemicals which persist in the environment (Peacock,1988; Australian Environment Council,1987; Longworth,1987). Microbiologically-produced animal growth hormones are already beginning to have a noticeable impact upon agriculture.

Bovine Somatotropin: the likely impact.

The possible impact of new biotechnologies has been discussed at length by social scientists in the United States (Buttle, 1986), but has not been well assessed by Australian research (although see Lawrence, 1987; Longworth,1987; Hindmarsh,1988). It is useful to review the US studies as they point to the likely dislocations and transformations which might be expected to occur in Australia. Bovine Somatotropin (BST) is a growth hormone which is prepared in a laboratory following the insertion of the

somatotropin gene in a recombinant microorganism. Injected into dairy animals, BST is capable of increasing milk output by between 25 and 30 percent with little increase in food intake. The hormone is expected to be released throughout the US during 1989. *Ex ante* socioeconomic studies (those seeking to establish likely impacts before the event) have shown that about 80 per cent of producers would be expected to adopt the product within the space of five years. Not all producers it seems, will benefit. According to Robert Kalter of Cornell University:

at the farm level there will be clear winners and losers ... Superior farm managers - often with large farm holdings and a secure financial position - will be the first to take advantage of the new technological innovations... and therefore [will be] the survivors.... In addition to the financial benefit that early innovation provides, it also allows an operator to move up the learning curve for the new technology before price begins to decline and additional productivity becomes necessary for survival.... The introduction of biotechnology will probably accelerate the trend toward fewer and larger farms, and the structure of agriculture will tend more and more toward specialization.... Only specialization permits the focus necessary for superior management. (Kalter, 1985:129-31)

While there is an existing trend toward larger and more specialised farming operations in the US, BST is likely to hasten change in that direction. US dairying is in a position of chronic over-supply. Questions have been raised about the appropriateness of a technology which will lead to an increase in aggregate milk production and to the removal of more farmers from the dairy industry. Such an outcome will also place more pressure on the Bush administration to support the price of milk above the average costs of production. Ironically it is at the Universities of Wisconsin-Madison and Cornell (in dairying states) where most of the new biotechnological research is carried out. Farmer and community groups have questioned the use of state money on experiments which may undermine the economic base of family farming in those states (Buttel, 1986; Buttel, 1988). It is estimated that the introduction of BST will result in a 30 to 35 per cent reduction in dairy farm numbers within five years and that the majority of those leaving the industry will be small operators.

In 1987 Australian scientists produced a hormone similar to BST from modified yeast cells, capable of giving a 40 percent boost in milk production. While there has been no attempt to assess this development it is possible to use the American example to highlight possible changes. It will become virtually compulsory for all Australian dairy farmers to purchase the hormone. If it is patented and marketed by an agribusiness company the costs of this hormone input to farming may become prohibitive for smaller producers.

As in the US, surplus output is likely to result. In this case Australian states will seek to increase the rate of adjustment by allowing the 'efficient' (read larger) farmers to survive and to help from the industry those no longer able to compete (the smaller producers). Structural change in dairying has been a major feature of Australian agriculture over the past two decades. Farms have grown in relation to herd size and output and their numbers have declined from a level of about 63,000 in the mid 1960s to 18,000 today. Biotechnology is likely to ensure the process of decline continues.

Those farmers marginalised by the new technology will require off-farm work, quite possibly their only farm survival option. The impact on local communities of the decline in producers, and the likely decrease in social interaction, is largely unquantifiable. Nevertheless, there are important negative outcomes resulting from the capitalisation of agriculture. For each person leaving farming in Australia there is an associated reduction of one person from the rural town which services the farm (Lawrence, 1987). Given the narrow employment base of most rural towns, downward multipliers are set in motion which lead to the further contraction of economic activity and more job losses. This results in increasing poverty and social stress in rural communities. Those farmers requiring off-farm work to supplement falling returns in agriculture find that the options have disappeared, placing increased pressure on the farmers to leave agriculture. The state encourages this and (in the absence of any real commitment to decentralisation) rural Australia is populated by fewer people who must travel further for access to services and facilities. Approximately one third of Australian country towns are in absolute decline and unemployment and poverty levels are higher than those in the cities (Harris & Vitols, 1986). Rural women bear the brunt of much of the change, being forced to sell their labour off the farm to keep

the farm household viable (Office of the Status of Women,1988; Leonard,1986).

The capitalisation of agriculture brings with it unintended consequences which include an increase in stress and ill-health among farming families, an increase in suicide rates, the 'redundancy' of older farmers and the decline in rural social activity (including participation in voluntary agencies). While technology per se is only partly implicated in this decline, its effects may be seen to be real and negative.

Moreover, the social structure of the dairy industry will change with agribusiness wanting to contract with the larger producers. According to a senior executive of Adsteam the evolution of 'corporate feedlot dairy farms' is inevitable. An agribusiness firm like Adsteam will provide the base capital and the expertise. It will issue production contracts to share farmers who will offer their land, money and labour for a guaranteed share of the profits. Production will be neatly divided into three specialised activities under the overall direction of the agribusiness firm. Some contract farmers will be 'feed farmers'; others will be 'breeders' responsible for herd replacement and care of dry cattle; a third group will be responsible for milking operations (National Farmer,2 Oct.1987,13). Any independence or autonomy on the part of the farmer will have been traded for a tenuous stake in corporate profit-making.

Family-farm activities will come increasingly under the direction of a few large firms. On the input side, these firms have the economic capacity and legal right (guaranteed by ownership of patents) to set prices for the new inputs. On the output side, they possess the market position to dictate to producers how they are to organise their operations. Whereas biotechnologies have the potential for reducing the dependence of the farmer on expensive agricultural inputs and of improving the market strength of individual producers, the ownership and control of the new technology would seem to lead instead to the subservience of farming to agribusiness.

Agriculture and the Corporate Control of Agri-genetics

Corporations are employing new biotechnologies in specific ways, and the state is assisting with particular measures, designed to develop the forces of production in agriculture. In past decades, hybrid seed technologies in both the private and public domain aided the growth of the

agribusiness industry. Hybrid seeds have required heavy doses of insecticides, herbicides and fungicides to achieve their high volume output. On most soils such output has been achieved only with increased applications of synthetic fertilisers (Kloppenborg, 1984). Machinery has had to be specifically designed for this new agriculture (Goodman et al., 1987).

Such appropriationism has now been extended via the emerging agricultural biotechnology industry. Corporations are viewing the seed as a 'delivery system' for their wares. If a corporation can genetically alter a seed so that various biological limitations can be transcended such things as salt, drought and chemical tolerance can become the bases for new profit-making opportunities. It is for this reason that corporations with interests in chemicals, oils, pharmaceuticals and food processing have begun to integrate vertically their activities. Many companies are now attempting to develop seeds compatible with their own proprietary agri-chemicals or to breed animals which will suit the assembly line, automated, system of food production.

The Role of the State

The state in Australia has played a major role in agricultural research and development which has aided the family-farm sector in past years. It now appears to be redirecting its activities to complement the profit-making demands of the corporate sector. The state has introduced specific measures to expand and protect the development of a corporate-sector biotechnology industry in Australia. To achieve this it has introduced economic incentives for investment in biotechnology in Australia. In the view of the Federal Government, research and development is sadly lacking in Australia (Australia, 1988). Rather than seeing this as a part of the policy of overseas-based transnationals to centralise costly R and D activities abroad, the Government considers that the problem is a lack of incentives for investment in Australia. Once defined in this way the solution is to provide concessions and tax breaks to provide capital inflow and investment. The Government's Management and Investment Company (MIC) licences to venture capital firms are one example of attempts to subsidise corporate investment.

Another change has been in the reorganisation of the Commonwealth Scientific and Industrial Research Organisation (CSIRO). The CSIRO has

altered its priorities regarding appropriate research, with biotechnology being designated one of the key technology ('sunrise') areas. An explicit aim is to fit publicly-funded research more closely to the needs of industry. Over the next four years, the CSIRO expects to double the level of funding it receives from private sources.² It currently expends about 10 per cent of its budget on biotechnology and this percentage is likely to rise as cuts are made in more traditional areas. In the August 1988 budget, funds to the CSIRO were cut in real terms by almost 9 per cent, adding to a 23 per cent overall reduction of funds in the last four budgets (The Australian, 14 August 1988, 11; Law Reform Commission, 1988). The organisation has re-drafted promotion criteria to aid those scientists involved in commercial activities, and it has sought to ensure that collaboration will generate private knowledge. As Dr. Keith Boardman, Chief Executive of the CSIRO, noted:

Communication and research findings will have to be constrained to allow patents to be obtained, or industrial collaborators to obtain the commercial benefits of the research in some way. (Commission for the Future, 1988)

To facilitate the privatisation of biological knowledge, scientists are being required to sacrifice the traditional freedom of publication to protect the interests of clients (Vinall, 1988).

The strengthening of the patent system to protect the interests of those involved in commercialising products of biotechnology adds another string to the bow of the corporations. The Plant Variety Rights Act of 1987 provides legal protection for new plant varieties developed by either selective breeding or by gene manipulation and transfer. The more general Patent legislation allows companies developing novel forms of life (including genetically-engineered species) to hold 16 year patents. As the Australian Consumers' Association (ACA) argued in its submission to the Victorian Law Reform Commission, Australia appears to be adopting 'derivative policies' which are inappropriate to the needs of citizens and potentially disadvantageous to Australian industry. It has called for a

2 *Some collaborative work has struck difficulty. Research into barber's pole worm (a pest which currently costs farmers millions of dollars annually) was stopped because of concern over intellectual property rights. The CSIRO's commercial partner is reported to have destroyed all existing results for fear they might have been leaked to a rival company.

review of the patent system (Australian Consumers' Association, 1988).

The ACA has also recommended review of the regulatory system for recombinant DNA research. At present, Australia has a system of monitoring which is based upon voluntary guidelines and self-appraisal. Yet regulation via voluntary guidelines has no legal status. Those involved in research need not notify anyone of their experiments. They need not follow the safety procedures laid down by the Recombinant DNA Monitoring Committee. Indeed, they may choose not to abide by the ethical guidelines established by the National Health and Medical Research Council.

Peer group pressure is a flimsy basis for the policing of developments in such a lucrative field as biotechnology. The secretive work of scientists leaves little opportunity for public scrutiny of projects. In agriculture, a firm is not required to discuss with any organisation the likely effects of the release of these new forms of life. It is neither obliged to inform anyone of its experiments nor to conduct an environmental impact study following release of the genetically-engineered species (Law Reform Commission 1988; Australian Environment Council 1987; Hobberlink 1987; Goodman et al. 1987).

There is no national statutory framework covering those experimenting with or commercialising biotechnologies. Despite concerns raised by a number of lobby groups, this is in keeping with the Government's stated desire to reduce the level of regulations as a means of both promoting private investment in rural research and of transnationalising Australian agriculture (Dept. of Trade 1987). The state is promoting agribusiness unapologetically as the most desirable system for food and fibre delivery in Australia. Input/supply and output/processing agricultural activities, already heavily dominated by large transnational agribusinesses (Lawrence 1987; Sargent 1986) will become increasingly owned and/or influenced by the corporate sector.

The Department of Trade has argued that Australian agriculture must link with international corporate structures if it is to remain a viable long term export sector. Corporate agribusiness is perceived to be the most appropriate vehicle for the penetration of new markets, particularly those in less developed economies. As processing agribusiness operations add value to exports, such operations are seen to enhance Australia's capacity

to earn extra revenue from agriculture. In keeping with this export-oriented logic, the Department of Trade has identified various barriers to agribusiness development which include government regulations, protectionist policies (in Australia and abroad) and existing state structures as those which may frustrate forward and backward linkages between components of agribusiness.

Of significance here are the Statutory Marketing Authorities (SMA's). Established to protect the interests of the smaller family-farm operator, the SMA's operate as grower monopolies, increasing the bargaining power of farmers in industries such as wool and wheat. The Department of Trade believes the SMA's represent a sizeable barrier to the integration of farming with existing agribusiness functions of input supply, processing and distribution (Dept. of Trade 1987:65,91). If such barriers were removed, it is argued, Australian farmers may have greater opportunity to participate in global agribusiness developments.

Contractual ties between corporations and farmers are endorsed by the Department of Trade as a means of making farming more responsive to the market perceptions and judgements of corporate capital. Yet:

it is by no means clear that in the longer term the benefits of this system are equally distributed among the main participants.... There is considerable evidence that short term gains to farmers are usually superseded by longer term disadvantages, as over time the processors attempt to re-negotiate and re-define the contract relationship.... farmers everywhere can only come under pressure to produce on terms most favourable to the large supermarkets or fast food chains.(Burch et.al. 1988:139)

Burch et.al. conclude that the model likely to develop in Australia is one where large corporate controlled farms which employ a manager and workers whose labour is relatively unskilled will be utilising the latest agribusiness technologies to provide food under contract to retail chains:

ultimately, processes of vertical integration may lead to a unified system of production and marketing, as large corporations come to organise the total process from the farm to the kitchen.(140)

It is clear from the foregoing analysis that biotechnology will be crucial to the evolution of these developments.

Assessment

Although the state is anxious to force agriculture to conform with the interests of transnational capital there is some concern that biotechnological advances will not provide the productivity boosts needed to re-assert Australia's previously strong position in world agricultural trade. Not only are traditional food and fibre importing nations looking to biotechnology to provide self sufficiency, but the protectionism of Australia's competitors (like the US and EEC) are likely to become major barriers to increased exports. The present course of Australian agriculture provides no guarantee that farmers will have control over the nature of economic developments in agriculture or that the benefits from productivity-related innovations will be generalised throughout the community. The example of Bovine Somatotropin highlights the potentially polarising nature of the introduction of products of agri-genetics.

Biotechnologies and other labour-saving technologies will not come to dominate because of their inherent social desirability. Rather:

the neoclassical theory of the firm forms the basis of thinking about production [and because] farmers and researchers come to work within this frame, excluding, by default, alternative technologies and the possibility of developing non-traditional farming systems. Within the normal operation of the 'free market' there is, therefore, an inbuilt tendency towards large scale production, a high division of labour and the demise of smaller farmers. (Kingma 1985)

It is important to recognise the contradictory nature of the extension of biotechnology into agriculture. Whereas the new products have the potential to enhance human welfare by eliminating food scarcity, the distribution of benefits will ultimately be determined by the economic interests of those who own and control the new technologies. Instead of aiding farmers by helping to reduce the costs of production, many of the innovations will add substantially to the costs of farming and threaten the smaller producers with economic marginalisation.

The state is involved in the contradictory processes of *accumulation* and *legitimation*. It must assist in the growth of the forces of production in agriculture by encouraging corporate farming, but must also retain the

support of those who are affected by changes to the economic organisation of agriculture.

To aid capital accumulation the Labor Government has been orchestrating changes in public sector policy. It has withdrawn its support from traditional areas of agricultural research and increased expenditure on biotechnology. It has also implemented changes designed to deregulate and privatise agriculture. The National Party (the supposed champions of family-farm agriculture) have been forced to take a stand. However, the party is linked with a Coalition partner which views restructuring as necessary and being forced by a right-wing National Farmers' Federation to ignore the cries from small farmers, in the name of a 'free-enterprise' agriculture. The dismantling of interventions which have aided family-farm agriculture may force a break between the Nationals and the Liberals if farmers become increasingly disillusioned with the trajectory of corporate agriculture.

The politicisation of rural policy already has a focus in rural research. CSIRO scientists have been placed in the contradictory position of having to undertake corporate research yet remain state-paid workers subject to public accountability. Scientists recognise that the state is forcing them to collaborate with industries which set the research agenda. The ethos of neutrality is either sacrificed or heavily compromised in the pursuit of corporate profits. However, the politicisation of science may help to make transparent the degree to which public funds are being appropriated by corporate enterprises.

The final contradiction relates to the environment. At the same time as biotechnology promises abundance through the creation of novel forms of life, there exists the possibility that such experimentation will lead to species extinction and environmental destruction. The likelihood of environmental damage is heightened in a situation of scientific self-regulation and of voluntary guidelines for experimentation.

To sum up, biotechnology will remain an exciting development. Farmers would be greatly advantaged if they could eliminate fertiliser costs by utilising nitrogen-fixing cereals, could reduce reliance upon pesticides and weedicides by planting more hardy, disease resistant crops, or could ensure the health of herbivorous animals by using bloat-safe lucernes and clovers. The reality is that, in the context of the extension of privatisation within advanced capitalism, the corporations backed by patent rights over

new life forms are likely to determine the course of Australian agriculture. This is unlikely to be a course which will advantage the bulk of farmers, consumers or the environment.

References

- Australian Consumers' Association(1988), Submission to the Law Reform Commission, Victoria, 28 June
- Australian Environment Council(1987), *Environmental Protection and Biotechnology*, Department of the Arts, Sport, The Environment, Tourism and Territories, Canberra, November
- Australian Government(1988), *Policies for Growth*, AGPS, Canberra, May
- Burch,D., R. Rickson & I. Thiel, 'Contract Farming and Social Change: The Implications of the Australian Experience', in Hindmarsh et.al.(eds)(1988)
- Buttel,F.(1986) 'Agricultural Research and Farm Structural Change: Bovine Growth Hormone and Beyond', *Agriculture and Human Values*, Fall
- Buttel,F.(1988). 'Social Impacts of Biotechnology on Agriculture and Rural America...', Cornell Rural Sociology Bulletin, No.150, Department of Rural Sociology, Cornell University, Ithaca
- Campbell,K.(1980), *Australian Agriculture*, Longman Cheshire, Melbourne
- Commission for the Future(1988), *In Future*
- Curran,B., P. Minnis and J. Barkalor(1987), 'Australian Agriculture in the International Community' *Quarterly Review of the Rural Economy*, 9, 1, February
- Department of Trade(1987), *Agribusiness: Structural Developments in Agriculture and the Implications for Australian Trade*, Trade Research and Policy Discussion Papers, No.4, July
- Fisher,B.(1986), 'Policy Options for Australia's Rural Recession', *Australian Quarterly*, Winter
- Friemann,J.(1987), 'Australian Agriculture: Its Future Structure and Role', *Search*, 18, 4, July/August
- Goodman,D., B. Sorj and J. Wilkinson(1987), *From Farming to Biotechnology*, Basil Blackwell, Oxford
- Harris,G. & M. Vitols(1986), 'Unemployment in Australian Rural Towns', *Australian Bulletin of Labour*, 13,1
- Hindmarsh,R.(1988), 'Social Impact Assessment, Biotechnology and Third World Development' in R.Hindmarsh et.al.(eds), *Papers on Assessing the Social Impacts of Development*, Institute of Applied Environmental Research, Griffith University, Brisbane
- Hobberlink,H.(1987), *New Hope or False Promise?*, International Coalition for Development Action, Belgium

Kalter,R.et.al.(1985), *Biotechnology and the Dairy Industry*, Department of Agricultural Economics, Cornell University, Ithaca

Kingma,O.(1985), *Agribusiness, Productivity, Growth and Economic Development in Australian Agriculture*, Research Monograph No. 22, TNC Research Project, University of Sydney, Sydney, October

Kloppenborg,J.(1984), 'The Social Impacts of Biogenetic Technology in Agriculture: Past and Future', in G. Berardi & C. Geisler (eds), *The Social Consequences and Challenges of New Agricultural Technologies*, Westview, Boulder

Law Reform Commission of Victoria(1988), *Genetic Manipulation*, Discussion Paper No. 11, Law Reform Commission, Victoria

Lawrence,G.(1987), *Capitalism and the Countryside*, Pluto, Sydney,

Leonard,S.(1986), *Who is on our Selection?*, Centre for Continuing Education, Wangaratta

Lloyd,A.(1986), *Rural Economic Study*, Victorian Government, Melbourne, July

Longworth,J.(1987), 'Biotechnology: Scientific Potential and Socio-economic Implications for Agriculture', *Review of Marketing and Agricultural Economics*, 55, 3, December

Malcolm,L. & A.Lloyd(1987), 'Agriculture in the Economy', in D. Connor & D. Smith (eds), *Agriculture in Victoria*, Australian Institute of Agricultural Science, Melbourne

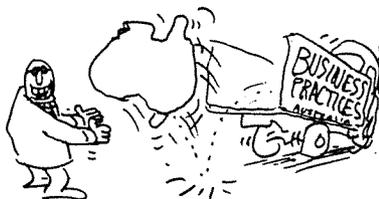
National Farmers' Federation(1981), *Farm Focus: The 80's*, National Farmer's Federation, Canberra, January

Office of the Status of Women & Country Women's Association of Australia(1988), *Life Has Never Been Easy*, AGPS, Canberra

Peacock,J.(1988), 'Farming with Genes', Genes in the Service of Society Symposium, ANZAAS Centenary Congress, Sydney

Sargent,S.(1986), *The Foodmakers*, Penguin, Ringwood

Vinall,C.(1988), 'Protecting an Innovation', Commercialisation of Agricultural Technology Seminar, Adelaide, 6 May



Copyright of Full Text rests with the original copyright owner and, except as permitted under the Copyright Act 1968, copying this copyright material is prohibited without the permission of the owner or its exclusive licensee or agent or by way of a license from Copyright Agency Limited. For information about such licences contact Copyright Agency Limited on (02) 93947600 (ph) or (02) 93947601 (fax)